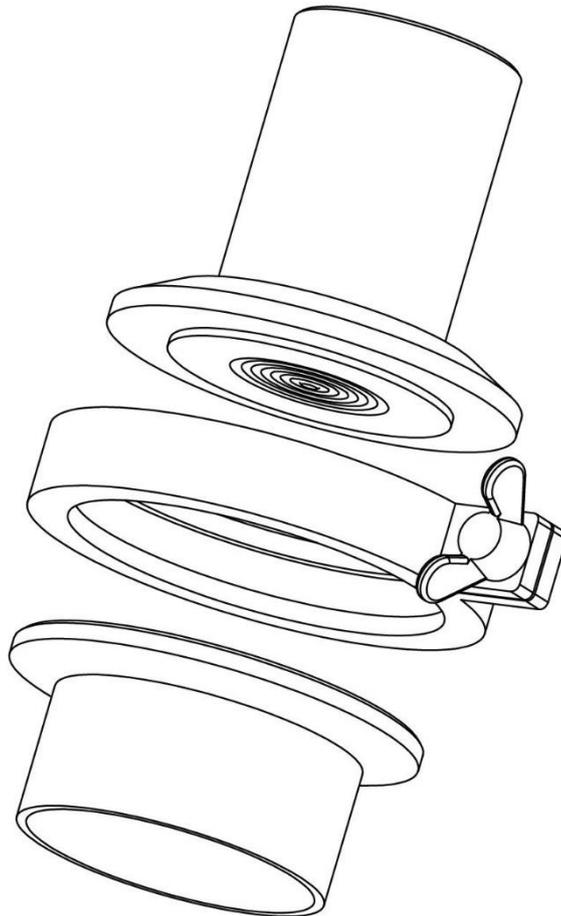


# APLISENS®

APLISENS S.A. – Produkcja Przemysłowej  
Aparatury Pomiarowej i Elementów Automatyki

## USER'S MANUAL DIAPHRAGM SEALS



## Symbols used

Symbol	Opis
	Warning to proceed strictly in accordance with the information contained in the documentation in order to ensure the safety and full functionality of the diaphragm seal together with a pressure gauge.
	Information particularly useful during installation and operation of the device.
	Information on disposal of used equipment.

### BASIC REQUIREMENTS AND SAFE USE



The manufacturer will not be liable for damage resulting from incorrect installation of the diaphragm seal or use other than for its intended purpose.

Installation should be carried out by qualified staff having the required authorizations to install I&C equipment. The installer is responsible for performing the installation in accordance with manual as well as with safety regulations and standards applicable to the type of installation.

In case of leakage, there is a danger to staff due to the medium under pressure. All safety and protection requirements must be observed during installation, operation and inspections.

If a malfunction occurs, the diaphragm seal together with a pressure measuring device should be disconnected and handed over to the manufacturer for repair.

Changes made to the manufacturing of products may be introduced before the paper version of the manual is updated. The up-to-date manuals are available on the manufacturer's website: [www.aplisens.com](http://www.aplisens.com).

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## 1. INTRODUCTION

### 1.1. Purpose of the document

These User's manual contain data on diaphragm seals and common data characterizing pressure measuring device, pressure and differential pressure transmitters and pressure gauges.

The data on seals contained in this manual can be used for the installation and use of all types of pressure transmitters with seals, e.g. **APC-2000**, **APC-2000ALW**, **APC-2000/XX PROFIBUS PA**, **PC-28.Smart**, **PC-28** and differential pressure transmitters e.g. **PR-54**, **APR-2000**, **APR-2000ALW**, **APR-2000/XX PROFIBUS PA** and **MS** type pressure gauges with diaphragm seals. The manual contains data, guidelines and general recommendations regarding safe installation and operation of the diaphragm seal together with a pressure measuring device, as well as procedures in the event of a possible failure.

## 2. SAFETY



- The installation and start-up and any activities related to operation shall be carried out after thorough examination of the contents of user's manual and the instructions related thereto.
- Installation and maintenance should be carried out by qualified staff having the required authorizations to install measuring devices.
- The diaphragm seals shall be used according to its intended purpose in line with the permissible parameters (→ [5.1. Diaphragm seals identification](#)).
- The protection elements used by the manufacturer to ensure transmitter safety may be less effective if the device is operated in a manner not consistent with its intended purpose.
- Assessment of damages and possible repair may only be performed by the manufacturer or authorized representative.
- Do not use instruments if damaged. In case of malfunction, the device must be put out of operation.

## 3. TRANSPORT AND STORAGE

### 3.1. Delivery check

After receiving the delivery of the equipment, it is necessary to check general terms and conditions of contracts od website:

[https://aplisens.pl/ogolne\\_warunki\\_umow.html](https://aplisens.pl/ogolne_warunki_umow.html).

### 3.2. Transport

Pressure measuring device should be transported in covered means of transport, in original packaging with protected process diaphragms. The packaging should be protected against movement and direct exposure to weather conditions.

### 3.3. Storage

Transmitters shall be stored in a factory packaging, in a room without vapours and aggressive substances, protected against mechanical impact.

## 4. GUARANTEE

General terms and conditions of guarantee are available on the manufacturer's website:

[www.aplisens.pl/ogolne\\_warunki\\_gwarancji](http://www.aplisens.pl/ogolne_warunki_gwarancji).



The guarantee shall be repealed if the pressure measuring device with diaphragm seals is used against its intended use, or failure to comply with user's manual or interference with its the structure.

## 5. IDENTIFICATION

### 5.1. Diaphragm seals identification

Marking of the components of the diaphragm seals used to mark them.

Depending on the type of diaphragm seal, the marking may differ in the amount of information.

**Table 1.** Symbols appearing in the designation of diaphragm seals

	Logo and company name
EN(...) / ANSI(...)/ JIS(...)	Standard No.
(DN PN) / (" #)	Execution
B, D / RF	Flange type
DI	Diaphragm
SF	Sealing Face
FL	Flange
BA	Base
FT	Fitting
WPx	Wetted Parts
LI	(Lining)
Zs-xxx-xx	Drawing numer of diaphragm seal assembly
KKPxxxxxx	Production order number

## 5.2. Examples of diaphragm seal designation S-P, S-PK, S-CH, S-ChK, S-P DN25(Ø48), S-Ch Hastelloy DN25(Ø48)

The marking of S P, S-PK diaphragm seals may contain LOGO.  
The remaining diaphragm seals do not have the LOGO marking.

An example of marking standard **S-P, S-PK** diaphragm seals made according to EN1092-1 type B, material of the flange, rebate and diaphragm (1.4404).

Circuit of flange	<b>APLISENS DN50 PN40 1.4404</b>	-----
Flange area	<b>EN1092-1 B FLSF/DI:1.4404 ZS-xxx-xx KKPxxxxxx</b>	<b>APLISENS EN1092-1 DN50 PN40 B FLSF/DI:1.4404 ZS-xxx-xx KKPxxxxxx</b>

An example of marking standard **S-P, S-PK** diaphragm seal made according to ANSI B16.5 type RF, material of the flange, rebate and diaphragm (316L).

Circuit of flange	<b>APLISENS ANSI 3" 150LB 1.4404</b>	-----
Flange area	<b>ANSI B16.5 RF FLSF/DI:AISI316L ZS-xxx-xx KKPxxxxxx</b>	<b>APLISENS ANSI B16.5 3" 150# RF FLSF/DI:AISI316L ZS-xxx-xx KKPxxxxxx</b>

An example of marking **S-Ch, S-ChK** made according to EN1092-1 type B.  
Flange material (1.4404), wetted part material (Hastelloy), diaphragm material (Hastelloy), .  
These diaphragm seals usually differ slightly from the norm in terms of rebate height.

Circuit of flange	<b>APLISENS DN100 PN40 1.4404</b>	-----
Flange area	<b>DI/SF:2.4819 ZS-xxx-xx KKPxxxxxx</b>	<b>DN100 PN40 B FL:1.4404 DI/SF:2.4819 ZS-xxx-xx KKPxxxxxx</b>

An example of marking **S-Ch, S-ChK** diaphragm seals made according to ANSI B16.5.  
Flange material (1.4404), material of the wetted part of the rebate and diaphragm (1.4404), coating on the diaphragm and rebate (PTFE).  
These diaphragm seals usually differ slightly from the norm in terms of rebate height.  
These diaphragm seals do not meet Ex requirements.

Circuit of flange	<b>APLISENS ANSI 3" 150LB 1.4404</b>	-----
Flange area	<b>WARNING Potential electrostatic charging hazard</b>	
	<b>(DI/SF)-LI:AISI316L-PTFE ZS-xxx-xx KKPxxxxxx</b>	<b>2" 150# RF FL:AISI316L (DI/SF)-LI:AISI316L-PTFE ZS-xxx-xx KKPxxxxxx</b>

An example of marking **S-P DN25 (Ø48)** diaphragm seals made according to EN1092-1 type D.  
Flange material (1.4404), material of the wetted part of the rebate and diaphragm (1.4404).  
These diaphragm seals usually differ slightly from the norm in terms of rebate height.

Circuit of flange	-----
Flange area	<b>DN25 PN10/40 D FL/DI/SF:1.4404 ZS-xxx-xx KKPxxxxxx</b>

### 5.3. Examples of marking S-T, S-TK, S-TK-P diaphragm seals

**S-T, S-TK, S-TK-P** diaphragm seals have the LOGO and STANDARD NO.

If all wetted parts are made of the same material, we use the abbreviated designation, e.g. ALL:EN1.4404.

An example of marking standard for **S-T, S-TK** diaphragm seals

<b>DN50 PN40 B1</b> <b>ALL:EN1.4404</b> ZS-xxx-xx/xx KKPxxxxxx	<b>2"150# RF</b> <b>ALL:AISI316L</b> ZS-xxx-xx/xx KKPxxxxxx
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### 5.4. Examples of marking S-Comp, S-CompK, S-Comp10MPa diaphragm seals

Example of marking **S-Comp, S-CompK** diaphragm seals. with all wetted parts made of steel (1.4404).

<b>ALL:EN1.4404</b> ZS-xxx-xx KKPxxxxxx	S-Comp, S-CompK, S-Comp10MPa,
---	----------------------------------

Example of **S-Comp51** diaphragm seals designation with mounting pipe for welding and all wetted parts made of steel (1.4404).

<b>FT/DI/BA/WP:EN1.4404</b> ZS-xxx-xx KKPxxxxxx	Comp 51
---	---------

An example of marking the **S-CompCh** diaphragm seals with a threaded stub and a diaphragm bed made of steel (1.4404), with a diaphragm made of tantalum and a wetted surface lined with PTFE.

<b>DI:TANTALUM</b> <b>BA/WP:EN1.4404</b> <b>(SF)/LI:PTFE</b> ZS-xxx-xx KKPxxxxxx
--

### 5.5. Examples of marking diaphragm seals with hygienic connectors np. S-DIN, S-Clamp, S-Poziom oraz S-Mazut, S-MazutK, S-RC..., S-CG..., S-Comp25MPa, S-Comp60MPa

Due to the limited space on the surface of the diaphragm seals, a simplified notation is usually used in the form of the ZS unit number and the KKP number, which are placed on the diaphragm seals connection or on its other parts when the connection is not present.

ZS-xxx-xx KKPxxxxxx
------------------------

## 6. TECHNICAL DATA

### 6.1. Materials

Contact face	1.4404 (316L) or PTFE, nickel, titanium, tantalum, hastelloy, monel
Seal diaphragm	1.4404/1.4435 (316L) PTFE coated or nickel, titanium, tantalum, hastelloy, monel
Filling liquid seal interior	Silicone oil, cooking oil, Fluorolube liquid

Other technical data on seals are given in section → [10. SPECIFIC DATA ABOUT DIAPHRAGM SEALS](#).

## 7. Characteristic features of diaphragm seals

Pressure and differential pressure transmitters and pressure gauges with diaphragm seals are designed for pressure, level and differential pressure measurement in difficult measurement conditions, where special process connections are necessary (food, chemical industry).

The pressure transmitter (or gauge) is fitted with one, and the differential pressure transmitter with one or two APLISENS diaphragm seals.

The diaphragm seal separates the transmitter from the medium and the pressure is transmitted through the diaphragm by means of the manometric liquid filling the space between the diaphragm and the sensing module. As a result of separation, the impact of unfavourable parameters characterizing the medium and working conditions on the measurement is reduced, such as:

- high or low temperature;
- high viscosity, deposit and impurity content;
- corrosive action of the medium;
- vibrations and installation vibrations (remote separation).

### 7.1. Recommendations on the selection of diaphragm seals

In terms of purpose, the offered diaphragm seals can be divided into several groups, each of which in turn contains several designs. The most important of these groups are:

- a. Flanged seals with flush diaphragm;
- b. Flanged seals with extended diaphragm for measuring crystallising media in multi-walled tanks;
- c. Sanitary diaphragm seals - with designs suitable for measurement under aseptic conditions. In special versions, a liquid approved for contact with food may be used. Attested by PZH (National Institute of Hygiene)
- d. Oxygen seals - the chemically passive liquid is used as the gauge liquid;
- e. Diaphragm seals for hot, high-viscosity media (e.g. mazut);
- f. Chemical flanged seals;
- g. Special seals - of non-standard construction.

Most of the diaphragm seals from the above groups can be made in two versions, as direct diaphragm seals mounted in one block with the transmitter or remote diaphragm seals connected to the transmitter via a capillary, used, for example, to separate the medium from the influence of vibrations and high temperature.

Pressure and differential pressure transmitters with a diaphragm seal can operate in explosive atmospheres - according to the user's manual of the selected product for Ex design.

### 7.1.1. Permissible working pressure PS

Flanged diaphragm seals are marked with material specification and pressure range. Depending on the designation, the range of permissible pressures, at a given temperature, specified in the standard for the appropriate flange applies.

All other diaphragm seals are subject to the pressure/temperature ranges given in the data sheet.

The allowable pressure of the measuring set is determined by the component with the lowest pressure.

ASME B16.5 standard for 316L material							
CLASS	150	300	400	600	900	1500	2500
Pressure PS [bar] in temp. -20 ÷ +38°C	15,9	41,4	55,2	82,7	124,1	206,8	344,7

PN-EN 1092-1 standard for material 1.4401												
PN	2,5	6	10	16	25	40	63	100	160	250	320	400
Pressure PS [bar] in temp. -10 ÷ +50°C	2,5	6	10	16	25	40	63	100	160	250	320	400

Standard JIS B 2220 for material 316L					
Designation	5K	10K	16K	20K	30K
Pressure PS [bar] in temp. ≤ +120°C	7	14	27	34	35

## 8. INSTALLATION

Protect the separating diaphragms (especially at low measuring ranges) from the dynamic effects of the medium, e.g. when pouring liquid into the tank.

When washing, do not direct a strong stream of cleaning agent onto the diaphragm.

Do not allow the medium to freeze, crystallize or harden deposits to occur in the place where the diaphragm seal is installed.

The main metrological problem with the use of diaphragm seals is the absolute “zero” temperature error, resulting from the influence of thermal expansion of the manometric fluid, which must be compensated for by the susceptibility of the separating diaphragm.

To minimise this impact, it is beneficial to:

- use the shortest possible capillaries, which will reduce the volume of the liquid in the system;
- locate the capillaries so as to minimise changes and differences in their temperature;
- use larger DN to increase the active surface of the diaphragms and therefore maximise their susceptibility.

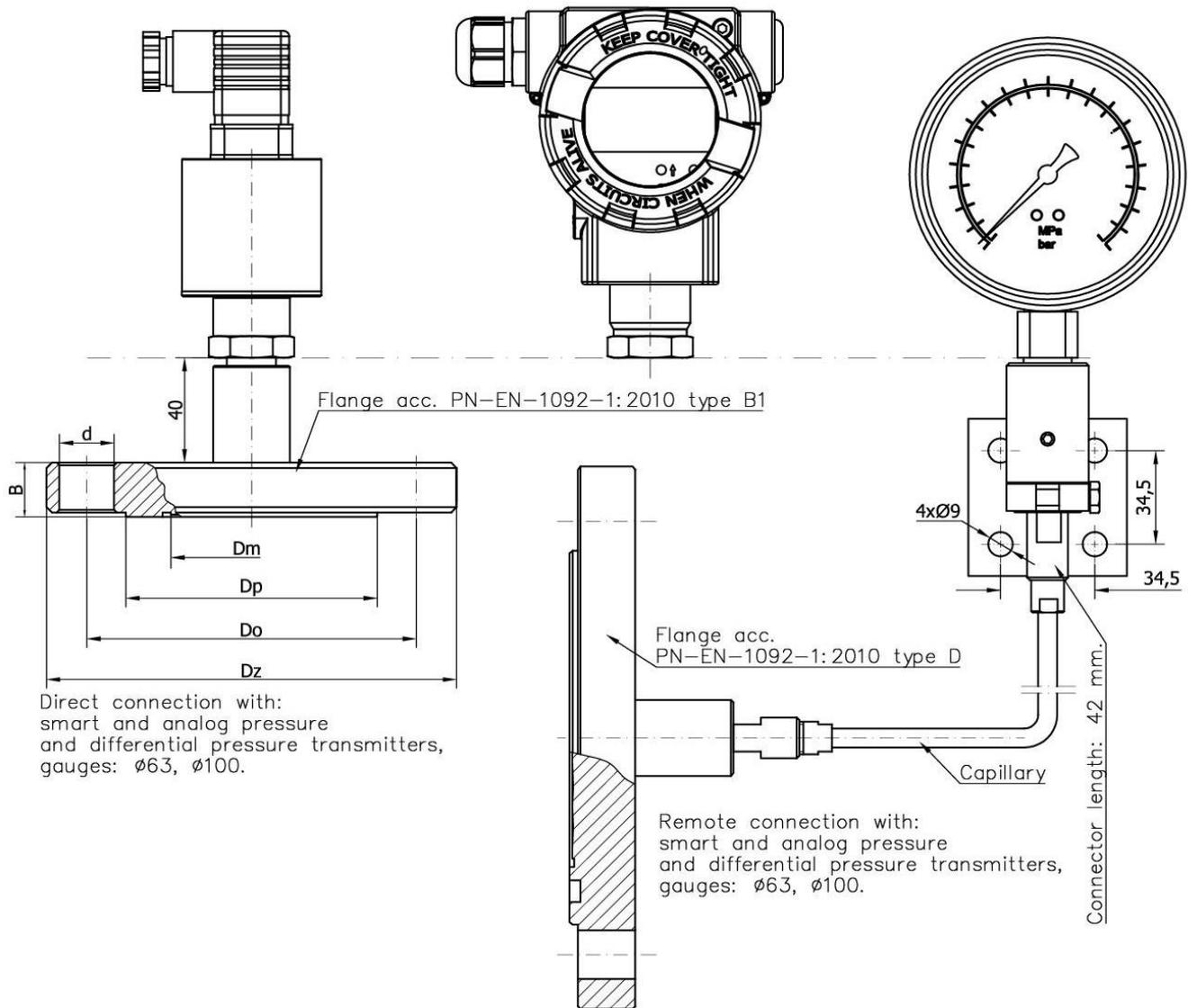
Other data regarding the installation of transmitters with diaphragm seals are provided in the User's Manual of the selected product, and data sheets concerning diaphragm seals and in → [10. SPECIFIC DATA ABOUT DIAPHRAGM SEALS](#).

## 9. LIST OF DIAPHRAGM SEALS BY APLISENS

Diaphragm types	Identification, name of the diaphragm seals
<b>Direct diaphragm seals</b>	
S-P	Flanged seals with flush diaphragm acc EN1092-1, ANSI ASME B16.5 or JIS B2220.
S-P – DN25(Ø48)	Flanged seals with flush diaphragm.
S-T	Flanged seals with extended diaphragm S-T acc EN1092-1 or ANSI ASME B16.5.
S-Comp M20×1,5	Threaded seals with large diaphragm S-Comp M20x1,5.
S-Comp ø51	Threaded seals with large diaphragm S-Comp ø51.
S-CompCh	Threaded chemical seals with P or GP connection.
S-Ch teflon	Chemical flanged seals with flush diaphragm S-Ch - teflon.
S-Ch nikiel	Chemical flanged seals with flush diaphragm S-Ch – nickel.
S-Ch tytan	Chemical flanged seals with flush diaphragm S-Ch – titanium.
S-Ch tantal	Chemical flanged seals with flush diaphragm S-Ch - tantalum.
S-Ch monel	Chemical flanged seals with flush diaphragm S-Ch – monel.
S-Ch hastelloy	Chemical flanged seals with flush diaphragm S-Ch – Hastelloy.
S-Ch hastelloy(Ø48)	Chemical flanged seals with flush diaphragm S-Ch - teflon.
S-Mazut	Threaded seals with large diaphragm S-Mazut.
S-RCM30x(2 lub 1,5)	Threaded seals with flush diaphragm and radiator S-RC.
S-RCG1”	Threaded seals with flush diaphragm CG1”.
S-Clamp...	Sanitary diaphragm seals Tri-Clamp ISO 2852.
S-DIN...	Sanitary diaphragm seals DIN 11851.
S-SMS...	Sanitary diaphragm seals SMS.
S-DRD 65	Sanitary diaphragm seals DRD.
S-Varivent...	Sanitary diaphragm seals Varivent.
S-Poziom...	Sanitary diaphragm seals Poziom.
S-XXX	Direct, special diaphragm seals.
<b>Remote diaphragm seals (with capillary)</b>	
S-PK	Flanged seals with flush diaphragm acc EN1092-1, ANSI ASME B16.5 or JIS B2220.
S-PK – DN25(Ø48)	Flanged seals with flush diaphragm.
S-TK	Flanged seals with extended diaphragm S-T acc EN1092-1 or ANSI ASME B16.5.
S-TK-P	Remote diaphragm seal with built-in diaphragm flushing unit.
S-CompK M20×1,5	Threaded seals with large diaphragm S-Comp M20x1,5.
S-CompK ø51	Threaded seals with large diaphragm S-Comp ø51.
S-Comp10MPa	Compact threaded seals, maximum measuring range 10MPa.
S-Comp25MPa	Compact threaded seals, maximum measuring range 25MPa.
S-Comp60MPa	Compact threaded seals, maximum measuring range 60MPa.
S-ChK teflon	Chemical flanged seals with flush diaphragm S-Ch - teflon with capillary.
S-ChK nikiel	Chemical flanged seals with flush diaphragm S-Ch - nickel with capillary.
S-ChK tytan	Chemical flanged seals with flush diaphragm S-Ch - titanium with capillary.
S-ChK tantal	Chemical flanged seals with flush diaphragm S-Ch - tantalum with capillary.
S-ChK monel	Chemical flanged seals with flush diaphragm S-Ch - monel with capillary.
S-ChK hastelloy	Chemical flanged seals with flush diaphragm S-Ch - hastelloy with capillary.
S-ChK hastelloy(Ø48)	Chemical flanged seals with flush diaphragm S-Ch (Ø48) - hastelloy with capillary.
S-MazutK	Threaded seals with large diaphragm S-Mazut with capillary.
S-Clamp...K	Sanitary diaphragm seals Tri-Clamp ISO 2852 with capillary.
S-DIN...K	Sanitary diaphragm seals DIN 11851 with capillary.
S-SMS...K	Sanitary diaphragm seals SMS with capillary.
S-DRD 65K	Sanitary diaphragm seals DRD with capillary.
S-Varivent...K	Sanitary diaphragm seals Varivent with capillary.
S- Poziom...K	Sanitary diaphragm seals Poziom with capillary.
S-XXXX	Remote special diaphragm seals.

## 10. SPECIFIC DATA ABOUT DIAPHRAGM SEALS

### 10.1. Flanged seals with flush diaphragm S-P, S-PK



**Tabel 2.** S-P Diaphragm seals dimensions

Version	Diaphragm diameter <b>Dm</b>	Contact face diameter <b>Dp</b>	Diameter of bolt circle <b>Do</b>	External diameter <b>Dz</b>	Thickness <b>B</b>	Diameter of holes <b>d</b>	Number of holes
DN50 PN40 2" ANSI 150	59	102 92	125 120,5	165 150	22 20	18 20	4 4
DN80 PN40 3" ANSI 150	89	138 127	160 152,5	200 190	24 24	18 20	8 4
DN100 PN40 4" ANSI 150	89	162 158	190 190,5	235 230	24 24	22 20	8 8

**Table 3.** Recommended minimum measuring range (bar), depending on the type of the set pressure measuring device - diaphragm seal S-P

Pressure measuring device	Diaphragm seal type	Diaphragm seal version		
		DN50 / 2"	DN80 / 3"	DN100 / 4"
Smart transmitters*	direct	0,1	0,025	0,025
	remote (2m)	1	0,25	0,25
PCE-28	direct	0,1	0,1	0,1
	remote (2m)	1	0,25	0,25
Gauge Ø63, Ø100	direct	1	1	1
	remote (2m)	2,5	1	1

\* The ranges given in the table for the smart transmitters should be taken as set ranges.

**Table 4.** Zero error from ambient temperature change for the set pressure measuring device - diaphragm seal S-P

Diaphragm seal type	Absolute zero error per 10°C for the diaphragm seal		
	DN50 / 2"	DN80 / 3"	DN100 / 4"
Direct	0,5 mbar	0,4 mbar	0,4 mbar
Remote (2m)	3 mbar	1 mbar	1 mbar

An additional zero error, resulting from temperature fluctuations in a medium, depends on the temperature gradient in the oil-based diaphragm sealing system. The error value is, in any case, significantly smaller than the error value shown in the table.

**Table 5.** Temperature range of measured medium for S-P

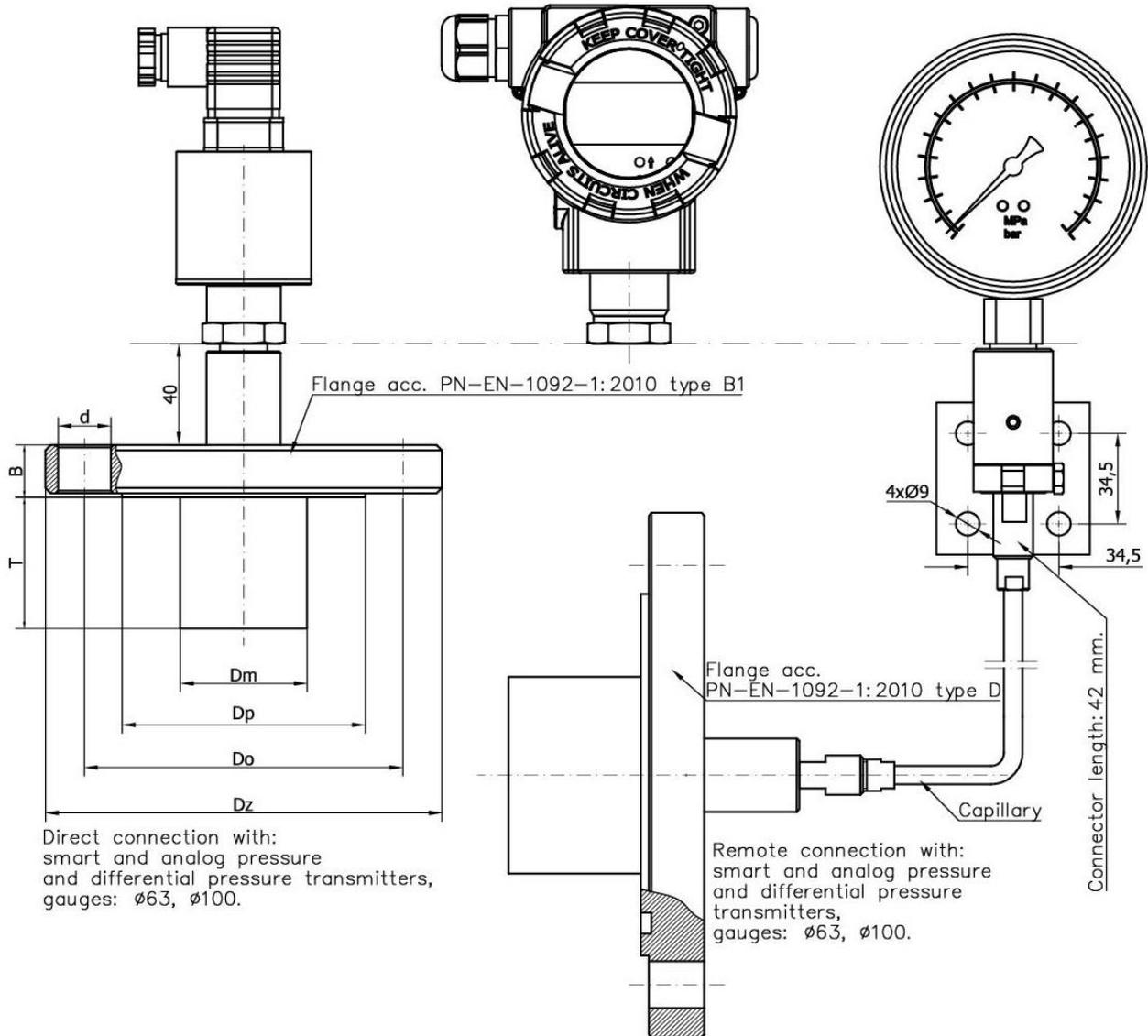
Direct diaphragm seal		-30° ... 150°C
Remote diaphragm seal		
Manometric liquid	Underpressure measurements	Overpressure measurements
high temperature (DC)	max.200°C – p > 0,05 bar ABS	-10° ... 315°C
very high temperature (DH)	max.250°C – p > 0,1 bar ABS	+15° ... 380°C
low temperature (AK)	not recommended for measurement of pressures < 0,2 bar ABS	-60° ... 200°C
 When operating with an ambient temperature of < 0°C, heating of capillaries filled with DC fluid is recommended.		

**Material of diaphragm and flange:** (316Lss)

**Special versions:**

- Other diaphragm seals according to DIN or ANSI standard.
- DN50 diaphragm seal according to PN-EN-1092-1 type B1 (with "flat" rebate).
- Filling with cooking oil (medium temperature -10° ... 150°C).
- Direct separation of medium above 150°C.
- **RD** – radial capillary exit in remote diaphragm seals.
- **AU** – gold-plated diaphragm.
- **321** – diaphragm and diaphragm flange material – 321 steel.
- Other - after consultation with an APLISENS consultant.

### 10.2. Flanged seals with extended diaphragm S-T, S-TK



**Table 6.** S-T Diaphragm seal dimensions

Version	Diaphragm diameter <b>Dm</b>	Contact face diameter <b>Dp</b>	Diameter of bolt circle <b>Do</b>	External diameter <b>Dz</b>	Thickness <b>B</b>	Diameter of holes <b>d</b>	Number of holes	Tube length <b>T</b>
DN50 PN40	48	102	125	165	22	18	4	50,100, 150, 200
2" ANSI 150	48	92	120,5	150	20	20	4	
DN80 PN40	75	138	160	200	24	18	8	50,100, 150
3" ANSI 150	75	127	152,5	190	24	20	4	
DN100 PN40	89	162	190	235	24	22	8	50,100, 150
4" ANSI 150	89	158	190,5	230	24	20	8	

The flanged diaphragm seal with extended diaphragm is typically applied to measure the pressure or level of the media in a multi-walled tank, where the separating diaphragm should be placed close to the inner wall of the tank.

**Table 7.** Recommended minimum measuring range (bar), depending on the type of the set pressure measuring device - diaphragm seal S-T

Pressure measuring device	Diaphragm seal type	Diaphragm seal version		
		DN50 / 2"	DN80 / 3"	DN100 / 4"
Smart transmitters*	Direct	0,1	0,1	0,1
	Remote (2m)	6	0,5	0,25
PCE-28	Direct	0,1	0,1	0,1
	Remote (2m)	2	0,5	0,25
Gauge Ø63	Direct	2,5	1	1
	Remote (2m)	6	2,5	1
Gauge Ø100	Direct	6	1	1
	Remote (2m)	6	2,5	1

\* The ranges given in the table for the smart transmitters should be taken as set ranges.

**Table 8.** Zero error from ambient temperature change for the set pressure measuring device - diaphragm seal S-T with a 100 mm of tube

Diaphragm seal type	Absolute zero error per 10°C for the diaphragm seal		
	DN50	DN80	DN100
Direct	2 mbar	0,6 mbar	0,4 mbar
Remote (2m)	10 mbar	2 mbar	1 mbar

An additional zero error, resulting from temperature fluctuations in a medium, depends on the temperature gradient in the oil-based diaphragm sealing system and is, in any case, significantly smaller than the error value shown in the table.

**Table 9.** Temperature range of measured medium for diaphragm seal S-T

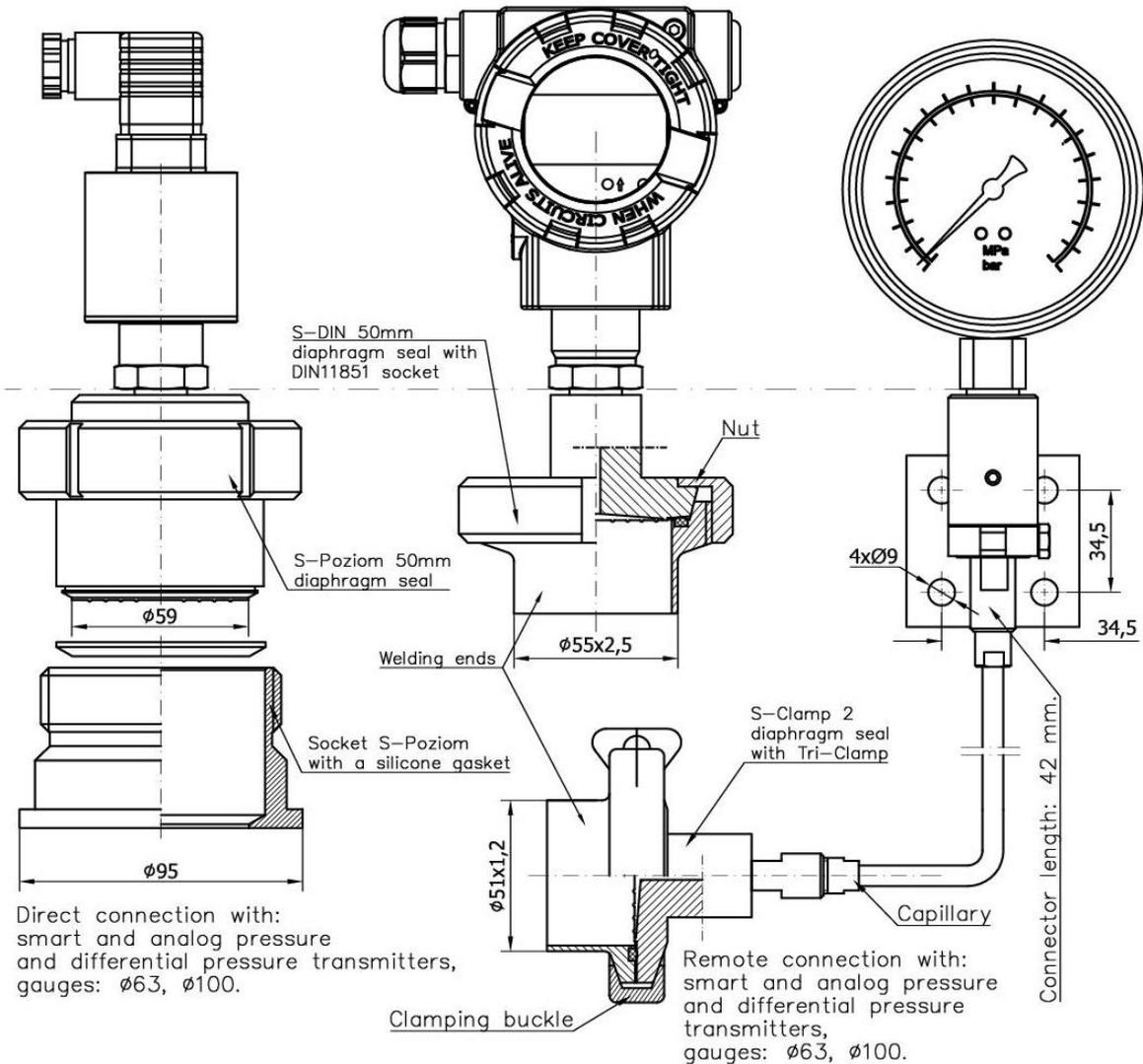
Direct diaphragm seal		-30° ... 150°C
Remote diaphragm seal		
Manometric liquid	Under pressure measurements	Overpressure measurements
high temperature (DC)	max.200°C - p > 0,05 bar ABS	-10° ... 315°C
very high temperature (DH)	max.250°C - p > 0,1 bar ABS	+15° ... 380°C
low temperature (AK)	Not recommended for measurement of pressures < 0,2 bar ABS	-60° ... 200°C
 When operating with an ambient temperature of < 0°C, heating of capillaries filled with DC fluid is recommended.		

**Material of diaphragm and flange:** 316Lss

**Special versions:**

- Other diaphragm seals according to DIN or ANSI standard.
- DN50 diaphragm seal according to PN-EN-1092-1 type B1 (with "flat" rebate).
- Direct separation of medium above 150°C.
- S-TK-D100/T=100 mm with additional diaphragm cleaning system (S-TK-P).
- **RD** – radial capillary exit in remote diaphragm seals.
- **Other** - after consultation with an APLISENS consultant.

### 10.3. Sanitary diaphragm seals



The both **S-DIN** and **S-Clamp** types of sanitary diaphragm seals can be used under aseptic conditions. They are typically applied to measure the pressure of media in the food and pharmaceutical industries. Aseptic **S-Poziom** diaphragm seal is typically mounted in the bottom parts of tanks. The construction has a diaphragm placed forward and so it does not make a hollow in the surface of the tank bottom part, which eliminates the settling of either the material or washing agent in a connection of the pressure device.

#### Maximum measuring range: 25bar

**Table 10.** Recommended minimum measuring range (bar), depending on the type of the set pressure measuring device - diaphragm seal S-DIN, S-Clamp, S-Poziom

Diaphragm seal type	Smart transmitters*, PCE-28	Gauge $\phi 63$	Gauge $\phi 100$
Direct	0,1	1	1
Remote (2m)	0,5	2,5	2,5

\* The ranges given in the table for smart transmitters should be taken as set ranges.



For measuring ranges lower than those listed in the table, we recommend special models of diaphragm seal, i.e.: Clamp 3" and DIN 80mm

**Table 11.** Zero error from ambient temperature change for the set pressure measuring device - diaphragm seal S-DIN, S-Clamp, S-Poziom

Diaphragm seal type	Absolute zero error	
	S-Clamp and S-DIN	S-Poziom
Direct	0,8 mbar / 10°C	0,3 mbar / 10°C
Remote (2m)	5 mbar / 10°C	3 mbar / 10°C

For a set: pressure transmitter - special diaphragm seal (larger diaphragm diameter) the quantity of thermal errors decreases proportionally to the cubed value of the active diameter of the separating diaphragm (i.e. to the diameter value raised to the third power).

An additional zero error, resulting from temperature fluctuations in a medium, depends on the temperature gradient in the oil-based diaphragm sealing system is, in any case, significantly smaller than the error value shown in the table.

**Medium temperature range:**

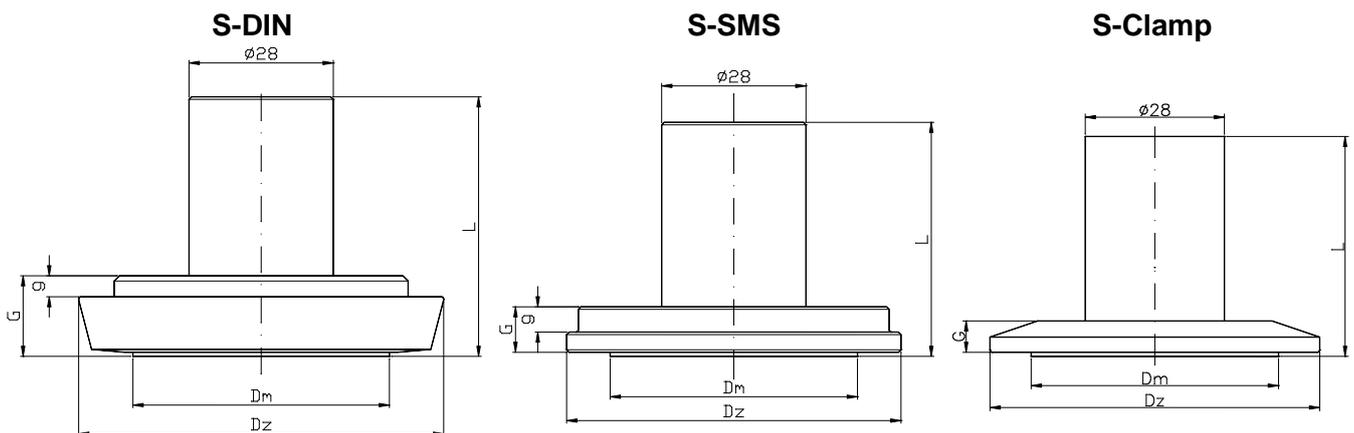
- 30° ... 200°C for remote diaphragm seal
- 20° ... 150°C for direct diaphragm seal
- 30° ... 85°C for measuring ranges to -1 bar

**Material of diaphragm and seal:** 00H17N14M2 (316Lss)

**Special versions:**

- Filling with NEOBEE M-20 liquid - approved for contact with food (medium temperature -10° ... 150°C).
- Diaphragm seals of other dimensions, e.g. DIN 25mm, DIN 40mm or Tri Clamp 1", Tri-Clamp 1.5", SMS 50mm, DRD, Varivent, Homogenizator.
- Version of diaphragm seal for the connector indicated by the customer.
- Direct separation of the medium above 150°C.
- **3.1** - material certificate 3.3 according to PN-EN 10204 (wetted parts).
- **CHR** - roughness certificate.
- **Other** - after consultation with an Aplisens consultant.

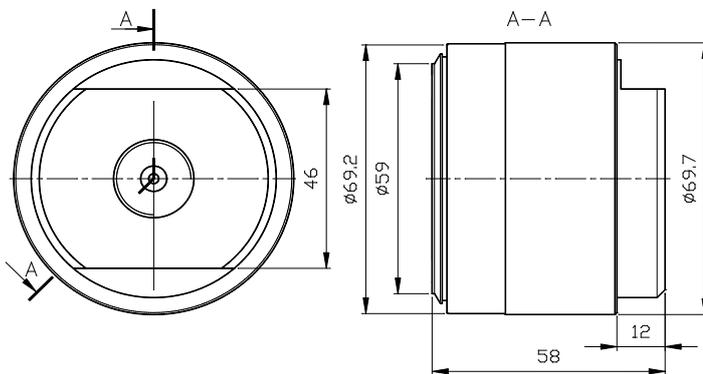
**Basic dimensions of diaphragm seals with standard food connectors**



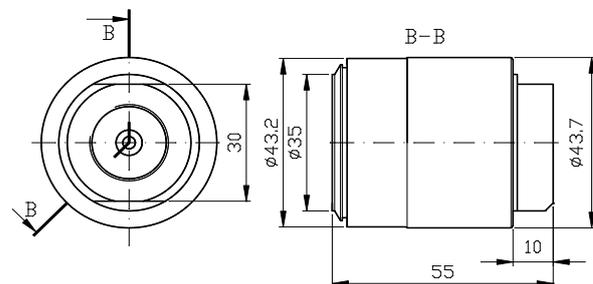
Diaphragm seal	Dz [mm]	Dm [mm]	G [mm]	g [mm]	L [mm]
S-DIN 25	44	25	15,8	5	52,3
S-DIN 32	50	30	15,8	5	52,3
S-DIN 40	56	35	14,8	4	51,3
S-DIN 50	68,5	48	15,8	4	51,3
S-DIN 65	86	59	16,8	4	52,3
S-DIN 80	100	75	16,8	4	52,3
S-SMS 1"	35,5	25	6,2	2	42,7
S-SMS 1,5"	54,9	35	10	4	46,5
S-SMS 2"	64,9	48	10	5	46,5

Diaphragm seal	Dz [mm]	Dm [mm]	G [mm]	L [mm]
S-Clamp 1"	50,5	25	7	43,5
S-Clamp 1,5"	50,5	35	7	43,5
S-Clamp 2"	64	48	7	43,5
S-Clamp 2,5"	77,5	54	7	43,5
S-Clamp 3"	91	70	7,8	44,3
S-Clamp 4"	119	89	9,8	45,8
S-Clamp DN 25	50,5	25	7	43,5
S-Clamp DN 40	50,5	35	7	43,5
S-Clamp DN 50	64	48	7	43,5
S-Clamp DN 65	91	70	7,8	44,3
S-Clamp DN 100	119	89	9,8	45,8

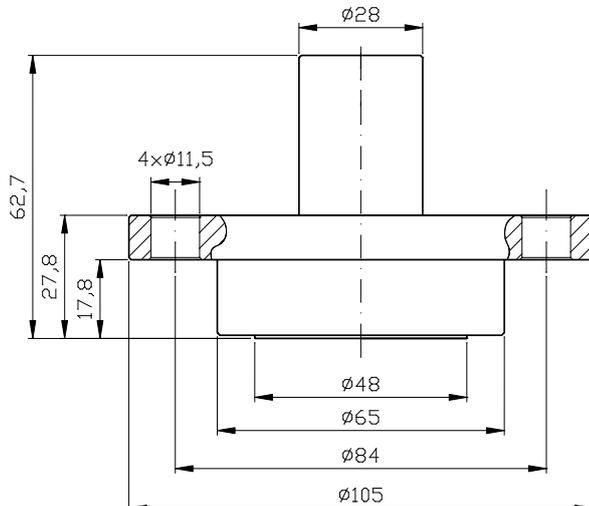
**S-POZIOM 50**



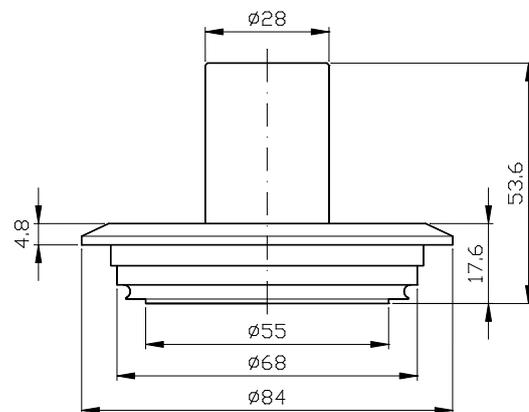
**S-POZIOM 25**



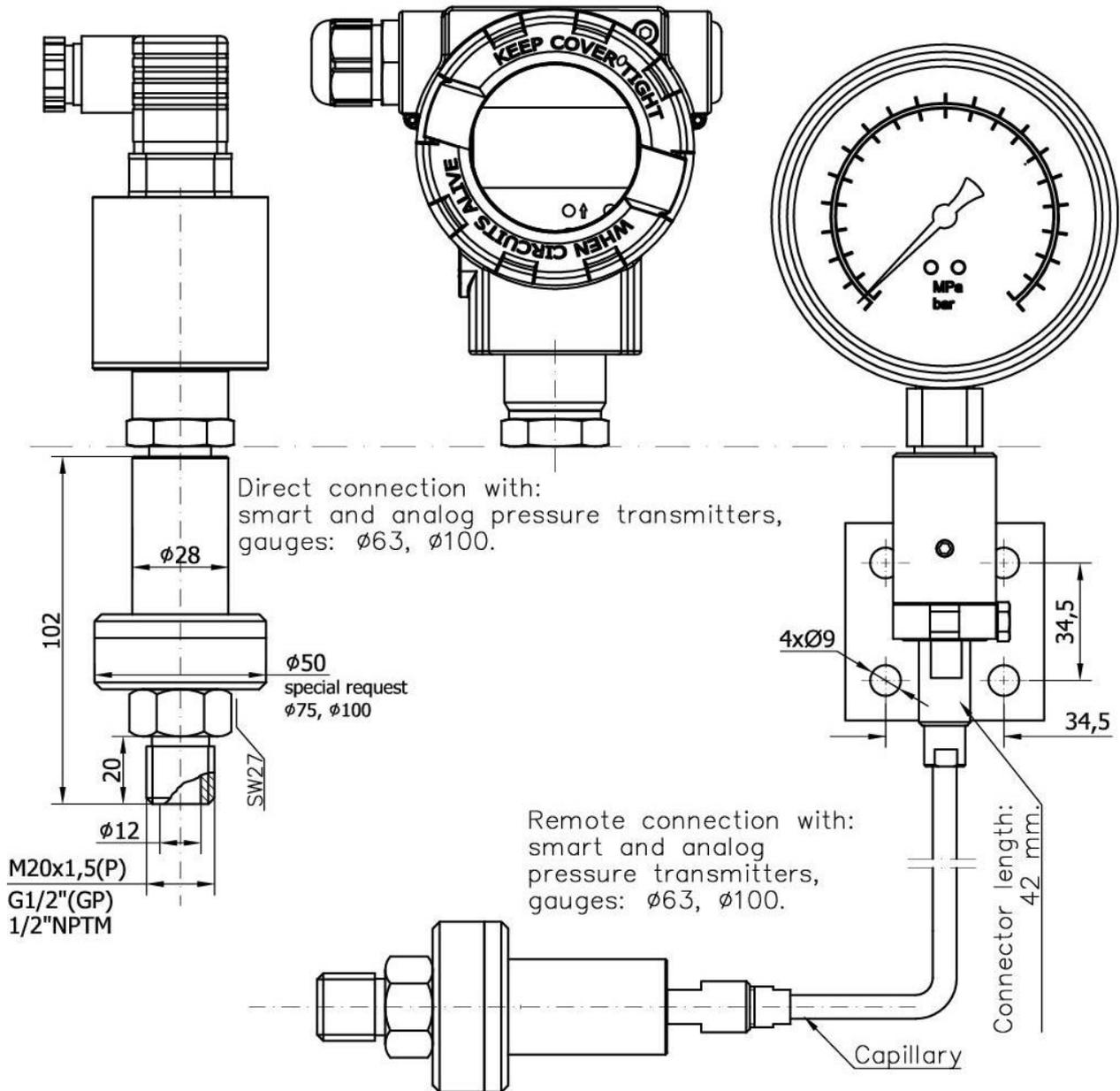
**S-DRD 65**



**S-Varivent DN50**



10.4. Threaded seals with large diaphragm S-Mazut, S-MazutK



The S-Mazut diaphragm seal is applicable to measurement of viscous liquids, at temperatures up to 150°C (315°C when remote diaphragm seal is used). A typical application is to measure the pressure of heavy fuel oil (petroleum atmospheric residue) in burners and in heat centers of power boilers.

**Maximum measuring range:** 0 ... 70 bar

**Table 12.** Recommended minimum measuring range (bar), depending on the type of the set pressure measuring device - diaphragm seal

Diaphragm seal type	Pressure transmitter			Gauge $\phi 100$ and diaphragm seal		
	S-Mazut	S-Mazut75	S-Mazut100	S-Mazut	S-Mazut75	S-Mazut100
Direct	2,5 bar	0,1 bar	0,05 bar	2,5 bar	1 bar	1 bar
Remote	6 bar	0,4 bar	0,25 bar	6 bar	2,5 bar	1 bar

**Table 13.** Zero error from ambient temperature change for the set: pressure measuring device – standard diaphragm seal S-Mazut

Diaphragm seal type	S-Mazut	S-Mazuty75	S-Mazut100
Direct	4 mbar / 10°C	2 mbar / 10°C	0,8 mbar / 10°C
Remote (capillary 2m).	5 mbar / 10°C	3 mbar / 10°C	01 mbar / 10°C

For a set: pressure transmitter - special diaphragm seal (special diaphragm seal means the larger diaphragm diameter), there is the following relation: the quantity of thermal errors decreases proportionally to the cubed value of the active diameter of the separating diaphragm (i.e. to the diameter value raised to the third power).

An additional zero error, resulting from temperature fluctuations in a medium, depends on the temperature gradient in the oil-based diaphragm sealing system.

The error value is, in any case, significantly smaller than the error value shown in the table.

**Overpressure limit:**

S -Mazut	110 bar
S -Mazut75	50 bar
S -Mazut100	40 bar

**Medium temperature range:**

-10° ... 315°C for remote seals

-10° ... 150°C for direct seals

**Material of diaphragm and seal:** 316Lss

**Special versions:**

- For low ranges:  
S-Mazut75,  
S-Mazut100.
- **Other** - after consultation with an Aplisens consultant.

10.5. Chemical flanged seals with flush diaphragm type S-Ch, S-ChK

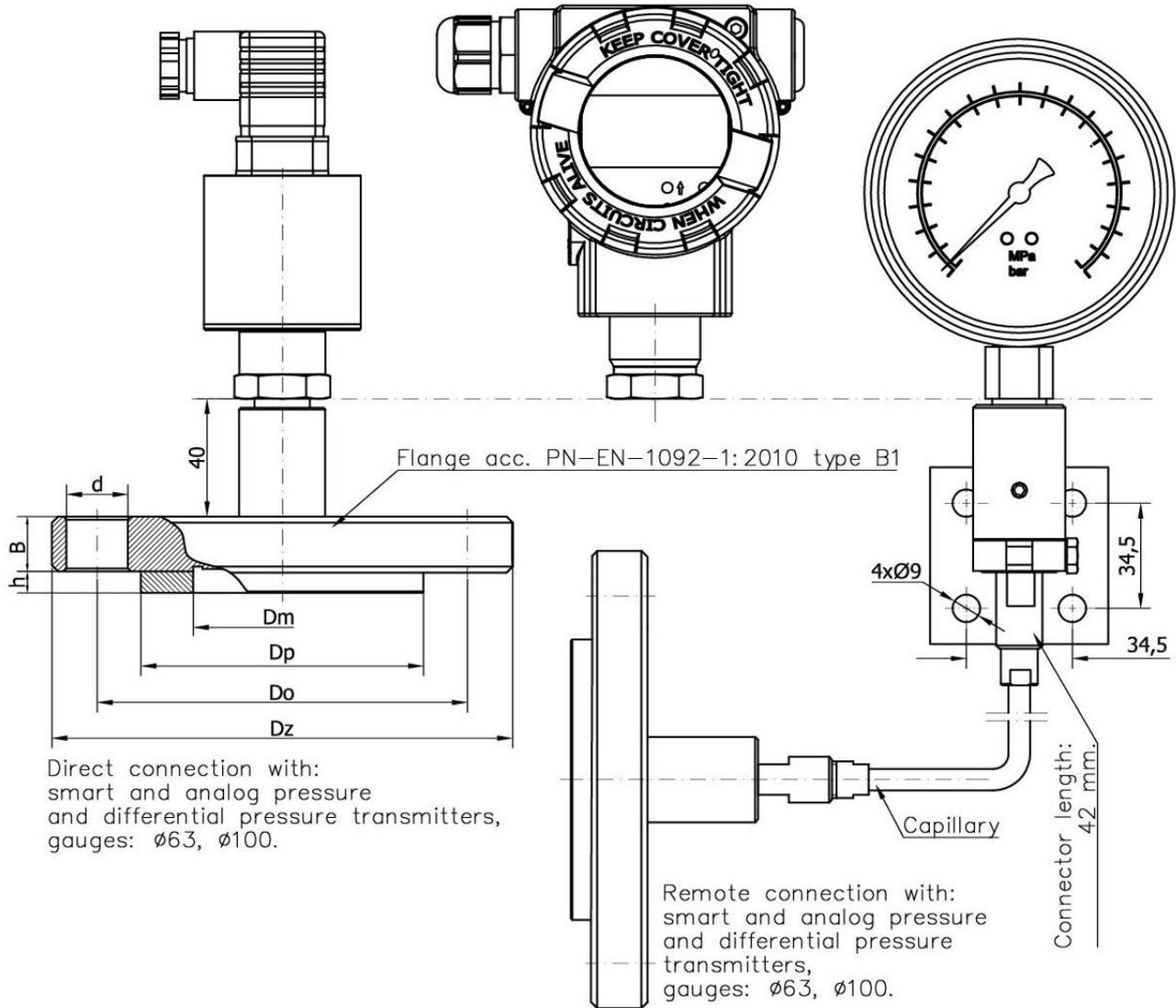


Table 14. Diaphragm seal dimensions acc. to DIN EN1092-1 except those marked \*

Material of wetted parts	Version	Diaphragm diameter <b>Dm</b>	Contact face dia. <b>Dp</b>	Dia. of bolt circle <b>Do</b>	External diameter <b>Dz</b>	Thickness <b>B</b>	Thickness <b>h</b>	Diameter of holes <b>d</b>	Number of holes
Hastelloy, Nickel, Monel	DN50 PN10/40	59	98*	125	165	18	7*	18	4
	DN80 PN25/40	89	132*	160	200	22	7*	18	8
Titanium	DN50 PN10/40	59	98*	125	165	24	6	18	4
	DN80 PN25/40	89	138	160	200	22	6	18	8
Tantalum	DN50 PN10/40	59	102	125	165	18	3	18	4
	DN80 PN25/40	89	138	160	200	22	3	18	8
Tantalum- PTFE	DN50 PN16	59	102	125	165	18	8	18	4
	DN80 PN10/16	89	138	160	200	22	8	18	8
PTFE	DN25 PN10/16	35	68	85	115	18	2	14	4
	DN50 PN10/40	59	102	125	165	18	7*	18	4
	DN80 PN25/40	89	138	160	200	22	7*	18	8

**Table 15.** Diaphragm seal dimensions acc. to ANSI ASME B16,5 except those marked \*

Material of wetted parts	Version	Diaphragm dia. <b>Dm</b>	Contact face dia <b>Dp</b>	Dia. of bolt circle <b>Do</b>	External diameter <b>Dz</b>	Thickness <b>B</b>	Thickness <b>h</b>	Diameter of holes <b>d</b>	Number of holes
Hastelloy, Nickel, 33Monel	2" ANSI 150	59	92	120,5	150	18	7*	20	4
	3" ANSI 150	89	123*	152,5	190	22	7*	20	4
Titanium	2" ANSI 150	59	92	120,5	150	18	2	20	4
	3" ANSI 150	89	127*	152,5	190	22	2	20	4
Tantalum	2" ANSI 150	59	92	120,5	150	18	8	20	4
	3" ANSI 150	89	127*	152,5	190	22	8	20	4
Tantalum-PTFE	2" ANSI 150	59	92	120,5	150	18	7*	20	4
	3" ANSI 150	89	127	152,5	190	22	7*	20	4
PTFE	1" ANSI 150	35	53	79,5	110	16	2	16	4
	2" ANSI 150	59	92	120,5	150	18	7*	20	4
	3" ANSI 150	89	127	152,5	190	22	7*	20	4

**Table 16.** Recommended minimum measuring range (bar), depending on the type of the set pressure measuring device - diaphragm seal S-Ch

Pressure measuring device	Diaphragm seal type	Diaphragm seal version		
		DN25 / 1"ANSI	DN50 / 2"ANSI	DN80 / 3"ANSI
Pressure transmitter	Direct	1	0,4	0,1
	Remote	----	1	0,4
Gauge Ø100	Direct	6	1	1
	Remote	---	2,5	2,5

The material of both diaphragms and contact faces for the chemical-resistant diaphragm seals is corrosion-resistant, considering the chemical composition of medium as well as its expected concentration range and temperature range.

**Table 17.** Available chemical-resistant materials with more important application limitations

Material of diaphragm and sealing surface	Overpressure limit	Media and conditions under which diaphragm seals should not be used
Hastelloy	40 bar	Measurement of hot, concentrated hydrochloric acid
Monel	40 bar	Acid measurements
Nickel	40 bar	Acid measurements
Tantalum	40 bar	Measurement of hydrofluoric acid, measurement of soda lye
Titanium	40 bar	Presence of dry chlorine, measurements in Ex zones
PTFE*	40 bar (10 bar for DN25 and 1")	Vacuum measurements, measurements of abrasive media, additionally limits the applicability of PTFE

\* Wetted elements of the diaphragm seal - diaphragm and faceplate, made of 316L steel, are covered with a layer of PTFE

**Table 18.** Zero error from ambient temperature change for the set pressure measuring device - diaphragm seal S-Ch

Diaphragm seal type	Absolute zero error per 10°C for the diaphragm seal		
	DN25 / 1"ANSI	DN50 / 2"ANSI	DN80 / 3"ANSI
Direct	20 mbar	5 mbar	2 mbar
Remote (capillary 2m).	---	10 mbar	4 mbar

An additional zero error, resulting from temperature fluctuations in a medium, depends on the temperature gradient in the oil based diaphragm sealing system is, in any case, significantly smaller than the error value shown in the table.

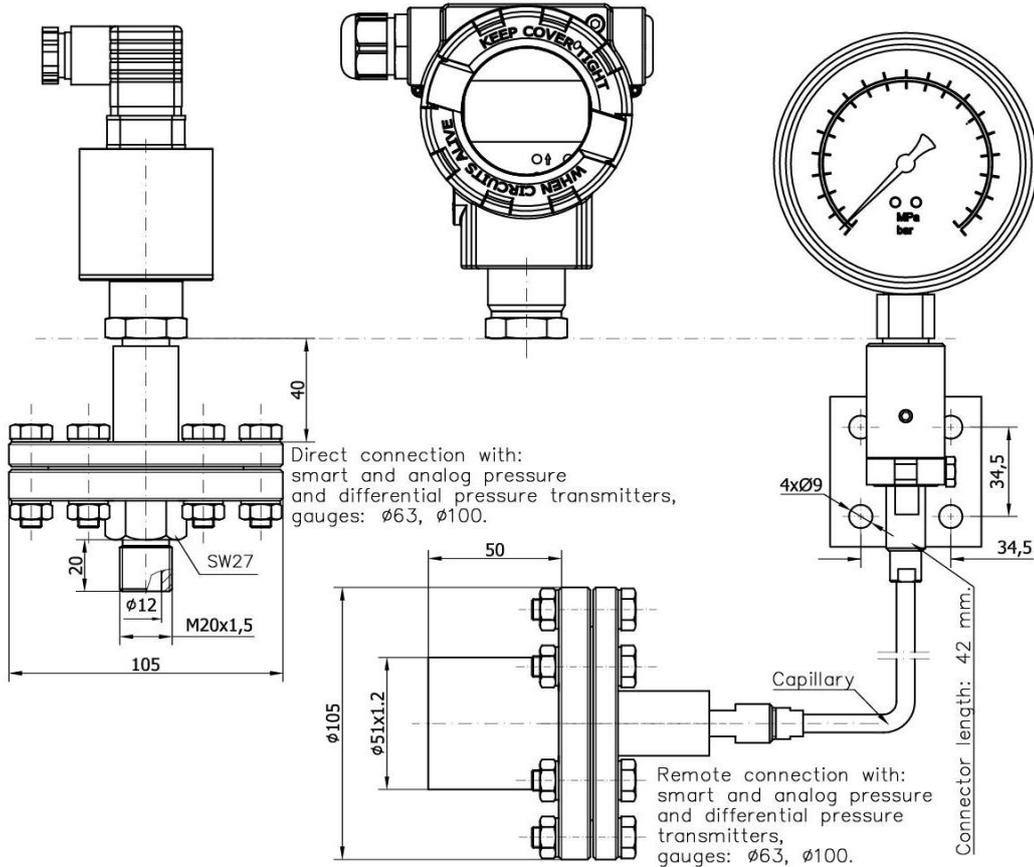
**Medium temperature range**

- -30° ... 180°C for remote diaphragm seals.
- -30° ... 150°C for direct diaphragm seals.

**Special versions:**

- Other diaphragm seals according to DIN or ANSI standard.
- Filling with FLUOROLUBE liquid.
- Direct separation of the medium above 150°C.
- Other - after consultation with an Aplisens consultant.

10.6. Threaded seals with large diaphragm type: S-Comp, S-CompK



**S-Comp** diaphragm seals have a large separating diaphragm ( $\phi 70$ ) while retaining a compact economic overall design.

Benefits of **S-Comp** diaphragm seals include:

- the ability to take measurements within a narrow range;
- simplicity of assembly.

**Maximum measuring range:** 0 ... 16 bar

**Material of diaphragm, flange and mounting part:** 00H17N14M2 (316Lss)

**Table 19.** Recommended minimum measuring range (bar), depending on the type of the set pressure measuring device - diaphragm seal

Diaphragm seal type	Transmitter APC-2000*, PCE-28	Gauge $\phi 63$	Gauge $\phi 100$
Direct	0,2	1	1
Remote	0,5	2,5	2,5

\* The ranges given in the table for the smart APC-2000 transmitter should be taken as set ranges.

**Table 20.** Zero error from ambient temperature change for the set pressure measuring device - diaphragm seal S-Comp

Diaphragm seal type	Absolute error of zero
Direct	0,6 mbar / 10°C
Remote (2m capillary)	2 mbar / 10°C

An additional zero error, resulting from temperature fluctuations in a medium, depends on the temperature gradient in the oil-based diaphragm sealing system is, in any case, significantly smaller than the error value shown in the table.

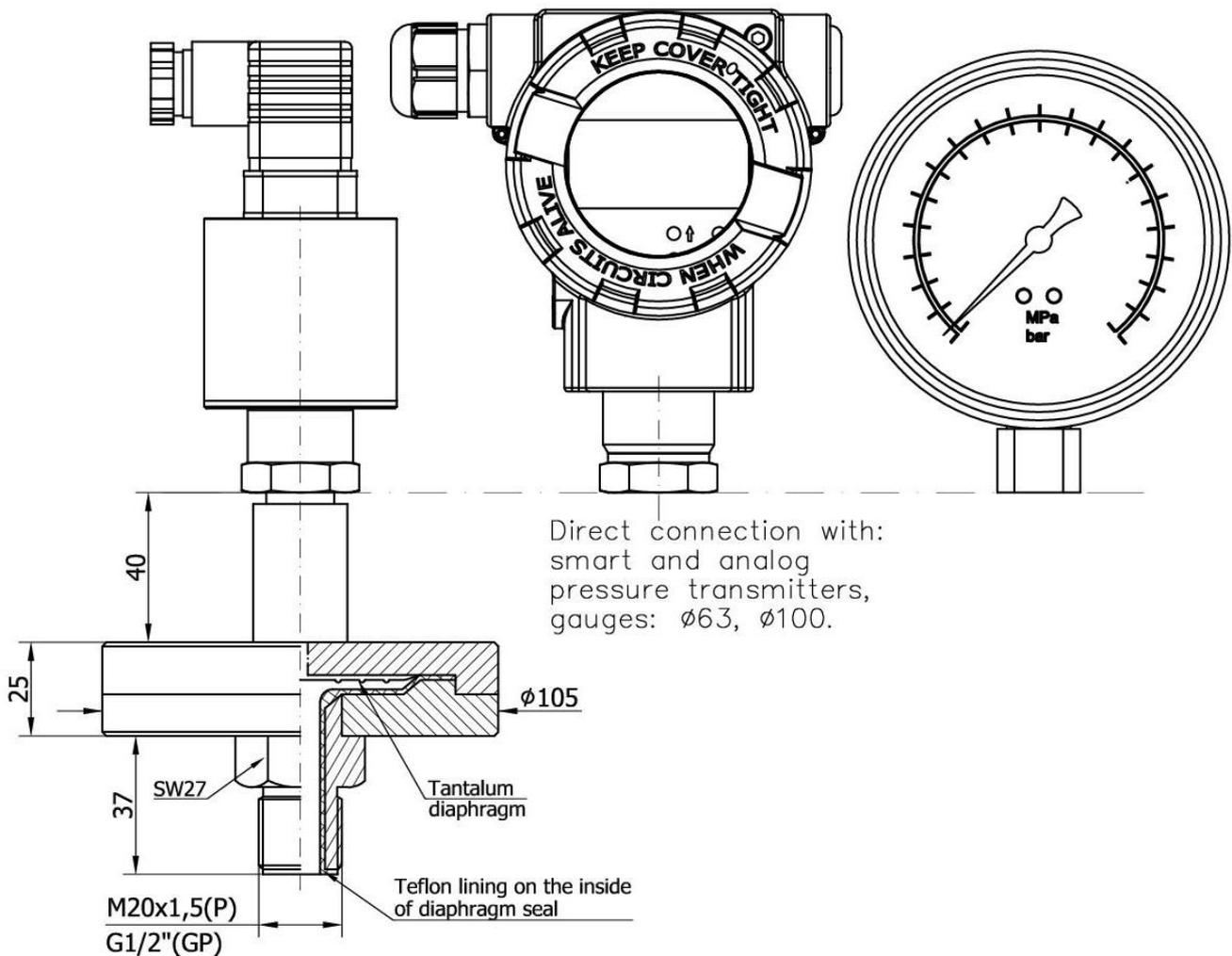
**Medium temperature range:**

- 30° ... 200°C for remote
- 30° ... 150°C for direct

**Special versions:**

- Diaphragm made of Hastelloy C 276.
- Capillary outlet at the side of the diaphragm seal.
- Direct diaphragm seal for medium temp. over 150°C
- Others.

## 10.7. Threaded chemical seals with large diaphragm S-CompCh



**S-CompCh** diaphragm seal are used for pressure measurements of chemically aggressive media. The wetted parts of the diaphragm seal are made of PTFE and tantalum. Several corrosive chemicals, except for hydrofluoric acid gaseous fluorine and soda lye, can be measured.

**Maximum measuring range:** 0 ... 16 bar

**Recommended minimum measuring range, depending on the type of the set: pressure measuring device - diaphragm seal**

0,4 bar for pressure transmitter;  
6 bar for gauge  $\varnothing 100$

An additional zero error, resulting from temperature fluctuations in a medium, depends on the temperature gradient in the oil-based diaphragm sealing system is, in any case, significantly smaller than the error value shown above.

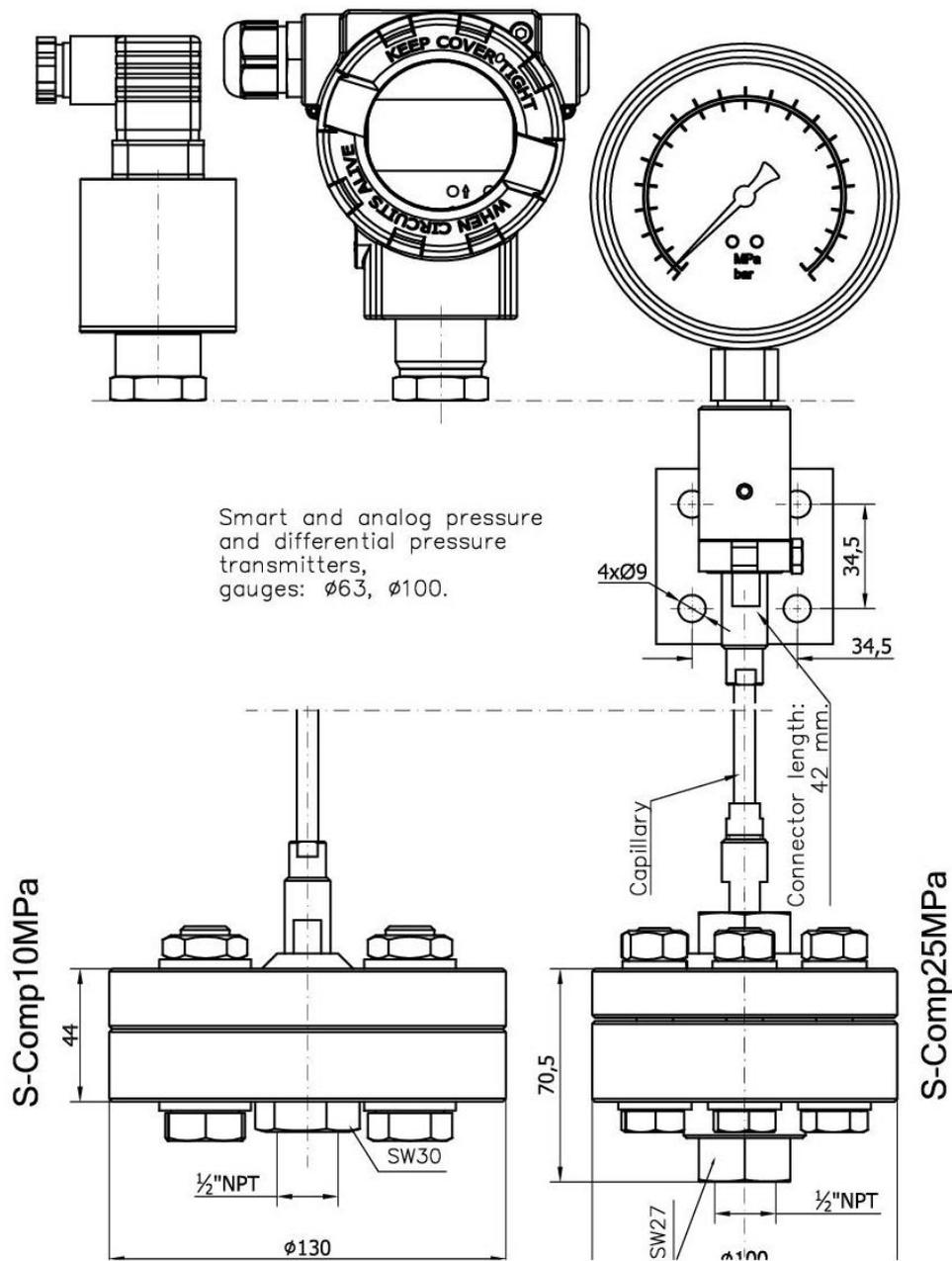
**Over pressure limit:** 25 bar

**Zero error from ambient temperature change.**

5 mbar /  $10^{\circ}\text{C}$  for direct diaphragm seal

**Medium temperature range:**  $-30^{\circ}$  ...  $100^{\circ}\text{C}$

10.8. Remote compact diaphragm seals type: S-Comp10M, 25M, 60M



**Recommended minimum measuring range for S-Comp10M:**

- 0,1 bar for transmitters with diaphragm seal
- 1,6 bar for transmitters with two diaphragm seals
- 1 bar for gauge Ø100 with diaphragm seal

**Recommended minimum measuring range for S-Comp25M or S-Comp60M: 10 bar**

**Maximum measuring range:**

- S-Comp10M – 100 bar
- S-Comp25M – 250 bar
- S-Comp60M – 600 bar

**Overpressure limit:**

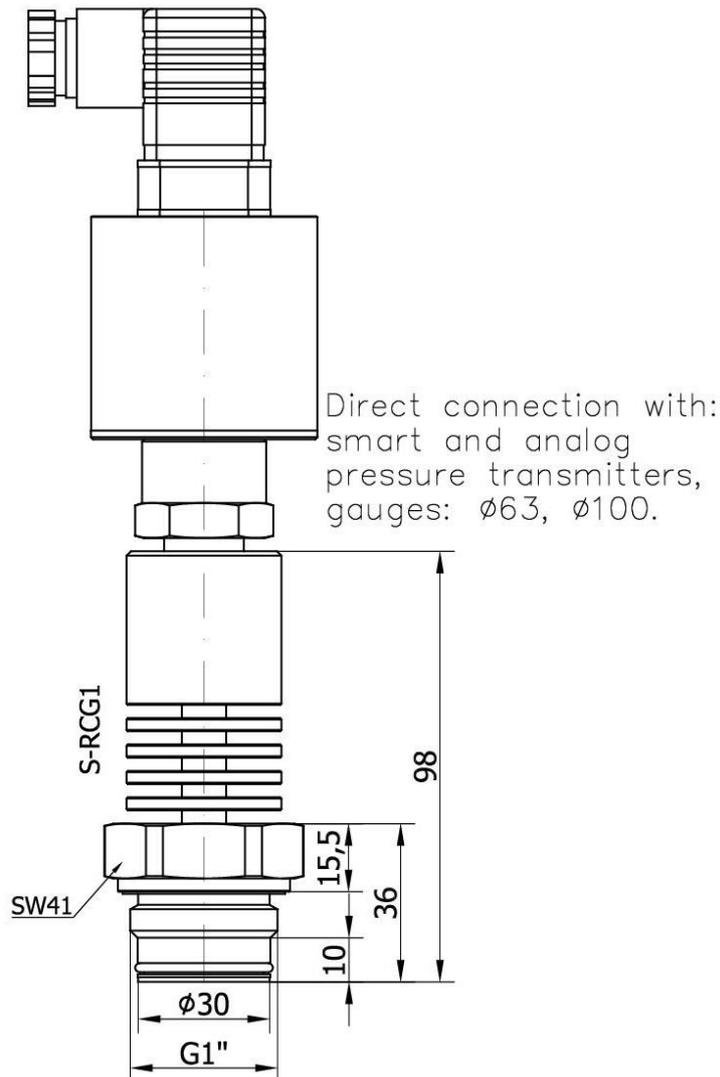
- S-Comp10M – 160 bar
- S-Comp25M – 280 bar
- S-Comp60M – 700 bar

**Medium temperature range:** -30° ... 180°C

**Material of diaphragm and flange:** 00H17N14M2 (316Lss)

**Material of seal:** PTFE (S-Comp10M. S-Comp25M), monel (S-Comp60M)

## 10.9. Threaded seals with flush diaphragm and radiator type S-RC



S-RC diaphragm seals are applicable to the measurement of hot, viscous, solidifying or contaminated liquids, in any cases where an impulse line cannot be used. For installation of transmitters with S-RC diaphragm seals, the Aplisens fitting sockets are recommended.

**Recommended minimum measuring range:** 0,4 bar.

**Medium temperature range:** 0° ... 160°C.

**Material of diaphragm and seal:** 00H17N14M2 (316Lss).

### Zero error from ambient temperature change

- 60 mbar/10°C for range  $\geq 2,5$  bar.
- 10 mbar/10°C for range  $< 2,5$  bar

An additional zero error, resulting from temperature fluctuations in a medium, depends on the temperature gradient in the oil-based diaphragm sealing system. The error value is, in any case, significantly smaller than the error value shown above.

### Maximum measuring range

0 ... 40 bar

### Overpressure limit

100 bar

### Special versions:

- Diaphragm seal for temperatures up to 260°C.
- Hastelloy – wetted parts of diaphragm seal made of Hastelloy C276 (overpressure limit 40 bar).
- Aseptic version S-RCG1, sealing upstream the thread, filling liquid - edible oil (max. temp. 150°C).
- Others.

## 11. INSPECTIONS

### 11.1. Periodic inspections

Inspections should be carried out in accordance with the rules specified in the user’s manual for the selected product.

During the inspection, the condition of the diaphragm and the seal face should be checked in particular - for mechanical damage, dents, deposits, corrosion marks or loss of tightness. If deposit has formed on the diaphragm - it must not be removed mechanically by scraping or scrubbing. The deposit should be dissolved and rinsed off, using only a soft brush to assist in these operations.

### 11.2. Repairs

If the diaphragm seal is damaged or destroyed, it is possible to replace the damaged diaphragm seal or repair it. This repair can only be carried out by the manufacturer.

## 12. SCRAPPING, DISPOSAL



Worn or damaged devices shall be scrapped in accordance with WEEE Directive (2012/19/EU) on waste electrical and electronic equipment or returned to the manufacturer.

## 13. HISTORY OF REVISIONS

Revision no.	Documentary revision	Description of changes
1	01.A.002/2023.07	Initial document version. Prepared by DBFD.
2	01.A.003/2024.01	Information regarding diaphragm seals has been changed. Editorial changes.