



## TORLON\* PAI

- Maintains strength and stiffness to 500°F (260°C)
- Minimal expansion rate to 500°F (260°C)
- Excellent wear resistance in bearing grades
- Able to endure harsh thermal, chemical and stress conditions

### Extruded or Injection Molded PAI

#### Torlon 4301 PAI - Polyamide-imide, extruded (bearing grade)

This Torlon PAI is primarily used for wear and friction parts. It offers a very low expansion rate, low coefficient of friction and exhibits little or no slip-stick in use. Torlon 4301's flexural modulus of 1,000,000 psi, is higher than most other advanced engineering plastics. This grade excels in severe service wear applications such as non-lubricated bearings, seals, bearing cages and reciprocating compressors or parts.

#### Torlon 4203 PAI - Polyamide-imide, extruded (electrical grade)

Torlon 4203 extruded PAI offers excellent compressive strength and the highest elongation of the Torlon grades. It also provides electrical insulation and exceptional impact strength. This grade is commonly used for electrical connectors and insulators due to its high dielectric strength. Torlon is the highest performing melt processable plastic. It has superior resistance to elevated temperatures. It is capable of performing under severe stress conditions at continuous temperatures to 500°F (260°C).

### Compression Molded PAI

#### Torlon 4503 (Compression Molded)

This grade is commonly used for dies and patterns of formed metal parts or as thermal insulators and isolators. It is similar in composition to Torlon 4203 PAI, and selected when larger shapes are required.

#### Torlon 4501 (Compression Molded)

Torlon 4501 PAI is well suited for general purpose wear and friction parts. It has a higher compressive strength and can therefore carry more load than Torlon 4540. It is similar in composition to Torlon 4301 PAI, and selected when larger shapes are required.

#### Torlon 4540 (Compression Molded)

This seal and bearing grade offers a very low coefficient of friction and good wear properties. It was developed specifically for use in rotating equipment. Its composition is the same as the former Torlon 4340 polyamide-imide and used when larger (especially tubular) shapes are required. Typical applications for Torlon 4540 PAI include labyrinth seals, wear rings, bushings, and bearings of all types.

#### Torlon 5530 PAI (CM) Polyamide-imide, 30% glass reinforced, compression molded

Torlon 5530 is 30% glass reinforced, compression molded PAI. It is ideal for higher load structural or electronic applications. This grade is similar in composition to Torlon 5030 PAI. It is selected for larger shapes or when the greatest degree of dimensional control is required. Torlon is the highest performing melt processable plastic. It has superior resistance to elevated temperatures. It is capable of performing under severe stress conditions at continuous temperatures to 500°F (260°C). Parts machined from Torlon stock shapes provide greater compressive strength and higher impact resistance than most advanced engineering plastics. Its extremely low coefficient of linear thermal expansion and high creep resistance deliver excellent dimensional stability over its entire use range. Torlon is an amorphous material with a T<sub>g</sub> (glass transition temperature) of 537°F (280°C).

Extruded	Rod	Disc	Plate	Tubular Bar	Other
Torlon* 4301 PAI	.025" - 2.0"	-	.250" - 1.25" (B)	-	-
Torlon* 4203 PAI	.062" - 2.0"	-	.250" - 1.25" (B)	-	-
Compression Molded	Rod	Disc	Plate	Tubular Bar	Other
Torlon* 4503 PAI	3.0" to 15.0"	4.0"-12.0" dia	-	1.50"-36.0" O.D. x .750"-29.5" ID	-
Torlon* 4501 PAI	1.5" to 15.0"	3.5"-15.0" dia	.375"-1.5" (C,E,F)	1.50"-36.0" O.D. x .750"-29.5" ID	-
Torlon* 4540 PAI	1.0" to 15.0"	3.5"-15.0" dia	.375"-1.5" (C,E,F)	1.50"-36.0" O.D. x .750"-29.5" ID	-
Torlon* 5530 PAI	.375" - 15.0"	3.5"-15.0" dia	.375"-2.0" (C,E,F)	1.50"-36.0" O.D. x .750"-29.5" ID	-

Key: B = 12" wide x 48" long C = 12" wide x 12" long E = 12" wide x 24" long F = 14" wide x 28" long

Los Angeles 800-800-0039	San Diego 858-552-0801	San Jose 800-800-2478	Seattle 800-488-7678	Portland 800-676-7678	Phoenix 800-395-7378	Denver 888-371-7678	Dallas/FtWorth 800-834-9391
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		Torlon 4301	Torlon 4203	Torlon 4503
<b>MECHANICAL PROPERTIES</b>	<b>ASTM</b>	<b>VALUE</b>	<b>VALUE</b>	<b>VALUE</b>
Specific Gravity	D792	1.45	1.41	1.4
Tensile Strength, psi	D638	12,000	18,000	18,000
Tensile Modulus, psi	D638	900,000	600,000	500,000
Elongation, %	D638	3	5	5
Flexural Strength, psi	D790	23,000	24,000	24,000
Flexural Modulus, psi	D790	800,000	600,000	600,000
Shear Strength, psi	D732	16,400	16,000	-
Compressive Strength, psi	D695, 10% Def.	22,000	24,000	18,000
Compressive Modulus, psi	D695	950,000	475,000	350,000
Hardness, Rockwell M	D785	70	80	80
Hardness, Rockwell R	D785	106	120	119
Izod Impact (Notched), ft-lb/in	D256 Type A	0.8	2	1.5
Coefficient of Friction, Dynamic	Dry vs. Steel,	0.2	0.35	0.3
Limiting PV, psi-fpm	PTM55010	10,000	4,500	3,000
k (wear) factor, 10-10in3-min/lb-ft-hr	PTM55010	473	100	200
<b>THERMAL PROPERTIES</b>				
Coefficient of Thermal Expansion,	E831 (TMA)	0.14	0.17	0.25
Deflection Temperature 264 psi, °F	D648	534	532	532
Tg-Glass Transition (Amorphous), °F	D3418	527	527	527
Continuous Service in Air (Max), °F	Without Load	500	500	500
Thermal Conductivity, BTU-in/hr-ft <sup>2</sup> -°F		3.7	1.8	1.8
<b>ELECTRICAL PROPERTIES</b>				
Dielectric Strength, Volts/mil	D149(2)	-	600	600
Volume Resistivity, Ohm-cm	D257	1E+15	1E+15	1E+15
Dielectric Constant, 1 MHz	ASTM D150(2)	6	4.2	4.2
Dissipation Factor, 1 MHz	ASTM D150(2)	0.037	0.026	0.03
<b>CHEMICAL PROPERTIES</b>				
Water Absorption Immersion, %	24 hr	0.4	0.4	0.35
Water Absorption, %	Saturation	1.5	1.7	1.7
Acids, Weak (acetic, dilute HCl)		3	3	3
Acids, Strong (conc. HCl or sulfuric)		3	3	2
Alkalies, Weak (dilute NaOH)		2	2	2
Alkalies, Strong (conc. NaOH)		1	1	1
Hydrocarbons, Aromatic (toluene)		3	3	3
Hydrocarbons, Aliphatic (gasoline)		3	3	3
Ketones, Esters (acetone)		3	3	3
Ethers (diethyl ether, THF)		3	3	3
Chlorinated Solvents (methylene chloride)		3	3	3
Alcohols (methanol, anti-freeze)		3	3	3
Inorganic Salt Solutions (NaCl, KCl)		3	3	2
Continuous Sunlight		3	2	2
Steam		1	1	1
1= Unacceptable, 2= Limited Service, 3= Acceptable Service				
<b>COMPLIANCE</b>				
Flammability, UL94 (5=V-0; 4=V-1; 3=V-2; 1=HB) V-O UL94		5 (VO)	5 (VO)	5 (VO)
FDA(1=Yes)		0 Compliant	0 Compliant	0 Compliant
USDA(1=Yes)		0 Compliant	0 Compliant	0 Compliant
NSF (1=Yes)		0 Compliant	0 Compliant	0 Compliant
3A-Dairy (1=Yes)		0 Compliant	0 Compliant	0 Compliant
Canada AG (1=Yes)		0 Compliant	0 Compliant	0 Compliant
USPClass VI (1=Yes)		1 Not Compliant	1 Not Compliant	1 Not Compliant



		Torlon 4501	Torlon 4540	Torlon 5530
<b>MECHANICAL PROPERTIES</b>	<b>ASTM</b>	<b>VALUE</b>	<b>VALUE</b>	<b>VALUE</b>
Specific Gravity	D792	1.45	1.46	1.61
Tensile Strength, psi	D638	10,000	13,000	15,000
Tensile Modulus, psi	D638	440,000	575,000	900,000
Elongation, %	D638	3	5	3
Flexural Strength, psi	D790	20,000	24,000	20,000
Flexural Modulus, psi	D790	650,000	680,000	900,000
Shear Strength, psi	D732	-	-	-
Compressive Strength, psi	D695, 10% Def.	16,000	17,000	27,000
Compressive Modulus, psi	D695	359,000	350,000	600,000
Hardness, Rockwell M	D785	70	66	85
Hardness, Rockwell R	D785	106	107	125
Izod Impact (Notched), ft-lb/in	D256 Type A	0.5	1.1	0.7
Coefficient of Friction, Dynamic	Dry vs. Steel,	0.2	0.2	0.2
Limiting PV, psi-fpm	PTM55010	7,500	7,500	5,000
k (wear) factor, 10-10in3-min/lb-ft-hr	PTM55010	25	315	300
<b>THERMAL PROPERTIES</b>				
Coefficient of Thermal Expansion,	E831 (TMA)	0.2	0.2	0.26
Deflection Temperature 264 psi, °F	D648	534	534	520
Tg-Glass Transition (Amorphous), °F	D3418	527	527	527
Continuous Service in Air (Max), °F	Without Load	500	500	500
Thermal Conductivity, BTU-in/hr-ft <sup>2</sup> -°F		3.7	-	2.5
<b>ELECTRICAL PROPERTIES</b>				
Dielectric Strength, Volts/mil	D149(2)	-	-	700
Volume Resistivity, Ohm-cm	D257	E+12	-	1E+14
Dielectric Constant, 1 MHz	ASTM D150(2)	6	-	-
Dissipation Factor, 1 MHz	ASTM D150(2)	0.04	-	-
<b>CHEMICAL PROPERTIES</b>				
Water Absorption Immersion, %	24 hr	0.3	0.3	0.32
Water Absorption, %	Saturation	1.5	1.5	1.5
Acids, Weak (acetic, dilute HCl)		3	3	3
Acids, Strong (conc. HCl or sulfuric)		2	2	2
Alkalies, Weak (dilute NaOH)		2	2	2
Alkalies, Strong (conc. NaOH)		1	1	1
Hydrocarbons, Aromatic (toluene)		3	3	3
Hydrocarbons, Aliphatic (gasoline)		3	3	3
Ketones, Esters (acetone)		3	3	3
Ethers (diethyl ether, THF)		3	3	3
Chlorinated Solvents (methylene chloride)		3	3	3
Alcohols (methanol, anti-freeze)		3	2	3
Inorganic Salt Solutions (NaCl, KCl)		2	3	2
Continuous Sunlight		3	1	2
Steam		1	1	1
1= Unacceptable, 2= Limited Service, 3= Acceptable Service				
<b>COMPLIANCE</b>				
Flammability, UL94 (5=V-0; 4=V-1; 3=V-2; 1=HB) V-O UL94		5 (VO)	5 (VO)	5 (VO)
FDA(1=Yes)		0 Compliant	0 Compliant	0 Compliant
USDA(1=Yes)		0 Compliant	0 Compliant	0 Compliant
NSF (1=Yes)		0 Compliant	0 Compliant	0 Compliant
3A-Dairy (1=Yes)		0 Compliant	0 Compliant	0 Compliant
Canada AG (1=Yes)		0 Compliant	0 Compliant	0 Compliant
USPClass VI (1=Yes)		1 Not Compliant	1 Not Compliant	1 Not Compliant



		Ryton PPS 40% Glass Reinforced Compression Molded	Ryton PPS Bearing Grade Compression Molded
<b>MECHANICAL PROPERTIES</b>	<b>ASTM</b>	<b>VALUE</b>	<b>VALUE</b>
Specific Gravity	D792	1.7	1.55
Tensile Strength, psi	D638	13,000	10,000
Tensile Modulus, psi	D638	730,000	800,000
Elongation, %	D638	2	1.5
Flexural Strength, psi	D790	23,000	15,000
Flexural Modulus, psi	D790	1,000,000	1,000,000
Shear Strength, psi	D732	24,000	-
Compressive Strength, psi	D695, 10% Def.	-	15,000
Compressive Modulus, psi	D695	1,300,000	800,000
Hardness, Rockwell M	D785	94	93
Hardness, Rockwell R	D785	125	126
Izod Impact (Notched), ft-lb/in	D256 Type A	1	1
Coefficient of Friction, Dynamic	Dry vs. Steel,	-	0.2
Limiting PV, psi-fpm	PTM55010	3,500	10,000
k (wear) factor, 10-10in3-min/lb-ft-hr	PTM55010	999	600
<b>THERMAL PROPERTIES</b>			
Coefficient of Thermal Expansion,	E831 (TMA)	0.25	0.12
Deflection Temperature 264 psi, °F	D648	490	490
Melting Point (Crystalline) Peak, °F	D3418	540	540
Continuous Service in Air (Max), °F	Without Load	450	450
Thermal Conductivity, BTU-in/hr-ft <sup>2</sup> -°F		2.1	2.2
<b>ELECTRICAL PROPERTIES</b>			
Dielectric Strength, Volts/mil	D149(2)	385	-
Volume Resistivity, Ohm-cm	D257	1E+15	-
Dielectric Constant, 1 MHz	ASTM D150(2)	-	-
Dissipation Factor, 1 MHz	ASTM D150(2)	-	-
<b>CHEMICAL PROPERTIES</b>			
Water Absorption Immersion, %	24 hr	0.02	0.02
Water Absorption, %	Saturation	0.03	0.0
Acids, Weak (acetic, dilute HCl)		3	3
Acids, Strong (conc. HCl or sulfuric)		2	2
Alkalies, Weak (dilute NaOH)		3	3
Alkalies, Strong (conc. NaOH)		3	3
Hydrocarbons, Aromatic (toluene)		3	3
Hydrocarbons, Aliphatic (gasoline)		3	3
Ketones, Esters (acetone)		3	3
Ethers (diethyl ether, THF)		3	3
Chlorinated Solvents (methylene chloride)		3	3
Alcohols (methanol, anti-freeze)		3	3
Inorganic Salt Solutions (NaCl, KCl)		3	3
Continuous Sunlight		2	3
Steam		3	3
1= Unacceptable, 2= Limited Service, 3= Acceptable Service			
<b>COMPLIANCE</b>			
Flammability, UL94 (5=V-0; 4=V-1; 3=V-2; 1=HB) V-O UL94		5 (VO)	5 (VO)
FDA(1=Yes)		0 Compliant	0 Compliant
USDA(1=Yes)		0 Compliant	0 Compliant
NSF (1=Yes)		0 Compliant	0 Compliant
3A-Dairy (1=Yes)		0 Compliant	0 Compliant
Canada AG (1=Yes)		0 Compliant	0 Compliant
USP Class VI (1=Yes)		1 Not Compliant	1 Not Compliant