Operating Instructions

Pressure sensor with metallic measuring cell

VEGABAR 39

Three-wire: transistor, 4 … 20 mA (active)

Document ID: 57536

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1 About this document

1.1 Function

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

1.2 Target group

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

1.3 Symbols used

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

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

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

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

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

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

Ex applications
This symbol indicates special instructions for Ex applications.

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

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

Disposal
This symbol indicates special instructions for disposal.

2 For your safety

2.1 Authorised personnel

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

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

2.2 Intended use

The VEGABAR 39 is a pressure transmitter for process pressure and hydrostatic level measurement.

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

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

2.3 Warning about incorrect use

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

2.4 General safety instructions

This is a state-of-the-art instrument complying with all prevailing regulations and directives. The instrument must only be operated in a technically flawless and reliable condition. The operating company is responsible for the trouble-free operation of the instrument. When measuring aggressive or corrosive media that can cause a dangerous situation if the instrument malfunctions, the operating company has to implement suitable measures to make sure the instrument is functioning properly.

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

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

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

2.5 Installation and operation in the USA and Canada

This information is only valid for USA and Canada. Hence the following text is only available in the English language.

Installations in the US shall comply with the relevant requirements of the National Electrical Code (NEC - NFPA 70) (USA).

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

3 Product description

3.1 Configuration

Scope of delivery

The scope of delivery encompasses:

- VEGABAR 39 pressure transmitter
- Information sheet "*Documents and software*" with:
  - Instrument serial number
  - QR code with link for direct scanning
- Information sheet "*PINs and Codes*" (with Bluetooth versions) with:
  - Bluetooth access code
- Information sheet "*Access protection*" (with Bluetooth versions) with:
  - Bluetooth access code
  - Emergency Bluetooth unlock code
  - Emergency device code

The further scope of delivery encompasses:

- Documentation
  - Quick setup guide VEGABAR 39
  - Ex-specific "*Safety instructions*" (with Ex versions)
  - Radio approvals (versions with Bluetooth)
  - If necessary, further certificates

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

Constituent parts

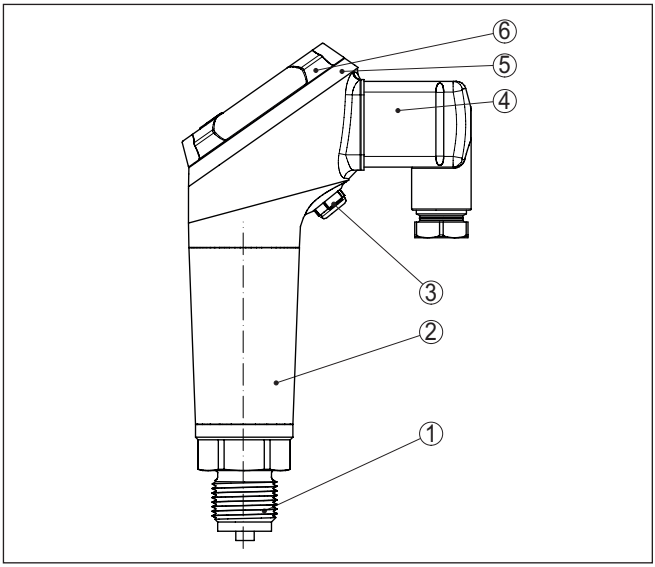


Fig. 1: Components of VEGABAR 39

1 Process fitting
2 Electronics housing
3 Ventilation/pressure compensation
4 Plug connector
5 LED illuminated ring
6 Display/adjustment unit

Type label

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

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

Documents and software

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

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

3.2 Principle of operation

Application area

VEGABAR 39 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 device is especially suitable for applications with higher temperatures and high pressures.

Measured variables

The VEGABAR 39 is suitable for the measurement of the following process variables:

- Process pressure
- Level

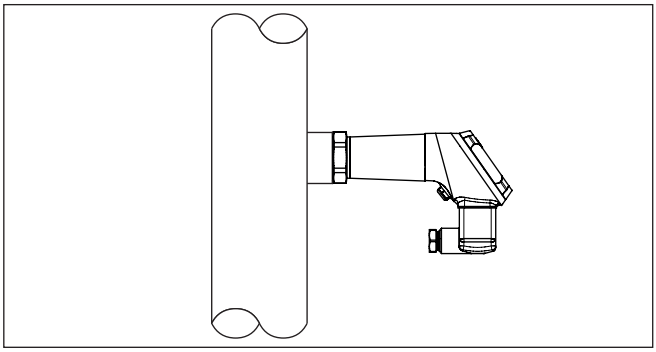


Fig. 2: Process pressure measurement VEGABAR 39

Measuring system

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

Piezoresistive sensor element

Measuring ranges up to and including 100 bar: piezoresistive sensor element with internal isolating liquid is used.

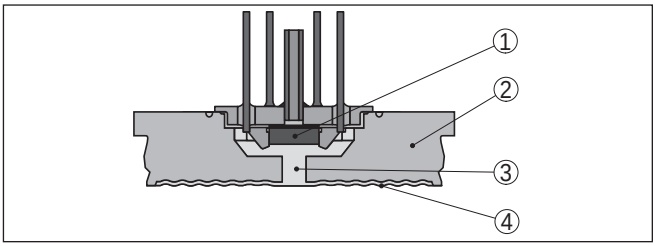


Fig. 3: Configuration of the measuring system with piezoresistive sensor element

1 Sensor element
2 Base element
3 Isolating liquid
4 Process diaphragm

Strain gauge (DMS) sensor element

For measuring ranges above and including 250 bar, a strain gauge (DMS) sensor element (dry system) is used.[1)]

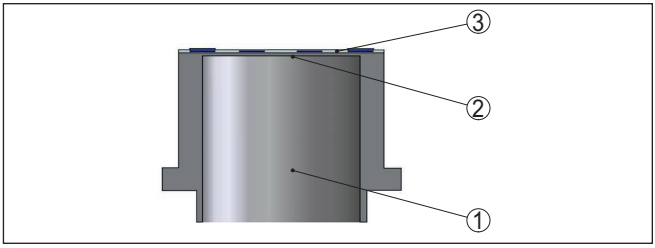


Fig. 4: Configuration of the measuring system with strain gauge (DMS) sensor element

1 Pressure cylinder
2 Process diaphragm
3 Sensor element

Measuring system temperature

A temperature sensor on the respective sensor element for pressure records the current process temperature. The temperature value is output via Bluetooth, for example.

Pressure types

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

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

Seal concept

The measuring system is completely welded and thus sealed against the process.

[1)] For cleaning procedures "free of oil, grease and silicone for oxygen applications" also for measuring range 100 bar

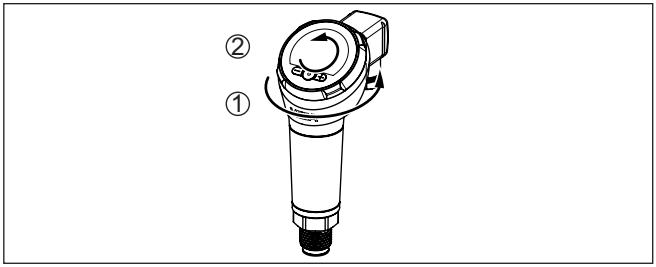
The process fitting is sealed against the process by a suitable seal. It must be provided by the customer, depending on the process fitting also included in the scope of delivery, see chapter "*Technical data*", "*Materials and weights*".

3.3 Adjustment

Local adjustment

The integrated display and adjustment unit is used for on-site adjustment of VEGABAR 39.

For convenient reading and operation in any installation position of the device, the housing and display and adjustment unit can be rotated without tools.



1 Rotating the housing by 330°
2 Rotating the display and adjustment unit by 270°

Wireless adjustment

Devices with integrated Bluetooth module can be adjusted wirelessly via standard adjustment tools:

- Smartphone/tablet (iOS or Android operating system)
- PC/notebook (Windows operating system)

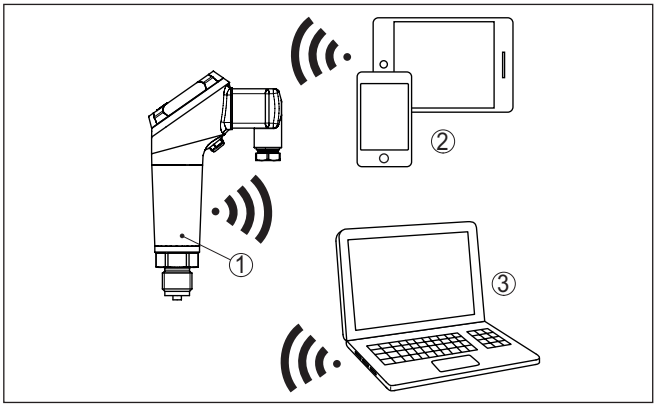


Fig. 5: Wireless connection to standard operating devices with integrated Bluetooth LE

1 Sensor
2 Smartphone/Tablet
3 PC/Notebook

3.4 Packaging, transport and storage

Packaging

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

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

Transport

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

Transport inspection

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

Storage

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

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

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

Storage and transport temperature

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

3.5 Accessories

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

Welded socket, threaded and hygienic adapter

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

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

Mounting accessories

The suitable mounting accessories for VEGABAR 39 includes siphons, blocking valves and measuring instrument holders.

4 Mounting

4.1 General instructions

Ambient conditions

The instrument is suitable for standard and extended ambient conditions acc. to DIN/EN/BS EN/IEC/ANSI/ISA/UL/CSA 61010-1. It can be used indoors as well as outdoors.

Process conditions

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

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

These are mainly:

- Active measuring component
- Process fitting
- Process seal

Process conditions in particular are:

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

Permissible process pressure (MWP) - Device

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

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

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

Protection against moisture

Protect your instrument against moisture ingress through the following measures:

- Use a suitable connection cable (see chapter "*Connecting to power supply*")
- Tighten the cable gland or plug connector

- When mounting horizontally, rotate the housing so that the cable gland or plug connector point downward
- Lead the connection cable downward in front of the cable entry or plug connector

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

Make sure that the degree of contamination specified in chapter "*Technical data*" meets the existing ambient conditions.

Ventilation and pressure compensation

Ventilation and pressure compensation for VEGABAR 39 are provided by an air-permeable, moisture-blocking filter element.

Note:
In case of horizontal mounting, turn the housing so that the filter element points downward after the instrument is installed. This provides better protection against buildup.

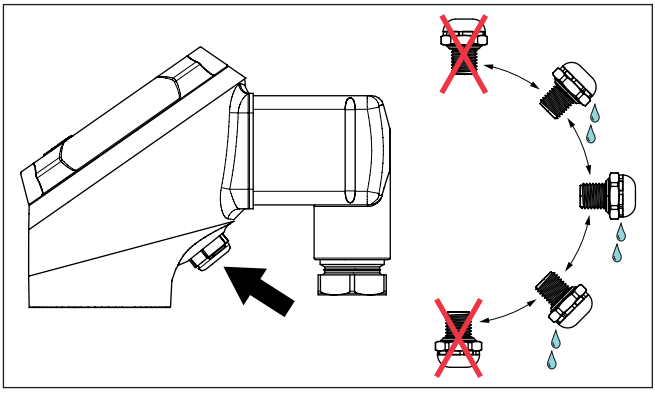


Fig. 6: Orientation of the filter element

Note:
If possible, position the housing so that moisture can drain off the filter element.

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

Screwing in

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

See chapter "*Dimensions*" for wrench size.

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

Permissible process pressure (MWP) - Mounting accessory

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

Temperature limits

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

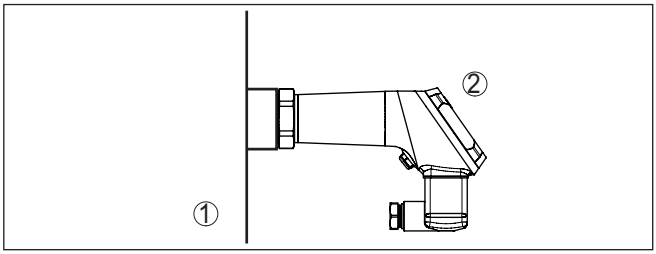


Fig. 7: Temperature ranges

1 Process temperature
2 Ambient temperature

4.2 Process pressure measurement

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.

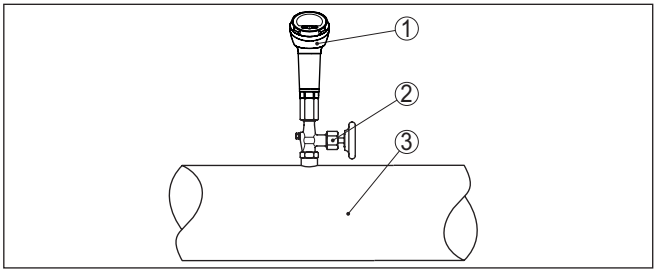


Fig. 8: Measurement setup for process pressure measurement of gases in pipelines

1 VEGABAR 39
2 Shut-off valve
3 Pipeline

In vapours

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

- Connect via a siphon

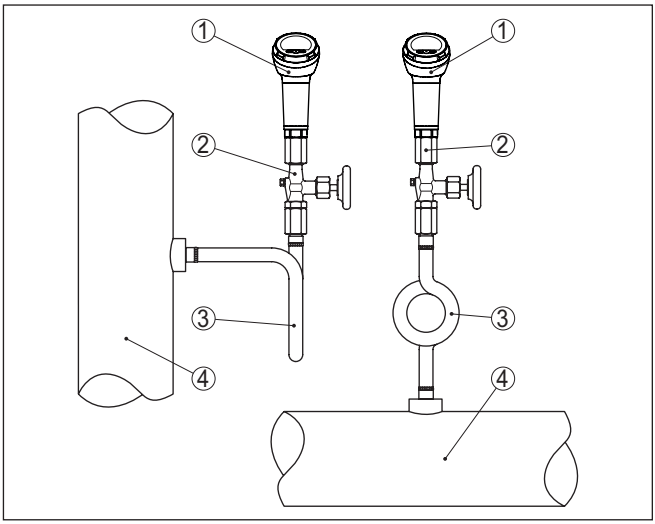


Fig. 9: Measurement setup for process pressure measurement of gases in pipelines

1 VEGABAR 39
2 Shut-off valve
3 Siphon in U or circular form
4 Pipeline

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

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.

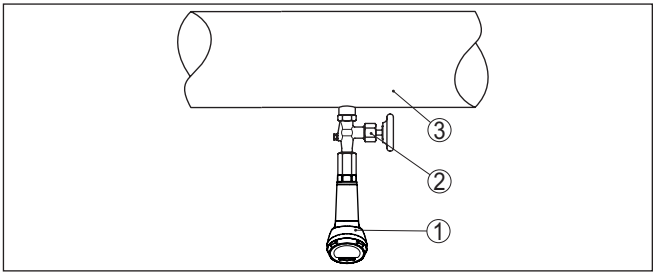


Fig. 10: Measurement setup for process pressure measurement of liquids in pipelines

1 VEGABAR 39
2 Shut-off valve
3 Pipeline

4.3 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

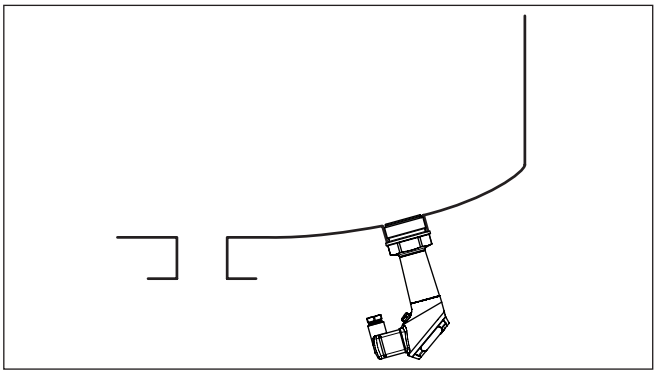


Fig. 11: Measurement setup for level measurement

5 Connecting to power supply

5.1 Preparing the connection

Safety instructions

Always keep in mind the following safety instructions:

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

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

Voltage supply

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

Note:
Power the instrument via an energy-limited circuit (power max. 100 W) acc. to IEC 61010-1, e.g.:

- Class 2 power supply unit (acc. to UL1310)
- SELV power supply unit (safety extra-low voltage) with suitable internal or external limitation of the output current
- PELV power supply unit (protective low voltage) with suitable internal or external limitation of the output current

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 signal)
- Influence of additional instruments in the circuit (see load values in chapter "*Technical data*")

Connection cable

Use cable with round cross section. Depending on the plug connection, you have to select the outer diameter of the cable respectively so that the seal effect of the cable gland is ensured.

Depending on the connection method or signal output, the device is connected with standard two, three or four-wire cable without shielding.

5.2 Connection procedure

M12 x 1 plug

This plug connection requires a complete confectioned cable with counter plug.

Plug according to ISO 4400

Proceed as follows:

1. Loosen the screw on the rear of the plug connector
2. Remove the plug connector and seal from VEGABAR 39
3. Remove the plug insert from the plug housing

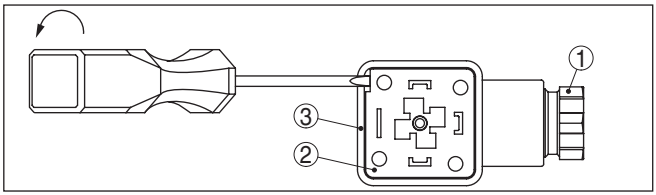


Fig. 12: Loosen the plug insert

1 Cable gland
2 Plug insert
3 Plug housing

4. Remove approx. 5 cm of the cable mantle, strip approx. 1 cm insulation from the individual wires
5. Lead the cable through the cable gland into the plug housing
6. Connect the wire ends to the screw terminals according to the wiring plan

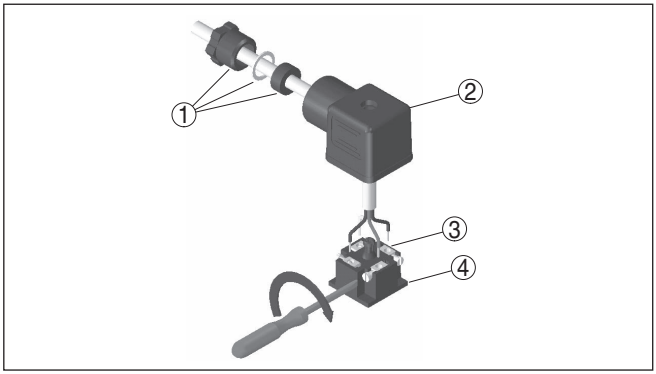


Fig. 13: Connection to the screw terminals

1 Cable gland
2 Plug housing
3 Plug insert
4 Plug seal

7. Snap the plug insert into the plug housing and insert the sensor seal
8. Plug the plug insert with seal to VEGABAR 39 and tighten the screw

The electrical connection is finished.

ISO 4400 plug with hinged cover

Proceed as follows:

1. Loosen the screw in the cover of the plug connector
2. Open the cover and remove it
3. Press the plug insert downwards
4. Loosen the screws of the strain relief and cable entry

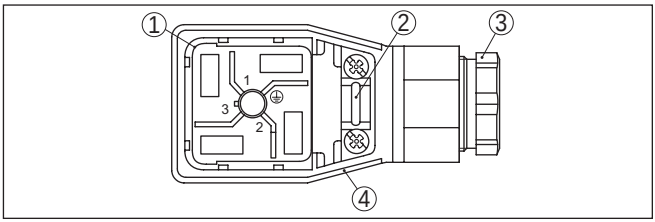


Fig. 14: Loosen the plug insert

1 Plug insert
2 Strain relief
3 Cable gland
4 Plug housing

5. Remove approx. 5 cm of the cable mantle, strip approx. 1 cm insulation from the individual wires
6. Lead the cable through the cable gland into the plug housing
7. Connect the wire ends to the screw terminals according to the wiring plan

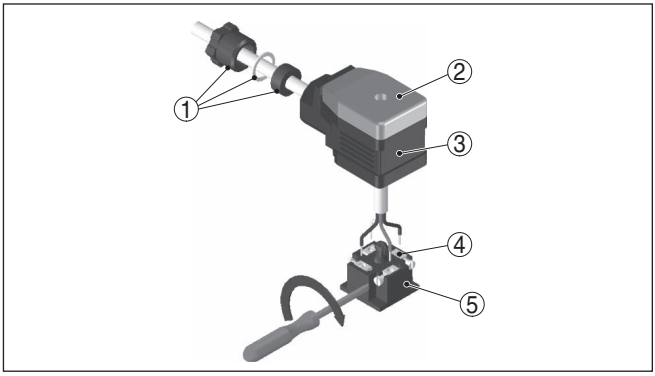


Fig. 15: Connection to the screw terminals

1 Cable gland
2 Cover
3 Plug housing
4 Plug insert
5 Plug seal

8. Snap the plug insert into the plug housing and insert the sensor seal

Information:
Note the correct arrangement, see illustration

9. Tighten the screws on the strain relief and cable entry
10. Hook in the cover and push onto the plug connection, tighten cover screw
11. Plug the plug insert with seal to VEGABAR 39 and tighten the screw

The electrical connection is finished.

Plug according to ISO 4400 with IDC method of termination

For this plug version you can use standard cable with round wire cross-section. The inner conductors do not have to be stripped. The plug connects the conductors automatically when screwing in. Cable diameter 5.5 … 8 mm, protection IP67.

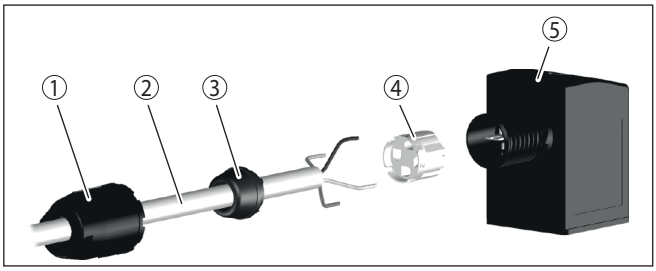


Fig. 16: Connection, valve plug ISO 4400 with IDC crimping technology

1 Compression nut
2 Cable
3 Seal ring
4 Terminal insert
5 Plug housing

5.3 Wiring plan

Plug according to ISO 4400

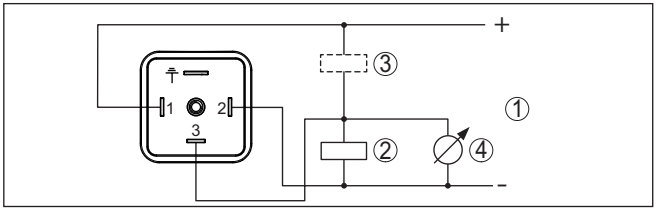


Fig. 17: Wiring plan - Three-wire 1 x transistor or 4 … 20 mA

1 Voltage supply
2 PNP switching
3 NPN switching
4 Current output

Contact, plug connector	Function/Polarity
1	Voltage supply/Plus
2	Voltage supply/Minus
3	Transistor or current output
⏚	Galvanically connected to the housing

5.4 Switch-on phase

After switching on, the device first carries out a self-check:

- Internal check of the electronics
- The output signal jumps to the set fault current[2)]
- Switching outputs are controlled

The current measured value is then output on the signal cable.

[2)] With current output activated

6 Access protection

6.1 Bluetooth radio interface

Devices with a Bluetooth radio interface are protected against unwanted access from outside. This means that only authorized persons can receive measured and status values and change device settings via this interface.

Bluetooth access code

A Bluetooth access code is required to establish Bluetooth communication via the adjustment tool (smartphone/tablet/notebook). This code must be entered once when Bluetooth communication is established for the first time in the adjustment tool. It is then stored in the adjustment tool and does not have to be entered again.

The Bluetooth access code is individual for each device. It is printed on the device housing with Bluetooth. In addition, it is supplied with the device in the information sheet "*PINs and Codes*" In addition, the Bluetooth access code can be read out via the display and adjustment unit, depending on the device version.

The Bluetooth access code can be changed by the user after the first connection is established. If the Bluetooth access code is entered incorrectly, the new entry is only possible after a waiting period has elapsed. The waiting time increases with each further incorrect entry.

Emergency Bluetooth unlock code

The emergency Bluetooth access code enables Bluetooth communication to be established in the event that the Bluetooth access code is no longer known. It can't be changed. The emergency Bluetooth access code can be found in information sheet "*Access protection*". If this document is lost, the emergency Bluetooth access code can be retrieved from your personal contact person after legitimation. The storage and transmission of Bluetooth access codes is always encrypted (SHA 256 algorithm).

6.2 Protection of the parameterization

The settings (parameters) of the device can be protected against unwanted changes. The parameter protection is deactivated on delivery, all settings can be made.

Device code

To protect the parameterization, the device can be locked by the user with the aid of a freely selectable device code. The settings (parameters) can then only be read out, but not changed. The device code is also stored in the adjustment tool. However, unlike the Bluetooth access code, it must be re-entered for each unlock. When using the adjustment app or DTM, the stored device code is then suggested to the user for unlocking.

Emergency device code

The emergency device code allows unlocking the device in case the device code is no longer known. It can't be changed. The emergency device code can also be found on the supplied information sheet "*Access protection*". If this document is lost, the emergency device code can be retrieved from your personal contact person after legitimation.

The storage and transmission of the device codes is always encrypted (SHA 256 algorithm).

6.3 Storing the codes in myVEGA

If the user has a "*myVEGA*" account, then the Bluetooth access code as well as the device code are additionally stored in his account under "*PINs and Codes*". This greatly simplifies the use of additional adjustment tools, as all Bluetooth access and device codes are automatically synchronized when connected to the "*myVEGA*" account

7 Set up with the integrated display and adjustment unit

7.1 Adjustment system

Function

The instrument is operated via the three keys of the integrated display and adjustment unit. The respective menu items are shown on the LC display. You can find the function of the individual keys in the below overview.

Certain settings are only possible to a limited extent or not possible with the integrated display and adjustment unit. For these settings, we recommend using the adjustment app or PACTware with corresponding DTM.

Display and adjustment elements

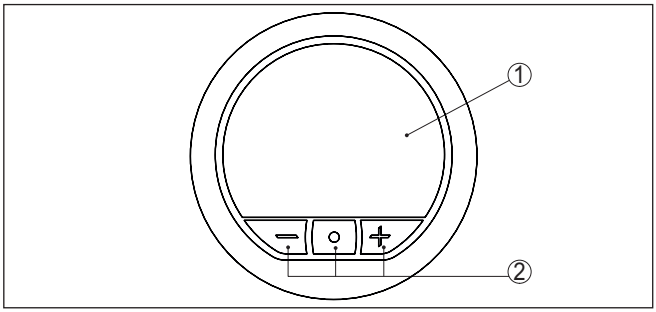


Fig. 18: Integrated display and adjustment unit

1 LC display
2 Adjustment keys

Key functions

Key	Function
[•]	Entry to the menu level Jump to selected menu item Edit parameter Select editing position Save value
[+]	Switching between the individual measured value windows Navigation in the menu items, forwards Change parameter values upwards
[-]	Switching between the individual measured value windows Navigation in the menu items, backwards Change parameter values downwards
[+] and **[-]** simultaneously	Jump to next higher menu Interrupt input

Time functions

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

Simultaneous pressing of the **[+]** and **[-]** keys causes a return to the measured value indication.

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

7.2 Measured value and menu image display

Measured value indication

Measured values are displayed according to the following presentation:

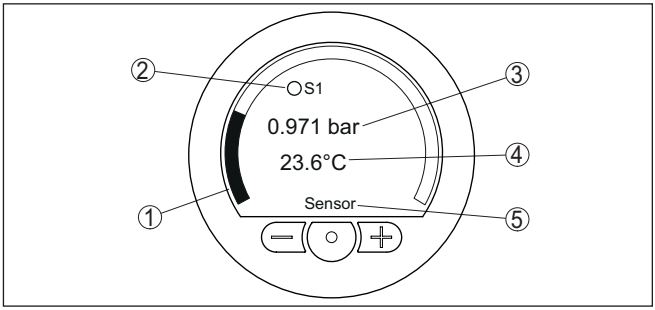


Fig. 19: Measured value, switching status and additional data (example electronics A and C)

1 Measured value as bargraph
2 Switching status
3 Measured value as digital value with unit
4 Measuring cell temperature
5 Sensor-TAG

Menu item display

The menu items are displayed according to the following diagram:

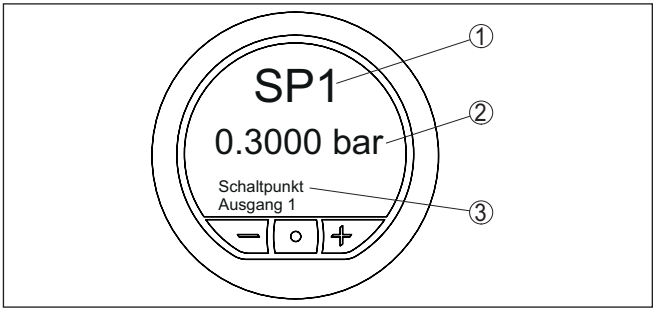


Fig. 20: Display menu item (example)

1 Menu item code acc. to VDMA 24574-1
2 Actual parameter value
3 Menu item name

7.3 Parameter adjustment

7.3.1 Main menu

Selection language

With the first setup, the instrument offers you a selection of the menu languages. The selection you are making here can be changed any time under "*Extended functions*", "*Menu language*".

Switching points

In this menu item, the switching and reset points for hysteresis function and the lower and upper values for window function are defined depending on the selected output function.

Hysteresis function

With the hysteresis function (HNO and HNC), the output changes its state when the measured variable has reached the switching point (SP). If the measured variable falls below the reset point (RP), the output returns to its previous state.

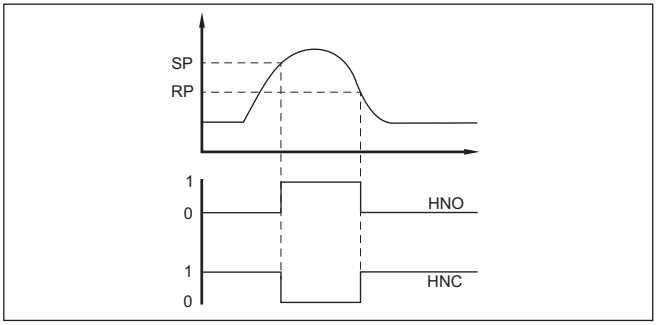


Fig. 21: Hysteresis function

If the measured variable moves between switching and reset point, the state of the output does not change.

Window function

With the window function (FNO and FNC), the output changes its state when the measured variable enters the window between the values window High (FH) and window Low (FL). If the measured variable leaves the window, the output returns to its previous state.

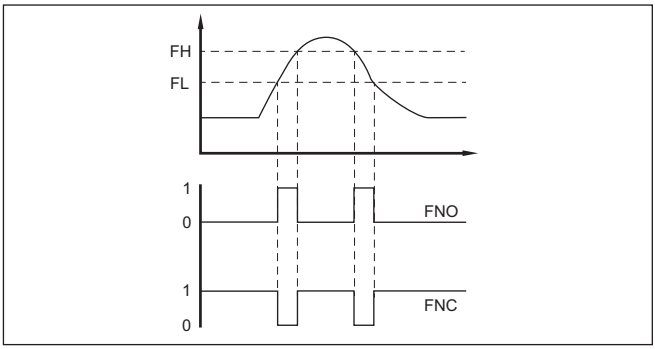
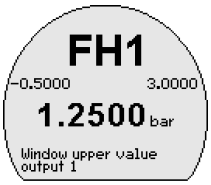
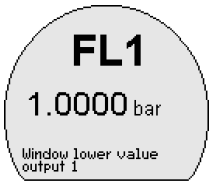


Fig. 22: Window function

If the measured variable moves within the window, the state of the output does not change.





Menu item code:

- SP
- RP
- FH
- FL

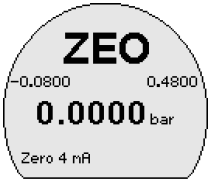
Parameter:

- Pressure value

Zero

The menu item Zero (initial value) defines the pressure value at the output current 4 mA.

Information:
The zero adjustment has no influence on the value of the span adjustment.



Menu item code:

- ZEO

Parameter:

57536-EN-251113

- Pressure value

Span

The menu item Span (final value) defines the pressure value at the output current 20 mA.

Menu item code:

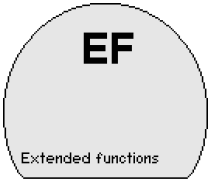
- SPN

Parameter:

- Pressure value

Extended functions, diagnosis

These menu items allow access to the menu areas "*Extended functions*" or "*Diagnosis*".



Menu item code:

- EF
- DIA

7.3.2 Extended functions

Damping

To damp process-dependent measured value fluctuations, set an integration time in this menu item.

Due to the set damping, the 4 … 20 mA output as well as the switching output react in case of a sudden increased of the measured variable with a time-delayed slope curve.

Menu item code:

- DAM

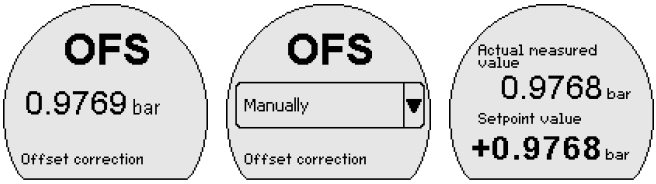
Parameter:

- Time value

Offset correction

The installation position of the device can shift the measured value minimally (offset). The offset correction compensates this measured value shift. The measured value that should currently be displayed is entered (manual offset correction). With relative pressure transmitters, an automatic offset to 0.0000 bar can alternatively be carried out.

Note:
With automatic offset correction, the current measured value must not be influenced by product coverage or static pressure.



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

Menu item code:

- OFS

Parameter:

- Pressure value

Transistor function

In this menu item the switching function of the transistor output is defined. With the PNP function, the connected load is switched against the negative cable, with the NPN function against the positive cable of the power supply (see chapter "*Wiring plan*").

Menu item code:

- P-N

Parameter:

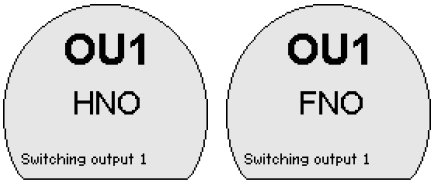
- PNP
- NPN

Function outputs

In this menu item the function of the signal outputs is defined.

Plug according to ISO 4400:

- One transistor output or
- One 4 … 20 mA output



Menu item code:

- OU1

Parameter:

- HNO
- HNC
- FNO

- FNC
- 4 … 20 mA

Switching delay times

In this menu item the switching and reset delay times for the outputs are set.

Hysteresis function

If the measured variable has reached the set switching point (SP), the state of the output does not change until the set delay time has elapsed. If the measured variable falls below the switching point again after this time has elapsed, the state of the output does not change.

If the measured variable has dropped to the reset point (RP) or below for the duration of the reset delay time, the output switches back to its previous state.

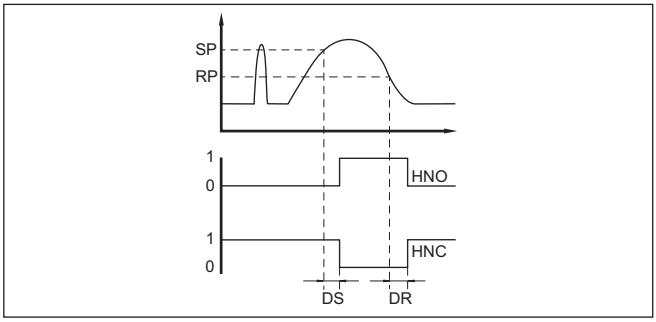


Fig. 23: Effect of the delay time on the output with hysteresis function

Window function

If the measured variable has reached the lower value of the window (FL), the state of the output does not change until this time has elapsed when the delay time has been set. If the measured value falls below the lower value of the window again after this time has elapsed, the state of the output does not change.

If the measured variable has exceeded the upper value of the window (FH) for the duration of the reset delay time, the output switches back to its previous state.

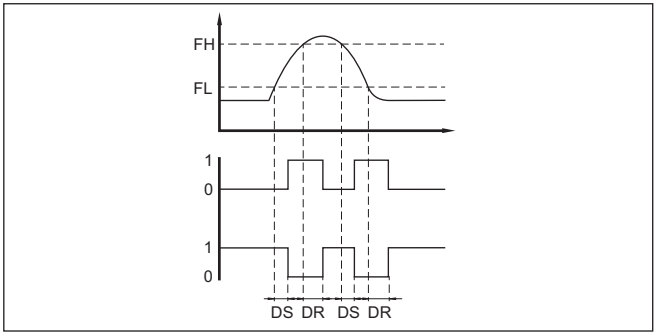


Fig. 24: Effect of the delay time on the output with window function

Menu item code:

- DS
- DR

Parameter:

- Time value

Reaction when malfunction occurs

In this menu item you define the behaviour of the current output in the event of failures.

Menu item code:

- FER

Parameter:

- ≤ 3.6 mA
- ≥ 21 mA

Accept value

In this menu item (live adjustment) you can accept the current measured value as the value for the 4 mA adjustment (LRV) or the 20 mA adjustment (URV).[3)]

Menu item code:

- LRV
- URV

Parameter:

- Pressure value

Display lighting

In this menu item you switch the backlight for the display off or on.

Menu item code:

- DIS

Parameter

- On
- Off

[3)] LRV: Lower Range Value, URV: Upper Range Value

Indication of the switching status

In this menu item you define the brightness of the LED illuminated ring for the switching status display.

Menu item code:

- LED

Parameter

- Off
- 10 %
- 20 %
- …
- 100 %

Pressure unit

In this menu item the adjustment unit of the device is defined. The selection made determines the displayed unit in the menu items "*Zero/ Span*" and "*Offset correction*" as well as "*Accept value*".

Menu item code:

- UNI

The following units are available: mbar, bar, psi, Pa, kPa, MPa, inHg, mmHg, mmH_2O, inH_2O

Unit temperature

In this menu item the temperature unit of the device is defined. The selection made determines the unit for the measuring cell temperature shown on the display.

Menu item code:

- TMP

Parameter:

- °C
- °F

Menu language

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

Menu item code:

German, English, French, Spanish, Portuguese, Italian, Dutch, Russian, Chinese, Turkish

Bluetooth access code

In this menu item, you can change the factory-preset Bluetooth access code to your personal Bluetooth access code.

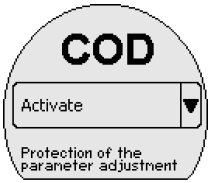
Note:
The individual preset Bluetooth access code of the device can be found on the supplied information sheet "*PINs and Codes*". If this is changed by the user and is no longer available, access is only possible via the emergency Bluetooth unlock code on the information sheet "*Emergency unlock codes*" also supplied.

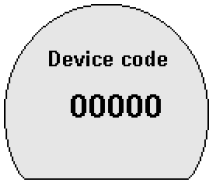
Menu item code:

- BT

Protection of the parameterization

In this menu item you safeguard the sensor parameters by entering a 6-digit device code against unauthorized or unintentional modifications.





With protected parameter adjustment, the individual menu items can be selected and displayed, however the parameters can no longer be modified.

The sensor operation can also be enabled in any menu item by entering the device code. The parameter adjustment remains open until you return to the measured value display. This takes place automatically after 60 min.

Menu item code:

- COD

Parameter:

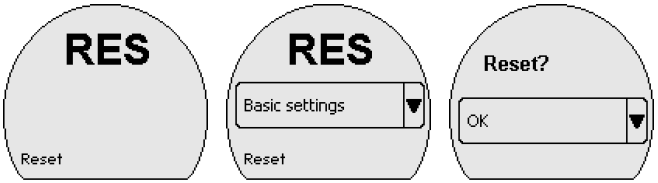
- Numerical value

Note:
The factory set device code is "*000000*". If this is changed by the user and is no longer available, access is only possible via the emergency device unlock code on the information sheet "*Emergency unlock codes*" also supplied.

Note:
With protected parameter adjustment, adjustment via the VEGA Tools app as well as PACTware/DTM and other systems is also blocked.

Reset

During a reset, parameter settings made by the user are reset to the values of the basic setting or the delivery status (see chapter "*Menu overview*").[4)]



Menu item code:

- RES

Parameter:

- Basic settings
- Delivery status[5)]

Basic settings: Resets the parameter settings to the default values of the respective device. The order-related settings are not transferred to the current parameters after this reset.

Delivery status: Resets the parameter settings to the delivery status.

Information:
The current status of the access protection, the Bluetooth access code and the device code are not reset.

7.3.3 Diagnostics

Status

In this menu item, the device status is displayed.

Menu item code:

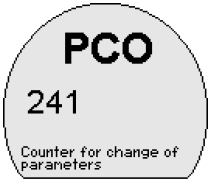
- STA

In the event of an error, the error code, e.g. F017, and an error description, e.g. "*Adjustment span too small*" are displayed.

4) Language and Bluetooth access code are not reset.
5) Parameter delivery status only available with a parameter adjustment that deviates from the basic settings, e.g. customer-specific adjustment

Parameter modification counter

This menu item displays the number of parameter changes made.



Menu item code:

- PCO

Peak indicator

In this menu item, the min. and max. values for pressure, measuring cell temperature and electronics temperature are displayed.

Menu item code:

- LO
- HI

Information:
To reset the peak indicator, the VEGA Tools app or PACTware/DTM is required.

Sensor information

This menu item displays the hardware and software status as well as the serial number of the device.

Menu item code:

- INF

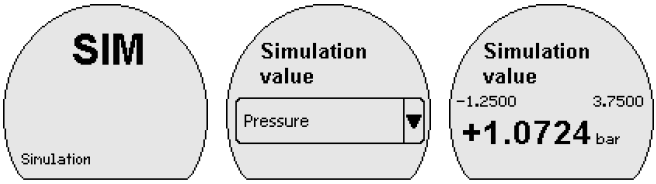
Parameter:

- HW
- SW
- SN

Simulation

In this menu item you simulate switching states of the transistor outputs or current values of the 4 … 20 mA output. This allows the signal path to be tested, e.g. via downstream display instruments or the input card of the control system. The simulation values are: Pressure, current, switching status.

Note:
Make sure the connected downstream devices are activated during the simulation.



Menu item code:

- SIM

Parameter:

- Numerical value for pressure or current
- Open or closed for switching output

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

8 Setup with smartphone/tablet (Bluetooth)

8.1 Preparations

System requirements

Make sure that your smartphone/tablet meets the following system requirements:

- Operating system: iOS 13 or newer
- Operating system: Android 5.1 or newer
- Bluetooth 4.0 LE or newer

Download the VEGA Tools app from the "*Apple App Store*", "*Google Play Store*" or "*Baidu Store*" to your smartphone or tablet.

8.2 Connecting

Connecting

Start the adjustment app and select the function "*Setup*". The smartphone/tablet searches automatically for Bluetooth-capable instruments in the area.

The message "*Connecting …*" is displayed.

The devices found are listed and the search is automatically continued.

Select the requested instrument in the device list.

As soon as the Bluetooth connection to a device is established, the LED display of the device in question flashes blue 4 times.

Authenticate

When establishing the connection for the first time, the operating tool and the sensor must authenticate each other. After the first correct authentication, each subsequent connection is made without a new authentication query.

Enter Bluetooth access code

For authentication, enter the 6-digit Bluetooth access code in the next menu window. You can find the code on the outside of the device housing and on the information sheet "*Pins and Codes*" in the device packaging.

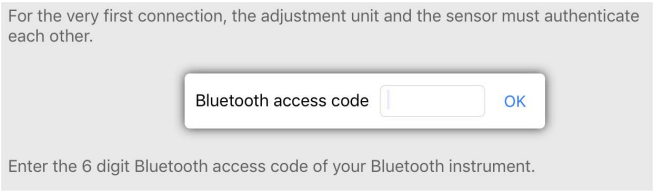


Fig. 25: Enter Bluetooth access code

Note:
If an incorrect code is entered, the code can only be entered again after a delay time. This time gets longer after each incorrect entry.

The message "*Waiting for authentication*" is displayed on the smartphone/tablet.

Connected

After connection, the sensor adjustment menu is displayed on the respective adjustment tool.

If the Bluetooth connection is interrupted, e.g. due to a too large distance between the two devices, this is displayed on the adjustment tool. The message disappears when the connection is restored.

Change device code

Parameter adjustment of the device is only possible if the parameter protection is deactivated. When delivered, parameter protection is deactivated by default and can be activated at any time.

It is recommended to enter a personal 6-digit device code. To do this, go to menu "*Extended functions*", "*Access protection*", menu item "*Protection of the parameter adjustment*".

8.3 Sensor parameter adjustment

Enter parameters

The sensor adjustment menu is divided into two areas, which are arranged next to each other or one below the other, depending on the adjustment tool.

- Navigation section
- Menu item display

The selected menu item can be recognized by the colour change.

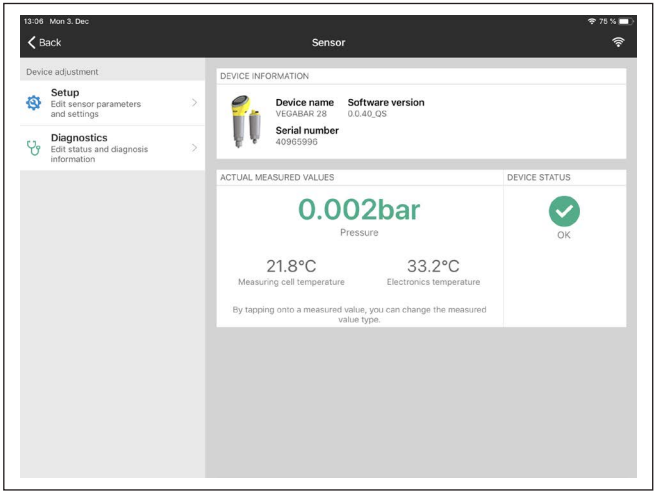


Fig. 26: Example of an app view - Setup measured values

9 Setup with PC/notebook (Bluetooth)

9.1 Preparations

System requirements

Make sure that your PC/notebook meets the following system requirements:

- Operating system Windows 10 or newer
- DTM Collection 10/2020 or newer
- Bluetooth 4.0 LE or newer

Activate Bluetooth connection

Activate the Bluetooth connection via the project assistant.

Note:
Older systems do not always have an integrated Bluetooth LE. In these cases, a Bluetooth USB adapter is required. Activate the Bluetooth USB adapter using the Project Wizard.

After activating the integrated Bluetooth or the Bluetooth USB adapter, devices with Bluetooth are found and created in the project tree.

9.2 Connecting

Connecting

Select the requested device for the online parameter adjustment in the project tree.

As soon as the Bluetooth connection to a device is established, the LED display of the device in question flashes blue 4 times.

Authenticate

When establishing the connection for the first time, the operating tool and the device must authenticate each other. After the first correct authentication, each subsequent connection is made without a new authentication query.

Enter Bluetooth access code

For authentication, enter in the next menu window the 6-digit Bluetooth access code:

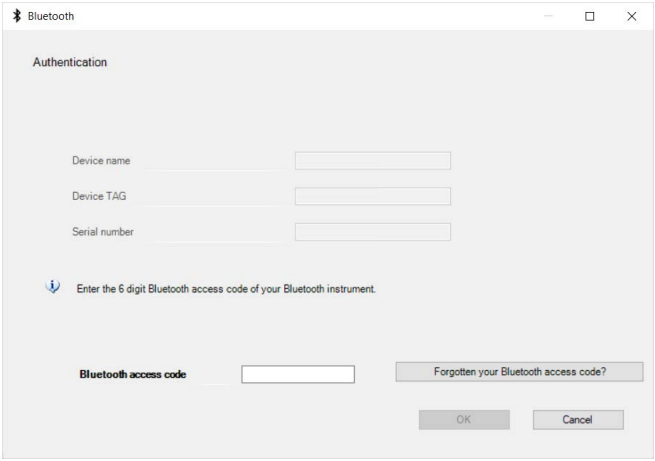


Fig. 27: Enter Bluetooth access code

You can find the code on the outside of the device housing and on the information sheet "*PINs and Codes*" in the device packaging.

Note:
If an incorrect code is entered, the code can only be entered again after a delay time. This time gets longer after each incorrect entry.

The message "*Waiting for authentication*" is displayed on the PC/notebook.

Connected

After connection, the device DTM appears.

If the connection is interrupted, e.g. due to a too large distance between device and adjustment tool, this is displayed on the adjustment tool. The message disappears when the connection is restored.

Change device code

Parameter adjustment of the device is only possible if the parameter protection is deactivated. When delivered, parameter protection is deactivated by default and can be activated at any time.

It is recommended to enter a personal 6-digit device code. To do this, go to menu "*Extended functions*", "*Access protection*", menu item "*Protection of the parameter adjustment*".

9.3 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.

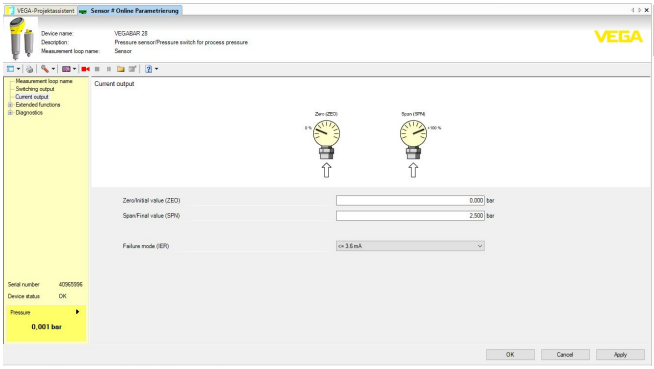


Fig. 28: Example of a DTM view - Adjustment current output

10 Menu overview

10.1 Display and adjustment unit (on site)

Measured value indication

Menu item	Measured value window 1	Measured value window 2
Measured value indication	Pressure, switching status	Pressure, switching status, measuring cell temperature, sensor TAG

Main menu

Menu item	Code acc. to VDMA 24574-1	Basic settings[6)]
Switching point output	SP1	25.00 %
Switch-back point output	RP1	23.00 %
Window upper value output	FH1	25.00 %
Window lower value output	FL1	23.00 %
Zero 4 mA	ZEO	Measuring range begin
Span 20 mA	SPN	Measuring range end
Extended functions	EF	-
Diagnostics	DIA	-

Extended functions

Menu item	Code acc. to VDMA 24574-1	Basic settings
Damping	DAM	1 s
Offset correction	OFS	-
Transistor function	P-N	PnP
Function output 1	OU1	HNO
Switching delay time output 1	DS1	0 s
Reset delay time output 1	DR1	
Reaction when malfunctions occur	FER	≤ 3.6 mA
Accept value 4 mA	LRV	-
Accept value 20 mA	URV	
Display lighting	DIS	On
Indication of the switching status	LED	100 %
Pressure unit	UNI	mbar
Unit temperature	TMP	°C
Menu language	LG	German

6) % values outputs referring to nominal measuring range

Menu item	Code acc. to VDMA 24574-1	Basic settings
Bluetooth access code	BT	Device-specific access code
Protection of the parameterization	COD	Deactivated
Reset	RES	-

Diagnostics

Menu item	Code acc. to VDMA 24574-1	Delivery status
Status	STA	-
Parameter modification counter	PCO	-
Min. value peak indicator	LO	Last values
Max. value peak indicator	HI	
Sensor information	INF, HW, SW	-
Simulation	SIM	-

10.2 VEGA Tools app and DTM (Bluetooth)

Start image (app)

Menu item	Device information	Actual measured values	Device status
Start image	Device name, serial number	Pressure, output current, switching status, measuring cell temperature, electronics temperature, sensor TAG	OK, error indication

Basic functions

Menu item	Parameter (code acc. to VDMA 24574-1)	Editing section	Basic setting
Measurement loop name	Measurement loop name	Up to 19 alphanumerical characters	Sensor
Switching output	Switching point (SP1)	Measuring range begin … measuring range end	25.00 %[7)]
	Reset point (RP1)		23.00 %
	Window upper value (FH1)		25.00 %
	Window lower value (FL1)		23.00 %
	Switching delay (DS1)	0 … 60 s	0 s
	Reset delay (DR1)		

7) % values of the outputs referred to the respective nominal measuring range, setting in bar

Menu item	Parameter (code acc. to VDMA 24574-1)	Editing section	Basic setting
Current output	Zero 4 mA (ZEO)	Measuring range begin … measuring range end	Measuring range begin
	Span 20 mA (SPN)		Measuring range end
	Reaction in case of fault (FER)	≤ 3.6 mA, ≥ 21 mA	≤ 3.6 mA
360° status indication (acc. to NAMUR NE 107)	Brightness (LED)	0 %, 10 %, 20 … 100 %	100 %
	Signalling	Acc. to NAMUR NE 107	Acc. to NAMUR NE 107
360° status display (switching output)	Brightness (LED)	0 %, 10 %, 20 … 100 %	100 %
	Signalling	Switching output	Acc. to NAMUR NE 107
	Switching output	Red, yellow, green …, individual colour selection, no signalling	Yellow
	Flashing	Yes, no	No
	Operating status	Red, yellow, green …, individual colour selection, no signalling	Green
	Flashing	Yes, no	No
	Fault	Red, yellow, green …, individual colour selection, no signalling	Red
	Flashing	Yes, no	No
360° status display (free signalling)	Brightness (LED)	0 %, 10 %, 20 … 100 %	100 %
	Signalling	Acc. to NAMUR NE 107, switching output, free signalling	Acc. to NAMUR NE 107
	Fault	Red, yellow, green …, individual colour selection, no signalling	Red
	Flashing	Yes, no	No
	Operating status[8)]	Operating states 1, 2, 3, 4, 5	1
	Upper limit	Measuring range begin minus 20 % … measuring range end plus 20 %	0.000 bar
	Colour selection	Red, yellow, green …, individual colour selection, no signalling	Green
	Flashing	Yes, no	No

Extended functions

Menu item	Parameter (code acc. to VDMA 24574-1)	Editing section	Basic setting
Damping	Integration time (DAM)	0 … 9.999 s	0 s
	Activate thermo-shock suppression	Yes, no	No
Offset correction (OFS)	-	-	0.000 bar

[8)] Signalling of process pressure ranges by colour and flashing

Menu item	Parameter (code acc. to VDMA 24574-1)	Editing section	Basic setting
Output	Transistor function (P-N)	pnp, npn	pnp, npn
	Function output (OU1)	Hysteresis function closing contact (HNO), hysteresis function opening contact (HNC), window function closing contact (FNO), window function opening contact (FNC), 4 … 20 mA	4 … 20 mA
Adjustment with medium	Apply min. pressure on the sensor	Accept 4 mA (LRV)	-
	Apply max. pressure on the sensor	Accept 20 mA (URV)	
Scaling	Scaling size (SCS)	Other, mass, volume, height, pressure, flow, temperature	Miscellaneou
	Scaling unit (SCU)	Dependent on SCS	User-defined
	Scaling format (SCF)	Number of decimal places	Automatically
	Minimum value (MIV)	-	-
	Maximum value (MAV)	-	-
Indication	Lighting (DIS)		On
	Menu language (LG)		German
	Presentation	Measured value indication 1, measured value indication 2	Measured value indication 1
Units	Pressure unit (UNI)	mbar, bar, Pa, kPa, MPa, psi, mmH2O, mmHg, inH2O, inHg	bar
	Temperature (TMP)	°C, °F	°C
Access protection	Bluetooth access code		Device-specific access code
	Protection of the parameterization		Deactivated
Reset	Reset		-

Diagnostics

Menu item	Parameter	Indication
Status	Device status, parameter change counter	Actual values
Peak indicator	Process pressure, measuring cell temperature, electronics temperature	Actual values, min. values, max. values
Measured values	Measured values, output, additional measured values	Actual values pressure, current output, switching output, electronics temperature, measuring cell temperature
Measured value memory (DTM)	-	Last values
Simulation	Pressure, current output, switching output	Simulated values

Menu item	Parameter	Indication
Sensor information		Device name, serial number, hardware version, software version, factory calibration date, Device Revision, measuring range begin, measuring range end
Sensor features (DTM)	Sensor characteristics	Features of the instrument version

11 Diagnostics and servicing

11.1 Maintenance

Maintenance

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

Precaution measures against buildup

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

Cleaning

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

Take note of the following:

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

11.2 Rectify faults

Reaction when malfunction occurs

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

Causes of malfunction

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

- Sensor
- Process
- Voltage supply
- Signal processing

Fault rectification

The first measures are:

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

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

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.

11.3 Diagnosis, fault messages

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	Fluctuating measured value	Set damping
4 … 20 mA signal missing	Electrical connection faulty	Check connection, correct, if necessary
	Voltage supply missing	Check cables for breaks; repair if necessary
	Operating voltage too low, load resistance too high	Check, adapt if necessary
	Short-circuit	Check, repair if necessary
Current signal greater than 22 mA, less than 3.6 mA	Sensor electronics defective	Replace device or send in for repair depending on device version

LED illuminated ring

The 360° status indication on the device (see chapter "*Configuration*") shows the following:

- Device status
- Switching status of the transistor output
- Operating status[9)]

This enables simple on-site diagnosis without tools, see the following table:

LED illuminated ring			Transistor output
Colour[10)]	**Permanent light**	**Flashing**	
Green	voltage supply on, operation without failure	Message acc. to NE 107 "*Maintenance required*" available	open (high-resistance)
Yellow		-	closed (low-resistance)
Red	voltage supply on, operation with failure	Message acc. to to NE 107 "*Function check*", "*Out of specification*" or "*Simulation state*" is displayed	open (high-resistance)

11.4 Status messages according to NE 107

The instrument features self-monitoring and diagnostics according to NE 107 and VDI/VDE 2650. In addition to the status messages in

9) Signalling of process pressure ranges by colour and flashing, adjustable via VEGA Tools app or PACTware/DTM.
10) Delivery status; adjustable via VEGA Tools app or PACTware/DTM

the following tables there are more detailed error messages available under the menu item "*Diagnostics*" via the respective adjustment module.

Status messages

The status messages are divided into the following categories:

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

and explained by pictographs:

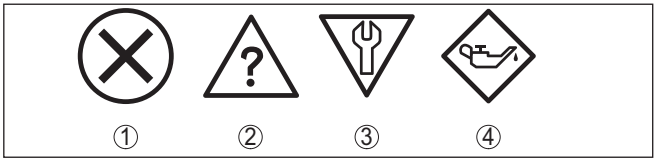


Fig. 29: Pictographs of the status messages

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

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

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

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

This status message is inactive by default.

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

This status message is inactive by default.

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

This status message is inactive by default.

Failure

Code Text message	Cause	Rectification
F013 no measured value available	Hardware error in the area of the measuring cell	Send instrument for repair

Code Text message	Cause	Rectification
F017 Adjustment span too small	Adjustment not within specification	Change adjustment
F036 no operable sensor software	Failed or interrupted software update	Repeat software update
F080 General software error	General software error	Restart
F110 Switching points too close together	Selected switching points too close together	Increase the distance between the switching points
F111 Switching points interchanged	Switching point 1 is smaller than switching point 2	Select switching point 1 to greater than switching point 2
F260 Error in the calibration	Checksum error in the calibration values	Send instrument for repair
F261 Error in the instrument settings	Checksum error in the configuration values	Carry out a reset

Function check

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

Out of specification

Code Text message	Cause	Rectification
S600 Impermissible electronics temperature	Temperature of the electronics in the non-specified range	Check ambient temperature Insulate electronics
S604 Switching output overloaded	Overload or short circuit at output 1 or 2	Electrical connection, check load resistance

Maintenance

Code Text message	Cause	Rectification
M504 Error at a device interface	Interference of the internal communication to Bluetooth	Restart Send instrument for repair
M510 No communication with the main controller	Fault in internal communication with the display	Restart Send instrument for repair

11.5 Software update

The device software is updated via Bluetooth.

The following components are required:

- Instrument
- Voltage supply
- PC/notebook with PACTware/DTM and Bluetooth USB adapter
- 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.

11.6 How to proceed if a repair is necessary

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

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

The following is required:

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

Print the generated instrument return form.

Clean the instrument and pack it damage-proof.

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

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

12 Dismount

12.1 Dismounting steps

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

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

12.2 Disposal

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

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

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

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

13 Certificates and approvals

13.1 Radio licenses

Bluetooth
The Bluetooth radio module in the device has been tested and approved according to the current edition of the applicable country-specific norms or standards.

The confirmations as well as regulations for use can be found in the document "*Radio licenses*" supplied or on our homepage.

13.2 Approvals for Ex areas

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

You can find the relevant documents on our homepage.

13.3 Approvals as overfill protection

Approved versions for use as part of an overfill protection system are available or in preparation for the device or the device series.

The corresponding approvals can be found on our homepage.

13.4 Food and pharmaceutical certificates

Versions for use in the food and pharmaceutical industries are available or in preparation for the device or the device series.

The corresponding certificates can be found on our homepage.

13.5 Conformity

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

The corresponding conformity declarations can be found on our homepage.

Due to the design of its process fittings, the device does not subject of EU pressure device directive if it is operated at process pressures ≤ 200 bar.[11)]

13.6 NAMUR recommendations

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

The device fulfils the requirements of the following NAMUR recommendations:

- NE 21 – Electromagnetic compatibility of equipment

[11)] Exception: Versions with measuring ranges from 250 bar. These are subject of the EU Pressure Device Directive.

- NE 43 – Signal level for fault 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.

13.7 Environment management system

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

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

14 Supplement

14.1 Technical data

Note for approved instruments

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

All approval documents can be downloaded from our homepage.

Materials and weights

Materials, wetted parts

Process fitting	316L
Diaphragm standard	316L
Diaphragm from measuring range 100 bar	316L, Elgiloy (2.4711)
Seal for process fitting (in the scope of delivery)	
– Thread G½ (EN 837), thread G½ inside G¼ (ISO 228-1), thread G½ inside 11.4 mm (ISO 228-1), thread M20 x 1.5 (EN 837), thread G1½ (DIN 3852-A)	Klingersil C-4400
– Further thread versions	Depending on the configuration

Materials for applications in foodstuffs

Surface quality, hygienic fittings, typ.	
– Process fitting	R_a < 0.76 µm

Materials, non-wetted parts

Electronics housing	316L und PBT/PC
Illuminated ring	PC
Isolating liquid	
– Piezoresistive measuring cell	Synthetic oil
– Strain gauge measuring cell front-flush	Synthetic oil
– Strain gauge measuring cell non-front-flush	without isolating liquid (dry system)
Plug connector according to ISO 4400	
– Contact, housing plug	PBT/PC
– Housing connector plug	PA
– Lid screw	StSt
– Contact surface	German silver
– Plug seal	Silicone
Weight	approx. 0.25 kg (0.55 lbs)

Torques

Max. torque for process fitting (examples)

- Clamp — 5/10 Nm (3.688/7.376 lbf ft)
- Varivent — 20 Nm (14.75 lbf ft)
- Thread G½ (ISO 228-1), G¾ (DIN 3852-E), M30 x 1.5, Ingold, NPT connections — 30 Nm (22.13 lbf ft)
- SMS, collar socket DIN 11851, DIN 11864-1, Form A — 40 Nm (29.50 lbf ft)
- Thread G½ (EN 837), G1 (ISO 228-1), G1½ (DIN 3852-A) — 50 Nm (36.88 lbf ft)
- Thread G1 with conus — 100 Nm (73.76 lbf ft)

Input variable

The specifications are only an overview and refer to the measuring cell. Limitations due to the material and version of the process fitting as well as the selected pressure type are possible. The specifications on the nameplate apply.[12)]

Nominal measuring ranges and overload capability in bar/kPa

Nominal range	Overload capability	
	maximum pressure	minimum pressure
Gauge pressure		
0 … +0.4 bar/0 … +40 kPa	+4 bar/+400 kPa	-1 bar/-100 kPa
0 … +1 bar/0 … +100 kPa	+4 bar/+400 kPa	-1 bar/-100 kPa
0 … +2.5 bar/0 … +250 kPa	+10 bar/+1000 kPa	-1 bar/-100 kPa
0 … +5 bar/0 … +500 kPa	+20 bar/+2000 kPa	-1 bar/-100 kPa
0 … +10 bar/0 … +1000 kPa	+40 bar/+4000 kPa	-1 bar/-100 kPa
0 … +25 bar/0 … +2500 kPa	+120 bar/+12 MPa	-1 bar/-100 kPa
0 … +60 bar/0 … +6000 kPa	+300 bar/+30 MPa	-1 bar/-100 kPa
0 … +100 bar/0 … +10 MPa	+300 bar/+30 MPa	-1 bar/-100 kPa
0 … +250 bar/0 … +25 MPa	+500 bar/+50 MPa	-1 bar/-100 kPa
0 … +600 bar/0 … +60 MPa	+1200 bar/+120 MPa	-1 bar/-100 kPa
0 … +1000 bar/0 … +100 MPa	+2000 bar/+200 MPa	-1 bar/-100 kPa
-0.2 … +0.2 bar/-20 … +20 kPa	+4 bar/+400 kPa	-1 bar/-100 kPa
-0.5 … +0.5 bar/-50 … +50 kPa	+4 bar/+400 kPa	-1 bar/-100 kPa
-1 … 0 bar/-100 … 0 kPa	+4 bar/+400 kPa	-1 bar/-100 kPa
-1 … +1,5 bar/-100 … 150 kPa	+10 bar/+1000 kPa	-1 bar/-100 kPa
-1 … +5 bar/-100 … +500 kPa	+20 bar/+2000 kPa	-1 bar/-100 kPa
Absolute pressure		
0 … 1 bar/0 … 100 kPa	+4 bar/+400 kPa	0 bar abs.

[12)] Data on overload capability apply for reference temperature.

Nominal range	Overload capability	
	maximum pressure	minimum pressure
0 … 2.5 bar/0 … 250 kPa	+10 bar/+1000 kPa	0 bar abs.
0 … 5 bar/0 … 500 kPa	+20 bar/+2000 kPa	0 bar abs.
0 … 10 bar/0 … 1000 kPa	+40 bar/+4000 kPa	0 bar abs.
0 … 25 bar/0 … 2500 kPa	+120 bar/+12 MPa	0 bar abs.

Nominal measuring ranges and overload capacity in psi

Nominal range	Overload capability	
	maximum pressure	minimum pressure
Gauge pressure		
0 … +5 psig	+60 psig	-14.5 psig
0 … +15 psig	+60 psig	-14.5 psig
0 … +30 psig	+145 psig	-14.5 psig
0 … +75 psig	+290 psig	-14.5 psig
0 … +150 psig	+580 psig	-14.5 psig
0 … +300 psig	+1740 psig	-14.5 psig
0 … +900 psig	+4350 psig	-14.5 psig
0 … +1450 psig	+4350 psig	-14.5 psig
0 … +3000 psig	+7250 psig	-14.5 psig
0 … +9000 psig	+17400 psig	-14.5 psig
0 … +15000 psig	+29000 psig	-14.5 psig
-3 … +3 psig	+60 psig	-14.5 psig
-7 … +7 psig	+60 psig	-14.5 psig
-14.5 … 0 psig	+60 psig	-14.5 psig
-14.5 … +22 psig	+145 psig	-14.5 psig
-14.5 … +72.5 psig	+290 psig	-14.5 psig
Absolute pressure		
0 … +15 psi	+43 psi	0 psi
0 … +30 psi	+145 psi	0 psi
0 … +75 psi	+290 psi	0 psi
0 … +150 psi	+580 psi	0 psi
0 … +300 psi	+1740 psi	0 psi

Adjustment ranges

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

Zero/Span adjustment:

- Zero -20 … +95 %

– Span	-120 … +120 %
Maximum permissible Turn Down	Unlimited (recommended 20 : 1)

Switching-on phase active current output	
Start-up time with operating voltage U_B	≤ 2 s
Starting current for run-up time	≤ 3.6 mA

Output variable - three-wire 4 … 20 mA	
Output signal	4 … 20 mA (active)
Connection technology	Three-wire
Range of the output signal	3.8 … 20.5 mA (default setting)
Signal resolution	5 µA
Fault signal, current output (adjustable)	Last valid measured value, ≥ 21 mA, ≤ 3.6 mA (Default)
Max. output current	21.5 mA
Load	See load resistance under Power supply

Output variable - Three-wire 1 x transistor	
Output signal	Transistor PNP or NPN can be configured
Connection technology	Three-wire
Load current	max. 250 mA
Overload resistance	yes
Short-circuit resistance	Permanently
Voltage loss	< 3 V
Inverse current PNP	< 16 µA
Inverse current NPN	< 32 µA

Dynamic behaviour output
Dynamic characteristics - Current output[13)]

[13)] Depending on medium and temperature

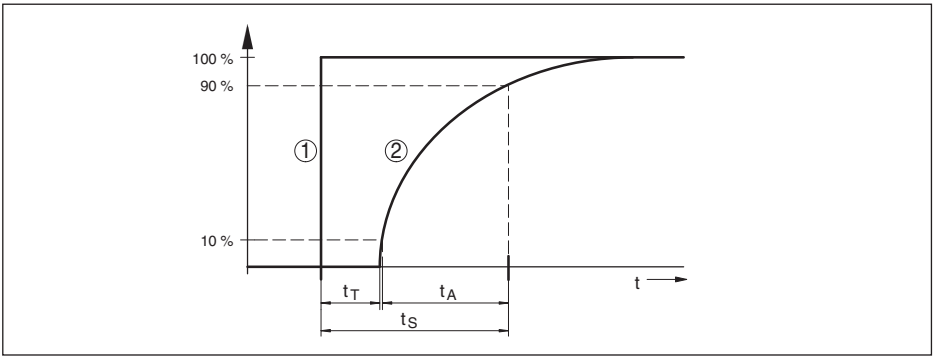


Fig. 30: Behaviour the current output in case of sudden change of the process variable. t_T: dead time; t_A: rise time; t_S: jump response time

1 Process variable
2 Output signal

Size	Time
Dead time	≤ 2 ms
Rise time (10 … 90 %)	≤ 4 ms
Step response time (ti: 0 s, 10 … 90 %)	≤ 6 ms

Reaction time transistor output with switching relevant change of the process variable total	≤ 10 ms
Damping (63 % of the input variable)	0 … 9 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
Characteristic curve	Linear
Reference installation position	upright, diaphragm points downward
Influence of the installation position	≤ 5 mbar/0.5 kPa (0.073 psig)
Max. measurement deviation with electromagnetic interference	< ± 80 µA

Deviation (according to IEC 60770)

Applies to the 4 … 20 mA current output and refers to the adjusted span. Turn down (TD) is the relation nominal measuring range/adjusted span.

Accuracy class	Non-linearity, hysteresis and repeatability with TD 1 : 1 up to 5 : 1	Non-linearity, hysteresis and repeatability at TD > 5 : 1
0.3 %	< 0.3 %	< 0.06 % x TD

Influence of the medium or ambient temperature

Average temperature coefficient of the zero signal

- In the compensated temperature range[14)] < 0.15 %/10 K
- Outside the compensated temperature range typ. 0.3 %/10 K

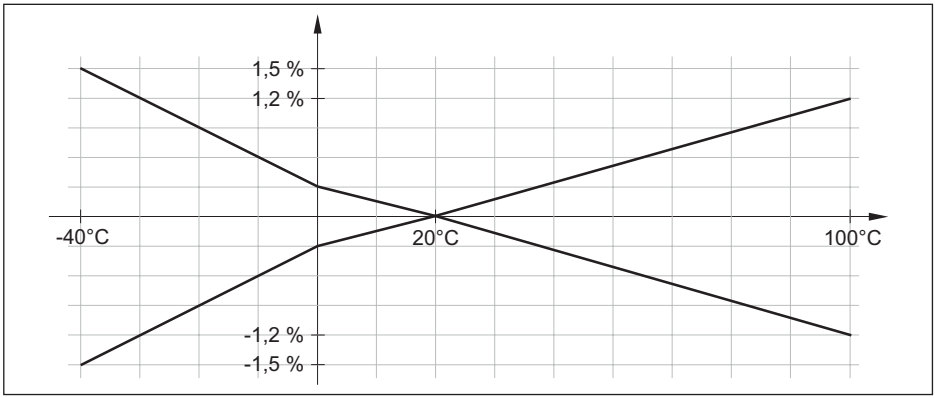


Fig. 31: Temperature error with TD 1 : 1

Additional factor through Turn Down

The additional factor FTD through Turn down is calculated according to the following formula:

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

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

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

Long-term stability (according to DIN 16086)

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

Time period	Long-term drift zero signal and output span
One year	< 0.1 % x TD
Five years	< 0.2 % x TD
Ten years	< 0.4 % x TD

Ambient conditions

Ambient temperature device	-40 … +70 °C (-40 … +158 °F)
Ambient temperature display	-25 … +70 °C (-13 … +158 °F)
Storage and transport temperature	-40 … +70 °C (-40 … +158 °F)

[14)] 0 … +100 °C (+32 … +212 °F)

57536-EN-251113

Mechanical environmental conditions	
Vibrations (oscillations)	Class 4M8 acc. to IEC 60721-3-4 (5 g, 4 … 200 Hz)
Impacts (mechanical shock)	Class 6M4 acc. to IEC 60721-3-6 (50 g; 2.3 ms)
Impact resistance	
– Plug according to ISO 4400	IK07 acc. to IEC 62262
– M12 x 1 plug	IK06 acc. to IEC 62262

Process conditions

Process temperature

Process temperature	
– Standard seal	-40 … +130 °C (-40 … +266 °F)
– Seal FKM (VP2/A)	-20 … +130 °C (-4 … +266 °F)
– EPDM (A+P 70.10-02/70.503-00)	-40 … +130 °C (-40 … +266 °F)

Temperature derating

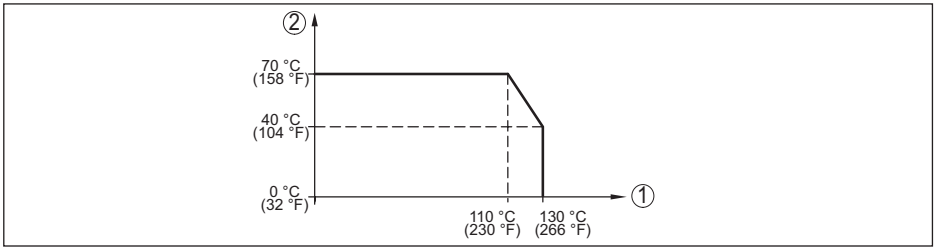


Fig. 32: Temperature derating VEGABAR 39

1 Process temperature
2 Ambient temperature

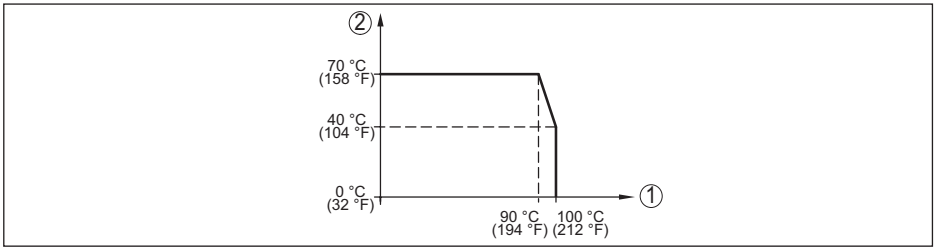


Fig. 33: Temperature derating VEGABAR 39, with activated Bluetooth communication

1 Process temperature
2 Ambient temperature

SIP process temperature[15)]

Device configuration suitable for vapour, i.e. process seal EPDM or FKM, previous CIP cleaning up to max. +80 °C (+176 °F):[16)]

[15)] SIP = Sterilization in place
[16)] CIP = Cleaning in place

Vapour stratification up to	
– 15 minutes	+150 °C (+302 °F)
– 30 minutes	+140 °C (+284 °F)
– 1 hour	+135 °C (+275 °F)
Process pressure	
Max. permissible process pressure	see specification "*MWP*" on the type label[17]
Min. permissible process pressure[18]	
– -40 … +60 °C (-40 … +140 °F)	2 $mbar_{abs}$ (200 Pa_{abs})
– +60 … +130 °C (-40 … +266 °F)	50 $mbar_{abs}$ (5 kPa_{abs})

Indication	
Measured value and menu display	
– Graphic-capable LC display, with lighting	digital and quasianalogue indication
– Max. indicating range	-9999 … 9999
Status indication	LED illuminated ring (green-yellow-red)

Adjustment	
Adjustment elements	3 x keys for menu adjustment
PC/Notebook	PACTware/DTM
Smartphone/Tablet	Adjustment app

Measuring cell temperature	
Range	-40 … +130 °C (-40 … +266 °F)
Resolution	< 0.2 K
Deviation	±3 K
Output of the temperature values via[19]	Display and adjustment unit, Bluetooth, IO-Link

Bluetooth interface	
Bluetooth standard	Bluetooth 5.0
Frequency	2.402 … 2.480 GHz
Max. emitted power	+2.2 dBm
Max. number of participants	1
Effective range	typically 25 m (82 ft)[20]

Electromechanical data	
Angled plug connector	
– Version	4-pin according to ISO 4400

[17] MWP: Maximum Working Pressure
[18] Measuring ranges up to 100bar/10 MPa
[19] Depending on the instrument version
[20] Depending on the local conditions

– Cable gland	M16 x 1.5 (for cable diameter 4.5 … 10 mm)
– Screw terminals for cable cross-section up to	1.5 mm² (AWG 15)
Angle plug connector with flap lid	
– Version	4-pin according to ISO 4400
– Cable gland	PG 11 (for cable diameter 4.5 … 11 mm)
– Screw terminals for cable cross-section	up to 1.5 mm² (AWG 15)

Voltage supply

Operating voltage U_B	12 … 35 V DC
Operating voltage U_B [21]	15 … 35 V DC
Max. power consumption[22]	
– Sensor	700 mW
– Load per transistor output[23]	9 W
Reverse voltage protection	Integrated
Permissible residual ripple	
– for U_N 12 V DC (12 V < U_B < 18 V)	≤ 0.7 V_{eff} (16 … 400 Hz)
– for U_N 24 V DC (18 V < U_B < 35 V)	≤ 1 V_{eff} (16 … 400 Hz)
Max. load resistor	
– Operating voltage U_B = 12 V DC	370 Ω
– Operating voltage U_B = 18 V DC	630 Ω

Electrical protective measures

Potential separation	Electronics potential free up to 500 V AC
Protection rating	

Connection technology	Protection according to EN 60529/IEC 529	Protection according to NEMA/ UL 50E
Plug according to ISO 4400	IP65	Type 4X
ISO 4400 plug with hinged cover		
Plug according to ISO 4400 with IDC method of termination		

Altitude above sea level	5000 m (16404 ft)
Protection class	III
Pollution degree	4

[21] Illuminated display and adjustment unit or activated 360° status display
[22] U_B = 35 V DC, output signal = 20 mA
[23] Load current = 250 mA

14.2 Dimensions

Connection technology

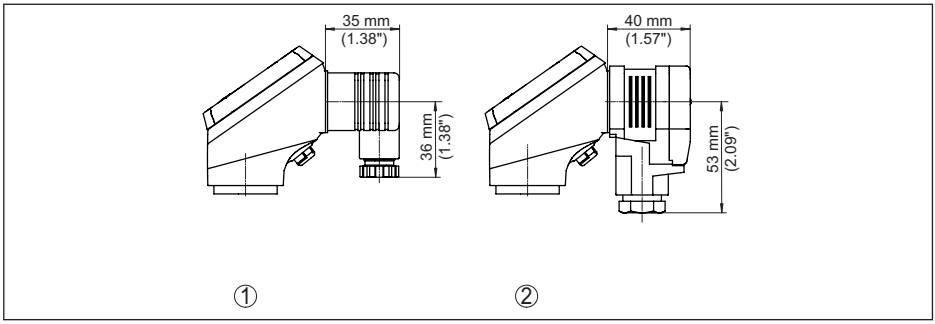


Fig. 34: Connection technology VEGABAR 39

1 Plug connector according to ISO 4400
2 Plug connector according to ISO 4400 with hinged cover

VEGABAR 39, threaded fitting not front-flush

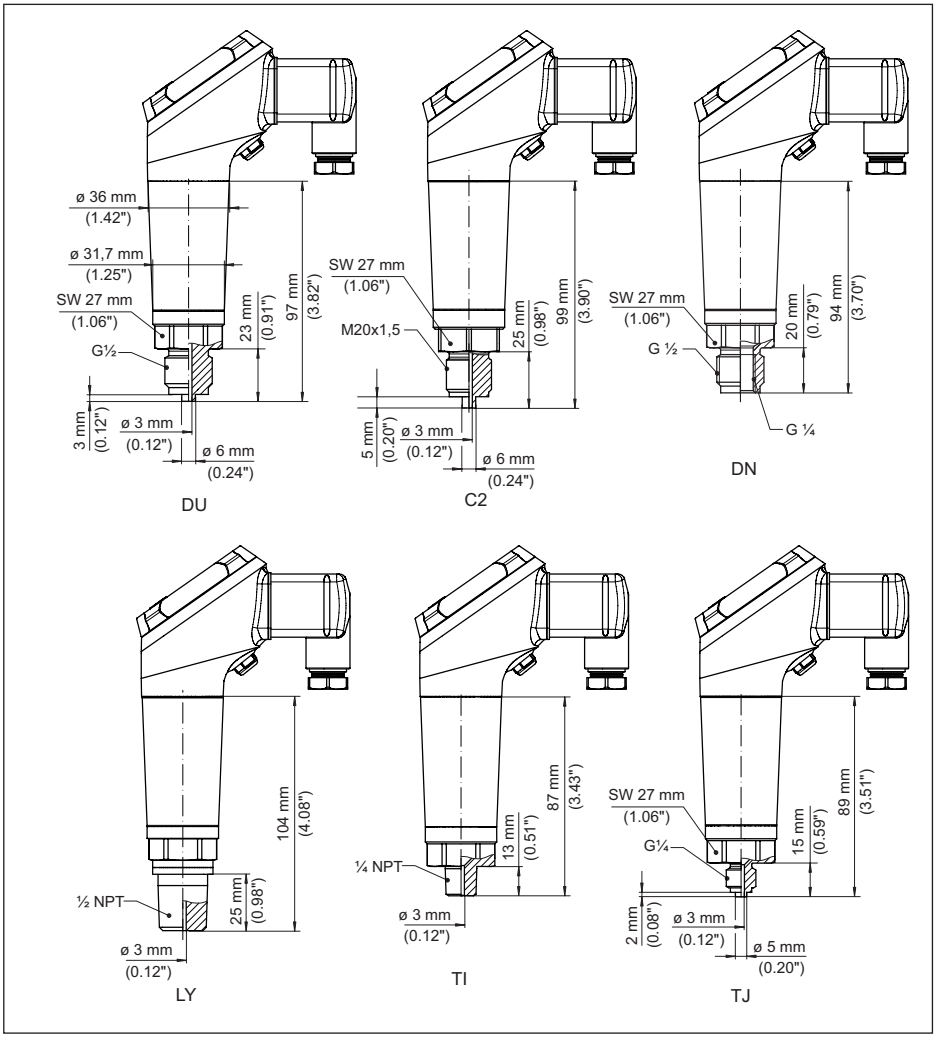


Fig. 35: VEGABAR 39, threaded fitting not front-flush

DU Thread G½ (EN 837), manometer connection
C2 Thread M20 x 1.5 (EN 837), manometer connection
LF Thread ½ NPT, inside ¼ NPT (ASME B1.20.1)
TI Thread ¼ NPT (ASME B1.20.1)
CS Thread G½, inside G¼ (ISO 228-1), Duplex (1.4462)
DQ Thread G½, inside G¼ (ISO 228-1), PVDF

VEGABAR 39, threaded fitting front-flush

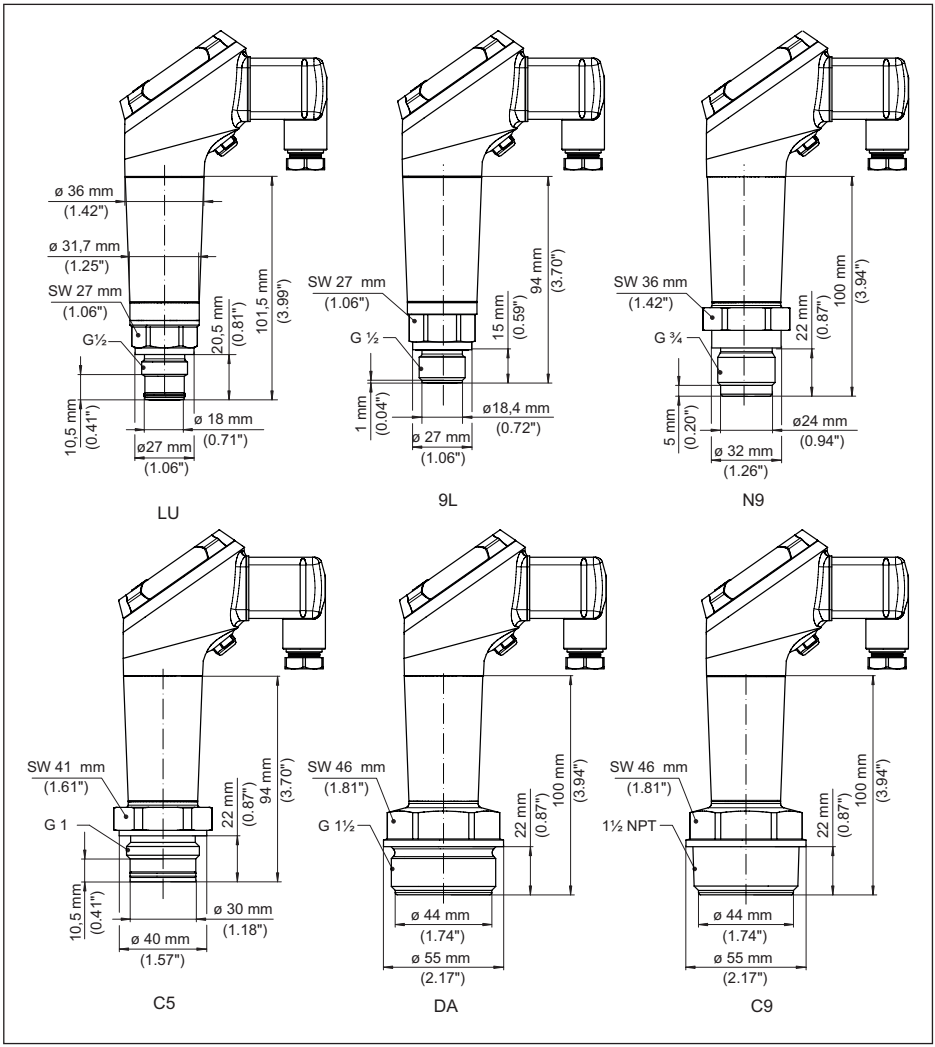


Fig. 36: VEGABAR 39, threaded fitting front-flush

C3 Thread G½ (ISO 228-1)
N9 Thread G¾ (DIN 3852-E)
C5 Thread G1 (ISO 228-1)
DA Thread G1½ (DIN 3852-A)
C9 Thread 1½ NPT (ASME B1.20.1)

VEGABAR 39, threaded fitting front-flush with cone/extension

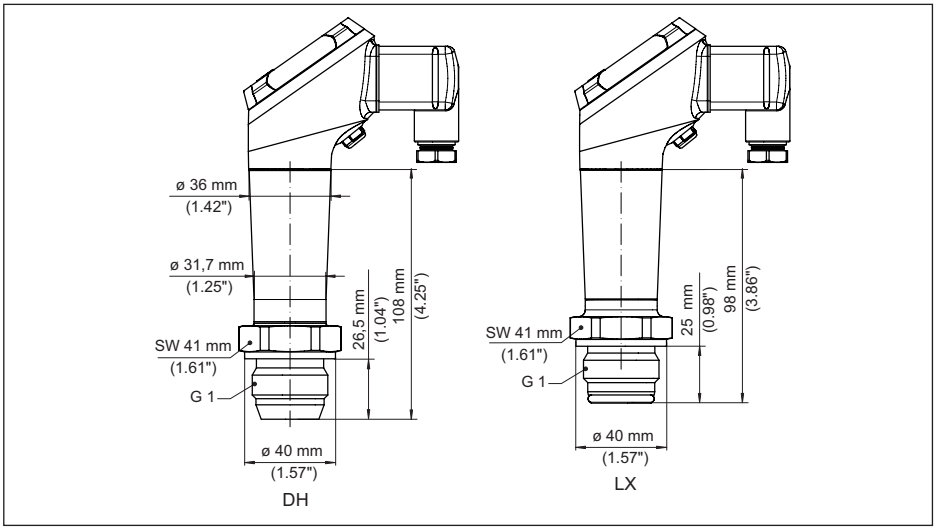


Fig. 37: VEGABAR 39, cone/extension fitting

DH Thread G1 (ISO 228-1), cone 40°
LX Thread G1 (ISO 228-1), hygienic design
AL Thread M30 x 1.5 (DIN 13)

VEGABAR 39, hygienic fitting

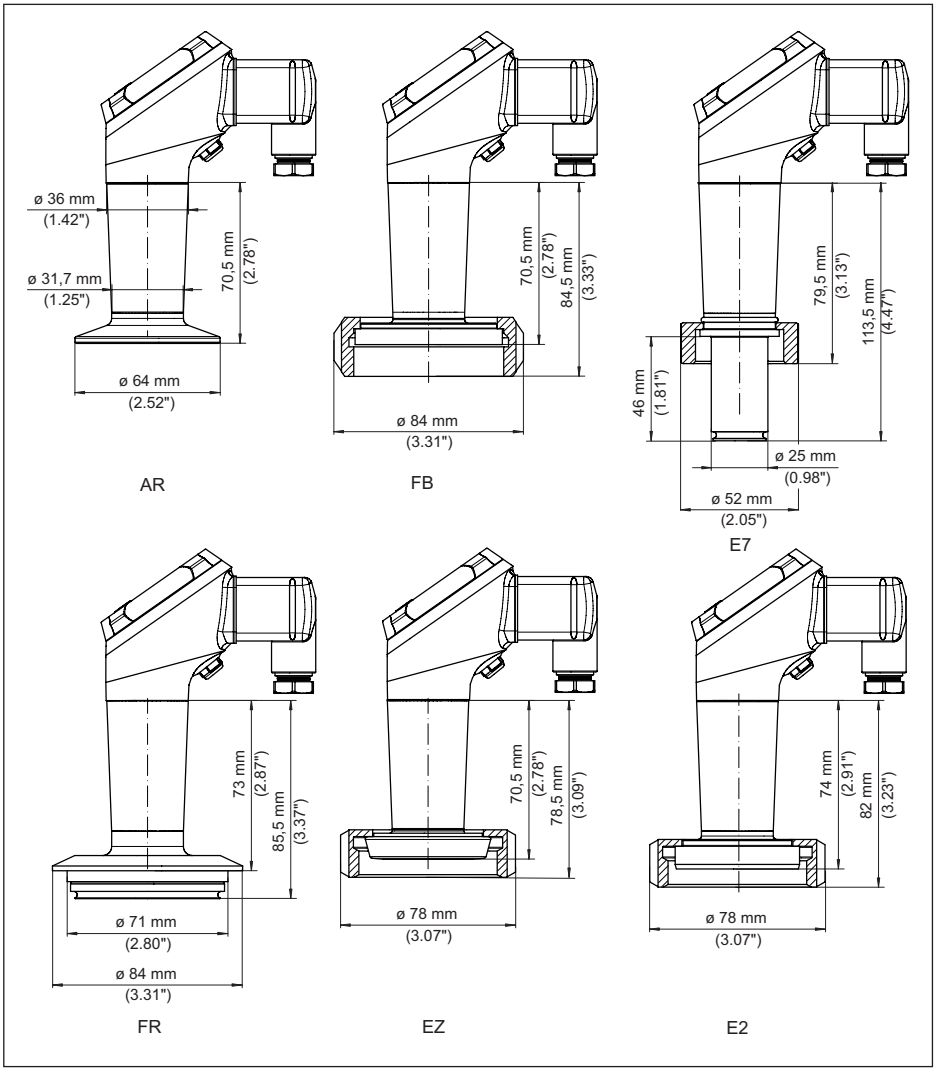


Fig. 38: VEGABAR 39, hygienic fitting

AR Clamp 2" PN 40, ø 64 mm (DIN 32676, ISO 2852)
FB SMS DN 51 PN 6
E7 Ingold connection PN 10
FR Varivent N50-40 PN 25
EZ Collar socket DN 40 PN 40 (DIN 11851)
E2 Collar socket DN 40 PN 40 (DIN 11864-1, Form A)

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