

## PEEK-OPTIMA™ Reinforced LT1CA30 (Granules)

### General Information

#### Product Description

High performance biocompatible thermoplastic material, 30% carbon fibre reinforced PolyEtherEtherKetone (PEEK), semi crystalline. Granules for injection moulding and extrusion, standard flow, for use in long term human implantation. Colour black.

#### 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.

This grade combines the biocompatibility of PEEK with the high strength and stiffness of carbon fiber. It is specifically designed for applications requiring higher strength or stiffness.

### Material Properties

Physical	Nominal Value	Unit	Test Method
Density (23°C)	1.40	g/cm <sup>3</sup>	ISO 1183
Melt Mass-Flow Rate (MFR) (400°C/2.16 kg)	11	g/10 min	Internal Method
Spiral Flow <sup>1</sup>	5.80	cm	Internal Method
Molding Shrinkage			ASTM D955
Flow	0.090	%	
Across Flow	0.81	%	
Water Absorption (Equilibrium, 23°C, 50% RH)	0.59	%	ISO 62
Crystallinity DSC	30.0	%	Internal Method
Mechanical	Nominal Value	Unit	Test Method
Tensile Modulus <sup>2</sup> (23°C)	19100	MPa	ISO 527-1
Tensile Stress			ISO 527-2
Yield, 23°C <sup>3</sup>	214	MPa	
Yield, 23°C <sup>4</sup>	225	MPa	
Yield, 23°C <sup>5</sup>	233	MPa	
Tensile Strain			ISO 527-2
Break, 23°C <sup>3</sup>	1.2	%	
Break, 23°C <sup>4</sup>	1.6	%	
Break, 23°C <sup>5</sup>	1.7	%	
Flexural Modulus			ISO 178
23°C <sup>3</sup>	22000	MPa	
23°C <sup>4</sup>	21000	MPa	
23°C <sup>5</sup>	20000	MPa	
Flexural Stress			ISO 178
Yield, 23°C <sup>3</sup>	300	MPa	
Yield, 23°C <sup>4</sup>	339	MPa	
Yield, 23°C <sup>5</sup>	388	MPa	
3.5% Strain, 23°C <sup>5</sup>	322	MPa	
Compressive Modulus <sup>5</sup> (23°C)	5920	MPa	ISO 604
Compressive Stress <sup>5</sup> (23°C)	186	MPa	ISO 604
Shear Modulus <sup>5</sup> (23°C)	2740	MPa	ISO 15310

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Mechanical	Nominal Value	Unit	Test Method
Shear Strength <sup>5</sup> (23°C)	105	MPa	ASTM D732
Poisson's Ratio <sup>5</sup> (23°C)	0.40		ASTM D638
Impact	Nominal Value	Unit	Test Method
Notched Izod Impact Strength			
23°C <sup>3</sup>	8.7	kJ/m <sup>2</sup>	ISO 180
23°C <sup>4</sup>	10.0	kJ/m <sup>2</sup>	ISO 180
Hardness	Nominal Value	Unit	Test Method
Rockwell Hardness (M-Scale, 23°C)	108		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	6.3E-6	cm/cm/°C	
Flow : 170 to 220°C	1.5E-5	cm/cm/°C	
Flow : 220 to 270°C	3.1E-5	cm/cm/°C	
Transverse : 50 to 120°C	4.8E-5	cm/cm/°C	
Transverse : 50 to 120°C <sup>6</sup>	5.4E-5	cm/cm/°C	
Transverse : 170 to 220°C	1.2E-4	cm/cm/°C	
Transverse : 170 to 220°C <sup>6</sup>	1.7E-4	cm/cm/°C	
Transverse : 220 to 270°C	1.5E-4	cm/cm/°C	
Transverse : 220 to 270°C <sup>6</sup>	2.1E-4	cm/cm/°C	
Specific Heat			Internal Method
37°C <sup>7</sup>	1260	J/kg/°C	
37°C <sup>8</sup>	2400	J/kg/°C	
400°C <sup>9</sup>	1360	J/kg/°C	
Recrystallization Temperature (Peak)	284	°C	ISO 11357-3
Fill Analysis	Nominal Value	Unit	Test Method
Melt Viscosity 1000 s <sup>-1</sup> (400°C)	920	Pa·s	Internal Method
Melt Stability 1000 s <sup>-1</sup> , 1 hr (400°C)	1.0	%	Internal Method
Shear Viscosity 100 s <sup>-1</sup> (400°C)	2306	Pa·s	Internal Method
Shear Viscosity 1000 s <sup>-1</sup> (400°C)	677	Pa·s	Internal Method
Shear Viscosity 10000 s <sup>-1</sup> (400°C)	237	Pa·s	Internal Method
Shear Viscosity 200 s <sup>-1</sup> (400°C)	1632	Pa·s	Internal Method
Shear Viscosity 2000 s <sup>-1</sup> (400°C)	460	Pa·s	Internal Method
Shear Viscosity 400 s <sup>-1</sup> (400°C)	1105	Pa·s	Internal Method
Shear Viscosity 4000 s <sup>-1</sup> (400°C)	320	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	375	°C
Middle Temperature	380 to 385	°C
Front Temperature	390	°C
Nozzle Temperature	395	°C

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Injection	Nominal Value	Unit
Mould Temperature	180 to 210	°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](http://www.invibio.com) or upon request.

## Notes

<sup>1</sup> 1.00 mm

<sup>2</sup> 0.05 – 0.25%

<sup>3</sup> 3-Cycles Steam

<sup>4</sup> 75 kGy Gamma

<sup>5</sup> As Moulded

<sup>6</sup> Through Flow

<sup>7</sup> Amorphous

<sup>8</sup> Crystalline

<sup>9</sup> Molten

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