Technical Data Sheet

Torlon® 4301
polyamide-imide

Torlon® 4301 is a wear-resistant grade of polyamide-imide (PAI) resin. It has a good balance of mechanical properties and wear resistance. It offers high flexural and compressive strength with a low coefficient of friction and outstanding wear resistance at both high velocity and high pressure conditions.

Torlon® PAI has the highest strength and stiffness of any thermoplastic up to 275°C (525°F). It has outstanding resistance to wear, creep, and chemicals.

Potential applications for Torlon® 4301 polyamide-imide include thrust washers, spline liners, valve seats, bushings, bearings, wear rings, cams and other applications requiring strength at high temperature and resistance to wear.

Injection Molding Grades:
- High Flow: Torlon® 4301 HF
- Low Flow: Torlon® 4301 LF
- Low Flow Small Pellets: Torlon® 4301 LFSP

Extrustion Grades:
- High Flow: Torlon® 4301-EXT
- Higher Flow: Torlon® 4301-HQ

General

Material Status	• Commercial: Active	
Availability	• Africa & Middle East • Asia Pacific • Europe	• Latin America • North America
Additive	• PTFE + Graphite Lubricant	
Features	• Chemical Resistant • Creep Resistant • Flame Retardant • High Heat Resistance • High Temperature Strength	• Low Friction • Self Lubricating • Semi Conductive • Wear Resistant
Uses	• Aerospace Applications • Aircraft Applications • Automotive Applications • Bearings • Bushings • Cams • Gears • Industrial Applications • Industrial Parts	• Machine/Mechanical Parts • Metal Replacement • Oil/Gas Applications • Rollers • Sealing Devices • Seals • Thrust Washer • Transmission Applications • Washer
RoHS Compliance	• RoHS Compliant	
Automotive Specifications	• BOSCH N28 BN05-OX2 N28 BN05-OX2, BN0512-CDSX-0Cgr01SO [1]	
Forms	• Pellets	

General

Processing Method	• Injection Molding • Machining	• Profile Extrusion

Physical	Typical Value	Unit	Test method
Density / Specific Gravity	1.46		ASTM D792
Molding Shrinkage - Flow	0.35 to 0.60	%	ASTM D955
Water Absorption (24 hr)	0.28	%	ASTM D570

Mechanical	Typical Value	Unit	Test method
Tensile Modulus			
--	6830	MPa	ASTM D638
-- [2]	6550	MPa	ASTM D1708
Tensile Strength	113	MPa	ASTM D638
Tensile Stress [3]	163	MPa	ASTM D1708
Tensile Elongation			
Break	3.3	%	ASTM D638
Break [2]	7.0	%	ASTM D1708
Flexural Modulus			ASTM D790
23°C	6890	MPa	
232°C	4960	MPa	
Flexural Strength			ASTM D790
23°C	215	MPa	
232°C	112	MPa	
Compressive Modulus	5310	MPa	ASTM D695
Compressive Strength	166	MPa	ASTM D695
Coefficient of Friction			ASTM D3702
-- [4]	0.31		
-- [5]	0.39		
-- [6]	0.18		
-- [7]	0.030		
Wear Factor			ASTM D3702
Dry: 0.25 m/s, 3.4 MPa (50 fpm, 500 psi)	14.0	in³·min^-10/ ft·lb·hr	
Dry: 4 m/s, 0.2 MPa (800 fpm, 31.25 psi)	17.0	in³·min^-10/ ft·lb·hr	
Lubricated: 0.25 m/s, 6.9 MPa (75 fpm, 1000 psi)	9.00	in³·min^-10/ ft·lb·hr	
Lubricated: 4 m/s, 5.2 MPa (800 fpm, 750 psi)	0.400	in³·min^-10/ ft·lb·hr	

Impact	Typical Value	Unit	Test method
Notched Izod Impact	64	J/m	ASTM D256
Unnotched Izod Impact	410	J/m	ASTM D4812

Thermal	Typical Value	Unit	Test method
Deflection Temperature Under Load			ASTM D648
1.8 MPa, Unannealed	279	°C	
Thermal Conductivity	0.53	W/m/K	ASTM C177
Coefficient of Linear Thermal Expansion	2.5E-5	cm/cm/°C	ASTM D696

Electrical	Typical Value	Unit	Test method
Surface Resistivity	8.0E+17	ohms	ASTM D257
Volume Resistivity	8.0E+15	ohms·cm	ASTM D257

Injection	Typical Value	Unit
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	

Injection Notes

Minimum drying conditions: 3 hours at 350°F (177°C), 4 hours at 300°F (149°C), or 16 hours at 250°F (121°C).
Compression Ratio: 1:1 to 1.5:1

Begin hold pressure at a high setting 6,000-8,000 psi (41.37-55.16 MPa), for several seconds, then drop off to 3,000-5,000 psi (20.69-34.48 MPa), 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.

[1] Material should be Tempered (Cured).

[2] 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.

[3] 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.

[4] Dry: 0.25 m/s, 3.4 MPa (50 fpm, 500 psi)

[5] Dry: 4 m/s, 0.2 MPa, (800 fpm, 31.25 psi)

[6] Lubricated: 0.25 m/s, 6.9 MPa (75 fpm, 1000 psi)

[7] Lubricated: 4 m/s, 5.2 MPa (800 fpm, 750 psi)

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Progress beyond

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