



### LONG CHAIN POLYAMIDE RESIN

Zytel® LCPA long chain polyamide resins provide an innovative and growing portfolio of flexible polymers with excellent thermal, chemical, and hydrolysis resistance. The diverse selection of Zytel® LCPA grades is targeted for a range of performance characteristics, balancing temperature resistance, flexibility and low permeation.

Zytel® 77G33L BK031 is a 33% glass fiber reinforced, black polyamide 612 resin for injection moulding.

| $\overline{}$ |   |               |   |     |     |     |    |    |    |   |   |    | 10 |        |   |   |
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| Product information                                   |                       |                                    |                   |  |  |
|---|-----------------------|------------------------------------|-------------------|--|--|
| Resin Identification                                  | PA612-GF33            | 3                                  | ISO 1043          |  |  |
| Part Marking Code                                     | >PA612-GF33<          | ISO 11469                          |                   |  |  |
| ISO designation                                       | ISO 16396-PA6         | ISO 16396-PA612,GF33,M1CGR,S09-090 |                   |  |  |
| 3 1 1 1 2 3 1 1 1                                     |                       | ,,,                                |                   |  |  |
| Rheological properties                                | dry/cond.             |                                    |                   |  |  |
| Melt mass-flow rate                                   | 47/*                  | g/10min                            | ISO 1133          |  |  |
| Melt mass-flow rate, Temperature                      | 250/*                 | °C                                 |                   |  |  |
| Melt mass-flow rate, Load                             | 10/*                  | kg                                 |                   |  |  |
| Viscosity number                                      | 100 <sup>[1]</sup> /* | cm <sup>3</sup> /g                 | ISO 307, 1628     |  |  |
| Moulding shrinkage, parallel                          | 0.3/-                 | %                                  | ISO 294-4, 2577   |  |  |
| Moulding shrinkage, normal                            | 0.9/-                 | %                                  | ISO 294-4, 2577   |  |  |
| Mold Shrinkage, Flow, 3.2mm (0.125in)                 | 0.2/*                 | %                                  |                   |  |  |
| Mold Shrinkage, Transverse, 3.2mm (0.125in)           | 1/*                   | %                                  |                   |  |  |
| [1]: sulphuric acid 96%                               |                       |                                    |                   |  |  |
| Typical mechanical properties                         | dry/cond.             |                                    |                   |  |  |
| Tensile modulus                                       | 9700/7900             | MPa                                | ISO 527-1/-2      |  |  |
| Tensile stress at break, 5mm/min                      | 170/140               | MPa                                | ISO 527-1/-2      |  |  |
| Tensile strain at break, 5mm/min                      | 3/3.2                 | %                                  | ISO 527-1/-2      |  |  |
| Flexural modulus                                      | 8500/-                | MPa                                | ISO 178           |  |  |
| Flexural strength                                     | 250/-                 | MPa                                | ISO 178           |  |  |
| Charpy impact strength, 23°C                          | 80/90                 | kJ/m²                              | ISO 179/1eU       |  |  |
| Charpy impact strength, -30°C                         | 60/65                 | kJ/m²                              | ISO 179/1eU       |  |  |
| Charpy notched impact strength, 23°C                  | 13/12                 | kJ/m²                              | ISO 179/1eA       |  |  |
| Charpy notched impact strength, -30°C                 | 12/10                 | kJ/m²                              | ISO 179/1eA       |  |  |
| Charpy notched impact strength, -40°C                 | 12/10                 | kJ/m²                              | ISO 179/1eA       |  |  |
| Izod notched impact strength, 23°C                    | 13/-                  | kJ/m²                              | ISO 180/1A        |  |  |
| Izod notched impact strength, -40°C                   | 11.0/-                | kJ/m²                              | ISO 180/1A        |  |  |
| Izod impact strength, 23°C                            | 60/-                  | kJ/m²                              | ISO 180/1U        |  |  |
| Poisson's ratio                                       | 0.34/0.34             |                                    |                   |  |  |
| Thermal properties                                    | dry/cond.             |                                    |                   |  |  |
| Melting temperature, 10°C/min                         | 218/*                 | °C                                 | ISO 11357-1/-3    |  |  |
| Glass transition temperature, 10°C/min                | 65/55                 | °C                                 | ISO 11357-1/-3    |  |  |
| Temperature of deflection under load, 1.8 MPa         | 200/*                 | °C                                 | ISO 75-1/-2       |  |  |
| Coeff. of linear therm. expansion, parallel, -40-23°C | 26/*                  | E-6/K                              | ISO 11359-1/-2    |  |  |
| Coefficient of linear thermal expansion               | 20/*                  | E-6/K                              | ISO 11359-1/-2    |  |  |
| (CLTE), parallel                                      |                       |                                    | · · · · · · · · · |  |  |
| Coeff. of linear therm. expansion, parallel, 55-160°C | 14/*                  | E-6/K                              | ISO 11359-1/-2    |  |  |
| • • • • • •   |                       |                                    |                   |  |  |

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| Coeff. of linear therm. expansion, normal, -40-23°C Coefficient of linear thermal expansion (CLTE),  | 83/*<br>110/*  | E-6/K<br>E-6/K   | ISO 11359-1/-2<br>ISO 11359-1/-2  |
|--|--|--|---|
| normal Coeff. of linear therm. expansion, normal, 55-160°C Thermal conductivity, flow Thermal conductivity of melt Specific heat capacity of melt Specific heat capacity solid RTI, electrical, 0.75mm RTI, electrical, 1.5mm RTI, electrical, 3.0mm RTI, strength, 1.5mm RTI, strength, 3.0mm RTI, strength, 3.0mm TGA curve  | 160/* 0.42 0.26 2100 950 105 120 120/* 120 available                       | E-6/K W/(m K) W/(m K) J/(kg K) °C °C °C °C               | ISO 11359-1/-2 ISO 22007-2 ISO 22007-2 ISO 22007-4 ISO 22007-4 UL 746B UL 746B UL 746B UL 746B UL 746B UL 746B ISO 11359-1/-2   |
| Flammability   | dry/cond.  |  |   |
| Burning Behav. at 1.5mm nom. thickn. Thickness tested UL recognition Burning Behav. at thickness h Thickness tested UL recognition Glow Wire Flammability Index, 0.75mm Glow Wire Flammability Index, 1.5mm Glow Wire Flammability Index, 3.0mm Glow Wire Ignition Temperature, 0.75mm Glow Wire Ignition Temperature, 1.5mm Glow Wire Ignition Temperature, 3.0mm FMVSS Class Burning rate, Thickness 1 mm  Electrical properties | HB/* 1.5/* yes/* HB/* 0.71/* yes/* 675/- 675/- 700/- 700/- 700/- 725/- B 5 | class<br>mm<br>class<br>mm<br>°C<br>°C<br>°C<br>°C<br>°C | IEC 60695-11-10 IEC 60695-11-10 UL 94 IEC 60695-11-10 IEC 60695-11-10 UL 94 IEC 60695-2-12 IEC 60695-2-12 IEC 60695-2-12 IEC 60695-2-13 |
| Volume resistivity   | 2E12/-   | Ohm.m  | IEC 62631-3-1   |
| Surface resistivity Electric strength  | */>1E15<br>46/-  | Ohm<br>kV/mm   | IEC 62631-3-2<br>IEC 60243-1  |
| Comparative tracking index   | 600/-  |  | IEC 60112   |
| Physical/Other properties  | dry/cond.  |  |   |
| Humidity absorption, 2mm   | 0.7/*  | %  | Sim. to ISO 62  |
| Water absorption, Immersion 24h Density  | 0.1 /*<br>1320 / -   | %<br>kg/m³   | Sim. to ISO 62<br>ISO 1183  |
| VDA Properties   | dry/cond.  |  |   |
| Weather stability delta I  | 36   |  | DIN 53236   |
| Weather stability delta a  | -0.2   |  | DIN 53236   |
| Weather stability delta b Weather stability delta E  | 10<br>37   |  | DIN 53236<br>DIN 53236  |
| Weather stability grey scale   | 3 <i>1</i><br>1  |  | ISO 105-A02   |
|  |  |  |   |

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### LONG CHAIN POLYAMIDE RESIN

Fogging, G-value (condensate) 0.1/\* mg ISO 6452

#### Injection

| Drying Recommended              | yes      |      |
|---------------------------------|----------|------|
| Drying Temperature              | 80       | °C   |
| Drying Time, Dehumidified Dryer | 2 - 4    | h    |
| Processing Moisture Content     | ≤0.2     | %    |
| Melt Temperature Optimum        | 290      | °C   |
| Min. melt temperature           | 280      | °C   |
| Max. melt temperature           | 300      | °C   |
| Screw tangential speed          | ≤0.2     | m/s  |
| Mold Temperature Optimum        | 100      | °C   |
| Min. mould temperature          | 70       | °C   |
| Max. mould temperature          | 120      | °C   |
| Hold pressure range             | 50 - 100 | MPa  |
| Hold pressure time              | 3        | s/mm |

#### Characteristics

Processing Injection Moulding

#### **Automotive**

 OEM
 STANDARD

 Bosch
 N28 BN05-OX020

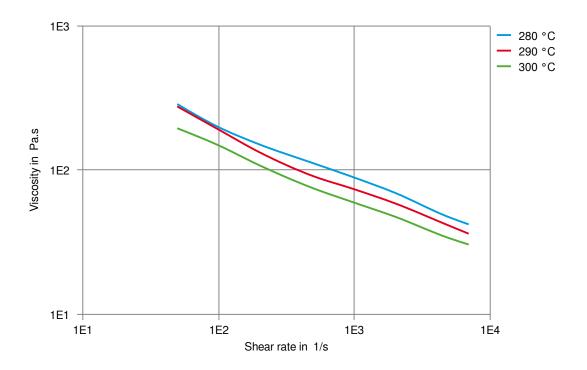
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Viscosity-shear rate



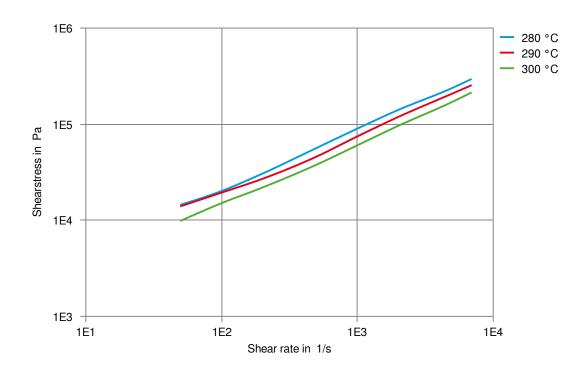
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Shearstress-shear rate



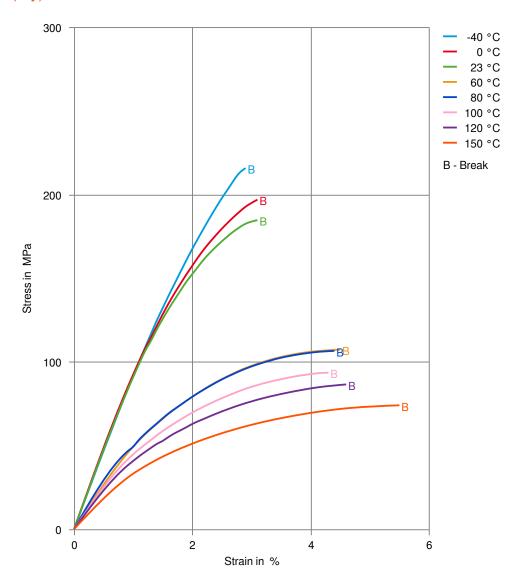
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### LONG CHAIN POLYAMIDE RESIN

Stress-strain (dry)



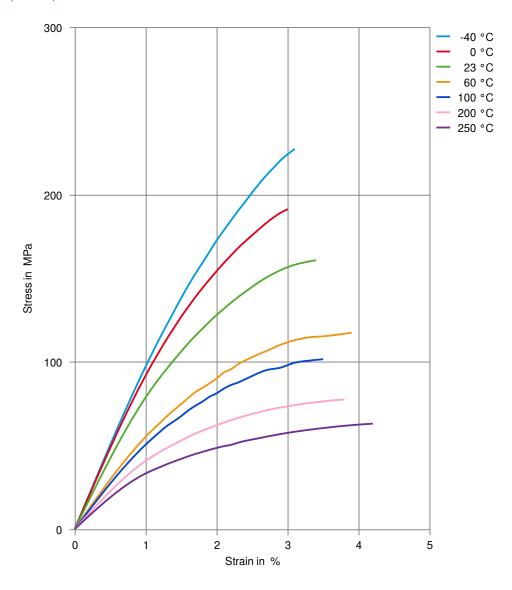
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### LONG CHAIN POLYAMIDE RESIN

Stress-strain (cond.)



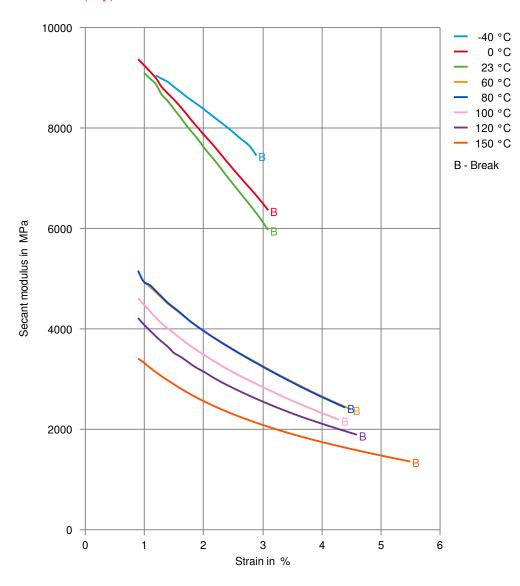
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### LONG CHAIN POLYAMIDE RESIN

Secant modulus-strain (dry)



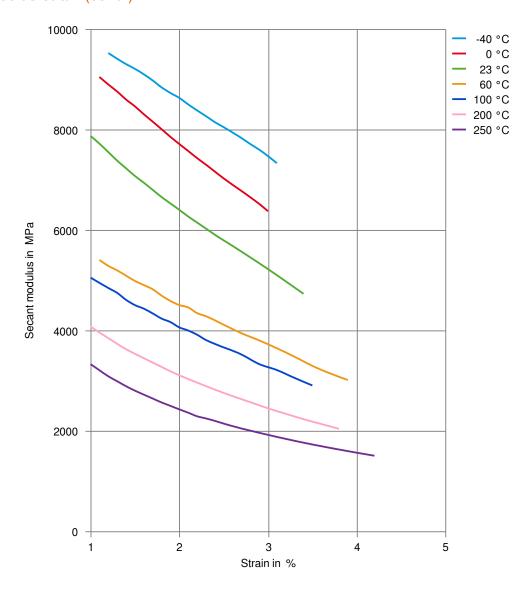
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### LONG CHAIN POLYAMIDE RESIN

Secant modulus-strain (cond.)



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#### LONG CHAIN POLYAMIDE RESIN

#### Chemical Media Resistance

#### Other

- ✓ Ethylene Glycol (50% by mass) in water, 108°C
- ✓ Water, 23°C
- ✓ Water, 90°C
- ✓ Coolant Glysantin G48, 1:1 in water, 125°C

#### Symbols used:

✓ possibly resistant

Defined as: Supplier has sufficient indication that contact with chemical can be potentially accepted under the intended use conditions and expected service life. Criteria for assessment have to be indicated (e.g. surface aspect, volume change, property change).

🗙 not recommended - see explanation

Defined as: Not recommended for general use. However, short-term exposure under certain restricted conditions could be acceptable (e.g. fast cleaning with thorough rinsing, spills, wiping, vapor exposure).

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Revised: 2025-05-01 Source: Celanese Materials Database

NOTICE TO USERS: Values shown are based on testing of laboratory test specimens and represent data that fall within the standard range of properties for natural material. These values alone do not represent a sufficient basis for any part design and are not intended for use in establishing maximum, minimum, or ranges of values for specification purposes. Colourants or other additives may cause significant variations in data values. Properties of moulded parts can be influenced by a wide variety of factors including, but not limited to, material selection, additives, part design, processing conditions and environmental exposure. Other than those products expressly identified as medical grade (including by MT® product designation or otherwise), Celanese's products are not intended for use in medical or dental implants. Regardless of any such product designation, any determination of the suitability of a particular material and part design for any use contemplated by the users and the manner of such use is the sole responsibility of the users, who must assure themselves that the material as subsequently processed meets the needs of their particular product or use. To the best of our knowledge, the information contained in this publication is accurate; however, we do not assume any liability whatsoever for the accuracy and completeness of such information. The information contained in this publication should not be construed as a promise or guarantee of specific properties of our products. It is the sole responsibility of the users to investigate whether any existing patents are infringed by the use of the materials mentioned in this publication. Moreover, there is a need to reduce human exposure to many materials to the lowest practical limits in view of possible adverse effects. To the extent that any hazards may have been mentioned in this publication, we neither suggest nor guarantee that such hazards are the only ones that exist. We recommend that persons intending to rely on any recommendation or to use any e

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