



# Budenberg

Made in Britain

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## Diaphragm Seals

Experience and a heritage to instill confidence



**Designed and Manufactured in the United Kingdom  
To EN837-3**

A Diaphragm or 'Chemical Seal' is a mechanical barrier that protects delicate instruments from harsh process fluids such as strong Acids, Alkalis and Slurries. All Chemical Seal units operate in an identical manner: the process medium acts upon a diaphragm the deflection of which is transmitted via the fill medium. This pressure is then displayed or transmitted. The style and materials of construction are carefully selected to withstand not only the process medium but also the maximum design pressure and temperature for each application.

For the sake of this overview, we have concentrated on the use of pressure gauges but 'Budenberg' chemical seal assemblies can be used with pressure transmitters, transducers and switches too.

# Model 254 and 255

A flexible range of diaphragm seal Gauges with features for use in an extensive variety of applications throughout industry to include the most arduous process situations

## Graduations

Budenberg Chemical Seal gauges are made with standard ranges from 1 to 600 bar (15 to 6,000 psi) and some specialised constructions graduated up to 700 bar (10,000psi), However, the maximum pressure may be governed by the pressure rating of the connection that is being used. .

Please refer to separate data sheet covering the various connections available from Budenberg.

Vacuum or compound scales are available with ranges up to 700mbar with an accuracy of  $\pm 1\%$ .

## Temperature

Budenberg Diaphragm Seal Gauges are specified to operate at temperatures from -40 degrees C to 400 degrees C. This will depend on the fill medium that is being used.

It is also possible to mount the assembly away from the process (remote mounting) using stainless steel capillary or an extended neck. The latter option is shown on page 4 and 5.

## Connections

These are wide and varied and examples are illustrated on page three and four.

## Connection Materials

All connections illustrated are available in Carbon Steel or 316 stainless steel. Other materials are available, however, based upon the process medium being used, including exotics. Carbon Steel connections (Types FN, FOT and FO) and type SE  $\frac{1}{2}$ " BSP can be supplied with machined PTFE liners limited to 100 °C and to ranges up to 40 bar (600psi).

## Electrical Contacts

Single and double electrical contacts are available for all gauges supplied with a chemical seal. See separate data sheet for details.

## Standard Connections

Type SE:

Screwed up to 1". 316 stainless steel or some exotic materials available.

Type FO:

BS 10 Tables A-E 2  $\frac{1}{2}$ " carbon steel, carbon steel P.T.F.E lined,

Type 316 stainless steel.

ANSI 2" up to class 2500

BS4504 Type 316 stainless steel and other exotic materials available

Type SEU:

Screwed union 1/2" BSP or 1/2" NPT.

## Diaphragms

For general use we recommend that diaphragms are made from Type 316 stainless steel or tantalum. Other materials can be offered to include Monel 400, Titanium and Hastelloy 'C' 276. Metal diaphragms are suitable for use up to 400C.

For liquids (not gases) which corrode these metals we would recommend P.T.F.E diaphragms which are limited to 100C and to ranges up to 40 bar (600 psi). PTFE protected diaphragms also available.

## Joints on Diaphragms

For graduations up to 40 bar (600psi) and for temperatures up to 200 °C, the seals above and below the diaphragm are made with P.T.F.E rings. For higher pressures or temperatures it will be necessary to offer 'metal-to-metal' joints.

## Upper Flange Assembly

This made from Type 316 stainless steel with socket head screws: 6 for up to 40 bar and 12 for higher pressures

## Filling Fluid

Syltherm is our standard filling fluid. This is suitable for temperatures from -40 ° C to 200 ° C.

Silicone Oil (STD) is available for temperatures from -40 °C to 200 °C. Silicone Oil (HT) is suitable for temperatures from 0 ° C to 300 °C.

Glycerine or glycerine/water mixtures or medicinal paraffin are suitable when the gauges are to be used for food and drink manufacturing or processing.

Inert Fluorine based fluids can be specified when a dangerous reaction could occur if the diaphragm were to be fractured and the filling fluid is likely to come into contact with the process medium such as oxygen or chlorine.

## Pressure Pulsations

If these are likely then an internal snubber can be fitted in the sealed system to steady the pointer and prolong the life of the gauge.

Viscous Damped movements are also available (see separate data sheet for further details).

## Capillary

Stainless Steel capillary is available with nylon-reinforced P.V.C tubing as an option. This is suitable for seal temperatures up to 100 °C.

Stainless steel capillary can be used when the risk of damage is present. It is able to withstand accidental knocks but, in some circumstances, it can also be supplied with a vinyl sheathing.

This is sometimes required when the atmosphere into which the capillary has been installed can become dirty and corrosive.

**Important:** The maximum capillary length from Budenberg is 30 metres for pressure applications and 10 metres for vacuum and compound applications.

## The Indicator

This is normally a pressure gauge generally as described in other parts of this catalogue. To reduce costs, always try and match your application to the usual scales that are produced at Budenberg. Dial sizes are from 63mm through to 150mm.

Budenberg Chemical Seal assemblies are also available as stand alone for use with pressure and vacuum transmitters as well as Differential pressure transmitters and pressure switches. Please refer to separate data sheets in this catalogue.

## Accuracy

All Budenberg chemical seal gauges are manufactured to an accuracy of  $\pm 1\%$  of scale. To maintain this in service, an adjustable pointer is used to compensate for small errors caused by a deviation in temperature changes and a difference in height between the gauge and the seal assembly.  $\pm 1\%$  is standard but  $\pm 0.5\%$  is also available.

## Maintenance and filling

Budenberg diaphragm seal gauges are designed for easy economical maintenance. The model 254 (Clamped) can be stripped to component parts, cleaned and reassembled without the use of a vacuum pump. Spare diaphragms are a great deal less expensive than complete assemblies. Bleed screws can be fitted into the top flange assemblies ( $\frac{1}{2}$ " NPT only) and the flanges are shaped to allow for any trapped air bubbles to escape.

## Seals Only

As stated, we can offer seals without gauges so that our customers can fit them to transmitters, gauges or switches. These seals have the upper flange tapped  $\frac{3}{8}$ " BSP or  $\frac{1}{2}$ " NPT and they have a volumetric displacement of 0.5 ml.

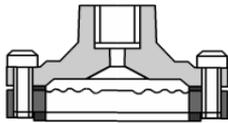
In general they can be fitted to bourdon tube operated pressure gauges and switches as well as to electronic transmitters but they are not suitable for switches operated by bellows or by diaphragms unless the size is the same as that is the unit or smaller.

## Notes:

For specific details on the gauge or transmitter assemblies available please refer to the main body of this catalogue.

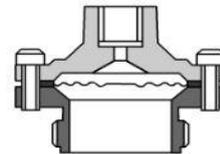
## Connection Types - Clamped versions

Budenberg manufacture a number of connection options and we are renowned for the quality of our seal assemblies - modified for critical applications. Our 'Field Serviceable' chemical seals provide the option for removal and cleaning of wetted parts and also for the replacement of diaphragms which, in the long term will radically reduce operating costs: it is far more cost effective to replace a diaphragm than a whole assembly whether connected to a gauge, transmitter or switch.



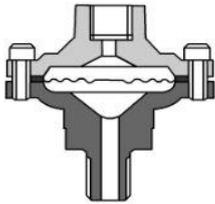
### Type C

Clean-out  
Six holes for 8mm bolts on 83.5 PDC



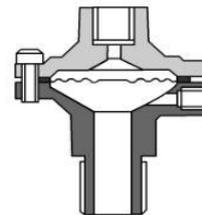
### Type SEH

Screwed External Hygienic  
To suit various couplings used in the food industry



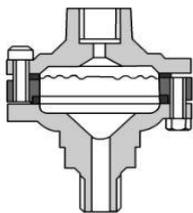
### Type SE

Screwed external pipe threads up to 1" general use



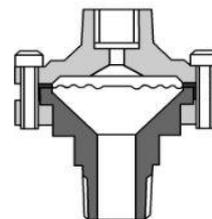
### Type SEP

Screwed External with Purge



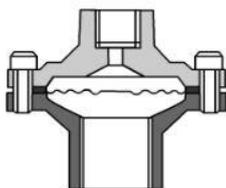
### Type SEC

Screwed External Clean-out



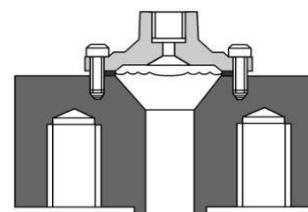
### Type SER

Screwed External - used when rare expensive material is necessary e.g. Hastelloy



### Type SI

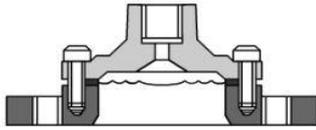
Screwed Internal pipe threads up to 1"



### Type FT

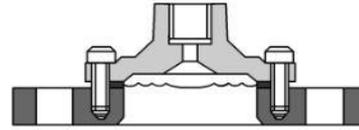
Flange Tapped  
1/2" - 1 1/2" Nominal bores

## Connection Types - Clamped versions continued



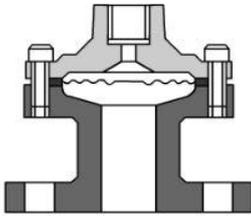
### Type SOT

Flange Open Tapped for studs  
BS. 1560 2" 150 (ANSI B16.5)  
BS 10 2" Tables A-E



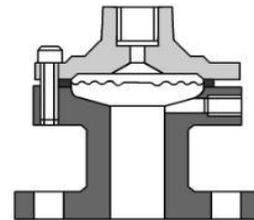
### Type FO

Flanged Open for larger sizes than Type FOT



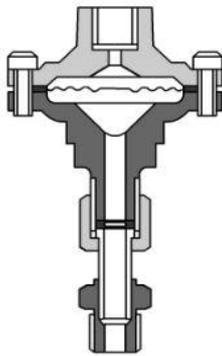
### Type FN

Flange Necked  
1/2" 1" and 1 1/2" Flanges



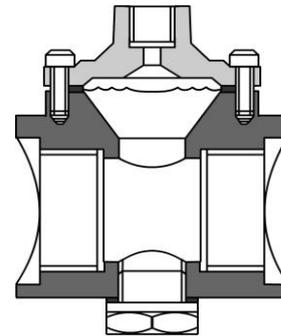
### Type FNP

Flange Necked with Purge



### Type SEU

Screwed External Union 1/2" BSP or 1/2" NPT.  
Useful for distance reading diaphragm seal gauge.

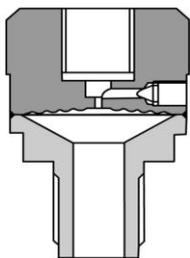


### Type LS

Line Small. For insertion directly into small process lines - field serviceable.

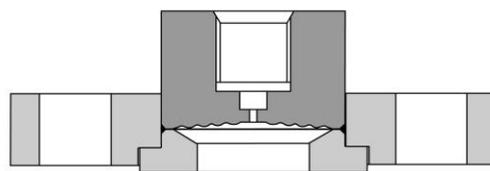
## Connection Types - Welded versions

As well as 'Field Serviceable' - clamped seals, Budenberg also manufactures a 'welded' diaphragm version. This provides a 'low cost' solution. It must be noted, however, that these versions cannot be repaired (diaphragm replacement) or cleaned in the field. Most the options for configuration that apply to the 'clamped' versions (as indicated above) also apply unless dissimilar metals are used for the top and bottom



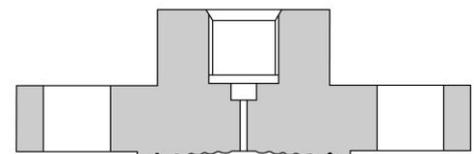
### Type WSE

Welded Screwed External thread



### Type WLF

Welded Loose flanged



### Type WF

Welded Flush flanged assembly

## Hygienic Diaphragm Seal Gauges

For dairy, brewing, pharmaceutical and food industries



Budenberg weld a 316 stainless steel diaphragm to the stainless steel upper flange. This flange matches the coupling and enables the gauge to be taken off plant for cleaning. Crevice free construction reduces the risk of food traces being harboured and creating a health risk for food production.

### Couplings

Hygienic diaphragm seal gauges can be supplied with up to 2" stainless steel nuts (IDF, ISS or RJT).

We are also able to offer cone joint, Homogeniser, Tri-Clover or Tri-clamp fittings ranging between 1 1/2", 2" and 3" nominal size.

### Pressure Ranges

For this design, ranges are available from 0 - 1 to 0 - 16 bar (0 - 15psi to 0 - 300 psi). This is limited by the connection being used.

Gauges with other connection types are made with graduations up to 1000 bar (15,000 psi) for use on homogenisers.

### Temperature

These gauges may be installed in systems working up to 100 °C. It can also withstand steam sterilisation of the system up to 140 °C

### Filling Fluid

The sealed system is normally filled with a liquid that is compatible with the process fluid; medicinal paraffin and glycerine/water are most often chosen to avoid harmful contamination of the pressure medium in the event of a diaphragm becoming punctured.

An internal snubber may be fitted to dampen out any pressure pulsations.

When distance reading gauges are required, similar gauges are supplied with a length of stainless steel capillary between the seal and the gauge.

### Gauge description.

Normally, these gauges are supplied with 100mm cases and a 316 stainless steel tube and movement. An acrylic plastic window and a paraffin filled system is also the norm. 63mm and 80mm cases are also available. The gauge case is supplied in 316 stainless steel but a DMC (plastic) case is also available for compatibility with some processes.

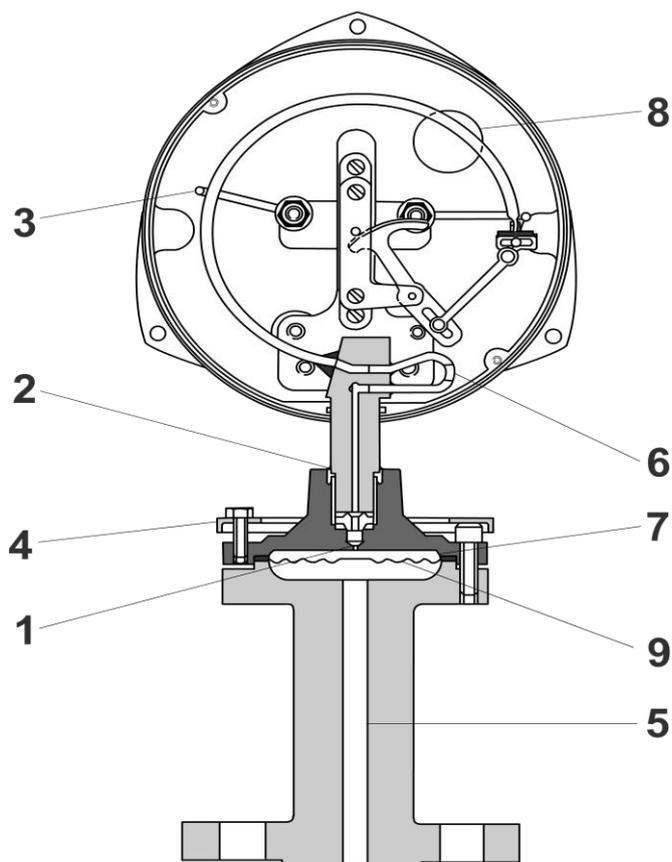
A 150mm dial can be supplied and, for severe applications, we offer viscous damped movements\* and internal snubbers to reduce damage caused by vibration or pulsation.

\* See separate data sheet

## Ultra-safe diaphragm seal gauges

For toxic service

The illustration shows a pressure gauge similar to the 254 described in this broad form. It incorporates certain safety features, however, that significantly reduce the risk of the process media escaping to atmosphere. Our specialised gauges - with these features - are used to measure the pressure of highly toxic materials e.g. liquid chlorine and vinyl chloride, both of which can kill or seriously harm plant operatives at very small levels of exposure. These gauges are specially made for critical applications and part All gauges for toxic service are assembled and calibrated in a controlled ensuring the highest levels of cleanliness.



- 1 The small hole in the top flange ensures that if the filling liquid leaks off for any reason, the diaphragm seals over the hole and there is no escape of the process fluid (pressure medium).
- 2 The connection of the stainless steel gauge is welded to the upper flange to give an all welded unit. This prevents this joint being unscrewed accidentally. The can also be locked to the upper flange.
- 3 Overload stops on the tube allow gauge to withstand 3x overpressure.
- 4 A plate with a sealed warning label deters removal of screws
- 5 Reduced bore on entry reduces the amount of toxic fluid released if the gauge has to be removed from plant before line is purged.
- 6 Capillary snubber welded into sealed system to reduce pulsations.
- 7 Diaphragm can be built to match upper-flange corrugations to allow the diaphragm to 'lock-off' against it in the event of an overpressure ensuring that the tube is not subjected to it.
- 8 Safety features such as 'blow out back' or discs, laminated safety glass and electrical contacts for use on hazardous areas can be fitted.
- 9 Gauges for toxic/hazardous process are often fitted with tantalum diaphragms and an inert fluorine based fill fluid.
- 10 The dials are marked with the pressure medium and process medium as well as any other special safety notes relating to the calibration medium to be used or the filling fluid between the diaphragm and tube assembly.

This is in accordance with EN 837.



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## Why Budenberg?

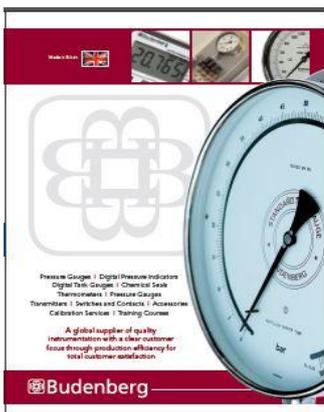
Budenberg speaks with the utmost confidence when they refer to their unrivalled history in the field of pressure and temperature gauges. There is no other company that can boast of over 160 years in both the design and manufacture of top quality instrumentation.

Budenberg pressure and temperature gauges are specified globally for use in some of the most hazardous and demanding areas across a wide spectrum of industries to include oil, gas, petrochemical, chemical processing, general manufacturing and original equipment production. A rich history in manufacturing is a virtue, but the quality and reliability of Budenberg products has ensured a brand loyalty that is also unrivalled.

A 100% British Company, with Middle East offices, Singapore and India Budenberg sells globally via a network of approved distributors which are listed on our website under the contacts section. Budenberg has expertise in many areas of instrumentation as detailed below: -



## Valves, Manifolds, Positioners, Chart Recorders, Transmitters, RTDs



# Budenberg®

Details of all Budenberg's products and accessories can be found on our website [www.budenberg.co.uk](http://www.budenberg.co.uk)

Broad form catalogues are also available from our approved distributors or from our sales department. Please contact us for further information or to arrange a meeting with one of our sales engineers/distributors.

