

# Torlon® 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

### General

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

### Physical

	Typical Value	Unit	Test method
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

# Torlon® 4435

polyamide-imide

<b>Mechanical</b>	<b>Typical Value</b>	<b>Unit</b>	<b>Test method</b>
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
Dry: 0.25 m/s, 3.4 MPa (50 fpm, 500 psi)	21.0	in <sup>3</sup> ·min <sup>-1</sup> - 10/ft·lb·hr	
Dry: 4 m/s, 0.2 MPa (800 fpm, 31.25 psi)	17.0	in <sup>3</sup> ·min <sup>-1</sup> - 10/ft·lb·hr	
<b>Impact</b>	<b>Typical Value</b>	<b>Unit</b>	<b>Test method</b>
Notched Izod Impact	43	J/m	ASTM D256
Unnotched Izod Impact	220	J/m	ASTM D256
<b>Thermal</b>	<b>Typical Value</b>	<b>Unit</b>	<b>Test method</b>
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/cm/°C	ASTM D696
<b>Electrical</b>	<b>Typical Value</b>	<b>Unit</b>	<b>Test method</b>
Surface Resistivity	6.0E+6	ohms	ASTM D257
Volume Resistivity	2.0E+7	ohms·cm	ASTM D257
<b>Injection</b>	<b>Typical Value</b>	<b>Unit</b>	
Drying Temperature	177	°C	
Drying Time	3.0	hr	
Suggested Max Moisture	0.050	%	
Rear Temperature	304	°C	
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		

# Torlon® 4435

polyamide-imide

## 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 pressure 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)

[www.solvay.com](http://www.solvay.com)

[SpecialtyPolymers.EMEA@solvay.com](mailto:SpecialtyPolymers.EMEA@solvay.com) | Europe, Middle East and Africa

[SpecialtyPolymers.Americas@solvay.com](mailto:SpecialtyPolymers.Americas@solvay.com) | Americas

[SpecialtyPolymers.Asia@solvay.com](mailto:SpecialtyPolymers.Asia@solvay.com) | Asia and Australia

Safety Data Sheets (SDS) are available by emailing us or contacting your sales representative. Always consult the appropriate SDS before using any of our products.

Neither Solvay Specialty Polymers nor any of its affiliates makes any warranty, express or implied, including merchantability or fitness for use, or accepts any liability in connection with this product, related information or its use. Some applications of which Solvay's products may be proposed to be used are regulated or restricted by applicable laws and regulations or by national or international standards and in some cases by Solvay's recommendation, including applications of food/feed, water treatment, medical, pharmaceuticals, and personal care. Only products designated as part of the Solviva® family of biomaterials may be considered as candidates for use in implantable medical devices. The user alone must finally determine suitability of any information or products for any contemplated use in compliance with applicable law, the manner of use and whether any patents are infringed. The information and the products are for use by technically skilled persons at their own discretion and risk and does not relate to the use of this product in combination with any other substance or any other process. This is not a license under any patent or other proprietary right.

All trademarks and registered trademarks are property of the companies that comprise the Solvay Group or their respective owners.

© 2015 Solvay Specialty Polymers. All rights reserved.

