

What is PEI

PEI natural

Polyetherimide (PEI)

Polyetherimide (PEI) is an amorphous high-performance plastic that combines high mechanical strength and stiffness with very good temperature resistance. Unlike many other high-performance plastics, PEI is inherently flame retardant and generates very little smoke in case of fire, without the need for added flame retardants. In its unreinforced, natural form the material is amber-coloured and transparent.

Material Character

PEI belongs to the group of amorphous high-performance plastics. Its polymer chain contains repeating imide and ether groups, which give the material its characteristic combination of high strength, good heat deflection resistance and inherent flame retardancy – without the need for halogenated flame retardants.

PEI is characterised by high stiffness even at elevated temperatures and retains its dimensional stability over a wide service range. Continuous service temperature is around 170 °C, with short-term exposure possible up to about 210 °C.

The material has very low moisture absorption and therefore high dimensional accuracy. Its electrical insulation properties remain largely constant even under thermal load, which makes it attractive for electrical and electronic applications.

Advantages and Limitations

Advantages

- High strength and stiffness even at high temperatures
- Inherently flame retardant (UL 94 V0) without added flame retardants
- Low smoke and toxicity generation in case of fire
- High dimensional stability due to low moisture absorption
- Very good electrical insulation properties
- Good resistance against high-energy radiation

Disadvantages

- Comparatively brittle under notch and impact loading
- Limited resistance to certain alkalis and some organic solvents
- Higher material cost than standard and many engineering plastics
- Amber-coloured transparency – no colour-neutral version available

Processing

PEI can be machined well with conventional machine tools, such as milling, turning and drilling. Before machining, the semi-finished product should be at room temperature and/or stored for at least 24 hours under normal ambient conditions so that internal stresses in the material are relieved.

Due to its low moisture absorption, the dimensional accuracy of finished parts remains very good even after machining.

Typical Properties

- High stiffness even at high temperatures
- Inherently flame retardant (UL 94 V0)
- Low smoke development in case of fire
- Good resistance against high-energy radiation
- Amber-coloured transparent

Product Examples

- Insulating components in electronics manufacturing
- Wafer handling components in the semiconductor industry
- Structural components in aerospace
- Precision parts for testing and measurement technology

Typical Industries

- Electrical industry
- Electronics
- Aerospace
- Semiconductor industry (front-end, wafer handling, back-end, high/low temperature)

	Test Method	Unit	Value
General Properties			
Density	DIN EN ISO 1183-1	g / cm ³	1.27
Water absorption	DIN EN ISO 62	%	0.5
Flammability (thickness 3 mm / 6 mm)	UL 94		V0 / V0
Mechanical Properties			
Yield stress	DIN EN ISO 527	MPa	110
Elongation at break	DIN EN ISO 527	%	12
Tensile modulus of elasticity	DIN EN ISO 527	MPa	3100
Notched impact strength	DIN EN ISO 179	kJ / m ²	4
Shore hardness	DIN EN ISO 868	scale D	86
Thermal Properties			
Thermal conductivity	DIN 52612-1	W / (m * K)	0.24
Thermal capacity	DIN 52612	kJ / (kg * K)	1.10
Coefficient of linear thermal expansion	DIN 53752	10 ⁻⁶ / K	45
Service temperature, long term	Average	°C	-50 ... 170
Service temperature, short term (max.)	Average	°C	210
Heat deflection temperature	DIN EN ISO 75, method A, HDT	°C	200
Electrical Properties			
Dielectric constant	IEC 60250		3.2
Dielectric dissipation factor (50 Hz)	IEC 60250		0.0015
Volume resistivity	DIN EN 62631-3-1	Ω * cm	10 ¹⁵
Surface resistivity	DIN EN 62631-3-2	Ω	10 ¹⁵
Comparative tracking index (CTI)	IEC 60112		150
Dielectric strength	IEC 60243	kV / mm	30

The values stated are average values secured through continuous statistical testing and conform to the requirements of DIN EN 15860. They serve as information for material selection and are not a legally binding guarantee of specific properties.