



G S Sales Technical Brief

For More Information Contact G S Sales at 317-595-6750, Fax at: 317-595-6755 or Email: gssales@insightbb.com
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Engineered Plastics

REP 104

Nylon {Sustamid}

- * Good Wear Resistance
- * 220°F Continual Usage Temperature
- * Good Chemical Resistance
- * Good Mechanical Strength
- * Good Impact Resistance
- * Natural Grades Meet FDA requirements
- * High Moisture Absorption
- * Self-extinguishing

Nylon comes in two primary ways, Cast and Extruded. The properties are different however not dramatically.

CAST Type 6

- * Lower Moisture Absorption
- * Higher Impact Resistance
- * Better Load Bearing
- * Fillers have substantial Effect on Cast

Extruded Type 6/6

- * Higher Usage Temperature
- * Higher Compressive Strength
- * Fillers Have Little Effect on Extruded Nylon

Smaller rods, tubes and thinner boards are generally extruded. While larger Diameter rods, tubes and thicker sheet is usually cast.

Sustaplast Stocks Extruded Nylon in Natural and Molly Filled.

Sustaplast Stocks Cast Nylon in Natural, Blue{Arimid Filled}, Black{Molly Filled}, Oil Filled {Yellow}, and Wax Filled.

Acetals{Sustarin}

- * Good Dimensional Stability
- * Low Moisture Absorption
- * High Fatigue Resistance
- * High Hardness & Stiffness
- * 180 F Operating Temperature
- * Easily Machined

Acetals come in two different types homopolymer{Delrin} and copolymer {Ultraform/Celcon}. There are some differences that I will itemize below however the main differences is that Dupont has done a excellent job promoting the Delrin name.

HOMOPOLYMER{DELRIN}

- * Approximately 10% Stiffer
- * Higher Mechanical Strength
- * Centerline Porosity Possible

COPOLYMER

- * Better Chemical Resistance
- * Performs Better in Hot Water
- * Centerline Porosity is Virtually Eliminated

Sustaplast stocks Acetal Copolymer in natural and black. Delrin is currently available with proper lead-time.

Delrin is also available in Teflon filled as Delrin AF



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ULTRA HIGH MOLECULAR WEIGHT POLYETHYLENE{UHMW} POLYSTONE M

REP 104-2

- * Excellent Abrasion Resistance
- * Low Coefficient of Friction
- * Good Chemical Resistance
- * No Water Absorption
- * Good Impact Resistance
- * Machines Easily
- * USDA & FDA Approved
- * Retains Properties -212°F to 180°F

UHMW is widely used in a wide variety of applications. It is the most economical material for the properties that it exhibits. UHMW is available in a variety of filled materials and colors. It is used extensively in a wide range of markets from lining in coal and aggregates, components in conveying and packaging machinery, to medical implants for hips and knees.

It is very common to have UHMW parts fabricated and extruded to standard and custom shapes. The reason for the number of extruded and molded parts is because as of this time UHMW is not easily injected molded.

Röchling offers UHMW in natural, X-Linked, Reprocessed{Green or Black}, Colored Sheet and MPG glass filled as standards. On special orders they offer Oil-Filled, Sand Topped, High Temperature, UV Stabilized and other special runs.

PTFE{Teflon}

- * Extremely Low Coefficient of Friction
- * Zero Water Absorption
- * Withstands High Corrosives
- * Easy to Machine
- * High Temperature 500°F
- * Non Stick
- * FDA Approved
- * Many Fillers are Available

People are familiar with Teflon primarily through its non-stick surface for pots and pans are sometimes surprised to learn that PTFE has been in existence since the beginning of World War II. Its slackness is not its only outstanding characteristic. PTFE also resist attack by most corrosive chemicals and retains its strength in extreme temperatures and because it absorbs little energy, it excels as electrical insulation. The secret to the unique characteristics of PTFE is concealed in its long fluorocarbon molecules.

PTFE{Teflon} is available in a wide variety of fillers and colors. PTFE is commonly filled with Glass {Rulon is a common trade name for this materials}, Carbon, Graphite, Molly, Bronze, Brass, Copper and Stainless Steel.

PTFE is also available with chemical etching to allow for bonding.



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ABS

REP 104-3

ABS is one of the oldest polymers known and is considered a bridge between the commodity plastics and the higher performing engineered plastics. As a result of this some consider it a low end engineering material that has been used in a wide range of products.

ABS is used in appliances, the transportation industry, business machines, the building industry{as pipe, offering low temperature and high impact characteristics}, and the industrial market{as marine products, irrigation, and medical devices}. ABS is very common as a thermoformed thin sheet material.

ABS is also available in Natural, Black and Flame Retardant grades.

PPO-Polyphenylene Oxide{Sustatec PPO mod.}

- * Good Structural Strength
- * Low Water Absorption
- * 230°F Operating Temperature
- * Flame Retardant

PPO is used in a wide variety of applications form pump impellers, pump housings, high temperature pipe, electrical connectors and fuse blocks.

PPO is available in Black{EN 265} and Natural 30% Glass Reinforced.

PET-Polyehylene Terephthalate{Sustodur PET}

- * Good Wear Resistance
- * No Centerline Porosity
- * Low Thermal Expansion and Creep
- * Low Coefficient of Friction
- * Excellent Stability
- * Low Water Absorption

PET has stepped in and filled a void left with thicker acetal plate and large rod due to centerline porosity in acetal.

PET is used in applications for food dispensing, pump housings, ink applications, pulleys, gears, and many other machined parts.



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POLYCARBONATE-Lexan {Sustonat PC}

REP 104-4

- * High Heat Deflection Temperature
- * Radiation Resistant
- * Good Clarity
- * Good Impact Strength
- * Relatively Unbreakable

Polycarbonate has been used for a number of years as an unbreakable alternative to acrylic sheet and glass. It is used very heavily in the medical industry because of its clarity, resistance to gamma radiation and resistance to sterilization. Poly carbonate is used in industry because of its durability. Lexan{Polycarbonate} became known for its use as bullet shields for police and security protection.

Polycarbonate is available in natural, black and 20% glass filled.

PSU-Polysulfone {Sustatec PSU}

- * Lowest Thermal Expansion
- * FDA and NSF Approved
- * Good Stability
- * No Water Absorption
- * Low Flammability
- * Low Smoke
- * Resists Microwaves

Widely used as a medical instruments, Microwave pans, coffee makers and auto fuses. This is a material that is just recently starting to be recognized in the industrial market for its superior properties.

PSU is available in only a natural color.

PBT Polyester{Celanex, Rynite, Ultradur and Valox}

- * Operates at 350 F
- * Low Water Absorption
- * Great Elongation
- * Good Wear Resistance

PBT Polyesters are intended for applications that require flexibility and fatigue resistance. It is intended for applications where rubber and elastomers cannot perform.

PBT Polyester is one of the Polyester family that is seeing the greatest growth right now. The other Polyesters are PET Polyester{Mylar} and TPE Polyester Elastomer{Hytrel, Riteflex and Santoprene}.



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PEI-Polyetherimide-Ultem{Sustatec PEI}

REP 104-5

- * Best Tensile Properties
- * Good Wear Resistance
- * Low Coefficient of Friction
- * Dimensionally Stable

PEI-Ultem is a unique material penetrating the industrial market more and more in a variety of unique applications. Glass filled PEI offers even better wear and temperature resistance to 410° F.

A unique application of PEI was in the Ford Taurus and Mercury Sable, it is used as a temperature sensor housing. It was chosen for this application because of its dimensional stability, toughness, lightweight, chemical resistance and ability to handle the temperature extremes.

PEI-Ultem is available in Natural, 10% Glass-Filled, 20% Glass-Filled, and 30% Glass-Filled

PPS-Polyphenylene Sulfide{SusatecPPS}

- * Excellent Thermal Properties
- * High Flexural Modules
- * High Dielectric Properties
- * Good Electrical Properties
- * Good Mechanical Properties

PPS is also widely known by the trade names Fortron & Ryton. It is used as gears, fittings, and caps in the industrial market. In the automotive market PPS is used for engine compartment components, fuel line systems, and where solvent resistance is required at higher temperatures.

PPS is available in natural form and 40% Glass Filled.

PVDF-Polyphenylenesulfide{Sustatec PVDF}

- * Good Abrasion Resistance
- * UV Resistant
- * Resistant to Nuclear Radiation
- * Excellent Chemical Resistance
- * Good Stability
- * Temperature Range -30°F to 340°F

PVDF is also known by the resin trade names "Kynar, Solef, and Forafon". PVDF is used widely in the chemical industry. Used as acid and nuclear waste processing equipment components, high purity water equipment parts, parts for high pressure applications, heat Exchanger components and pump components.



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PEEK-Polyetheretherketone{Sustatec PEEK}

REP 104-6

- * Excellent Chemical Resistance
- * High Flexural Modules
- * Good Abrasion Resistance
- * Excellent Hydrolysis Resistance
- * High Temperature 480°F {600°F Filled}
- * Lowest Thermal Expansion
- * Extremely Tough

Applications for PEEK include wire cable coverings, aerospace components, valve parts, pump components and Bearings

PEEK is available in Natural, 30% glass-filled and 30% carbon-filled.

I consider PEEK the premier engineered material. It offers the best properties of all the engineered materials.



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FILLERS Reinforcement Agents

REP 104-7

- * Glass Fillers
- * Oil Fillers
- * Colors
- * Carbon Fillers{Black}
- * MSO2{Molly-Black}
- * Heat Stabilizers
- * Arimid Fillers{Blue}
- * X-Linking
- * UV Stabilizers

Fillers affect many of the materials that we have discussed in difference ways. I will itemize some to these filler and material groups.

Cast Nylon {Glass Fillers, MSO2, Arimid}

- * Decreased Water Absorption
- * Doubles Flexural Strength
- * Decreases Heat Deflection Temperature
- * Increases Wear Resistance
- * Decreased Thermal Expansion{2 to 4 times}
- * Increased Impact Strength
- * Increased Tensile Strength
- * Oil Fillers become part of product

Extruded Nylon and Acetal and other extruded materials {Glass Fillers and Carbon Fillers}

Carbon fillers are a help on nylon and Acetal and other extruded materials as it give you conductivity and some degree of UV Stabilization. Glass Filler do give you better wear resistance however on a whole these products are not as positively effected by fillers as Cast Nylon is.

UHMW -Ultra High Molecular Weight {Polystone} Glass, Oil, MSO2, Carbon and X-linking agents

UHMW is a very unique material and filler have a very differing effects on it. I will list how each of these filler effect UHMW below:

X-Linking agents-Increases wear resistance, reduces expansion and contraction by 25% and increases coefficient of friction.

Glass Fillers-Increase the wear resistance of UHMW usually only used with a X-Linking agent. Never used over 5 % of total mix or properties are lost.

Oil-Fillers- This is a common filler however I believe they attract dirt and are more negative.

Carbon-Filled- Carbon filler will give you a degree of conductivity {anti-Static} and will also increase your UV properties. {Note: a chemical modifier gives you a better UV product}.

MSO2 {Molly}-I believe that this will give you the best low coefficient of friction for low friction applications not requiring FDA approval

Colors: UHMW is easily colored with pigments. Colors can be matched where required.