

# Zytel® 101L NC010

## NYLON RESIN

### Product Description

Zytel® 101L NC010 is a lubricated polyamide 66 resin for injection molding.

### General

|                               |                                                     |                                                      |                        |
|-------------------------------|-----------------------------------------------------|------------------------------------------------------|------------------------|
| Material Status               | • Commercial: Active                                |                                                      |                        |
| Availability                  | • Asia Pacific                                      | • Europe                                             | • North America        |
| Additive                      | • Lubricant                                         |                                                      |                        |
| Features                      | • Fast Molding Cycle                                | • Good Mold Release                                  | • High Flow            |
|                               | • Fatigue Resistant                                 | • Good Moldability                                   | • Low Molecular Weight |
|                               | • Fuel Resistant                                    | • Good Processability                                | • Lubricated           |
|                               | • Good Chemical Resistance                          | • Good Wear Resistance                               | • Oil Resistant        |
|                               | • Good Electrical Properties                        | • Grease Resistant                                   | • Ultrasonic Weldable  |
| Uses                          | • Appliance Components<br>• Automotive Applications | • Connectors<br>• Electrical/Electronic Applications |                        |
| RoHS Compliance               | • Contact Manufacturer                              |                                                      |                        |
| Appearance                    | • Natural Color                                     |                                                      |                        |
| Processing Method             | • Injection Molding                                 |                                                      |                        |
| Multi-Point Data              | • Isothermal Stress vs. Strain (ISO 11403-1)        | • Shear Modulus vs. Temperature (ISO 11403-1)        |                        |
| Part Marking Code (ISO 11469) | • >PA66<                                            |                                                      |                        |
| Resin ID (ISO 1043)           | • PA66                                              |                                                      |                        |
| Product Category              | • Unreinforced Resins                               |                                                      |                        |

| Physical                  | Dry  | Conditioned | Unit              | Test Method         |
|---------------------------|------|-------------|-------------------|---------------------|
| Density                   | 1.14 | --          | g/cm <sup>3</sup> | ISO 1183            |
| Molding Shrinkage         |      |             |                   |                     |
| Flow: 3.20 mm             | 1.5  | --          | %                 | Internal Method     |
| Across Flow: 2.00 mm      | 1.4  | --          | %                 | ISO 294-4           |
| Flow: 2.00 mm             | 1.4  | --          | %                 | ISO 294-4           |
| Water Absorption          |      |             |                   |                     |
| 23°C, 24 hr               | 1.2  | --          | %                 | ASTM D570           |
| Saturation, 23°C          | 8.5  | --          | %                 | ASTM D570<br>ISO 62 |
| Equilibrium, 23°C, 50% RH | 2.6  | --          | %                 | ISO 62              |
| Mechanical                | Dry  | Conditioned | Unit              | Test Method         |
| Tensile Modulus (23°C)    | 3100 | 1400        | MPa               | ISO 527-2           |

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| Mechanical                              | Dry                   | Conditioned        | Unit              | Test Method        |
|-----------------------------------------|-----------------------|--------------------|-------------------|--------------------|
| <b>Tensile Strength</b>                 |                       |                    |                   |                    |
| Yield, -40°C                            | 114                   | 110                | MPa               | ASTM D638          |
| Yield, 23°C                             | 83.0                  | 58.0               | MPa               | ASTM D638          |
| Yield, 77°C                             | 45.0                  | 34.0               | MPa               | ASTM D638          |
| Yield, 121°C                            | 33.0                  | 28.0               | MPa               | ASTM D638          |
| Yield, 23°C                             | 82.0                  | 55.0               | MPa               | ISO 527-2          |
| -40°C                                   | 114                   | 110                | MPa               | ASTM D638          |
| 23°C                                    | 83.0                  | 77.0               | MPa               | ASTM D638          |
| 77°C                                    | 62.0                  | 41.0               | MPa               | ASTM D638          |
| 121°C                                   | 43.0                  | 38.0               | MPa               | ASTM D638          |
| <b>Tensile Elongation</b>               |                       |                    |                   |                    |
| Yield, -40°C                            | 4.0                   | --                 | %                 | ASTM D638          |
| Yield, 23°C                             | 5.0                   | 25                 | %                 | ASTM D638          |
| Yield, 77°C                             | 30                    | 30                 | %                 | ASTM D638          |
| Yield, 121°C                            | 45                    | 40                 | %                 | ASTM D638          |
| Yield, 23°C                             | 4.5                   | 25                 | %                 | ISO 527-2          |
| Break, -40°C                            | 15                    | 20                 | %                 | ASTM D638          |
| Break, 23°C                             | 60                    | > 300              | %                 | ASTM D638          |
| Break, 77°C                             | > 300                 | > 300              | %                 | ASTM D638          |
| Break, 121°C                            | > 300                 | > 300              | %                 | ASTM D638          |
| Break, 23°C                             | 45                    | --                 | %                 | ISO 527-2/50       |
| Nominal Tensile Strain at Break (23°C)  | 25                    | > 100              | %                 | ISO 527-2          |
| <b>Tensile Creep Modulus</b>            |                       |                    |                   | ISO 899-1          |
| 1 hr                                    | --                    | 1400               | MPa               |                    |
| 1000 hr                                 | --                    | 820                | MPa               |                    |
| <b>Flexural Modulus</b>                 |                       |                    |                   |                    |
| -40°C                                   | 3240                  | 3450               | MPa               | ASTM D790          |
| 23°C                                    | 2830                  | 1210               | MPa               | ASTM D790          |
| 77°C                                    | 690                   | 565                | MPa               | ASTM D790          |
| 121°C                                   | 538                   | 414                | MPa               | ASTM D790          |
| 23°C                                    | 2800                  | 1200               | MPa               | ISO 178            |
| Shear Strength (23°C)                   | 66.0                  | --                 | MPa               | ASTM D732          |
| <b>Impact</b>                           | <b>Dry</b>            | <b>Conditioned</b> | <b>Unit</b>       | <b>Test Method</b> |
| <b>Charpy Notched Impact Strength</b>   |                       |                    |                   | ISO 179/1eA        |
| -30°C                                   | 4.5                   | 3.0                | kJ/m <sup>2</sup> |                    |
| 23°C                                    | 5.5                   | 15                 | kJ/m <sup>2</sup> |                    |
| <b>Charpy Unnotched Impact Strength</b> |                       |                    |                   | ISO 179/1eU        |
| -30°C                                   | 400 kJ/m <sup>2</sup> | No Break           |                   |                    |
| 23°C                                    | No Break              | No Break           |                   |                    |
| <b>Notched Izod Impact</b>              |                       |                    |                   |                    |
| -40°C                                   | 32                    | 27                 | J/m               | ASTM D256          |
| 23°C                                    | 53                    | 110                | J/m               | ASTM D256          |
| -40°C                                   | 5.5                   | --                 | kJ/m <sup>2</sup> | ISO 180/1A         |
| -30°C                                   | 5.5                   | 3.0                | kJ/m <sup>2</sup> | ISO 180/1A         |
| 23°C                                    | 5.5                   | 12                 | kJ/m <sup>2</sup> | ISO 180/1A         |
| <b>Unnotched Izod Impact Strength</b>   |                       |                    |                   | ISO 180/1U         |
| -30°C                                   | 300                   | --                 | kJ/m <sup>2</sup> |                    |
| 23°C                                    | No Break              | No Break           |                   |                    |
| <b>Tensile Impact Strength</b>          |                       |                    |                   | ASTM D1822         |
| 23°C <sup>2</sup>                       | 504                   | 1470               | kJ/m <sup>2</sup> |                    |
| 23°C <sup>3</sup>                       | 157                   | 232                | kJ/m <sup>2</sup> |                    |
| <b>Hardness</b>                         | <b>Dry</b>            | <b>Conditioned</b> | <b>Unit</b>       | <b>Test Method</b> |
| <b>Rockwell Hardness</b>                |                       |                    |                   | ASTM D785          |

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| Hardness                               | Dry     | Conditioned | Unit     | Test Method          |
|----------------------------------------|---------|-------------|----------|----------------------|
|                                        |         |             |          | ISO 2039-2           |
| M-Scale                                | 79      | 59          |          |                      |
| R-Scale                                | 121     | 108         |          |                      |
| Thermal                                | Dry     | Conditioned | Unit     | Test Method          |
| Deflection Temperature Under Load      |         |             |          |                      |
| 0.45 MPa, Unannealed                   | 210     | --          | °C       | ASTM D648            |
| 0.45 MPa, Unannealed                   | 200     | --          | °C       | ISO 75-2/B           |
| 1.8 MPa, Unannealed                    | 65.0    | --          | °C       | ASTM D648            |
| 1.8 MPa, Unannealed                    | 70.0    | --          | °C       | ISO 75-2/A           |
| Brittleness Temperature                | -80.0   | -65.0       | °C       | ASTM D746            |
| Glass Transition Temperature           | 60.0    | --          | °C       | ISO 11357-2          |
| Melting Temperature <sup>4</sup>       | 262     | --          | °C       | ISO 11357-3          |
| CLTE                                   |         |             |          | ISO 11359-2          |
| Flow: 23 to 55°C                       | 0.00010 | --          | cm/cm/°C |                      |
| Transverse: 23 to 55°C                 | 0.00011 | --          | cm/cm/°C |                      |
| Electrical                             | Dry     | Conditioned | Unit     | Test Method          |
| Surface Resistivity                    | 1.0E+12 | 1.0E+12     | ohm      | IEC 60093            |
| Volume Resistivity                     | 1.0E+14 | 1.0E+12     | ohm·cm   | IEC 60093            |
| Dielectric Constant                    |         |             |          |                      |
| 23°C, 100 Hz                           | 4.00    | 8.00        |          | ASTM D150            |
| 23°C, 1 kHz                            | 3.90    | 7.00        |          | ASTM D150            |
| 23°C, 1 MHz                            | 3.60    | 4.60        |          | ASTM D150            |
| 23°C, 100 Hz                           | 3.80    | 10.9        |          | IEC 60250            |
| 23°C, 1 MHz                            | 3.50    | 4.00        |          | IEC 60250            |
| Dissipation Factor                     |         |             |          |                      |
| 23°C, 100 Hz                           | 0.010   | 0.20        |          | ASTM D150            |
| 23°C, 1 kHz                            | 0.020   | 0.20        |          | ASTM D150            |
| 23°C, 1 MHz                            | 0.020   | 0.10        |          | ASTM D150            |
| 23°C, 100 Hz                           | 0.0080  | 0.21        |          | IEC 60250            |
| 23°C, 1 MHz                            | 0.018   | 0.075       |          | IEC 60250            |
| Comparative Tracking Index (3.00 mm)   | 600     | --          | V        | IEC 60112            |
| Electric Strength (23°C, 1.00 mm)      | 32      | --          | kV/mm    | IEC 60243-1          |
| Flammability                           | Dry     | Conditioned | Unit     | Test Method          |
| Flame Rating - UL (0.710 mm)           | V-2     | --          |          | UL 94                |
| Flammability Classification (0.710 mm) | V-2     | --          |          | IEC 60695-11-10, -20 |
| Glow Wire Flammability Index           |         |             |          | IEC 60695-2-12       |
| 0.710 mm                               | 960     | --          | °C       |                      |
| 1.50 mm                                | 960     | --          | °C       |                      |
| 3.00 mm                                | 960     | --          | °C       |                      |
| Glow Wire Ignition Temperature         |         |             |          | IEC 60695-2-13       |
| 0.710 mm                               | 725     | --          | °C       |                      |
| 1.50 mm                                | 750     | --          | °C       |                      |
| 3.00 mm                                | 800     | --          | °C       |                      |
| Oxygen Index                           |         |             |          |                      |
| --                                     | 28      | 31          | %        | ASTM D2863           |
| --                                     | 28      | --          | %        | ISO 4589-2           |
| UL                                     | Dry     | Conditioned | Unit     | Test Method          |
| RTI Str (0.710 mm)                     | 85.0    | --          | °C       | UL 746               |
| RTI Imp (0.710 mm)                     | 75.0    | --          | °C       | UL 746               |
| RTI Elec (0.710 mm)                    | 130     | --          | °C       | UL 746               |
| Comparative Tracking Index (CTI)       | > 600   | --          | V        | UL 746               |

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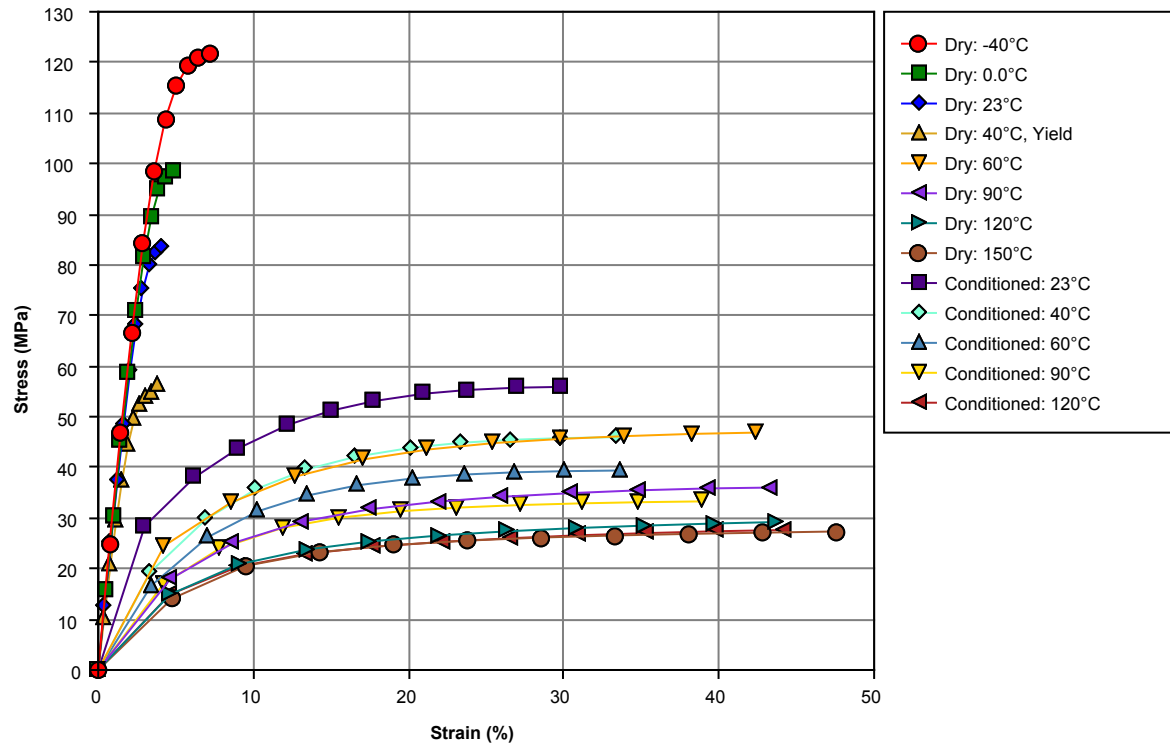
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| Injection                 | Dry Unit                                                    |
|---------------------------|-------------------------------------------------------------|
| Drying Temperature        | 80.0 °C                                                     |
| Drying Time               | 2.0 to 4.0 hr                                               |
| Suggested Max Moisture    | < 0.20 %                                                    |
| Processing (Melt) Temp    | 280 to 300 °C                                               |
| Melt Temperature, Optimum | 290 °C                                                      |
| Mold Temperature          | 50.0 to 90.0 °C                                             |
| Mold Temperature, Optimum | 70 °C                                                       |
| Drying Recommended        | Yes, if moisture content of resin exceeds recommended level |

## Isothermal Stress vs. Strain (ISO 11403-1)



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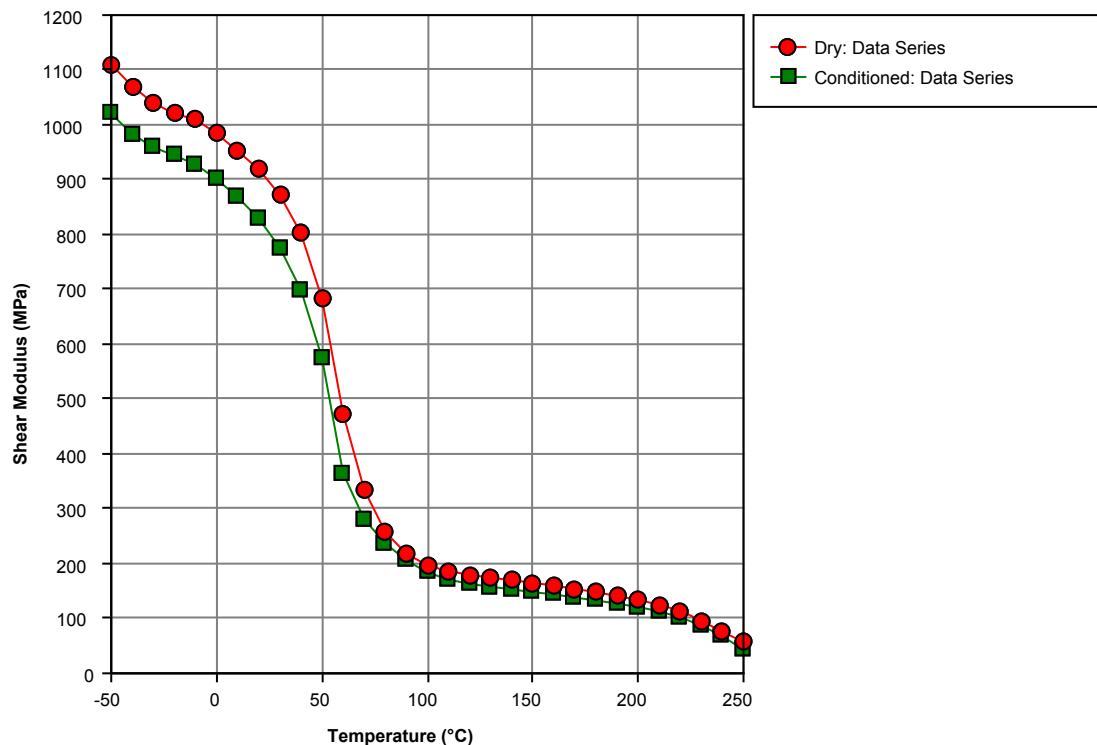


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Shear Modulus vs. Temperature (ISO 11403-1)



## Notes

<sup>1</sup> Typical properties: these are not to be construed as specifications.

<sup>2</sup> Type L

<sup>3</sup> Type S

<sup>4</sup> 10°C/min

Contact DuPont for Material Safety Data Sheet, general guides and/or additional information about ventilation, handling, purging, drying, etc.

ISO Mechanical properties measured at 4.0mm, ISO Electrical properties measured at 2.0mm, and all ASTM properties measured at 3.2mm.

Test temperatures are 23°C unless otherwise stated.

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