

## Torlon® 4275

### polyamide-imide

Torlon 4275 is a wear-resistant grade of polyamide-imide (PAI). This grade offers an excellent balance of mechanical properties and wear resistance. It offers high tensile strength and modulus with a low coefficient of friction and outstanding wear resistance at both high velocity and high pressure conditions.

Potential applications for Torlon 4275 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.

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.

#### General

|                           |   |  |   |
|---------------------------|---|--|---|
| Material Status           | • Commercial: Active  |  |   |
| Availability              | • Africa & Middle East<br>• Asia Pacific  | • Europe<br>• North America  | • South America   |
| Additive                  | • PTFE + Graphite Lubricant   |  |   |
| Features                  | • Flame Retardant<br>• Good Chemical Resistance<br>• Good Creep Resistance  | • Good Wear Resistance<br>• High Heat Resistance<br>• High Temperature Strength  | • Low Friction<br>• Self Lubricating<br>• Semi Conductive             |
| Uses                      | • Aerospace Applications<br>• Aircraft Applications<br>• Automotive Applications<br>• Bearings<br>• Bushings<br>• Gears | • Industrial Applications<br>• Industrial Parts<br>• Machine/Mechanical Parts<br>• Metal Replacement<br>• Rollers<br>• Sealing Devices | • Seals<br>• Thrust Washer<br>• Transmission Applications<br>• Washer |
| RoHS Compliance           | • RoHS Compliant  |  |   |
| Automotive Specifications | • ASTM D4000 PAI000 L23 A22334 GA15 DZ1Z2Z3Z4Z5, Dwg 3C3P-7D019-BA<br>• CHRYSLER MS-DB405 CPN3373                       |  |   |
| Forms                     | • Pellets   |  |   |
| Processing Method         | • Injection Molding   | • Machining  | • Profile Extrusion   |

#### Physical

|                          | Typical Value | Unit              | Test Method |
|--------------------------|---------------|-------------------|-------------|
| Specific Gravity         | 1.51          | g/cm <sup>3</sup> | ASTM D792   |
| Molding Shrinkage - Flow | 0.25 to 0.45  | %                 | ASTM D955   |
| Water Absorption (24 hr) | 0.33          | %                 | ASTM D570   |

#### Mechanical

|                             | Typical Value | Unit | Test Method |
|-----------------------------|---------------|------|-------------|
| Tensile Modulus             |               |      |             |
| -- <sup>1</sup>             | 7790          | MPa  | ASTM D1708  |
| --                          | 8830          | MPa  | ASTM D638   |
| Tensile Strength            | 117           | MPa  | ASTM D638   |
| Tensile Stress <sup>2</sup> | 131           | MPa  | ASTM D1708  |

| Mechanical  | Typical Value        | Unit  | Test Method |
|---|----------------------|---|-------------|
| Tensile Elongation                                |                      |   |             |
| Break <sup>1</sup>                                | 7.0                  | %   | ASTM D1708  |
| Break   | 2.6                  | %   | ASTM D638   |
| Flexural Modulus                                  |                      |   | ASTM D790   |
| 23°C  | 7310                 | MPa   |             |
| 232°C   | 5100                 | MPa   |             |
| Flexural Strength                                 |                      |   | ASTM D790   |
| 23°C  | 208                  | MPa   |             |
| 232°C   | 110                  | MPa   |             |
| Compressive Modulus                               | 4000                 | MPa   | ASTM D695   |
| Compressive Strength                              | 123                  | MPa   | ASTM D695   |
| Coefficient of Friction                           |                      |   |             |
| -- <sup>3</sup>                                   | 0.15                 |   | ASTM D1894  |
| -- <sup>4</sup>                                   | 0.050                |   | ASTM D1894  |
| -- <sup>5</sup>                                   | 0.31                 |   | ASTM D3702  |
| -- <sup>6</sup>                                   | 0.29                 |   | ASTM D3702  |
| Wear Factor                                       |                      |   |             |
| Dry: 0.25 m/s, 3.4 MPa (50 fpm, 500 psi)          | 13.0                 | in <sup>3</sup> ·min <sup>-1</sup> /<br>10/ft·lb·hr |             |
| Dry: 4 m/s, 0.2 MPa (800 fpm, 31.25 psi)          | 17.5                 | in <sup>3</sup> ·min <sup>-1</sup> /<br>10/ft·lb·hr | ASTM D3702  |
| Lubricated: 0.375 m/s, 6.9 MPa (75 fpm, 1000 psi) | 7.00                 | in <sup>3</sup> ·min <sup>-1</sup> /<br>10/ft·lb·hr | ASTM D3702  |
| Lubricated: 4 m/s, 5.2 MPa (800 fpm, 750 psi)     | 0.700                | in <sup>3</sup> ·min <sup>-1</sup> /<br>10/ft·lb·hr | ASTM D3702  |
| Impact  | Typical Value        | Unit  | Test Method |
| Notched Izod Impact                               | 85                   | J/m   | ASTM D256   |
| Unnotched Izod Impact                             | 270                  | J/m   | ASTM D256   |
| Thermal   | Typical Value        | Unit  | Test Method |
| Deflection Temperature Under Load                 |                      |   | ASTM D648   |
| 1.8 MPa, Unannealed                               | 280                  | °C  |             |
| Thermal Conductivity                              | 0.65                 | W/m/K   | ASTM C177   |
| Coefficient of Linear Thermal Expansion           | 0.000025             | cm/cm/°C  | ASTM D696   |
| Electrical  | Typical Value        | Unit  | Test Method |
| Surface Resistivity                               | 4.0E+17              | ohms  | ASTM D257   |
| Volume Resistivity                                | 8.0E+15              | ohm·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 |   |             |

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**Injection Notes**

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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.

<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> 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>3</sup> Lubricated: 0.25 m/s, 6.9 MPa (75 fpm, 1000 psi)

<sup>4</sup> Lubricated: 4 m/s, 5.2 MPa (800 fpm, 750 psi)

<sup>5</sup> Dry: 0.25 m/s, 3.4 MPa (50 fpm, 500 psi)

<sup>6</sup> Dry: 4 m/s, 0.2 MPa (800 fpm, 31.25 psi)

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

## Contact Solvay Specialty Polymers

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

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