Operating instructions

Chemical seal CSB

for VEGADIF 65

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Contents

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1 For your safety

1.1 Authorised personnel

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

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

1.2 Appropriate use

The chemical seal is a functional part of the differential pressure transmitter VEGADIF 65.

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.

1.3 Warning about incorrect use

Inappropriate or incorrect use of the instrument can give rise to application-specific hazards, e.g. vessel overfill or damage to system components through incorrect mounting or adjustment.

1.4 General safety instructions

The safety information in the operating instructions manual of the respective sensor must be noted.

1.5 Installation and operation in the USA and Canada

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

Installations in the US shall comply with the relevant requirements of the National Electrical Code (ANSI/NFPA 70).

Installations in Canada shall comply with the relevant requirements of the Canadian Electrical Code

2 Product description

2.1 Configuration

Scope of delivery

The scope of delivery encompasses:

- Chemical seal mounted on VEGADIF 65
- Documentation
  - This operating instructions manual

Constituent parts

The CSB chemical seal consists of the following components: separating diaphragm, process fitting as well as transmission line (capillaries). The components are fully welded together with each other and with the associated differential pressure transmitter and represent a hermetically sealed system.

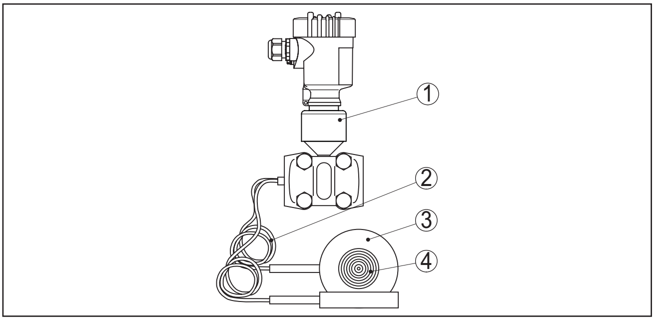

Fig. 1: VEGADIF 65 with chemical seal CSB

1 VEGADIF 65
2 Transmission line (capillaries)
3 Process fitting
4 Separating diaphragm

2.2 Principle of operation

Application area

Chemical seals should be used if a separation between medium and pressure transmitter is necessary, particularly with:

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

Functional principle

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

2.3 Packaging, transport and storage

Packaging

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

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

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

Transport

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

Transport inspection

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

Storage

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

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

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

Storage and transport temperature

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

Lifting and carrying

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

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3 Planning instructions for isolating systems

3.1 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 ≥ 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 $TK_{Zero\ point}$, 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.

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_{abs} > 1 bar/14.5 psi. For the medium temperature with instrument version for p_{abs} < 1 bar/14.5 psi, see chapter "*Chemical seal for vacuum applications*".

Filling oil	Permissible medium temperature with p_{abs} > 1 bar/14.5 psi	Density in g/cm³ at 25 °C	Kinematic viscosity in cSt at 25 °C	Corrective factor for TK	Application area
Silicone oil KN17	-40 … +180 °C (-40 … +356 °F)	0.96	4.4	1	Low temperatures
Silicone oil KN2.2	-40 … +200 °C (-40 … +392 °F)	0.96	54.5	1	Standard
High temperature oil KN32	-10 … +300 °C (-14 … +572 °F)	1.06	47.1	0.77	High temperatures
High temperature oil KN32	-10 … +400 °C (+14 … +752 °F)	1.06	47.1	0.77	High temperatures
Halocarbon oil KN21	-40 … +150 °C (-40 … +302 °F)	1.89	10.6	0.83	For chlorine applications

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Filling oil	Permissible medium temperature with p_{abs} > 1 bar/14.5 psi	Density in g/cm³ at 25 °C	Kinematic viscosity in cSt at 25 °C	Corrective factor for TK	Application area
Halocarbon oil KN21 (BAM tested)[1]	-40 … +60 °C (-40 … +140 °F)	1.89	10.6	0.83	For oxygen applications
Medical white oil KN92 (FDA approved)	-10 … +250 °C (+14 … +482 °F)	0.85	45.3	0.63	Food applications
Neobee M-20 KN59 (FDA approved)	-10 … +150 °C (+14 … +302 °F)	0.92	10		Food applications

The implemented filling oil also influences the $TK_{zero\ point}$, 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 $TK_{zero\ point}$ and the step response time of the isolating system through the volume of its lateral flanges and its control volume.[2]

3.2 Influence of temperature changes

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*".

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.

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[1] 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)

[2] The control volume is the volume that must be shifted in order to utilise the entire measuring range.

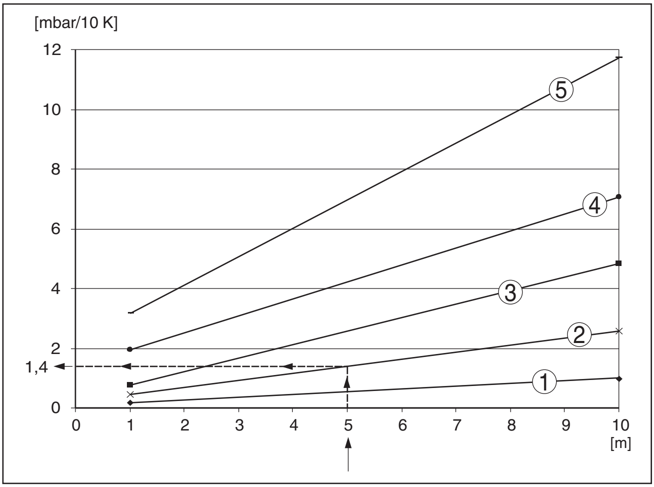

Fig. 2: Temperature coefficient "$TK_{Ambient}$" depending on the capillary length. Characteristics 1 … 5 related to the process fittings listed below.

- **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 socket, 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 socket, 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. $T_{Ambient}$ - $T_{Calibration}$ = 45 °C - 25 °C = 20 °C; (1.4 mbar/10 K) • 20 K = 2.8 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:

- 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.

- **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

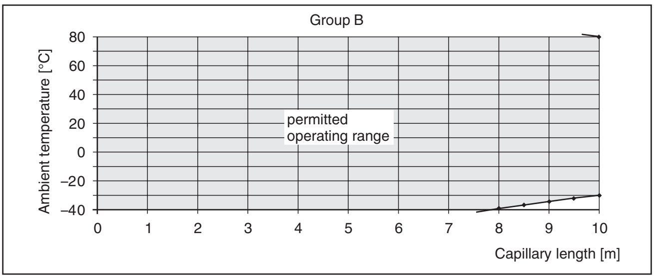

Fig. 3: Permissible ambient temperature range depending on the capillary length for chemical seals of group B

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- **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

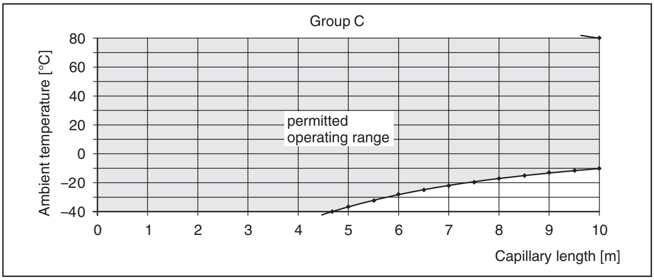

Fig. 4: Permissible ambient temperature range depending on the capillary length for chemical seals of group C

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

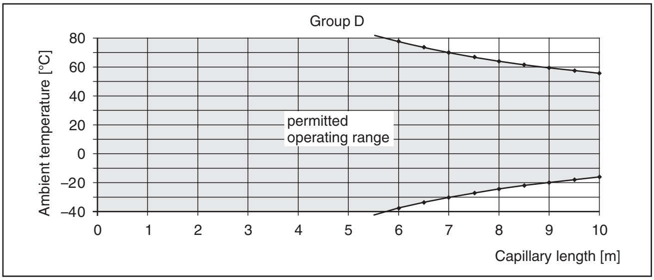

Fig. 5: Permissible ambient temperature range depending on the capillary length for chemical seals of group D

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

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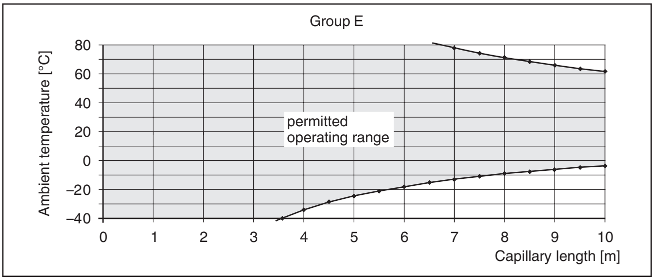

Fig. 6: Permissible ambient temperature range depending on the capillary length for chemical seals of group E

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

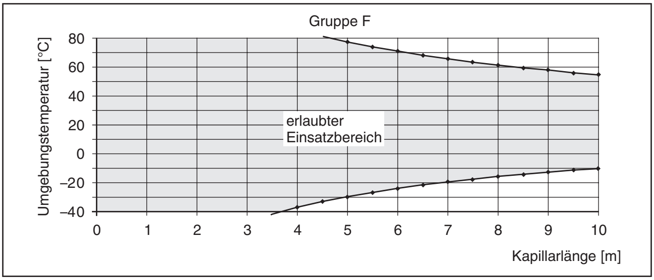

Fig. 7: Permissible ambient temperature range depending on the capillary length for chemical seals of group F

3.3 Dynamic behaviour of the chemical seals

Step response time

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 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 typical step response times (T90) 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.

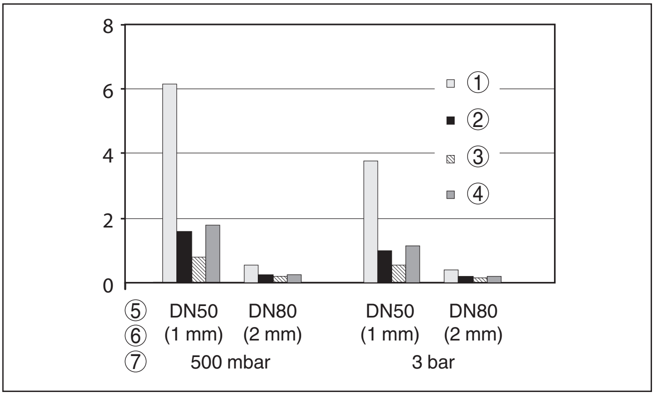

Fig. 8: Typical step response times (T90) in s/m for different filling oils depending on the measuring cell and capillary inner diameter. Ambient temperature = 20 °C

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

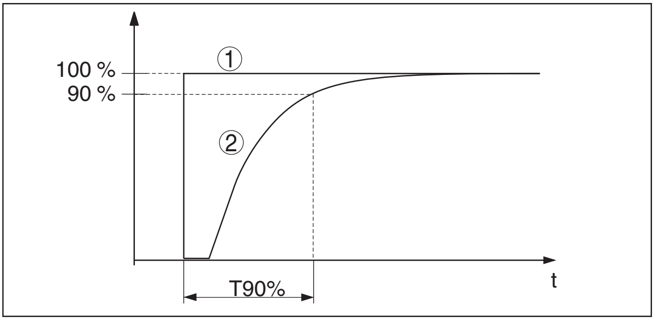

Fig. 9: Presentation of the step response time (T90)

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

3.4 Installation position

Standard applications

When the pressure transmitter is mounted above the lower chemical seal, the max. height difference H1 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 H1 are 7 m with silicone oil and 4 m with halocarbon oil.

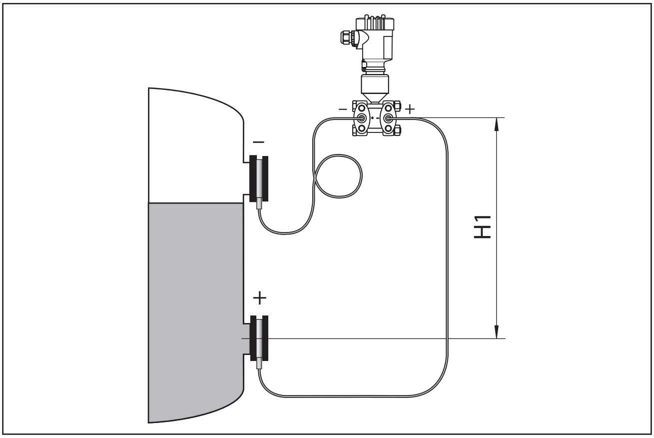

Fig. 10: Max. height when mounting above the lower chemical seal

Vacuum applications

In vacuum applications, the pressure transmitter should be mounted at the same height as or below the lower chemical seal. By doing this, an additional vacuum load from the filling oil in the capillaries is avoided.

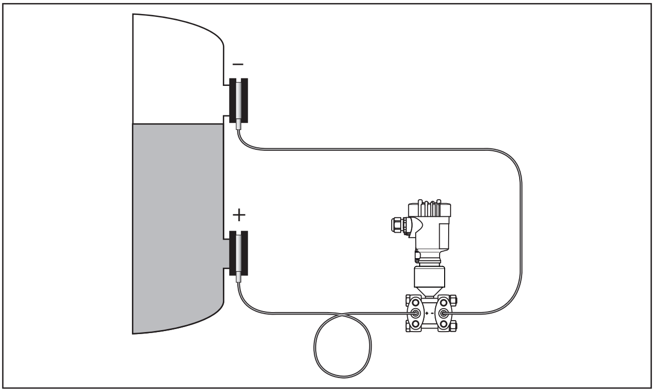

Fig. 11: Preferred mounting below the lower chemical seal

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Density measurement

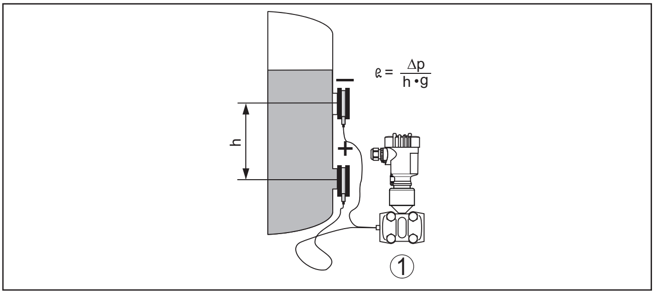

Fig. 12: Density measurement with VEGADIF 65, h = defined mounting distance, Δp = differential pressure, ρ = density of the medium, g = acceleration of gravity

1 VEGADIF 65

Interface measurement

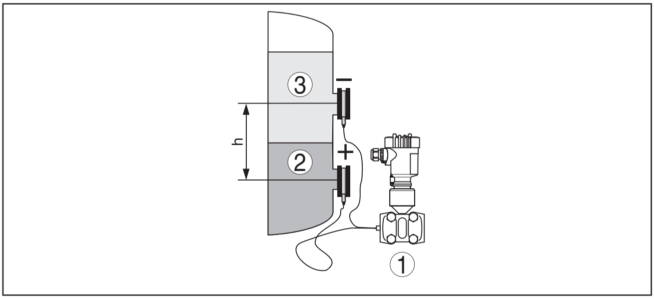

Fig. 13: Interface measurement with VEGADIF 65

1 VEGADIF 65
2 Liquid with higher density
3 Liquid with lower density

3.5 Selection of the measuring range

For instruments with chemical seals and capillaries, the zero point shift due to the hydrostatic pressure of the fluid column in the capillaries must be taken into account when selecting the measuring cell.

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Example for selection of the measuring cell

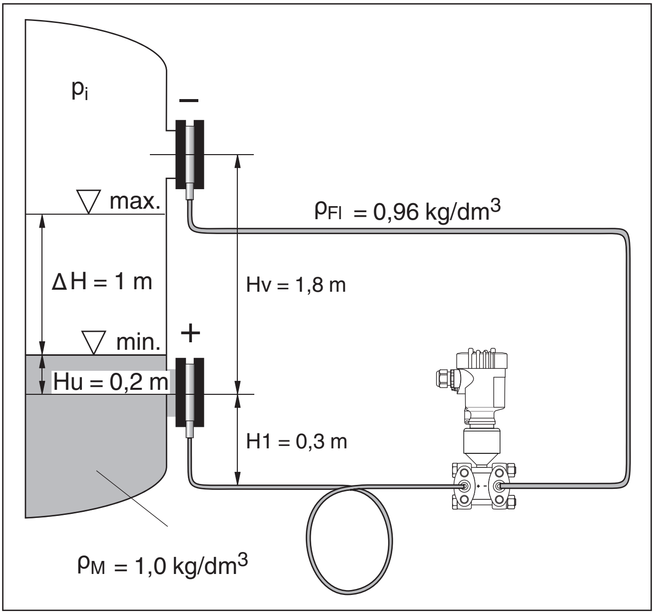

Fig. 14: Data for selection of the measuring cell

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

$p_- = p_{Hv} + p_{H1} = Hv \bullet \rho_{Fl} \bullet g + H1 \bullet \rho_{Fl} \bullet g + p_i$

$= 1.8\ m \bullet (0.96\ kg/dm^3 \bullet 9.81\ m/s) + 0.3\ m \bullet (0.96\ kg/dm^3 \bullet 9.81 m/s) + p_i$

$= 197.77\ mbar + p_i$

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

$p_+ = p_{Hu} + p_{H1} = Hu \bullet \rho_{FM} \bullet g + H1 \bullet \rho_{Fl} \bullet g + p_i$

$= 0.2\ m \bullet (1\ kg/dm^3 \bullet 9.81\ m/s) + 0.3\ m \bullet (0.96\ kg/dm^3 \bullet 9.81\ m/s) + p_i$

$= 47.87\ mbar + p_i$

Differential pressure on the transmitter with min. level:

$\Delta p_{Transmitter} = p_+ - p_-$

$= 47.87\ mbar - 197.77\ mbar$

$= -149.90\ mbar$

Differential pressure on the transmitter with max. level:

$\Delta p_{Transmitter} = p_+ - p_- + \Delta H \bullet (1.0\ kg/dm^3 \bullet 9.81\ m/s)$

$= -149.90\ mbar + 98.1\ mbar$

$= -51.80\ mbar$

Hence a 100 mbar measuring cell is required for this application example.

3.6 Calculation of the temperature error

Actuating variables

With double-sided mounting of chemical seals, the total temperature influence is composed of the following:

- 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 $TK_{Amb.}$ 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*" of the differential pressure transmitter.

Information:
In case of double-sided, idential 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 invidual errors of the two chemical seals. This is also taken into account in the following example.

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

Example of double-sided chemical seal:

- 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
- $TK_{Capillaries}$ = 0.3 mbar/10K (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

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

Corrective factor diaphragm material = 21.44 mbar • 1.5 = 32.16 mbar

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

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Δp_{Total} = 32.16 mbar + 4.8 mbar = 36.96 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.

4 Mounting

4.1 Application conditions

Suitability for the process conditions

Before mounting, setup and operation, take note that the pressure transmitter as well as the chemical seal were selected according to measuring range, version and material suitable for the process conditions. The load limits must be maintained in order to guarantee the specified accuracy.

Caution:
In dangerous substances such as e.g. oxygen, acetylene, combustible or toxic products as well as in refrigerating plants, compressors, etc., the pertinent instructions must be observed in addition to the general regulations.

Process and ambient temperature

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

4.2 Oxygen applications

Oxygen applications

Oxygen and other gases can be explosive when brought into contact with oils, grease and plastics, so the following measures must also be taken:

- All components of the plant, such as e.g. measuring instruments must be cleaned oil and grease-free for oxygen applications according to the requirements of BAM (Federal Institute for Materials Research and Testing)
- Max. temperatures and pressures determined with oxygen applications must not be exceeded, see chapter "*Technical data*" and "*Chemical seals with vacuum applications*", also keep sealing material in mind

Danger:
Instruments for oxygen applications must be unpacked just before mounting. After removing the protective cover of the process fitting, the label "O_2" will be visible on the process fitting. Penetration of oil, grease and dirt should be avoided. Danger of explosion!

4.3 Instructions for handling

- Instruments must be protected against soiling and strong fluctuations of the ambient temperature

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- 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
- 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

4.4 Mounting instructions

Sealing

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

Laying the capillaries

- 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

5 Maintenance and fault rectification

5.1 Maintenance

Maintenance

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

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

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.

6 Supplement

6.1 Technical data

Materials

Diaphragm	316L, 316L with gold rhodium coating, Alloy C276 (2.4819), Tantalum, Titanium, Alloy 600 (2.4816), Duplex (1.4462), Superduplex (1.4410)
Flanges	316L
Capillaries	316Ti
Protective hose for capillaries	304

Process conditions

Max. process pressure	see operating instructions manual of the respective sensor
Max. process temperature	see operating instructions manual of the respective sensor

6.2 Chemical seal with vacuum applications

Introduction

A chemical seal has two tasks:

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

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

Vacuum

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

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

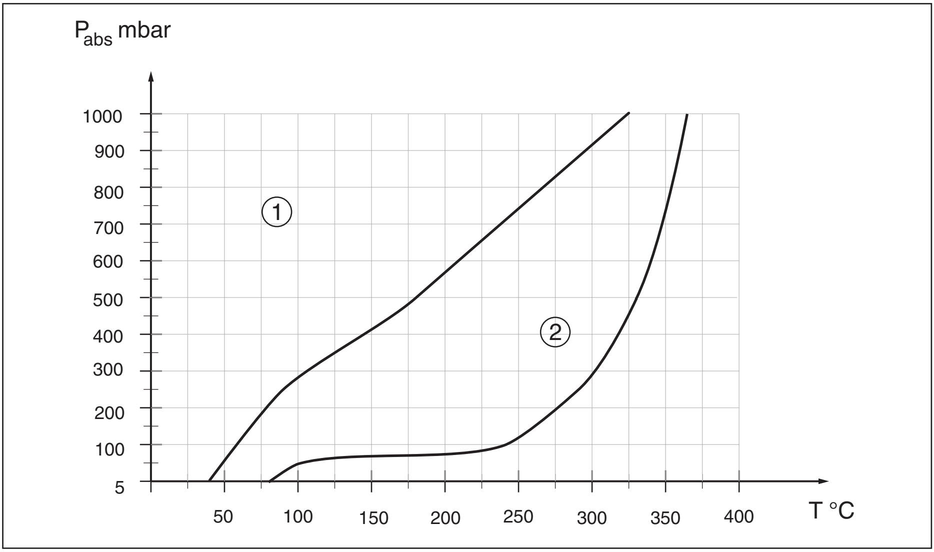

Fig. 15: Area of application for high temperature oil KN 32

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

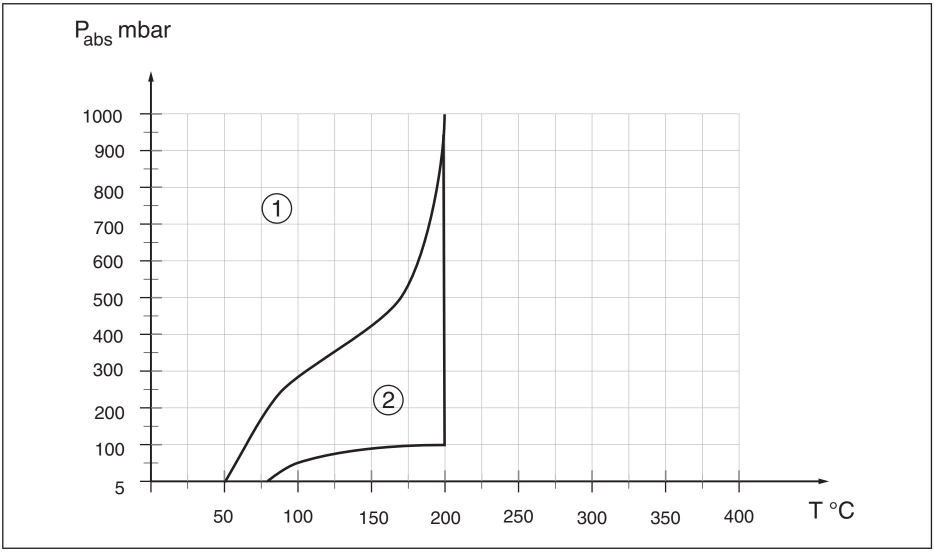

Fig. 16: Area of application for silicone oil KN 2.2

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

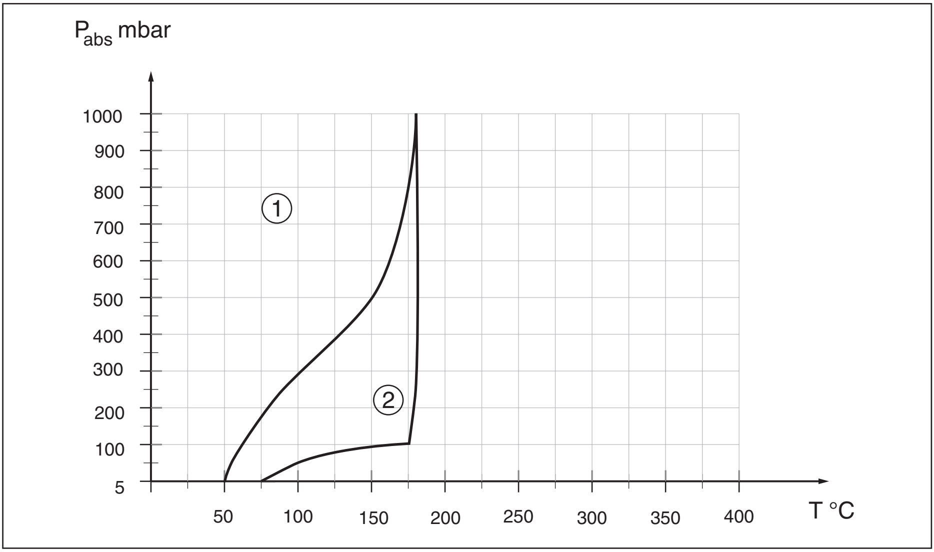

Fig. 17: Area of application for silicone oil KN 17

1 Standard chemical seal
2 Chemical seal with vacuum service

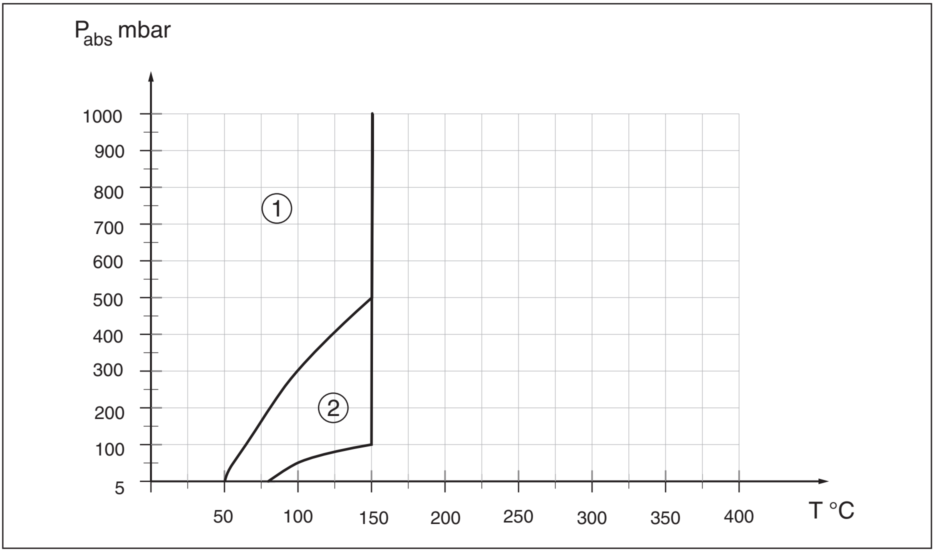

Fig. 18: Area of application for Halocarbon oil KN21

1 Standard chemical seal
2 Chemical seal with vacuum service

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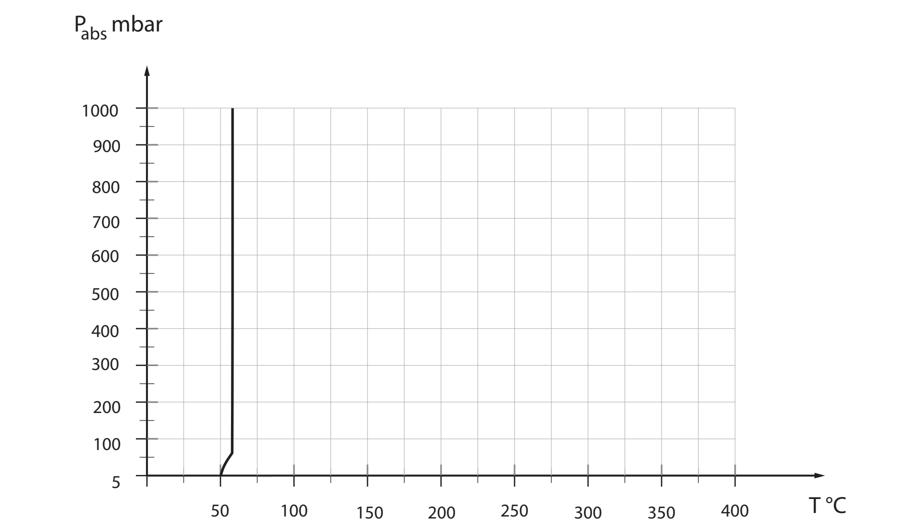

Fig. 19: Application area for Halocarbon oil KN21 for oxygen applications

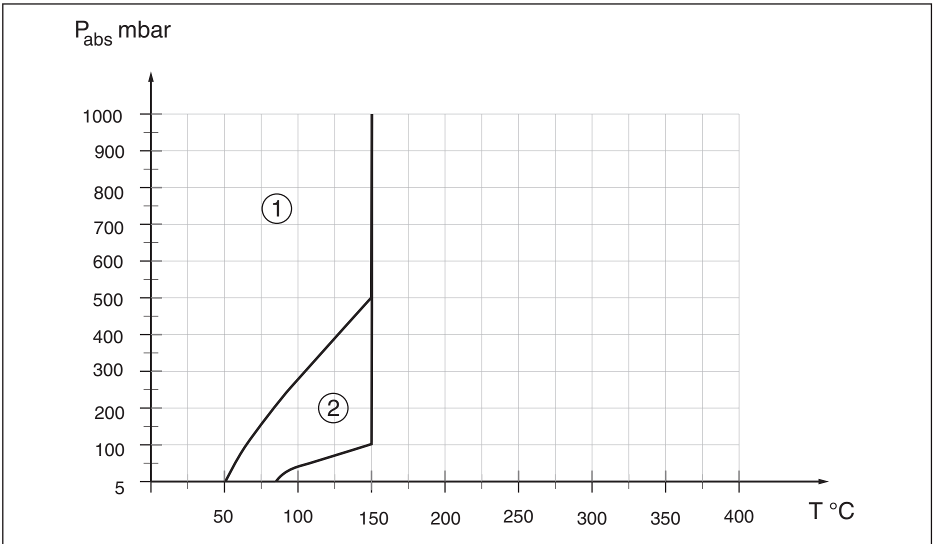

Fig. 20: Area of application for Neobee KN 59

1 Standard chemical seal
2 Chemical seal with vacuum service

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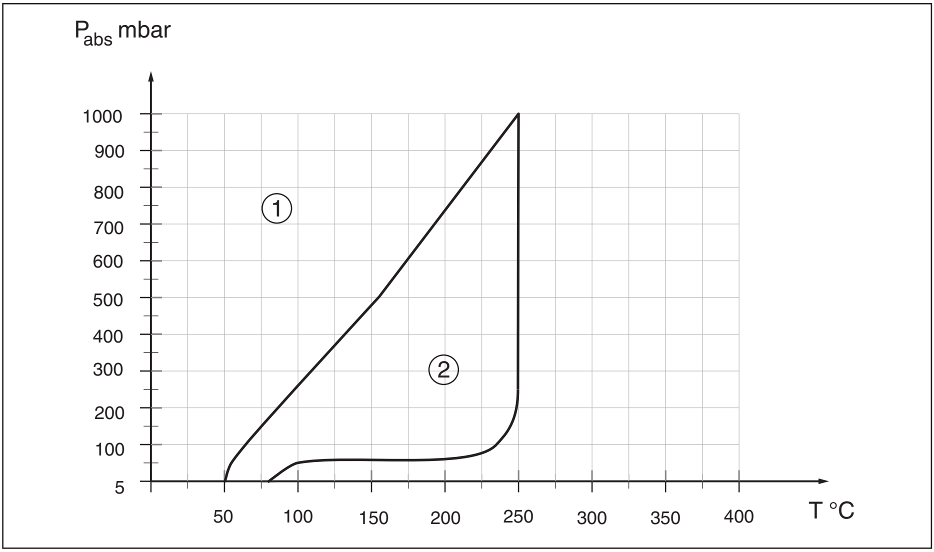

Fig. 21: Area of application for med. white oil KN 92

1 Standard chemical seal
2 Chemical seal with vacuum service

6.3 Dimensions and weight

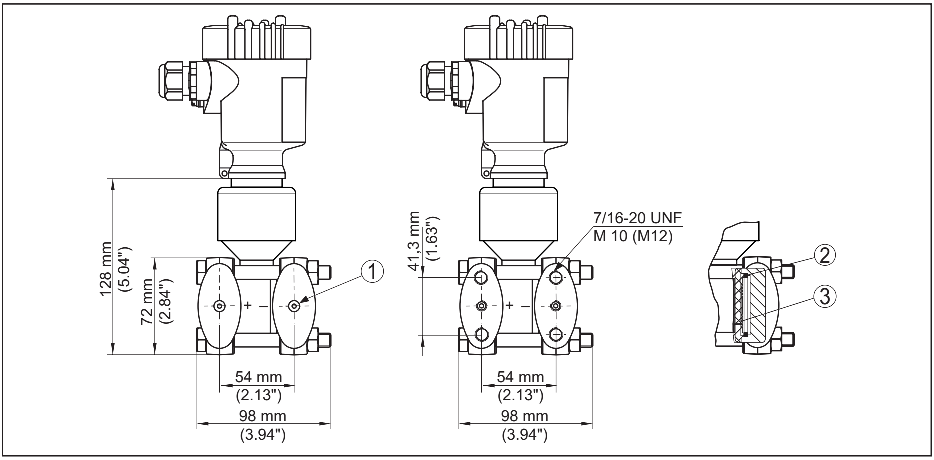

Fig. 22: left: Process fitting VEGADIF 65 prepared for chemical seal assembly. right: Position of the copper ring seal

1 Chemical seal connection
2 Copper ring seal
3 Cup diaphragm

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 with 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 weights of the chemical seals are listed in the charts. For the weight of the transmitter see also "*Dimensions and weights*" in operating instructions VEGADIF 65.

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

Chemical seal with EN/DIN flanges

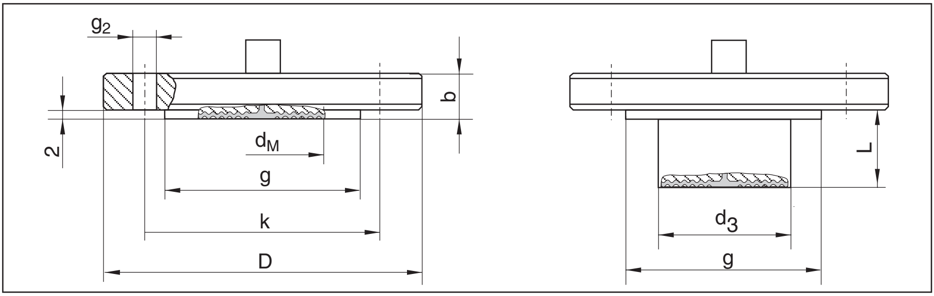

Fig. 23: Chemical seal with EN/DIN flanges, dimensions according to EN 1092-1/DIN 2501

Version	Nominal diameter	Nominal pressure	Form	Diameter D [mm]	Thickness b [mm]	Seal ledge g [mm]	Extension length L [mm]	Extension diameter d3 [mm]
FB	DN 40	PN 40	D	150	20	88	-	-
FC	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
E8	DN 100	PN 16	B1	220	20	158	150	94

Version	Number of screw holes	Diameter, screw holes g2 [mm]	Hole circle, screw holes k [mm]	Max. diaphragm diameter dM [mm]	TK process [mbar/10K]	Weight of two chemical seals [kg]
FB	4	18	110	45	+4.2	2.10
FC	4	18	125	59	+1.20	6.6
FD	4	18	125	47	+4.2	8.6
DH	4	18	125	47	+4.2	-
FH	8	18	160	89	+0.4	11.6

Version	Number of screw holes	Diameter, screw holes g2 [mm]	Hole circle, screw holes k [mm]	Max. diaphragm diameter dM [mm]	TK process [mbar/10K]	Weight of two chemical seals [kg]
FJ	8	18	160	72	+1.34	13.6
FK	8	18	160	72	-	-
FL	8	18	160	72	-	-
E8	8	18	190	89	+0.4	-

Chemical seal with ASME flanges

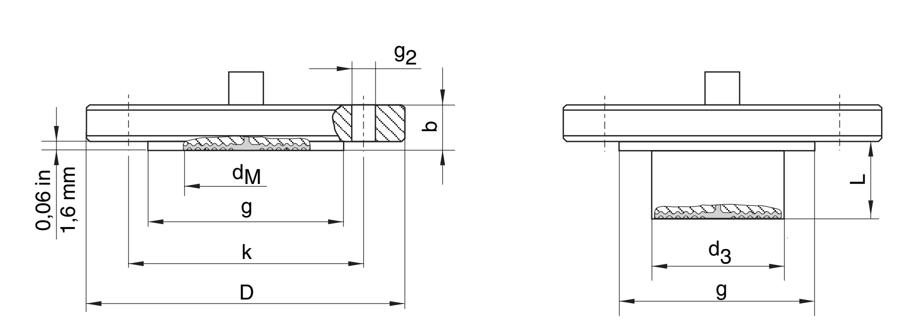

Fig. 24: Chemical seal with ASME flanges, dimensions according to B16.5, seal ledge RF

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)
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)
FQ	3	150	7.5 (190)	0.94 (24)	5 (127)	6 (150)	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	8	0.75 20	6 152.5	3.50 89	+0.4	5.3
EW	8	0.75 20	6 152.5	2.83 72	+1.34	6.3

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]
FQ	8	0.75 20	6 152.5	2.83 72	-	-

Tube isolating diaphragm with EN flange

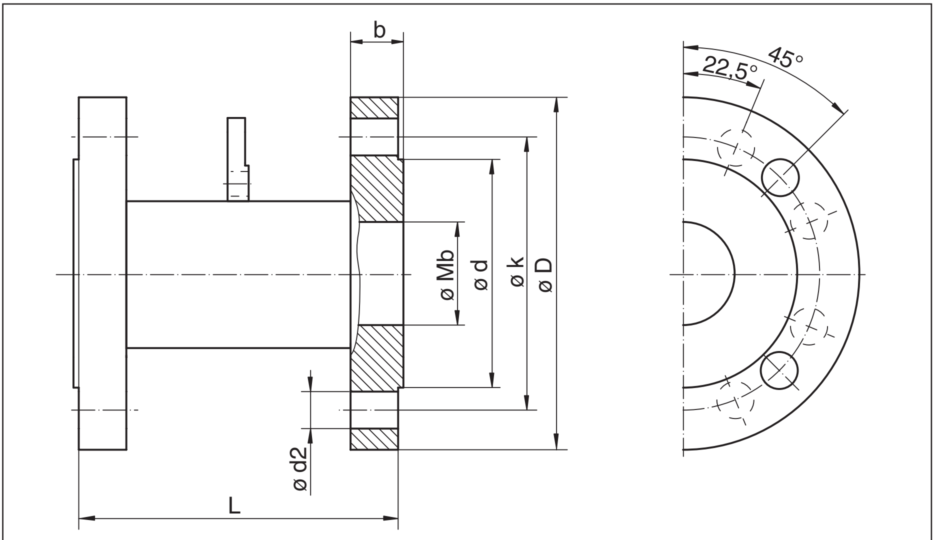

Fig. 25: Tube isolating diaphragm with EN flange, dimensions according to EN 1092-1

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	-	-

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Chemical seal with Clamp

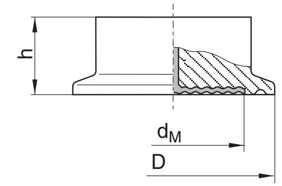

Fig. 26: Chemical seal with Clamp according to ISO 2852

Version	Nominal diameter	Nominal pressure	Diameter D [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 LA connection

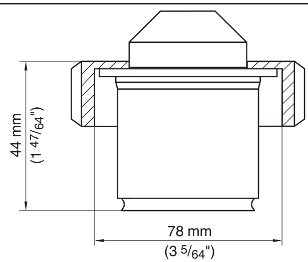

Fig. 27: Chemical seal with LA connection

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

Chemical seal with Tuchenhagen Varivent connection

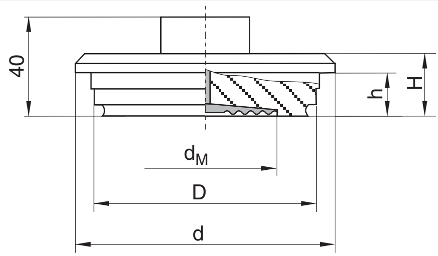

Fig. 28: Chemical seal with Tuchenhagen Varivent connection

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Version	Nominal diameter	Nominal pressure	Diameter d [mm]	Diameter D [mm]	Diaphragm diameter dM [mm]	Height h [mm]	Height h[mm]	TK process [mbar/10K]	Weight of two chemical seals [kg]
TA	DN 32 (ISO tube), DN 40 … DN 125 (former term: DN 40/50)	PN 25	84	68	60	17	12.3	±0.56	1.2

Chemical seal with slotted nut according to DIN 11851

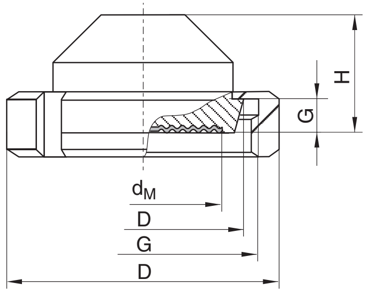

Fig. 29: Chemical seal with slotted nut according to DIN 11851 (version cone socket with compression nut)

Version	Nominal diameter	Nominal pressure	Diameter d [mm]	Diameter d [mm]	Diaphragm diameter dM [mm]	Height h [mm]	Height h [mm]	TK process [mbar/10K]	Weight of two chemical seals [kg]
RW	DN 50	PN 25	92	50	52	11	40	±1.23	1.6
RX	DN 80	PN 25	127	81	71	12	40	±0.34	2.5

Chemical seal with DRD connection

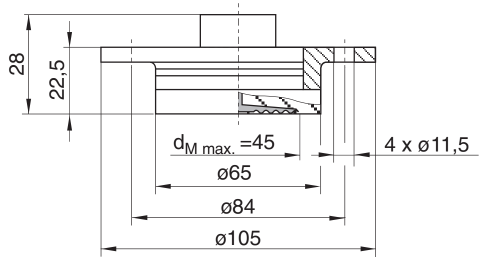

Fig. 30: Chemical seal with DRD connection

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Version	Diameter [mm]	Nominal pressure	TK process [mbar/10K]	Weight of two chemical seals [kg]
DW	65	PN 40	±0.20	1.5

Chemical seal with SMS connection

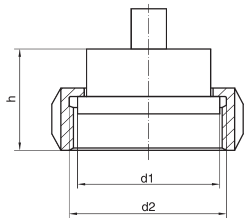

Fig. 31: Chemical seal with connection SMS 2" DN 51

Version	Nominal diameter [mm]	Nominal pressure	TK process [mbar/10K]	Weight of two chemical seals [kg]
SB	DN 51	PN 40	±0.18	1

Cell isolating diaphragm

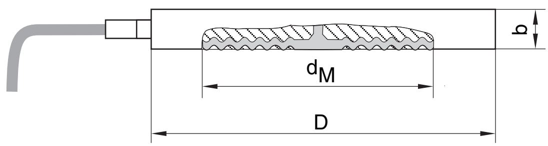

Fig. 32: Chemical seal in cell construction

Version	Nominal diameter	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]
AA	DN 50	PN 16-400	102	59	20	-	-	±0.30	2.6
AK	DN 80	PN 16-400	138	89	20	-	-	±0.06	4.6
ZH	DN 80	PN 16-400	138	89	20	350	76	-	5.6
AR	DN 100	PN 16-400	138	89	20	-	-	±0.06	4.6

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Version	Nominal diameter [in]	Class [lb][sq. in]	Diameter d [in] [mm]	Diaphragm diameter dM [in] [mm]	Height b [in] [mm]	Extension length L [in][mm]	Extension diameter d3 [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

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