CNC MACHINING

PEEK

High Performance Thermoplastic

PEEK offers exceptional chemical resistance, thermal stability, and mechanical strength, making it a premier choice for CNC machined components used in extreme environments.



MACHINING ENVELOPE	LEAD TIME	TOLERANCE	PROCESS
1000 × 600 × 500 mm	5-7 business days	±0.050 mm typical	CNC Machining

MECHANICAL PROPERTIES

PEEK delivers dependable strength, stiffness and toughness, handling demanding load conditions while its balanced mechanical profile prevents brittleness in critical applications. It suits downhole tool components, seals and instrument parts that need long-term durability in harsh service.

MCAM reports tensile strength at yield, and the wide gap between elongation at yield and at break shows how far the material stretches before it fails. Unnotched samples do not break, while notched values are far lower, so generous internal radii at corners and thread roots keep the full toughness of the material in machined parts.

PROPERTY	VALUE	TEST STANDARD
Tensile Strength	**110 MPa**	ASTM D638
Tensile Modulus	**4340 MPa**	ASTM D638
Elongation at Yield	**5 %**	ASTM D638
Elongation at Break	**40 %**	ASTM D638
Flexural Strength	**172 MPa**	ASTM D790
Flexural Modulus	**4140 MPa**	ASTM D790
Compressive Strength (10% deformation)	**138 MPa**	ASTM D695
Shear Strength	**55 MPa**	ASTM D732
Izod Impact Strength, Notched	**32 J/m**	ASTM D256 Type A
Charpy Impact Strength, Unnotched	**No break**	ISO 179-1/1eU
Charpy Impact Strength, Notched	**3.5 kJ/m²**	ISO 179-1/1eA
Rockwell Hardness M	**100**	ASTM D785
Rockwell Hardness R	**126**	ASTM D785

THERMAL PROPERTIES

PEEK withstands repeated thermal cycling, which suits aerospace, medical and oil and gas parts mounted near heat sources. Heat deflection shows the short-term limit under load. The continuous service temperature is a long-term ageing limit in air, after which about half the room-temperature tensile strength remains, and strength falls steadily as temperature rises, so size loaded parts from strength at operating temperature.

Expansion climbs steeply in the top temperature band as PEEK passes its glass transition, so check clearances against metal parts at operating temperature. The oxygen index shows that PEEK needs far more oxygen than air contains to keep burning.

PROPERTY	VALUE	TEST STANDARD
Melting Temperature	**340 °C**	ASTM D3418
HDT @ 1.8 MPa	**160 °C**	ASTM D648
Continuous Service Temperature (air, 20,000 h)	**250 °C**	—
Minimum Service Temperature	**-50 °C**	—
Thermal Conductivity (23 °C)	**0.25 W/m·K**	ASTM F433
Coefficient of Linear Expansion (−40 to 150 °C)	**47 ×10^{-6}/K**	ASTM E831
Coefficient of Linear Expansion (23 to 100 °C)	**50 ×10^{-6}/K**	—
Coefficient of Linear Expansion (23 to 150 °C)	**55 ×10^{-6}/K**	—
Coefficient of Linear Expansion (above 150 °C)	**130 ×10^{-6}/K**	—
Oxygen Index	**35 %**	ISO 4589-1/-2

PHYSICAL PROPERTIES

Low density keeps PEEK parts light, and very low moisture absorption keeps them on size in humid or wet service. Consistent density keeps downstream finishing predictable, so assemblies fit without secondary rework.

Friction, wear rate and limiting PV come from dry bearing tests against steel. Use them to size unlubricated bearing parts; the PV limit already includes MCAM's safety factor.

PROPERTY	VALUE	TEST STANDARD
Density	**1.31 g/cm^3**	ASTM D792
Water Absorption (24 h, 23 °C)	**0.10 %**	ASTM D570
Water Absorption (saturation, 23 °C)	**0.5 %**	ASTM D570
Dynamic Coefficient of Friction (dry vs. steel)	**0.32**	QTM 55007
Wear Rate (pin-on-disk vs. steel)	**28 µm/km**	ISO 7148-2
Limiting PV (100 ft/min, 4:1 safety factor)	**0.298 MPa·m/s**	QTM 55007

ELECTRICAL PROPERTIES

PEEK is an electrical insulator, neither conductive nor static dissipative, which suits connector bodies and instrumentation housings in integrated electrical systems.

Volume resistivity describes insulation through the part and surface resistivity across its faces. The dielectric constant and dissipation factor are measured at 1 MHz and help evaluate dielectric losses in signal-sensitive or high-frequency use.

PROPERTY	VALUE	TEST STANDARD
Volume Resistivity	**10^{14} Ω·cm**	IEC 62631-3-1
Surface Resistivity	**10^{13} Ω**	ANSI/ESD STM 11.11
Dielectric Strength (short term)	**18.9 kV/mm**	ASTM D149
Dielectric Constant (1 MHz)	**3.3**	ASTM D150
Dissipation Factor (1 MHz)	**0.003**	ASTM D150

CHEMICAL PROPERTIES

Victrex immersed unfilled PEEK test bars for at least seven days at 23, 100 and 200 °C. PEEK resists hot water, strong alkalis, oils and hydraulic fluids up to 200 °C, and fuels, ketones and chlorinated solvents at room temperature, while concentrated sulfuric and nitric acid, chlorine and phenol attack it.

These are PEEK polymer screening data, and MCAM's category ratings for Ketron 1000 PEEK agree with them. MCAM rates continuous sunlight as limited, so protect outdoor parts from UV. Confirm chemical ratings with application-specific testing before production release.

CHEMICAL	23 °C	100 °C	200 °C
Water vapour (steam)	**No interaction**	**No interaction**	**No interaction**
Water	**No interaction**	**No interaction**	**No interaction**
Sea water	**No interaction**	**No interaction**	**Not tested**
Sodium hydroxide 50%	**No interaction**	**No interaction**	**No interaction**
Hydrochloric acid 10%	**No interaction**	**No interaction**	**Not tested**
Hydrochloric acid, concentrated	**No interaction**	**Slight interaction**	**Not tested**
Phosphoric acid 50%	**No interaction**	**No interaction**	**No interaction**
Sulfuric acid below 40%	**Slight interaction**	**Slight interaction**	**Slight interaction**
Sulfuric acid above 40%	**Severe interaction**	**Severe interaction**	**Severe interaction**
Nitric acid 10%	**No interaction**	**No interaction**	**Not tested**
Nitric acid 30%	**Slight interaction**	**Not tested**	**Not tested**
Nitric acid, concentrated	**Severe interaction**	**Severe interaction**	**Severe interaction**
Acetone	**No interaction**	**No interaction**	**Not tested**
Methyl ethyl ketone (MEK)	**No interaction**	**Slight interaction**	**Severe interaction**
Methylene chloride	**No interaction**	**Not tested**	**Not tested**
Toluene	**No interaction**	**Not tested**	**Not tested**
Gasoline	**No interaction**	**No interaction**	**Not tested**
Motor oil	**No interaction**	**No interaction**	**No interaction**

Brake fluid (polyglycol)	**No interaction**	**No interaction**	**No interaction**
Skydrol hydraulic fluid	**No interaction**	**Not tested**	**Not tested**
Hydrogen peroxide	**No interaction**	**No interaction**	**Not tested**
Sodium hypochlorite	**No interaction**	**No interaction**	**Not tested**
Chlorine	**Severe interaction**	**Severe interaction**	**Severe interaction**
Phenol, concentrated	**Severe interaction**	**Severe interaction**	**Severe interaction**

COMPLIANCE

MCAM lists natural Ketron 1000 PEEK as compliant with FDA 21 CFR 177 food-contact regulations; other colours can carry different approvals. The NORSOK M-710 certification covers MCAM's extruded Ketron 1000 PEEK stock shapes, and programs qualify finished parts from that supplier data.

MCAM estimates a UL 94 V-0 rating at 3 mm from raw-material data, as stock shapes have no UL file number. Ketron 1000 PEEK has no biocompatibility data, so medical parts with body contact need a life-science PEEK grade, such as one pre-assessed to ISO 10993 and USP Class VI for contact under 24 hours.

STANDARD	STATUS
FDA 21 CFR 177 (Food contact) Food-contact compliance listed for natural Ketron 1000 PEEK; other colours can carry different approvals	MCAM statement
NORSOK M-710 (sour gas ageing) Extruded Ketron 1000 PEEK stock shapes are NORSOK M-710 certified for oil, gas and subsea sealing, seat and back-up parts	MCAM certified shapes
UL 94 flammability Estimated rating at 3 mm from raw-material data; no UL file number for stock shapes	V-0 (estimated)

MANUFACTURING

Colours & finishes	**Deburring, annealing, polishing and threading**
Surface finish	**As-machined Ra 1.6-3.2 µm; precision finish Ra 0.4 µm**
Minimum wall thickness	**1.5 mm for plastic parts**