

## Torlon<sup>®</sup> 4435 polyamide-imide

Torlon® 4435 is a polyamide-imide resin specifically designed to provide exceptionally low wear performance in non-lubricated applications even at high pressure and velocity (PV) conditions. Not only is Torlon® 4435 particularly suited to applications where lubrication is impossible or undesirable, it provides an additional margin of safety for lubricated systems in the event that lubrication is lost.

The impressive flexural and compressive stiffness from cryogenic to elevated temperatures allows it

to be used for demanding load-bearing applications. The low coefficient of thermal expansion provides the ability to meet close tolerances over a wide temperature range. Due to its electrically dissipative property, this grade may also be considered for anti-static functions.

Specific applications where Torlon® 4435 may be used are thrust washers, seal rings, sliding vanes, bobbins, bushings, clutch rollers and pistons. The resin can be injection molded into complex shapes.

• High flow: Torlon® 4435-HF

Material Status	<ul> <li>Commercial: Active</li> </ul>	
Availability	<ul> <li>Africa &amp; Middle East</li> <li>Asia Pacific</li> <li>Europe</li> </ul>	<ul><li>Latin America</li><li>North America</li></ul>
Features	<ul> <li>Chemical Resistant</li> <li>Creep Resistant</li> <li>Flame Retardant</li> <li>High Heat Resistance</li> <li>High Temperature Strength</li> </ul>	<ul> <li>Low Friction</li> <li>Self Lubricating</li> <li>Semi Conductive</li> <li>Wear Resistant</li> </ul>
Uses	<ul> <li>Aerospace Applications</li> <li>Aircraft Applications</li> <li>Automotive Applications</li> <li>Bearings</li> <li>Bushings</li> <li>Cams</li> <li>Gears</li> <li>Industrial Applications</li> <li>Industrial Parts</li> </ul>	<ul> <li>Machine/Mechanical Parts</li> <li>Metal Replacement</li> <li>Rollers</li> <li>Sealing Devices</li> <li>Seals</li> <li>Thrust Washer</li> <li>Transmission Applications</li> <li>Washer</li> </ul>
RoHS Compliance	RoHS Compliant	
Forms	Pellets	
Processing Method	<ul><li>Injection Molding</li><li>Machining</li></ul>	Profile Extrusion

Physical	Typical Value Unit	Test method
Density / Specific Gravity	1.59	ASTM D792
Molding Shrinkage - Flow	0.14 %	ASTM D955
Water Absorption (24 hr)	0.12 %	ASTM D570

Mechanical	Typical Value Unit	Test method
Tensile Modulus		
	14500 MPa	ASTM D638
	9720 MPa	ASTM D1708
Tensile Strength	93.8 MPa	ASTM D638
Tensile Stress	110 MPa	ASTM D1708
Tensile Elongation		
Break	1.0 %	ASTM D638
Break <sup>1</sup>	6.0 %	ASTM D1708
Flexural Modulus		ASTM D790
23°C	14500 MPa	
232°C	10300 MPa	
Flexural Strength		ASTM D790
23°C	152 MPa	
232°C	89.6 MPa	
Compressive Modulus	8550 MPa	ASTM D695
Compressive Strength	138 MPa	ASTM D695
Poisson's Ratio	0.42	
Coefficient of Friction		ASTM D3702
2	0.29	
3	0.27	
Wear Factor		ASTM D3702
	a, a in³·m	in^-10/
Dry: 0.25 m/s, 3.4 MPa (50 fpm, 500 psi)	21.0 ft·lb·h	
Dry: 4 m/s, 0.2 MPa (800 fpm, 31.25 psi)	in³∙m 17.0 ft·lb·ł	in^-10/
	1001	
Impact	Typical Value Unit	Test method
Notched Izod Impact	43 J/m	ASTM D256
Unnotched Izod Impact	220 J/m	ASTM D4812
Thermal	Typical Value Unit	Test method
Deflection Temperature Under Load		ASTM D648
1.8 MPa, Unannealed	278 °C	
Thermal Conductivity	0.81 W/m	K ASTM C177
Coefficient of Linear Thermal Expansion	1.4E-5 cm/c	
Electrical	Typical Value Unit	Test method
Surface Resistivity	6.0E+6 ohm	
Volume Resistivity	2.0E+7 ohm	
	2.02 7 01111	ASTWD237
Injection	Typical Value Unit	
Drying Temperature	177 °C	
Drying Time	3.0 hr	
Suggested Max Moisture	0.050 %	
Rear Temperature	304 °C	

Injection	Typical Value Unit
Nozzle Temperature	371 °C
Mold Temperature	199 to 216 °C
Back Pressure	6.89 MPa
Screw Speed	50 to 100 rpm
Screw L/D Ratio	18.0:1.0 to 24.0:1.0

## **Injection Notes**

Minimum drying conditions: 3 hours at 350°F, 4 hours at 300°F, or 16 hours at 250°F. Compression Ratio: 1:1 to 1.5:1

Begin hold preasure at 6000-8000 psi for several seconds, then drop off to 3000-5000 psi for the duration of the hold pressure sequence.

Molded parts must be post cured.

## Notes

Typical properties: these are not to be construed as specifications.

<sup>1</sup> ASTM Test Method D1708 has been used to measure the tensile properties of PAI and similar materials because the small test specimen conserved material. Today the most widely used specimen is the Type 1 bar of ASTM D638.

These D1708 values are included for historical purposes and they should not be compared to the D638 values.

<sup>2</sup> Dry: 0.25 m/s, 3.4 MPa (50 fpm, 500 psi)

<sup>3</sup> Dry: 4 m/s, 0.2 MPa (800 fpm, 31.25 psi)

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