

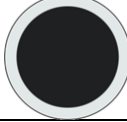

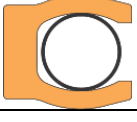






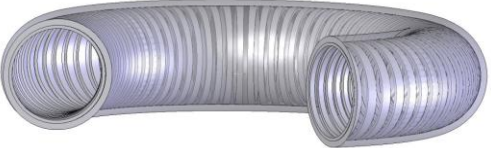
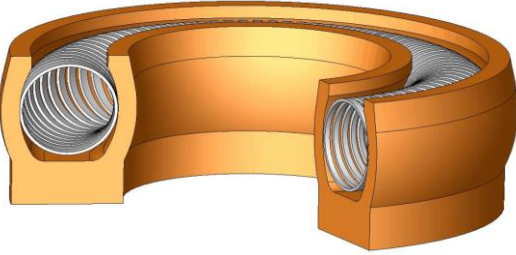
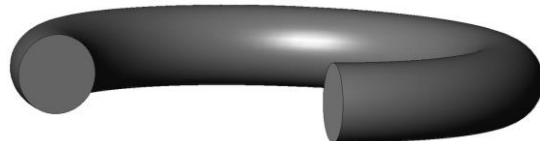
## PFA/FEP ENCAPSULATED AND SPRING ENERGIZED SEALS

FEP and PFA Teflon® type Fluoropolymers (plastics) offer excellent chemical and temperature resistance, but lack the resiliency of elastomers (rubber) required to maintain a quality seal. Encapsulated and spring energized seals combine the best features of plastics, elastomers and steel springs to increase chemical and temperature performance compared to most solid elastomers. The main offsetting limitation is Teflon's® stiffness can require custom gland design to maximize sealing.

Seal Type (CPD#)	Seal Cross-Section	Relative Price	Highlight Features	Temperature Range	Pressure Range	Dynamic Application	Slow Dynamic Application	Excellent Chemical Compatibility	Static Application
FEP Encapsulated Silicone Core (T1002)		\$	Lowest Cost Most Readily Available	-80° F To +400° F PFA +500°F	Up to 1500 psi	No	Yes	Yes	Yes
FEP Encapsulated Hollow Silicone Core (T1003)		\$\$	Mechanically softer	-80° F To +400° F PFA +500°F	Up to 500 psi	No	Yes	Yes	Yes
FEP Encapsulated FKM (Viton®) Core (T1001)		\$\$	Better chemical compatibility	-15° F To +400° F	Up to 1500 psi	No	Yes	Yes	Yes
FEP Encapsulated Steel Spring Core (T1021)		\$\$\$	Cryogenic Sealing Applications	-420° F To +400° F PFA +500°F	Up to 3000 psi Vents	No	Yes	Yes	Yes
Steel Spring Energized PTFE (Teflon®) Seal		\$\$\$	Extreme Temp Pressure Chemical Dynamic App Performance	-420° F To +600° F	Up to 60,000psi Design	Yes	Yes	Yes	Yes
SOLID FFKM MARKEZ® KALREZ®		\$\$\$	Improved Sealing Performance Longer Seal Life	-50° F To +620° F	Up to 25000 psi With back-up ring	Yes	Yes	Yes	Yes

This information is to the best of our knowledge accurate and reliable. However, Marco Rubber makes no warranty, expressed or implied, that parts manufactured from this material will perform satisfactorily in the customer's application. It's the customer's responsibility to evaluate parts prior to use.

Teflon® and Viton® are Registered Trade names of DuPont.

<p><b>FEP Encapsulated Silicone O-Rings</b></p> 	<p>O-Ring with a FEP or PFA (Teflon®) outer layer encapsulating a Silicone core. The Teflon® shell offers excellent chemical and temperature resistance while the Silicone core provides the resiliency needed to provide effective sealing. Readily available is common USA and metric cross-sections and nearly unlimited diameters. CPD# T1002 is FEP encapsulated Solid Silicone with improved chemical resistance up to +400° F. CPD# T1022 is PFA encapsulated Solid Silicone up to +500° F.</p>
<p><b>FEP Encapsulated Silicone Hollow Core</b></p> 	<p>O-Ring with a FEP (Teflon®) outer layer encapsulating a Hollow Silicone core. The Teflon® shell offers excellent chemical and temperature resistance while the Hollow Silicone core provides the resiliency needed to provide effective sealing. The hollow core requires less force to compress the seal resulting in easier installation and improved sealing performance in some applications. Readily available is common USA and metric cross-sections and nearly unlimited diameters. CPD# T1003 is FEP encapsulated Hollow Silicone with up to +400° F.</p>
<p><b>FEP Encapsulated FKM (Viton®) Core</b></p> 	<p>O-Ring with a FEP (Teflon®) outer layer encapsulating a Solid FKM (Viton®) core. The Teflon® shell offers excellent chemical and temperature resistance while the FKM core provides the resiliency needed to provide effective sealing. The FKM core provides increased compression set resistance resulting in longer lasting sealing in some applications. Readily available is common USA and metric cross-sections and nearly unlimited diameters. CPD# T1001 is FEP encapsulated Solid FKM with improved chemical resistance up to +400° F</p>
<p><b>FEP Encapsulated Steel Spring Core</b></p> 	<p>O-Ring with a FEP (Teflon®) outer layer encapsulating Stainless Steel Spring. The Teflon® shell offers excellent chemical and temperature resistance while the Steel Spring core provides the resiliency needed to provide effective Cryogenic Seal performance down -420° F. Readily available in USA and metric cross-sections and nearly unlimited diameters. CPD# T1021 is FEP encapsulated Steel Spring with Cryogenic Sealing down to -420° F and up to +400° F. PFA encapsulated steel spring up to +500° F.</p>
<p><b>Steel Spring Energized PTFE (Teflon®) Seals</b></p> 	<p>PTFE (Teflon®) U-Cup style Lip Seal energized by a stainless steel spring. Spring Energized Teflon Seals provide the best chemical resistance, widest temperature and pressure performance ranges of any plastic or elastomeric seal. Spring Energized Teflon Seals can perform in Cryogenic Sealing temperatures of nearly absolute zero -420° F to 600° F. Pressures up to 3,000 psi and custom designs allow up to 60,000 psi. A wide range of high performance plastics are available for specific application performance. Designed for radial, face or custom seal configurations, as well as rotary, reciprocating and oscillatory motions depending on design. Low friction and long service life in demanding application. Wide range of spring energizing configurations based on applications. Seals are available in Rod and Piston Inside and Outside Pressure and unidirectional sealing configurations. Great performance in compressed gas waterless fracking seals, LPG and Liquid Nitrogen seals. Alternative to MSE® Seals, Bal Seals, Variseal®, OmniSeal®, FlexiSeal®. Details at <a href="http://www.marcorubber.com">www.marcorubber.com</a></p>
<p><b>SOLID FFKM MARKEZ® KALREZ®</b></p> 	<p>O-Rings and Custom Molded FFKM MARKEZ® KALREZ® Seals provide the ultimate chemical, temperature and sealing performance in demanding applications that are worth investing in high performance high cost seals. Dozens of specialized compounds are available to maximize specific application performance temperatures to -50° F and +620° F Details at <a href="http://www.marcorubber.com">www.marcorubber.com</a></p>

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**COMMON APPLICATION**

- Valve Stems
- Flanges
- Pumps
- Swivels
- Turbo Pumps
- Joints
- Turbo Expanders
- Cryogenic seals
- Waterless fracking

**ENCAPSULATED O-RING COMMON CROSS-SECTIONS AND DIAMETERS**

O-Ring Cross-Section (inches)	O-Ring Cross-Section (mm)	Recommended Compression (inches)	Minimum ID	Maximum ID
0.070 +/- .005	1.78	0.017	0.500	10.000
0.075 +/- .005	1.91	0.018	0.500	10.000
0.094 +/- .005	2.40	0.022	0.600	15.000
0.103 +/- .005	2.62	0.024	0.600	Unlimited
0.110 +/- .005	2.79	0.025	0.600	Unlimited
0.118 +/- .005	3.00	0.025	0.750	Unlimited
0.125 +/- .006	3.18	0.025	0.750	Unlimited
0.139 +/- .006	3.53	0.025	0.750	Unlimited
0.148 +/- .006	3.76	0.027	0.950	Unlimited
0.157 +/- .007	3.99	0.027	1.150	Unlimited
0.177 +/- .007	4.50	0.031	1.500	Unlimited
0.197 +/- .008	5.00	0.035	1.500	Unlimited
0.210 +/- .008	5.33	0.038	1.500	Unlimited
0.225 +/- .008	5.72	0.040	1.500	Unlimited
0.250 +/- .010	6.35	0.043	2.500	Unlimited
0.275 +/- .010	6.99	0.043	2.500	Unlimited
0.295 +/- .010	7.49	0.047	2.750	Unlimited
0.315 +/- .012	8.00	0.050	3.000	Unlimited
0.331 +/- .012	8.40	0.057	4.000	Unlimited

Date: 2016-7-1

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