PTFE Diaphragms

Diaphragms are hermetrical seals between two spaces with media and pressures which, typically, differ from each other. Unlike piston and rod seals, there is no drag leakage at the contacting surfaces, and the requirements to be met in terms of tolerances and surfaces are lower.

Chemical resistance to aggressive media, flexibility and long service life are major requirements made on materials and the design of membranes. For perfect service, it is indispensable that diaphragms design and selection of the respective compound be adapted specifically to the particular application conditions.

Benefits
- Good reverse bending strength
- Nearly universal chemical resistance
- Very good suitability for sterilization
- Temperature resistance
  -60°C to +200°C
- FDA-conformable materials
- Freedom of design
- Homogeneous structure
Applications

Fields of Applications
- Metering devices for the pharmaceutical and food industries
- Pumps for the chemical industry
- Pumps for painting technology
- Pressure regulators
- Pharmaceutical valves
PTFE diaphragms are used in metering devices for the pharmaceutical and food industries as well as in pumps of the chemical industry and in painting technology.

Because of their outstanding physical and chemical properties PTFE diaphragms are being used in constantly increasing fields of application. The lift of the diaphragm is determined by its shape and design as well as the existing effective diameters.

To reduce the risk of damage, the sandwich diaphragm technology is primarily being used (principle of the double barrier, diaphragm technology with breakage sensor). This enables early detection of malfunctions for planned execution of timely repairs and appropriate corrective action which reduces production downtimes significantly. In addition, this helps prevent contamination of the media fluids to be pumped.

With multi-layered diaphragms and constant material thicknesses the actuating forces are considerably lower than those of single-layered diaphragms.

In addition to stamped diaphragms, machined diaphragms are increasingly being used. A major advantage over PTFE/elastomer composite diaphragms is the homogeneous structure and freedom of design offered by these diaphragms.

To increase service life, specially treated PTFE films and films made from modified PTFE are used.

For information on materials with good reverse bending strength and low permeation, see pages 26–27.

For your inquiry, please complete the technical questionnaire at the end of the catalog.
Versions

**Film Diaphragms**
- For large volumes
- For medium requirements regarding lift, service life, pressure
- More sophisticated design of clamping surfaces

**Machined Diaphragms**
- For maximum requirements regarding lift, service life, pressure ($H_{max} \leq 0.30 \times \phi_{eff}$)
- For specified installation spaces

**Flat Diaphragms**
- Only for very small lifts
- Lowest tooling and manufacturing costs
- Low assembly height

**Versatile Design Options**
- No dead space in clamping areas
- Leakage evacuation with multi-layered designs
- Reinforcement grooves, beads, cuts to avoid radial creasing
- Sealing elements to close openings
- Core/disc design for mechanical articulation

**Diaphragms with Stamped Contour**
- High performance capability
- Low restoring forces
- Multi-layered designs (for evacuation of leakage, higher pressure strength)
Assembly and Design Instructions

In the clamping zone, the diaphragm is fastened between the housing flanges under sufficient pressure (thread-fastening, clamping). The diaphragm in this case acts like a static seal. Deformation damage caused by excessive clamping pressures must be avoided through flange stops and/or specified torque levels. Depending on the diaphragm material and diaphragm thickness, additional flat or profile seals may be used for sealing.

With PTFE diaphragms, sealing performance can be improved by a V-profile surface structure of the respective assembly components, meaning the V-profile structure of the housing or supporting parts is pushed into the PTFE, resulting in improved sealing performance.

For mechanical articulation, the diaphragm is typically clamped between the supporting and the pressure disc. The individual components are joined by a threaded connection, riveting or vulkanized. When designing the support, it must be ensured that the surfaces contacting the diaphragm are burr-free and that there are sufficiently dimensioned transition radii.

General rule: \[ R \geq 4 \cdot s \]

\( R = \) radius; \( s = \) diaphragm thickness

For perfect service, it is indispensable that diaphragm design and selection of the respective compound be adapted specifically to the particular application conditions.

We will be pleased to provide you with respective consulting support.

**Dimensioning Legend for Engineering Drawings**
- \( D \), \( \varnothing \) outside
- \( D_w \), \( \varnothing \) eff
- \( b \) (radial bead width)
- \( S \) (membrane thickness in the bead area)
- \( P \) (pressure)
- \( H_{max} \) (maximum lift)
- \( R \) (radii at the transition points)

**Flat Diaphragms**

**Diaphragm with Bead**

**Other Clamping Options**