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WHITE PAPER

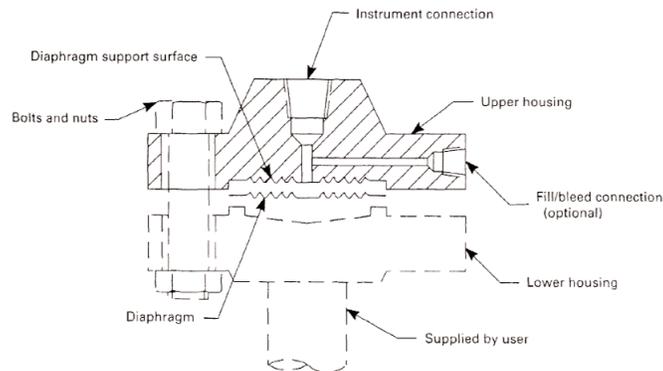
Overview of Diaphragm and Chemical Seals

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Overview of Diaphragm and Chemical Seals

Introduction

A diaphragm or chemical seal is a device comprised of a thin membrane known as a diaphragm, which is clamped between two flanges. This unit is gasketed to prevent fluid leakage. A diaphragm seal acts as a barrier between the process fluid and the pressure sensing element. The following illustration shows a typical diaphragm seal unit. Note that the wetted parts are the lower housing and diaphragm.



Diaphragm or chemical seals are typically used for the following pressure measuring functions:

- Prevent corrosive process fluids from entering the pressure sensor and damaging the sensing element
- Prevent process fluids from gelling or hardening when it is separated from the process, resulting in a drop in temperature
- Prevent high temperature process fluid from entering the pressure-sensing element, which will decrease accuracy and possibly damage the sensing unit
- Prevent slurries or viscous process fluids from entering and possibly clogging the sensing element, which will result in inaccurate readings



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Function

A pressure instrument such as a pressure gauge or pressure transmitter can be mounted directly to the diaphragm seal or connected through a capillary. In order for the pressure sensor to measure correctly, the space between the diaphragm and sensing element must be filled with a “filling fluid” possessing a very low expansion coefficient. This fluid is deemed incompressible for this discussion. The filling fluid will allow the process pressure to be transmitted from the diaphragm to the sensing element of the instrument. Presence of air in the system is not desirable as air is compressible and will render inaccurate pressure readings from the instrument.



Here is a list of some of the most commonly-used filling fluids:

- Glycerin
- 70% Glycerin, 30% Water
- Silicone
- Instrument Oil

The choice of filling fluids used is largely determined by the process temperatures and compatibility of process media to the filling fluid. Please consult Winters Instruments for more information on this topic (www.winters.com).

Pressure Limits

It is important to note that various seals have been designed to operate at different pressure ranges. For example, please see the following two Winters stainless steel diaphragm seals below. The choice of materials for the diaphragm seal will also affect the pressure limits for a given diaphragm seal.



30-2500 psi



0-1000 psi



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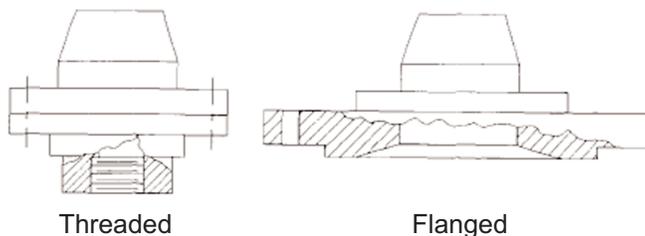
Materials

While 316 stainless steel is a common material for the diaphragm seal wetted parts, there are many other materials available. The majority of diaphragm seal failures are due to improper selection of wetted parts. Please see below for a list of Winters Instruments' comprehensive offering to cover all applications.

DIAPHRAGM	LOWER HOUSING
316 Stainless Steel	316 Stainless Steel
PTFE	PTFE or Kynar
Monel	Monel
Hastelloy B or C	Hastelloy C
Nickel	Carbon Steel
Carpenter 20	PVC or PROPYLENE
Tantalum	Titanium
	Nickel
	Carpenter 20
	CPVC

Process Connections

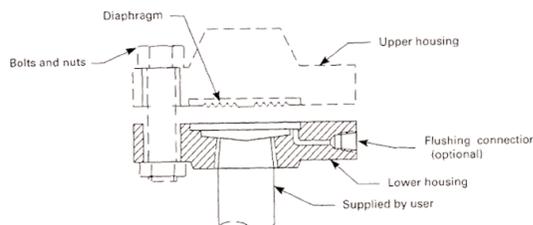
The most common types of process connections are threaded and flanged connections.



Winters' diaphragm seals can accommodate all types of process connections such as sanitary, in-line and saddle.

Purging of Pressure Chamber

A flushing connection can be provided to purge the pressure chamber below the diaphragm. This is useful for applications where material build-up is a possibility.





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Flush Mount Diaphragm Seals

For applications where plugging can occur around the pressure chamber or if the process media is a slurry or very viscous, flush mount diaphragm seals should be considered. These seals are constructed in such a way that there is no lower housing, therefore, no pressure chamber. The units shown below are two of Winters Instruments' offering:



Affects on Instrument Accuracy

Because the diaphragm has a fixed spring rate, pressure is required to displace the filling fluid. This negatively affects the accuracy of the instrument and diaphragm seal assembly. In general, accuracies are downgraded by 0.5% to 1.0%. If capillaries are used, the accuracies may be further degraded.

Diaphragm Seal Selection Criteria

There are many components to consider in deciding which diaphragm seal is required. Here are some considerations:

- Process connection
- Process pressure
- Material required for wetted parts
- Media property (viscosity, clogging possibilities, etc.)
- Process temperature
- Instrument connection
- Filling fluid

Winters Instruments is a global manufacturer of pressure and temperature instrumentation, with distribution in over 80 countries. Go to www.winters.com to view our extensive list of products and distributors, or call 1-800-WINTERS for more information.

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