Turcon® M12

UNRIVALED PERFORMANCE IN HYDRAULIC SEALING

Turcon® M12 Unrivaled performance in hydraulic sealing

Turcon® M12 from Trelleborg Sealing Solutions is a polytetrafluoroethylene (PTFE) based sealing material whose performance is unrivaled in key hydraulic sealing characteristics, such as friction, wear and high pressure operation.

FEATURES AND BENEFITS OF TURCON® M12

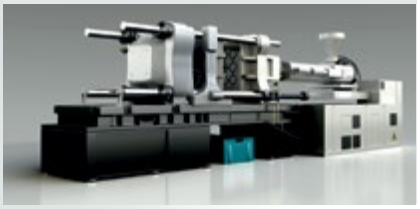
- Resistant to virtually all media including a broad range of lubricants
- Outstanding wear resistance and friction characteristics
- Provides extended seal life
- Operates in wide temperature, pressure and velocity ranges
- Minimal abrasion of hardware, preventing damage to counter surfaces
- Robust for harsh environments
- Good resistance to extrusion
- Reduced environmental impact as it does not include bronze fillers
- Sealing material for universal use in hydraulic applications
- Lower stock holding and fewer items to handle
- Cost-effective solution

No other material can give such universally exceptional performance

Extensive testing showed that Turcon® M12 is resistant to virtually all media, including a broad range of lubricants, and has outstanding wear resistance and friction characteristics. This cost-effective material also provides customers with extended seal life, as well as a wide operating window in terms of temperature, pressure and velocity. Comprehensive testing has shown that no other PTFE material can give such universally exceptional performance, and Turcon® M12 is now recommended by Trelleborg Sealing Solutions as the material of choice for a wide variety of hydraulic applications.

KEY APPLICATIONS

Turcon® M12 is the material of choice for a wide variety of hydraulic applications.

Segment	Application	Turcon® M12 advantages
Fluid power 	• Hydraulic cylinders and actuators • Giant cylinders • Hydraulic jacks • Clamping cylinders	• Compatible with all types of hydraulic fluid, including fluids with low lubrication performance • Low abrasion • Low friction for frequent movement • Avoids hardware damage on counter surface
Hydraulic machinery 	• Machine tools and machining centers • Injection molding machines • Hydraulic presses • Press brake and punching machines • Steel and rolling mills	• Low friction and suited to short stroke linear movement • Compatible with all types of hydraulic fluid, especially those fluids with low lubrication performance • Withstands constant activation • High wear resistance • Operates under high pressure • Heavy duty
Wind power 	• Hydraulic pitch cylinders • Turbine piston accumulators	• Extended seal life reduces maintenance • 24-7 operation
Automotive 	• Cylinders for convertibles • Shock absorbers • Active body control	• Avoids damage to counter surfaces • Low friction gives smooth movement • Withstands high system pressure
Mobile hydraulics 	• Lifting and telescopic cylinders • Active suspension and stabilizer cylinders	• Withstands harsh environments • High sealing efficiency • Improved absorption of abrasive contaminants
Rail 	• Shock absorbers	• Robust for difficult environments • Superior for short stroke and high frequencies

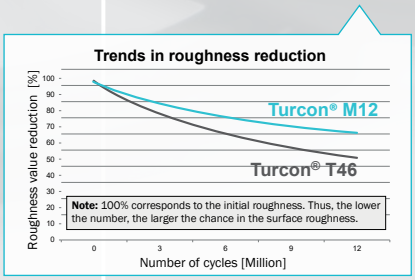
DETAILED RESULTS OF TESTS

The Turcon® M12 matrix is medium-filled with a complex mix of non-abrasive mineral fibers combined with additives. Turcon® M12 and other PTFE based sealing materials were used to produce Turcon® Stepseal® 2K, Turcon® Twinseal, Turcon® Stepseal® V and Turcon® Slydring® . The seals underwent a number of stringent test regimes to measure performance in a variety of sealing parameters critical to the effective performance of seals within hydraulic applications.

Test		Compatibility with mineral oil and environmentally-friendly hydraulic fluids	Friction mapping – performance at different pressures and speeds	Friction force Turcon® Slydring®
Details	**Lubricant**	Mineral-based HLP 46 cSt. Synthetic ester-based, biodegradable fluid, 46 cSt.	Equivis ZS 46, viscosity 46 cSt. mineral oil	Equivis ZS 46, viscosity 46 cSt. mineral oil
	Cycles	200,000	30,000	100,000
	Stroke length	280 mm/ 11 in	200 mm/ 8 in	250 mm/ 9 in
	Total length	112 kilometers/ 70 miles	12 kilometers/ 7.5 miles.	50 kilometers/ 31 miles
	Pressure	30 MPa/ 4351 psi cycle on both sides of the test cylinder	10 to 30 MPa/ 1450 to 4350 psi cycle on both sides of the cylinder	Constant 2.5 MPa/ 362 psi Side load: 8 N/mm²
	Velocity	0.20 m/s/ 0.66 ft/s	Between 0.05 m/s/ 0.16 ft/s and 0.30 m/s/ 0.98 ft/s	0.20 m/s/ 0.66 ft/s
	Temperature	+55 °C/ +131 °F	+55 °C/ +131 °F	+50 °C/ +122 °F
Result		**In mineral oil:** Turcon® M12 matched the best-in-class materials and demonstrated the lowest friction force of all compounds. In addition, it had the smallest reduction in seal profile height, resulting in the lowest overall wear and deformation. **In environmentally-friendly hydraulic fluids:** Environmentally-friendly hydraulic fluids can create challenging environments for seals. In this test some compounds showed unacceptably high leakage. Turcon® M12 gave outstanding results in terms of leakage control, and the friction force of Turcon® M12 was extremely good with excellent stability. Reduction in radial height of the profile was comparable to best-in-class materials and extrusion was acceptable. Turcon® M12 is now recommended as the material of choice for use with environmentally-friendly hydraulic fluids.	In these tests the seal must operate within the opposing effects of pressure and velocity. As pressure increases, the contact area between the seal and the rod increases and friction becomes higher. At higher velocities, friction is reduced as the coefficient of friction is decreased by a higher oil film formation. At all pressures and velocities, Turcon® M12 had the lowest friction force.	In this test, the friction additives in Turcon® M12 demonstrate their positive effect, and after the run-in period the friction is lower than all other compounds tested. The material had the combined lowest wear and deformation, leading to extended life of the Slydring® .

Note: All tests were performed with a ø 50mm/ 2 in hard chrome-plated rod.

	High-pressure wear test	Endurance Testing	Wear test – hydro pulse	Wear test – wind power specification
Lubricant	HLP 46, zinc-free mineral oil	HLP 46, zinc-free mineral oil	HLP 46, zinc-free mineral oil	HLP 46, zinc-free mineral oil
Cycles	1 million	16 million	1.3 million in 24 hours	1 million cycles both ways at a constant pressure
Stroke length	300 mm/ 12 in	300 mm/ 12 in	+/- 5 mm / 0.2 in	20 mm/ 0.8 in
Total length / Frequency	–	> 9500 km	Up to 15Hz	1Hz
Pressure	4 to 36 MPa/ 580 to 5221 psi	30 to 0 MPa/ 4351 to 0 psi	15 MPa/ 2175 psi	20 MPa/ 2900 psi
Velocity	0.14 m/s/ 0.46 ft/s (average, sine signal)	–	–	–
Temperature	+80 °C/ +176 °F	+60 °C/ +140 °F	+60 °C/ +140 °F	+80 °C/ +176 °F
	These are extreme requirements for a seal, especially in zinc-free oil. The seals in Turcon® M12 showed virtually zero wear with no micro-scratching. The material performed better than any other Turcon® compound in this test.	Looking at the results in terms of friction behavior and wear over a test distance travelling more than 9500 km, prove the results of Turcon® M12's character strength in a Tribo stable system where the Turcon® M12 seals no longer function as wear parts. Low friction as well as low wear on the seal and on the counter surface, guarantee a stable Tribo-System with a resulting benefit of a long service life.	This test proved that Turcon® M12 prevents counter surface scratching. Even after 1.3 million cycles the grinding pattern is still visible on the rod with only slight polishing of the metal surface and no micro-scratching. Turcon® M12 is particularly suited to applications where there are short-stroke, high-frequency movements.	The chrome-plated surface of the rod was only slightly polished with no micro-scratching and no seal extrusion. Roughness values stayed very constant, which enabled the tribological system between seal contact area and counter surface to run in a defined area. The surface of the seal in Turcon® M12 showed virtually no wear.



Watch the film and find out more about Turcon® M12.

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Trelleborg Sealing Solutions is a leading developer, manufacturer and supplier of precision seals, bearings and custom-molded polymer components. It focuses on meeting the most demanding needs of aerospace, automotive and general industrial customers with innovative solutions.

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