

Operating Instructions

Differential pressure transmitter with
metallic measuring diaphragm

VEGADIF 85

Two-wire: 4 ... 20 mA



Document ID: 53566



VEGA

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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.



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

VEGADIF 85 is an instrument for measurement of flow, level, differential pressure, density and interface.

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 NAMUR recommendations

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

The device fulfils the requirements of the following NAMUR recommendations:

- NE 21 – Electromagnetic compatibility of equipment
- NE 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.

2.6 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).

A Class 2 power supply unit has to be used for the installation in the USA and Canada.

2.7 Environmental instructions

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

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

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

3 Product description

3.1 Configuration

Scope of delivery

The scope of delivery encompasses:

- VEGADIF 85 pressure transmitter
- Chemical seal mounted - depending on configuration
- Ventilation valves, closing screws – depending on version (see chapter "*Dimensions*")

The further scope of delivery encompasses:

- Documentation
 - Quick setup guide VEGADIF 85
 - Test certificate for pressure transmitters
 - Instructions for optional instrument features
 - Ex-specific "*Safety instructions*" (with Ex versions)
 - If necessary, further certificates



Information:

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

Type label

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

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

Documents and software

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

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

Chemical seal

Depending on the configuration, the differential pressure transmitter is delivered with a mounted chemical seal.

The chemical seal consists of the following components: separating diaphragm, process fitting as well as temperature decoupler. The components are welded with the associated differential pressure transmitter and represent a hermetically sealed system.

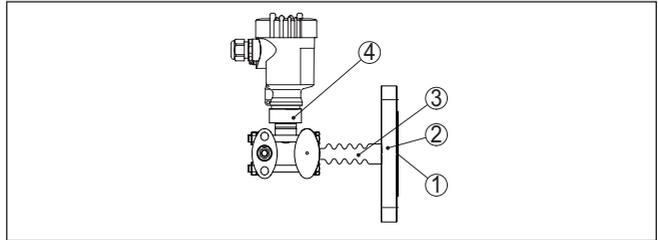


Fig. 1: VEGADIF 85 with chemical seal, single-sided

- 1 Separating diaphragm
- 2 Process fitting
- 3 Transmission line (capillaries)
- 4 VEGADIF 85

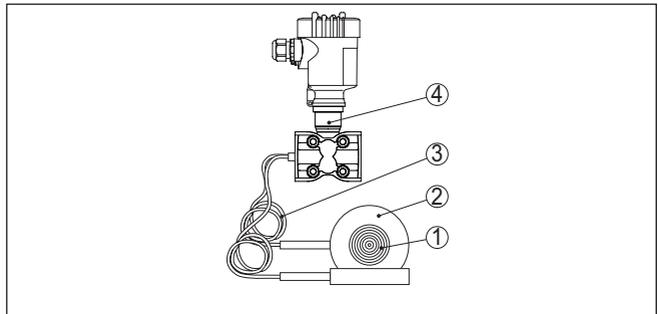


Fig. 2: VEGADIF 85 with chemical seal, bilateral

- 1 Separating diaphragm
- 2 Process fitting
- 3 Temperature decoupler
- 4 VEGADIF 85

3.2 Principle of operation

Application area

VEGADIF 85 is suitable universally for applications in virtually all industries. It is used for the measurement of the following pressure types:

- Differential pressure
- Static pressure

Chemical seals are used if a separation of medium and pressure transmitter is necessary, particularly with:

- High product temperatures
- Corrosive products
- Strong vibration at the measuring point

Measured products

Measured products are gases, vapours and liquids.

Measured variables

The differential pressure measurement enables the measurement of:

- Level

- Flow
- Differential pressure
- Density
- Interface

Level measurement

The instrument is suitable for level measurement in closed, superimposed pressure vessels. The static pressure is compensated by differential pressure measurement. It is available as a separate measured value for digital signal outputs.

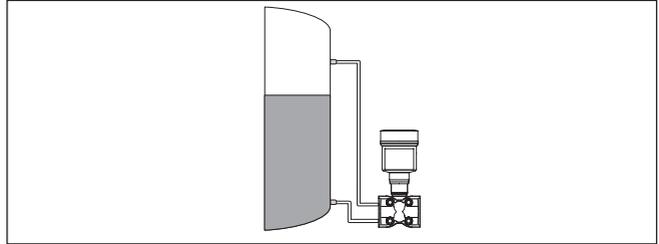


Fig. 3: Level measurement with VEGADIF 85 in a pressurized vessel

Flow measurement

The flow measurement is carried out via an effective pressure transmitter, such as an orifice plate or pitot tube. The device records the resulting pressure difference and converts the measured value into the flow. With digital signal outputs, the static pressure is available as a separate measured value.

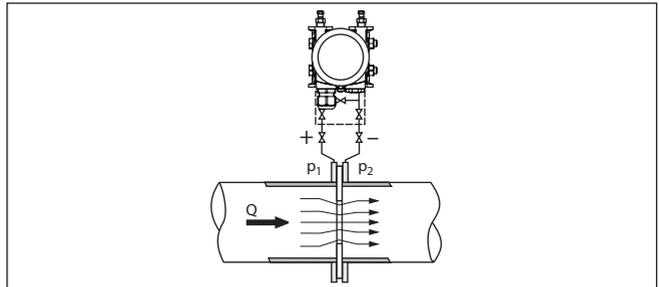


Fig. 4: Flow measurement with VEGADIF 85 and orifice, Q = flow, differential pressure $\Delta p = p_1 - p_2$

Differential pressure measurement

The pressures in two different pipelines are acquired via effective pressure lines. The device determines the differential pressure.

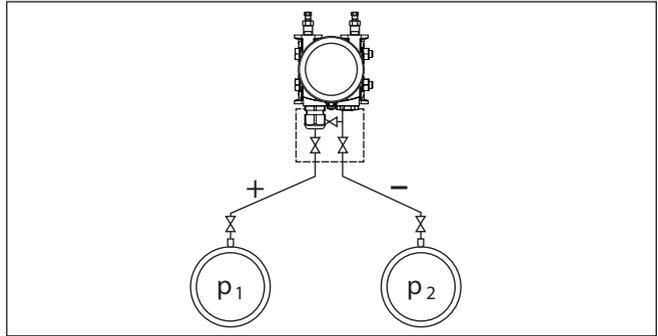


Fig. 5: Measurement of the differential pressure in pipelines with VEGADIF 85, differential pressure $\Delta p = p_1 - p_2$

Density measurement

With the help of the instrument, density measurement in a vessel with changing level and homogeneous density distribution can be easily realized. The instrument is connected to the vessel via a chemical seal at two different measuring points.

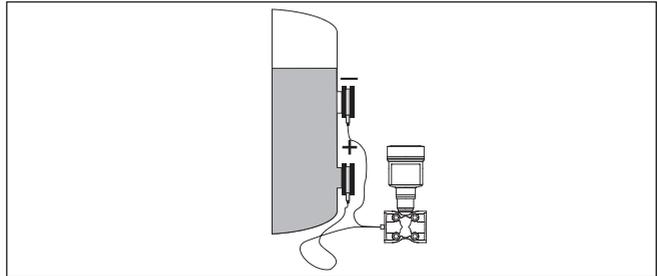


Fig. 6: Density measurement with VEGADIF 85

Interface measurement

The instrument can also be used for interface measurement in a vessel with changing level. The instrument is connected to the vessel via a chemical seal at two different measuring points.

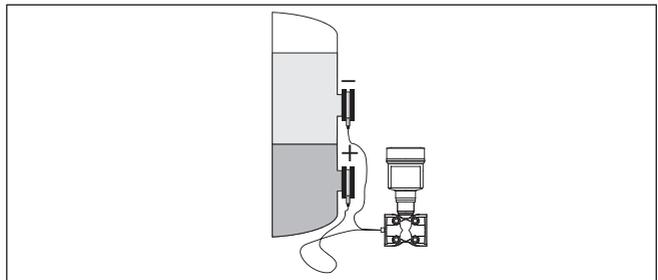


Fig. 7: Interface measurement with VEGADIF 85

Functional principle

A metallic measuring cell is used as sensor element. The process pressures are transmitted via the separating diaphragms and filling oils to a piezoresistive sensor element (resistance measuring bridge using semiconductor technology).

The difference between the acting pressures changes the bridge voltage. This change is measured, further processed and converted into a corresponding output signal.

When measurement limits are exceeded, an overload system protects the sensor element against damage.

In addition, the measuring cell temperature and the static pressure are measured on the low pressure side. The measuring signals are further processed and are available as additional output signals.

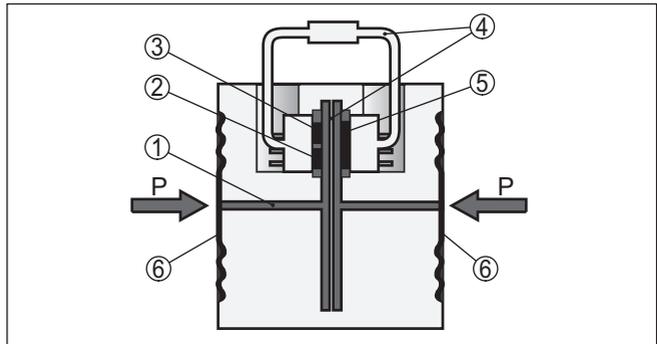


Fig. 8: Configuration metallic measuring cell

- 1 Filling fluid
- 2 Temperature sensor
- 3 Absolute pressure sensor, static pressure
- 4 Overload system
- 5 Differential pressure sensor
- 6 Separating diaphragm

Functional principle chemical seal

The process pressure acts on the separating diaphragm. This diaphragm transmits the process pressure through the capillary line with a pressure transmission liquids to the sensor element of the differential pressure transmitter.

3.3 Supplementary cleaning procedures

The VEGADIF 85 is also available in the version "Oil, grease and silicone-free". These instruments have passed through a special cleaning procedure to remove oil, grease and paint-wetting impairment substances (PWIS).

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

**Caution:**

The VEGADIF 85 in this version may not be used in oxygen applications. For this purpose, instruments are available in the special version "Oil, grease and silicone-free for oxygen applications".

3.4 Packaging, transport and storage**Packaging**

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

The packaging 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 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 see chapter "*Supplement - Technical data - Ambient conditions*"
 - Relative moisture 20 ... 85 %

Storage and transport temperature**Lifting and carrying**

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

3.5 Accessories

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

Display and adjustment module

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

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

VEGACONNECT

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

VEGADIS 82

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

Overvoltage protection

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

Protective cover

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

Mounting accessories

The suitable mounting accessories for VEGADIF 85 include oval flange adapters, valve blocks as well as mounting brackets.

4 Mounting

4.1 General instructions

Process conditions



Note:

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

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

These are mainly:

- Active measuring component
- Process fitting
- Process seal

Process conditions in particular are:

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

Permissible process pressure (MWP)

The permissible process pressure range is specified on the type label with "MWP" (Maximum Working Pressure), see chapter "Configuration". This specification refers to a reference temperature of +25 °C (+76 °F). The MWP may also be permanently applied on one side.

In order to prevent damage to the device, a test pressure acting on both sides 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").

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

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
- Lead the connection cable downward in front of the cable entry or plug connector

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



Note:

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

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

Ventilation

The ventilation for the electronics housing is realised via a filter element in the vicinity of the cable glands.

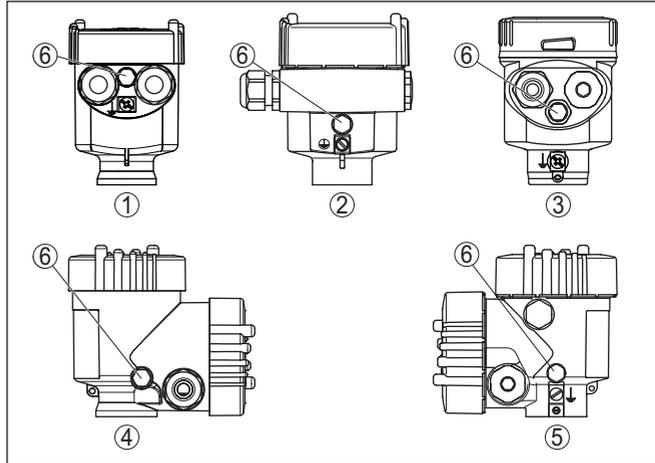


Fig. 9: Position of the filter element - non-Ex, Ex ia and Ex d ia version

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



Information:

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

Turning the housing

For better readability of the display or access to the wiring, the electronics housing can be rotated by 330°. A stop prevents the housing from being turned too far.

Depending on the version and housing material, the locking screw on the neck of the housing must be slightly loosened. The housing can then be turned to the correct position. As soon as the requested position is reached, tighten the locking screw.

Vibrations

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

Temperature limits

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

Take note of the following issues in respect to the process and ambient temperature:

- Mount the differential pressure transmitter in such a way that the permissible process and ambient temperature limits are neither underrun nor exceeded.
- Take the influence of convection and heat radiation into account
- When selecting the chemical seals, make sure that the fittings and flanges are pressure and temperature resistant
- For this purpose select the suitable material and pressure stage
- Mount in such a way that plus and minus side have the same ambient temperatures to keep the temperature influences low



Caution:

With a surface temperature of the vessel $> 100\text{ }^{\circ}\text{C}$ the electronics of VEGADIF 85 is heated up unnecessarily. This can cause damages or a failure of the electronics.

The vessel must be isolated in a suitable way so that this can be avoided.

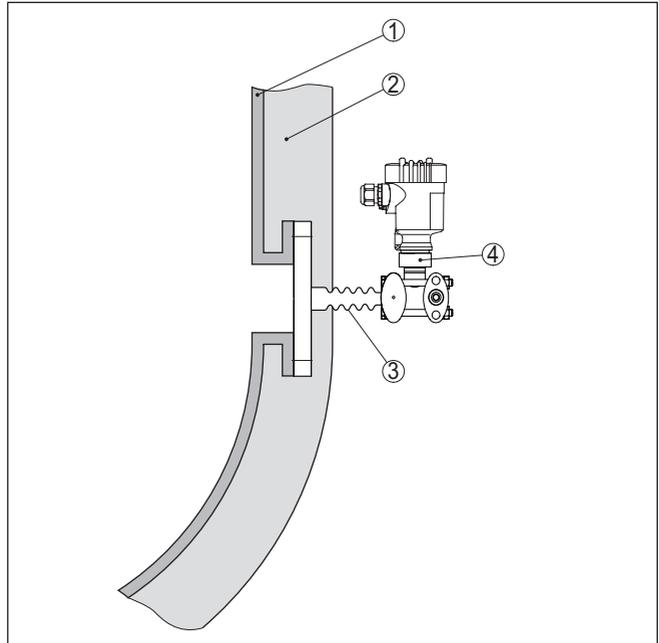


Fig. 10: Recommended vessel insulation with chemical seal without cooling area (length 100 mm)

- 1 Vessel wall
- 2 Vessel insulation
- 3 Temperature decoupler
- 4 VEGADIF 85

If a suitable insulation of the vessel is not possible, use a chemical seal with cooling area (length 150 mm).

4.2 Instructions for oxygen applications



Warning:

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

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

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

4.3 Connection to the process

DP flow element

DP flow elements are installations in pipelines which generate a flow-dependent pressure drop. The flow rate is measured via this differential pressure. Typical DP flow elements are Venturi tubes, orifice plates or impact pressure probes.

Instructions for mounting the DP flow elements are stated in the appropriate standards as well as in the documentation from the respective manufacturer.

Effective pressure lines

Effective pressure lines are pipelines with a small diameter. They are used to connect the differential pressure transmitter to the pressure tapping point or the DP flow element.

Principles

Effective pressure lines for gases must always remain completely dry and no condensate must collect. Effective pressure lines for liquids must always be completely filled and must not contain any gas bubbles. Therefore, suitable venting systems must be provided for liquids and suitable drainage systems for gases.

Wiring

Effective pressure lines must always run with a sufficient, strictly monotonous slope/gradient of at least 2 %, but better up to 10 %.

Recommendations for wiring of effective pressure lines are stated in the corresponding national and international standards.

Connection

Effective pressure lines are connected to the device via standard cutting ring screw connections with suitable thread.

**Note:**

Follow the mounting instructions of the respective manufacturer and seal the thread, e.g. with PTFE tape.

Valve blocks

Valve blocks are used for initial shut-off when connecting the differential pressure transmitter to the process. They are also used for pressure compensation of the measuring chambers during adjustment.

3-fold and 5-fold valve blocks are available (see chapter "*Mounting and connection instructions*").

Ventilation valves, closing screws

Free openings on the process assembly must be closed by ventilation valves or closing screws. Required torque see chapter "*Technical data*".

**Note:**

Use the supplied parts and seal the thread with four layers of PTFE tape.

4.4 Mounting and connection instructions

Connection high/low pressure side

When connecting VEGADIF 85 to the measuring point, take note of the high/low pressure side of the process component.¹⁾

The "H" identifies the high pressure side, the low pressure side due to an "L" on the process component next to the oval flanges.

**Note:**

The static pressure is measured on the low pressure side "L".

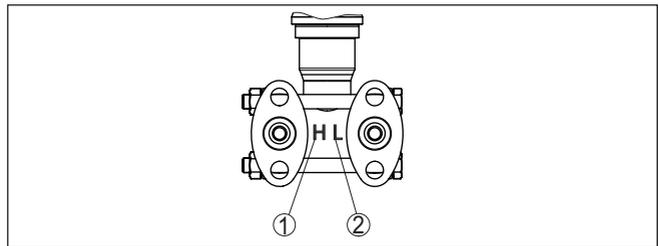


Fig. 11: Marking for high/low pressure side on the process component

- 1 H = High pressure side
- 2 L = Low pressure side

Instructions for handling

- Instruments must be protected against soiling and strong fluctuations of the ambient temperature
- Leave the measuring system in the packaging until mounting to protect it against mechanical damages
- When removing the packaging and when mounting, take special care to avoid mechanical damage and deformation of the diaphragm

¹⁾ The pressure effective on "H" is considered as positive, the pressure effective on "L" as negative in the calculation of the pressure difference.

- Do not carry the pressure transmitter by holding the capillary line
- Do not bent the capillary lines. Kinks can cause leakage and lead to an increase in response time
- Never loosen sealed screws on the chemical seal or the pressure transmitter
- Do not damage the isolating diaphragm: scratches on the isolating diaphragm (e.g. from sharp subjects) are the main areas where corrosion can occur

Mounting instructions

- Suitable seals must be selected for sealing
- With the flange mounting, use a seal with a sufficiently large inner diameter and place the seal centrally; contact with the diaphragm will cause measurement deviations
- When using Elastomer or PTFE seals, take note of the regulations of the seal manufacturer, particularly with respect to torque and settling cycles

Laying the capillaries on both sides of the chemical seal

- Lay in vibration-free areas to avoid additional pressure fluctuations
- Do not lay close to heating or cooling lines
- Insulate in case of colder or warmer ambient temperatures
- Bending radius of the capillaries ≥ 30 mm

3-fold valve block

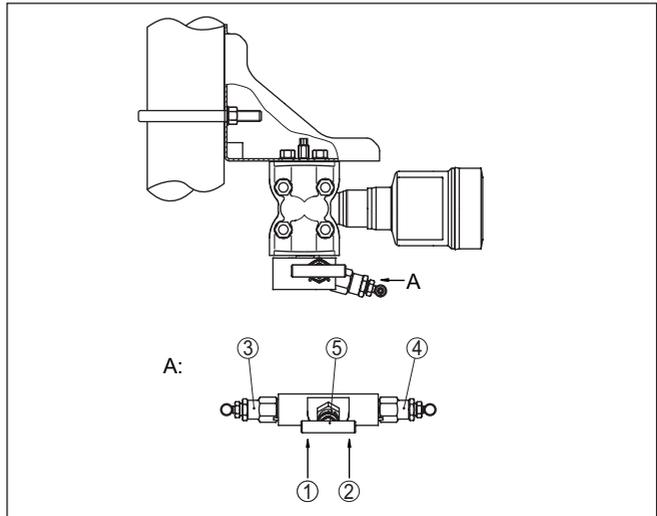


Fig. 12: Connection of a 3-fold valve block

- 1 Process fitting
- 2 Process fitting
- 3 Inlet valve
- 4 Inlet valve
- 5 Breather valve

3-fold valve block, flanging on both sides

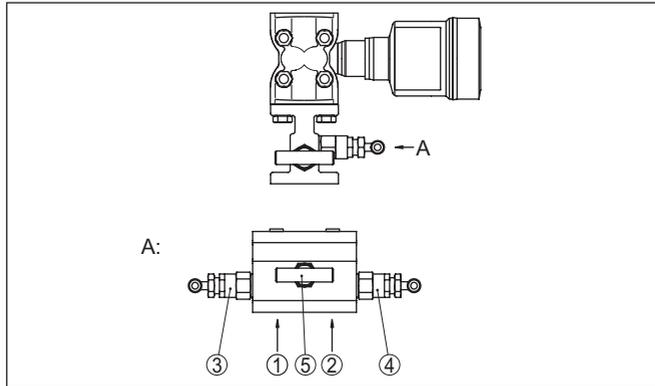


Fig. 13: Connection of a 3-fold valve block, flanging on both sides

- 1 Process fitting
- 2 Process fitting
- 3 Inlet valve
- 4 Inlet valve
- 5 Breather valve



Note:

No mounting bracket is required for valve blocks that can be flange-mounted on both sides. The process side of the valve block is mounted directly to a DP flow element, e.g. an orifice plate.

5-fold valve block

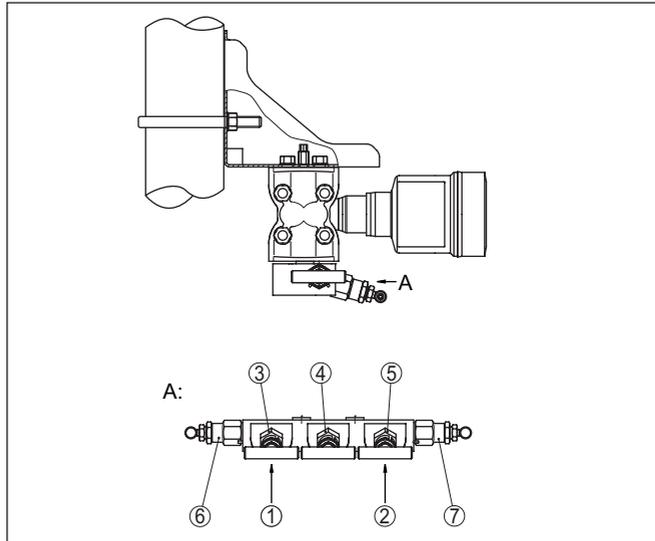


Fig. 14: Connection of a 5-fold valve block

- 1 Process fitting
- 2 Process fitting
- 3 Inlet valve
- 4 Breather valve
- 5 Inlet valve
- 6 Valve for checking/ventilating
- 7 Valve for checking/ventilating

4.5 Measurement setups

4.5.1 Overview

The following sections show common measurement setups:

- Level
- Flow
- Differential pressure
- Interface
- Density

Depending on the application, there may also be different arrangements.



Note:

For simplification, the effective pressure lines are partly shown with a horizontal course and sharp angles. For wiring, please observe the instructions in chapter "Mounting, Connection to the process" as well as the hook ups in the supplementary instructions "Mounting accessory pressure technology".

4.5.2 Level

In closed vessels with effective pressure lines

- Mount device below the lower measurement connection so that the effective pressure lines are always filled with liquid
- Always connect the low pressure side above the max. level in the vessel
- For measurement in products with solid content, such as e.g. dirty liquids, the installation of separators and drain valves is recommended. Debris and sediment can thus be collected and removed.

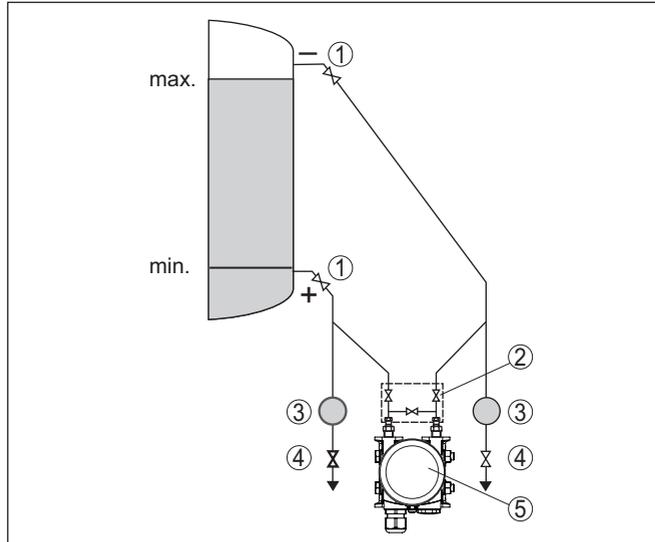


Fig. 15: Measurement setup, level measurement in closed vessel

- 1 Blocking valves
- 2 3-fold valve block
- 3 Precipitator
- 4 Drain valves
- 5 VEGADIF 85

In closed vessels with single chemical seal

- Mount device directly to the vessel
- Always connect the low pressure side above the max. level in the vessel
- For measurement in products with solid content, such as e.g. dirty liquids, the installation of separators and drain valves is recommended. Debris and sediment can thus be collected and removed.

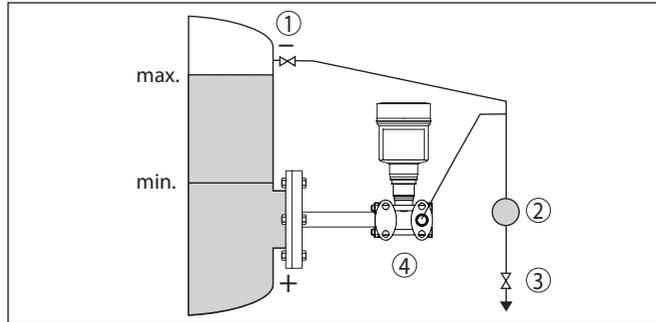


Fig. 16: Measurement setup, level measurement in closed vessel

- 1 Shut-off valve
- 2 Precipitator
- 3 Drain valve
- 4 VEGADIF 85

In closed vessels with double chemical seal

- Mount device below the lower chemical seal
- The ambient temperature should be the same for both capillaries



Information:

Level measurement is only carried out between the upper edge of the lower and the lower edge of the upper chemical seal.

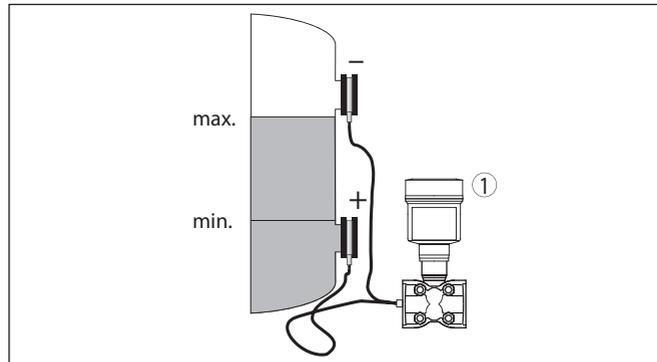


Fig. 17: Measurement setup, level measurement in closed vessel

- 1 VEGADIF 85

In closed vessels with steam layering with effective pressure line

- Mount device below the lower measurement connection so that the effective pressure lines are always filled with liquid
- Always connect the low pressure side above the max. level in the vessel
- The condensate vessel ensures a constant pressure on the low pressure side
- For measurement in products with solid content, such as e.g. dirty liquids, the installation of separators and drain valves is recommended. Debris and sediment can thus be collected and removed.

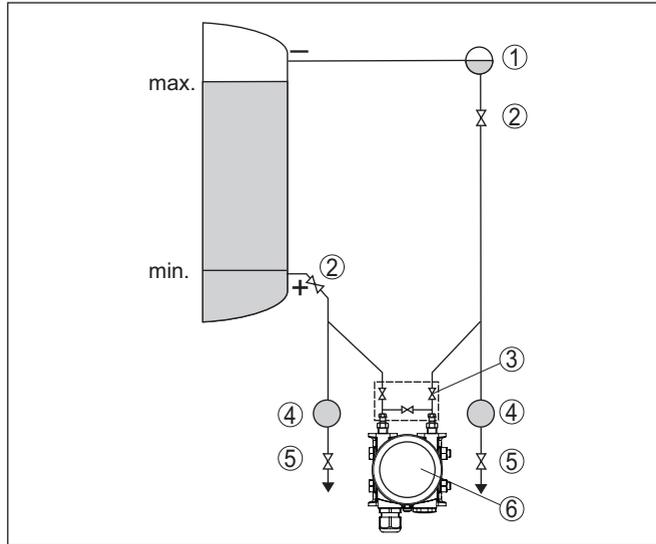


Fig. 18: Measurement setup in closed vessel with superimposed steam

- 1 Condensate vessel
- 2 Blocking valves
- 3 3-fold valve block
- 4 Precipitator
- 5 Drain valves
- 6 VEGADIF 85

4.5.3 Flow

In gases

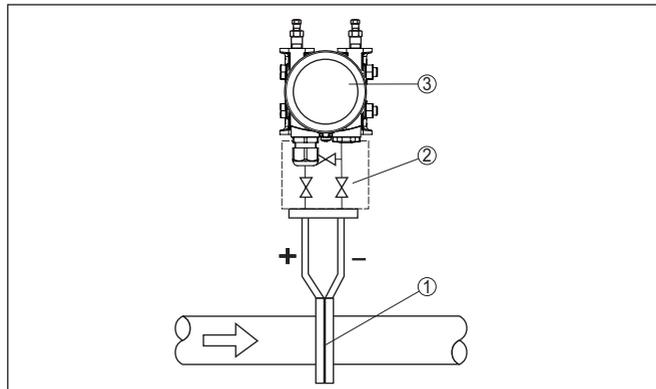


Fig. 19: Measurement setup with flow measurement of gases, connection via 3-fold valve block, flanging on both sides

- 1 Orifice or pitot tube
- 2 3-fold valve block, flanging on both sides
- 3 VEGADIF 85

In vapours

- Mount the instrument below the measuring point
- Mount condensate vessels at the same height with the discharge socket and at the same distance to the device
- Fill the effective pressure lines to the height of the condensate vessels before setup

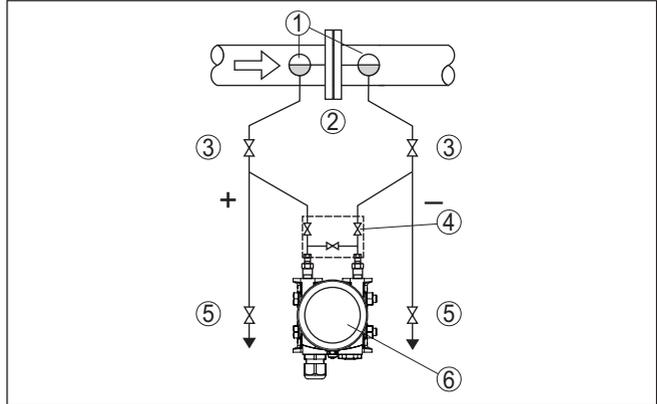


Fig. 20: Measurement setup, flow measurement in vapours

- 1 Condensate vessels
- 2 Orifice or pitot tube
- 3 Blocking valves
- 4 3-fold valve block
- 5 Drain valves
- 6 VEGADIF 85

In liquids

- Mount device below the measurement loop so that the effective pressure lines are always filled with liquid and gas bubbles can bubble up to the process line
- For measurements in products with solid content such as e.g. dirty liquids, the installation of separators and drain valves is recommended to enable collection and removal of debris and sediment.
- Fill the effective pressure lines to the height of the condensate vessels before setup

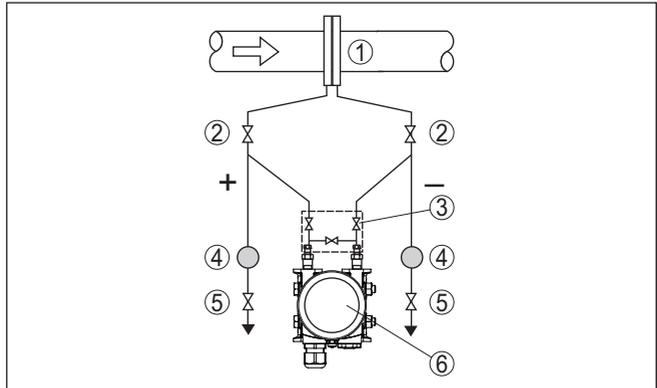


Fig. 21: Measurement setup, flow measurement in liquids

- 1 Orifice or pitot tube
- 2 Blocking valves
- 3 3-fold valve block
- 4 Precipitator
- 5 Drain valves
- 6 VEGADIF 85

4.5.4 Differential pressure

In gases and vapours

- Mount device above the measurement loop so that condensate can drain off in the process cable.

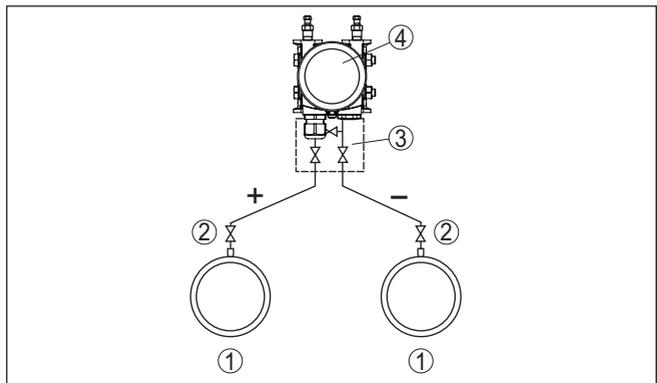


Fig. 22: Measurement setup with differential pressure measurement between two pipelines in gases and vapours

- 1 Pipelines
- 2 Blocking valves
- 3 3-fold valve block
- 4 VEGADIF 85

In vapour and condensate plants

- Mount device below the measurement loop so that some condensate can collect in the effective pressure lines.

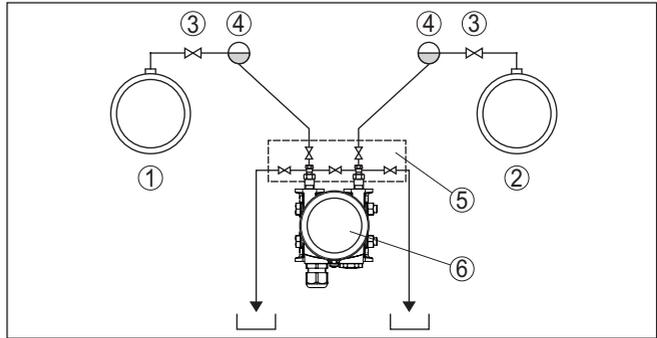


Fig. 23: Measurement setup with differential pressure measurement between a vapour and a condensate line

- 1 Vapour cable
- 2 Condensate line
- 3 Blocking valves
- 4 Condensate vessels
- 5 5-fold valve block
- 6 VEGADIF 85

In liquids

- Mount device below the measurement loop so that the effective pressure lines are always filled with liquid and gas bubbles can bubble up to the process line
- For measurement in products with solid content, such as e.g. dirty liquids, the installation of separators and drain valves is recommended. Debris and sediment can thus be collected and removed.

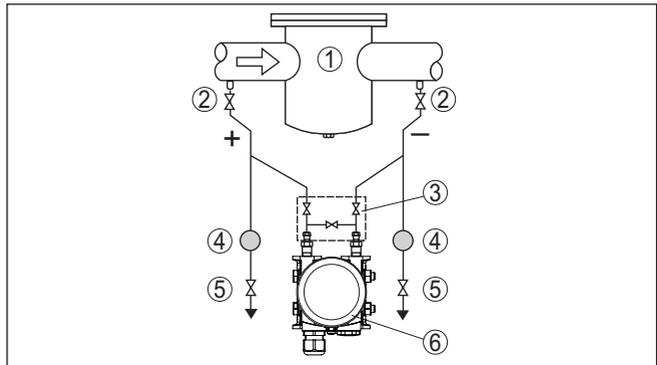


Fig. 24: Measurement setup with differential pressure measurement in liquids

- 1 e.g. filter
- 2 Blocking valves
- 3 3-fold valve block
- 4 Precipitator
- 5 Drain valves
- 6 VEGADIF 85

- Mount chemical seal with capillaries on top or laterally on the pipeline

- In vacuum applications: Mount VEGADIF 85 below the measurement loop
- The ambient temperature should be the same for both capillaries

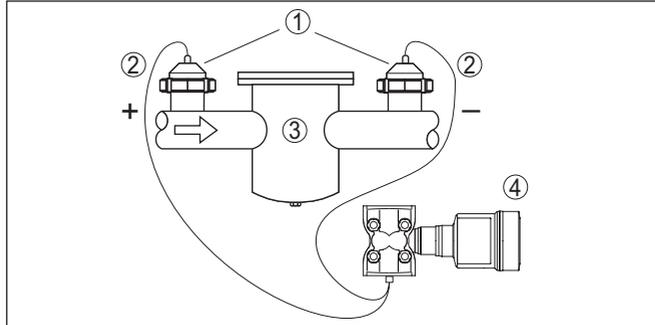


Fig. 25: Measurement setup, differential pressure measurement in gases, vapours and liquids

- 1 Chemical seal with slotted nut
- 2 Capillaries
- 3 E.g. filter
- 4 VEGADIF 85

4.5.5 Density

Density measurement

- Mount device below the lower chemical seal
- The distance between the two measurement points must be as large as possible to ensure a high measurement accuracy
- The ambient temperature should be the same for both capillaries

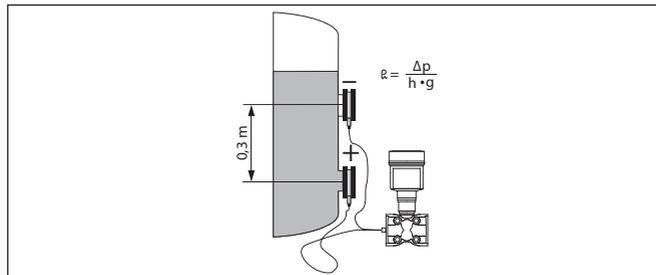


Fig. 26: Measurement setup for density measurement

Density measurement is only possible when the level remains above the upper measuring point. If the level falls below the upper measuring point, the measuring system continues to work with the last density value.

This density measurement functions with open as well as closed vessels. Make sure that small density changes cause only small changes to the measured differential pressure.

Example

Distance between the two measurement points 0.3 m, min. density 1000 kg/m³, max. density 1200 kg/m³

Carry out min. adjustment for the differential pressure measured with density 1.0:

$$\begin{aligned} \Delta p &= \rho \cdot g \cdot h \\ &= 1000 \text{ kg/m}^3 \cdot 9.81 \text{ m/s}^2 \cdot 0,3 \text{ m} \\ &= 2943 \text{ Pa} = 29.43 \text{ mbar} \end{aligned}$$

Carry out max. adjustment for the differential pressure measured with density 1.2:

$$\begin{aligned} \Delta p &= \rho \cdot g \cdot h \\ &= 1200 \text{ kg/m}^3 \cdot 9.81 \text{ m/s}^2 \cdot 0.3 \text{ m} \\ &= 3531 \text{ Pa} = 35.31 \text{ mbar} \end{aligned}$$

4.5.6 Interface

Interface measurement

- Mount device below the lower chemical seal
- The ambient temperature should be the same for both capillaries

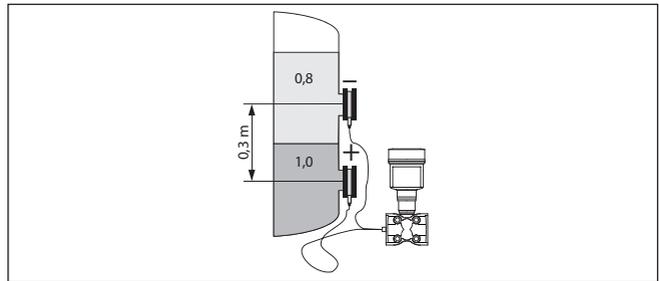


Fig. 27: Measurement setup with interface measurement

An interface measurement is only possible if the densities of the two media remain the same and the interface is between the two measurement points. The total level must be above the upper measurement point.

This interface measurement functions with open but also with closed vessel.

Example

Distance between the two measurement points 0.3 m, min. density 800 kg/m³, max. density 1000 kg/m³

Carry out min. adjustment for the differential pressure which is measured at the height of the interface on the lower measurement point:

$$\begin{aligned} \Delta p &= \rho \cdot g \cdot h \\ &= 800 \text{ kg/m}^3 \cdot 9.81 \text{ m/s} \cdot 0.3 \text{ m} \\ &= 2354 \text{ Pa} = 23.54 \text{ mbar} \end{aligned}$$

Carry out max. adjustment for the differential pressure which is measured at the height of the interface on the upper measurement point:

$$\begin{aligned} \Delta p &= \rho \cdot g \cdot h \\ &= 1000 \text{ kg/m}^3 \cdot 9.81 \text{ m/s} \cdot 0.3 \text{ m} \\ &= 2943 \text{ Pa} = 29.43 \text{ mbar} \end{aligned}$$

5 Planning instructions for isolating systems

5.1 Influence of the components

Separating diaphragm

The following properties of the separating diaphragm determine the application area of the chemical seal:

- Diameter
- Resilience
- Material

The bigger the diaphragm diameter, the higher the resilience and the smaller the temperature influence on the measuring result. Note: To keep this influence within reasonable limits, you should use a chemical seal with a nominal width \geq DN 80.

The resilience also depends on the diaphragm thickness, the material as well as a possible coating.

Capillaries

The capillary line influences the temperature coefficient $TK_{\text{Zero point}}$, the permissible ambient temperature and the step response time of an isolating system through its length and inner diameter. See also chapter "Influence of the temperature on the zero point", "Ambient temperature range" and "Step response time".

Chemical seal filling oil

In the selection of filling oil, product and ambient temperature as well as process pressure are of utmost importance. Also take note of temperatures and pressures during setup and cleaning.

The filling oil expands as the temperature increases. The additional volume presses on the chemical seal. The more rigid the diaphragm, the more it counteracts a volume change. The additional volume also adds to the process pressure on the measuring cell and thus shifts the zero point. The respective temperature coefficient " TK_{Process} " is listed in chapter "Dimensions and weights".

Another criterium is the compatibility of the filling oil with the requirements of the medium. In the food processing industry, for example, only filling oils that present no health risks are permitted, e.g. medicinal white oil. See overview of filling oils in the following chart.

The table also shows the permissible medium temperature depending on the isolating liquid and instrument version for $p_{\text{abs}} > 1 \text{ bar}/14.5 \text{ psi}$. For the medium temperature with instrument version for $p_{\text{abs}} < 1 \text{ bar}/14.5 \text{ psi}$, see chapter "Chemical seal for vacuum applications".

Filling oil	Permissible product temperatures	Permissible medium temperature with $p_{\text{abs}} < 1 \text{ bar}/14.5 \text{ psi}$	Density in g/cm^3 at 25 °C	Kinematic viscosity in cSt at 25 °C	Corrective factor for TK	Application area
Silicone oil VE 2.2, KN 2.2	-40 ... +150 °C (-40 ... +302 °F)		0.96	54.5	1	Standard

Filling oil	Permissible product temperatures	Permissible medium temperature with $p_{abs} < 1 \text{ bar}/14.5 \text{ psi}$	Density in g/cm^3 at 25 °C	Kinematic viscosity in cSt at 25 °C	Corrective factor for TK	Application area
Silicone oil KN 17	-90 ... +180 °C (-130 ... +356 °F)	-90 ... +80 °C (-130 ... +176 °F)	0.92	4.4	-	Low temperatures
Silicone oil VE 2.2, KN 2.2 and cooling element	-40 ... +200 °C (-40 ... +392 °F)	-40 ... +150 °C (-40 ... +302 °F)	0.96	54.5	1	High temperatures
High temperature oil VE 32, KN 32	-10 ... +300 °C (-14 ... +572 °F)	-10 ... +200 °C (-14 ... +392 °F)	1.06	47.1	0.77	
High temperature oil VE 32, KN 32	-10 ... +400 °C (+14 ... +752 °F)					
Halocarbon oil KN 21	-40 ... +150 °C (-40 ... +302 °F)	-90 ... +80 °C (-130 ... +176 °F)	1.89	10.6	0.83	Chlorine applications
Halocarbon oil KN 21 (BAM tested) ²⁾	-40 ... +60 °C (-40 ... +140 °F)					Oxygen applications
Medical white oil KN 92, KN 92 (FDA approved)	-10 ... +150 °C (+14 ... +302 °F)		0.85	45.3	0.63	Food applications
Medical white oil KN 92, KN 92 (FDA approved) and cooling element	-10 ... +250 °C (+14 ... +482 °F)	-10 ... +160 °C (+14 ... +320 °F)				Food applications, high temperatures
Neobee M-20 KN 59 (FDA approved)	-38 ... +260 °C (-36,4 ... +500 °F)		0.92	10	-	Food applications

The implemented filling oil also influences the $TK_{zero \text{ point}}$, the permissible ambient temperature and the step response time of a chemical seal. See also chapter "Influence of the temperature on the zero point" and "Step response time".

Differential pressure transmitter

The differential pressure transmitter also influences the temperature application range, the $TK_{zero \text{ point}}$ and the step response time of the isolating system through the volume of its lateral flanges and its control volume.³⁾

²⁾ Cleaning procedure oil and grease-free for oxygen applications, max. oxygen pressure 50 bar (725.2 psi) acc. to BAM investigation (Federal Institute for Materials Research and Testing)

³⁾ The control volume is the volume that must be shifted in order to utilise the entire measuring range.

5.2 Temperature influence depending on capillary length

Influence of the temperature on the zero point

The following diagram shows the temperature coefficient depending on the capillary length. The process temperature corresponds to the calibration temperature. The temperature coefficients determined from the diagram apply to silicone oil and the diaphragm material 316L. For other filling oil, these temperature coefficients have to be multiplied with the correction factor for the TK of the respective filling oil.

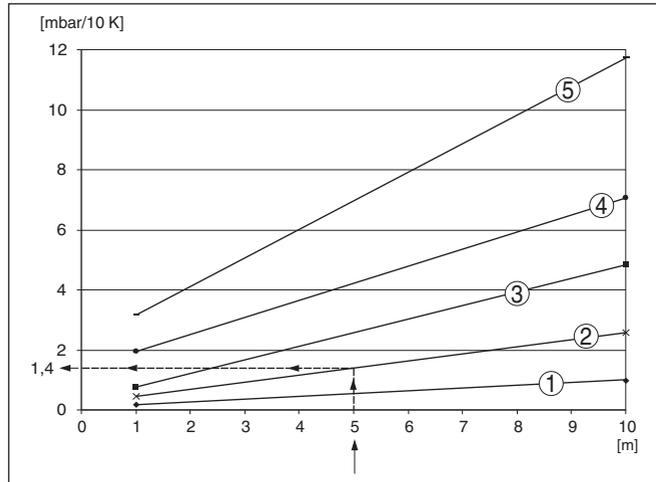


Fig. 28: Temperature coefficient "TK_{Ambient}" depending on the capillary length. Characteristics 1 ... 5 related to the process fittings listed below.

- **Characteristics 1**
 - Clamp 3" (ø 91 mm) according to DIN 32676, ISO 2852/316L
- **Characteristics 2**
 - EN/DIN flange DN 80 PN 10-40 B1, 316L
 - EN/DIN flange DN 100 PN 10-16 B1, 316L
 - EN/DIN flange DN 100 PN 25-40 B1, AISI 316L
 - ASME flange 3" 150 lbs RF, 316/316L
 - ASME flange 3" 300 lbs RF, 316/316L
 - DIN 11851 DN 80 PN 25, 316L
 - DIN 11851 DN 80 PN 25 nozzle, AISI 316L
 - Cell DN 80 PN 16-400, 316L
 - Cell DN 100 PN 16-400, 316L
 - Cells 3" 150-2500 lbs, 316L
- **Characteristics 3**
 - ASME flange 3" 150 lbs RF, 316/316L, extension: 2"/4"/6"/8"
- **Characteristics 4**
 - EN/DIN flange DN 50 PN 10-40 B1, 316L
 - ASME flange 2" 150 lbs RF, 316/316L
 - ASME flange 3" 300 lbs RF, 316/316L
 - DIN 11851 DN 50 PN 25, 316L
 - DIN 11851 DN 50 PN 25 nozzle, AISI 316L

- Cell DN 50 PN 16-400, 316L
- Cell 2" 150-2500 lbs, 316L
- **Characteristics 5**
- DRD DN 50 (65 mm), PN 25, 316L

Method of calculation

- Chemical seal: EN/DIN flange DN 80 PN 10-40 B1, AISI 316L
- Capillary length: 5 m
- Ambient temperature capillaries/transmitter: 45 °C
- Filling oil: Silicone oil

To calculate the indication, proceed as follows:

1. Choose characteristics for the chemical seal from the list.
Result: characteristics 2
2. Determine value for $TK_{Ambient}$ from the diagram.
Result: 1.4 mbar/10 K
3. $\frac{T_{Ambient} - T_{Calibration}}{2.8 \text{ mbar}} = 45 \text{ °C} - 25 \text{ °C} = 20 \text{ °C}; (1.4 \text{ mbar}/10 \text{ K}) \cdot 20 \text{ K} = 2.8 \text{ mbar}$

Result:

In this application case, the zero point is shifted by 2.8 mbar.

The influence of the temperature on the zero point can be corrected by a position adjustment.

Reduction of the temperature influence

The following are options for reducing the temperature influence:

- Identical chemical seals and capillaries of equal length on both sides. This compensates for temperature influences, and 20 % of the sum of the individual errors of the two chemical seals is calculated.
- Smaller capillary inner diameter (Note: The step response time increases with decreasing diameter, however)
- Shorter capillaries
- Chemical seal with larger diaphragm diameter
- Filling oil with a smaller expansion coefficient

Ambient temperature range

The following parameters determine the ambient temperature range of the chemical seal system:

- Filling oil
- Capillary length
- Capillary inner diameter
- Oil volume of the chemical seal
- Process temperature

The following diagrams show the permissible ambient temperature range depending on the capillary length. They apply to a process temperature of 25 °C and silicone oil. The application range can be extended by using a filling oil with a smaller expansion coefficient and shorter capillaries.



Note:

The illustrations are in principle examples and serve as a guideline. The actual permissible temperatures must be determined individually for each application.

- **Group B**

- Cell 2" 150-2500 lbs, 316L
- ASME flange 2" 150 lbs RF, 316/316L
- ASME flange 2" 300 lbs RF, 316/316L
- Cell DN 50 PN 16-400, 316L

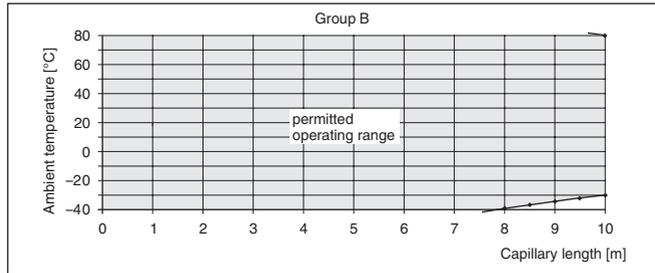


Fig. 29: Permissible ambient temperature range depending on the capillary length for chemical seals of group B

- **Group C**

- EN/DIN flange DN 80 PN 10-40 B1, 316L
- EN/DIN flange DN 100 PN 10-16 B1, 316L
- EN/DIN flange DN 100 PN 25-40 B1, AISI 316L
- DIN 11851 DN 80 PN 25, 316L
- Cell DN 80 PN 16-400, 316L
- Cell DN 100 PN 16-400, 316L
- Cell 3" 150-2500 lbs, 316L

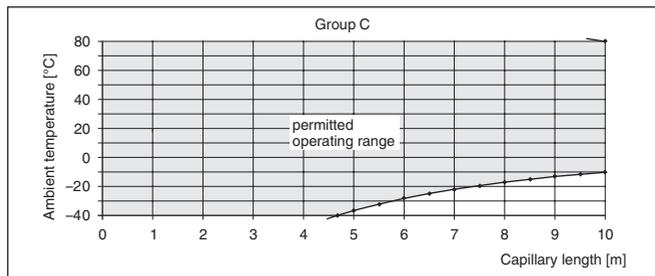


Fig. 30: Permissible ambient temperature range depending on the capillary length for chemical seals of group C

- **Group D**

- ASME flange 3" 150 lbs RF, 316/316L
- ASME flange 3" 300 lbs RF, 316/316L
- Cell 3" 150-2500 lbs, 316L

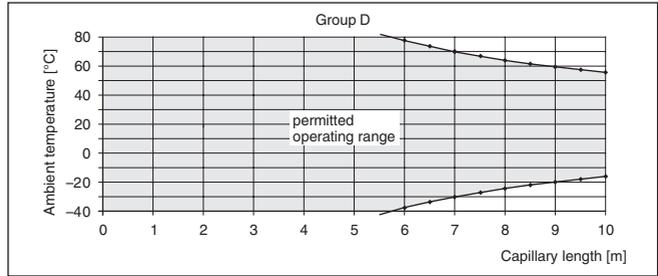


Fig. 31: Permissible ambient temperature range depending on the capillary length for chemical seals of group D

● **Group E**

- ASME flange 3" 150 lbs RF, 316/316L, extension: 2"/4"/6"/8"

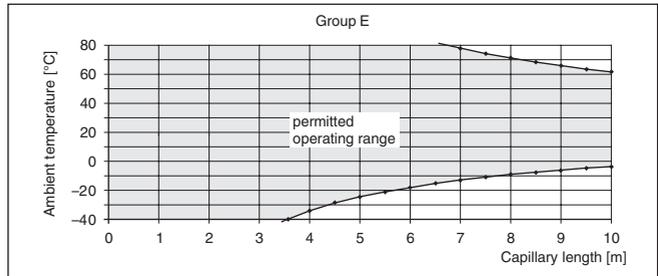


Fig. 32: Permissible ambient temperature range depending on the capillary length for chemical seals of group E

● **Group F**

- DRD DN 50 (65 mm), PN 25, 316L

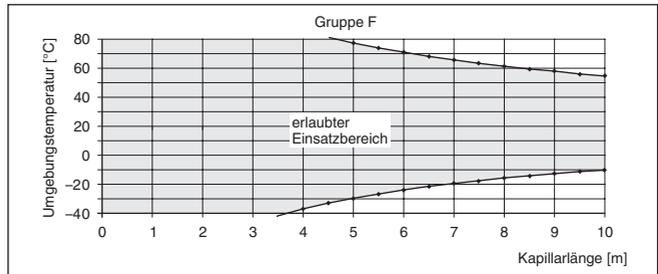


Fig. 33: Permissible ambient temperature range depending on the capillary length for chemical seals of group F

5.3 Dynamic behaviour of the chemical seals, bilateral

The viscosity of the filling oil, the capillary length as well as the inner diameter influence the frictional resistance. The higher the frictional resistance, the longer the step response time. The step response time

Step response time

is also influenced by the control volume of the measuring cell. The smaller the control volume of the measuring cell, the shorter the step response time.

The following diagram shows the response times (T_{90}) of the different filling oils depending on the measuring cell and capillary inner diameter. The values are specified in seconds per meter capillary length and must be multiplied by the actual length of the capillaries. The step response time of the transmitter must also be taken into account.



Note:

The illustration is exemplary and serves as orientation. The actual times must be determined individually for each application.

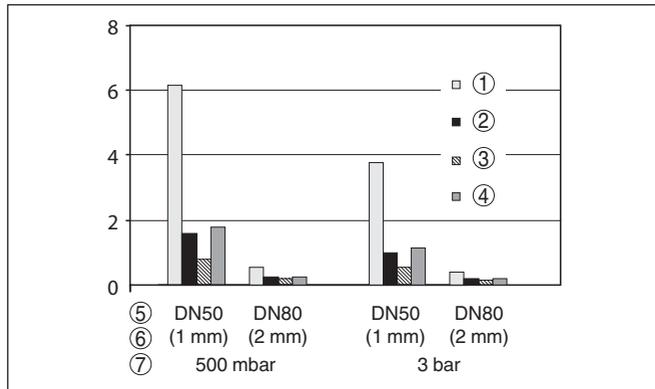


Fig. 34: Typical step response times (T_{90}) in s/m for different filling oils depending on the measuring cell and capillary inner diameter. Ambient temperature = 20 °C

- 1 Silicone oil
- 2 High temperature oil
- 3 Medical white oil
- 4 Halocarbon oil
- 5 Nominal width
- 6 Capillary inner diameter
- 7 Measuring cell

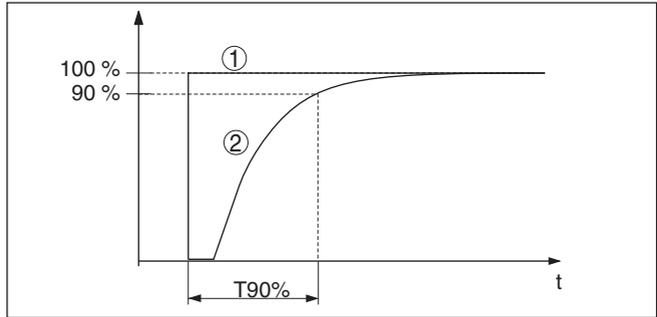


Fig. 35: Presentation of the step response time (T_{90})

- 1 Pressure jump
- 2 Output signal

Minimization of the step response time

For minimisation of the step response time, you have to following options:

- Bigger capillary inner diameter
- Shorter capillaries
- Filling oil with lowest viscosity

5.4 Installation position

Standard applications

When the pressure transmitter is mounted above the lower chemical seal, the max. height difference H_1 according to the following illustration may not be exceeded. The value depends on the density of the filling oil and the smallest pressure that may act on the chemical seal of the plus side (empty vessel).

Typical values for H_1 are 7 m with silicone oil and 4 m with halocarbon oil.

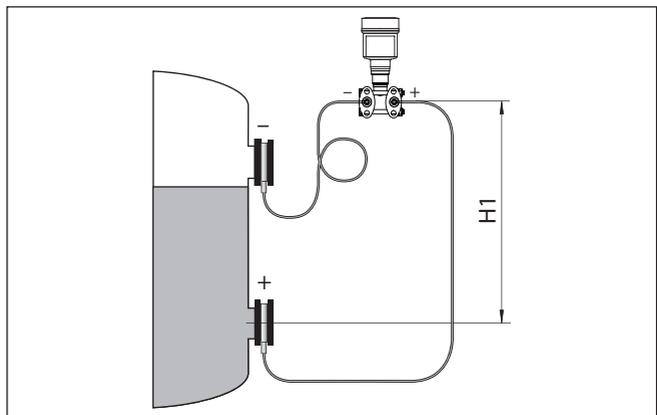


Fig. 36: Max. height when mounting above the lower chemical seal

Pressure on the minus side of the differential pressure transmitter with min. level:

$$\begin{aligned}
 p_- &= p_{Hv} + p_{H1} = H_v \cdot \rho_{F1} \cdot g + H1 \cdot \rho_{F1} \cdot g + p_i \\
 &= 1.8 \text{ m} \cdot (0.96 \text{ kg/dm}^3 \cdot 9.81 \text{ m/s}^2) + 0.3 \text{ m} \cdot (0.96 \text{ kg/dm}^3 \cdot 9.81 \text{ m/s}^2) \\
 &\quad + p_i \\
 &= 197.77 \text{ mbar} + p_i
 \end{aligned}$$

Pressure on the plus side of the differential pressure transmitter with min. level:

$$\begin{aligned}
 p_+ &= p_{Hu} + p_{H1} = H_u \cdot \rho_{FM} \cdot g + H1 \cdot \rho_{F1} \cdot g + p_i \\
 &= 0.2 \text{ m} \cdot (1 \text{ kg/dm}^3 \cdot 9.81 \text{ m/s}^2) + 0.3 \text{ m} \cdot (0.96 \text{ kg/dm}^3 \cdot 9.81 \text{ m/s}^2) + p_i \\
 &= 47.87 \text{ mbar} + p_i
 \end{aligned}$$

Differential pressure on the transmitter with min. level:

$$\begin{aligned}
 \Delta p_{\text{Transmitter}} &= p_+ - p_- \\
 &= 47.87 \text{ mbar} - 197.77 \text{ mbar} \\
 &= -149.90 \text{ mbar}
 \end{aligned}$$

Differential pressure on the transmitter with max. level:

$$\begin{aligned}
 \Delta p_{\text{Transmitter}} &= p_+ - p_- + \Delta H \cdot (1.0 \text{ kg/dm}^3 \cdot 9.81 \text{ m/s}^2) \\
 &= -149.90 \text{ mbar} + 98.1 \text{ mbar} \\
 &= -51.80 \text{ mbar}
 \end{aligned}$$

Hence a 500 mbar measuring cell is required for this application example.

5.6 Calculation of the temperature error

Actuating variables

The total temperature influence when installing a chemical seal is composed as follows:

- Influence of the process temperature on the chemical seal (TK_{Process})
- Corrective factor with special materials (with Tantalum, Alloy: 1.5; with PTFE coating: 1.8)
- Corrective factor for filling oil
- Influence of the ambient temperature $TK_{\text{Amb.}}$ on the pressure transmitter (thermal modification of zero signal and span)

The calibration temperature of the isolating system is 20 °C. For the calculation, the temperature must be deducted from the respective process or ambient temperature.

The TK_{Process} chemical seal is listed in the tables in chapter "Dimensions and weights" of this operating instructions. The correction factor for the filling oil is listed in chapter "Influence of the components". The thermal change of zero signal and span is specified in chapter "Technical data".



Information:

In case of double-sided, identical chemical seal mounting, the temperature influences should compensate. It shows that there is nevertheless an error through the temperature influence. In practice we calculate with 20 % of the sum of the individual errors of the two chemical seals. This is also taken into account in the following example.

Example for single chemical seal

Finally, the calculated temperature errors of pressure transmitter and chemical seal must be added up geometrically.

- Process temperature: 100 °C
- Flange isolating diaphragm DN 80 PN 40 with extension 50 mm
- TK Process flange isolating diaphragm: 1.34 mbar/10K (see chapter "Supplement" of this manual)
- Capillary length: 4 m
- Filing oil silicone: correction factor 1
- Diaphragm material.: Tantalum, correction factor 1.5
- Ambient temperature TU: 40 °C

ΔT Process temperature-Reference temperature chemical seal
 = 100 °C - 20 °C = 80 K

$TK_{\text{Capillaries}} = 0.3 \text{ mbar}/(10\text{K}\cdot 1 \text{ m})$

ΔT Ambient temperature-Reference temperature capillaries
 = 40 °C - 20 °C = 20 K

Error calculation

$\Delta p_{\text{chemical seal}} = (1.34 \text{ mbar}/10\text{K}) \cdot 80\text{K} = 10.72 \text{ mbar}$

Corrective factor diaphragm material = 10.72 mbar • 1.5 = 16.08 mbar

$\Delta p_{\text{Capillaries}} = (0.3 \text{ mbar}/10\text{K} \cdot 1 \text{ m}) \cdot 20\text{K} \cdot 4 \text{ m} = 2.4 \text{ mbar}$

$\Delta p_{\text{Total}} = 16.08 \text{ mbar} + 2.4 \text{ mbar} = 18.48 \text{ mbar}$

With one-side chemical seals, the total temperature influence is 18.48 mbar

Example of double-sided chemical seal:**Information:**

In case of double-sided, identical chemical seal mounting, the temperature influences should compensate. It shows that there is nevertheless an error through the temperature influence. In practice we calculate with 20 % of the sum of the individual errors of the two chemical seals. This is also taken into account in the following example.

- Process temperature: 100 °C
- Flange isolating diaphragm DN 80 PN 10-40
- TK Process flange isolating diaphragm: 1.34 mbar/10K (see chapter "Supplement" of this manual)
- Capillary length: 4 m
- Filing oil silicone: correction factor 1
- Diaphragm material.: Tantalum, correction factor 1.5
- Ambient temperature TU: 40 °C
- $TK_{\text{Capillaries}} = 0.3 \text{ mbar}/10\text{K}$ (see diagram in chapter "Influence of temperature changes" or delivery documents)

ΔT Process temperature-Reference temperature chemical seal
 = 100 °C - 20 °C = 80 K

ΔT Ambient temperature-Reference temperature capillaries
 = 40 °C - 20 °C = 20 K

Number of chemical seals = 2

Error calculation

$$\Delta p_{\text{chemical seal}} = (1.34 \text{ mbar/10K}) \cdot 80\text{K} \cdot 2 = 21.44 \text{ mbar}$$

$$\text{Corrective factor diaphragm material} = 21.44 \text{ mbar} \cdot 1.5 = 32.16 \text{ mbar}$$

$$\Delta p_{\text{Capillaries}} = (0.3 \text{ mbar/10K}) \cdot 20\text{K} \cdot 4 \text{ m} \cdot 2 = 4.8 \text{ mbar}$$

$$\Delta p_{\text{Total}} = 32.16 \text{ mbar} + 4.8 \text{ mbar} = 36.96 \text{ mbar}$$

The total temperature error of the double-sided chemical seal is 20 % of 36.96 mbar as listed above, i.e. 7.4 mbar.

6 Connecting to power supply

6.1 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

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

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

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

Power the instrument via an energy-limited circuit acc. to IEC 61010-1, e.g. via Class 2 power supply unit.

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

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

Use cable with round cross section for instruments with housing and cable gland. Use a cable gland suitable for the cable diameter to ensure the seal effect of the cable gland (IP protection rating).

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

Cable glands

Metric threads:

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



Note:

You have to remove these plugs before electrical connection.

NPT thread:

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

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



Note:

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

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

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

Cable screening and grounding

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



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

In electroplating plants as well as plants for cathodic corrosion protection it must be taken into account that significant potential differences exist. This can lead to unacceptably high currents in the cable screen if it is grounded at both ends.



Note:

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

You can find specifications on the potential connections inside the instrument in chapter "*Technical data*".

6.2 Connecting

Connection technology

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

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



Information:

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

Connection procedure

Proceed as follows:

1. Unscrew the housing lid
2. If a display and adjustment module is installed, remove it by turning it slightly to the left
3. Loosen compression nut of the cable gland and remove blind plug

4. Remove approx. 10 cm (4 in) of the cable mantle, strip approx. 1 cm (0.4 in) of insulation from the ends of the individual wires
5. Insert the cable into the sensor through the cable entry



Fig. 39: Connection steps 5 and 6 - Single chamber housing

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



Information:

Solid cores as well as flexible cores with wire end sleeves are inserted directly into the terminal openings. In case of flexible cores without end sleeves, press the terminal from above with a small screwdriver, the terminal opening is then free. When the screwdriver is released, the terminal closes again.

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

6.3 Wiring plans

6.3.1 Single chamber housing



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

Electronics and connection compartment

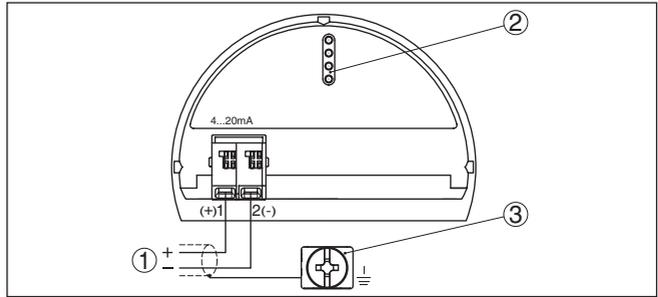


Fig. 40: Electronics and connection compartment - single chamber housing

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

Wire assignment, connection cable

6.3.2 Housing IP66/IP68 (1 bar)

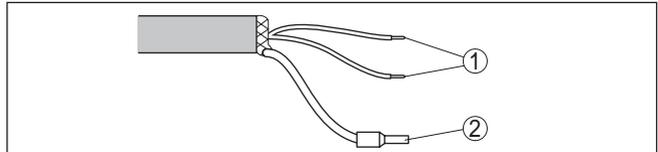


Fig. 41: Wire assignment in permanently connected connection cable

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

6.3.3 External housing with version IP68 (25 bar)

Electronics and connection compartment for power supply

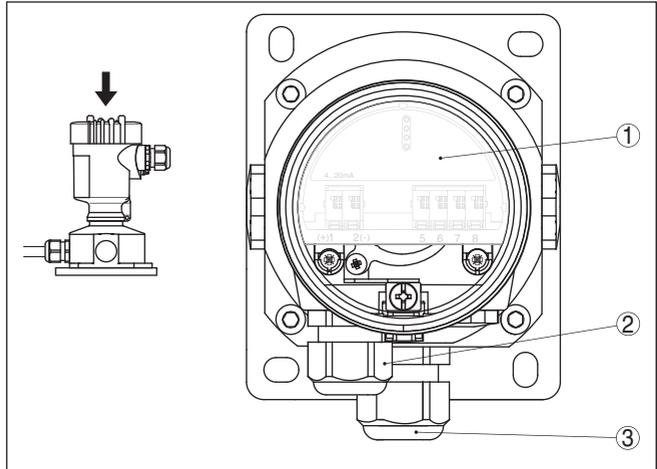


Fig. 42: Electronics and connection compartment

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

Terminal compartment, housing socket

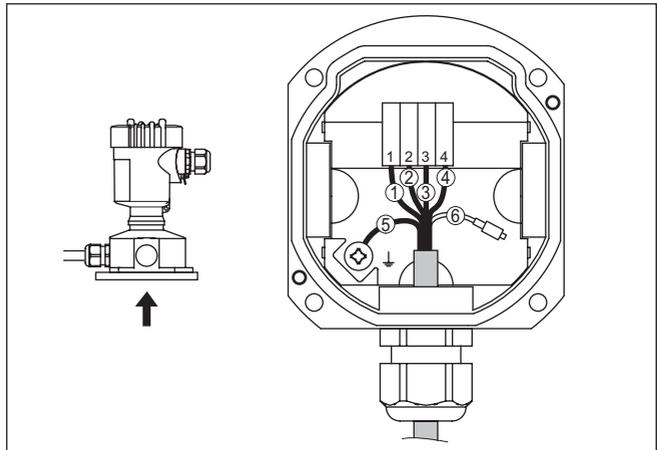


Fig. 43: Connection of the process component in the housing base

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

Electronics and connection compartment

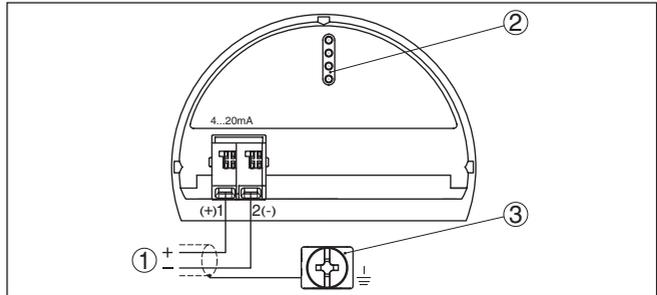


Fig. 44: Electronics and connection compartment - single chamber housing

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

6.4 Switch-on phase

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

- Internal check of the electronics
- Indication of a status message on the display or PC
- The output signal jumps to the set fault current

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

7 Set up the sensor with the display and adjustment module

7.1 Insert display and adjustment module

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

Proceed as follows:

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

Disassembly is carried out in reverse order.

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



Fig. 45: Installing the display and adjustment module in the electronics compartment of the single chamber housing



Note:

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

7.2 Adjustment system

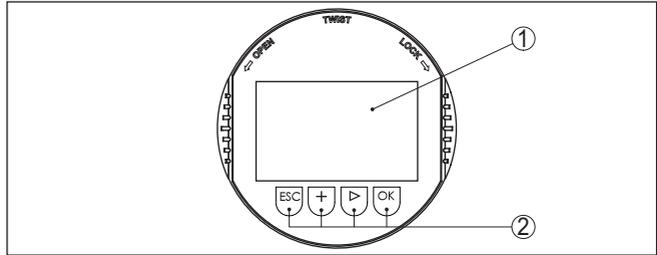


Fig. 46: Display and adjustment elements

- 1 LC display
- 2 Adjustment keys

Key functions

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

Adjustment system

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

Adjustment system - keys via magnetic pen

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

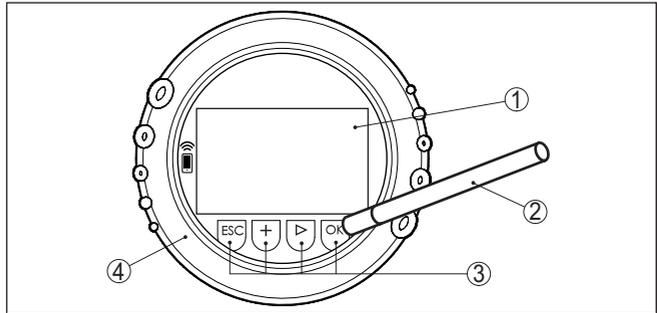


Fig. 47: Display and adjustment elements - with adjustment via magnetic pen

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

Time functions

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

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

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

7.3 Measured value indication

Measured value indication

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

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

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

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



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

Selection language

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



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

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

7.4 Parameter adjustment - Quick setup

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



Select the individual steps with the [→] key.

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

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



Note:

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

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

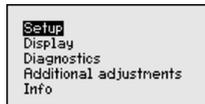
7.5 Parameter adjustment - Extended adjustment

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



Main menu

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



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

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

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

Additional adjustments: date/time, reset, copy function

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



Note:

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

The submenu points are described below.

7.5.1 Setup

Measurement loop name

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

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

The available digits include:

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



Application

The VEGADIF 85 can be used for flow, differential pressure, density and interface measurement. The default setting is differential pressure measurement. Switchover is carried out in the adjustment menu.

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

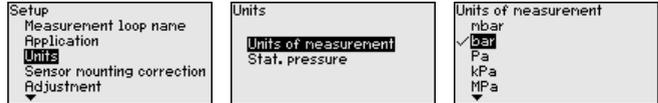


Enter the requested parameters via the appropriate keys, save your settings with [OK] and jump to the next menu item with the [ESC] and the [->] key.

Units

Unit of measurement:

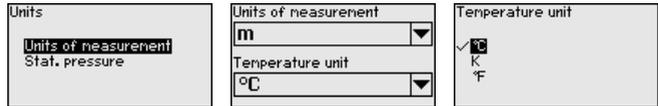
In this menu item, the adjustment units of the instrument are determined. The selection determines the unit displayed in the menu items "Min. adjustment (Zero)" and "Max. adjustment (Span)".



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

Temperature unit:

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



Unit, static pressure:

The unit "Static pressure" is also set here.



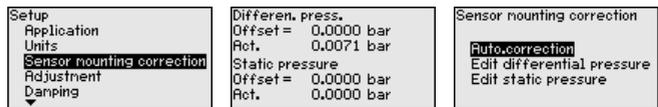
Enter the requested parameters via the appropriate keys, save your settings with [OK] and jump to the next menu item with the [ESC] and the [->] key.

Position correction

The installation position of the instrument can shift the measured value (offset). The position correction function compensates this offset. In the process the current measured value can be accepted automatically.

VEGADIF 85 has two separate sensor systems: one sensor for differential pressure and one sensor for static pressure. The following possibilities thus result for position correction:

- Automatic correction for both sensors
- Manual correction for differential pressure
- Manual correction for static pressure



During an automatic position correction, the current measured value is accepted as the correction value. This value must not be influenced/corrupted by product coverage or static pressure.

In case of a manual position correction, the offset value is determined by the user. Select for this purpose the function "Edit" and enter the requested value.

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

The correction value must be within the nominal measuring range, regardless of whether the correction value is determined automatically or entered manually. Depending on the correction value, the nominal measuring range apparently decreases or increases. However, this is only a consequence of the calculated offset. The actual nominal measuring range does not change. The following graphic illustrates this:

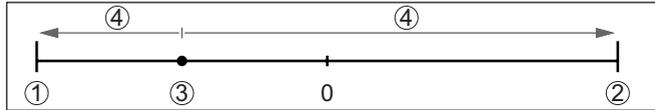


Fig. 48: Example correction value

- 1 Lower limit of the nominal measuring range
- 2 Upper limit of the nominal measuring range
- 3 Correction value (example); shown as "0" on display
- 4 Apparently decreased/increased nominal measuring range

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

Adjustment

VEGADIF 85 always measures pressure independently of the process variable selected in the menu item "Application". To output the selected process variable correctly, an allocation of the output signal to 0 % and 100 % must be carried out (adjustment).

When using the application "Level", the hydrostatic pressure, e.g. with full and empty vessel, is entered as adjustment value. A superimposed pressure is detected by the low pressure side and automatically compensated. See the following example:

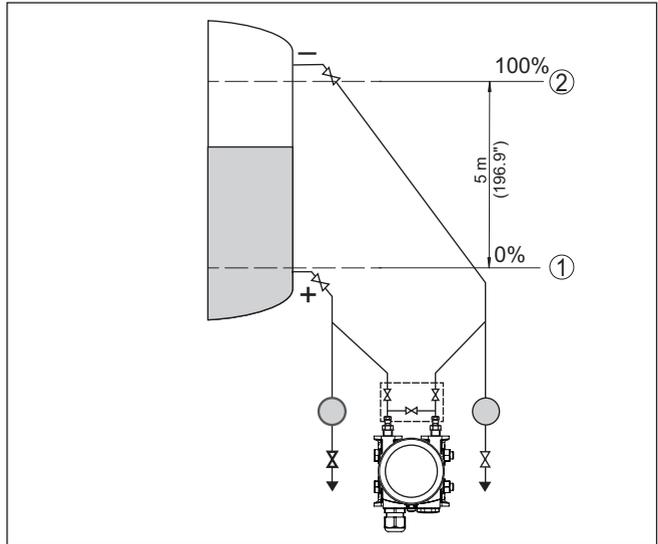


Fig. 49: Parameter adjustment example Min./max. adjustment, level measurement

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

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

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



Note:

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

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



Information:

Depending on the vessel shape and adjustment, levels of -10 % ... +110 % are displayed. This means that - within certain limits - "underfilling" and "overfilling" can also be displayed.

Min. adjustment - Level

Proceed as follows:

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



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

The min. adjustment is finished.

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

Max. adjustment - Level

Proceed as follows:

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



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

The max. adjustment is finished.

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

Min. adjustment flow

Proceed as follows:

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



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

With flow in two directions (bidirectional) a negative differential pressure is also possible. The maximum negative pressure must then be entered for the min. adjustment. For linearization, select "*bidirectional*" or "*bidirectional-extracted by root*" accordingly, see menu item "*Linearization*".

The min. adjustment is finished.

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

Max. adjustment flow

Proceed as follows:

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



2. Edit the mbar value with **[OK]** and set the cursor to the requested position with **[>]**.
3. Set the requested mbar value with **[+]** and store with **[OK]**.

The max. adjustment is finished.

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

Zero adjustment differential pressure

Proceed as follows:

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



2. Edit the mbar value with **[OK]** and set the cursor to the requested position with **[>]**.
3. Set the requested mbar value with **[+]** and store with **[OK]**.
4. Change with **[ESC]** and **[>]** to the span adjustment

The zero adjustment is finished.



Information:

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

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

Proceed as follows:

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



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

The span adjustment is finished.

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

Distance density

Proceed as follows:

- Select in the menu item "Setup" with **[->]** "Adjustment" and confirm with **[OK]**. Now confirm the menu item "Distance" with **[OK]**.



- Edit the sensor distance with **[OK]** and set the cursor to the requested position with **[->]**.
- Set the distance with **[+]** and save with **[OK]**.

The adjustment of the distance is hence finished.

Min. adjustment density

Proceed as follows:

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



2. Edit the percentage value with **[OK]** and set the cursor to the requested position with **[->]**.
3. Set the requested percentage value with **[+]** and save with **[OK]**. The cursor jumps now to the density value.
4. Enter the min. density corresponding to the percentage value.
5. Save settings with **[OK]** and move with **[ESC]** and **[->]** to the max. adjustment.

The min. adjustment for density is finished.

Max. adjustment density

Proceed as follows:

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



2. Edit the percentage value with **[OK]** and set the cursor to the requested position with **[->]**.
3. Set the requested percentage value with **[+]** and save with **[OK]**. The cursor jumps now to the density value.
4. Enter the max. density value corresponding to the percentage value.

The max. adjustment for density is finished.

Distance interface

Proceed as follows:

1. Select in the menu item "Setup" with **[->]** "Adjustment" and confirm with **[OK]**. Now confirm the menu item "Distance" with **[OK]**.



2. Edit the sensor distance with **[OK]** and set the cursor to the requested position with **[->]**.
3. Set the distance with **[+]** and save with **[OK]**.

The adjustment of the distance is hence finished.

Min. adjustment interface

Proceed as follows:

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



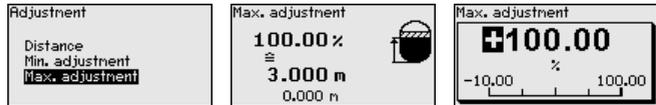
2. Edit the percentage value with **[OK]** and set the cursor to the requested position with **[->]**.
3. Set the requested percentage value with **[+]** and save with **[OK]**. The cursor jumps now to the height value.
4. Enter the min. height of the interface corresponding to the percentage value.
5. Save settings with **[OK]** and move with **[ESC]** and **[->]** to the max. adjustment.

The min. adjustment for interface is thus finished.

Max. adjustment interface

Proceed as follows:

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



2. Edit the percentage value with **[OK]** and set the cursor to the requested position with **[>]**.
3. Set the requested percentage value with **[+]** and save with **[OK]**. The cursor jumps now to the height value.
4. Enter the max. height of the interface corresponding to the percentage value.

The max. adjustment for interface is finished.

Damping

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

The adjusted integration time is effective for all applications of the differential pressure measurement.



The default setting is a damping of 0 s.

Linearisation

A linearization is necessary for all applications in which the measured process variable does not increase linearly with the measured value. This applies for example to the flow measured via the differential pressure or the vessel volume measured via the level. Corresponding linearization curves are preprogrammed for such cases. They represent the correlation between the measured value percentage and process variable. The linearization applies to the measured value indication and the current output.



With flow measurement and selection "*Linear*" display and output (percentage/current) are linear to "**Differential pressure**". This can be used, for example, to feed a flow computer.

With flow measurement and selection "*Extraction by root*" display and output (percentage/current) are linear to "**Flow**".⁴⁾

With flow in two directions (bidirectional) a negative differential pressure is also possible. This must already be taken into account in menu item "*Min. adjustment flow*".

⁴⁾ The device assumes an approximately constant temperature and static pressure and calculates the flow rate from the measured differential pressure using the characteristic curve extracted by root.



Caution:

Note the following, if the respective sensor is used as part of an over-fill protection system according to WHG:

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

Current output

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

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

Current output (mode)

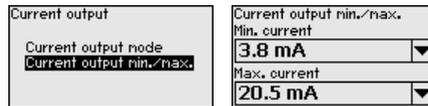
In the menu item "Current output mode" you determine the output characteristics and reaction of the current output in case of fault.



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

Current output (min./max.)

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

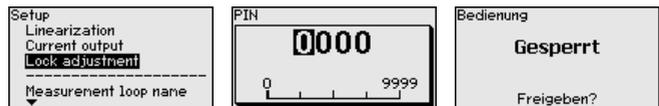


The default setting is min. current 3.8 mA and max. current 20.5 mA.

Lock/Unlock adjustment

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

This is done by entering a four-digit PIN.



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

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

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



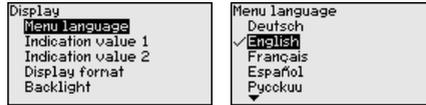
Caution:

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

7.5.2 Display

Language

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



The following languages are available:

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

In delivery status, the VEGADIF 85 is set to English.

Display value 1 and 2 - 4 ... 20 mA

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



The default setting for the displayed value is "*Differential pressure*".

Display format 1 and 2

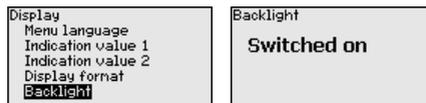
In this menu item you define the number of decimal positions with which the measured value is displayed.



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

Backlight

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

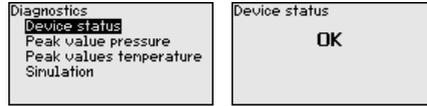


In delivery status, the lighting is switched on.

7.5.3 Diagnostics

Device status

In this menu item, the device status is displayed.

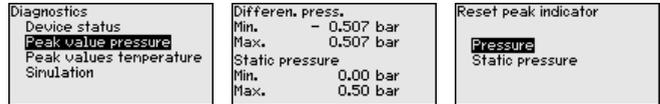


In case of an error, for example error code F017, the fault description, for example "Adjustment span too small" and a four-digit number are displayed for service purposes.

Peak indicator, pressure

The respective min. and max. measured values for the differential pressure and static pressure are stored in the sensor. In menu item "Peak indicator, pressure", both values are displayed.

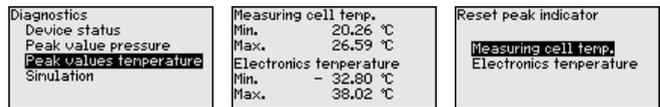
In another window you can carry out a reset of the peak values separately.



Peak indicator, temperature

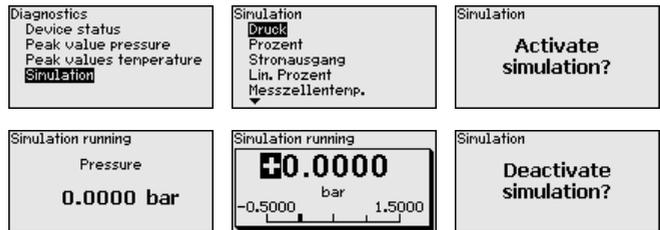
The respective min. and max. measured values of the measuring cell and the electronics temperature are stored in the sensor. In menu item "Peak indicator, temperature", both values are displayed.

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



Simulation

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



Select the requested simulation variable and set the requested value.

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



Caution:

During simulation, the simulated value is output as 4 ... 20 mA current value and with instruments 4 ... 20 mA/HART in addition as digital

HART signal. The status message within the context of the asset management function is "Maintenance".



Note:

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

7.5.4 Additional adjustments

Reset

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



The following reset functions are available:

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

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

Totalizer 1 and 2: Reset of the summarized flow volumes with application "Flow"

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

Setup

Menu item	Parameter	Default value
Measurement loop name		Sensor
Application	Application	Level
Units	Unit of measurement	mbar (with nominal measuring range ≤ 400 mbar) bar (with nominal measuring ranges ≥ 1 bar)
	Temperature unit	°C
Position correction		0.00 bar
Adjustment	Zero/Min. adjustment	0.00 bar 0.00 %
	Span/Max. adjustment	Nominal measuring range in bar 100.00 %
Damping	Integration time	1 s
Linearisation		Linear

Menu item	Parameter	Default value
Current output	Current output - Mode	Output characteristics 4 ... 20 mA Reaction when malfunctions occur ≤ 3.6 mA
	Current output - Min./Max.	3.8 mA 20.5 mA
Lock adjustment		Released

Display

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

Diagnostics

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

Additional adjustments

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

Menu item	Parameter	Default value
DP flow element	Unit	kg/s
	Adjustment	0 % corresponds to 0 kg/s 100 % corresponds to 1 kg/s

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

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

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

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



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



Note:

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

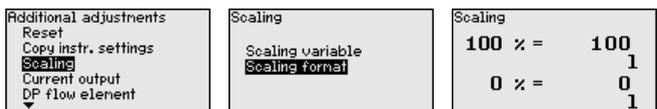
Scaling (1)

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



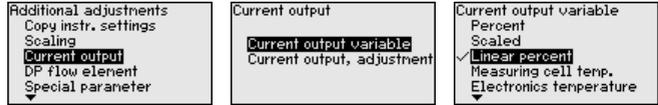
Scaling (2)

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



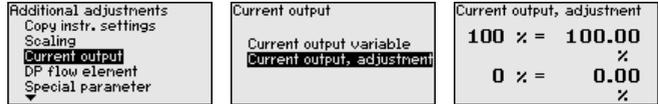
Current output (meas. variable)

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

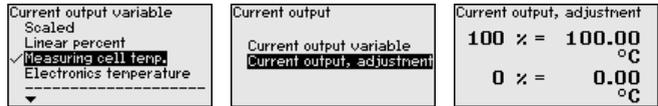


Current output (adjustment)

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

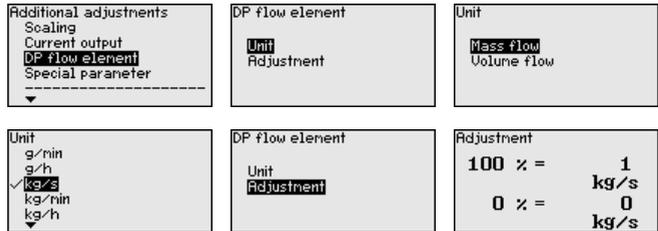


If the measuring cell temperature is selected as measured variable, then e.g. 0 °C refers to 4 mA and 100 °C to 20 mA.



Characteristics values DP flow element

In this menu item, the units for the DP flow element are determined and the selection of mass or volume flow is carried out.



Furthermore the adjustment for the volume or mass flow rate at 0 % or 100 % is carried out.

Special parameters

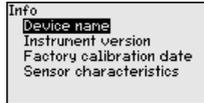
In this menu item you gain access to the protected area where you can enter special parameters. In exceptional cases, individual parameters can be modified in order to adapt the sensor to special requirements.

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

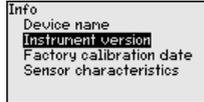


7.5.5 Info

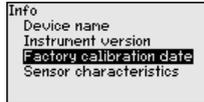
In this menu item, you can read out the instrument name and the instrument serial number:

**Instrument version**

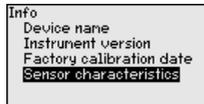
In this menu item, the hardware and software version of the sensor is displayed.

**Factory calibration date**

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

**Sensor characteristics**

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



7.6 Save parameter adjustment data

On paper

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

Display and adjustment module

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

8 Set up measuring system

8.1 Level measurement

Closed vessel

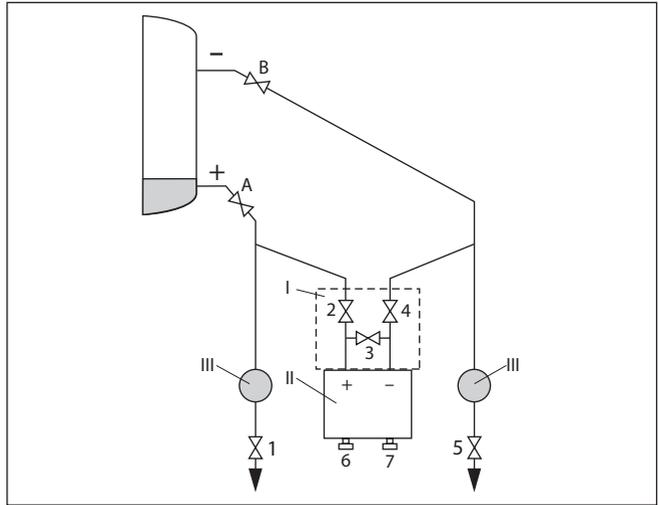


Fig. 50: Preferred measurement setup for closed vessels

- I VEGADIF 85
- II 3-fold valve block
- III Precipitator
- 1, 5 Drain valves
- 2, 4 Inlet valves
- 3 Breather valve
- 6, 7 Vent valves on VEGADIF 85
- A, B Blocking valves

Proceed as follows:

1. Fill the vessel to just above the lower tap
2. Fill measuring system with medium
Close valve 3: Separate high/low pressure side
Open valve A and B: Open block valves
3. Vent high pressure side (probably empty low pressure side)
Open valve 2 and 4: Discharge medium on the high pressure side
Briefly open valve 6 and 7, then close again: Fill the high pressure side completely with the medium and remove air.
4. Set measurement loop to operation
Now:
Valve 3, 6 and 7 are closed
Valves 2, 4, A and B are open

Closed vessel with steam layer

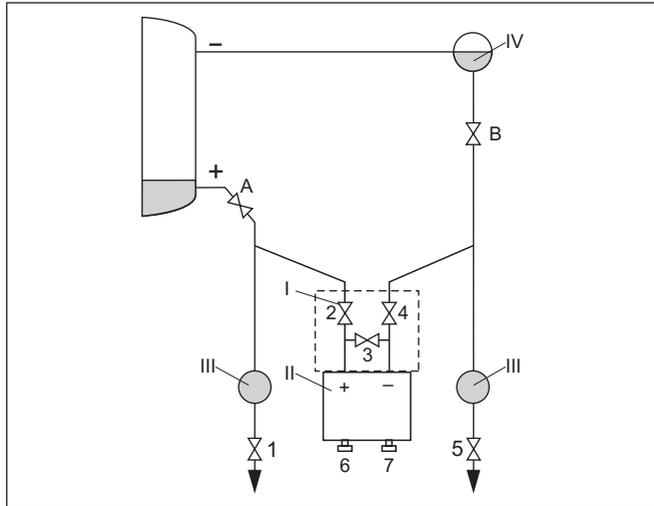


Fig. 51: Preferred measurement setup for closed vessels with steam overlay

- I VEGADIF 85
- II 3-fold valve block
- III Precipitator
- IV Condensate vessel
- 1, 5 Drain valves
- 2, 4 Inlet valves
- 3 Breather valve
- 6, 7 Vent valves on VEGADIF 85
- A, B Blocking valves

Proceed as follows:

1. Fill the vessel to just above the lower tap
2. Fill measuring system with medium
Open valve A and B: Open block valves
Fill the low pressure effective pressure line on the height of the condensation pot
3. Remove air from instrument:
Open valve 2 and 4: Discharge medium
Open valve 3: Equalisation high and low pressure side
Briefly open valve 6 and 7, then close again: Fill the measuring instrument completely with the medium and remove air
4. Put measurement loop into operation:
Close valve 3: Separate high and low pressure side
Open valve 4: Connect low pressure side
Now:
Valve 3, 6 and 7 are closed
Valves 2, 4, A and B are open.

8.2 Flow measurement

Gases

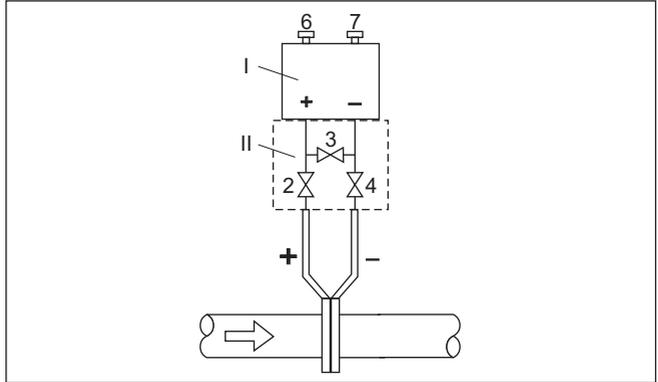


Fig. 52: Preferred measurement setup for gases, connection via 3-fold valve block, flanging on both sides

- I VEGADIF 85
- II 3-fold valve block
- 2, 4 Inlet valves
- 3 Breather valve
- 6, 7 Vent valves on VEGADIF 85

Liquids

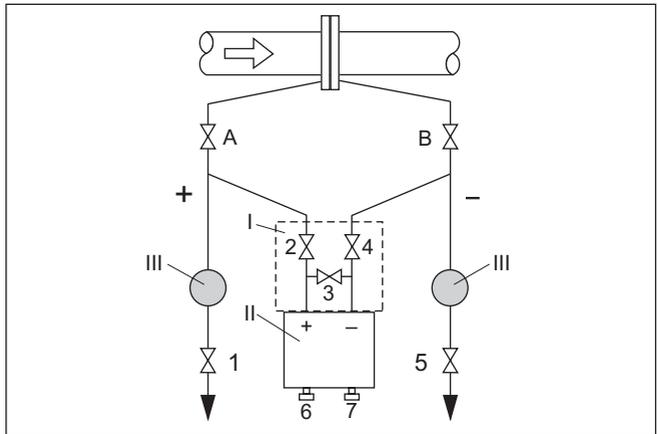


Fig. 53: Preferred measurement setup for liquids

- I VEGADIF 85
- II 3-fold valve block
- III Precipitator
- 1, 5 Drain valves
- 2, 4 Inlet valves
- 3 Breather valve
- 6, 7 Vent valves on VEGADIF 85
- A, B Blocking valves

Proceed as follows:

1. Close valve 3
2. Fill measuring system with medium.
For this purpose, open valves A, B (if available) as well as 2, 4:
Medium flows in
If necessary, clean the differential pressure lines: - with gases by blowing out with compressed air - with liquids by rinsing.⁵⁾
For this purpose close valve 2 and 4, i.e. block the instrument.
Then open valve 1 and 5 so that the effective pressure lines blow out/rinse.
Close valves 1 and 5 (if available) after cleaning
3. Remove air from instrument:
Open valves 2 and 4: Medium flows in
Close valve 4: Low pressure side is closed
Open valve 3: Equalisation high and low pressure side
Briefly open valve 6 and 7, then close again: Fill the measuring instrument completely with the medium and remove air
4. Carry out a position correction if the following conditions apply. If the conditions are not fulfilled, then carry out the position correction after step 6.
Conditions:
The process cannot be sealed off.
The pressure extraction points (A and B) are at the same geodesic height.
5. Put measurement loop into operation:
Close valve 3: Separate high and low pressure side
Open valve 4: Connect low pressure side
Now:
Valves 1, 3, 5, 6 and 7 are closed⁶⁾
Valves 2 and 4 are open
Valves A and B open
6. Carry out position correction, if flow can be blocked. In this case, step 5 is not required.

⁵⁾ Arrangement with 5 valves.

⁶⁾ Valves 1, 3, 5: Configuration with 5 valves.

9 Diagnosis, asset management and service

9.1 Maintenance

Maintenance

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

Precaution measures against buildup

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

Precautions against buildup on the separating diaphragm

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



Caution:

Never clean the separating diaphragm mechanically, for example with tools! This can damage the diaphragm and lead to oil leakage.

Cleaning of the separating diaphragm

If necessary, clean the separating diaphragm with a soft brush and suitable cleaning detergent. Make sure that the materials are resistant to the cleaning process. The wide variety of applications of chemical seals makes special cleaning instructions necessary for each application. Please ask the agency serving you.

Cleaning

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

Take note of the following:

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

9.2 Diagnosis memory

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

Measured value memory

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

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

- Level
- Process pressure
- Differential pressure
- Static pressure
- Percentage value
- Scaled values
- Current output

- Lin. percent
- Measuring cell temperature
- Electronics temperature

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

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

Event memory

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

Event types are for example:

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

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

9.3 Asset Management function

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

Status messages

The status messages are divided into the following categories:

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

and explained by pictographs:

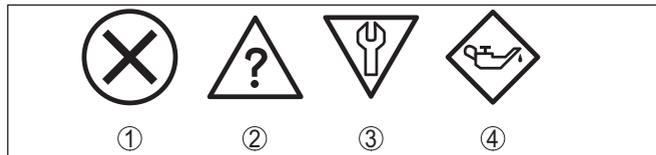


Fig. 54: Pictographs of the status messages

- 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 valid measured value available	Gauge pressure or low pressure Measuring cell defective	Exchange measuring cell Send instrument for repair
F017 Adjustment span too small	Adjustment not within specification	Change the adjustment according to the limit values
F025 Error in the linearization table	Index markers are not continuously rising, for example illogical value pairs	Check linearization table Delete table/Create new
F036 no operable sensor software	Failed or interrupted software update	Repeat software update Check electronics version Exchanging the electronics Send instrument for repair
F040 Error in the electronics	Hardware defect	Exchanging the electronics Send instrument for repair
F041 Communication error	No connection to the sensor electronics	Check connection between sensor and main electronics (with separate version)
F080 General software error	General software error	Disconnect operating voltage briefly
F105 Measured value is determined	The instrument is still in the switch-on phase, the measured value could not yet be determined	Wait for the end of the switch-on phase
F113 Communication error	Error in the internal instrument communication	Disconnect operating voltage briefly Send instrument for repair

Code Text message	Cause	Rectification
F260 Error in the calibration	Error in the calibration carried out in the factory Error in the EEPROM	Exchanging the electronics Send instrument for repair
F261 Error in the instrument settings	Error during setup Error when carrying out a reset	Repeat setup Repeat reset
F264 Installation/Setup error	Inconsistent settings (e.g.: distance, adjustment units with application process pressure) for selected application Invalid sensor configuration (e.g.: application electronic differential pressure with connected differential pressure measuring cell)	Modify settings Modify connected sensor configuration or application
F265 Measurement function disturbed	Sensor no longer carries out a measurement	Carry out a reset Disconnect operating voltage briefly

Tab. 6: Error codes and text messages, information on causes as well as corrective measures

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 Use instrument with higher temperature range
S603 Impermissible operating voltage	Operating voltage below specified range	Check electrical connection If necessary, increase operating voltage
S605 Impermissible pressure value	Measured process pressure below or above the adjustment range	Check nominal measuring range of the instrument If necessary, use an instrument with a higher measuring range

Maintenance

Code Text message	Cause	Rectification
M500 Error in the delivery status	The data could not be restored during the reset to delivery status	Repeat reset Load XML file with sensor data into the sensor
M501 Error in the non-active linearisation table	Index markers are not continuously rising, for example illogical value pairs	Check linearization table Delete table/Create new
M502 Error in the event memory	Hardware error EEPROM	Exchanging the electronics Send instrument for repair
M504 Error at a device interface	Hardware defect	Exchanging the electronics Send instrument for repair
M507 Error in the instrument settings	Error during setup Error when carrying out a reset	Carry out reset and repeat setup

9.4 Rectify faults

Reaction when malfunction occurs

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

Fault rectification

The first measures are:

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

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

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
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

Reaction after fault rectification

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

24 hour service hotline

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

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

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

9.5 Replace process flanges

If required, the process flanges can be replaced by an identical type by the user.

Preparations

Required spare parts, depending on order specification:

- Process flanges
- Seals
- Screws, nuts

Required tools:

- Wrench SW 13

It is recommended that the work be carried out on a clean, level surface, e.g. a workbench.

**Caution:**

There is a risk of injury due to residues of process media in the process flanges. Take suitable protective measures against this.

Dismounting

Proceed as follows:

1. Loosen hexagon head screws crosswise with wrench
2. Carefully remove the process flanges without damaging the differential pressure measuring cell
3. Lift O-ring seals out of the grooves of the process flanges using a pointed tool
4. Clean O-ring grooves and separating diaphragms with a suitable cleaner and soft cloth

**Note:**

Note additional cleaning for oil and grease-free version

Mounting

Proceed as follows:

1. Insert new, undamaged O-ring seals into the grooves, check for correct position
2. Mount process flanges carefully on the differential pressure measuring cell, the seal must remain in the groove
3. Insert undamaged screws and nuts, screw together crosswise
4. First tighten with 8 Nm, then with 12 Nm

5. Finally tighten with 16 Nm at 160 bar, 18 Nm at 400 bar, 22 Nm for copper gaskets.

The process flanges are exchanged.

**Note:**

After installing the device in the measuring point, carry out a position correction again.

9.6 Exchange process module on version IP68 (25 bar)

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

Required tools:

- Hexagon key wrench, size 2

**Caution:**

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



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

**Caution:**

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

Proceed as follows when carrying out the exchange:

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

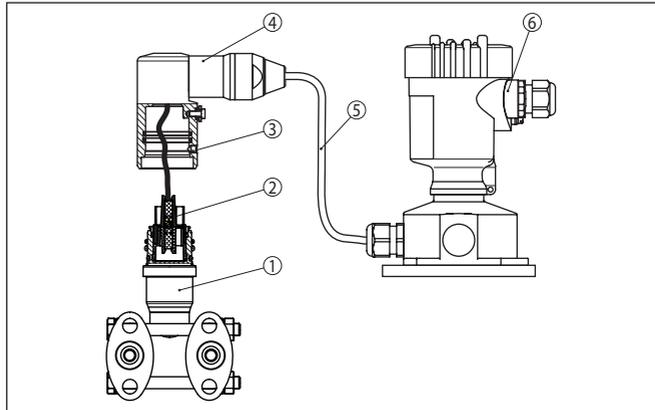


Fig. 55: VEGADIF 85 in IP68 version, 25 bar and lateral cable outlet, external housing

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

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

The exchange is finished.

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

9.7 Exchanging the electronics module

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



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

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

9.8 Software update

The following components are required to update the instrument software:

- Instrument
- Voltage supply
- Interface adapter VEGACONNECT

- PC with PACTware
- Current instrument software as file

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

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

**Caution:**

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

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

9.9 How to proceed if a repair is necessary

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

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

The following is required:

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

Print the generated instrument return form.

Clean the instrument and pack it damage-proof.

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

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

10 Dismount

10.1 Dismounting steps

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



Warning:

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

10.2 Disposal



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

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

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

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

11 Supplement

11.1 Technical data

Note for approved instruments

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

All approval documents can be downloaded from our homepage.

Materials and weights

Material 316L corresponds to stainless steel 1.4404 or 1.4435

Materials, wetted parts

- Process fitting with lateral flanges 316L, Alloy C276 (2.4819), Superduplex (1.4410)
- Separating diaphragm 316L, Alloy C276 (2.4819), 316L/1.4404 6 µm gold coated, 316L/1.4404 20 µm gold coated
- Seal FKM (ERIKS 514531), EPDM (ERIKS 55914)
- Seal for chemical seal assembly Copper sealing ring
- Diaphragm chemical seal 316L, 316L gold Rhodium coated, 316L gold coated, Alloy C276 (2.4819), Tantalum, Titanium, PFA, Alloy 400 (2.4819), Alloy 400 (2.4819) gold Rhodium coated, nickle, PTFE foil on 316L, Inconel 600, Superduplex (1.4410)
- Screw plugs 316L
- Ventilation valves 316L

Isolating liquid

- Standard applications Silicone oil
- Oxygen applications Halocarbon oil⁷⁾

Materials, non-wetted parts

- Electronics housing Plastic PBT (polyester), Alu die-casting, powder-coated, 316L
- Cable gland, blind plug cable gland PA, stainless steel, brass
- Sealing, cable gland CR/NBR
- Capillaries chemical seal 316Ti
- Protective hose for capillaries 316L
- External housing Plastic PBT (Polyester), 316L
- Socket, wall mounting plate external electronics housing Plastic PBT (Polyester), 316L
- Seal between housing socket and wall mounting plate TPE (fixed connected)
- Seal, housing lid Silicone SI 850 R, NBR silicone-free

⁷⁾ Note deviating process temperature limits

- Inspection window housing cover	Polycarbonate (UL-746-C listed), glass ⁸⁾
- Screws and nuts for lateral flange	PN 160 and PN 400: hexagon screw DIN 931 M8 x 85 A4-70 (1.4404/316L), hexagon nut DIN 934 M8 A4-70 (1.4404/316L)
- Ground terminal	316Ti/316L
- Connection between IP68 transmitter and external electronics housing	PE, PUR
- Type label support with IP68 version on cable	PE hard
Weight	approx. 4.2 ... 4.5 kg (9.26 ... 9.92 lbs), depending on process fitting

Max. torques

Fixing nuts bracket for mounting angle	30 Nm (22.13 lbf ft)
Mounting screws for oval flange adapter, valve block and mounting bracket on the process assembly	25 Nm (18.44 lbf ft)
Ventilation valves, closing screws ⁹⁾	18 Nm (13.28 lbf ft)
Mounting screws for process assembly	
- 160 bar	16 Nm (11.80 lbf ft)
- 400 bar	18 Nm (13.28 lbf ft)
Socket screws, external housing	5 Nm (3.688 lbf ft)
NPT cable glands and Conduit tubes	
- Plastic housing	10 Nm (7.376 lbf ft)
- Aluminium/Stainless steel housing	50 Nm (36.88 lbf ft)

Input variable

Measuring ranges in bar

Measuring range	Nominal range	Max. adjustment range
10 mbar	-10 mbar ... +10 mbar	-12 mbar ... +12 mbar
30 mbar	-30 mbar ... +30 mbar	-36 mbar ... +36 mbar
100 mbar	-100 mbar ... +100 mbar	-120 mbar ... +120 mbar
500 mbar	-500 mbar ... +500 mbar	-600 mbar ... +600 mbar
3 bar	-3 bar ... +3 bar	-3.6 bar ... +3.6 bar
16 bar	-16 bar ... +16 bar	-19.2 bar ... +19.2 bar
40 bar	-40 bar ... +40 bar	-48 bar ... +48 bar

Measuring ranges in psi

⁸⁾ Glass with Aluminium and stainless steel (precision casting) housing

⁹⁾ 4 layers PTFE

Measuring range	Nominal range	Max. adjustment range
0.15 psig	-0.15 psig ... +0.15 psig	-0.18 psig ... +0.18 psig
0.45 psig	-0.45 psig ... +0.45 psig	-0.54 psig ... +0.54 psig
1.5 psig	-1.5 psig ... +1.5 psig	-1.8 psig ... +1.8 psig
7.5 psig	-7.5 psig ... +7.5 psig	-9 psig ... +9 psig
45 psig	-45 psig ... +45 psig	-5.4 psig ... +5.4 psig
240 psig	-240 psig ... +240 psig	-288 psig ... +288 psig
580 psig	-580 psig ... +580 psig	-696 psig ... +696 psig

Measuring ranges in kPa

Measuring range	Nominal range	Max. adjustment range
1 kPa	-1 kPa ... +1 kPa	-1.2 kPa ... +1.2 kPa
3 kPa	-3 kPa ... +3 kPa	-3.6 kPa ... +3.6 kPa
10 kPa	-10 kPa ... +10 kPa	-12 kPa ... +12 kPa
50 kPa	-50 kPa ... +50 kPa	-60 kPa ... +60 kPa
300 kPa	-300 kPa ... +300 kPa	-360 kPa ... +360 kPa
1600 kPa	-1600 kPa ... +1600 kPa	-1920 kPa ... +1920 kPa
4000 kPa	-4000 kPa ... +4000 kPa	-4800 kPa ... +4800 kPa

Turn Down

Maximum permissible Turn Down Unlimited (recommended up to 20 : 1)

Turn down (TD) is the relation nominal measuring range/adjusted span.

Switch-on phase

Start-up time with operating voltage U_b

- ≥ 12 V DC ≤ 9 s

- < 12 V DC ≤ 22 s

Starting current (for run-up time) ≤ 3.6 mA

Output variable

Output signal 4 ... 20 mA - passive

Connection technology Two-wire

Range of the output signal 3.8 ... 20.5 mA (default setting)

Signal resolution 0.3 μ A

Fault signal, current output (adjustable) ≤ 3.6 mA, ≥ 21 mA, last measured value

Max. output current 21.5 mA

Load See load resistance under Power supply

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

Dynamic behaviour output

Dynamic characteristics depending on medium and temperature

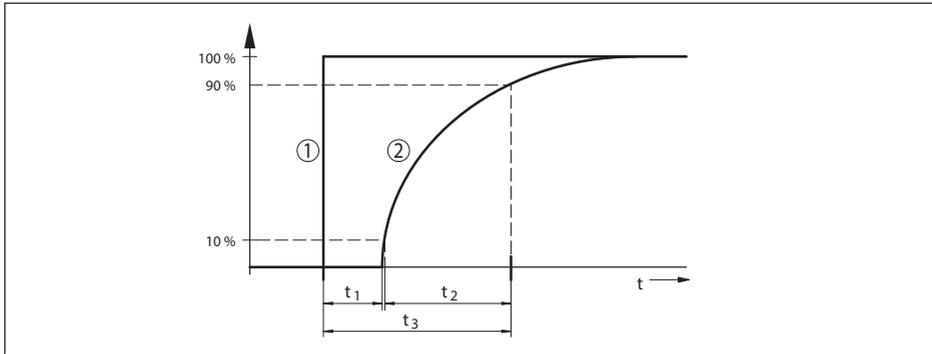


Fig. 56: Behaviour in case of sudden change of the process variable. t_1 : dead time; t_2 : rise time; t_3 : jump response time

- 1 Process variable
- 2 Output signal

Version, nominal measuring range	Dead time t_1	Rise time t_2	Step response time t_3
Basic version 10 bar and 30 bar	160 ms	115 ms	275 ms
Basic version 100 mbar	130 ms	95 ms	225 ms
Basic version 500 mbar		75 ms	205 ms
Basic version, 3 bar		60 ms	190 ms
Basic version, 16 bar			
Chemical seal version, all nominal measuring ranges	Dependent on the chemical seal	Dependent on the chemical seal	Dependent on the chemical seal
Version IP68 (25 bar)	additionally 50 ms	additionally 150 ms	additionally 200 ms

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

Additional output parameter - Measuring cell temperature

Range -40 ... +85 °C (-40 ... +185 °F)

Measuring cell temperature

- Resolution 1 K
- Deviation ±1 K

Output of the temperature values

- Indication Via the display and adjustment module
- Analogue Via the current output, the additional current output
- Digital Via the digital output signal (depending on the electronics version)

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

Reference conditions according to DIN EN 61298-1

- Temperature	+18 ... +30 °C (+64 ... +86 °F)
- Relative humidity	45 ... 75 %
- Air pressure	860 ... 1060 mbar/86 ... 106 kPa (12.5 ... 15.4 psig)
Determination of characteristics	Limit point adjustment according to IEC 61298-2
Characteristic curve	Linear
Calibration position of the measuring cell	Vertical, i.e. upright process component
Influence of the installation position	<0.35 mbar/20 Pa (0.003 psig) 10° inclination each around the transverse axis
Material, lateral flanges	316L
Deviation at the current output due to strong, high-frequency electromagnetic fields	
- In accordance with EN 61326-1	< ±80 µA
- In accordance with IACS E10 (ship-building)/IEC 60945	<= ±160 µA

Deviation determined according to the limit point method according to IEC 60770 or IEC 61298

The measurement deviation includes the non-linearity, hysteresis and non-reproducibility.

The values apply to the **digital** signal output (HART, Profibus PA, Foundation Fieldbus) as well as to the **analogue** current output 4 ... 20 mA. For differential pressure they refer to the set span, for static pressure to the measuring range final value. Turn down (TD) is the ratio of the nominal measuring range to the set span.

Differential pressure

Measuring range	TD ≤ 5 : 1	TD > 5 : 1	TD > 10 : 1		
10 mbar (1 kPa)/0.145 psi	< ±0.1 %	< ±0.02 % x TD			
30 mbar (3 kPa)/0.44 psi					
100 mbar (10 kPa)/1.5 psi	< ±0.065 %	< ±0.035 % + 0.01 % x TD			
500 mbar (50 kPa)/7.3 psi					
3 bar (300 kPa)/43.51 psi				< ±0.015 % + 0.005 % x TD	
16 bar (1600 kPa)/232.1 psi				< ±0.035 % + 0.01 % x TD	
40 bar (4000 kPa)/580.2 psi					

Static pressure

Measuring range	Up to nominal pressure ¹⁰⁾	TD 1:1
10 mbar (1 kPa)/0.145 psi	40 bar (4000 kPa)	< ±0.1 %
30 mbar (3 kPa)/0.44 psi		
100 mbar (10 kPa)/1.5 psi	160 bar (16000 kPa) resp. 400 bar (40000 kPa)	
500 mbar (50 kPa)/7.3 psi		
3 bar (300 kPa)/43.51 psi		
16 bar (1600 kPa)/232.1 psi		
40 bar (4000 kPa)/580.2 psi		

Flow > 50 %¹¹⁾

Measuring range	TD ≤ 5 : 1	TD > 5 : 1	TD > 10 : 1
10 mbar (1 kPa)/0.145 psi	< ±0.1 %		< ±0.02 % x TD
30 mbar (3 kPa)/0.44 psi			
100 mbar (10 kPa)/1.5 psi	< ±0.065 %		< ±0.035 % + 0.01 % x TD
500 mbar (50 kPa)/7.3 psi			< ±0.015 % + 0.005 % x TD
3 bar (300 kPa)/43.51 psi			
16 bar (1600 kPa)/232.1 psi			< ±0.035 % + 0.01 % x TD
40 bar (4000 kPa)/580.2 psi			

25 % < Flow ≤ 50 %¹²⁾

Measuring range	TD ≤ 5 : 1	TD > 5 : 1	TD > 10 : 1
10 mbar (1 kPa)/0.145 psi	< ±0.2 %		< ±0.04 % x TD
30 mbar (3 kPa)/0.44 psi			
100 mbar (10 kPa)/1.5 psi	< ±0.13 %		< ±0.07 % + 0.02 % x TD
500 mbar (50 kPa)/7.3 psi			< ±0.03 % + 0.01 % x TD
3 bar (300 kPa)/43.51 psi			
16 bar (1600 kPa)/232.1 psi			< ±0.07 % + 0.02 % x TD
40 bar (4000 kPa)/580.2 psi			

Influence of the medium or ambient temperature

The values apply to the **digital** signal output as well as to the **analogue** current output 4 ... 20 mA. Turn down (TD) is the ratio "nominal measuring range/set span".

Thermal change zero signal and output span, differential pressure¹³⁾

¹⁰⁾ Measuring range end, absolute pressure

¹¹⁾ Root characteristic

¹²⁾ Root characteristic

¹³⁾ Relating to the adjusted span.

Measuring range	-10 ... +60 °C / +14 ... +140 °F	-40 ... -10 °C / -40 ... +14 °F und +60 ... +85 °C / +140 ... +185 °F
10 mbar (1 kPa)/0.145 psi	< ±0.15 % + 0.20 % x TD	< ±0.4 % + 0.3 % x TD
30 mbar (3 kPa)/0.44 psi	< ±0.15 % + 0.10 % x TD	< ±0.2 % + 0.15 % x TD
100 mbar (10 kPa)/1.5 psi	< ±0.15 % + 0.15 % x TD	< ±0.15 % + 0.20 % x TD
500 mbar (50 kPa)/7.3 psi	< ±0.15 % + 0.05 % x TD	< ±0.2 % + 0.06 % x TD
3 bar (300 kPa)/43.51 psi		
16 bar (1600 kPa)/232.1 psi	< ±0.15 % + 0.15 % x TD	< ±0.15 % + 0.20 % x TD
40 bar (4000 kPa)/580.2 psi		

Thermal change zero signal and output span, static pressure¹⁴⁾

Measuring range	Up to nominal pressure ¹⁵⁾	-40 ... +80 °C / -40 ... +176 °F
10 mbar (1 kPa)/0.145 psi	40 bar (4000 kPa)	< ±0.5 %
30 mbar (3 kPa)/0.44 psi		
100 mbar (10 kPa)/1.5 psi	160 bar (16000 kPa) resp. 400 bar (40000 kPa)	
500 mbar (50 kPa)/7.3 psi		
3 bar (300 kPa)/43.51 psi		
16 bar (1600 kPa)/232.1 psi		
40 bar (4000 kPa)/580.2 psi		

Thermal change current output through ambient temperature

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

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

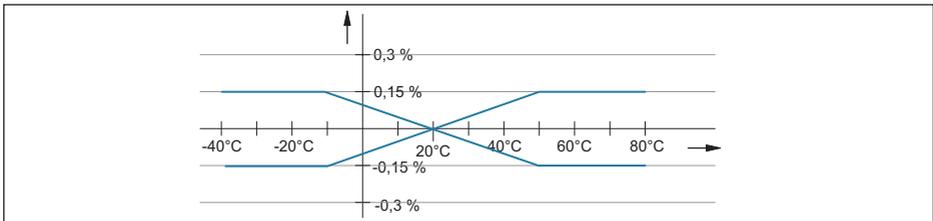


Fig. 57: Thermal change, current output

Influence of the static pressure

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

Change zero signal and output span

¹⁴⁾ Relating to the measuring range end value.

¹⁵⁾ Measuring range end, absolute pressure.

Nominal range	Up to nominal pressure ¹⁶⁾	Influence on the zero point	Influence on the span
10 mbar (1 kPa), (0.145 psi)	40 bar (4000 kPa), (600 psi)	< ±0.10 % x TD	< ±0.10 %
30 mbar (3 kPa), (0.44 psi)			
100 mbar (10 kPa), (1.5 psi)	160 bar (16000 kPa), (2400 psi) 400 bar (4000 kPa), (5800 psi)	160 bar (16000 kPa), (2400 psi): < ±0.10 % x TD 400 bar(4000 kPa), (5800 psi): ≤ 0.25 % x TD	160 bar(16000 kPa), (2400 psi): < ±0.10 % 400 bar(4000 kPa), (5800 psi): ≤ 0.25 %
500 mbar (50 kPa), (7.3 psi)			
3 bar (300 kPa), (43.51 psi)			
16 bar (1600 kPa), (232.1 psi)			
40 bar (4000 kPa)/580.2 psi			

Long-term stability (according to DIN 16086)

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

The long-term stability of the zero signal and output span corresponds to the value F_{Stab} in chapter "Calculation of the total deviation (according to DIN 16086)".

Long-term stability zero signal and output span

Measured variable	Time range		
	1 year	5 years	10 years
Differential pressure ¹⁷⁾	< 0.065 % x TD	< 0.1 % x TD	< 0.15 % x TD
Static pressure ¹⁸⁾	< ±0.065 %	< ±0.1 %	< ±0.15 %

Process conditions

Process temperature¹⁹⁾

Material seal	Filling oil	Temperature limits
FKM (ERIKS 514531)	Silicone oil	-20 ... +105 °C (-4 ... +221 °F)
	Halocarbon oil for oxygen applications	-10 ... +60 °C (-4 ... +140 °F)

¹⁶⁾ Measuring range end, absolute pressure.

¹⁷⁾ Relating to the adjusted span.

¹⁸⁾ Relating to the measuring range end value.

¹⁹⁾ With entry into the process fitting, connection via valve block, brief venting, no permanent flow through the measuring chambers

Process conditions with oxygen applications

Max. process temperature	Max. oxygen pressure
+60 °C	50 bar
>+60 °C up to 100 °C	30 bar
>+100 °C up to 175 °C	25 bar

Ambient conditions

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

Electromechanical data - version IP66/IP67 and IP66/IP68 (0.2 bar)²²⁾

Options of the cable entry

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

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

Wire cross-section (spring-loaded terminals)

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

Electromechanical data - version IP66/IP68 (1 bar)

Connection cable, mechanical data

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

²²⁾ IP66/IP68 (0.2 bar), only with absolute pressure.

Connection cable, electrical data

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

Electromechanical data - version IP68 (25 bar)

Connection cable, mechanical data

- Configuration Wires, strain relief, breather capillaries, screen braiding, metal foil, mantle
- Standard length 5 m (16.40 ft)
- Max. length 50 m (164.0 ft)
- Min. bending radius (at 25 °C/77 °F) 25 mm (0.985 in)
- Diameter approx. 8 mm (0.315 in)
- Colour PE Black
- Colour PUR Blue

Connection cable, electrical data

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

Interface to the external display and adjustment unit

Data transmission Digital (I²C-Bus)

Connection cable Four-wire

Sensor version	Configuration, connection cable	
	Max. cable length	Shielded
4 ... 20 mA/HART	50 m	●
4 ... 20 mA/HART SIL		
Profibus PA, Foundation Fieldbus	25 m	●

Integrated clock

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

Additional output parameter - Electronics temperature

Range -40 ... +85 °C (-40 ... +185 °F)
 Resolution < 0.1 K
 Deviation ± 3 K

Availability of the temperature values

- Indication Via the display and adjustment module
- Output Via the respective output signal

Voltage supply

Operating voltage U_B	11 ... 35 V DC
Operating voltage U_B with lighting switched on	16 ... 35 V DC
Reverse voltage protection	Integrated
Permissible residual ripple	
– for U_N 12 V DC ($11 \text{ V} < U_B < 14 \text{ V}$)	$\leq 0.7 V_{\text{eff}}$ (16 ... 400 Hz)
– for U_N 24 V DC ($18 \text{ V} < U_B < 35 \text{ V}$)	$\leq 1.0 V_{\text{eff}}$ (16 ... 400 Hz)
Load resistor	
– Calculation	$(U_B - U_{\text{min}})/0.022 \text{ A}$
– Example - $U_B = 24 \text{ V DC}$	$(24 \text{ V} - 11 \text{ V})/0.022 \text{ A} = 591 \Omega$

Potential connections and electrical separating measures in the instrument

Electronics	Non-floating
Galvanic separation	
– between electronics and metallic parts of the device	Reference voltage 500 V AC
Conductive connection	Between ground terminal and metallic process fitting

Electrical protective measures

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

Connection of the feeding power supply unit Networks of overvoltage category III

Altitude above sea level

- by default up to 2000 m (6562 ft)
- with connected overvoltage protection up to 5000 m (16404 ft)

Pollution degree²³⁾ 4

Protection rating (IEC 61010-1) II

²³⁾ When used with fulfilled protection.

11.2 Chemical seal with vacuum applications

A chemical seal is closed to the medium with a metallic diaphragm. The inner space between the diaphragm and the sensor element is completely filled with a pressure transmission fluid.

As the pressure decreases, the boiling temperature of the pressure transmission liquid drops. Thus, at pressure values $< 1 \text{ bar}_{\text{abs}}$, depending on the temperature, gas particles can be released which are dissolved in the pressure transmission fluid. This makes it compressible, which leads to faulty measured values.

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

The following graphics show typical areas of application for different pressure transmission liquids. The characteristic curves are exemplary and can also deviate depending on the process fitting and diaphragm material.

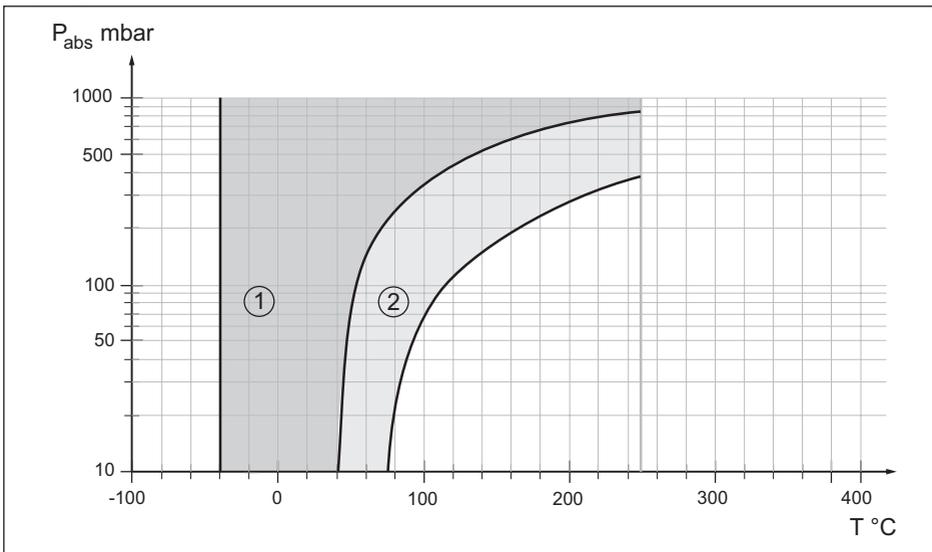


Fig. 58: Area of application for silicone oil VE 2, KN 2

- 1 Standard chemical seal
- 2 Chemical seal with vacuum service

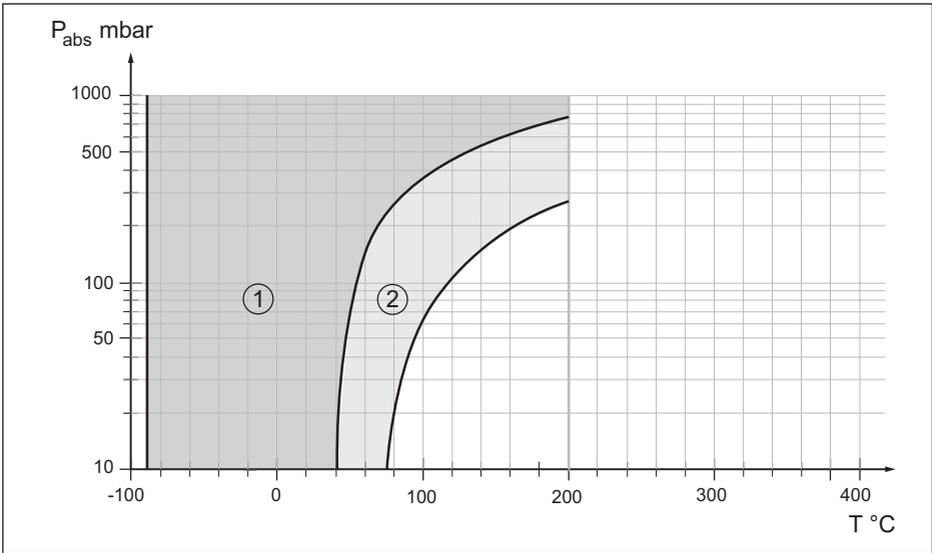


Fig. 59: Area of application for silicone oil KN 17

- 1 Standard chemical seal
- 2 Chemical seal with vacuum service

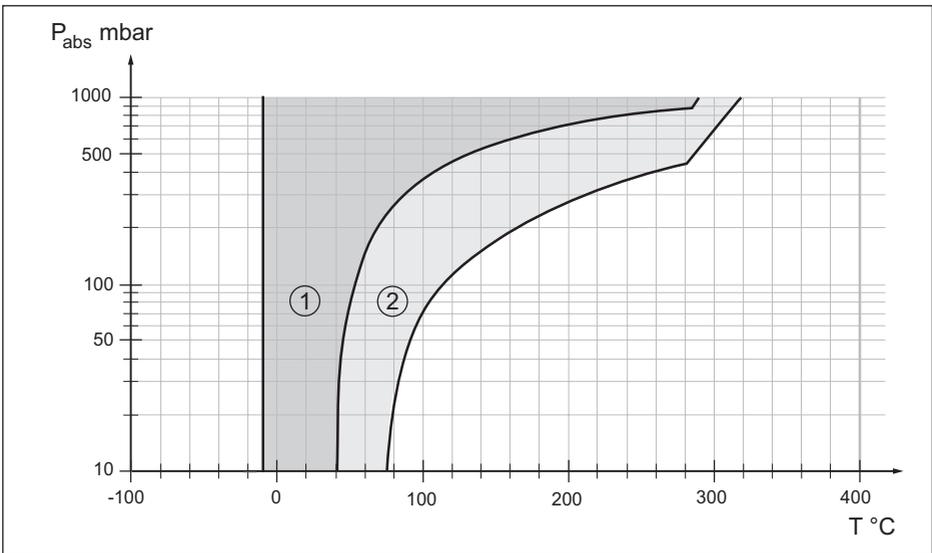


Fig. 60: Area of application for high temperature oil VE 32, KN 32

- 1 Standard chemical seal
- 2 Chemical seal with vacuum service

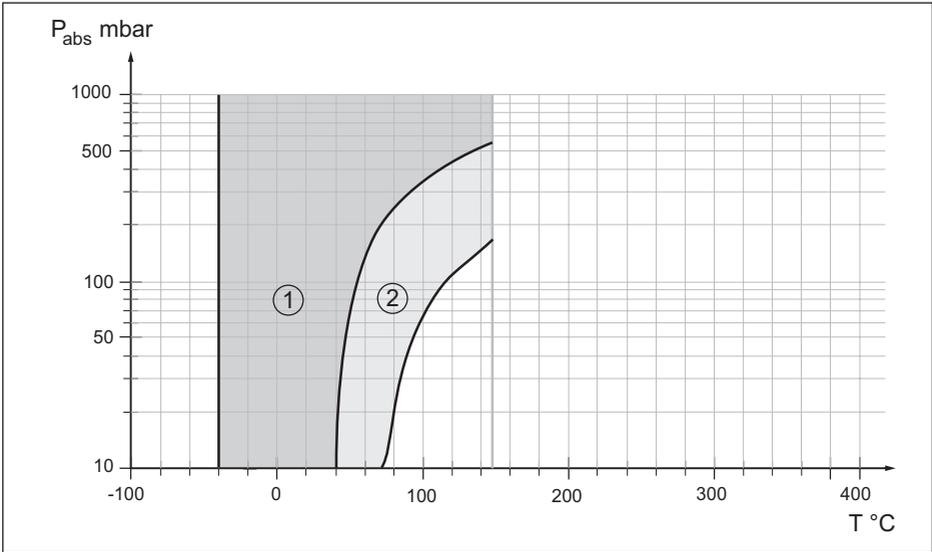


Fig. 61: Area of application for Halocarbon oil KN 21

- 1 Standard chemical seal
- 2 Chemical seal with vacuum service

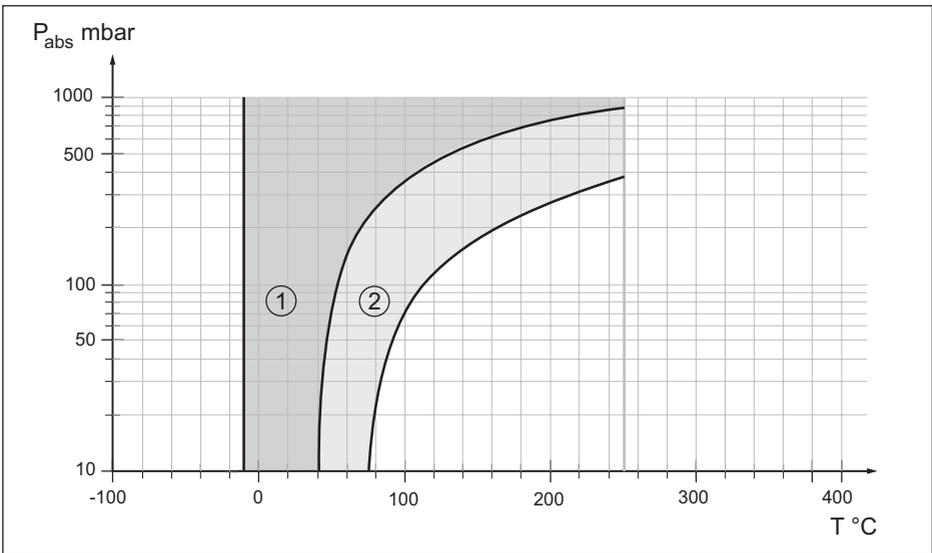


Fig. 62: Application area for medical white oil KN 92

- 1 Standard chemical seal
- 2 Chemical seal with vacuum service

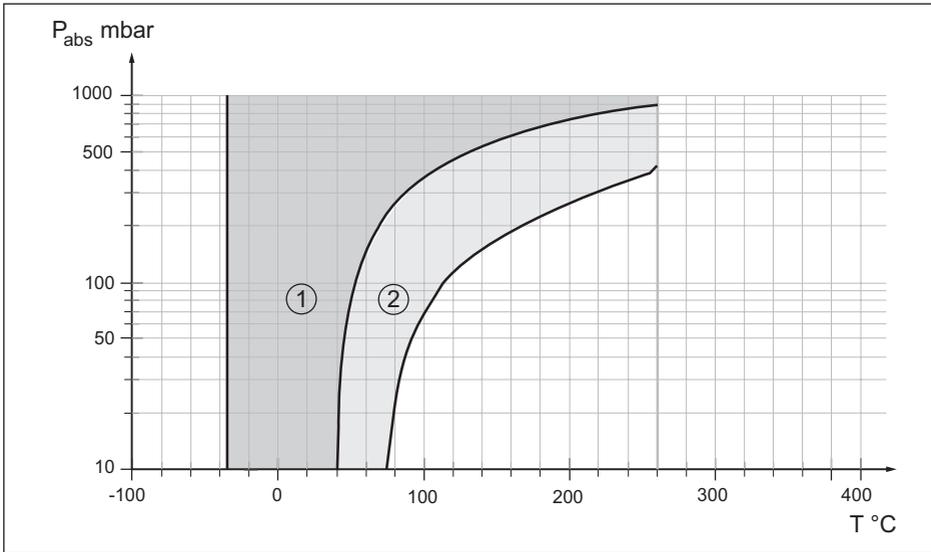


Fig. 63: Area of application for Neobee M-20 KN 59

- 1 Standard chemical seal
- 2 Chemical seal with vacuum service

11.3 Calculation of the total deviation

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

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

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

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

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

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

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

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

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

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

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

11.4 Calculation of the total deviation - Practical example

Data

Differential pressure **250 mbar** (25 kPa), medium temperature on the measuring cell 60 °C

VEGADIF 85 with measuring range **500 mbar**

The required values for the temperature error F_T , deviation F_{kl} and long-term stability F_{stab} are available in the technical data.

1. Calculation of the Turn down

TD = 500 mbar/250 mbar

TD = **2 : 1**

2. Determination temperature error F_T

Measuring range	-10 ... +60 °C / +14 ... +140 °F	-40 ... -10 °C / -40 ... +14 °F und +60 ... +85 °C / +140 ... +185 °F
10 mbar (1 kPa)/0.145 psi	< ±0.15 % + 0.20 % x TD	< ±0.4 % + 0.3 % x TD
30 mbar (3 kPa)/0.44 psi	< ±0.15 % + 0.10 % x TD	< ±0.2 % + 0.15 % x TD
100 mbar (10 kPa)/1.5 psi	< ±0.15 % + 0.15 % x TD	< ±0.15 % + 0.20 % x TD
500 mbar (50 kPa)/7.3 psi	< ±0.15 % + 0.05 % x TD	< ±0.2 % + 0.06 % x TD
3 bar (300 kPa)/43.51 psi		
16 bar (1600 kPa)/232.1 psi	< ±0.15 % + 0.15 % x TD	< ±0.15 % + 0.20 % x TD

$$F_T = 0.15 \% + 0.05 \% \times TD$$

$$F_T = 0.15 \% + 0.1 \%$$

$$F_T = \mathbf{0.25 \%}$$

3. Determination of deviation and long-term stability

Deviation

Measuring range	TD 1 : 1 up to 5 : 1	TD > 5 : 1	TD > 10 : 1
10 mbar (1 kPa)/0.145 psi	< ±0.1 %		< ±0.02 % x TD
30 mbar (3 kPa)/0.44 psi			
100 mbar (10 kPa)/1.5 psi	< ±0.065 %		< ±(0.035 % + 0.01 %) x TD
500 mbar (50 kPa)/7.3 psi			< ±(0.015 % + 0.005 %) x TD
3 bar (300 kPa)/43.51 psi			< ±(0.035 % + 0.01 %) x TD
16 bar (1600 kPa)/232.1 psi			< ±(0.035 % + 0.01 %) x TD

Long-term stability

Measured variable	Time range		
	1 year	5 years	10 years
Differential pressure ²⁴⁾	< 0.065 % x TD	< 0.1 % x TD	< 0.15 % x TD

²⁴⁾ Relating to the adjusted span.

Measured variable	Time range		
	1 year	5 years	10 years
Static pressure ²⁵⁾	< ±0.065 %	< ±0.1 %	< ±0.15 %

4. Calculation of the total deviation - 4 ... 20 mA signal

- 1. step: Basic accuracy F_{perf}

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

$$F_T = 0.25 \%$$

$$F_{\text{Kl}} = 0.065 \%$$

$$F_a = 0.15 \%$$

$$F_{\text{perf}} = \sqrt{(0.25 \%)^2 + (0.065 \%)^2 + (0.15 \%)^2}$$

$$F_{\text{perf}} = 0.3 \%$$

- 2. step: Total deviation F_{total}

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

$$F_{\text{stab}} = 0.065 \% \times \text{TD}$$

$$F_{\text{stab}} = 0.065 \% \times 2$$

$$F_{\text{stab}} = 0.13 \%$$

$$F_{\text{total}} = 0.3 \% + 0.13 \% = 0.43 \%$$

The total percentage deviation of the measurement is thus 0.43 %. The absolute total deviation is 0.43 % of 250 mbar = 1.1 mbar

The example shows that in practice the error of use can be significantly higher than the actual measurement error. The causes are temperature influence and turn down.

11.5 Temperature coefficients

In the following charts, the typical values for the temperature coefficient "TK Process" are listed apart from the dimensions. The values apply for silicone oil and the diaphragm material 316L. For other filling oils, these must be multiplied by the TK corrective factor of the respective filling oil.

The stated nominal pressure applies to the chemical seal. The max. pressure for the complete measuring system depends on the weakest element (with regard to pressure) of the selected components.

The following drawings are unifilar diagrams. The actual dimensions of the chemical seal can deviate from these dimensions.

²⁵⁾ Relating to the measuring range end value.

Chemical seal, single-sided

EN flanges, dimensions according to EN 1092-1

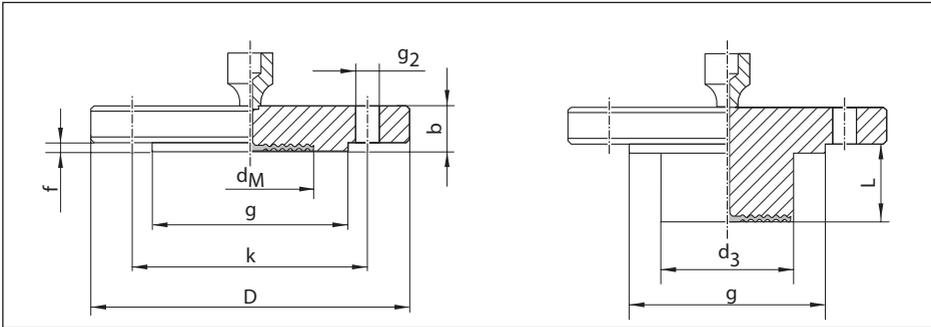


Fig. 64: Process fitting VEGADIF 85 with single-sided chemical seal, plus side EN flange with and without extension, 316L

Version	Nominal diameter	Nominal pressure	Form	Diameter D [mm]	Thickness b [mm]	Seal ledge g [mm]	Extension length L [mm]	Extension diameter d3 [mm]
EJ	DN 50	PN 40	B1	165	20	102	-	-
FD	DN 50	PN 40	B1	165	20	102	50	48.5
BW	DN 80	PN 40	B1	200	24	138	-	-
FJ	DN 80	PN 40	B1	200	24	138	50	76

Version	Number of screw holes	Diameter, screw holes g2 [mm]	Hole circle, screw holes k [mm]	Max. diaphragm diameter dM [mm]	TK ambient [mbar/10K]	TK process [mbar/10K]	Weight flange [kg (lb)]
EJ	4	18	125	58	+1.70	+1.20	3.0 (6.62)
FD	4	18	125	47	-	-	4.3 (9.48)
BW	8	18	160	89	+0.21	+0.25	5.2 (11.47)
FJ	8	18	160	72	+1.06	+1.34	6.2 (13.67)

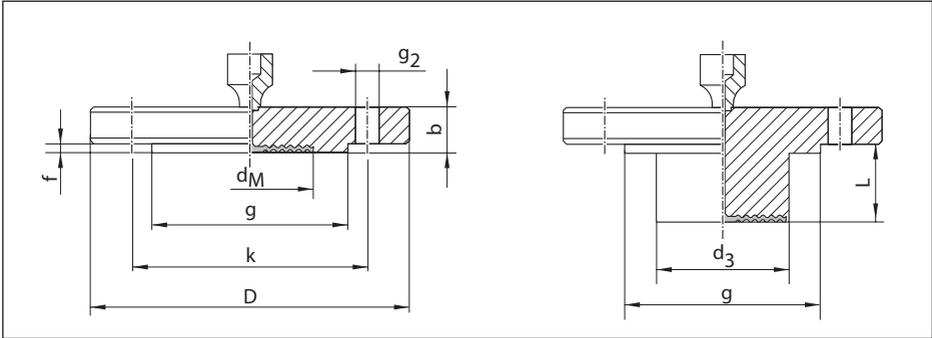
ASME flanges, dimensions according to B16.5, seal ledge RF


Fig. 65: Process fitting VEGADIF 85 with single-sided chemical seal, plus side ASME flange with and without extension, 316/316L

Version	Nominal diameter ["]	Class [lb]/[sq.in]	Diameter D [in]	Thickness b [in]	Seal ledge g [in]	Extension length L [in]	Extension diameter d3 [in]
F5	2	150	6	0.75	3.62	-	-
FS	3	150	7.5	0.94	5	-	-
EW	3	150	7.5	0.94	5	2	2.99

Version	Number of screw holes	Diameter, screw holes g2 [in]	Hole circle, screw holes k [in]	Max. diaphragm diameter dM [in]	TK ambient [mbar/10K]	TK process [mbar/10K]	Weight [kg (lb)]
F5	4	0.75	4.75 (120.5)	2.05	+1.70	+1.20	2.6 (5.73)
FS	4	0.75	6 (152.5)	3.15	+0.21	0.25	5.1 (11.25)
EW	4	0.75	6 (152.5)	2.83	+1.06	+1.34	6 (13.23)

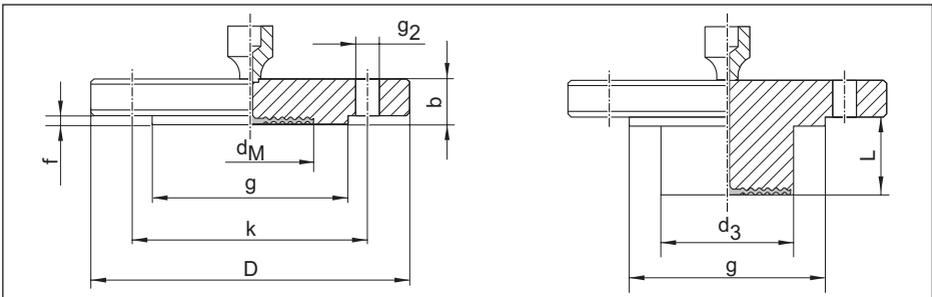
Isolating diaphragm, bilateral
Chemical seal with EN flange


Fig. 66: Chemical seal with EN flange, dimensions according to EN 1092-1

Version	Nominal diameter	Nominal pressure	Form	Diameter D [mm]	Thickness b [mm]	Seal ledge g [mm]	Extension length L [mm]	Extension diameter d3 [mm]
AH	DN 50	PN 40	D	165	20	102	-	-
FD	DN 50	PN 40	D	165	20	102	50	48.5
DH	DN 50	PN 40	D	165	20	102	150	48.5
FH	DN 80	PN 40	D	200	24	138	-	-
FJ	DN 80	PN 40	D	200	24	138	50	76
FK	DN 80	PN 40	D	200	24	138	100	76
FL	DN 80	PN 40	D	200	24	138	150	76
PW	DN 100	PN 40	D	220	20	158	150	94

Version	Number of screw holes	Diameter, screw holes g2 [mm]	Hole circle, screw holes k [mm]	Max. dia-phragm diameter dM [mm]	TK process [mbar/10K]	Weight of two chemical seals [kg]
FD	4	18	125	59	+1.20	6.0
AH	4	18	125	47	+4.2	8.6
DH	4	18	125	47	+4.2	-
FH	8	18	160	89	+0.4	10.4
FJ	8	18	160	72	+1.34	-
FK	8	18	160	72	-	-
FL	8	18	160	72	-	-
PW	8	18	190	89	+0.4	13.4

Chemical seal with ASME flange

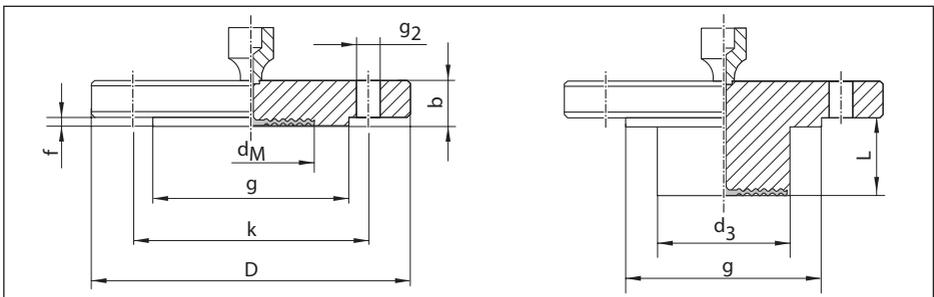


Fig. 67: Chemical seal with ASME flange, dimensions according to B16.5, seal ledge RF

Version	Nominal diameter ["]	Class [lb] [sq.in]	Diameter D [in][mm]	Thickness b [in][mm]	Seal ledge g [in][mm]	Extension length L [in][mm]	Extension diameter d3 [in][mm]
F5	2	150	6 (150)	0.75 (20)	3.62 (92)	-	-
F7	2	150	6 (150)	0.75 (20)	3.62 (92)	2 (50)	1.9 (48.3)

53566-EN-250919

Version	Nominal diameter ["]	Class [lb [sq.in]	Diameter D [in][mm]	Thickness b [in][mm]	Seal ledge g [in][mm]	Extension length L [in][mm]	Extension diameter d3 [in][mm]
FS	3	150	7.5 (190)	0.94 (24)	5 (127)	-	-
EW	3	150	7.5 (190)	0.94 (24)	5 (127)	2 (50)	2.9 (73.7)

Version	Number of screw holes	Diameter, screw holes g2 [in][mm]	Hole circle, screw holes k [in][mm]	Max. diaphragm diameter dM [in][mm]	TK process [mbar/10K]	Weight [kg]
F5	4	0.75 20	4.75 120.5	2.32 59	+1.20	2.7
F7	4	0.75 20	4.75 120.5	1.85 47	-	3.7
FS	4	0.75 20	6 152.5	3.50 89	+0.4	5.3
EW	4	0.75 20	6 152.5	2.83 72	+1.34	6.3

Tube isolating diaphragm with EN flange

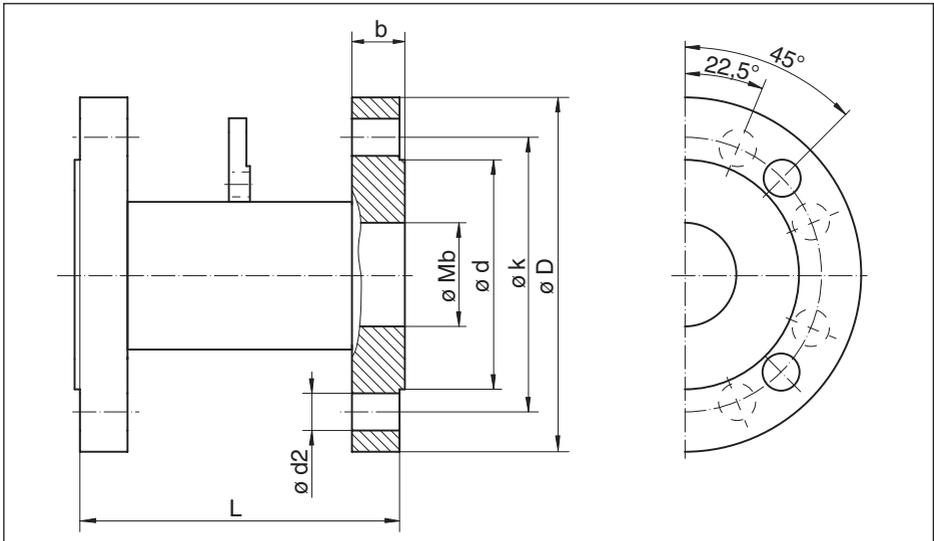


Fig. 68: Tube isolating diaphragm with EN flange, dimensions according to EN 1092-1

Version	Nominal diameter	Nominal pressure	Form	Diameter D [mm]	Thickness b [mm]	Seal ledge g [mm]	Length L [mm]
RB	DN 40	PN 40	D	150	18	88	146

Version	Number of screw holes	Diameter, screw holes d2 [mm]	Hole circle, screw holes k [mm]	Diaphragm diameter dM [mm]	TK process [mbar/10K]	Weight of two chemical seals [kg]
RB	4	18	110	43	-	-

The following drawings are unifilar drawings, i.e. the dimensions of the supplied isolating diaphragm can deviated from the dimensions specified.

Chemical seal with Clamp

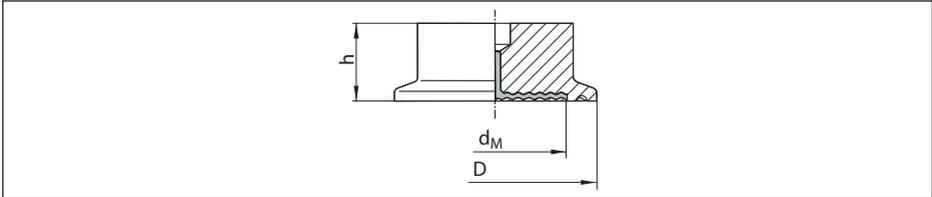


Fig. 69: Chemical seal with Clamp according to ISO 2852

Version	Nominal diameter	Nominal pressure	Diameter C7 [mm]	Diaphragm diameter dM [mm]	Height h [mm]	TK process [mbar/10K]	Weight of two chemical seals [kg]
CB	DN 40	PN 10	64	35	20	±0.44	0.5

Chemical seal with aseptic connection with compression nut

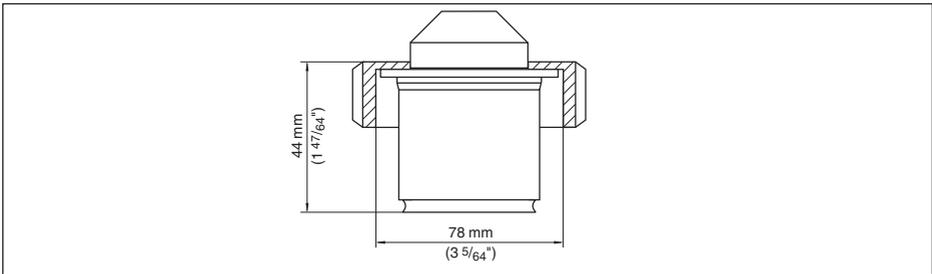


Fig. 70: Chemical seal with aseptic connection with compression nut

Version	Nominal pressure	TK process [mbar/10K]	Weight of two chemical seals [kg]
LA	PN 40	±0.44	0.5

Chemical seal with Varivent connection

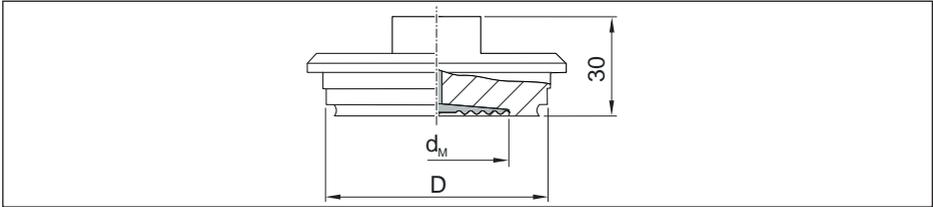


Fig. 71: Chemical seal with connection Varivent type N for tubes

Version	Nominal diameter	Nominal pressure	Diameter D [mm]	Diaphragm diameter dM [mm]	TK process [mbar/10K]	Weight of two chemical seals [kg]
TA	DN 40 ... DN 162	PN 25	68	34	±0.56	1.6

Chemical seal with slotted nut according to DIN 11851

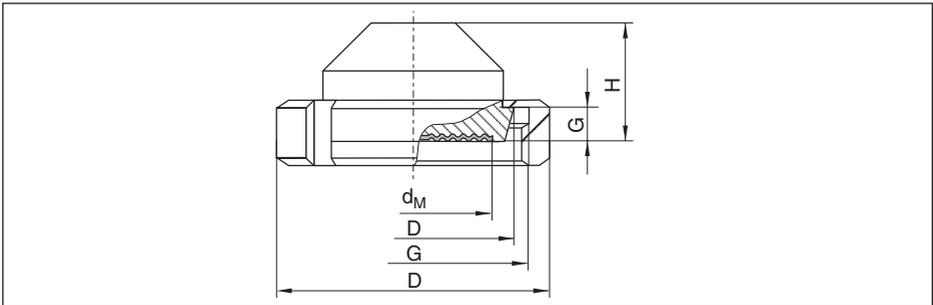


Fig. 72: Chemical seal with slotted nut according to DIN 11851 (version cone socket with compression nut)

Version	Nominal diameter	Nominal pressure	Diameter D [mm]	Diaphragm diameter dM [mm]	Groove nut thread G	Groove nut height m [mm]	Cone height f [mm]	TK process [mbar/10K]	Weight of two chemical seals [kg]
RW	DN 50	PN 25	68.5	52	Rd 78x1/6"	19	11	±1.23	2.2
RX	DN 80	PN 25	100	81	Rd 110x1/4"	26	12	±0.34	4.1

Chemical seal with DRD connection

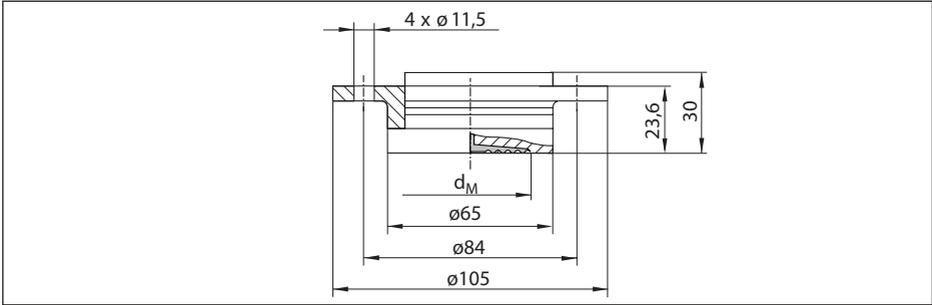


Fig. 73: Chemical seal with DRD connection

Version	Diaphragm diameter dM [mm]	Nominal pressure	TK process [mbar/10K]	Weight of two chemical seals [kg]
DW	65	PN 25	±0.20	1.5

Chemical seal with SMS connection

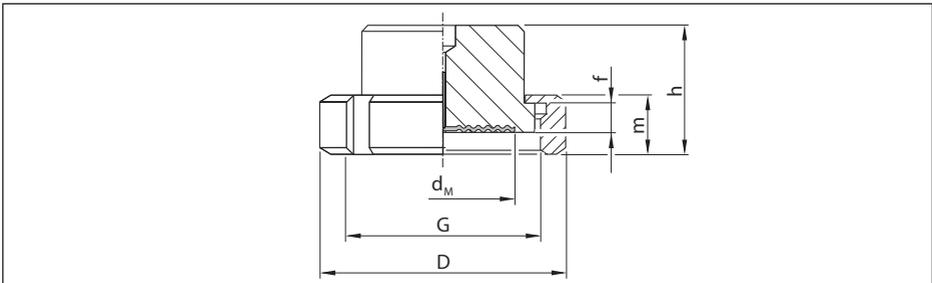


Fig. 74: Chemical seal with connection SMS 2" DN 51

Version	Nominal diameter	Nominal pressure	Groove nut diameter D [mm]	Thread diameter G [mm]	Diaphragm diameter dM [mm]	Groove nut height m [mm]	Socket height f [mm]	TK process [mbar/10K]	Weight of two chemical seals [kg]
SB	2"	PN 6	74	Rd 60 - 1/6	36	25	57	±0.18	1.3
SC	3"	PN 6	84	Rd 70 - 1/6	48	26	62	±0.18	2.1

Cell isolating diaphragm

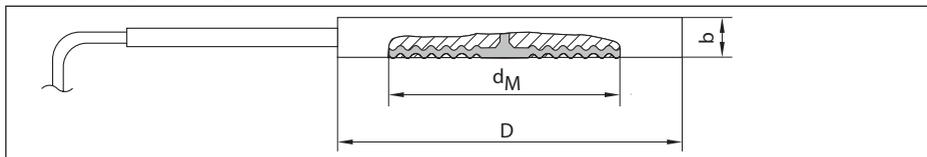


Fig. 75: Chemical seal in cell construction

Version	Nominal diameter	Nominal pressure	Diameter d [mm]	Diaphragm diameter d _M [mm]	Height b [mm]	Extension length L [in] [mm]	Extension diameter d ₃ [in][mm]	TK process [mbar/10K]	Weight of two chemical seals [kg]
AA	DN 50	PN 16-400	102	59	20-22	-	-	±0.30	2.6
AQ	DN 80	PN 16-400	138	89	20-22	-	-	±0.06	4.6
ZH	DN 80	PN 16-400	138	89	20-22	350	76	-	5.6
AR	DN 100	PN 16-400	138	89	20-22	-	-	±0.06	4.6

Version	Nominal diameter [in]	Class [lb][sq. in]	Diameter d [in] [mm]	Diaphragm diameter d _M [in] [mm]	Height b [in] [mm]	Extension length L [in][mm]	Extension diameter d ₃ [in][mm]	TK process [mbar/10K]	Weight of two chemical seals [kg]
CA	2	150-2500	3.91 102	2.32 59	0.792 20	-	-	±0.30	2.6
CK	3	150-2500	5.28 138	3.50 89	0.792 20	-	-	±0.06	4.6

Chemical seal with connection for headbox

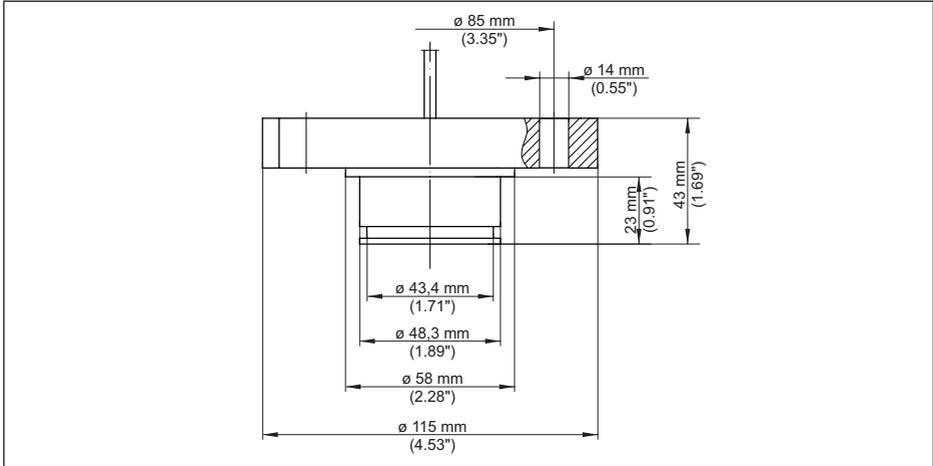


Fig. 76: Chemical seal with connection for headbox acc. to ZG 2976, flattened on both sides

Version	Flange size	Nominal pressure	Diameter d [mm]	Diaphragm diameter dM [mm]	Height b [mm]	Extension length L [in][mm]	Extension diameter d3 [in][mm]	TK process [mbar/10K]	Weight of two chemical seals [kg]
A1	DN 25	without PN specification	102	59	20	23	48	±0.30	2.6

11.6 Dimensions, versions process component

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

Housing

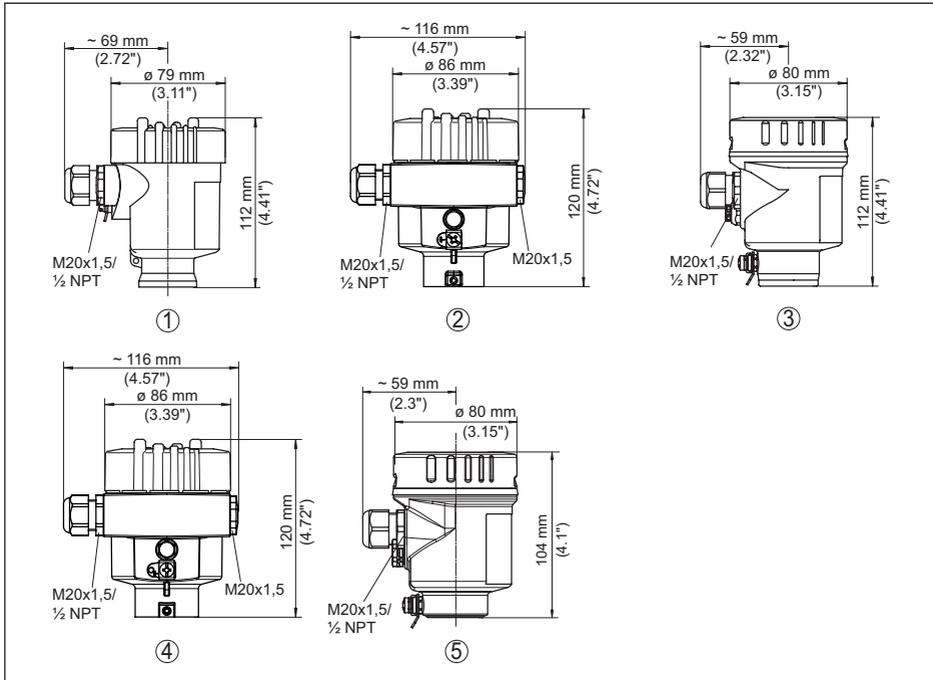


Fig. 77: Housing versions with protection rating IP66/67 and IP66/IP68 (0.2 bar) - with integrated display and adjustment module the housing is 9 mm/0.35 in higher, with Aluminium and stainless steel precision casting housings 18 mm/0.71 in

- 1 Plastic single chamber (IP66/IP67)
- 2 Aluminium - single chamber
- 3 Stainless steel single chamber (electropolished)
- 4 Stainless steel single chamber (precision casting)
- 5 Stainless steel single chamber (electropolished), IP69

External housing with IP68 (25 bar) version

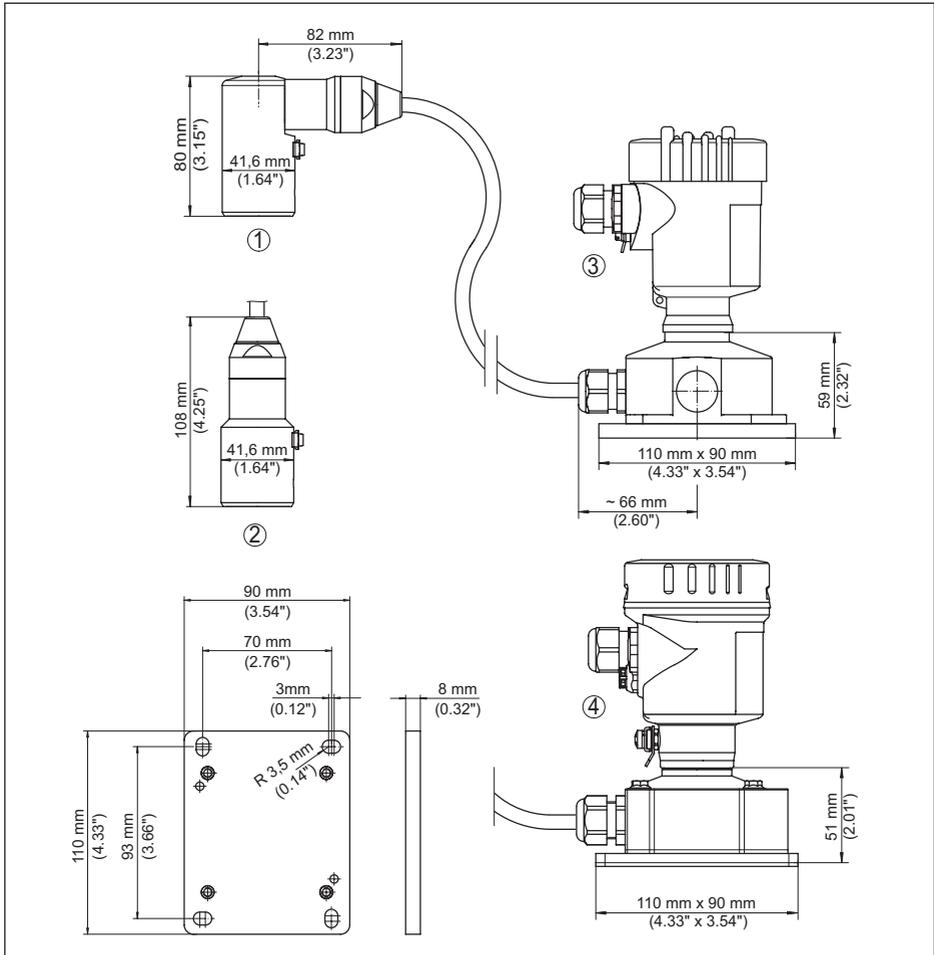


Fig. 78: IP68 version with external housing

- 1 Lateral cable outlet
- 2 Cable outlet axial
- 3 Plastic single chamber
- 4 Stainless steel single chamber (electropolished)

Ventilation on process axis

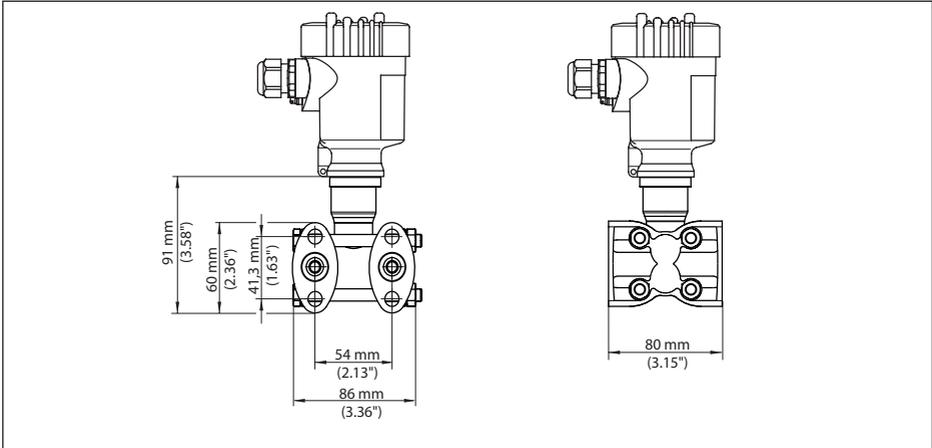


Fig. 79: VEGADIF 85, ventilation on process axis

Connection	Fastening	Material	Scope of delivery
¼-18 NPT, IEC 61518	7/16-20 UNF	316L	incl. 2 vent valves
¼-18 NPT, IEC 61518	7/16-20 UNF	Alloy C276 (2.4819)	
¼-18 NPT, IEC 61518	7/16-20 UNF	Superduplex (2.4410)	without

Lateral ventilation

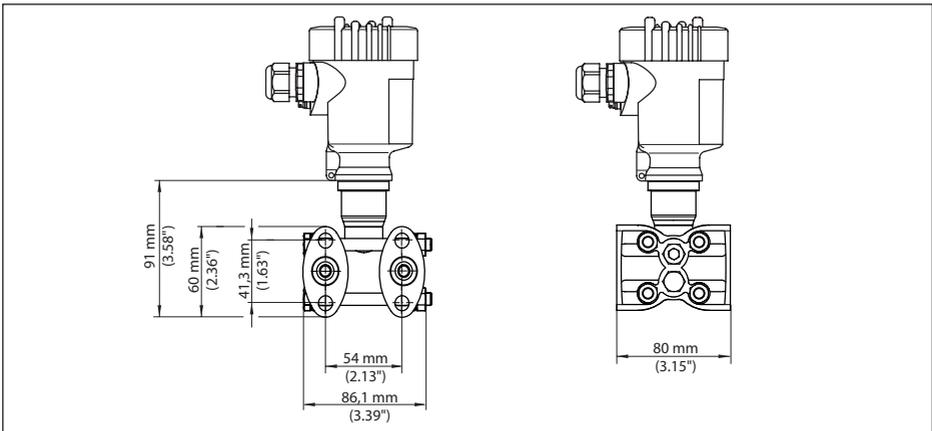


Fig. 80: VEGADIF 85, ¼-18 NPT connection, with lateral ventilation

Connection	Fastening	Material	Scope of delivery
¼-18 NPT, IEC 61518	7/16-20 UNF	316L	incl. 4 closing screws and 2 ventilation valves
¼-18 NPT, IEC 61518	7/16-20 UNF	Alloy C276 (2.4819)	

Oval flange, prepared for chemical seal connection

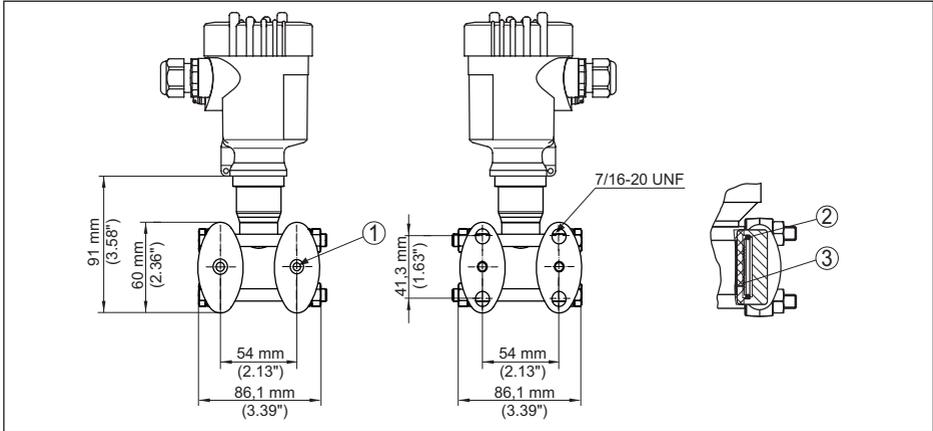


Fig. 81: left: Process fitting VEGADIF 85 prepared for chemical seal assembly. right: Position of the copper ring seal

- 1 Chemical seal connection
- 2 Copper ring seal
- 3 Separating diaphragm

Process fitting with chemical seal, single-sided

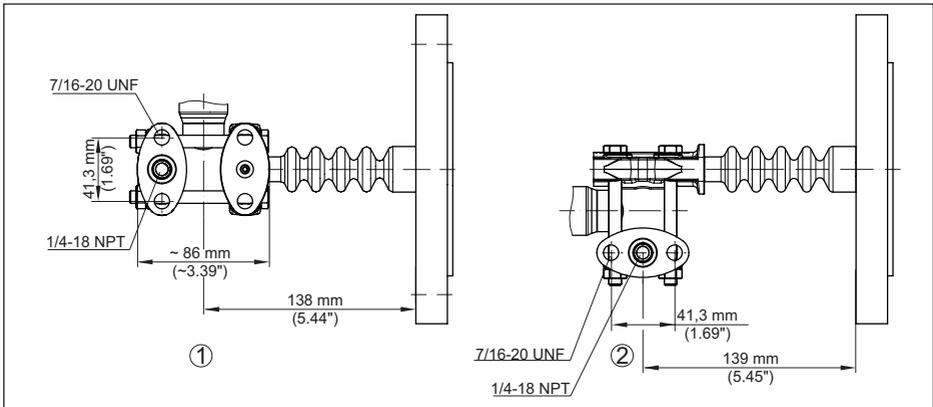


Fig. 82: Process fitting with chemical seal one-sided. Dimension L je dependent on the version 100 mm or 150 mm. Connection of the minus side via 1/4-18 NPT, mounting via 7/16-20 UNF, connection of the plus side see following tables.

- 1 Pressure transmitter horizontally (100 mm)
- 2 Pressure transmitter vertically (100 mm)

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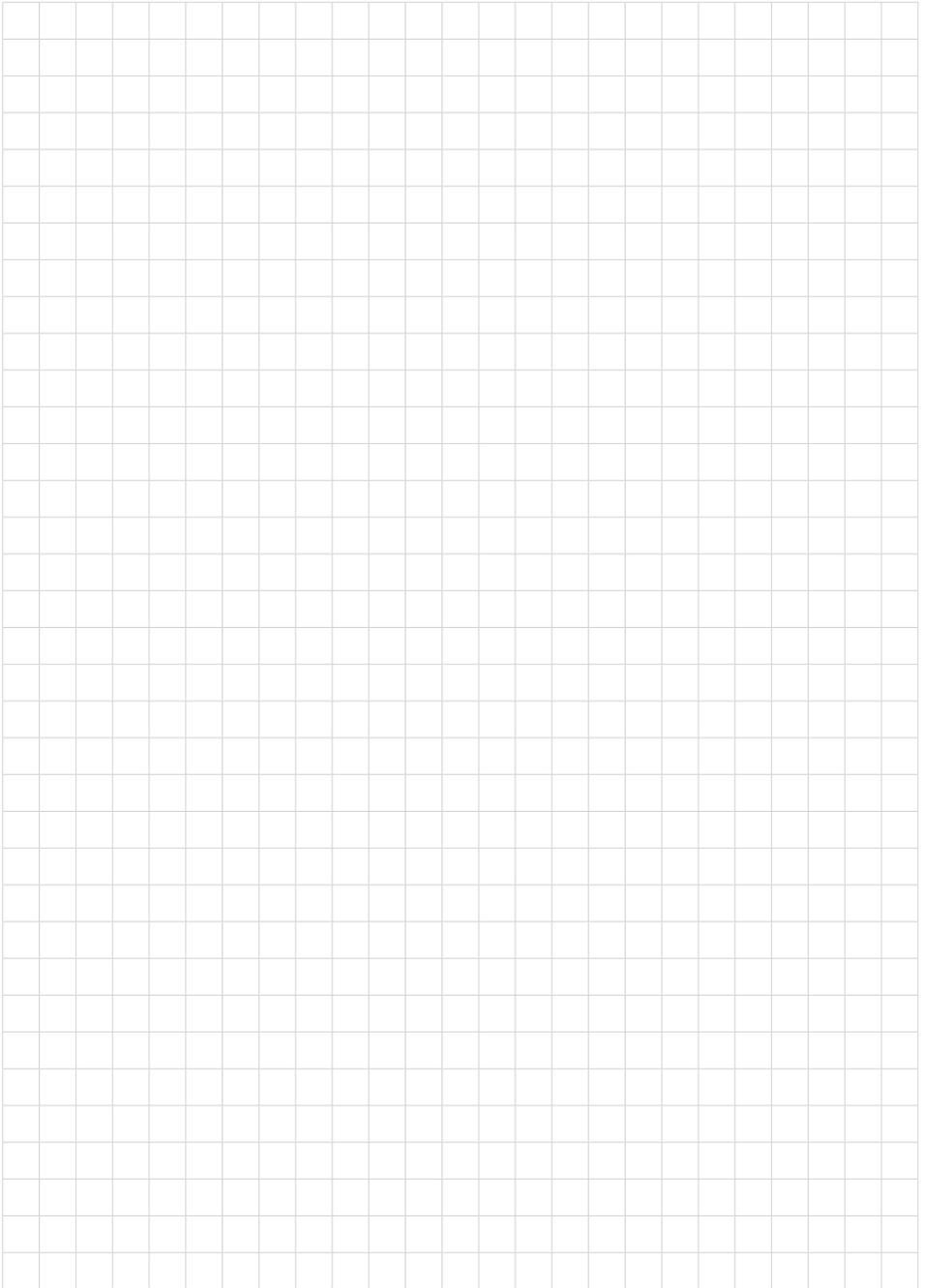
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