

NUCLEAR FUSION SYSTEMS

High-Performance Plastics for Next-Generation Energy

Modern Plastics supplies precision-engineered polymer components for high-field tokamak and HTS magnet assemblies. Our materials deliver exceptional electrical insulation, vacuum integrity, and cryogenic stability under extreme temperature and radiation.

WHY IT MATTERS IN FUSION

- Electrical & thermal insulation
- Cryogenic strength & stability
- Ultra-high vacuum sealing
- Radiation & heat resistance
- Precision machining & traceability



PLASTICS ENGINEERED FOR FUSION PERFORMANCE

1 PEEK VACUUM FLANGE GASKET

High-temperature sealing ring machined from PEEK to maintain ultra-high-vacuum integrity while electrically isolating stainless-steel flanges.

2 BORATED POLYETHYLENE

SHIELDING Neutron radiation shielding to protect people and equipment.

3 G10 / GLASS-EPOXY SPACER

Glass-fiber-reinforced epoxy spacers support and insulate superconducting magnet coils at cryogenic temperature.

4 PEEK / POLYIMIDE COIL INSULATION

SLEEVE Rigid insulating channels separate HTS magnet windings,

preventing arcing and minimizing heat generation during current ramps.

5 CRYOGENIC SUPPORT STANDOFF

G10 per MIL-I-24768/2 composite standoffs hold cold magnet structures inside cryostats—strong, dimensionally stable, and low conductivity.

6 ULTEM / PEEK DIAGNOSTIC SENSOR

HOUSING Vacuum-compatible, low-out-gassing housings for optics and instrumentation around the plasma chamber.

7 VESPEL POLYIMIDE VALVE SEAT

/ STEM TIP High-temperature, radiation-resistant valve components for tritium gas control and containment.

CERTIFICATIONS

- ▶ ISO 9001:2015 and AS9100D REGISTERED
- ▶ ISO 9001:2015 and AS9120B REGISTERED
- ▶ ISO 13485: 2016 REGISTERED



- ▶ ASTM Compliant
- ▶ FDA 21 CFR 177.2470
- ▶ Full Material Traceability / Lot & Batch Reports

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TECHNICAL REFERENCE & APPLICATIONS

Advanced Polymer Components for Fusion Systems

1

PEEK VACUUM FLANGE GASKET

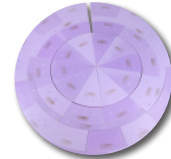
Precision-machined from high-purity PEEK, this gasket maintains ultra-high-vacuum integrity and provides electrical insulation between metal flanges. Used in high-field tokamak systems where welded joints are replaced with serviceable polymer seals.



2

BORATED POLYETHYLENE

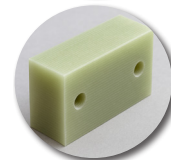
Borated polyethylene is a crucial material for nuclear fusion and other radiation shielding because it effectively absorbs neutrons.



3

G10 GLASS-EPOXY SPACER

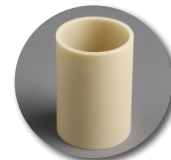
Structural laminates used to support and insulate superconducting coils. These cryogenic-grade materials carry mechanical loads, provide dielectric isolation, and limit heat transfer into cold zones.



4

PEEK / POLYIMIDE COIL INSULATION SLEEVE

Rigid insulating sleeves and channels separate HTS magnet windings, preventing arcing and reducing heat buildup. Designed for high voltage and rapid current ramping inside superconducting magnet coils.



5

CRYOGENIC SUPPORT STANDOFF

Fiberglass-epoxy composite standoffs hold cold magnet structures inside cryostats. Engineered to withstand heavy loads at liquid nitrogen and helium temperatures with minimal thermal conductivity.



6

DIAGNOSTIC SENSOR HOUSING / INSTRUMENT MOUNT

Machined from Ultem or PEEK, these housings support optical sensors, alignment modules, and diagnostic hardware. Low-out-gassing and radiation-tolerant for vacuum and plasma environments.



7

VESPEL POLYIMIDE VALVE SEAT / STEM TIP

High-temperature, radiation-resistant Vespel polyimide components used in tritium valve systems. Maintain sealing performance through repeated thermal and pressure cycling.



ADDITIONAL CAPABILITIES

- Custom CNC Machining of All Plastics
- Full Certification Documentation
- Bar Coding & Traceability
- Large Inventory of High-Performance Plastics
- Global Distribution & Technical Support

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