Technical Information

# VESTAKEEP®, the ductile PEEK

## The importance of ductility

Ductility describes a materials' ability to withstand deformation under load before breaking.

A ductile material would absorb the energy from a load and continue to deform until fracture. Ductile fracture occurs slowly as there is a large amount of elongation, and thus more strain energy required to cause breakage.

Alternatively, the fracture of a brittle material is abrupt with little or no deformation.

## Greater crack resistance with VESTAKEEP® PEEK

Being a more ductile material, VESTAKEEP® PEEK has a lower tendency to crack under load. More strain energy is required to cause fracture, thus the material will plastically deform before a crack initiates. Upon crack initiation, the crack will not propagate unless more stress is applied.

## Ductility enhances safety

Spindle nuts are utilized in automotive electrical steering column adjustment assemblies (see Figure 1). In an accident it will deform and disable the steering wheel column.

Under impact fracture tests, it was discovered that competition PEEK spindle nuts fracture in a brittle mode resulting in fragmented pieces that could potentially puncture the airbag (see Figure 2, right).

On the other hand, VESTAKEEP® PEEK spindle nuts deformed in a ductile mode while remaining in the deformed shape (see Figure 2, left).

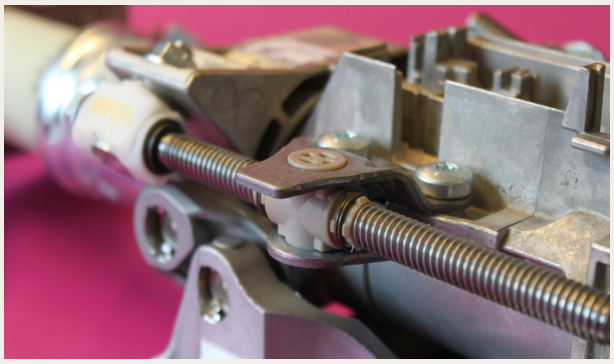

Figure 1 – Steering column adjustment assembly

Figure 2 – Spindle nuts comparison

For more information please visit our website **www.vestakeep.com**

## VESTAKEEP® PEEK offers superior ductility, crack resistance, toughness, and low temperature impact.

### Higher impact resistance with VESTAKEEP® PEEK

Figure 3a – VESTAKEEP® PEEK

Figure 3b – Competition PEEK

VESTAKEEP® PEEK shows ductile fracture behaviour due to a higher energy absorption ability, arresting further crack propagation (see Figure 3a).

Competition PEEK cracks under impact showing severe crack propagation in brittle failure mode, (see Figure 3b).

VESTAKEEP® PEEK has been proved to offer up to 25% higher impact resistance than competition PEEK at identical mechanical strength. This means a tougher, more reliable part as cracks are less likely to initiate and propagate under impact.

### Higher mechanical performance with VESTAKEEP® PEEK

VESTAKEEP® PEEK offers higher mechanical performance at elevated temperatures than competitors, providing high stiffness and E-modulus. As seen in Figure 4, VESTAKEEP® 5000 G retains its tensile modulus up to 140°C while competition PEEK starts to decrease from 100°C. This results in VESTAKEEP 5000 offering a better retention of mechanical properties in the regime around the glass transition temperature (Tg) when compared to other types of PEEK.

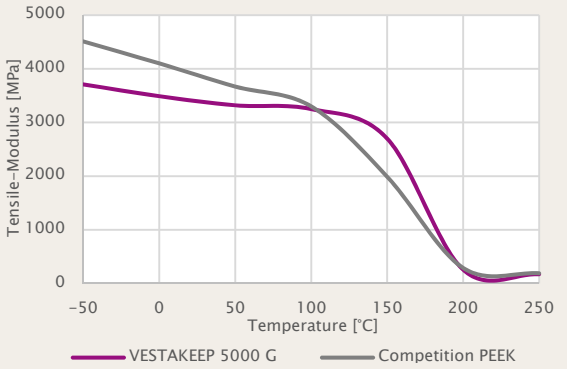


Figure 4 – Tensile Modulus between -50°C and 250°C

### Better seal material with VESTAKEEP® PEEK

The ductile nature VESTAKEEP® PEEK offers the right property combination for back-up valve rings in sealing applications. In such applications the elastic recovery of VESTAKEEP® PEEK leads to a perfect seal with no leakage. By comparison, competition PEEK's elastic recovery is much lower due to permanent plastic deformation normally associated with a less ductile material. VESTAKEEP® PEEK grades, thus offer, exceptional performance under severe conditions such as, chemicals (sour gas), high pressure, high temperature (HPHT), dynamic loads and complex assemblies.



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