



ISO 1043

ISO 11359-1/-2

ISO 11359-1/-2

## Zytel® FE5382 BK276

### 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.

PA612-GF33

Zytel® FE5382 BK276 is a 33% glass fiber reinforced, heat stabilized, black polyamide 612 resin developed for electrical bobbins and encapsulation applications.

### **Product information**

Resin Identification

Part Marking Code ISO designation	>PA612-GF33<  SO 16396-PA612,GF33,MCG1HR,S10-100		ISO 1043 ISO 11469 S1HR S10-100
·	100 10000 1710	,	,670 700
Rheological properties	dry/cond.		
Viscosity number	105 <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)	0.3/*	%	
Mold Shrinkage, Transverse, 3.2mm (0.125in)	1/*	%	
[1]: sulfuric acid 96%			
Typical mechanical properties	dry/cond.		
Tensile modulus	10000/8000	MPa	ISO 527-1/-2
Tensile stress at break, 5mm/min	180/150	MPa	ISO 527-1/-2
Tensile strain at break, 5mm/min	3/4	%	ISO 527-1/-2
Flexural modulus	9000/7500	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	12/12	kJ/m²	ISO 179/1eA
Charpy notched impact strength, -40°C	10/9	kJ/m²	ISO 179/1eA
Izod notched impact strength, 23°C	11/-	kJ/m²	ISO 180/1A
Izod notched impact strength, -40°C	10.0/-	kJ/m²	ISO 180/1A
Izod impact strength, 23°C	80/-	kJ/m²	ISO 180/1U
Poisson's ratio	0.34/0.34		
Shore D hardness, 15s	84/-		ISO 48-4 / ISO 868
Thermal properties	dry/cond.		
Melting temperature, 10°C/min	218/*	°C	ISO 11357-1/-3
Temperature of deflection under load, 1.8 MPa	200/*	°C	ISO 75-1/-2
Temperature of deflection under load, 0.45 MPa	216/*	°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 (CLTE), parallel	20/*	E-6/K	ISO 11359-1/-2
Coeff. of linear therm. expansion, parallel, 55-160°C	14/*	E-6/K	ISO 11359-1/-2

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83/\*

110/\*

E-6/K

E-6/K

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Coeff. of linear therm. expansion, normal, -40-23°C

Coefficient of linear thermal expansion (CLTE),

normal





## LONG CHAIN POLYAMIDE RESIN

Coeff. of linear therm. expansion, normal, 55-160°C Thermal conductivity of melt Specific heat capacity of melt RTI, electrical, 0.75mm RTI, electrical, 1.5mm RTI, electrical, 3.0mm RTI, impact, 0.75mm RTI, impact, 1.5mm RTI, impact, 1.5mm RTI, strength, 0.75mm RTI, strength, 0.75mm RTI, strength, 1.5mm RTI, strength, 3.0mm	160/* 0.26 2130 65 65 65 65 65 65 65 65 65	E-6/K W/(m K) J/(kg K) °C °C °C °C °C °C °C	ISO 11359-1/-2 ISO 22007-2 ISO 22007-4 UL 746B
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, 1.0mm Glow Wire Flammability Index, 2.0mm Glow Wire Flammability Index, 3.0mm Glow Wire Ignition Temperature, 1.0mm Glow Wire Ignition Temperature, 2.0mm Glow Wire Ignition Temperature, 3.0mm FMVSS Class Burning rate, Thickness 1 mm  Electrical properties	HB/* 1.5/* yes/* HB/* 0.75/* yes/* 725/- 750/- 750/- 750/- 750/- 8 50  dry/cond.	class mm class mm °C °C °C °C °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 Surface resistivity Electric strength	1E13/1E12 */>1E15 34/-	Ohm.m Ohm kV/mm	IEC 62631-3-1 IEC 62631-3-2 IEC 60243-1
Comparative tracking index	600/600		IEC 60112
Physical/Other properties  Humidity absorption, 2mm  Water absorption, 2mm  Density  Density of melt	dry/cond. 0.8/* 1.8/* 1320/- 1120	% % kg/m³ kg/m³	Sim. to ISO 62 Sim. to ISO 62 ISO 1183
VDA Properties  Weather stability delta I Weather stability delta a Weather stability delta b Weather stability delta E Weather stability grey scale Fogging, G-value (condensate)	dry/cond.  9 -0.2 -0.5 9 2 0.1/*	mg	DIN 53236 DIN 53236 DIN 53236 DIN 53236 ISO 105-A02 ISO 6452

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### LONG CHAIN POLYAMIDE RESIN

### Injection

Drying Recommended	yes	
Drying Temperature	80	°C
Drying Time, Dehumidified Dryer	2 - 4	h
Processing Moisture Content	≤0.15	%
Melt Temperature Optimum	290	°C
Min. melt temperature	280	°C
Max. melt temperature	300	°C
Mold Temperature Optimum	100	°C
Min. mould temperature	70	°C
Max. mould temperature	120	°C
Ejection temperature	181	°C

### Characteristics

Processing Injection Moulding

Delivery form Pellets

Additives Release agent, Low halide content Special characteristics Heat stabilised or stable to heat

### **Automotive**

OEM STANDARD
Bosch N28 BN05-OX019

Stellantis B62\_0300\_61/216E/213M/12/C1B

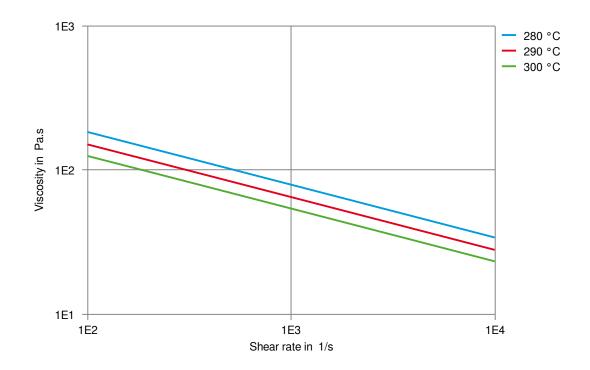
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LONG CHAIN POLYAMIDE RESIN

Viscosity-shear rate



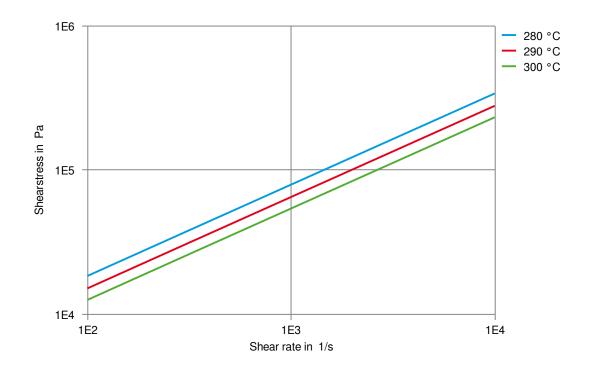
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LONG CHAIN POLYAMIDE RESIN

Shearstress-shear rate



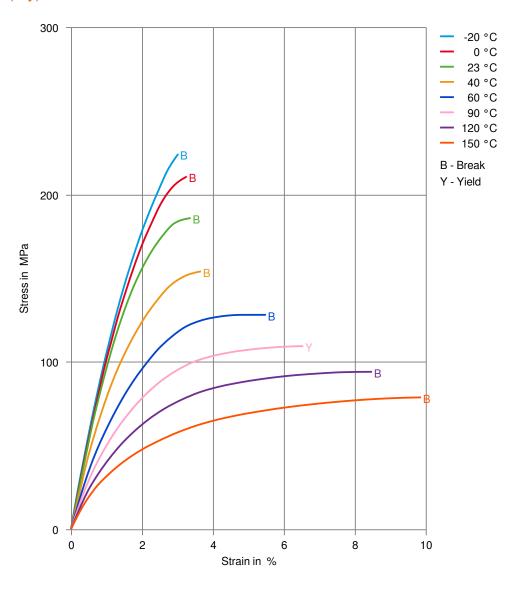
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### LONG CHAIN POLYAMIDE RESIN

Stress-strain (dry)



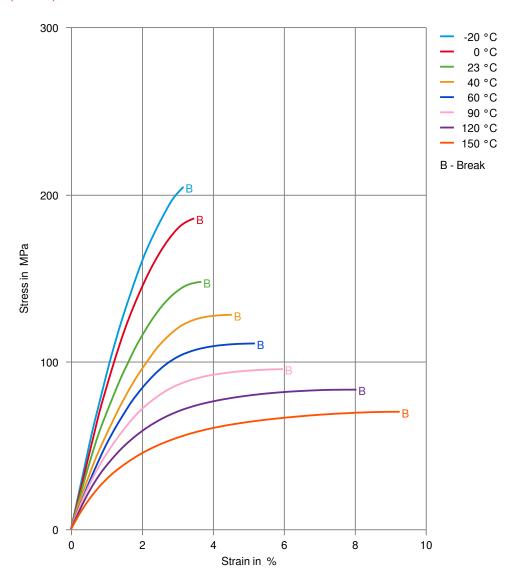
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### LONG CHAIN POLYAMIDE RESIN

Stress-strain (cond.)



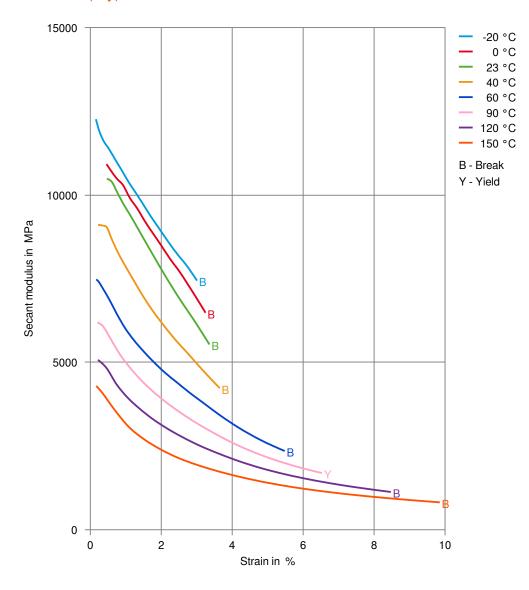
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### LONG CHAIN POLYAMIDE RESIN

Secant modulus-strain (dry)



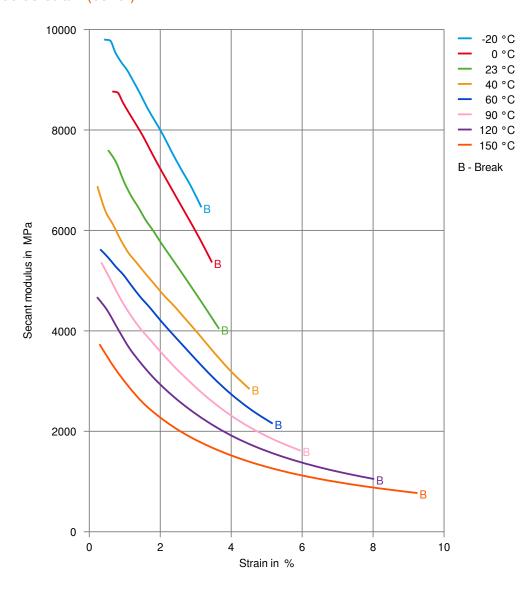
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### LONG CHAIN POLYAMIDE RESIN

Secant modulus-strain (cond.)



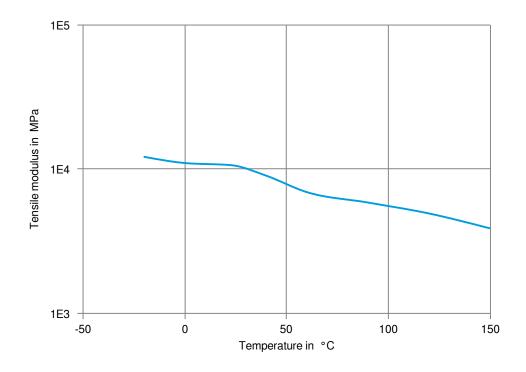
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Tensile modulus-temperature (dry)



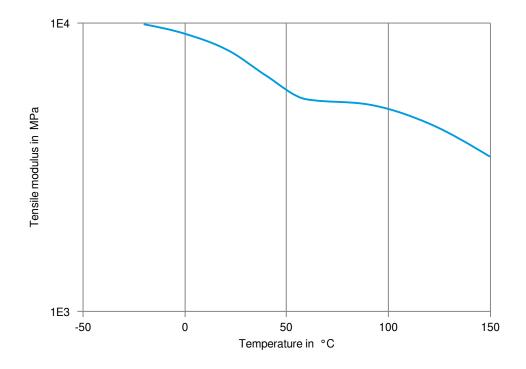
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Tensile modulus-temperature (cond.)



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### LONG CHAIN POLYAMIDE RESIN

### Chemical Media Resistance

#### Acids

- ✓ Acetic Acid (5% by mass), 23°C
- ✓ Citric Acid solution (10% by mass), 23°C
- ✓ Lactic Acid (10% by mass), 23°C
- X Hydrochloric Acid (36% by mass), 23°C
- X Nitric Acid (40% by mass), 23°C
- X Sulfuric Acid (38% by mass), 23°C
- X Sulfuric Acid (5% by mass), 23°C
- X Chromic Acid solution (40% by mass), 23°C

#### Bases

- X Sodium Hydroxide solution (35% by mass), 23°C
- ✓ Sodium Hydroxide solution (1% by mass), 23°C
- ✓ Ammonium Hydroxide solution (10% by mass), 23°C

#### **Alcohols**

- ✓ Isopropyl alcohol, 23°C
- ✓ Methanol, 23°C
- ✓ Ethanol, 23°C

#### Hydrocarbons

- ✓ n-Hexane, 23°C
- ✓ Toluene, 23°C
- ✓ iso-Octane, 23°C

### Ketones

✓ Acetone, 23°C

### **Ethers**

✓ Diethyl ether, 23°C

### Mineral oils

- ✓ SAE 10W40 multigrade motor oil, 23°C
- ✓ SAE 10W40 multigrade motor oil, 130°C
- ✓ SAE 80/90 hypoid-gear oil, 130°C
- ✓ Insulating Oil, 23°C

#### Standard Fuels

- ✓ ISO 1817 Liquid 1 E5, 60°C
- ✓ ISO 1817 Liquid 2 M15E4, 60°C
- ✓ ISO 1817 Liquid 3 M3E7, 60°C
- ✓ ISO 1817 Liquid 4 M15, 60°C
- ✓ Standard fuel without alcohol (pref. ISO 1817 Liquid C), 23°C
- ✓ Standard fuel with alcohol (pref. ISO 1817 Liquid 4), 23°C
- ✓ Diesel fuel (pref. ISO 1817 Liquid F), 23°C
- ✓ Diesel fuel (pref. ISO 1817 Liquid F), 90°C
- ✓ Diesel fuel (pref. ISO 1817 Liquid F), >90°C
- ✓ Diesel EN 590, 100°C

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#### Salt solutions

- ✓ Sodium Chloride solution (10% by mass), 23°C
- X Sodium Hypochlorite solution (10% by mass), 23°C
- ✓ Sodium Carbonate solution (20% by mass), 23°C
- ✓ Sodium Carbonate solution (2% by mass), 23°C
- ✓ Zinc Chloride solution (50% by mass), 23°C

#### Other

- ✓ Ethyl Acetate, 23°C
- X Hydrogen peroxide, 23°C
- ✓ DOT No. 4 Brake fluid, 130°C
- ✓ Ethylene Glycol (50% by mass) in water, 108°C
- √ 1% nonylphenoxy-polyethyleneoxy ethanol in water, 23°C
- ✓ 50% Oleic acid + 50% Olive Oil, 23°C
- ✓ Water, 23°C
- ✓ Water, 90°C
- X Phenol solution (5% by mass), 23°C
- ✓ Urea solution (32.5% by mass), 23°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).

x 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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