Product Information

Has-Mor's main product offering is FEP and PFA encapsulated o-rings. Encapsulated o-rings are double-action sealing elements. The seal is provided by the FEP or PFA encapsulation; whereas, the elastomer o-ring (fluorocarbon rubber, silicone, etc.), serves as an elastic pretension element exerting a permanent and uniform pressure against the mating surface. The FEP or PFA "jacket" encases the elastomer o-ring without seams.

Encapsulated o-rings are used wherever conventional elastomer o-rings cannot be used due to their inadequate chemical resistance. FEP and PFA materials offer superior chemical resistance to a greater range of media, but offer no rubber elastic properties, by combining the FEP or PFA jacket with such core materials, the o-ring now offers the required elasticity and chemical resistance expanding uses into the chemical industry, medical technology, petrochemical, food industries and similar industrial uses.

Encapsulated o-rings are primarily used as static seals (axial and radial) for lids and covers, flanges, disks, etc. When subject to significant strains and stresses (speed and pressure), the seal can also be used for dynamic sealing for pistons, rods, valve spindles, and mechanical seals. When greater stress is anticipated, preliminary experiments are recommended.

The most important advantages of o-rings with FEP or PFA encapsulation as compared to conventional o-rings include:

- low friction, no stick slip effect, no adhesion tendency
- very good chemical resistance, compatible with most fluids and chemicals
- no contamination when used with food, pharmaceutical and medical products
- physiologically harmless, can be sterilized
- low steam permeability
- wide temperature ranges (varies based on o-ring compound)

Materials

The materials below are used to produce our standard product line. Specialty compounds are used occasionally depending upon overall demand or special customer needs.

FEP (Fluorinated Ethylene Propylene) offers an excellent combination of properties.

- possesses a very high degree of stress crack resistance
- chemically inert
- low coefficient of friction permits viscous liquids to flow freely
- exceptional dielectric properties
- heat resistant

- retention of properties after service at 400°F (204°C) with useful properties at -454°F (-270°C)
- meets FDA 21CFR.177.1550.

PFA (Perfluoroalkoxy) is a premium resin preferred when extended service is required in hostile environments involving chemical, thermal, and mechanical stress.

- high melt strength
- stability at high processing temperature
- excellent crack and stress resistance
- low coefficient of friction allows fluids to flow freely
- resistance to creep at its high service temperature
- retention of properties after service 500°F (260°C) with useful properties at -320°F (-195°C).
- meets FDA 21CFR.177.1550.

VITON® (Fluorocarbon Rubber) is a fluoroelastomer compound which offers exceptional mechanical properties and low compression set. ***Has-Mor Industries, Inc. is an authorized licensee for DuPont Performance Elastomers Genuine Viton® with Viton® Tracer™ Technology.***

- recommended for use in hot chemically corrosive environments that are very degrading to most other rubber compounds
- for use in Aerospace, Oil and Gas, Automotive and Chemical manufacturing
- temperature range: 0°F (-17°C) to 400°F (204°C). Short periods above and below the temperature range are tolerable.
- meets or exceeds all AMS 3216G (formerly Mil Spec MIL-R-83248C, Type II, Class 1) physical and chemical requirements, 75 Durometer.

Silicone Elastomer possesses mechanical properties similar to fluoroelastomer compounds but with slightly lower compression set resistance.

- excellent heat resistance and the best low temperature flexibility of all elastomers.
- temperature range: -60°F (-51°C) to 400°F (204°C).
- meets FDA 21CFR.177.2600, 70 Durometer.

EPDM is a peroxide-cured elastomer.

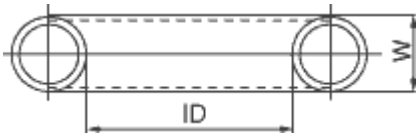
- low gas permeability
- resistance to ozone, steam, water, alcohols, and brake fluids
- temperature range: -50°F (-46°C) to 300°F (149°C),
- short term exposures to -60°F (-51°C) to 350°F (175°C)
- 65 Durometer.

The temperature ranges advised are limit values and must always be considered in connection with the medium to be sealed and the operating pressure. This means that the permissible temperature for extended operation is always lower than the upper limit values.

Sizes

The dimensions of encapsulated o-rings are specified by the inside diameter (ID) and the cross section (W). Encapsulated o-rings are available in five standard cross sections:

O-Ring Dissection



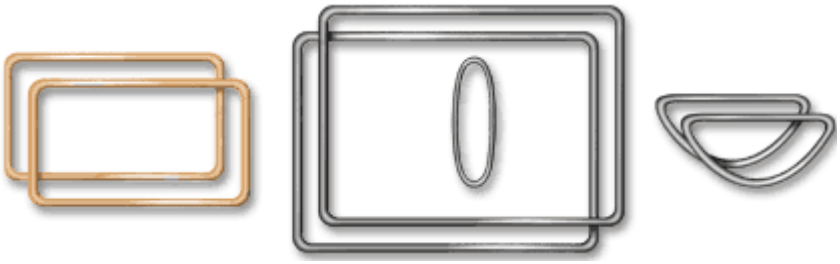
O-Ring Section (W*)	O-ring AS-568A
.070” (1.78 mm)	O-rings -011 to -050
.103” (2.62 mm)	O-rings -111 to -178
.139” (3.53 mm)	O-rings -210 to -284
.210” (5.33 mm)	O-rings -325 to -395
.275” (7.00 mm)	O-rings -425 to -475

* Cross section W in accordance to AS 568A.

The finished cross section of an encapsulated o-ring is the same width as a standard o-ring in the same size. Besides the most common standard ID/CS range listed above, a range of nonstandard diameters is also available in the standard cross sections. In addition, other metric and nonstandard cross sections are also available from .063" (1.6mm) through .787" (20mm).

Custom Shapes and Sizes

One of our strengths is our flexibility. Occasionally, customers have certain proprietary needs. At Has-Mor, we can work with you to meet these needs. To be sure your project is feasible and can meet our minimum order and production requirements, please contact us at Info@Has-Mor.com or (570) 383-0185 for more information.



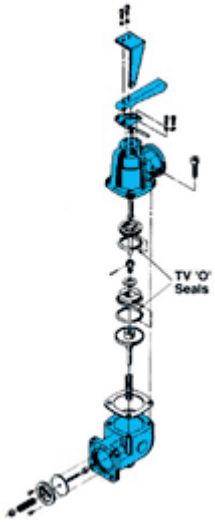
Installation and Service Life

Typical Mechanical Seal

In general, the same regulations apply to installation of encapsulated o-rings as for conventional elastomer o-rings. Due to FEP encapsulation, these sealing rings can neither be squeezed into place as easily as the purely elastic o-rings, nor do they contract as easily after stretching. To avoid unnecessary distortion of the encapsulation when the ring is installed, a split groove is recommended for radial-static and dynamic installation.

When used for external seal application (e.g. pistons), the encapsulated o-rings must be stretched out and then put back in shape. For installation recommendations, please contact us.

For internal seal application (e.g. rods), encapsulated o-rings with increasing diameter can be installed. For installation of o-rings with smaller diameters, the possibility of using closed grooves should be investigated in each particular case.



The sealing ring must never be forced into the groove by buckling it, since this can spoil the sealing function. In such cases, a split groove must be used.

Encapsulated o-rings are installed in rectangular grooves. For operating pressures higher than approximately 50 bar, additional backup rings can be an advantage. This prevents the FEP encapsulation from being buckled or damaged by sharp groove edges or narrow corner angles.

Function and Service Life (Surface Roughness)

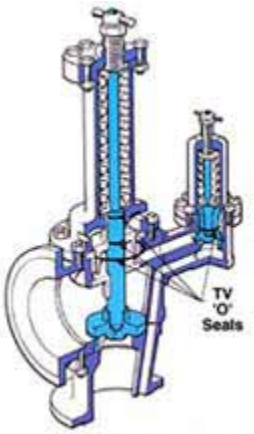
The function and service life of a seal depends on the quality and character of the surface.

Radial—Dynamic and Static

Bore/Rod
Ra = 0.05-0.6 µm [Rmax = .02-2.5 µm]
Groove Surface, Static
Ra < or = 2.5 µm [Rmax < or = 10 µm]

Groove Surface, Dynamic with pulsating pressures
Ra < or = 1.5 µm [Rmax < or = 6 µm]

Axial-Static
Seal and Groove Surface
Ra < or = 2.5 µm [Rmax < or = 10 µm]
with Pulsating Pressures
Ra < or = 1.5 µm [Rmax < or = 6 µm]



Typical Valve Stem

If you need more information on installing your o-rings please e-mail Info@Has-Mor.com or call (570) 383-0185.