

# TORLON® 4203 PAI and GLASS-REINFORCED TORLON® 4XG PAI

Lighter, Smaller, Higher Performance Solenoid Valve Seals for the Aerospace Industry



## TRENDS

Manufacturers of aerospace systems typically are challenged with finding materials that afford lighter weight and extreme performance. Smaller design packages are often the route, a particular challenge for systems that must perform at extremes of heat and cold under high loads and often in aggressive fluids.

## QEPP ANSWERS

A manufacturer of micro-solenoid valves contacted Quadrant for material selection support with a new design. Quadrant recommended TORLON® 4203 PAI and TORLON® 4XG (5030) PAI machining stock for the component, a rotating seal. The application needed to perform above 149°C and manage the loads of high pressure gas transport.

## CUSTOMER BENEFITS

TORLON® PAI provided an unmatched combination of temperature resistance, dimensional stability via its low coefficient of linear thermal expansion, and chemical resistance. This performance combination allowed a design that provided the biggest benefit: a five-fold weight reduction compared with other options considered.



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# EXTRUSION / MACHINING

Application requirements	TORLON® PAI performance factors
Miniature solenoid valves operate in extreme environments with temperatures exceeding 149°C and pressures up to 5,000 psi.	TORLON® has excellent strength and stiffness to maintain structural integrity across wide temperature and pressure extremes.
Weight savings and space constraints are always critical design factors in Aerospace applications. In conventional sealing, back-up ring and O-ring designs require larger cross-sections.	TORLON® PAI performed well in smaller designs for miniature solenoid valves allowing space and weight savings.
Materials with high thermal expansion create leakage and potential system failures.	TORLON® PAI's extremely low CLTE provides low predictable expansion of sealing components and minimizes leakage at extreme pressures.
Miniature rotating components require long service life without external lubrication.	Self lubricating TORLON® PAI minimizes wear and extends service life of the rotating seal with no lubrication.

### Other material candidates vs. TORLON® PAI:

- VESPEL® PI: Far higher cost; less dimensional stability over wide temperature changes.
- PEEK blends: Not stable at temperatures required; abrasive to mating parts.

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