

HIGH TEMPERATURE PLASTIC GUIDE

Producing Results. Building Relationships.

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Aligning with your injection molding partner to choose the best resin for your plastic part early in the design for manufacturability process, is crucial to a part's production success.

Resins used in the injection molding process are made up of structures that are defined in terms of crystallinity – or how the molecules of the polymer are packed together. Crystalline structures are in most cases very ordered, which gives the material strength and rigidity. Amorphous polymers are the opposite.

The following guide is intended to provide you with information about high-heat / exotic resins and the attributes each feature that could play a critical role in your unique application.

AMORPHOUS MATERIALS

Material	Key Characteristics	Reaction to Heat	Performance	Market/Industry
Polyimide (PI) <i>Trade Names:</i> Dupont™ Kapton® Vespel® Meldin®	High Strength High Heat Resistance High Voltage Resistance Abrasion Resistance Chemical Resistance	Melting Point: 752°F Service Temp: 572-752°F	Excellent mechanical, thermal, electrical, and chemical-resistant properties. Offers flexibility, high tensile strength, biocompatibility, low friction, transparency, tight tolerances, thin walls, smooth surface, pushability, and column strength.	Electronics Mechanical parts Filters Medical Tubing Semiconductor Industry
Polyamide-imide (PAI) <i>Trade Names:</i> Vylomax® Torlon® Duratron®	High Strength Exceptional High Heat Resistance Chemical Resistance Mechanical and Thermal Properties	Melting Point: 820°F Service Temp: 500 °F	High tensile and flexural strength, excellent resistance to wear and creep, excellent dimensional stability up to 482°F, difficult to burn, outstanding resistance to degradation by UV radiation, good chemical resistance to many chemicals, good electrical properties, good processability	Automotive Aerospace Electrical Decorative Industrial (corrosion resistant coatings)
Polyethersulfone (PES) <i>Trade Names:</i> BASF Ultrason® Victrex™	Dimensional Stability High Temperature Performance Inherently Flame Retardant High Strength / Good Stiffness Chemical Resistant Transparent Hot Water / Steam Resistant	Melting Point: 446°F Service Temp: 374°F	High strength, low creep, good chemical resistance, excellent hydrolytic stability, dimensional stability, low moisture absorption, self extinguishing abilities	High Temp Metal Replacement Medical Automotive Electrical
Polyphenylsulfone (PPSU) <i>Trade Names:</i> Quadrant® PPSU Radel® Tecason™ Ultrason® P Veriva™	Ultra High Strength High Heat Resistance Chemical Resistant Flame Retardant Good Thermal Stability Radiation Resistant High Resistance to Aqueous Mineral Acids, Bases and Oxidizing Agents	Melting Point: 680-735°F Service Temp: 320°F	High operating temperature (356°F), good chemical compatibility, excellent resistance to hydrolysis, high rigidity over a wide range of temperatures, very high impact strength, high dimensional stability, good resistance against high energy radiation (gamma and X-rays), good electrical insulating properties and dielectric characteristics	Automotive Aerospace Plumbing Dental Medical
Polyether Imide (PEI) <i>Trade Names:</i> Duratron® PEI SustaPEI® Tecapei® Ultem® 1000 ZELLAMID® 1000	High Temperature Performance High Strength and Good Stiffness Good Chemical Resistance Transparent Hot Water and Steam Resistance Outstanding Dimensional Stability Flame Retardant Excellent Electrical Insulation Properties	Melting Point: 424-464°F Service Temp: 338°F	High tensile strength, high compression strength, high pressure and creep resistance, excellent resistance to wear under high pressure, good cold temperature properties, inherently flame retardant, high radiation resistance, good chemical resistance, excellent electrical insulation properties	Aerospace Automotive Metal Replacement Electrical Medical

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Polysulfone (PSU) <i>Trade Names:</i> Udel® Ultrason® S PSU 1000 Sustason® PSU Tecason® S Thermalux®	Very High Surface Temperature Limits High Strength Low Creep Good Electrical Characteristics Hot water and steam performance to 300°F Hot water and steam resistance Flame Retardant High Thermal Stability Resistant to Many Solvents	Melting Point: 392°F Service Temp: 338°F	High impact strength and rigidity, very good dimensional stability, high chemical stability, high resistance to all kinds of radiation, self-extinguishing	Automotive Electronic Medical
Polycarbonate (PC) <i>Trade Names:</i> SABIC Lexan® Bayer MaterialScience Makrolon®	Exceptional Impact Resistance Tensile Strength Dimensional Stability Optical Clarity Moderate Temperature Resistance Translucent	Melting Point: 550-600°F Service Temp: 266°F	Pliable, can be combined with flame retardant materials, useful when impact resistance and/or transparency are a product requirement	Electronic Medical Construction Data storage Automotive, Aircraft, Railway Security Components
PolyEtherKetone-EtherKetoneKetone (PEKEKK) <i>Trade Names:</i> Victrex™ TECAPEEK® ST"	High Thermal and Mechanical Capacity Good Chemical Resistance Low Moisture Absorption High Dimensional Stability Inherent Flame Retardance Good Resistance to Chemicals and High Energy Radiation Excellent Electrical Properties	Melting Point: 723°F Service Temp: 572°F	High strength and stiffness, high flexural strength combined with a higher glass transition point, excellent mechanical properties at high temperatures, excellent chemical resistance, electrically insulating, good dimensional stability	Mechanical Engineering Chemical Automotive
Polyetheretherketone (PEEK) <i>Trade Names:</i> Victrex™ LNP™ VESTAKEEP® Zeniva® LUVOCOM®	Excellent Strength High Rigidity and Toughness at Elevated Temperatures Low Permeability Low Moisture Absorption Excellent Electrical Properties Low Moisture Absorption Excellent Fatigue, Stress-Crack, Hydrolysis and Chemical Resistance Superior Creep Resistance	Melting Point: 340-345°F Service Temp: 250-260°F	Chemically resistant, suited for high temperature and wear applications, superior combination of strength, stiffness and toughness, resists most common organic compounds	Medical Aerospace Automotive Electrical Military
Polyetherketone (PEK) <i>Trade Names:</i> G-PAEK® Ultraprek® RTP®	High Thermal Capacity Good Wear Resistance Good Chemical Resistance Inherently Flame Retardant Electrically Uninsulating High Creep Resistance Resistant Against High Energy Radiation	Melting Point: 725-775°F Service Temp: 500-572°F	High-performance material with high thermal dimensional stability, low flammability, outstanding chemical resistance, and excellent mechanical properties	Mechanical Engineering Conveyor Technology Automotive Chemical Plant Engineering
Liquid Crystal Polymer (LCP) <i>Trade Names:</i> RTP® LCP Vectra® Xydar® Zenite®	Outstanding Chemical Resistance Heat Resistance Good Solvent Resistance Low Flammability Low Water Absorption Good Weatherability Translucent	Melting Point: 626°F Service Temp: 464°F	High mechanical strength at high temperatures, resistant to stress cracking, very strong, translucent, ideal for high-stressed parts	Electrical & Electronics Industrial Machinery Automotive
Polyphenylene Sulfide (PPS) <i>Trade Names:</i> Tecatron® Ryton® Fortron® Polystone PPS Sustatron® Techtron®	High Heat Resistance Flame Retardant Good Chemical Resistance Good Electrical Insulator Moisture Resistant Good Tensile Strength and Flexural Modulus High Strength and Stiffness Good Dimensional Stability	Melting Point: 554°F Service Temp: 320°F	Excellent processing, good surface finish, low creep, good dimensional stability, high impact strength and chemical resistance	Electrical & Electronics Automotive General Industries

SEMI-CRYSTALLINE MATERIALS

Material	Key Characteristics	Reaction to Heat	Performance	Market/Industry
Polytetrafluoroethylene (PTFE) <i>Trade Names:</i> Dyneon™ Teflon® DAIKIN-POLYFLON™ Fluon®	High Flexural Strength, Even In Low Temperatures High Electrical Resistance High Dielectric Strength Low Friction Highly Flexible Chemical Resistant Thermal Resistant Non-Stick Thermally Stable	Melting Point: 621°F Service Temp: 500°F	Remarkably low coefficient of friction, exceptional chemical resistance, exceptional dielectric properties, good wear resistance, can be enhanced by blending with other materials to create unique compounds	Aerospace Electronics Industrial
Perfluoroalkoxy Alkanes (PFA) <i>Trade Names:</i> Teflon® PFA Neoflon™ Daikin®	High Continuous Use Temperatures Good Barrier Properties Chemically Inert Anti-stick Properties UV Resistant Excellent Weatherability High Melt Strength Excellent Crack And Stress Resistance High Resistance to Creep High Dielectric Strength High Resistance to Impact and Tearing	Melting Point: 585°F Service Temp: 328-500°F	High melt strength, stability at high processing temperatures, resistance to creep at high service temperatures, inert to nearly all industrial chemicals and solvents, excellent dielectric properties, moderate stiffness and high elongation.	Medical Aerospace Defense Industrial Pharmaceutical
Polyvinylidene Fluoride (PVDF) <i>Trade Names:</i> Tecafion® Solef® Kynar®	Resistant to Creep and Fatigue Excellent Thermal Stability Resistant To Radiation and UV Lightweight High Abrasion Resistance Resistant to most Chemicals and Solvents Good Electrical Insulator Resistance to Chemical Corrosion High Purity	Melting Point: 410-550°F Service Temp: 266°F	Good for applications that require high temperature and high pressure loads, optimal hardness and toughness, low flammability and high chemical resistance, resists harsh thermal, chemical and ultraviolet environments.	Chemical Semiconductor Medical Defense Lithium-ion batteries

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When considering the intended end use for your injection molded part, understanding key characteristics is **essential** to selecting the best resin.

Contact an Engineer at Plastic Components, Inc.