

Engineering plastics material selection guide

PEEK / PPS / PI / PEI / PAI

Great Plastics | October 2026

Start with your application

Your material shortlist starts with the conditions the part must withstand. Heat, chemicals, load and motion act together. A family name or a single datasheet value does not establish suitability.

The conditions that change the choice

Temperature: continuous operation, brief peaks, thermal cycling and the surrounding atmosphere.

Chemical exposure: chemical identity, concentration, contact duration and cleaning agents.

Load: sustained force, impact, contact area and creep that could change the fit.

Wear: sliding or rotating motion, pressure, speed, lubrication and the mating surface.

Electrical duty: insulation, static dissipation or conductivity for the exact grade.

Dimensions: working clearances, moisture exposure and the temperature at which the part is measured.

What this guide gives you

Five material starting points, a limit for each candidate, grade and geometry considerations, and links to detailed data and manufacturing support.

Use it for initial screening. Final selection depends on the supplied grade and your application testing. It is not a purchasing specification or an application approval.

Five material starting points

PEEK

For bushings, seals and structural parts where heat, chemicals and mechanical duty overlap. Unfilled, reinforced and wear-modified grades serve different needs. Fillers change stiffness, friction and electrical behavior. Strong oxidizers need specific compatibility data.

PPS

For fluid-contact parts, guides and supports where chemical exposure and dimensional stability matter. Grade and exposure conditions determine resistance. Thin sections and notches need care when impact or assembly stress is present.

PI

For hot-zone spacers, insulating supports and specialized wear parts. Grade, atmosphere and moisture affect performance. Hot-water exposure needs application-specific evidence. A high-temperature family description does not establish service life.

PEI

For electrical fixtures, housings and rigid insulating components. Unfilled and reinforced grades differ in stiffness and dimensional response. Chemical exposure can cause stress cracking, especially in a loaded or stressed part.

PAI

For loaded bearings, thrust components and precision wear parts. Grade selection changes friction and load response. Moisture conditioning affects dimensions. Hot water, steam and amines need grade-specific review.

Keep the grade in the comparison

Carbon-filled material may conduct electricity. A wear-modified grade can behave differently against your mating surface. Compare the actual formulation, not just the polymer name.

Grade, stock form and geometry

Grade differences worth checking

The published Great Plastics datasheet collection distinguishes PEEK-1000, FC1030, G1030 and C1030; PPS-1000 and PPS-G1040; and PAI grades TORLON 4203, 4301 and 5530. These grade references identify data to review; they do not establish current stock availability.

Unfilled, reinforced and wear-modified materials differ in stiffness, thermal expansion, wear and electrical behavior. A reinforced grade may suit a rigid support while a wear-modified grade addresses sliding contact. Neither choice establishes electrical insulation: the filler system matters.

Your geometry changes the manufacturing decision

Sheet, rod and tube are starting forms. Available dimensions, machining allowance and clamping space constrain the finished part. Stock form and manufacturing history can affect properties and residual stress.

Thin walls and long sleeves may deflect under clamping or cutting forces. Deep pockets need cutter reach. Internal corners retain a tool radius. Intersecting holes need access for burr removal.

Keep operating fit separate from measured size

Thermal expansion, moisture and creep can change clearances in service. A bore measured at room temperature does not establish running clearance under heat and load.

For a sleeve, record the shaft size, bore clearance and conditions during operation. For an insulating fixture, record the electrical requirement and any cleaning exposure. These details connect the material shortlist to the features that must work. Critical dimensions need agreement by feature, grade and measurement condition.

Reading a property table

Check the grade, filler, test method and conditioning state. Typical values describe test specimens; they do not guarantee the behavior of your finished component. Temperature ratings alone do not establish life under sustained load.

From shortlist to your next part

Detailed material information

Open the Material Datasheets collection for published PDF data. Use the selection tool and property comparisons to narrow the next question. Keep the specific material and grade attached to every value used in your specification.

[Material datasheets](#)

[Material selection tool](#)

[Material properties](#)

Stock shapes or a finished component?

Great Plastics supplies engineering plastic stock shapes and custom parts. CNC milling and turning produce bores, pockets, slots and profiles. Your geometry, quantity and grade determine the manufacturing discussion.

[CNC plastic machining](#)

[Custom plastic parts](#)

Request a part quote

Send your drawing or CAD file, revision and quantity. Add the grade if known, operating temperature, chemical exposure, load and motion. Identify the datums and dimensions that control fit. Include documentation and acceptance requirements that affect your order.

[Send your drawing to Great Plastics](#)

Reference basis

Great Plastics material pages: PEEK, PPS, PI, PEI and PAI; Material Datasheets; CNC Plastic Machining. Public sources reviewed October 2026. Grade data and application evidence take precedence over this family-level guide.

[Explore the material range](#)