

PEEK-OPTIMA™ Natural LT1 (Granules)

General Information

Product Description

High performance biocompatible thermoplastic material, PolyEtherEtherKetone (PEEK), semi crystalline. Granules for injection moulding and extrusion, standard flow, for use in long term human implantation. Colour natural/beige.

Typical Application Areas

For use in applications requiring high strength, high stiffness, and high ductility. Suitable for use in long-term implantable medical devices. Excellent sterilisation resistance. As PEEK is hygroscopic, drying before use is recommended. Further information is available upon request.

PEEK-OPTIMA™ is known for its outstanding biocompatibility, chemical resistance, and mechanical strength. PEEK-OPTIMA™ Natural provides a reliable and versatile solution for short and long-term implants.

Material Properties

| Physical | Nominal Value | Unit | Test Method |
|--|---------------|-------------------|-----------------|
| Density (23°C) | 1.30 | g/cm ³ | ISO 1183 |
| Melt Mass-Flow Rate (MFR) (400°C/2.16 kg) | 3.7 | g/10 min | Internal Method |
| Spiral Flow ¹ | 11.5 | cm | Internal Method |
| Molding Shrinkage | | | ASTM D955 |
| Flow | 1.3 | % | |
| Across Flow | 1.6 | % | |
| Water Absorption (Equilibrium, 23°C, 50% RH) | 0.50 | % | ISO 62 |
| Crystallinity DSC | 30.0 | % | Internal Method |
| Mechanical | Nominal Value | Unit | Test Method |
| Tensile Modulus ² (23°C) | 5940 | MPa | ISO 527-1 |
| Tensile Stress | | | ISO 527-2 |
| Yield, 23°C ³ | 104 | MPa | |
| Yield, 23°C ⁴ | 100 | MPa | |
| Yield, 23°C ⁵ | 96.9 | MPa | |
| Tensile Strain | | | ISO 527-2 |
| Break, 23°C ³ | 29 | % | |
| Break, 23°C ⁴ | 34 | % | |
| Break, 23°C ⁵ | 28 | % | |
| Flexural Modulus | | | |
| 23°C ³ | 4100 | MPa | ISO 178 |
| 23°C ⁵ | 3800 | MPa | ISO 178 |
| Flexural Stress | | | ISO 178 |
| Yield, 23°C ³ | 168 | MPa | |
| Yield, 23°C ⁴ | 164 | MPa | |
| Yield, 23°C ⁵ | 156 | MPa | |
| 3.5% Strain, 23°C ⁵ | 122 | MPa | |
| Compressive Modulus ⁵ (23°C) | 3970 | MPa | ISO 604 |
| Compressive Stress ⁵ (23°C) | 130 | MPa | ISO 604 |
| Shear Modulus ⁵ (23°C) | 1150 | MPa | ISO 15310 |
| Shear Strength ⁵ (23°C) | 91.2 | MPa | ASTM D732 |

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| Mechanical | Nominal Value | Unit | Test Method |
|--|---------------|-------------------|-----------------|
| Poisson's Ratio ⁵ (23°C) | 0.36 | | ASTM D638 |
| Impact | Nominal Value | Unit | Test Method |
| Notched Izod Impact Strength | | | ISO 180 |
| 23°C ³ | 6.7 | kJ/m ² | |
| 23°C ⁴ | 7.3 | kJ/m ² | |
| 23°C ⁵ | 7.2 | kJ/m ² | |
| Hardness | Nominal Value | Unit | Test Method |
| Rockwell Hardness (M-Scale, 23°C) | 99 | | ISO 2039-2 |
| Thermal | Nominal Value | Unit | Test Method |
| Glass Transition Temperature (Onset) | 145 | °C | ISO 11357-2 |
| Melting Temperature | 340 | °C | ISO 11357-3 |
| CLTE | | | ASTM D696 |
| Flow : 50 to 120°C | 4.1E-5 | cm/cm/°C | |
| Flow : 170 to 220°C | 1.2E-4 | cm/cm/°C | |
| Flow : 220 to 270°C | 1.5E-4 | cm/cm/°C | |
| Transverse : 50 to 120°C ⁶ | 3.5E-5 | cm/cm/°C | |
| Transverse : 50 to 120°C | 6.5E-5 | cm/cm/°C | |
| Transverse : 170 to 220°C ⁶ | 8.5E-5 | cm/cm/°C | |
| Transverse : 170 to 220°C | 1.3E-4 | cm/cm/°C | |
| Transverse : 220 to 270°C ⁶ | 1.1E-4 | cm/cm/°C | |
| Transverse : 220 to 270°C | 1.6E-4 | cm/cm/°C | |
| Specific Heat | | | Internal Method |
| 37°C ⁷ | 1170 | J/kg/°C | |
| 37°C ⁸ | 2630 | J/kg/°C | |
| 400°C ⁹ | 1400 | J/kg/°C | |
| Recrystallization Temperature (Peak) | 294 | °C | ISO 11357-3 |
| Fill Analysis | Nominal Value | Unit | Test Method |
| Melt Viscosity 1000 s ⁻¹ (400°C) | 440 | Pa·s | Internal Method |
| Melt Stability 1000 s ⁻¹ , 1 hr (400°C) | 1.0 | % | Internal Method |
| Shear Viscosity 100 s ⁻¹ (400°C) | 958 | Pa·s | Internal Method |
| Shear Viscosity 1000 s ⁻¹ (400°C) | 353 | Pa·s | Internal Method |
| Shear Viscosity 10000 s ⁻¹ (400°C) | 96.9 | Pa·s | Internal Method |
| Shear Viscosity 200 s ⁻¹ (400°C) | 734 | Pa·s | Internal Method |
| Shear Viscosity 2000 s ⁻¹ (400°C) | 246 | Pa·s | Internal Method |
| Shear Viscosity 400 s ⁻¹ (400°C) | 534 | Pa·s | Internal Method |
| Shear Viscosity 4000 s ⁻¹ (400°C) | 170 | Pa·s | Internal Method |

Typical Processing Information

| Injection | Nominal Value | Unit |
|------------------------|---------------|------|
| Drying Temperature | 120 to 150 | °C |
| Drying Time | 3.0 to 5.0 | hr |
| Suggested Max Moisture | 0.020 | % |
| Hopper Temperature | < 100 | °C |
| Rear Temperature | 355 | °C |
| Middle Temperature | 360 to 365 | °C |
| Front Temperature | 370 | °C |
| Nozzle Temperature | 375 | °C |

PEEK-OPTIMA™ Natural LT1 (Granules)

| Injection | Nominal Value | Unit |
|-------------------|---------------|------|
| Mould Temperature | 180 to 200 | °C |

Injection Notes

Drying Temperature / Time: 150°C / 3h or 120°C / 5h (residual moisture <0.02%)

Runner: Die / Nozzle >3 mm, Manifold >3.5 mm

Gate: >1 mm or 0.5 x part thickness

Important Notes:

1) Processing conditions quoted in our datasheets are typical of those used in our processing laboratories

- Data for mould shrinkage should be used for material comparison. Actual mould shrinkage values are highly dependent on part geometry, mould configuration, and processing conditions.
- Mould shrinkage differs for along flow and across flow directions. "Along flow" direction is taken as the direction the molten material is travelling when it exits the gate and enters the mould.
- Mould shrinkage is expressed as a percent change in dimension of a specimen in relation to mould dimensions.

2) Data are generated in accordance with prevailing national, international and internal standards, and should be used for material comparison.

Actual property values are highly dependent on part geometry, mould configuration and processing conditions. Properties may also differ for along flow and across flow directions.

Detailed data available on our website www.invibio.com or upon request.

Notes

¹ 1.00 mm

² 0.05 – 0.25%

³ 3-Cycles Steam

⁴ 75 kGy Gamma

⁵ As Moulded

⁶ Through Flow

⁷ Amorphous

⁸ Crystalline

⁹ Molten

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