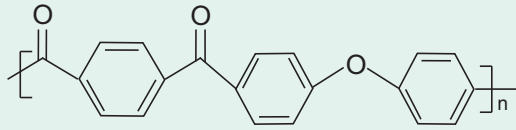




PEKK

(Polyether Ketone Ketone: GAPEKK™)

GAPEKK™ combines high temperature stability, strength, stiffness and ease of processing. PEKK has superior temperature resistance than other ketone base polymers (PEK & PEEK). It has excellent creep resistance, wear and radiation resistance and also inherent flame retardancy.



PEKK : Polyether Ketone Ketone

Advantages of GAPEKK™

- High (300°C) continuous service temperature.
- Highest Compressive strength in ketone family polymers, making it suitable for off-shore & aerospace applications.
- Excellent electrical resistance at high temperature.
- Retention of mechanical and physical properties over 30°C higher than other PEKK standard polymer supporting higher loads at elevated temperature up to 300° without permanent deformation.
- Excellent gamma radiation resistance, making it suitable for nuclear power applications.
- Excellent hydrolysis resistance at high temperatures.
- Excellent chemical resistance at high temperatures.

1. GAPEKK™ Grades

GAPEKK is available in a variety of grades for specific applications. The main grades available are provided below.

Standard Unfilled PEKK Polymers

Virgin PEKK polymer is available as powder in following grades:

Grade	Powder	Applications
3100PF	Low Flow	Compression Molding
3200P	Standard Flow	Compounding/Extrusion
3300P	Medium Flow	Compounding/Extrusion

Granules are also available as general purpose extrusion & injection molding grades.

Grade	Granules	Applications
3200G	Standard Flow	Injection Molding/Stock shapes
3300G	Medium Viscosity	Injection Molding/Compounding
3400P	High Flow	Composite

Glass/Carbon Fiber Filled Grades

The addition of glass fiber reinforcement greatly increases the general mechanical properties at a given temperature (tensile strength, flexural strength and flexural modulus), and reduces the elongation at break and impact strength at ambient temperatures. Carbon fiber filled grades of PEK also have much reduced thermal expansion rates and greatly improved thermal conductivity.

Grade	Fiber Filled
GAPEKK™ 3230GF	30% Glass Fiber, Standard flow, Brown in color.
GAPEKK™ 3230CF	30% Carbon Fiber, Standard flow, Black in color.

Tribological Grade

GAPEKK™ has excellent wear resistance properties like PEEK & PEK. Tribological grades are a combination of carbon fiber, PTFE, graphite/MoS₂ reinforced in Polyether ketone.

Grade	Tribological Grades
GAPEKK™ 3230FC	Standard Flow, Carbon/Glass Fiber, Graphite, PTFE & MoS ₂

2. Heat Distortion Temperature

The short term thermal performance of material can be characterized by determining the Heat distortion temperature (HDT, ASTM D648).

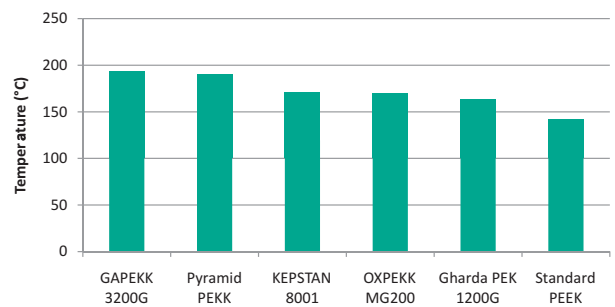


Fig. 1 Heat Distortion Temperature for Range of High Performance Materials.

A comparative chart of different grades of virgin PEKK using ASTM D648, HDT values (Fig. 1) for a defined applied stress of 1.82 MPa shows that Gharda PEKK polymer is superior to most of the other polymeric materials.

3. Compressive Strength

Compressive strength was evaluated in accordance with ASTM D 695 at room temperatures. Fig. 2 shows compressive strength of PEKK from different manufacturer. Gharda PEKK polymer exhibits higher compressive strength as compared to competitive PEKK & PEK.



Properties of GAPEKK™ : Polyether Ketone Ketone

PROPERTY	TEST METHOD	UNIT	GAPEKK™ 3200G	GAPEKK™ 3300G	GAPEKK™ 3230CF	GAPEKK™ 3230GF	GAPEKK™ 3230FC
General Properties							
Solid Density	23°C	g/cc	1.3	1.3	1.41	1.51	1.41
Water Absorption	GSRF	%	0.1	0.1	0.1	0.1	0.1
Hardness Shore D	ASTM D 2240	D	88	88	91	91	91
Thermal Properties							
Glass Transition Temperature (T _g)	DSC	°C	175	176	175	175	175
Melting Point	DSC	°C	390	390	390	390	390
Heat Deflection Temperature (HDT)	ASTM D 648 / 1.8 MPa	°C	194	194	385	381	360
Continuous Use Temperature (Expected)	UL 746B	°C	300	300	300	300	300
Mechanical Properties at 23°C							
Tensile Strength	ASTM D 638	MPa	110	85	260	170	130
Tensile Modulus	ASTM D 638	MPa	4000	4000	28440	11500	18000
Elongation at Break	ASTM D 638	%	10-15	5-10	2.6	2.7	1.8
Compressive Strength	ASTM D 785	MPa	145	129	196	162	165
Compressive Modulus	ASTM D 785	MPa	2000	2100	2950	2700	2200
Flexural Strength	ASTM D 790	MPa	190	185	435	261	215
Flexural Modulus	ASTM D 790	MPa	4400	4400	26330	11900	14100
Izod Impact Strength (Notched)	ASTM D 256	J/m	45	35	60	60	40

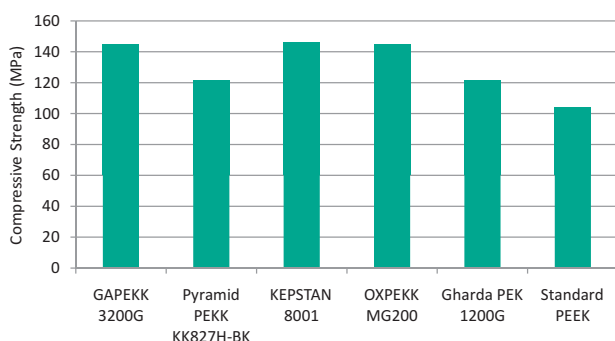


Fig. 2 Compressive Strength for a range of High Temperature Engineering Polymers.

4. Processing

GAPEKK™ (PEKK) can be processed by injection molding, extrusion as well as compression molding similar to other engineering plastics. The screw and barrel assembly should be of bimetallic construction. Melting point of PEKK is 391°C and therefore, barrel and cylinder temperature should be set at a higher value, between 390 ~ 420°C. The mold temperature should be around 200-220°C.

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GAPEKK™ absorbs about 0.05 - 0.1 % moisture and therefore, it needs pre-drying at 150-180°C for 2-3 hours by dehumidifier or air circulating type dryer. GAPEKK is relatively less thermally stable and degradation may occur beyond residence time of 20 minutes during injection molding & extrusion.

5. Applications

- Automotive: Gear, Bushes, Friction Bearing
- Oil & Gases: Off shore oil & gas production and test lines, Gas & water injection lines, Gas lift lines
- Medical- Body Implants, Sterilizing Hardware, Dental Tools, Drug Delivery
- Coating: Electrostatic coating, cookware's, industrial part coating
- Textile: Yarn & Thread Guides, Wear Plates, Bearing & bushings

