

CIRCOR Chooses VICTREX[®] PEEK[™] Film for Diaphragm Liner in Back Pressure Regulator

When CIRCOR Instrumentation Technologies (CIT), a leading provider of fluid process instrumentation technology, encountered a sampling system application with ambient temperatures up to 260°C (500°F), it replaced the PTFE liner in a BP-3 series GO back pressure regulator with VICTREX[®] PEEK[™] film because of its **high temperature capabilities**.

According to Scott Tomlinson, Sales Manager, North America and Product Manager for GO Regulator, “For many sampling system applications, PTFE works very well as a diaphragm liner. In fact, we’ve used PTFE as our primary liner for over 30 years. Every once in a while, however, we run into an application where a little more chemical resistance and a little more temperature resistance are required. In this particular application, with maximum temperatures up to 260°C (500°F), the PTFE would migrate toward one of the internal ports of the back pressure regulator. When this happened, flow was restricted through the unit. VICTREX PEEK is a much **more rigid material** and doesn’t have a tendency to cold-flow or creep like PTFE. It has not migrated toward the internal port and thus has provided an excellent solution for this application.”

The liner is essentially a circular washer with a 1.725” O.D. and a 0.320” I.D. “We used 10 mil VICTREX PEEK

Film Can Withstand Harsh Environments

VICTREX PEEK provides material solutions for designers seeking extruded film that can withstand the harshest environments while providing high purity and excellent dimensional stability over a wide temperature range. Key features include high temperature performance, excellent tribological properties, broad chemical resistance, high strength and toughness, electrical stability and radiation resistance. VICTREX PEEK can be modified with fillers to enhance stiffness, tribological properties, and sealability.



film which works well inside the diaphragm assembly,” says Tomlinson. “In this particular application, the media being used was a mixture of H₂ and CO, and the working pressure was around 435 psi.”

The VICTREX PEEK film is used as a barrier between sample process media and the backing of the diaphragm which in this particular application is stainless steel. “The diaphragm is a key wetted part inside the regulator that helps give us the ability to regulate pressure,” explains Tomlinson.

In this application, GO back pressure regulators are being used to maintain a constant pressure in an analyzer. “Applications for these types of pressure regulators can be very demanding, as these analyzers are typically used to validate samples of process media that are being produced in refineries, chemical plants, and a variety of other petrochemical/natural gas processing facilities,” adds Tomlinson. In addition to excellent high temperature and creep resistance required for this application, VICTREX PEEK offers high purity and is an excellent moisture and gas permeation barrier.

Properties of VICTREX PEEK Film

Property	Units	Test Method	VICTREX PEEK Amorphous	VICTREX PEEK Crystalline
GENERAL				
Color	—	—	Translucent Grey/Tan	Opaque Grey/Tan
Density	lb/ft ³ (g/cc)	ASTM D 792	78.66 (1.26)	82.40 (1.32)
Typical Crystallinity	%	DSC	0 - 10	30
Shrinkage, 257°F (125°C)	%	—	0.2	0.1
Shrinkage, 392°F (200°C)	%	—	8 - 12	2
Water Absorp., 24hr, 74°F (23°C)	%	ASTM D 570	0.5	0.5
Area Factor	ft ² /lb/mil (m ² /kg/μm)	—	152 (1.23)	144 (1.16)
MECHANICAL				
Tensile Strength, yield	ksi (MPa)	ASTM D 882	10 (71)	13.2 (91)
Tensile Elongation, break	%	ASTM D 882	>250	>150
Tensile Elongation, yield	%	ASTM D 882	6	6
Tensile Modulus	ksi (GPa)	ASTM D 882	319 (2.2)	460 (3.2)
Abrasion Resistance	lb/cycles (mg/cycles)	Taber CS, 1kg	4.4x10 ⁻⁵ -11x10 ⁻⁵ (20-50)	1.1x10 ⁻⁵ (5)
Tear Strength, propagation	lb-force/ft (kN/m)	ASTM D 1922	26,500 (388)	5,100 (75)
Tear Strength, initiation	lb-force/ft (kN/m)	ASTM D 1004	2,000 (29.4)	67,600 (990)
Folding Endurance	—	MIT, 1000 μm	390	115
THERMAL				
Glass Transition Temperature	°F (°C)	DSC	289 (143)	289 (143)
Melting Temperature	°F (°C)	DSC	649 (343)	649 (343)
Thermal Conductivity	BTU/hr/ft ² °F (W/m ² °C)	ASTM C 177	0.47 (0.25)	0.47 (0.25)
Specific Heat	BTU/lb/°F (kJ/kg/°C)	DSC	0.52 (2.16)	0.52 (2.16)
Coeff. Thermal Expansion <T _g	10 ⁻⁵ /°F (10 ⁻⁵ /°C)	ASTM D 696	3.3 (6.0)	2.6 (4.7)
Coeff. Thermal Expansion >T _g	10 ⁻⁵ /°F (10 ⁻⁵ /°C)	ASTM D 696	N/A	6.0 (10.3)
RTI, Electrical Strength	°F (°C)	UL 746B	392 (200)	392 (200)
RTI, Mechanical Strength w/o Impact	°F (°C)	UL 746B	428 (220)	428 (220)
ELECTRICAL				
Dielectric Strength, in air, 50 μm	V/mil (kV/mm)	ASTM D 149*	4800 (189)	5100 (200)
Dielectric Strength, in air, 50 μm	V/mil (kV/mm)	ASTM D 149**	3700 (147)	3700 (147)
Dielectric Strength, in air, after 48 hrs water immersion, 50 μm	V/mil (kV/mm)	ASTM D 149**	3700 (147)	3700 (147)
Dielectric Constant, 1kHz	—	ASTM D 150	3.3	3.3
Dissipation Factor, 10kHz	—	ASTM D 150	0.0026	0.0026
Surface Resistivity	Ω/sq	ASTM D 257	2.0 x 10 ¹⁵	2.0 x 10 ¹⁵
Volume Resistivity	Ω-cm	ASTM D 257	4.9 x 10 ¹⁶	4.9 x 10 ¹⁶
IGNITION CHARACTERISTICS				
Oxygen Index, 400 μm	%	ASTM D 2863	24	24
UL File Number	—	—	E161131	E161131
Flame Retardance	1 mil (25 μm)	UL94	VTM-0	HB
MISCELLANEOUS				
Resistance to Gamma Radiation	—	—	Excellent	Excellent
Resistance to Chemicals	—	—	Very Good	Excellent
Hydrolysis Resistance 392°F (200°C), 2000 hours	—	—	Excellent	Excellent
Agency Approvals	—	—	FDA, UL, 3-A	FDA, UL, 3-A



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Victrex USA Inc.
3A Caledon Court
Greenville, SC 29615
USA

Phone: 800-VICTREX
Fax: 864-672-7328
E-mail: usasales@victrex.com
Website: www.victrex.com



GO Regulator
A CIRCOR Instrumentation Technologies Company
405 Centura Court
Spartanburg, SC 29303

Phone: 864-574-7966
Fax: 864-587-5608
Website: www.goreg.com

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