



## CURBELL PLASTICS ENGINEERING MATERIALS GUIDE

**CURBELL**  
PLASTICS

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With over 70 years of experience, a highly trained staff of plastics professionals, and a full line of plastic materials, Curbell Plastics is committed to providing our customers with the best technical expertise and service. From bearing and wear to electrical or high temperature applications, we focus on working with our customers to understand their specific applications and material needs.

#### CURBELL PLASTICS' CAPABILITIES:

- Technical expertise
- Local inventory
- Wide product offering
- On-time delivery
- Cut-to-size materials
- Fabrication services
- Film conversion

#### Put us to work – for you!™

Curbell Plastics has been supplying plastic sheet, rod, tube, films, adhesives, sealants, tapes, prototyping and tooling materials, and fabricated parts for over 70 years.

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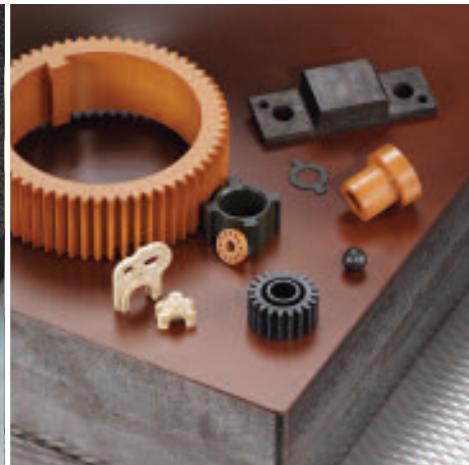
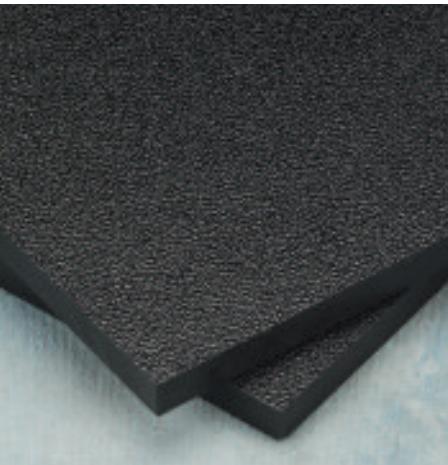
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## OUR PARTNERS

WE ARE ABLE TO PROVIDE SUPERIOR SERVICE AND QUALITY BECAUSE WE PARTNER WITH THE BEST MANUFACTURERS IN THE INDUSTRY



**ACRYLITE**®

**ALTUGLAS**  
INTERNATIONAL  
ARKEMA GROUP

Bayer MaterialScience

**CAST NYLONS**  
LIMITED

**DUPONT**®

**ENSINGER**   
ASK. THINK. SUCCEED.

**KYDEX**  
THERMOPLASTIC SHEET

**PLASKOLITE, INC.**

 **RÖCHLING**  
Engineering Plastics



**VYCOM**  
OLEFIN AND PVC SOLUTIONS  
WHERE QUALITY MEETS PERFORMANCE

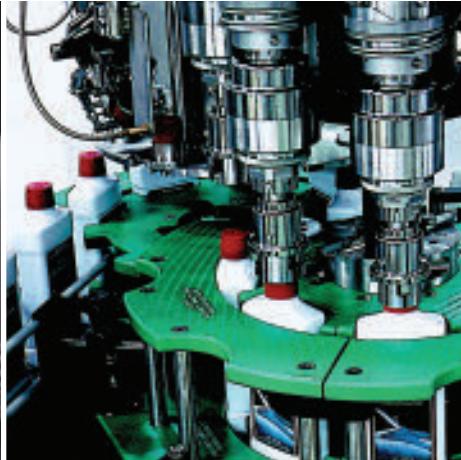
Aerospace • Agriculture • Amusement and Recreation • Automotive • Batteries Bearings • Bulk Material Handling Chemical Processing • Churches, Unions, and Associations • Construction • Electrical • Engineering and Design Services Farm, Construction, and Mining Equipment • Food Processing • Furniture, Cabinets, and Countertops • Glass and Glazing Government Agencies • HVAC Lenses and Optics • Lighting Fixtures • Machine Shops • Marine • Medical • Metal Fabrication • Motor Homes, Trailers, and Campers • Packaging Machinery • Pharmaceutical • Picture Frames and Art Supplies • Pipe, Valve, Fittings, Seals, and Gaskets • Plastic Fabrication • Plastic Film Coaters and Converters Photographic Equipment • Printing and Graphics • Prisons and Police Stations • Prototypes and Patterns • Restaurants and Hotels Schools, Colleges, and Libraries • Scientific Instrumentation • Semiconductor and Electronics • Sports and Recreational Equipment • Textile • Toys and Games • Transportation • Tub, Shower, and Spa • Visual Merchandising, Sign, and Point-Of-Purchase • Window

## MARKETS WE SERVE

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MACHINE SHOPS



PACKAGING MACHINERY



POINT-OF-PURCHASE DISPLAYS



AEROSPACE



AUTOMOTIVE



AMUSEMENT AND RECREATION



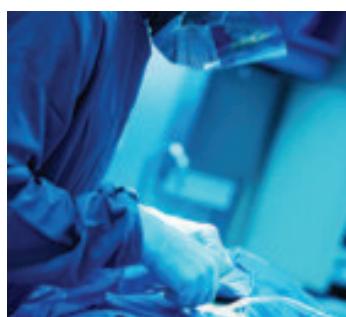
BULK MATERIAL HANDLING



FOOD PROCESSING



GLASS AND GLAZING



MEDICAL

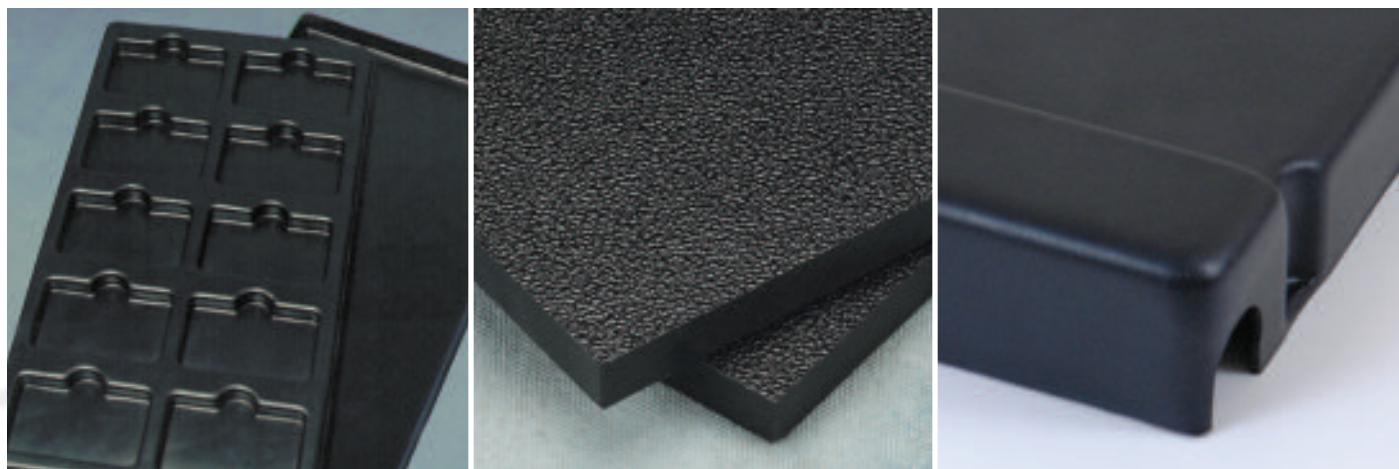


SEMICONDUCTOR AND ELECTRONICS

# ABS

(acrylonitrile-butadiene-styrene)

ROYALITE®



## TYPICAL USES:

### THERMOFORMED HOUSING

- Tough
- Easy to thermoform and fabricate



ABS is a low cost thermoplastic material with outstanding impact resistance, machinability, and thermoforming characteristics. It is an excellent choice for machine housings, retail store fixtures, and point-of-purchase displays where impact resistance is required.

Royalite® R59 is a fire-rated ABS/PVC alloy sheet material, that is often used for transportation, architectural, and electronics applications that require UL certifications.

Royalite® R84/21 is an ABS sheet material with a proprietary weatherable cap layer for improved performance in outdoor environments. The material is an excellent choice for marine, automotive, and recreational vehicle components where good weatherability is required.



### KEY CHARACTERISTICS:

- Outstanding impact resistance
- Good machinability
- Easy to thermoform
- Easy to bond with adhesives
- Strong and stiff
- Low cost
- Flame retardant grades available
- Available in a wide variety of colors and textures

### APPLICATIONS:

- Machine housings, guards, and covers
- Instrument panels
- Point-of-purchase displays
- Models and prototypes
- Thermoformed trays and tote bins

### ABS TYPICAL PROPERTIES:

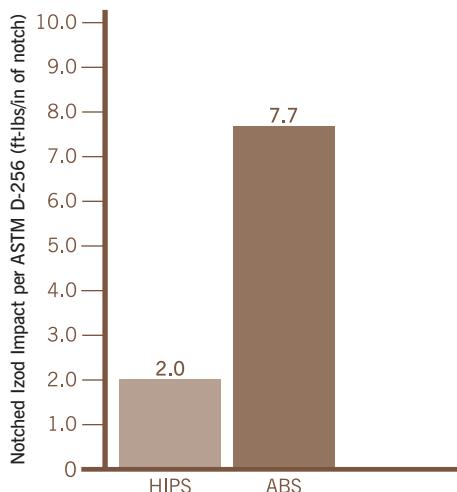
	UNITS	ASTM TEST	ABS	ROYALITE® R59	ROYALITE® R84/21
Tensile strength	psi	D-638	4,100	5,200	4,600
Flexural modulus	psi	D-790	304,000	290,000	270,000
Izod impact (notched)	ft-lbs/in of notch	D-256	7.7	10.0	7.0
Heat deflection temperature @264 psi	°F	D-648	177	170	205
Maximum continuous service temperature in air	°F		160	-	-
Water absorption (immersion 24 hours)	%	D-570	0.30	-	-
Coefficient of linear thermal expansion	in/in/°Fx10 <sup>-5</sup>	D-696	5.6	4.6-5.5	4.2-5.6

**Standard Sizes:** SHEET: 24"x48" (0.25"-4.0" thick), 48"x96" (0.06"-4.0" thick) ROD: diameter 0.25"-6.0"

Length, width, thickness, and diameter tolerances vary by size and by manufacturer • Custom sizes and colors available upon request • Many of our materials are available as films with thicknesses of 0.029" or less. For additional property data please refer to the chart on the inside back cover. Values may vary according to brand name. Please ask your Curbell Plastics representative for more specific information about an individual brand.

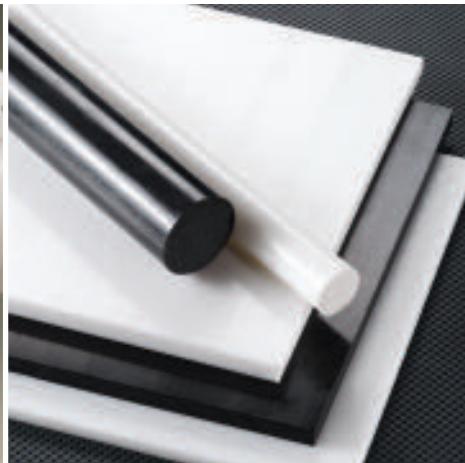
### IMPACT RESISTANCE

of ABS compared with High Impact Polystyrene



# ACETAL (polyoxymethylene)

DELRIN® / SUSTARIN® / TECAFORM™



## TYPICAL USES:

### BEARING BLOCK

- High strength
- Easy to machine



### BELT GUIDE BUSHING

- Low water absorption
- Good wear properties
- Low friction



Acetal is a high strength, low friction engineering plastic that has excellent wear properties in both wet and dry environments. Good dimensional stability and ease of machining make acetal an outstanding choice for applications requiring complex machining to tight tolerances.

Homopolymer acetal (Delrin®) has superior room temperature strength, stiffness, and toughness. Copolymer acetal has superior performance in continuous high heat and hot water environments. Copolymer acetal also tends to have less porosity than homopolymer acetal.

Acetal is available in glass-filled grades that offer enhanced strength and stiffness. It is also available in a number of enhanced bearing and wear grades including: Delrin® AF, Delrin® AF blend, and TECAFORM™ HPV 13.

**ENSINGER**  ASK. THINK. SUCCEED.

**RÖCHLING**  Engineering Plastics

### KEY CHARACTERISTICS:

- Strong and stiff
- Excellent machinability
- Good dimensional stability
- Low moisture absorption
- Excellent wear properties in both wet and dry environments
- Low friction
- Good chemical resistance

- Homopolymer and copolymer grades available
- FDA compliant grades available
- Enhanced bearing and wear grades available
- Glass-filled grades available
- Medical grades available
- Natural (white), black, and colors available

### APPLICATIONS:

- Bearings and bushings
- Pump and valve parts
- Manifolds
- Gears
- Wear pads
- Jigs and fixtures
- Packaging machinery parts
- Food processing machinery parts
- Electrical components

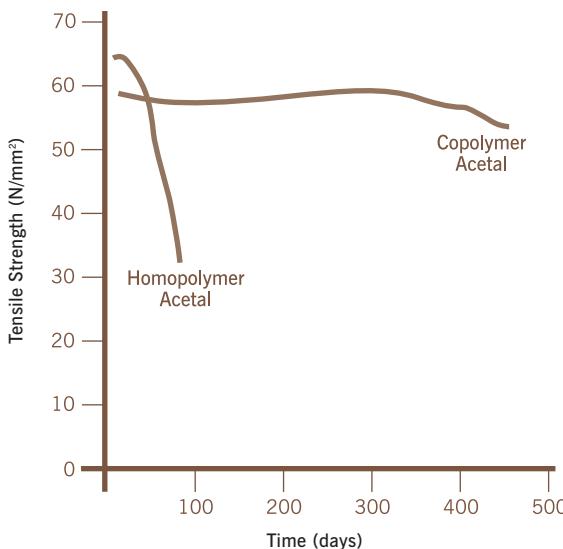
### ACETAL TYPICAL PROPERTIES:

	UNITS	ASTM TEST	HOMOPOLYMER ACETAL	COPOLYMER ACETAL	TECAFORM™ HPV 13 PTFE-FILLED ACETAL	20% GLASS FIBER FILLED HOMOPOLYMER ACETAL
Tensile strength	psi	D-638	10,000	9,800	6,800	8,500
Flexural modulus	psi	D-790	420,000	370,000	350,000	730,000
Izod impact (notched)	ft-lbs/in of notch	D-256	1.5	1.0	0.7	0.8
Heat deflection temperature @264 psi	°F	D-648	257	230	244	316
Maximum continuous service temperature in air	°F		185	195	185	185
Water absorption (immersion 24 hours)	%	D-570	0.25	0.20	0.22	0.25
Coefficient of linear thermal expansion	in/in/°Fx10 <sup>-5</sup>	D-696	6.8	6.1	5.1	2.0-4.5
Coefficient of friction (dynamic)			0.20	0.21	0.12	0.35

**Standard Sizes:** SHEET: 24"x48" (0.25"-6.0" thick), 48"x96" (0.125"-2.0" thick), 48"x120" (0.125"-2.0" thick) ROD: diameter 0.25"-12.0" TUBE: OD 1.0"-4.0" Length, width, thickness, and diameter tolerances vary by size and by manufacturer • Custom sizes and colors available upon request • Many of our materials are available as films with thicknesses of 0.029" or less. For additional property data please refer to the chart on the inside back cover. Values may vary according to brand name. Please ask your Curbell Plastics representative for more specific information about an individual brand.

### LONG TERM EFFECTS OF BOILING WATER

on the tensile strengths of Homopolymer Acetal and Copolymer Acetal



# ACRYLIC

(polymethyl methacrylate)

ACRYLITE® / OPTIX® / PLEXIGLAS®



## TYPICAL USES:

### POINT-OF-PURCHASE DISPLAY

- Easy to fabricate
- Cost effective



Acrylic is a transparent thermoplastic with outstanding strength, stiffness, and optical clarity. Acrylic sheet is easy to fabricate, bonds well with adhesives and solvents, and is easy to thermoform.

Acrylic is widely used for architectural glazing, indoor and outdoor signs, retail store fixtures, and point-of-purchase displays.

ACRYLITE®

ALTUGLAS  
INTERNATIONAL  
ARKEMA GROUP

PLASKOLITE, INC.

### KEY CHARACTERISTICS:

- Optically clear
- Strong and stiff
- Easy to fabricate
- Easy to solvent bond
- UV resistant grades available
- Impact resistant grades available
- Wide array of coatings available, including: abrasion resistant, bullet resistant, and ESD (electrostatic dissipative)

- FDA compliant grades available (non UV stabilized)
- Cell cast grades available
- Variety of profiles and shapes available
- Many colors and textures available

### APPLICATIONS:

- Signs
- Retail fixtures
- Point-of-purchase displays
- Architectural glazing
- Skylights
- Aircraft canopies
- Boat windshields
- Transparent manifolds

### ACRYLIC TYPICAL PROPERTIES:

	UNITS	ASTM TEST	CONTINUOUSLY PROCESSED ACRYLIC SHEET
Tensile strength	psi	D-638	10,000
Flexural modulus	psi	D-790	480,000
Izod impact (notched)	ft-lbs/in	D-256	0.4
Heat deflection temperature @264 psi	°F	D-648	195
Maximum continuous service temperature in air	°F		160
Water absorption (immersion 24 hours)	%	D-570	0.20
Coefficient of linear thermal expansion	in/in/°Fx10 <sup>-5</sup>	D-696	4.0
Light transmittance	%	D-1003	92

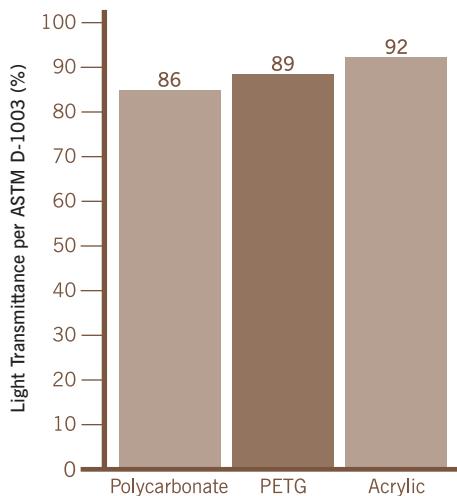
Standard Sizes: **SHEET:** 48"x96" (0.06"-3.0" thick), 60"x96" (0.08"-2.0" thick), 51"x100" (0.08"-2.0" thick), 72"x96" (0.08"-2.0" thick)

**ROD:** diameter 0.125"-4.5" **TUBE:** OD 0.25" - 6.0"

Length, width, thickness, and diameter tolerances vary by size and by manufacturer • Custom sizes and colors available upon request • Many of our materials are available as films with thicknesses of 0.029" or less. For additional property data please refer to the chart on the inside back cover. Values may vary according to brand name. Please ask your Curbell Plastics representative for more specific information about an individual brand.

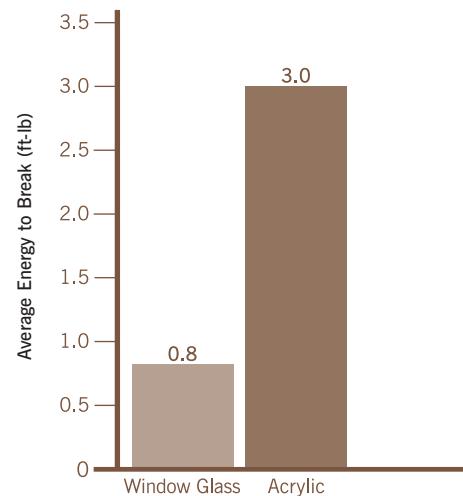
### LIGHT TRANSMITTANCE

of Acrylic compared with Polycarbonate and PETG



### ENERGY TO BREAK (AVERAGE)

of Acrylic compared with Window Glass



# KYDEX® THERMOPLASTIC SHEET



## TYPICAL USES:

### AIRPLANE TRAY TABLES

- Easy to thermoform
- Aircraft grades meet FAA fire retardancy requirements



Kydex® thermoplastic sheet is a proprietary thermoplastic sheet material that has excellent aesthetic qualities, superior impact resistance, and outstanding formability. It is an excellent choice for thermoformed equipment housings and airplane, bus, and train interior parts where appearance, toughness, and complex thermoforming are required.

**KYDEX®**  
THERMOPLASTIC SHEET

### KEY CHARACTERISTICS:

- Excellent impact resistance
- Easy to thermoform
- Strong and stiff
- Good electrical insulating properties
- Consistent color throughout material helps hide scratches and wear
- UL rated grades available
- Fire retardant grades available
- FAA compliant grades available
- Available in a wide variety of colors and textures

### APPLICATIONS:

- Thermoformed equipment housings
- Kiosks
- Point-of-purchase displays
- Store fixtures
- Aircraft, bus, and train interior parts
- Membrane pressed furniture components

### KYDEX® THERMOPLASTIC SHEET TYPICAL PROPERTIES:

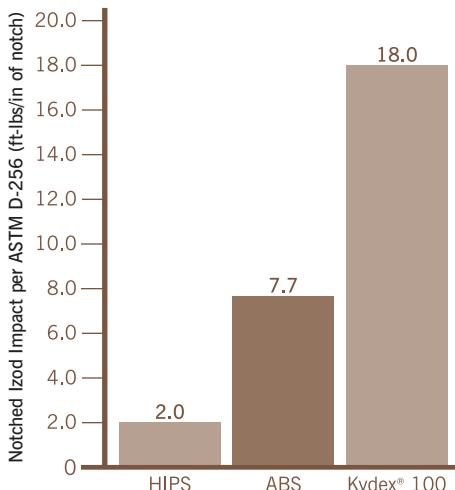
	UNITS	ASTM TEST	KYDEX® 100
Tensile strength	psi	D-638	6,100
Flexural modulus	psi	D-790	335,000
Izod impact (notched)	ft-lbs/in of notch	D-256	18.0
Heat deflection temperature @264 psi	°F	D-648	173
Maximum continuous service temperature in air	°F		-
Water absorption (immersion 24 hours)	%	D-570	0.05-0.08
Coefficient of linear thermal expansion	in/in/°Fx10 <sup>-5</sup>	D-696	4.2

### Standard Sizes: SHEET: 48"x96" (0.028"-0.3125" thick)

Length, width, thickness, and diameter tolerances vary by size and by manufacturer • Custom sizes and colors available upon request • Many of our materials are available as films with thicknesses of 0.029" or less. For additional property data please refer to the chart on the inside back cover. Values may vary according to brand name. Please ask your Curbell Plastics representative for more specific information about an individual brand.

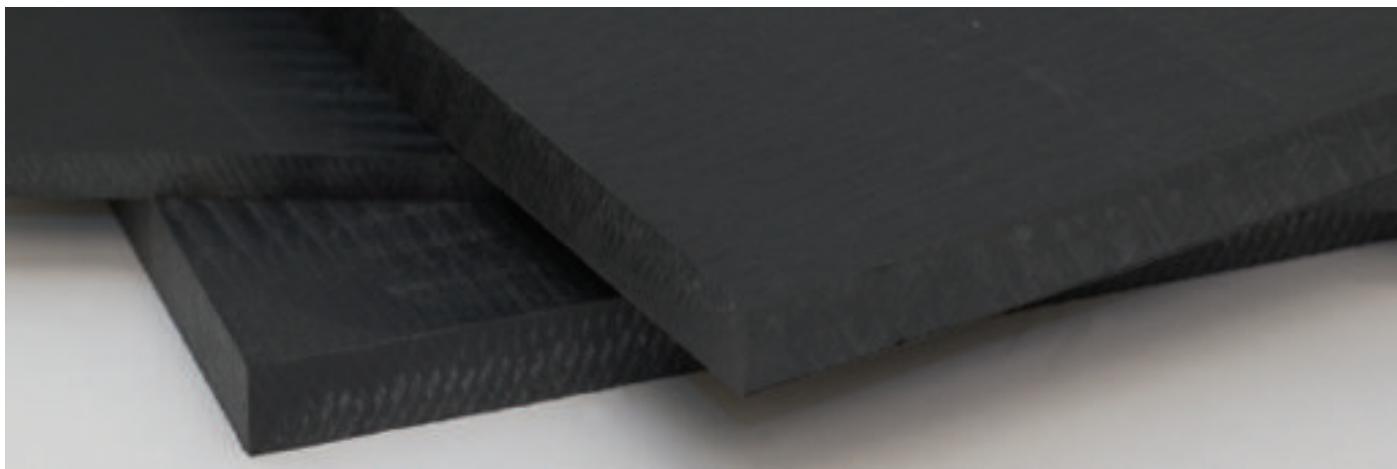
### IMPACT RESISTANCE

of Kydex® compared with High Impact Polystyrene and ABS



# NORYL® (modified ppo)

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Noryl® modified PPO is an engineering thermoplastic with outstanding strength, stiffness, and electrical insulating properties. Noryl® has high dielectric strength, a low coefficient of thermal expansion, and low moisture absorption which make it an excellent choice for electrical applications that require machining to tight tolerances.

Noryl® is available in glass-filled grades which have enhanced strength and stiffness.

### KEY CHARACTERISTICS:

- High dielectric strength
- Strong and stiff
- Good impact resistance
- Good dimensional stability
- Easy to machine
- Glass-filled grades available
- Grades available that meet UL 94-V0

### APPLICATIONS:

- Electrical components
- Semiconductor equipment parts
- Scientific instrumentation components

### NORYL® TYPICAL PROPERTIES:

	UNITS	ASTM TEST	NORYL®	NORYL® 30% GLASS-FILLED
Tensile strength	psi	D-638	9,600	17,500
Flexural modulus	psi	D-790	370,000	1,130,000
Izod impact (notched)	ft-lbs/in of notch	D-256	3.5	2.2
Heat deflection temperature @264 psi	°F	D-648	254	275
Maximum continuous service temperature in air	°F		220	221
Water absorption (immersion 24 hours)	%	D-570	0.07	0.06
Coefficient of linear thermal expansion	in/in/°Fx10 <sup>-5</sup>	D-696	3.3	1.4

**Standard Sizes:** SHEET: 24"x48" (0.25"-4.0" thick) ROD: diameter 0.1875"-8.0"

Length, width, thickness, and diameter tolerances vary by size and by manufacturer • Custom sizes and colors available upon request • Many of our materials are available as films with thicknesses of 0.029" or less. For additional property data please refer to the chart on the inside back cover. Values may vary according to brand name. Please ask your Curbell Plastics representative for more specific information about an individual brand.

### ENGINEERING NOTES:

Noryl® can often be used as a lower cost alternative to Ultem® for electrical applications where the high temperature capability and high dielectric strength of Ultem® are not required.

# NYLON

NYCAST® / NYLOIL® / NYMETAL™ / SUSTAMID® / TECAMID™



Photos property of Cast Nylons LTD.

## TYPICAL USES:

### GEAR

- Low friction
- Reduced wear on mating parts



### VALVE COMPONENT

- High strength
- Good chemical resistance



Nylon is a strong, stiff engineering plastic with outstanding bearing and wear properties. Nylon is frequently used to replace metal bearings and bushings, often eliminating the need for external lubrication. Other benefits include a reduction in part weight, less operating noise, and decreased wear on mating parts.

Nylon is available in a variety of specialty formulations. Molybdenum disulfide-filled and oil-filled nylons have enhanced wear properties, while heat stabilized nylon will withstand higher operating temperatures. For enhanced strength and stiffness, nylon is also available in glass-filled grades.

In power transmission applications NYMETAL™ billets made with nylon and a metal core combine the performance advantages of nylon and metal into one cohesive unit. The billets can be manufactured into many different components including gears, rollers, sprockets, and augers.

**CAST NYLONS**  
LIMITED

**ENSINGER**   
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**RÖCHLING**  
Engineering Plastics

### KEY CHARACTERISTICS:

- Excellent bearing and wear properties
- Strong and stiff
- Good chemical resistance
- Easy to machine
- Reduced noise, weight, and wear on mating parts compared with many traditional metal bearing materials
- Nylon billets with metal cores available

- Internally lubricated grades often eliminate the need for external lubrication in bearing and wear applications
- Enhanced bearing and wear grades available
- FDA compliant grades available
- Glass-filled grades available

### APPLICATIONS:

- Bearings and bushings
- Gears
- Wear pads
- Packaging machinery components
- Food processing machinery components
- Wheels
- Rollers
- Seals and gaskets

### NYLON TYPICAL PROPERTIES:

	UNITS	ASTM TEST	EXTRUDED NYLON 6/6	CAST NYLON 6	MD-FILLED CAST NYLON 6	OIL-FILLED CAST NYLON 6	HEAT STABILIZED CAST NYLON 6
Tensile strength	psi	D-638	12,400	10,000-13,500	10,000-14,000	9,500-11,000	12,000-13,500
Flexural modulus	psi	D-790	410,000	420,000-500,000	400,000-500,000	375,000-475,000	420,000-500,000
Izod impact (notched)	ft-lbs/in of notch	D-256	1.2	0.7-0.9	-	1.4-1.8	0.7-0.9
Heat deflection temperature @264 psi	°F	D-648	194	200-400	200-470	200-400	200-430
Maximum continuous service temperature in air	°F		210	230	-	230	250
Water absorption (immersion 24 hours)	%	D-570	1.20	0.60-1.20	.05-1.40	0.50-0.60	0.50-0.60
Coefficient of linear thermal expansion	in/in/°Fx10 <sup>-5</sup>	D-696	4.5	5.0	-	5.0	5.0
Coefficient of friction (dynamic)			0.28	0.22	0.30	0.12	-

**Standard Sizes:** EXTRUDED SHEET: 24"x48" (0.03"-2.0" thick), 48"x96" (0.125"-0.5" thick), 48"x120" (0.125"-0.5" thick) EXTRUDED ROD: diameter 0.25"-6.0"  
CAST SHEET: 24"x48" (0.25"-4.0" thick), 48"x96" (0.25"-4.0" thick) CAST ROD: diameter 1.0"-12.0" CAST TUBE: diameter 2.0"-40.0"

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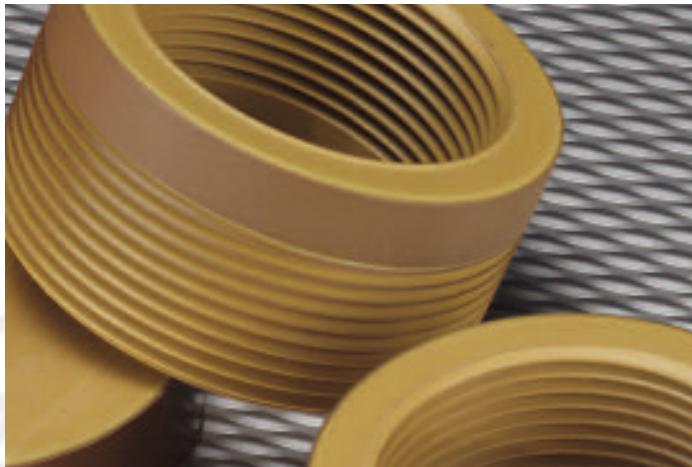
Nylon is also available as a film. See pages 58-59 for more detailed information.

### ENGINEERING NOTES:

Nylon has relatively high moisture absorption compared with many other thermoplastics. Nylon parts that must perform in wet environments should be designed with tolerances that factor in dimensional changes due to moisture absorption.

# PAI (polyamide-imide)

TECATOR™



## TYPICAL USES:

### TEST SOCKET

- Dimensionally stable
- Performs well at elevated temperatures



PAI (polyamide-imide) is an extremely strong and stiff plastic material. It is often used in elevated temperature environments where other thermoplastics would lose their mechanical properties.

PAI is a very dimensionally stable material with an extremely low coefficient of thermal expansion making it an excellent choice for applications that require machining to tight tolerances.

PAI is available in a variety of formulations including electrical, bearing and wear, and glass-filled grades. Electrical grade PAI has extremely high dielectric strength and it is often used for applications where it functions as an electrical insulator. Bearing grade PAI can be used for demanding bearing applications that require extreme loads, speeds, and/or elevated temperatures. Glass-filled PAI has enhanced strength and stiffness.

**ENSINGER**  ASK. THINK. SUCCEED.

### ENGINEERING NOTES:

PAI should not be used in environments where it will be exposed to steam since steam tends to attack the material.

### KEY CHARACTERISTICS:

- Strong and stiff
- Performs well at elevated temperatures
- Extremely low thermal expansion
- Excellent electrical insulating properties (electrical grade)
- Outstanding bearing and wear properties (bearing grade)
- Good resistance to many common solvents, fuels, and acids

### APPLICATIONS:

- Semiconductor machinery parts
- Chip test sockets
- Aerospace components
- Electrical connectors
- Bearings and bushings
- Bearing cages
- Pump and valve parts
- Seals

### PAI TYPICAL PROPERTIES:

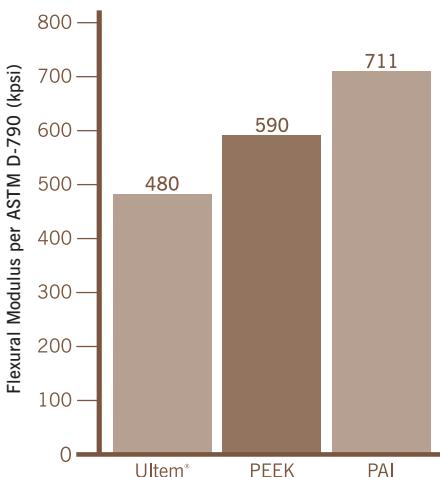
	UNITS	ASTM TEST	PAI UNFILLED GRADE	PAI BEARING GRADE
Tensile strength	psi	D-638	21,000	19,000
Flexural modulus	psi	D-790	711,000	870,000
Izod impact (notched)	ft-lbs/in of notch	D-256	2.3	2.0
Heat deflection temperature @264 psi	°F	D-648	532	534
Maximum continuous service temperature in air	°F		500	500
Water absorption (immersion 24 hours)	%	D-570	0.30	-
Coefficient of linear thermal expansion	in/in/°Fx10 <sup>-5</sup>	D-696	1.7	-

**Standard Sizes:** SHEET: 11.8"x48" (0.197"-1.575" thick) ROD: diameter 0.295"-3.15"

Length, width, thickness, and diameter tolerances vary by size and by manufacturer • Custom sizes and colors available upon request • Many of our materials are available as films with thicknesses of 0.029" or less. For additional property data please refer to the chart on the inside back cover. Values may vary according to brand name. Please ask your Curbell Plastics representative for more specific information about an individual brand.

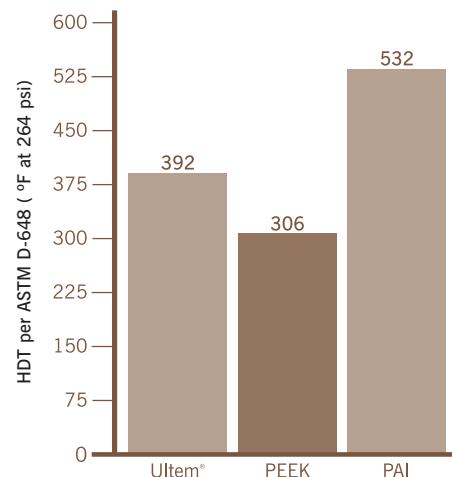
### FLEXURAL MODULUS

of Polyamide-imide compared with Ultem® and PEEK



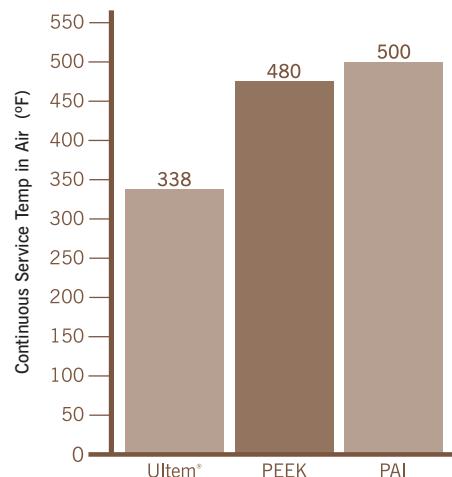
### HEAT DEFLECTION TEMPERATURE

of Polyamide-imide compared with Ultem® and PEEK



### CONTINUOUS SERVICE TEMP IN AIR

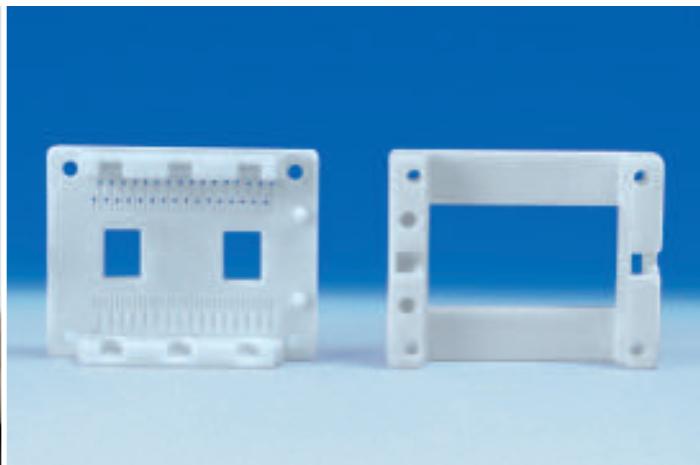
of Polyamide-imide compared with Ultem® and PEEK



# PBT

(polybutylene terephthalate)

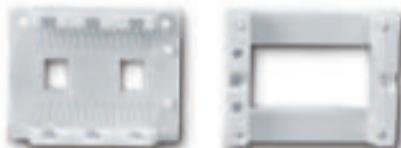
SUSTADUR® PBT / TECADUR™ PBT



## TYPICAL USES:

### CONTACT MOUNTING

- High dielectric strength
- Low moisture absorption



PBT is a strong, stiff engineering plastic with excellent machining characteristics, chemical resistance, and bearing and wear properties. PBT is often used for food processing machinery applications when low moisture absorption, resistance to staining, or resistance to cleaning chemicals is required.

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Engineering Plastics  


### KEY CHARACTERISTICS:

- Excellent chemical resistance including resistance to many CIP wash-down solutions
- Low moisture absorption
- Excellent wear resistance, even in wet environments
- Excellent machining characteristics
- Stain resistance
- Internally lubricated bearing grades available
- FDA compliant grades available

### APPLICATIONS:

- Valves
- Filler pistons
- Bearings and bushings
- Gears
- Wear pads
- Packaging machinery parts
- Food processing machinery components
- Wheels
- Rollers
- Electrical components

### PBT TYPICAL PROPERTIES:

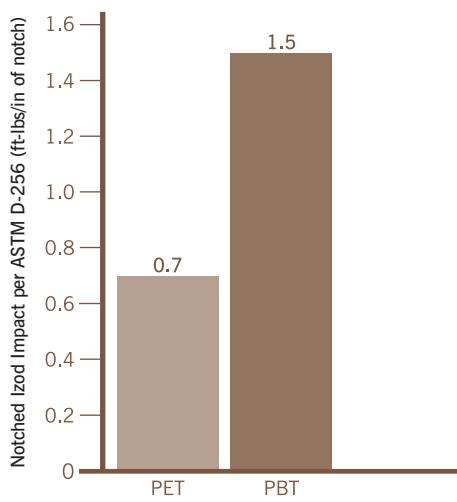
	UNITS	ASTM TEST	PBT	PBT INTERNALLY LUBRICATED
Tensile strength	psi	D-638	8,690	7,200
Flexural modulus	psi	D-790	330,000	390,000
Izod impact (notched)	ft-lbs/in of notch	D-256	1.5	0.7
Heat deflection temperature @264 psi	°F	D-648	130	195
Maximum continuous service temperature in air	°F		245	221
Water absorption (immersion 24 hours)	%	D-570	0.08	0.07

**Standard Sizes:** SHEET: 24"x48" (0.25"-2.5" thick) ROD: diameter 0.25"-6.0"

Length, width, thickness, and diameter tolerances vary by size and by manufacturer • Custom sizes and colors available upon request • Many of our materials are available as films with thicknesses of 0.029" or less. For additional property data please refer to the chart on the inside back cover. Values may vary according to brand name. Please ask your Curbell Plastics representative for more specific information about an individual brand.

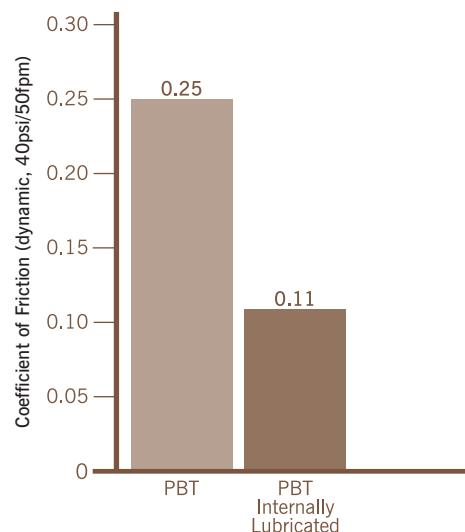
### IMPACT RESISTANCE

of PBT compared with PET



### COEFFICIENT OF FRICTION

of PBT compared with Internally Lubricated PBT



PBT is also available as a film. See pages 58-59 for more detailed information.



# PEEK (polyetheretherketone)

SUSTA® PEEK / TECAPEEK™



## TYPICAL USES:

### IDLER GEAR FOR GEAR PUMP

- Strong
- Chemical resistant
- Able to withstand elevated temperatures



PEEK is a strong and stiff plastic material that is often used in applications where performance at elevated temperatures is required. PEEK has outstanding chemical resistance as well as resistance to steam and hot water.

Virgin PEEK is naturally abrasion resistant. Bearing-grade PEEK has enhanced bearing and wear properties.

**ENSINGER**   
ASK. THINK. SUCCEED.

**RÖCHLING**   
Engineering Plastics

### KEY CHARACTERISTICS:

- Strong and stiff
- Outstanding chemical resistance
- Good mechanical properties at elevated temperatures
- Excellent chemical resistance
- Resistant to hot water and steam
- Bearing grade has excellent wear characteristics

- UL 94 V-0 flammability rating (0.059" thickness)
- Very low smoke and toxic gas emissions when exposed to flame
- Glass-filled grades available
- FDA compliant grades available
- Medical grades available

### APPLICATIONS:

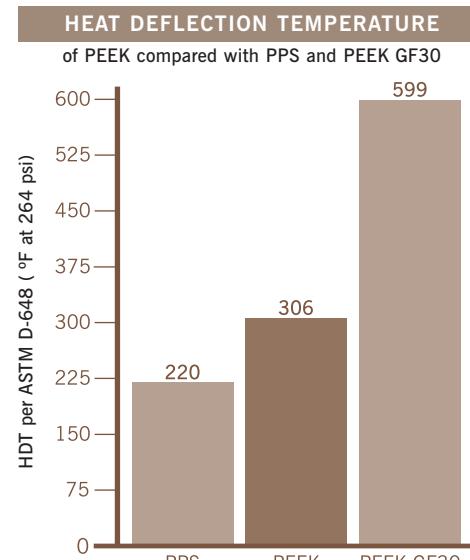
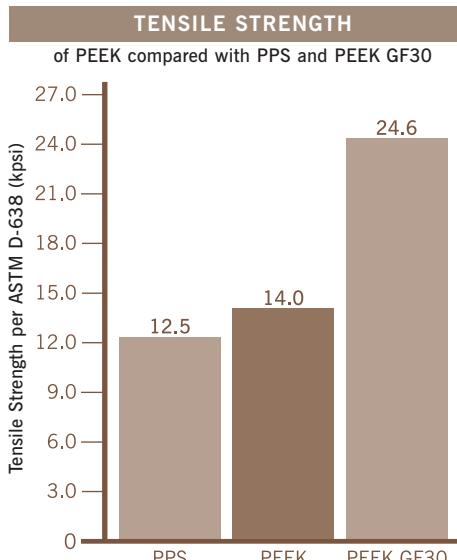
- Semiconductor machinery components
- Aerospace parts
- Seals
- Pump and valve components
- Bearings and bushings (bearing grade)
- Electrical components
- Medical instrument parts
- Food processing machinery components

### PEEK TYPICAL PROPERTIES:

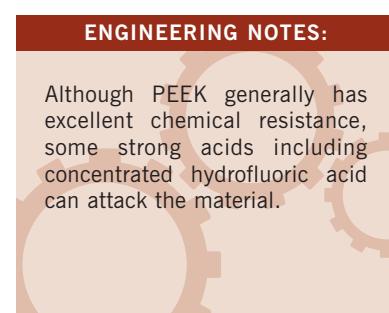
	UNITS	ASTM TEST	PEEK	PEEK 30% GLASS-FILLED
Tensile strength	psi	D-638	14,000	24,620
Flexural modulus	psi	D-790	590,000	1,450,000
Izod impact (notched)	ft-lbs/in	D-256	1.6	1.84
Heat deflection temperature @264 psi	°F	D-648	306	599
Maximum continuous service temperature in air	°F		480	482
Water absorption (immersion 24 hours)	%	D-570	0.50	0.11
Coefficient of linear thermal expansion	in/in/°Fx10 <sup>-5</sup>	D-696	2.6	1.2
Coefficient of friction (dynamic)			0.25	0.30

**Standard Sizes:** SHEET: 24"x48" (0.03"-2.0" thick) ROD: diameter 0.25"-6.0" TUBE: call for availability

Length, width, thickness, and diameter tolerances vary by size and by manufacturer • Custom sizes and colors available upon request • Many of our materials are available as films with thicknesses of 0.029" or less. For additional property data please refer to the chart on the inside back cover. Values may vary according to brand name. Please ask your Curbell Plastics representative for more specific information about an individual brand.



PEEK is also available as a film. See pages 58-59 for more detailed information.



#### ENGINEERING NOTES:

Although PEEK generally has excellent chemical resistance, some strong acids including concentrated hydrofluoric acid can attack the material.

# PET

(polyethylene terephthalate, semicrystalline)

SUSTADUR® PET / TECADUR™ PET



## TYPICAL USES:

### ROLLER

- Low friction
- Good machinability



### FILLING PISTON

- Low friction
- Good chemical resistance
- Low thermal expansion
- Low moisture absorption



PET (semicrystalline) is a strong, stiff engineering plastic with excellent machining characteristics, chemical resistance, and bearing and wear properties. PET is often used for food processing machinery applications where low moisture absorption, low thermal expansion, resistance to staining, or resistance to cleaning chemicals is required.

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### KEY CHARACTERISTICS:

- Strong and stiff
- Excellent chemical resistance, including resistance to many CIP wash-down solutions
- Low moisture absorption
- Low thermal expansion
- Excellent wear characteristics, even in wet environments
- Stain resistance
- Internally lubricated grades available
- FDA compliant grades available

### APPLICATIONS:

- Valve components
- Manifolds
- Filler pistons
- Bearings and bushings
- Wear pads
- Packaging machinery parts
- Food processing machinery components
- Wheels
- Rollers
- Electrical components

### PET TYPICAL PROPERTIES:

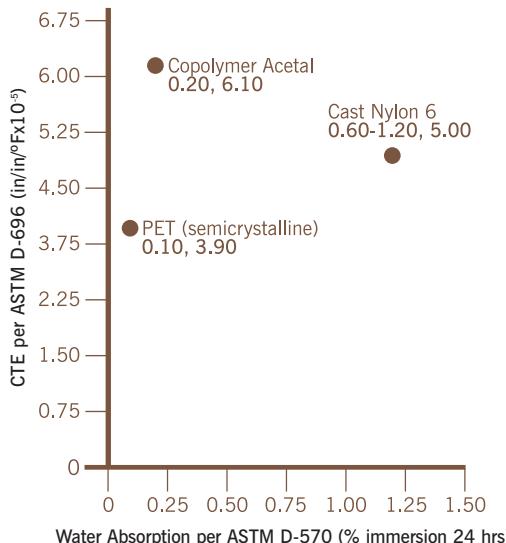
	UNITS	ASTM TEST	PET (SEMICRYSTALLINE)
Tensile strength	psi	D-638	11,500
Flexural modulus	psi	D-790	400,000
Izod impact (notched)	ft-lbs/in of notch	D-256	0.7
Heat deflection temperature @264 psi	°F	D-648	175
Maximum continuous service temperature in air	°F		230
Water absorption (immersion 24 hours)	%	D-570	0.10
Coefficient of linear thermal expansion	in/in/°Fx10 <sup>-5</sup>	D-696	3.9

**Standard Sizes: SHEET: 24"x48" (0.25"-4.0" thick) ROD: diameter 0.25"-6.0"**

Length, width, thickness, and diameter tolerances vary by size and by manufacturer • Custom sizes and colors available upon request • Many of our materials are available as films with thicknesses of 0.029" or less. For additional property data please refer to the chart on the inside back cover. Values may vary according to brand name. Please ask your Curbell Plastics representative for more specific information about an individual brand.

### DIMENSIONAL STABILITY

of PET compared with Copolymer Acetal and Cast Nylon 6



# PETG

(amorphous copolyester)

SPECTAR® / VIVAK®



## TYPICAL USES:

### THERMOFORMED DISPLAY

- Excellent deep draw thermoforming characteristics



PETG is a transparent thermoplastic sheet material with outstanding thermoformability and good impact resistance. PETG is an excellent choice for applications that require durability, deep draw thermoforming, and clarity.

Bayer MaterialScience



### KEY CHARACTERISTICS:

- Outstanding thermoforming characteristics, particularly in deep draw applications
- Does not usually require drying prior to thermoforming
- Good impact resistance
- Clear
- Lower cost alternative to polycarbonate
- Less brittle than acrylic
- Superior chemical resistance when compared with many other transparent plastics
- Easy to fabricate
- Allows for rapid thermoforming cycle times
- Brake formable (up to 0.080" thickness)
- FDA compliant grades available

### APPLICATIONS:

- Point-of-purchase displays
- Retail store fixtures
- Prototypes and models
- Orthotic and prosthetic devices
- Machine guards and housings

### PETG TYPICAL PROPERTIES:

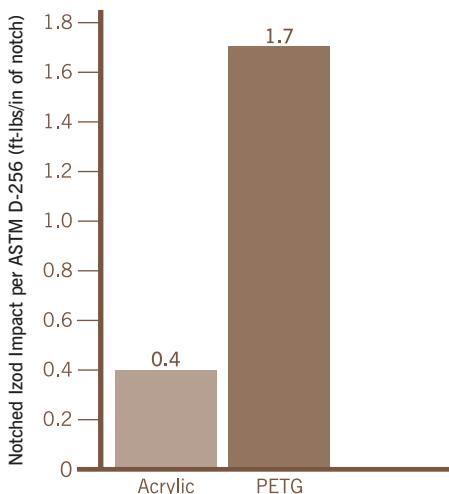
	UNITS	ASTM TEST	PETG
Tensile strength	psi	D-638	7,700
Flexural modulus	psi	D-790	310,000
Izod impact (notched)	ft-lbs/in of notch	D-256	1.7
Heat deflection temperature @264 psi	°F	D-648	157
Maximum continuous service temperature in air	°F		-
Water absorption (immersion 24 hours)	%	D-570	0.20
Coefficient of linear thermal expansion	in/in/°Fx10 <sup>-5</sup>	D-696	3.8

### Standard Sizes: SHEET: 48"x96" (0.03"-0.5" thick)

Length, width, thickness, and diameter tolerances vary by size and by manufacturer • Custom sizes and colors available upon request • Many of our materials are available as films with thicknesses of 0.029" or less. For additional property data please refer to the chart on the inside back cover. Values may vary according to brand name. Please ask your Curbell Plastics representative for more specific information about an individual brand.

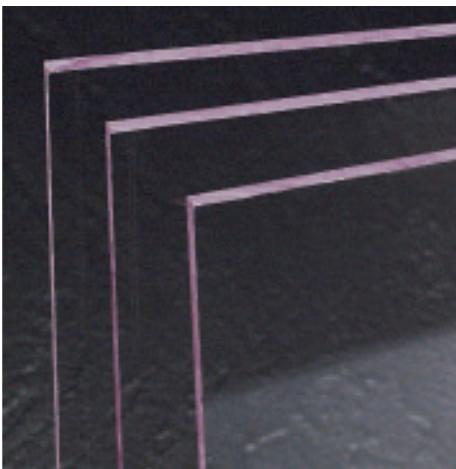
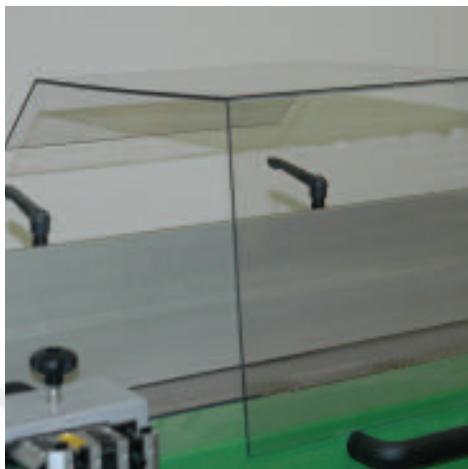
### IMPACT RESISTANCE

of PETG compared with Acrylic



# POLYCARBONATE

MAKROFOL® / MAKROLON® / SUSTANAT® / TECANAT™



Makrolon Hygard® bullet resistant sheet

## TYPICAL USES:

### PLUG

- Transparent
- Low water absorption



### MANIFOLD

- Extremely tough
- Good dimensional stability



Polycarbonate is a transparent, strong, and stiff thermoplastic material with outstanding impact resistance.

Polycarbonate's toughness and optical clarity make it ideal for a wide variety of applications including machine guards, indoor and outdoor signs, architectural glazing, face shields, skylights, and point-of-purchase displays.

Polycarbonate rod and plate are easy to machine and have excellent dimensional stability. Polycarbonate machining stock is used for numerous applications including electrical components, manifolds, sight glasses, and semiconductor machinery parts.

Polycarbonate thermoforms well, is easy to paint, and bonds well using solvents or adhesives.

Makrolon® AR is polycarbonate sheet with a transparent hard coat finish, which provides the material with enhanced weatherability, chemical resistance, and abrasion resistance. It is often used for glazing applications in high traffic areas such as bus shelters.

Makrolon Hygard® laminates are bullet-resistant sheet materials consisting of layers of polycarbonate or polycarbonate and acrylic with bonding interlayers. Makrolon Hygard® is used for security glazing applications including police stations and detention centers. The material is available in a variety of configurations depending on the level of protection required.

Bayer MaterialScience

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Engineering Plastics

### KEY CHARACTERISTICS:

- Outstanding toughness
- Good optical clarity
- Strong and stiff
- Easy to fabricate
- Thermoforms well after drying
- Replaces acrylic and PETG in high impact applications
- Available with a UL 94 V-0 flammability rating (0.220" thickness, clear)

- Brake formable (up to 0.100" thickness)
- Easy to solvent bond
- Bullet resistant grades available
- Abrasion resistant grades available
- UV resistant grades available
- Many colors and textures available
- FDA compliant grades available (non UV stabilized)
- Glass-filled grades available for enhanced strength and stiffness

### APPLICATIONS:

- Machine guards
- Signs
- Point-of-purchase displays
- Architectural glazing
- Skylights
- Transparent manifolds
- Site glasses
- Semiconductor machinery components

### POLYCARBONATE TYPICAL PROPERTIES:

	UNITS	ASTM TEST	POLYCARBONATE	POLYCARBONATE 20% GLASS-FILLED
Tensile strength	psi	D-638	9,500	16,000
Flexural modulus	psi	D-790	345,000	800,000
Izod impact (notched)	ft-lbs/in of notch	D-256	12.0-16.0	2.0
Heat deflection temperature @264 psi	°F	D-648	270	295
Maximum continuous service temperature in air	°F		240	248
Water absorption (immersion 24 hours)	%	D-570	0.15	0.16
Coefficient of linear thermal expansion	in/in/°Fx10 <sup>-5</sup>	D-696	3.8	1.5

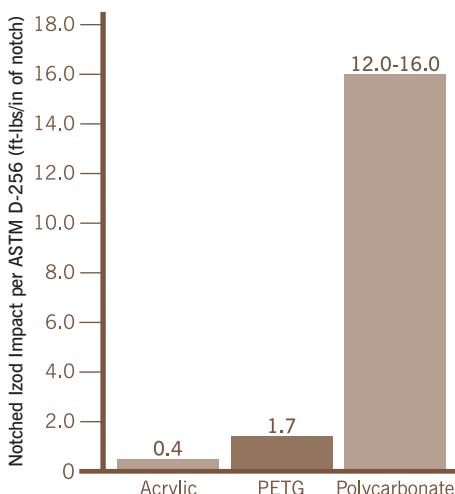
Standard Sizes: **SHEET:** 24"x48" (0.03"-4.0" thick), 48"x96" (0.03"-2.0" thick) **ROD:** diameter 0.25"-10.0"

**FILM:** 24"x48" (0.005"-0.030" thick) Roll stock and cut-to-size sheet also available

Length, width, thickness, and diameter tolerances vary by size and by manufacturer • Custom sizes and colors available upon request • Many of our materials are available as films with thicknesses of 0.029" or less. For additional property data please refer to the chart on the inside back cover. Values may vary according to brand name. Please ask your Curbell Plastics representative for more specific information about an individual brand.

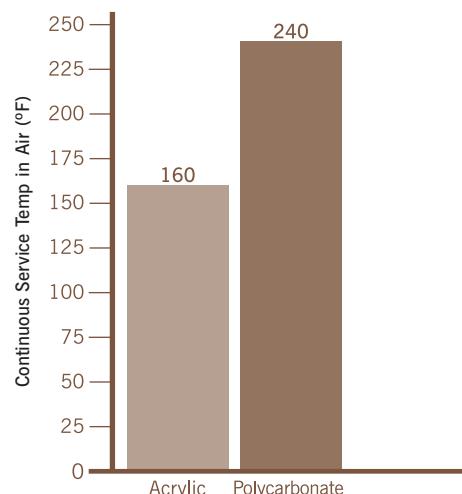
#### IMPACT RESISTANCE

of Polycarbonate compared with Acrylic and PETG



#### CONTINUOUS SERVICE TEMP IN AIR

of Polycarbonate compared with Acrylic

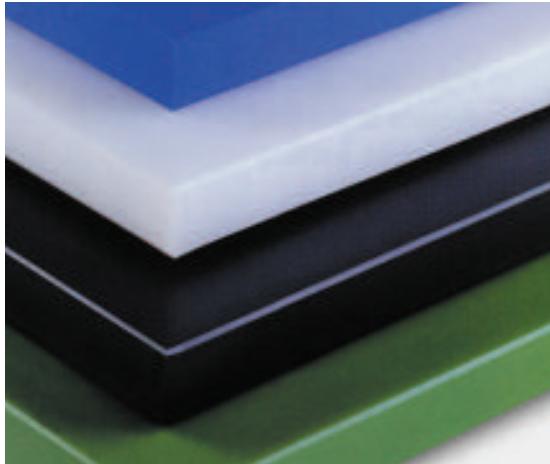


Polycarbonate is also available as a film. See pages 58-59 for more detailed information.

#### ENGINEERING NOTES:

Polycarbonate can often be used as a low cost alternative to Ultem® for electrical applications where the high temperature capability and high dielectric strength of Ultem® are not required.

# POLYETHYLENE (LDPE, HDPE, UHMW-PE)



Polyethylene is a low cost, chemically resistant plastic material that can be used for a wide variety of applications. The versatility of polyethylene has made it one of the world's most popular plastics. Polyethylene is available in a number of grades according to its molecular weight.



Polyethylene is also available as a film and tape. See pages 58-59 and 60 respectively for more detailed information.

## POLYETHYLENE TYPICAL PROPERTIES:

	UNITS	ASTM TEST	LDPE	HDPE	UHMW-PE
Tensile strength	psi	D-638	1,400	4,000	3,100
Flexural modulus	psi	D-790	30,000	200,000	110,000
Izod impact (notched)	ft-lbs/in of notch	D-256	no break	1.3	18.0*
Heat deflection temperature @66 psi	°F	D-648	122	172	-
Maximum continuous service temperature in air	°F		-	-	180
Water absorption (immersion 24 hours)	%	D-570	0.10	0.10	slight
Coefficient of linear thermal expansion	in/in/°Fx10 <sup>-5</sup>	D-696	-	7.0	11.1

For additional property data please refer to the chart on the inside back cover. Values may vary according to brand name. Please ask your Curbell Plastics representative for more specific information about an individual brand.

\* Double-15° notch

**KEY CHARACTERISTICS:**

- Soft and pliable
- Easy to weld and easy to heat seal
- Good chemical resistance
- Low cost
- Printable grades available
- FDA compliant grades available
- Available in a wide variety of colors

**APPLICATIONS:**

- Orthotics
- Prosthetics

# LDPE (low density polyethylene)

---



LDPE (low density polyethylene) is a soft, stretchy plastic material. LDPE sheet is used for orthotics and prosthetics when softness and flexibility are required.

**TYPICAL USES:****ORTHOTICS**

- Soft
- Flexible

**Standard Sizes: SHEET: 48"x96" (0.062"-2.0" thick)**

Length, width, thickness, and diameter tolerances vary by size and by manufacturer • Custom sizes and colors available upon request • Many of our materials are available as films with thicknesses of 0.029" or less.

# HDPE (high density polyethylene)

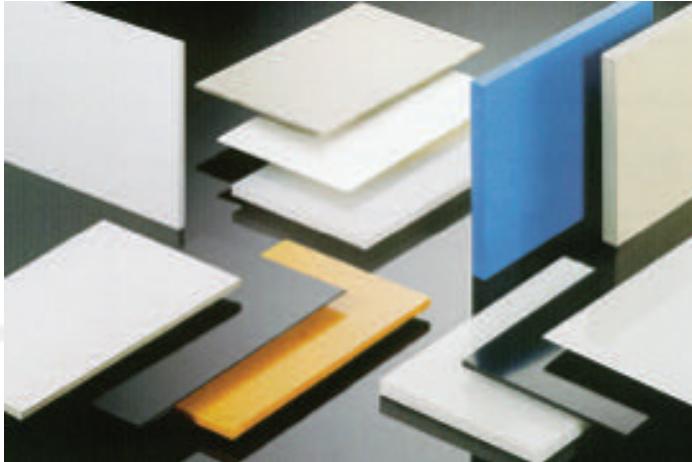
## KEY CHARACTERISTICS:

- Easy to weld using thermoplastic welding equipment
- Low moisture absorption
- Excellent surface for food preparation
- Good chemical resistance
- Low cost
- Printable grades available
- FDA compliant grades available
- Available in a wide variety of colors

## APPLICATIONS:

- Chemical tanks
- Water pipe flanges (pipe grade)
- Cutting boards for food preparation
- Orthotics and prosthetics
- Playground equipment

POLYSTONE® G / SANATEC®



## TYPICAL USES:

### CUTTING BOARDS

- FDA compliant
- Low water absorption
- Chemical resistance



HDPE (high density polyethylene) is available as sheet or rod stock for applications that require greater strength and stiffness than LDPE. HDPE with an embossed surface is widely used as a cutting board material in restaurants and food processing plants. HDPE is easy to weld using thermoplastic welding equipment and is an excellent choice for fabricated water tanks and chemical tanks that must be assembled by thermoplastic welding.

Standard Sizes: **SHEET:** 48"x96" (0.062"-4.0" thick), 48"x120" (0.062"-4.0" thick),  
60"x120" (0.125"-1.0" thick), 96"x120" (1.5"-4.0" thick),  
96"x240" (1.5"-4.0" thick) **ROD:** diameter 0.25"-10.0"

Length, width, thickness, and diameter tolerances vary by size and by manufacturer • Custom sizes and colors available upon request • Many of our materials are available as films with thicknesses of 0.029" or less.

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Engineering Plastics

 **VYCOM**  
OLEFIN AND PVC SOLUTIONS

### KEY CHARACTERISTICS:

- Extremely tough and durable
- Low friction
- Excellent abrasion resistance
- Good chemical resistance
- Low water absorption
- Easy to fabricate
- Reprocessed grades available
- Enhanced bearing and wear grades available
- FDA compliant grades available

### APPLICATIONS:

- Chute liners and hopper liners
- Wear strips
- Star wheels
- Idler sprockets
- Packaging machinery components
- Food processing machinery components

# UHMW-PE (ultra high molecular weight polyethylene)

POLYSTONE® M



UHMW-PE (ultra high molecular weight polyethylene) is an extremely tough and abrasion resistant thermoplastic that is used for applications that require durability and/or abrasive wear resistance.

UHMW sheet is often used for lining chutes and hoppers in order to protect metal surfaces and promote the flow of solid materials such as sand, wood chips, or coal. UHMW is also used for packaging, conveyor, and food processing machinery parts including star wheels, idler sprockets, and under-chain wear strips.

Standard Sizes: **SHEET:** 48"x96" (0.062"-4.0" thick), 48"x120" (0.062"-7.0" thick),

48"x144" (0.375"-4.0" thick), 60"x96" (0.375"-4.0" thick),

60"x120" (0.375"-4.0" thick)

**POLYSTONE® MEASHEET:** 96"x240" (0.375" - 4.0" thick)

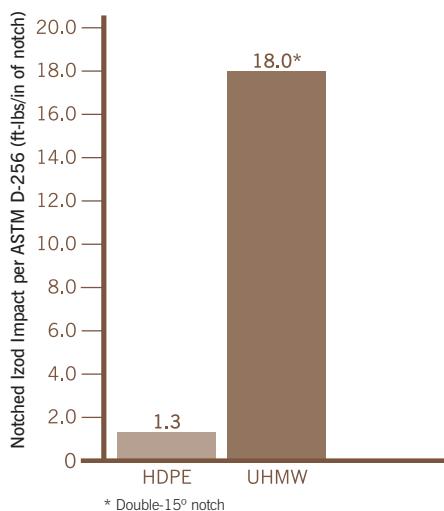
**ROD:** diameter 0.25" - 10.00" **TUBE:** diameter 2.0" - 9.398"

Length, width, thickness, and diameter tolerances vary by size and by manufacturer • Custom sizes and colors available upon request • Many of our materials are available as films with thicknesses of 0.029" or less.

 **RÖCHLING**  
Engineering Plastics

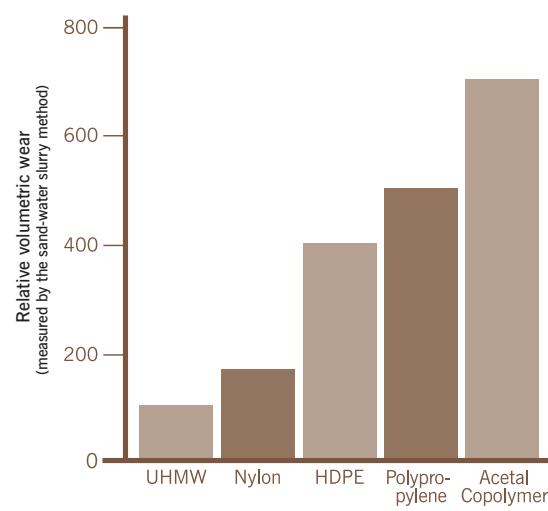
### IMPACT RESISTANCE

of UHMW compared with HDPE



### ABRASION RESISTANCE

of UHMW compared with Nylon, HDPE, Polypropylene, and Acetal



UHMW is also available as a film and tape. See pages 58-59 and 60 respectively for more detailed information.

### ENGINEERING NOTES:

Ultra high molecular weight polyethylene has a relatively high coefficient of thermal expansion. This may make it difficult to hold tight tolerances on UHMW parts that will be exposed to changing temperatures.

# POLYPROPYLENE

**POLYSTONE® P**



## TYPICAL USES:

### CHEMICAL TANK

- Good chemical resistance
- Cost effective



Polypropylene is a low cost, chemically resistant plastic material with excellent aesthetic qualities. Polypropylene is easy to weld using thermoplastic welding equipment and is often fabricated into water and chemical tanks.

Polypropylene is available in both homopolymer and copolymer grades. Homopolymer polypropylene is stronger and stiffer than copolymer. Copolymer polypropylene is a bit softer, but it is tougher and more durable than homopolymer polypropylene. Copolymer polypropylene tends to have better stress crack resistance and low temperature toughness than homopolymer.

Heat stabilized polypropylene is available in a medical grade which is easily machined and specifically designed for surgical trays and caddies. It has excellent dimensional stability and resistance to steam autoclaving with relatively low moisture absorption

**ENSINGER**

**RÖCHLING**  
Engineering Plastics

### KEY CHARACTERISTICS:

- Easy to weld using thermoplastic welding equipment
- Low moisture absorption
- Good chemical resistance
- Low cost
- Extremely tough (copolymer)
- Excellent aesthetic properties
- Easy to fabricate
- FDA compliant grades available
- Heat stabilized grades available
- Medical grades available

### APPLICATIONS:

- Chemical tanks
- Plating tanks
- Fire truck water tanks (copolymer)
- Cutting boards for food preparation
- Semiconductor equipment cabinets and work surfaces
- Orthotics and prosthetics

### POLYPROPYLENE TYPICAL PROPERTIES:

	UNITS	ASTM TEST	POLYPROPYLENE HOMOPOLYMER	POLYPROPYLENE COPOLYMER
Tensile strength	psi	D-638	5,400	3,800
Flexural modulus	psi	D-790	225,000	215,000
Izod impact (notched)	ft-lbs/in of notch	D-256	1.2	12.5
Heat deflection temperature @66 psi	°F	D-648	210	190
Maximum continuous service temperature in air	°F		-	-
Water absorption (immersion 24 hours)	%	D-570	slight	slight
Coefficient of linear thermal expansion	in/in/°Fx10 <sup>-5</sup>	D-696	-	-

**Standard Sizes:** SHEET: 48"x96" (0.062"-4.0" thick), 48"x120" (0.062"-4.0" thick), 60"x120" (0.125"-1.0" thick), 96"x120" (1.5"-4.0" thick), 96"x240" (1.5"-4.0" thick) ROD: diameter 0.25"-10.0"

Length, width, thickness, and diameter tolerances vary by size and by manufacturer • Custom sizes and colors available upon request • Many of our materials are available as films with thicknesses of 0.029" or less. For additional property data please refer to the chart on the inside back cover. Values may vary according to brand name. Please ask your Curbell Plastics representative for more specific information about an individual brand.



Polypropylene is also available as a film. See pages 58-59 for more detailed information.

# POLYSTYRENE

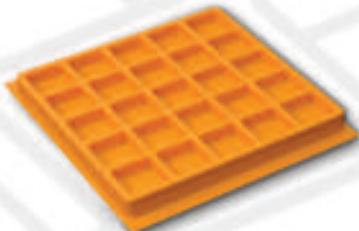
(HIPS, high impact polystyrene)



## TYPICAL USES:

### POINT-OF-PURCHASE DISPLAY

- Cost effective
- Easy to thermoform



High impact polystyrene is a low cost, tough plastic material that is easy to thermoform and fabricate. It is often used for countertop point-of-purchase displays, banners, and indoor signs. The material can be assembled with mechanical fasteners, solvents, or adhesives.

Printable grades of high impact polystyrene can be decorated using a variety of printing methods including screen printing, offset lithography, and flexography.

HIPS sheet is available in a wide variety of colors and textures.



**KEY CHARACTERISTICS:**

- Low cost
- Easy to paint or print on
- Easy to assemble with adhesives or solvents
- Outstanding thermoforming characteristics
- Good machinability
- High impact strength
- FDA compliant grades available
- Available in a wide variety of colors and textures

**APPLICATIONS:**

- Point-of-purchase displays
- Printed advertising graphics
- Models and prototypes
- Thermoformed machine housings

**HIGH IMPACT POLYSTYRENE TYPICAL PROPERTIES:**

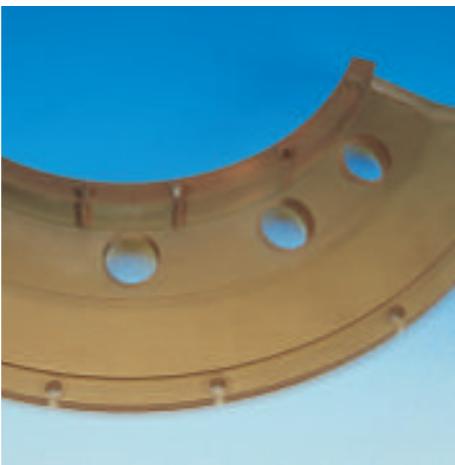
	UNITS	ASTM TEST	HIGH IMPACT POLYSTYRENE
Tensile strength	psi	D-638	3,500
Flexural modulus	psi	D-790	310,000
Izod impact (notched)	ft-lbs/in of notch	D-256	2.0
Heat deflection temperature @264 psi	°F	D-648	185
Maximum continuous service temperature in air	°F		-
Water absorption (immersion 24 hours)	%	D-570	-
Coefficient of linear thermal expansion	in/in/°Fx10 <sup>-5</sup>	D-696	4.5

**Standard Sizes: SHEET: 48"x96" (0.03"-0.25" thick)**

Length, width, thickness, and diameter tolerances vary by size and by manufacturer • Custom sizes and colors available upon request • Many of our materials are available as films with thicknesses of 0.029" or less. For additional property data please refer to the chart on the inside back cover. Values may vary according to brand name. Please ask your Curbell Plastics representative for more specific information about an individual brand.

# POLYSULFONE

SUSTATRON® PSU / TECASON™ S



## TYPICAL USES:

### CAP

- Low water absorption
- Performs well at elevated temperatures



### VALVE PLUNGER

- Translucent
- Dimensionally stable
- Safe for use with food
- Resistant to disinfectants



Polysulfone is a high temperature, amber colored, semi-transparent plastic material with good mechanical properties. Polysulfone is resistant to degradation from hot water and steam and it is often used in medical and food preparation applications where repeated sterilization is required.

Polysulfone can be used as an alternative to polycarbonate or acrylic for applications requiring high temperature performance or exposure to hot water and steam.

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**RÖCHLING** Engineering Plastics

### KEY CHARACTERISTICS:

- Semi-transparent
- Resists hydrolysis when exposed to hot water or steam
- Strong and stiff
- Can be used at higher temperatures than acrylic or polycarbonate
- Thermoformable
- FDA compliant grades available
- Medical grades available

### APPLICATIONS:

- Medical instrument components
- Manifolds
- Medical trays
- Autoclavable instruments and trays

### POLYSULFONE TYPICAL PROPERTIES:

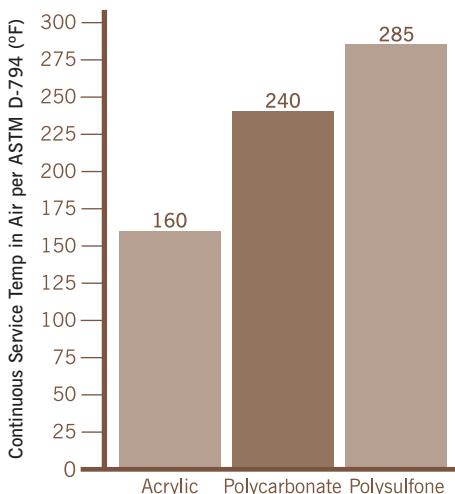
	UNITS	ASTM TEST	POLYSULFONE
Tensile strength	psi	D-638	10,200
Flexural modulus	psi	D-790	390,000
Izod impact (notched)	ft-lbs/in of notch	D-256	1.3
Heat deflection temperature @264 psi	°F	D-648	345
Maximum continuous service temperature in air	°F		285
Water absorption (immersion 24 hours)	%	D-570	0.30
Coefficient of linear thermal expansion	in/in/°Fx10 <sup>-5</sup>	D-696	3.1

**Standard Sizes:** SHEET: 24"x48" (0.25"-4.0" thick) ROD: diameter 0.375"-4.0" TUBE: call for availability

Length, width, thickness, and diameter tolerances vary by size and by manufacturer • Custom sizes and colors available upon request • Many of our materials are available as films with thicknesses of 0.029" or less. For additional property data please refer to the chart on the inside back cover. Values may vary according to brand name. Please ask your Curbell Plastics representative for more specific information about an individual brand.

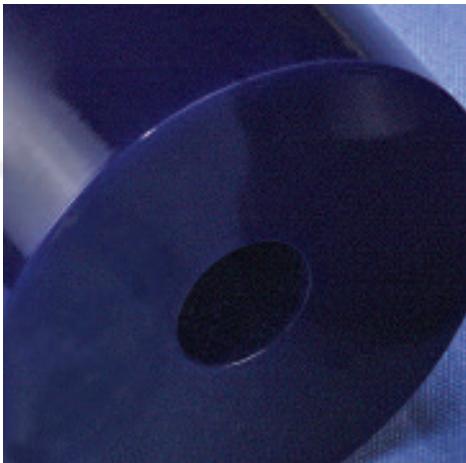
### CONTINUOUS SERVICE TEMP IN AIR

of Polysulfone compared with Acrylic and Polycarbonate



# POLYURETHANE

---



## TYPICAL USES:

### SOCKET COVER

- Won't scratch or mar finished parts
- Reduces scrap and saves money



Polyurethanes are engineered elastomers that can be cast into sheets or rods as well as finished parts. Polyurethanes are graded depending on their hardness or durometer. They are available in a wide variety of durometers ranging from Shore 50A (extremely soft and rubbery) to Shore 75D (hard and stiff).

Polyurethanes are extremely tough, resilient, and abrasion resistant. They are used for a wide variety of applications including bumpers, wheel covers, roller covers, snow plow edges, and screen printing squeegees.

#### KEY CHARACTERISTICS:

- Absorbs impact and vibration
- Resilient and tough
- Abrasion resistant
- Can be cast into a variety of shapes and finished parts
- Can be cast directly onto metal wheels and rollers

#### APPLICATIONS:

- Bumpers
- Wheels
- Rollers
- Snow plow edges
- Packaging machinery components
- Assembly fixtures, checking fixtures, and storage fixtures



**Standard Sizes: SHEET: 48"x48" (0.0313"-5.0" thick) ROD: diameter 0.25" and up**

Length, width, thickness, and diameter tolerances vary by size and by manufacturer • Custom sizes and colors available upon request • Many of our materials are available as films with thicknesses of 0.029" or less. For additional property data please refer to the chart on the inside back cover. Values may vary according to brand name. Please ask your Curbell Plastics representative for more specific information about an individual brand.

# PPS

(polyphenylene sulfide)

SUSTATRON® PPS / TECATRON™



PPS is a chemical and corrosion resistant plastic material that is often used in applications involving exposure to corrosive chemicals at elevated temperatures. PPS has outstanding mechanical properties and is also available in a bearing-grade that has excellent wear resistance.

PPS is often used as a lower cost alternative to PEEK at low to moderate temperatures.



### KEY CHARACTERISTICS:

- Outstanding chemical resistance
- Resistant to hot water and steam
- Strong and stiff
- Can be used at elevated temperatures
- Bearing grade has excellent wear characteristics
- Good dimensional stability
- Low moisture absorption
- Low thermal expansion
- High dielectric strength

### APPLICATIONS:

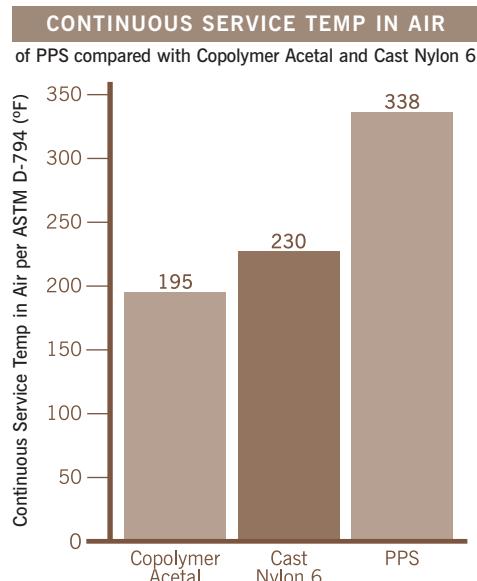
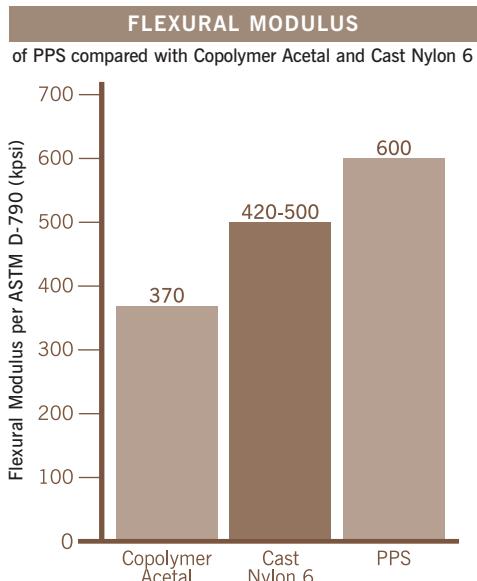
- Semiconductor machinery components
- Scientific instrumentation parts
- Seals
- Pump and valve components
- Bearings and bushings (bearing grade)
- Electrical components

### PPS TYPICAL PROPERTIES:

	UNITS	ASTM TEST	PPS
Tensile strength	psi	D-638	12,500
Flexural modulus	psi	D-790	600,000
Izod impact (notched)	ft-lbs/in of notch	D-256	0.5
Heat deflection temperature @264 psi	°F	D-648	220
Maximum continuous service temperature in air	°F		338
Water absorption (immersion 24 hours)	%	D-570	0.02
Coefficient of linear thermal expansion	in/in/°Fx10 <sup>-5</sup>	D-696	4.0

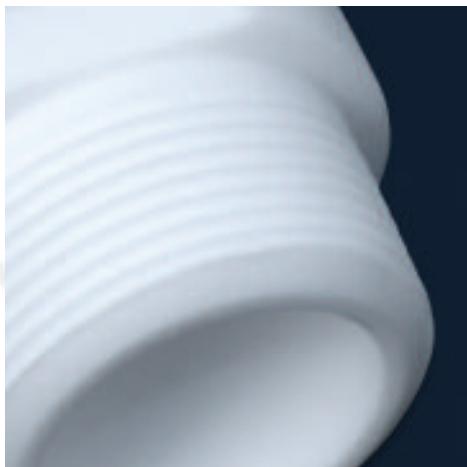
**Standard Sizes:** SHEET: 24"x48" (0.25"-2.0" thick) ROD: diameter 0.5"-2.0" TUBE: call for availability

Length, width, thickness, and diameter tolerances vary by size and by manufacturer • Custom sizes and colors available upon request • Many of our materials are available as films with thicknesses of 0.029" or less. For additional property data please refer to the chart on the inside back cover. Values may vary according to brand name. Please ask your Curbell Plastics representative for more specific information about an individual brand.



# PTFE

(polytetrafluoroethylene)



## TYPICAL USES:

### FITTING

- Good sealing characteristics



### FILTER COMPONENT

- Good chemical resistance



PTFE is a soft, low friction fluoropolymer with outstanding chemical resistance and weathering resistance. PTFE is stable at temperatures up to 500°F and it is often used in high temperature environments. PTFE also has excellent electrical insulating properties.

PTFE is available in a variety of formulations including unfilled, glass-filled, and bearing grades. Unfilled PTFE is extremely soft and formable and it is often used for chemical resistant seals and gaskets. Glass-filled PTFE has enhanced strength and stiffness. Bearing grades of PTFE have extremely low friction and high service temperatures. They are frequently specified for high performance bearings and bushings, particularly in applications that require resistance to corrosive chemicals.

PTFE sheet, rod, and tube are available in virgin grade, which is made from virgin PTFE resin as well as reprocessed or mechanical grade, which is made from recycled material.

### KEY CHARACTERISTICS:

- Outstanding chemical resistance
- Extremely low friction
- Soft and formable
- Good bearing and wear properties (bearing grades)
- Good weathering resistance
- Performs well at elevated temperatures
- FDA compliant grades available

### APPLICATIONS:

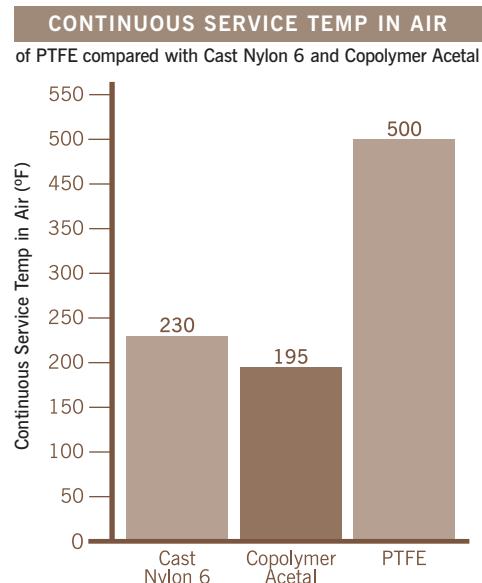
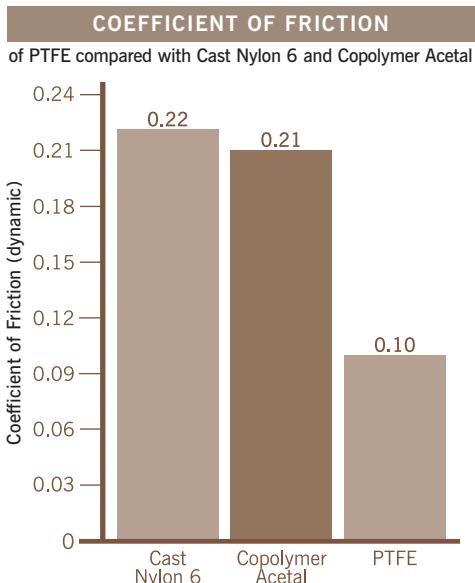
- Seals and gaskets
- Valve and fitting components
- Pump parts
- Manifolds
- Semiconductor equipment
- Scientific equipment
- Medical equipment
- Chemical resistant tubing
- Bearings and bushings (bearing grades)

### PTFE TYPICAL PROPERTIES:

	Units	ASTM Test	PTFE
Tensile strength	psi	D-638	1,500-3,000
Flexural modulus	psi	D-790	72,000
Izod impact (notched)	ft-lbs/in of notch	D-256	3.5
Heat deflection temperature @66 psi	°F	D-648	250
Maximum continuous service temperature in air	°F		500
Water absorption (immersion 24 hours)	%	D-570	<0.01
Coefficient of linear thermal expansion	in/in/°Fx10 <sup>-5</sup>	D-696	5.5
Coefficient of friction (dynamic)			0.10

**Standard Sizes:** SHEET: 48"x48" (0.03"-3.0" thick) ROD: diameter 0.125"-12.0" TUBE: OD 0.3125"-2.5"

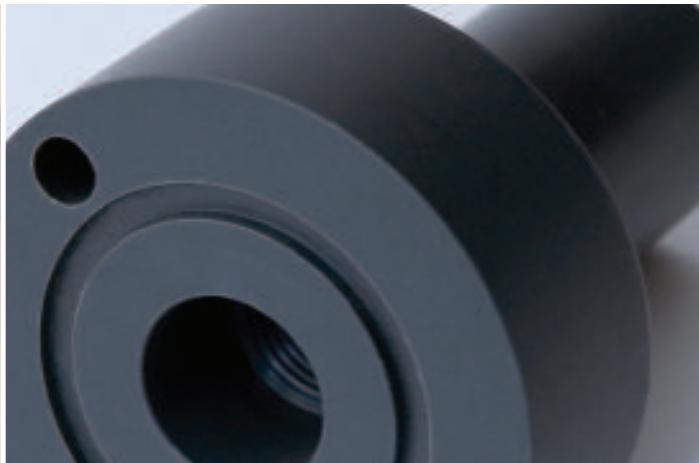
Length, width, thickness, and diameter tolerances vary by size and by manufacturer • Custom sizes and colors available upon request • Many of our materials are available as films with thicknesses of 0.029" or less. For additional property data please refer to the chart on the inside back cover. Values may vary according to brand name. Please ask your Curbell Plastics representative for more specific information about an individual brand.



PTFE is also available as a film and tape. See pages 58-59 and 60 respectively for more detailed information.

# PVC (polyvinyl chloride, rigid)

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## TYPICAL USES:

### VALVE COMPONENT

- Excellent machining characteristics
- Easy to bond with adhesives



Rigid PVC is a strong, stiff, low cost plastic material that is easy to fabricate and easy to bond using adhesives or solvents. It is also easy to weld using thermoplastic welding equipment. PVC is frequently used in the construction of tanks, valves, and piping systems.

### KEY CHARACTERISTICS:

- Strong and stiff
- Low cost
- Easy to weld using thermoplastic welding equipment
- Easy to join using solvents or adhesives
- FDA compliant grades available

### APPLICATIONS:

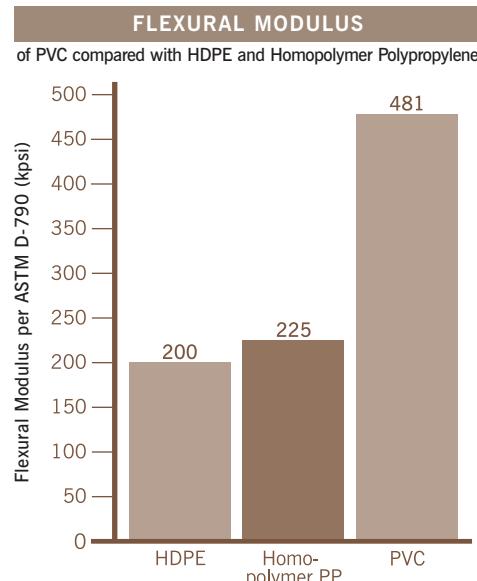
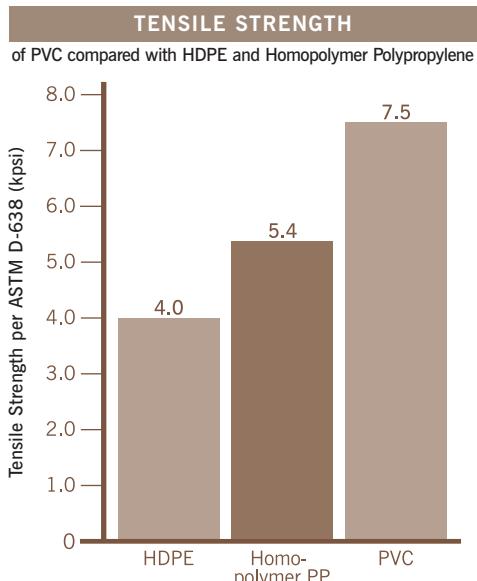
- Welded tanks
- Manifolds
- Valve and pump housings
- Fittings
- Piping systems
- Cabinets and working surfaces

### PVC TYPICAL PROPERTIES:

	UNITS	ASTM TEST	PVC (RIGID)
Tensile strength	psi	D-638	7,500
Flexural modulus	psi	D-790	481,000
Izod impact (notched)	ft-lbs/in of notch	D-256	1.0
Heat deflection temperature @264 psi	°F	D-648	158
Maximum continuous service temperature in air	°F		140
Water absorption (immersion 24 hours)	%	D-570	0.06
Coefficient of linear thermal expansion	in/in/°Fx10 <sup>-5</sup>	D-696	3.2

**Standard Sizes: SHEET: 48"x96" (0.06"-3.0" thick) ROD: diameter 0.25"-12.0"**

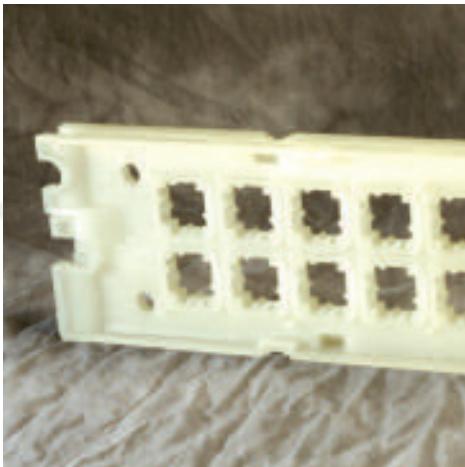
Length, width, thickness, and diameter tolerances vary by size and by manufacturer • Custom sizes and colors available upon request • Many of our materials are available as films with thicknesses of 0.029" or less. For additional property data please refer to the chart on the inside back cover. Values may vary according to brand name. Please ask your Curbell Plastics representative for more specific information about an individual brand.



# PVDF

(polyvinylidene fluoride)

KYNAR® / SUSTA® PVDF / TECAFLO™



Photos courtesy of Arkema. Kynar® PVDF is a registered trademark of Arkema.

## TYPICAL USES:

### MANIFOLD

- High purity
- Chemical resistant



PVDF, often referred to by its trade name Kynar®, is a high purity engineering thermoplastic with excellent chemical resistance, abrasion resistance, flame resistance, and UV stability. PVDF is widely used for chemical tank liners and semiconductor equipment components.

Homopolymer PVDF has higher strength and stiffness and has a higher heat deflection temperature than copolymer PVDF. Copolymer PVDF is less stiff but has superior impact resistance and stress crack resistance.

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Engineering Plastics

### KEY CHARACTERISTICS:

- Excellent chemical resistance
- High purity
- Easy to weld using thermoplastic welding equipment
- Good UV stability
- Flame resistant
- Abrasion resistant
- FDA compliant grades available

### APPLICATIONS:

- Chemical tank liners
- Semiconductor equipment components
- Pump and valve parts

### PVDF TYPICAL PROPERTIES:

	UNITS	ASTM TEST	PVDF HOMOPOLYMER
Tensile strength	psi	D-638	7,800
Flexural modulus	psi	D-790	310,000
Izod impact (notched)	ft-lbs/in of notch	D-256	3.0
Heat deflection temperature @264 psi	°F	D-648	235
Maximum continuous service temperature in air	°F		-
Water absorption (immersion 24 hours)	%	D-570	0.02
Coefficient of linear thermal expansion	in/in/°Fx10 <sup>-5</sup>	D-696	7.1

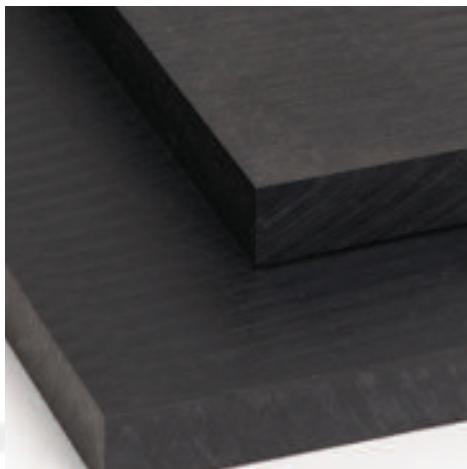
**Standard Sizes: SHEET: 24"x48" (0.25"-4.0" thick), 48"x96" (0.125"-2.0" thick) ROD: diameter 0.375"-6.0"**

Length, width, thickness, and diameter tolerances vary by size and by manufacturer • Custom sizes and colors available upon request • Many of our materials are available as films with thicknesses of 0.029" or less. For additional property data please refer to the chart on the inside back cover. Values may vary according to brand name. Please ask your Curbell Plastics representative for more specific information about an individual brand.



PVDF is also available as a film. See pages 58-59 for more detailed information.

# RADEL R® (polypheylsulfone)



## TYPICAL USES:

### SURGICAL INSTRUMENT HANDLE

- Tough
- Autoclavable



### SIZING TRIAL

- Dimensionally stable
- Autoclavable



Radel R® is a high temperature thermoplastic material with outstanding impact resistance. Radel R® is resistant to hot water and steam and can withstand repeated cycles in a steam autoclave. Radel R® is often used instead of polysulfone or Ultem® for medical applications when superior toughness or extended service life with repeated autoclave cycles is desired.

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**RÖCHLING**  Engineering Plastics



Radel R® is also available as a film. See pages 58-59 for more detailed information.

#### KEY CHARACTERISTICS:

- Extremely high impact resistance
- Resistant to hydrolysis when exposed to hot water and steam
- Can withstand repeated sterilization cycles in a steam autoclave
- Thermoforms well
- USP Class VI compliant grades available
- Medical grades available
- Available in a wide variety of colors

#### APPLICATIONS:

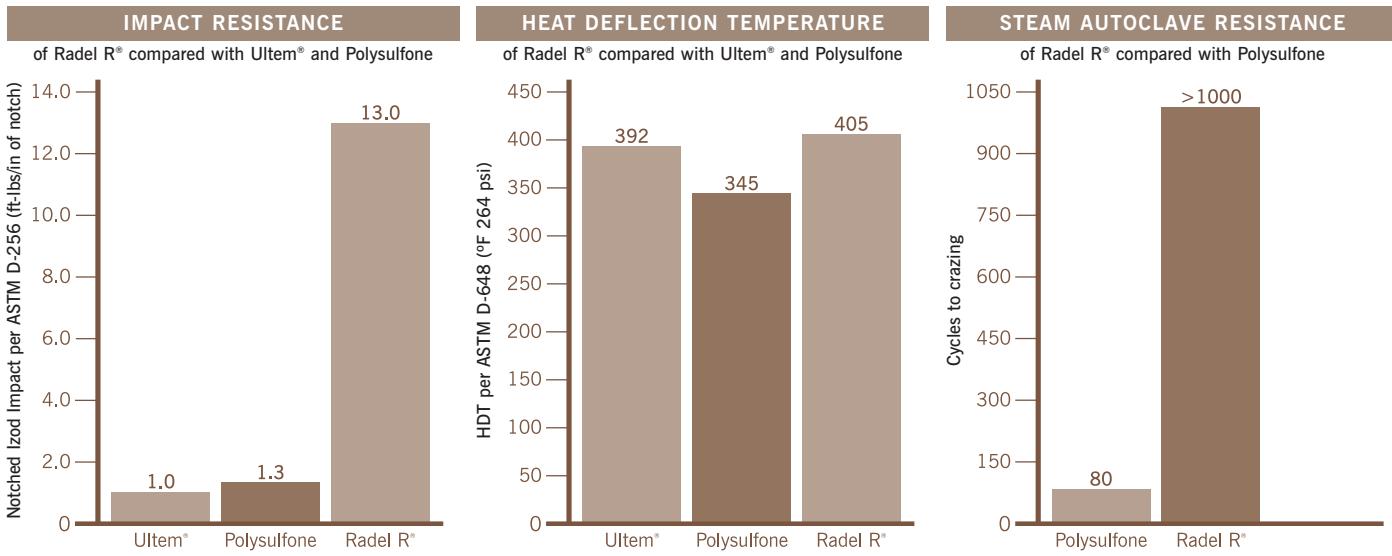
- Medical instrument components
- Sterilization trays
- Implant trials

#### RADEL R® TYPICAL PROPERTIES:

	UNITS	ASTM TEST	RADEL R®
Tensile strength	psi	D-638	10,100
Flexural modulus	psi	D-790	350,000
Izod impact (notched)	ft-lbs/in of notch	D-256	13.0
Heat deflection temperature @264 psi	°F	D-648	405
Maximum continuous service temperature in air	°F		392
Water absorption (immersion 24 hours)	%	D-570	0.37
Coefficient of linear thermal expansion	in/in/°Fx10 <sup>-5</sup>	D-696	3.1

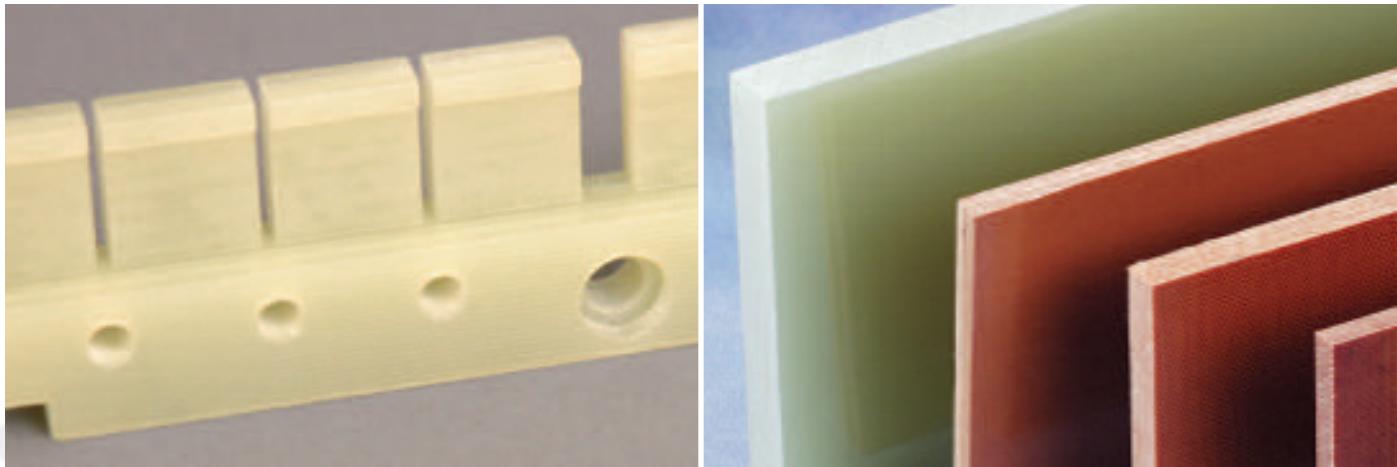
#### Standard Sizes: SHEET: 24"x48" (0.25"-4.0" thick) ROD: diameter 0.25"-6.0"

Length, width, thickness, and diameter tolerances vary by size and by manufacturer • Custom sizes and colors available upon request • Many of our materials are available as films with thicknesses of 0.029" or less. For additional property data please refer to the chart on the inside back cover. Values may vary according to brand name. Please ask your Curbell Plastics representative for more specific information about an individual brand.



Autoclave: 27 psig steam, 270°F steam contains 50ppm Morpholine  
Test conditions: Bar - 5 x 0.5 x 0.125 in, Flexural stress - 1000psi

# THERMOSET COMPOSITES



## TYPICAL USES:

### ELECTRICAL INSULATOR

- Good electrical insulating properties



Thermoset composite materials have the advantage of having extremely high strength and stiffness at relatively low cost when compared with thermoplastics. Each thermoset composite consists of a reinforcement material such as glass fiber or woven cotton that has been impregnated with a plastic resin such as phenolic or epoxy. The resulting composite has unique properties depending on the resin-reinforcement combination selected.

Commercially available grades include

Paper Phenolic: grades X, XX, and XXX, and punchable grades

Canvas Phenolic: grades C and CE

Linen Phenolic: grades L and LE

Glass Epoxy: grades FR-4, G-10, and G-11

Glass Melamine: grades G-5 and G-9

Glass Silicone: grade G-7

Glass Polyester: grades GPO-1, GPO-2, and GPO-3

**KEY CHARACTERISTICS:**

- Strong and stiff
- Outstanding electrical properties (electrical grades)
- Excellent bearing and wear properties (bearing grade phenolic)
- Good creep resistance
- Dimensionally stable
- High temperature resistant grades available

**APPLICATIONS:**

- Electrical insulators (electrical grades)
- Countertops and other work surfaces
- Bearings, bushings, and gears (bearing grade phenolic)
- Wear pads (bearing grade phenolic)

**THERMOSET COMPOSITES TYPICAL PROPERTIES:**

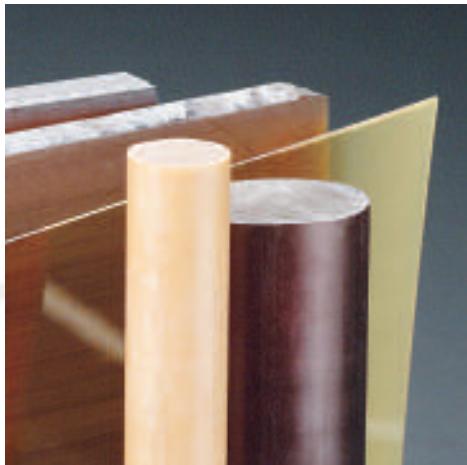
	UNITS	ASTM TEST	XX (Paper Phenolic)	CE (Canvas Phenolic)	LE (Linen Phenolic)	FR-4 (Glass Epoxy)	G7 (Glass Silicone)	GPO-3 (Glass Polyester)
Specific gravity		D-792	1.35	1.37	1.34	1.80	1.88	1.80
Tensile strength (CW)	psi	D-638	11,500	9,000	9,000	38,000	-	8,000-11,000
Flexural strength (CW)	psi	D-790	17,000	15,000	16,000	60,000	15,400	18,000-25,000
Flexural modulus	psi	D-790	-	1,500,000	1,200,000	2,400,000	-	1,500,000
Compressive strength	psi	D-695	25,000	34,000	36,000	55,000	-	30,000-35,000
Hardness	Rockwell (scale as noted)	D-785	M95	M100	M100	M110	M100	-
Izod impact (notched, CW)	ft-lbs/in of notch	D-256	0.4	1.5	1.1	12.0	8.5	8.0-9.5
Maximum continuous service temperature in air	°F		266	257	257	266	338	-
Water absorption (immersion 24 hours)	%	D-229	2.00	2.00	1.90	0.10	0.19	0.20

**Standard Sizes: SHEET: 36"x48" (0.03"-10.0" thick), 48"x96" (0.03"-4.0" thick)**

Length, width, thickness, and diameter tolerances vary by size and by manufacturer • Custom sizes and colors available upon request • Many of our materials are available as films with thicknesses of 0.029" or less. For additional property data please refer to the chart on the inside back cover. Values may vary according to brand name. Please ask your Curbell Plastics representative for more specific information about an individual brand.

# ULTEM® (polyetherimide)

SUSTA® PEI / TECAPEI™



## TYPICAL USES:

### TEST SOCKET

- High dielectric strength
- Good machinability



Ultem® is a semi-transparent high strength plastic material that can operate in high service temperature environments. Ultem® is resistant to hot water and steam and can withstand repeated cycles in a steam autoclave. Ultem® has outstanding electrical properties, with one of the highest dielectric strengths of any thermoplastic material. Ultem® is often used instead of polysulfone when superior strength, stiffness, or temperature resistance is required.

Ultem® is available in glass-filled grades with enhanced strength and stiffness.

**ENSINGER**   
ASK. THINK. SUCCEED.

**RÖCHLING**   
Engineering Plastics



Ultem® is also available as a film. See pages 58-59 for more detailed information.

#### KEY CHARACTERISTICS:

- Extremely strong and stiff
- High dielectric strength
- Resistant to hydrolysis when exposed to hot water and steam
- Can withstand repeated sterilization cycles in a steam autoclave
- Good thermoforming properties
- FDA compliant grades available
- USP Class VI compliant grades available
- Medical grades available
- Available in a wide variety of colors

#### APPLICATIONS:

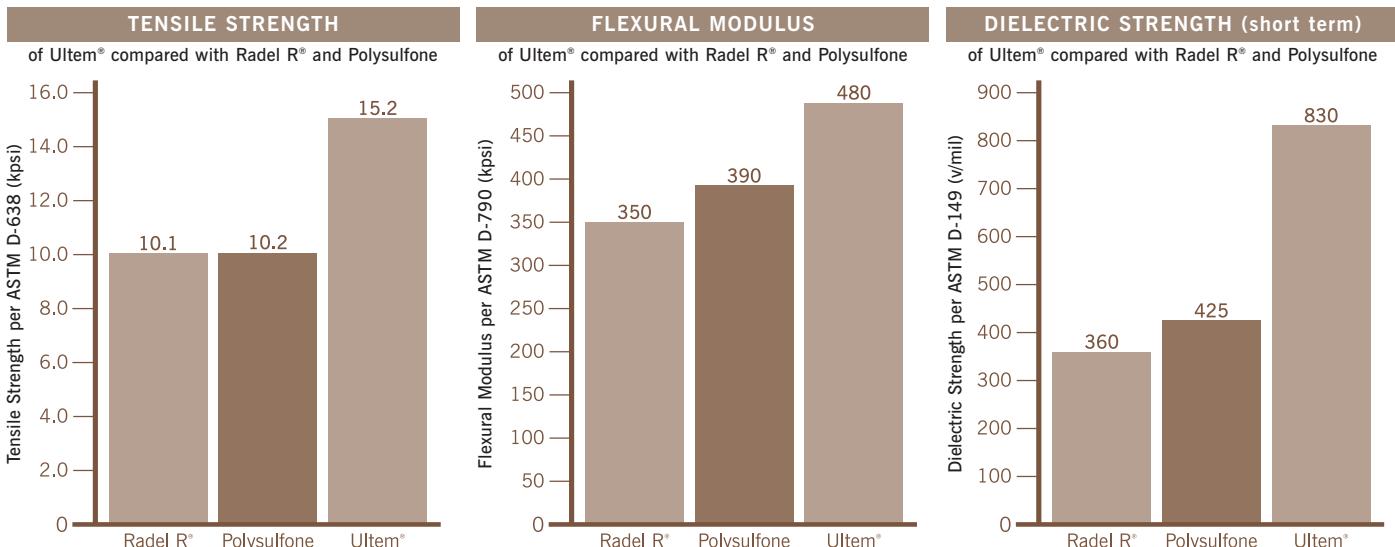
- Medical instrument components
- Scientific equipment parts
- Manifolds
- Electrical connectors
- Electrical insulation parts
- Semiconductor equipment components
- Chip test sockets

#### ULTEM® TYPICAL PROPERTIES:

	UNITS	ASTM TEST	ULTEM®
Tensile strength	psi	D-638	15,200
Flexural modulus	psi	D-790	480,000
Izod impact (notched)	ft-lbs/in of notch	D-256	1.0
Heat deflection temperature @264 psi	°F	D-648	392
Maximum continuous service temperature in air	°F		338
Water absorption (immersion 24 hours)	%	D-570	0.25
Coefficient of linear thermal expansion	in/in/°Fx10 <sup>-5</sup>	D-696	3.1

#### Standard Sizes: SHEET: 24"x48" (0.03"-4.0" thick) ROD: diameter 0.25"-8.0"

Length, width, thickness, and diameter tolerances vary by size and by manufacturer • Custom sizes and colors available upon request • Many of our materials are available as films with thicknesses of 0.029" or less. For additional property data please refer to the chart on the inside back cover. Values may vary according to brand name. Please ask your Curbell Plastics representative for more specific information about an individual brand.



# DUPONT™ VESPEL® POLYIMIDE SHAPES



## TYPICAL USES:

### VALVE SEAT

- Long life
- Wear resistant
- Resists creep and permanent deformation
- Low coefficient of friction
- High temperature performance



Dupont™ Vespel® Polyimide is an extremely high temperature, creep resistant material that is often used in high heat environments where thermoplastic materials lose their mechanical properties.

Vespel® is available in a variety of formulations including unfilled grades and several low friction and wear grades. Unfilled Vespel® has outstanding sealing properties when it interfaces with metal mating parts. These properties make Vespel® ideal for use in high temperature and high pressure or high vacuum valve seat and gasket applications.

Bearing grade Vespel® will operate successfully without lubrication in many high load, high speed, and/or high temperature environments where thermoplastic bearings and many metal bearing materials may quickly fail.

The new SCP family of DuPont™ Vespel® Polyimide Shapes exhibits enhanced mechanical properties and superior thermal stability.



## KEY CHARACTERISTICS:

- Long term performance at temperatures up to 260°C (500°F)
- Outstanding sealing characteristics when mated against metals
- Excellent unlubricated wear properties (bearing grades)
- Extremely high limiting PV values (bearing grades)
- Good electrical insulating properties (unfilled grade)

## APPLICATIONS:

- Semiconductor machinery
- Chip test sockets
- Wafer clamping rings
- Aerospace components
- Spline couplings
- High performance bearings and bushings
- Valve seats
- Gaskets
- Seals
- Piston rings
- Welding nozzle tips

## TYPICAL PROPERTIES –

DUPONT™ VESPEL® ISOSTATIC SHAPE GRADES

Data from DuPont™ document: (02/10) Reference No. VPE-A11004-00-A1111 Previously K-21998-1

			VESPEL® SP				VESPEL® SCP				
	ASTM METHOD	UNITS	SP-1 Unfilled	SP-21 15% graphite	SP-22 40% graphite	SP-211 15% graphite and 10% Teflon®	SP-3 Vacuum Bearing Grade	SCP-5000 Unfilled	SCP-5009 Graphite filled	SCP-50094 Graphite Bearing Grade-Low fill	SCP-5050 Graphite Bearing Grade-High fill
<b>MECHANICAL</b>											
Tensile strength 23°C (73°F)	D1708/D638	MPa (kpsi)	86.2 (12.5)	65.5 (9.5)	51.7 (7.5)	44.8 (6.5)	56.5 (8.2)	163 (23.6)	116 (16.9)	124 (18.0)	72 (10.5)
Tensile Strength 260°C (500°F)	D1708/D638	MPa (kpsi)	41.4 (6.0)	37.9 (5.5)	23.4 (3.4)	24.1 (3.5)		62 (9)	57 (8.4)	55 (8.0)	39 (5.6)
Elongation at Break 23°C (73°F)	D1708/D638	%	7.5	4.5	3.0	3.5	4.0	7.5	3.0	4.3	2.5
Elongation at Break 260°C (500°F)	D1708/D638	%	6.0	3.0	2.0	3.0		49.0	9.7	13.0	5.3
Flexural Modulus 23°C (73°F)	D790	MPa (kpsi)	3100 (450)	3790 (550)	4830 (700)	3100 (450)	3280 (475)	5760 (836)	6231 (903)	6360 (923)	7790 (1130)
Flexural Modulus 260°C (500°F)	D790	MPa (kpsi)	1720 (250)	2550 (370)	2760 (400)	1380 (200)	1860 (270)	3010 (436)	3560 (516)	3540 (514)	5100 (740)
Compressive Stress at 10% strain 23°C (73°F)	D695	MPa (kpsi)	133 (19.3)	133 (19.3)	112 (16.3)	102 (14.8)	128 (18.5)	230 (33.4)	222 (32.2)	220 (31.9)	172 (25)
Deformation Under 13.8 MPa (2,000 psi) load	D621	%	0.14	0.10	0.08	0.13	0.12	0.05	0.03	0.05	0.03
<b>FRiction</b>											
Coeff of Friction at PV = .875 MPa m/s (25,000 psi-ft/min)*			0.29	0.24	0.20	0.12	0.25	0.26	0.22	0.25	0.12
Coeff of Friction at PV = 3.5 MPa m/s (25,000 psi-ft/min)*				0.12	0.09	0.08	0.17	0.15	0.14	0.07	0.08
Static Coeff of Friction in Air*			0.35	0.30	0.27	0.20					
PV Limit (unlubricated)**		MPa·m/s (kpsi ft/min)		12.3 (350)	12.3 (350)	3.5 (100)			25K/0.22 100K/0.14	17.5 (500)	
<b>OTHER PROPERTIES</b>											
Coeff of Thermal Expansion 23–300°C (73–572°F)	E831	µm/m/K (10 <sup>-6</sup> in/in°F)	54 (30)	49 (27)	38 (21)	54 (30)	52 (29)	47 (26)	44 (24)	43 (24)	29 (16)
Hardness	D785	Rockwell E	45–60	25–45	5–25	1–20	40–55	95	91	91	63
Water Absorption 24 hr at 23°C (73°F)	D570	%	0.24	0.19	0.14	0.21	0.23	0.08	0.14	0.06	0.04

\*Versus carbon steel, steady state, unlubricated, in air, thrust bearing. \*\*PV limits for any material vary with different combinations of pressure and velocity as well as other conditions.

Standard Sizes: **SHEET:** 10" x 10" (0.062"-2.0" thick) **ROD:** diameter 0.125"-6.0" **BALLS:** diameter 1/8"-5/8" (DuPont™ Vespel® SP-1, only)

Machined Sheet: 10"x10" (0.062"-2.0" thick) available. Machined sheet properties may differ from those shown.

For additional property data please refer to the chart on the inside back cover.

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Curbell Plastics is the Western US Region Authorized Supplier of Authentic Vespel® Polyimide Shapes.

# DUPONT™ VESPEL® POLYIMIDE SHAPES



VESPEL® PLAQUE AND ROD



VESPEL® SP-1 SPLINES

## VESPEL® SP-1: FOR PHYSICAL AND ELECTRICAL PROPERTIES

SP-1 has high purity and provides physical strength, elongation and toughness, and the best electrical and thermal insulation properties. Semiconductor manufacturers often find components fabricated from Vespel® SP-1 shapes useful in production processes. Applications include: insulators, valve seats, balls, gaskets, poppets, wafer clamping, and in-chamber semiconductor parts.

## VESPEL® SP-21: FOR BALANCED LOW WEAR AND PHYSICAL PROPERTIES

SP-21 is ideal for low wear and friction in applications such as bearings, thrust washers, bushings, seal rings, slide blocks, and other wear surfaces. SP-21 has physical strength, elongation, and toughness.

## VESPEL® SP-22: FOR LOW WEAR AND DIMENSIONAL STABILITY

SP-22 provides enhanced resistance to wear and friction as well as improved dimensional and oxidative stability. Applications include: bearings, thrust washers, seal rings, ferrules, sleeves, wear strips, and vanes.

## VESPEL® SP-211: FOR LOW COEFFICIENT OF FRICTION AND UNLUBRICATED WEAR

SP-211 provides the lowest coefficient of friction over a wide range of operating conditions. It offers excellent wear resistance up to 300°F (149°C). Applications include: sliding and linear bearings, bushings, thrust washers, and seal rings.

## VESPEL® SP-3: FOR UNLUBRICATED SEALING AND LOW WEAR IN VACUUM OR DRY ENVIRONMENTS

SP-3 provides lubrication for seals and bearings in vacuum or dry environments. SP-3 provides maximum wear and friction resistance in vacuum and other moisture-free environments, where graphite actually becomes abrasive. Applications include: bushings, bearings, piston rings, seals, and gears.



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**VESPEL® SCP-5000: FOR STRENGTH, HARDNESS, AND CHEMICAL RESISTANCE OVER A BROAD TEMPERATURE RANGE**

SCP-5000 has been developed for demanding applications that require toughness, thermal and dimensional stability, chemical resistance, and stable dielectric performance across a broad temperature range. Applications include: CMP retaining rings, test sockets, substrate lift pins, and aircraft engine parts.

**VESPEL® SCP-5009: FOR HIGH WEAR AND FRICTION APPLICATIONS UNDER HIGH OPERATING PRESSURE AND ELEVATED TEMPERATURE ENVIRONMENTS**

SCP-5009 shapes have a low coefficient of thermal expansion and provide good sealing as well as outstanding mechanical properties like high compressive strength and low creep, even at these extreme conditions.

**VESPEL® SCP-5050: FOR HIGH TEMPERATURES, WEAR RESISTANCE, AND EXCEPTIONAL COEFFICIENT OF THERMAL EXPANSION**

SCP-5050 is a new and innovative polyimide composition. SCP-5050 has improved high temperature and wear resistance compared to conventional polyimides allowing replacement of metal and graphite in more applications. Its proprietary composition is designed to offer a coefficient of thermal expansion (CTE) close to the CTE of metals.

**VESPEL® SCP-50094: FOR HIGH TEMPERATURE AND WEAR RESISTANCE**

SCP-50094 is a proprietary polymer designed for demanding applications that require high strength, high temperature, and wear resistance.



VESPEL® SCP RODS



VESPEL® SCP FABRICATED PARTS

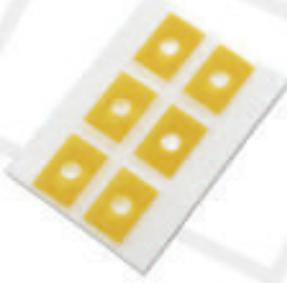
# PLASTIC FILMS



## TYPICAL USES:

### POLYIMIDE FILM

- High temperature resistance
- Chemical resistance



For over 65 years Curbell has been dedicated to providing technical expertise to our customers in a variety of industrial markets. We provide assistance with film material selection for many different environments. From films that offer good chemical resistance to films that have excellent electrical insulation to products that perform well in high temperatures, Curbell can help you select the appropriate film for the job.

Our partnerships with key manufacturers offer our customers access to engineering films such as Polycarbonate, Polyester, Polyimide, PEEK, Ultem®, and PTFE. In addition to providing raw material, Curbell Films also has conversion capabilities. Our services include: die-cutting, sheeting, guillotining, slitting, re-rolling, interleaving, tipping, masking, spooling, and laminating.

Please call for more information on a specific film or thin gauge product.



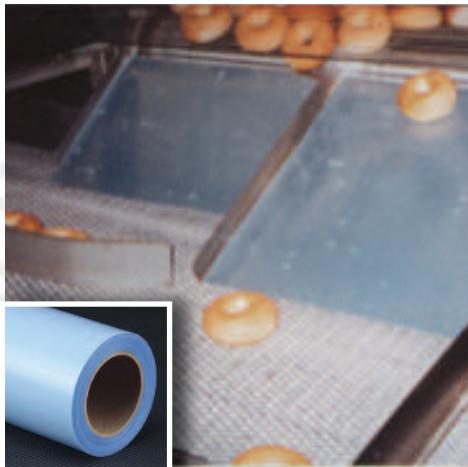
### FILMS TYPICAL PROPERTIES:

	CHEMICAL RESISTANT	EASY TO BOND	FDA COMPLIANT GRADES AVAILABLE	HIGH HEAT	STRONG/STIFF	IMPACT RESISTANT	LOW COEFFICIENT OF FRICTION	UV STABILIZED GRADES AVAILABLE
FEP (Fluoropolymer)	X		X	X				X
Nylon	X		X		X		X	
PBT (Polybutylene Terephthalate)	X		X		X		X	
PEEK (Polyetheretherketone)	X	X	X	X	X			X
PEN	X	X		X	X			
PETG			X	X			X	
Polycarbonate			X	X	X	X	X	X
Polyester	X	X	X			X		
Polyethylene	X		X				X	
Polyimide	X	X		X	X			
Polypropylene	X		X					X
PTFE	X		X	X				X
PVDF	X		X	X				X
Radel R® (Polyphenylsulfone)		X	X	X	X	X		
UHMW-PE	X		X			X	X	
Ultem® (Polyetherimide)		X	X	X	X			X

### FILMS TYPICAL APPLICATIONS:

	APPLICATIONS
FEP (Fluoropolymer)	Gas bag liner
Nylon	Wear parts, drum liners, environmental waste disposal bags
PBT (Polybutylene Terephthalate)	Electrical insulation, wiring devices
PEEK (Polyetheretherketone)	Pump components, chemical pumps, submersible components, high temperature and chemical protection
PEN	Medical test strips, solar panel inserts, flexible circuits
PETG	Face shields
Polycarbonate	Electrical enclosures, membrane switches, overlays
Polyester	Pump components, electrical enclosures, membrane switches, overlays, touch pads
Polyethylene	Medical packaging, chemical applications
Polyimide	Flexible circuits, chip conveyors, loudspeaker cones, electrical applications
Polypropylene	Medical packaging, chemical applications
PTFE	Gaskets, chemical washdowns, medical tables, wire wrap, chutes
PVDF	Filters, fuel cell bags, release films, chemical resistant tank liners, medical bags
Radel R® (Polyphenylsulfone)	Medical tags, aircraft insulation
UHMW-PE	Chutes, chemical washdowns, bearing and wear applications
Ultem® (Polyetherimide)	Flexible circuits, loudspeaker cones

# TAPES AND FABRICS



UHMW tape for sliding applications



PTFE tape for heat sealing applications



Flame spray tape for plasma spray applications

## TYPICAL USES:

### CIRCUIT BOARD ASSEMBLY

- Excellent electrical insulation
- Silicone adhesive leaves little residue



With over 65 years experience, a highly trained staff of plastic professionals, and a full line of plastic materials, Curbell is dedicated to helping you find the best tape, fabric, and belting solution for your engineering application.

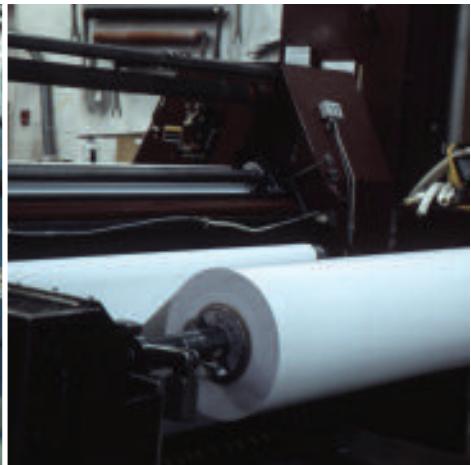
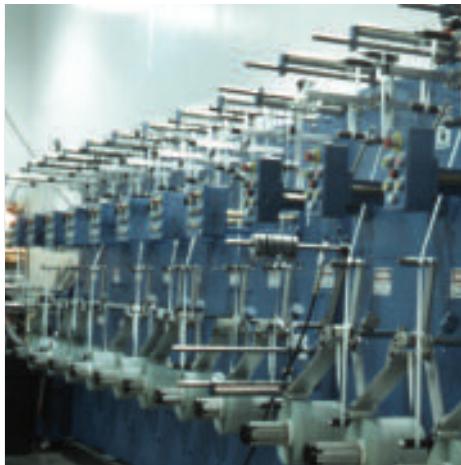
Curbell provides premium PTFE tapes, UHMW tapes, Polyimide tapes, Thermal Spray tapes, PTFE fabrics and belts. All these products are available to you within a one-day shipping lane. We also offer conversion capabilities; such as custom slitting and die-cutting. With nationwide locations we can provide you with technical assistance and quick turnaround on a large inventory of in-stock items. Curbell Specialty Products Group provides material solutions – creating the best customer service in our industry.

Our line of tapes and fabrics includes: very high bond acrylic tapes, PTFE tapes, PTFE fabrics, thermal spray tapes, UHMW tapes, polyimide tapes, and fabric belts. Please call for more information on a specific tape or fabric.

 SAINT-GOBAIN  
PERFORMANCE PLASTICS

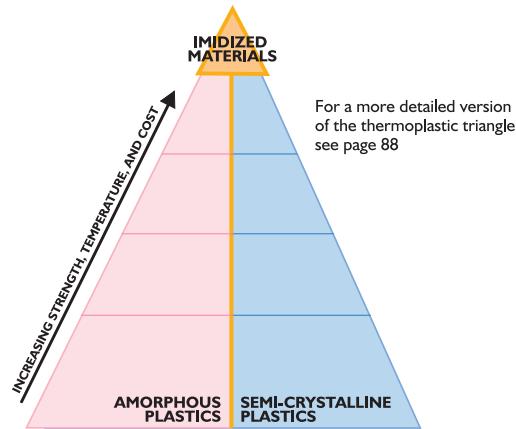
 3M

# CONVERSION CAPABILITIES



## CONVERSION CAPABILITIES:

- Die cutting
- Guillotining
- Inter-leaving
- Laminating
- Masking
- Perforating
- Re-rolling
- Sheeting
- Slitting
- Spooling
- Tipping



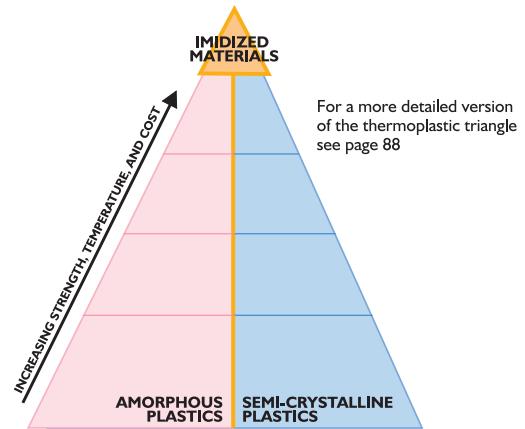
# MATERIAL SELECTION GUIDE

## 1. GET IN THE RIGHT GROUP WHAT IS MOST IMPORTANT TO THE APPLICATION?

GENERAL GROUP CHARACTERISTICS		
AMORPHOUS THERMOPLASTICS	SEMICRYSTALLINE THERMOPLASTICS	IMIDIZED MATERIALS
<ul style="list-style-type: none"> <li>• Soften over a wide temperature range</li> <li>• Good formability</li> <li>• Transparency</li> <li>• Poor chemical resistance</li> <li>• Bond well using adhesives or solvents</li> <li>• Prone to stress cracking</li> <li>• Poor fatigue resistance</li> <li>• Structural applications only (not suitable for bearing and wear)</li> </ul>	<ul style="list-style-type: none"> <li>• Sharp melting point</li> <li>• Poor formability</li> <li>• Opaque</li> <li>• Good chemical resistance</li> <li>• Difficult to bond using adhesives or solvents</li> <li>• Resistant to stress cracking</li> <li>• Good fatigue resistance</li> <li>• Good for bearing and wear (as well as structural applications)</li> </ul>	<ul style="list-style-type: none"> <li>• Best physical properties above 400°F</li> <li>• Best temperature resistance</li> <li>• Best bearing and wear capabilities</li> <li>• Good chemical resistance</li> </ul>
POTENTIAL MATERIAL CHOICES	POTENTIAL MATERIAL CHOICES	POTENTIAL MATERIAL CHOICES
<ul style="list-style-type: none"> <li>• ABS</li> <li>• Acrylic</li> <li>• Kydex®</li> <li>• Noryl®</li> <li>• PETG</li> <li>• Polycarbonate</li> </ul>	<ul style="list-style-type: none"> <li>• Polystyrene (HIPS)</li> <li>• Polysulfone</li> <li>• PVC</li> <li>• Radel R®</li> <li>• Ultem®</li> </ul>	<ul style="list-style-type: none"> <li>• Acetal</li> <li>• HDPE</li> <li>• LDPE</li> <li>• Nylon</li> <li>• PBT</li> <li>• PEEK</li> <li>• PET</li> <li>• Polypropylene</li> <li>• PPS</li> <li>• PTFE</li> <li>• PVDF (Kynar®)</li> <li>• UHMW-PE</li> </ul>

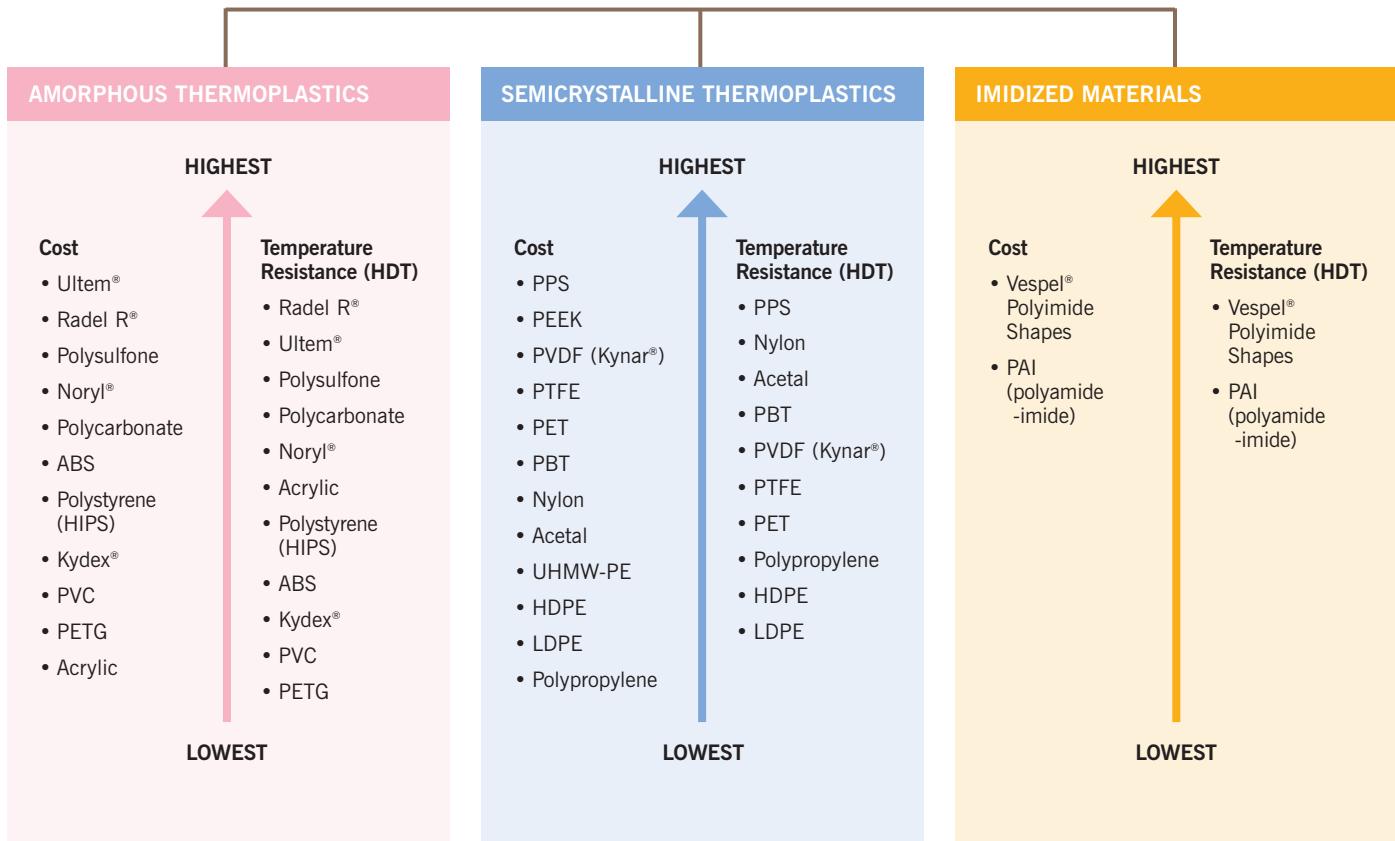
This selector guide is intended to help you review the needs of your particular application and determine a few material candidates that can then be tested.

Although the information and statements herein are believed to be accurate, no guarantee of their accuracy is made. The statements and information are included for reference purposes only and are not intended and should not be construed as either a warranty of any type or representations applicable to the particular application, use or design of the buyer or user of the goods. In every case, we recommend that the purchaser or user before using or buying any product perform their own tests and make their own decision to determine to their own satisfaction whether the product is of acceptable quality, type and design and is suitable for the particular purposes under their own operating conditions.

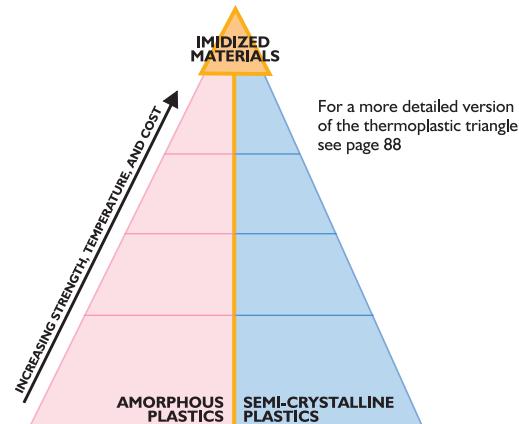


## MATERIAL SELECTION GUIDE

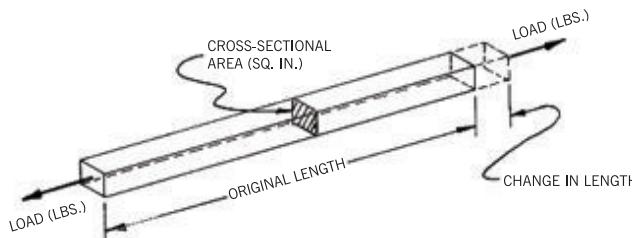
### 2. CHOOSE THE BEST FAMILY IS TEMPERATURE A FACTOR? HOW CRITICAL IS COST?



For more information about costs please see the chart on page 79.  
 For more information about temperature resistance please see the charts on pages 75-76.

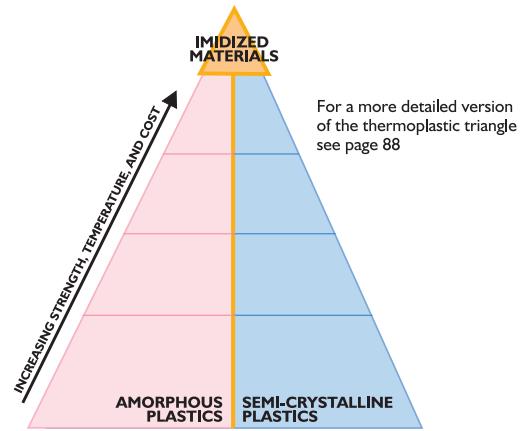


## MATERIAL SELECTION GUIDE

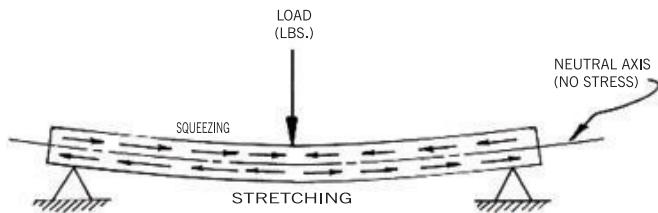


### 3. COMPARE THE MECHANICAL PROPERTIES IS TENSILE STRENGTH (RESISTANCE TO BEING PULLED APART) IMPORTANT?

AMORPHOUS THERMOPLASTICS	SEMICRYSTALLINE THERMOPLASTICS	IMIDIZED MATERIALS
<b>Tensile strength - pull apart (psi)</b> <ul style="list-style-type: none"> <li>• Ultem® 15,200</li> <li>• Polysulfone 10,200</li> <li>• Radel R® 10,100</li> <li>• Acrylic 10,000</li> <li>• Noryl® 9,600</li> <li>• Polycarbonate 9,500</li> <li>• PETG 7,700</li> <li>• PVC 7,500</li> <li>• Kydex® 6,100</li> <li>• ABS 4,100</li> <li>• Polystyrene (HIPS) 3,500</li> </ul>	<b>Tensile strength - pull apart (psi)</b> <ul style="list-style-type: none"> <li>• PEEK 14,000</li> <li>• Nylon (6 cast) 10,000-13,500</li> <li>• PPS 12,500</li> <li>• Nylon (6/6 extruded) 12,400</li> <li>• PET 11,500</li> <li>• Acetal (Homopolymer) 10,000</li> <li>• Acetal (Copolymer) 9,800</li> <li>• PBT 8,690</li> <li>• PVDF (Kynar®) 7,800</li> <li>• Polypropylene (Homopolymer) 5,400</li> <li>• HDPE 4,000</li> <li>• Polypropylene (Copolymer) 3,800</li> <li>• UHMW-PE 3,100</li> <li>• PTFE 1,500-3,000</li> <li>• LDPE 1,400</li> </ul>	<b>Tensile strength - pull apart (psi)</b> <ul style="list-style-type: none"> <li>• PAI (polyamide-imide) 21,000</li> <li>• Vespel® Polyimide SP-1 12,500</li> <li>• Vespel® Polyimide SP-21 9,500</li> <li>• Vespel® Polyimide SP-3 8,200</li> <li>• Vespel® Polyimide SP-22 7,500</li> <li>• Vespel® Polyimide SP-211 6,500</li> </ul>

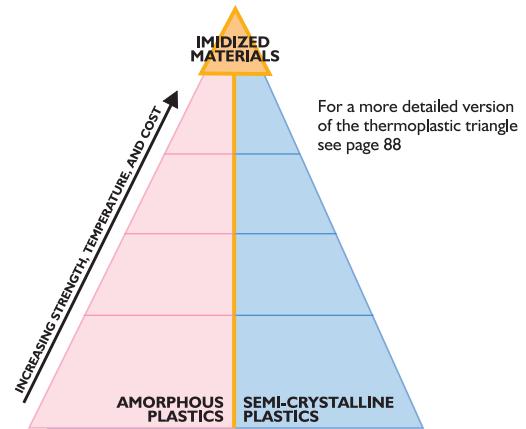


## MATERIAL SELECTION GUIDE

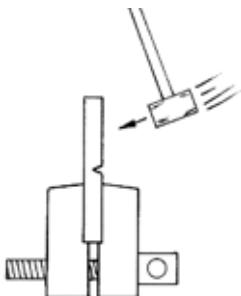


### 4. COMPARE THE MECHANICAL PROPERTIES IS FLEXURAL MODULUS (BENDING STIFFNESS) IMPORTANT?

AMORPHOUS THERMOPLASTICS	SEMICRYSTALLINE THERMOPLASTICS	IMIDIZED MATERIALS
<b>Flexural modulus - stiffness (psi)</b> <ul style="list-style-type: none"> <li>• Ultem® (30% glass-filled) 1,300,000</li> <li>• Polycarbonate (20% glass-filled) 800,000</li> <li>• PVC 481,000</li> <li>• Ultem® 480,000</li> <li>• Acrylic 480,000</li> <li>• Polysulfone 390,000</li> <li>• Noryl® 370,000</li> <li>• Radel R® 350,000</li> <li>• Polycarbonate 345,000</li> <li>• Kydex® 335,000</li> <li>• Polystyrene (HIPS) 310,000</li> <li>• PETG 310,000</li> <li>• ABS 304,000</li> </ul>	<b>Flexural modulus - stiffness (psi)</b> <ul style="list-style-type: none"> <li>• PPS 600,000</li> <li>• PEEK 590,000</li> <li>• Nylon (6 cast) 420,000-500,000</li> <li>• Acetal (Homopolymer) 420,000</li> <li>• Nylon (6/6 extruded) 410,000</li> <li>• PET 400,000</li> <li>• Acetal (Copolymer) 370,000</li> <li>• PBT 330,000</li> <li>• PVDF (Kynar®) 310,000</li> <li>• Polypropylene (Homopolymer) 225,000</li> <li>• Polypropylene (Copolymer) 215,000</li> <li>• HDPE 200,000</li> <li>• UHMW-PE 110,000</li> <li>• PTFE 72,000</li> <li>• LDPE 30,000</li> </ul>	<b>Flexural modulus - stiffness (psi)</b> <ul style="list-style-type: none"> <li>• PAI (polyamide-imide) 711,000</li> <li>• Vespel® Polyimide SP-22 700,000</li> <li>• Vespel® Polyimide SP-21 550,000</li> <li>• Vespel® Polyimide SP-3 475,000</li> <li>• Vespel® Polyimide SP-211 450,000</li> <li>• Vespel® Polyimide SP-1 450,000</li> </ul>

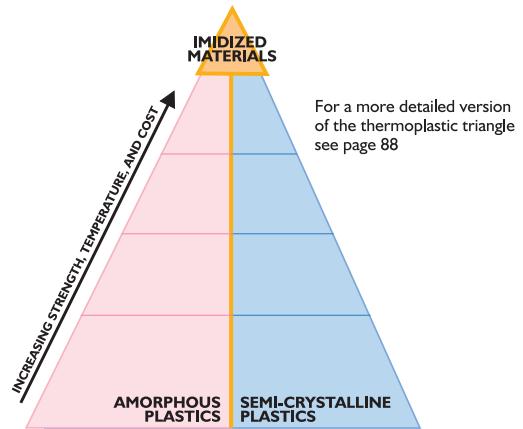


## MATERIAL SELECTION GUIDE

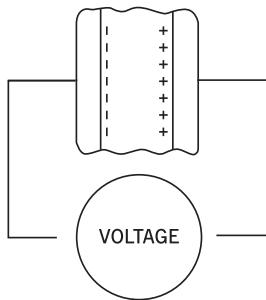


### 5. COMPARE THE MECHANICAL PROPERTIES IS IZOD IMPACT (TOUGHNESS) IMPORTANT?

AMORPHOUS THERMOPLASTICS	SEMICRYSTALLINE THERMOPLASTICS	IMIDIZED MATERIALS
<b>Izod impact (notched) - toughness (ft-lbs/in)</b> <ul style="list-style-type: none"> <li>Kydex® 18</li> <li>Polycarbonate 12.0-16.0</li> <li>Radel R® 13</li> <li>ABS 7.7</li> <li>Noryl® 3.5</li> <li>Polystyrene (HIPS) 2.0</li> <li>PETG 1.7</li> <li>Polysulfone 1.3</li> <li>Ultem® 1.0</li> <li>PVC 1.0</li> <li>Acrylic 0.4</li> </ul>	<b>Izod impact (notched) - toughness (ft-lbs/in)</b> <ul style="list-style-type: none"> <li>LDPE no break</li> <li>UHMW-PE 18.0</li> <li>Polypropylene (Copolymer) 12.5</li> <li>PTFE 3.5</li> <li>PVDF (Kynar®) 3.0</li> <li>PEEK 1.6</li> <li>PBT 1.5</li> <li>Acetal (Homopolymer) 1.5</li> <li>Polypropylene (Homopolymer) 1.2</li> <li>Nylon (6/6 extruded) 1.2</li> <li>Acetal (Copolymer) 1.0</li> <li>Nylon (6 cast) 0.7-0.9</li> <li>PET 0.7</li> <li>PPS 0.5</li> </ul>	<b>Izod impact (notched) - toughness (ft-lbs/in)</b> <ul style="list-style-type: none"> <li>PAI (polyamide-imide) 2.3</li> <li>Vespel® Polyimide SP-21 0.8</li> <li>Vespel® Polyimide SP-1 0.8</li> <li>Vespel® Polyimide SP-3 0.4</li> </ul>

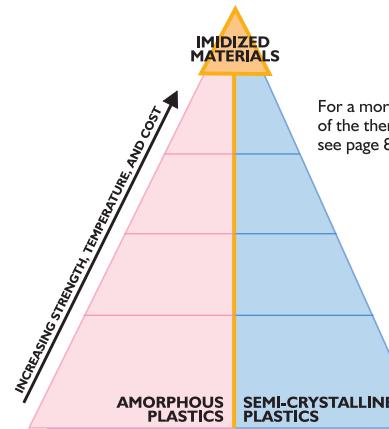


## MATERIAL SELECTION GUIDE



### 6. COMPARE THE PROPERTIES IS DIELECTRIC STRENGTH (ELECTRICAL INSULATION) IMPORTANT?

AMORPHOUS THERMOPLASTICS	SEMICRYSTALLINE THERMOPLASTICS	IMIDIZED MATERIALS
<b>Dielectric strength - insulation (v/mil)</b> <ul style="list-style-type: none"> <li>• Ultem® 830</li> <li>• PVC 544</li> <li>• Kydex® 514</li> <li>• Noryl® 500</li> <li>• Acrylic 430</li> <li>• Polysulfone 425</li> <li>• PETG 410</li> <li>• Polycarbonate 380</li> <li>• Radel R® 360</li> </ul>	<b>Dielectric strength - insulation (v/mil)</b> <ul style="list-style-type: none"> <li>• Nylon (6 cast) 500-600</li> <li>• Acetal (Homopolymer) 500</li> <li>• Acetal (Copolymer) 500</li> <li>• PTFE 400-500</li> <li>• PEEK 480</li> <li>• PPS 450</li> <li>• PET 400</li> <li>• PBT 400</li> <li>• Nylon (6/6 extruded) 300-400</li> <li>• PVDF (Kynar®) 280</li> </ul>	<b>Dielectric strength - insulation (v/mil)</b> <ul style="list-style-type: none"> <li>• PAI (polyamide-imide) 600</li> <li>• Vespel® Polyimide SP-1 560</li> </ul>



For a more detailed version  
of the thermoplastic triangle  
see page 88

## MATERIAL SELECTION GUIDE

### 7. THINK ABOUT THE APPLICATION - IS FDA COMPLIANCE IMPORTANT?

AMORPHOUS THERMOPLASTICS	SEMICRYSTALLINE THERMOPLASTICS
<b>FDA compliant grades available:</b> <ul style="list-style-type: none"> <li>• Acrylic</li> <li>• PETG</li> <li>• Polycarbonate</li> <li>• Polystyrene (HIPS)</li> <li>• Polysulfone</li> <li>• PVC</li> <li>• Radel R®</li> <li>• Ultem®</li> </ul>	<b>FDA compliant grades available:</b> <ul style="list-style-type: none"> <li>• Acetal</li> <li>• HDPE</li> <li>• LDPE</li> <li>• Nylon</li> <li>• PBT</li> <li>• PEEK</li> <li>• PET</li> <li>• Polypropylene</li> <li>• PTFE</li> <li>• PVDF (Kynar®)</li> <li>• UHMW-PE</li> </ul>

The virgin, natural, unfilled formulations of the sheet, rod, tube, and film products listed here are available from Curbell Plastics, Inc. in grades that comply with one or more of the FDA's guidelines for direct food contact at room temperature.

**It is important to specify FDA compliant material at the time of the order to ensure that FDA compliant material is provided.**

### 8. THINK ABOUT THE APPLICATION - IS CHEMICAL RESISTANCE IMPORTANT?

SEMICRYSTALLINE THERMOPLASTICS	IMIDIZED MATERIALS
<b>Good chemical resistance:</b> <ul style="list-style-type: none"> <li>• Acetal</li> <li>• HDPE</li> <li>• LDPE</li> <li>• Nylon</li> <li>• PBT</li> <li>• PEEK</li> <li>• PET</li> <li>• Polypropylene</li> <li>• PPS</li> <li>• PTFE</li> <li>• PVDF (Kynar®)</li> <li>• UHMW-PE</li> </ul> <p>See pages 76-77 for more specific information</p>	<b>Good chemical resistance:</b> <ul style="list-style-type: none"> <li>• PAI (polyamide-imide)</li> <li>• Vespel® Polyimide Shapes</li> </ul> <p>See pages 80-81 for more specific information</p>

Use this worksheet to help us gather all the information necessary to provide Engineering Plastic options for your application. Please take a moment to answer all the questions pertinent to your application. The answers you list will help us to understand what SPECIFIC characteristics are important to the application.

Please visit [www.curbellplastics.com](http://www.curbellplastics.com) to fill this form out electronically.

# APPLICATION WORKSHEET

## SELECTION AND DESIGN GUIDELINES

1. What is the primary function of the part? (ie. bearing and wear, structural, or electrical insulator?)  
\_\_\_\_\_  
\_\_\_\_\_
2. What material is currently being used?  
\_\_\_\_\_  
\_\_\_\_\_
3. Are there any problems with the current material?  
\_\_\_\_\_  
\_\_\_\_\_
4. What is the maximum continuous use temperature?  
\_\_\_\_\_  
\_\_\_\_\_
5. Is the temperature exposure intermittent? What is the cycle time?  
\_\_\_\_\_  
\_\_\_\_\_
6. What is the load or stress on the part?  
Is there a cycle time for the load or stress?  
\_\_\_\_\_  
\_\_\_\_\_
7. For a bearing and wear application, what is the velocity? FPM? \_\_\_\_\_ RPM? \_\_\_\_\_  
Is the motion continuous or intermittent?  
\_\_\_\_\_  
If intermittent, what is the cycle time?  
\_\_\_\_\_  
What is the surface area of the bearing?  
\_\_\_\_\_  
What is the load on the bearing surface?  
\_\_\_\_\_  
\_\_\_\_\_
8. Is FDA, USDA, NSF, 4A Dairy or any other agency compliance required?  
\_\_\_\_\_  
\_\_\_\_\_
9. What chemicals will be encountered during service?  
\_\_\_\_\_  
What will the exposure time be?  
\_\_\_\_\_  
What is the temperature during exposure?  
\_\_\_\_\_  
What is the concentration level of the chemicals involved?  
\_\_\_\_\_

10. What other environmental factors need to be considered?  
(ie. UV light, interior/exterior application, radiation, etc.)

---

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11. Is dimensional stability in a wet or humid environment critical?

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12. Is toughness or impact resistance critical during use?

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13. Is the application an electrical insulator?

---

What is the dielectric strength requirement?

---

What is the target dielectric constant and at what frequency?

---

What is the target dissipation factor and at what frequency?

14. Are static dissipative characteristics important in the application?

---

---

15. Are there minimum flammability requirements for the application?

---

---

16. What is the part geometry?

Thickness \_\_\_\_\_ Width \_\_\_\_\_  
Length \_\_\_\_\_ OD \_\_\_\_\_ ID \_\_\_\_\_

17. Is the color of the part important?

---

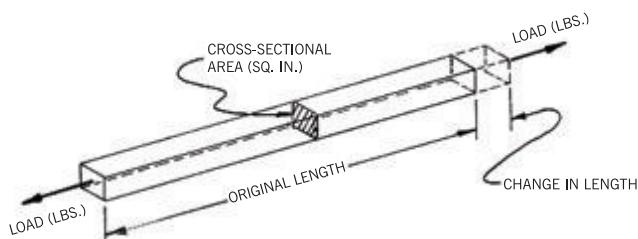
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18. What other characteristics are important in the application?

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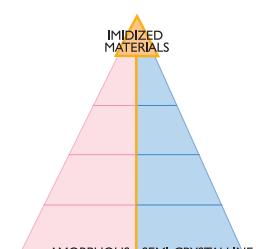
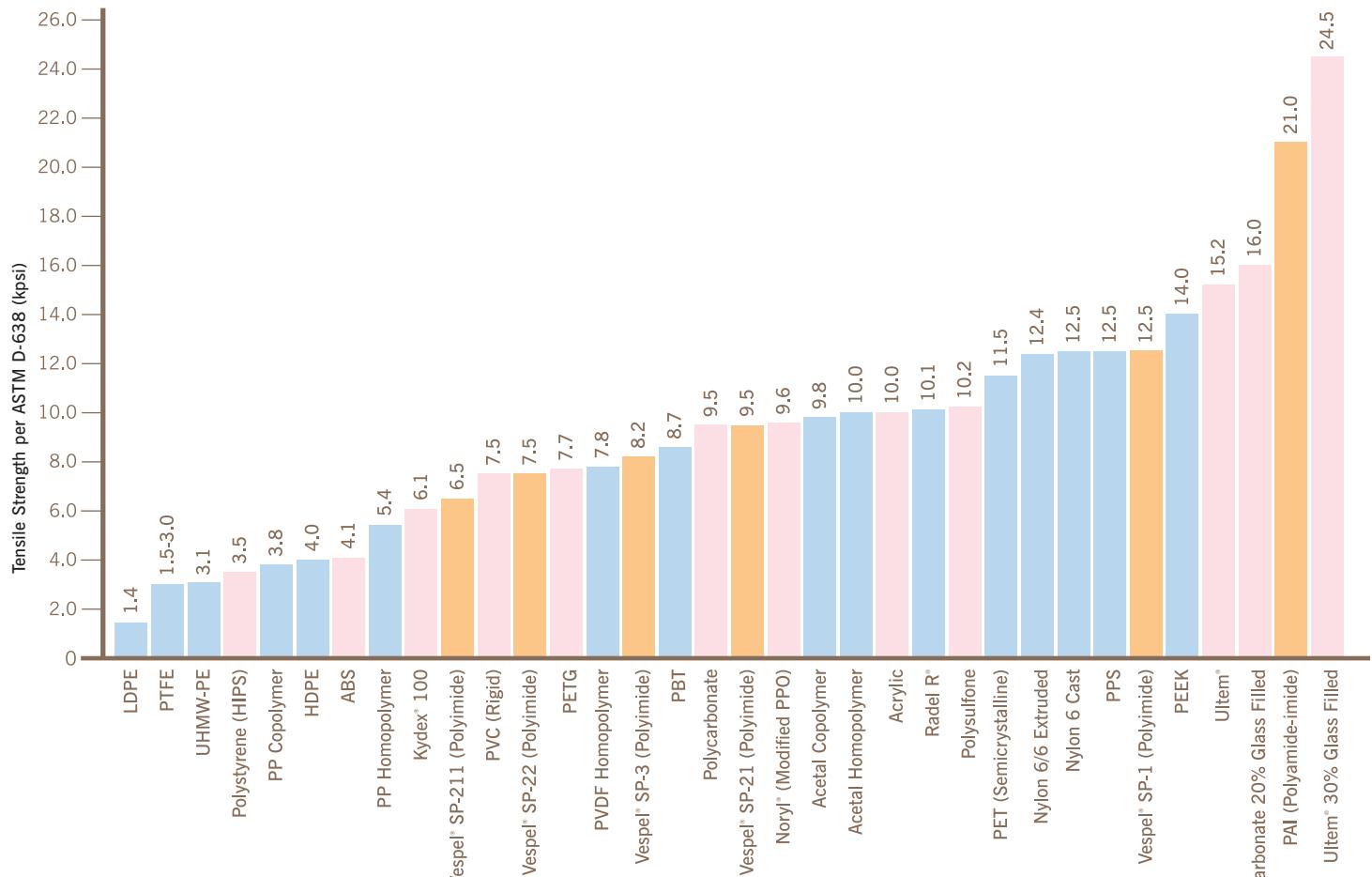
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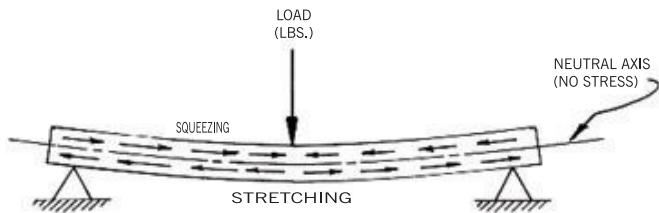
## TENSILE STRENGTH

(ABILITY OF THE MATERIAL TO RESIST BEING PULLED APART)

**THE MAXIMUM NOMINAL STRESS SUSTAINED BY A TEST SPECIMEN BEING PULLED FROM BOTH ENDS, AT A SPECIFIED TEMPERATURE AND AT A SPECIFIED RATE OF STRETCHING.**

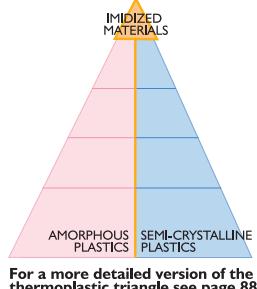
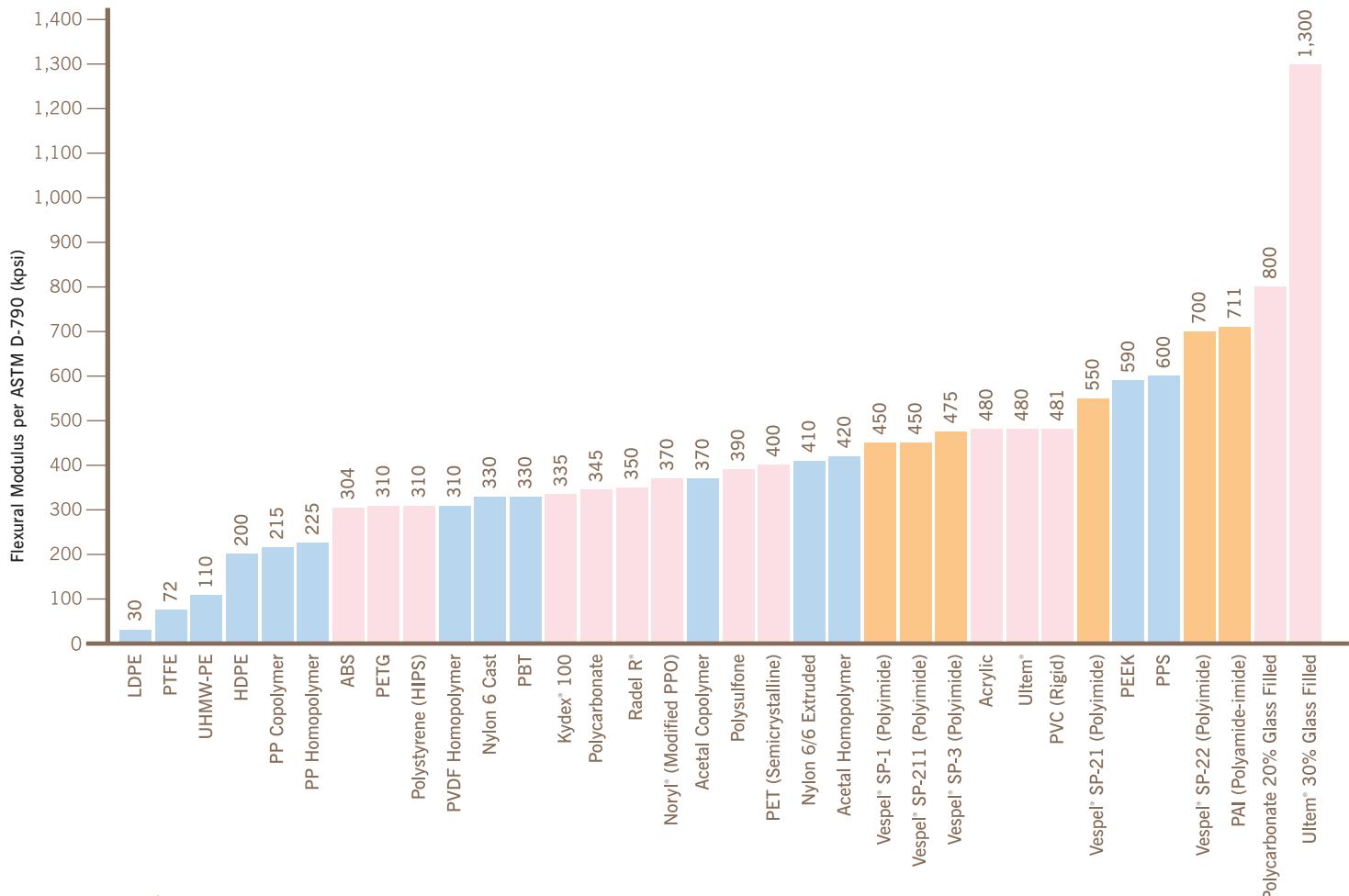


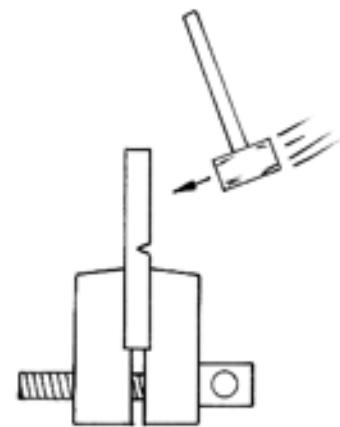
For a more detailed version of the thermoplastic triangle see page 88



## FLEXURAL MODULUS (STIFFNESS)

THE RATIO, WITHIN THE ELASTIC LIMIT, OF THE APPLIED STRESS IN THE OUTERMOST FIBERS OF A TEST SPECIMEN IN THREE-POINT, STATIC FLEXURE, TO THE CALCULATED STRAIN IN THOSE OUTERMOST FIBERS.

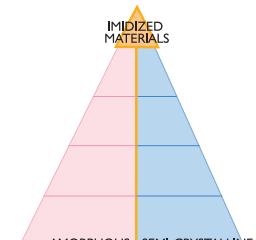
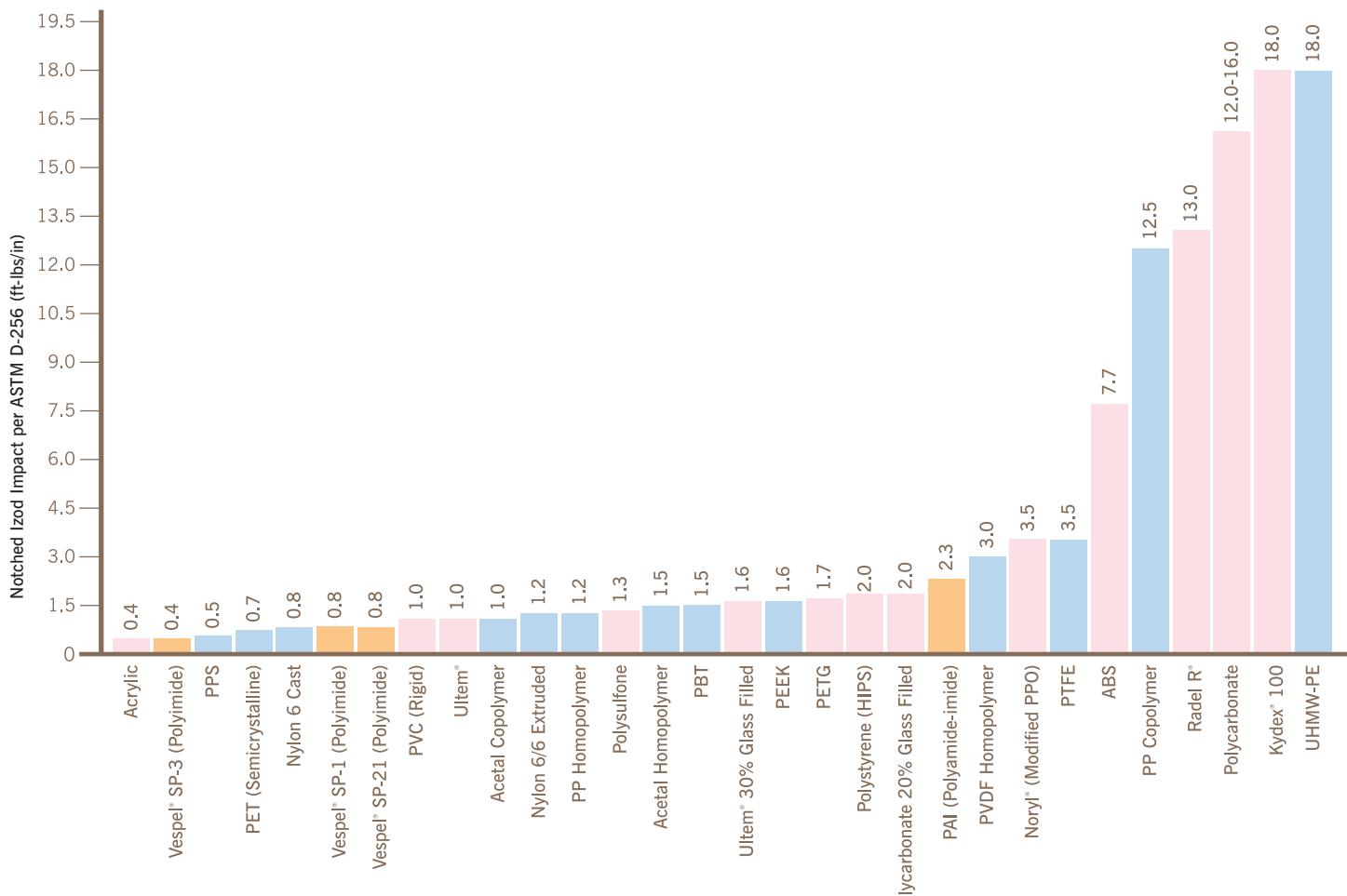




# IMPACT RESISTANCE

(TOUGHNESS)

THE RELATIVE DURABILITY OF PLASTICS ARTICLES TO FRACTURE UNDER STRESSES APPLIED AT HIGH SPEEDS.

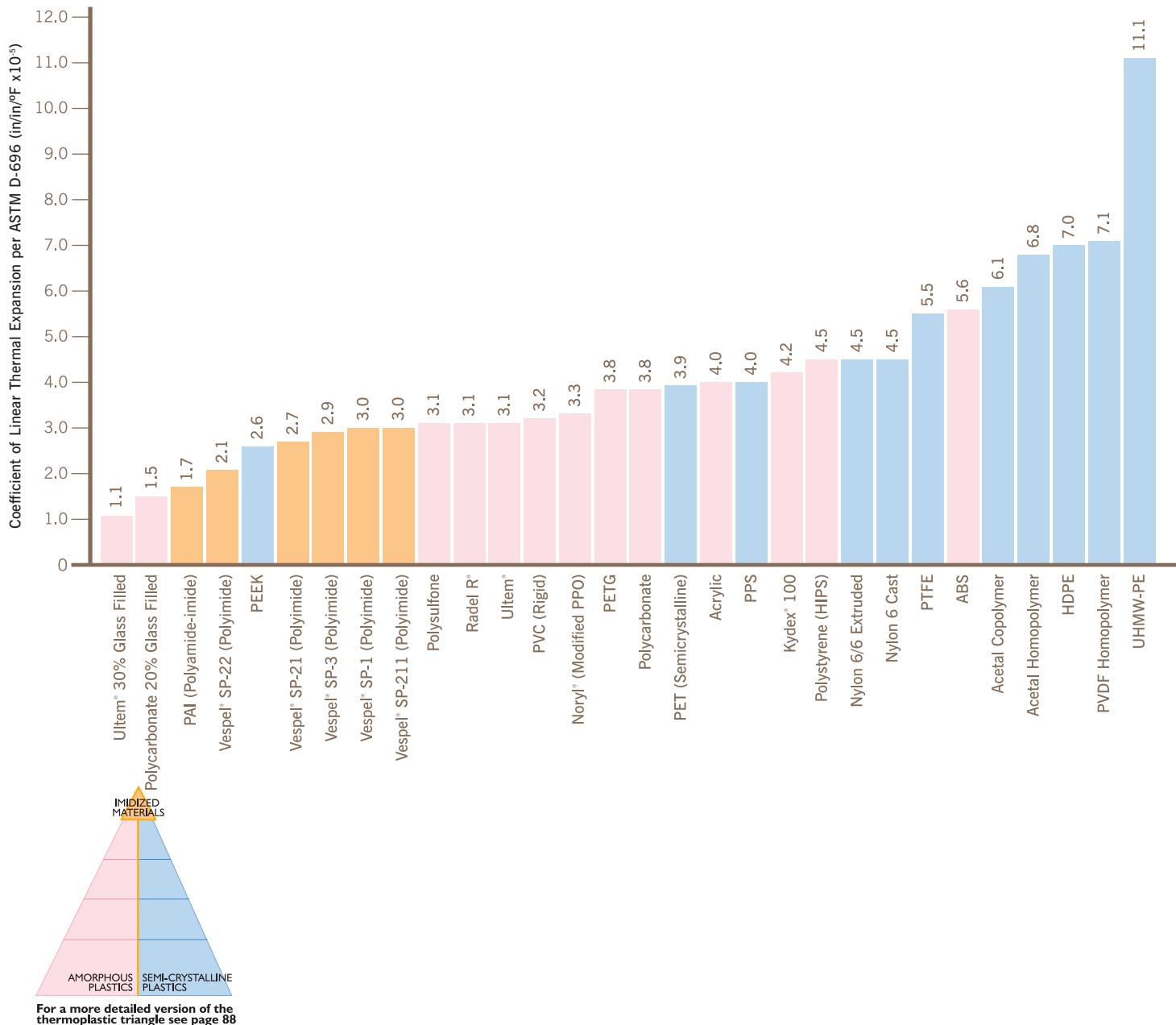


For a more detailed version of the thermoplastic triangle see page 88

# COEFFICIENT OF THERMAL EXPANSION

(HOW MUCH A PLASTIC GROWS WITH HEAT)

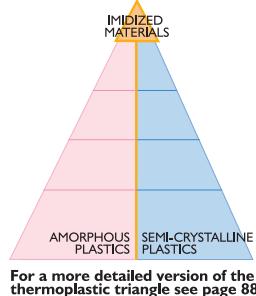
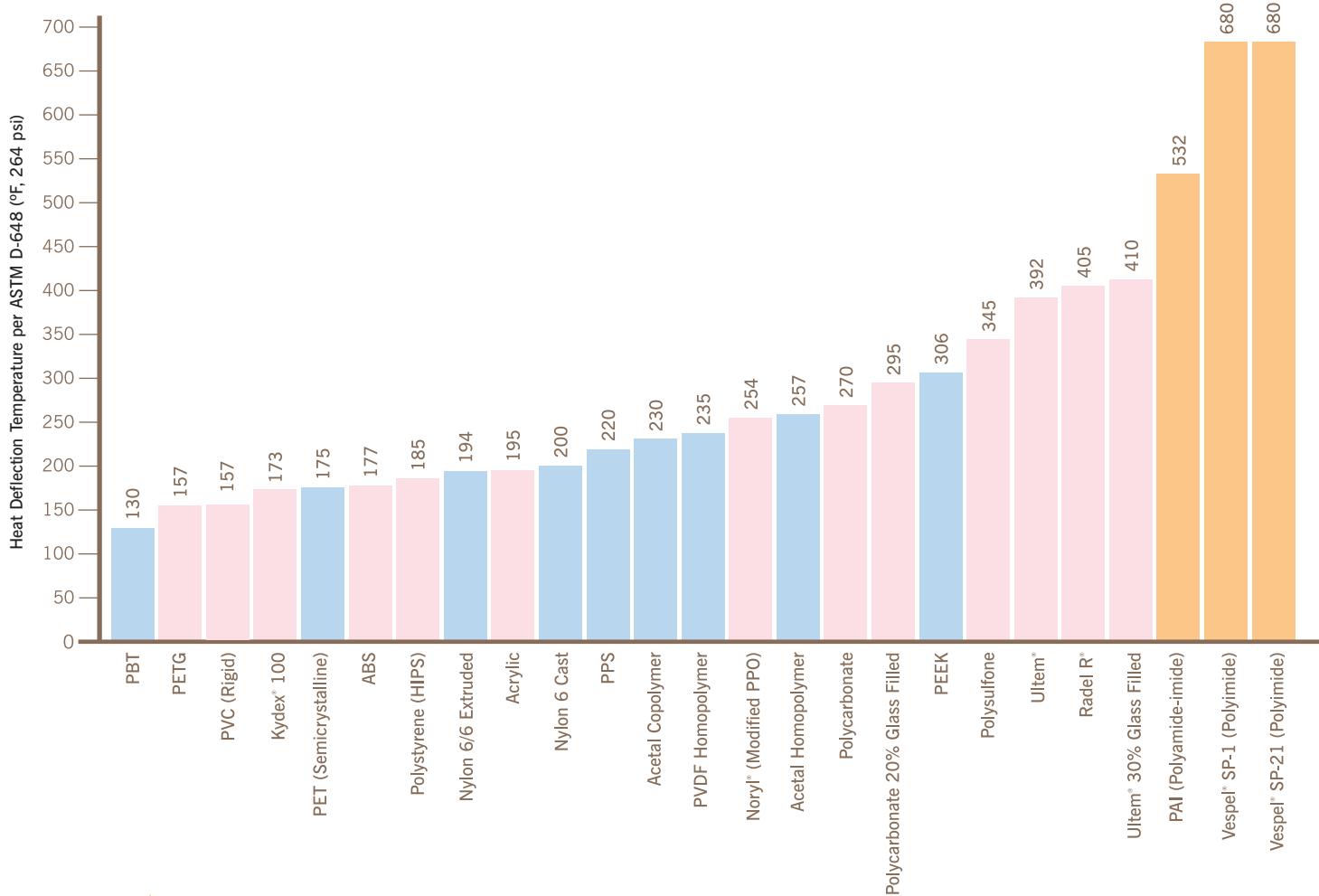
THE FRACTIONAL CHANGE IN LENGTH OF A MATERIAL FOR A UNIT CHANGE IN TEMPERATURE.



# HEAT DEFLECTION TEMPERATURE

(TEMPERATURE AT WHICH A PLASTIC GETS SOFT)

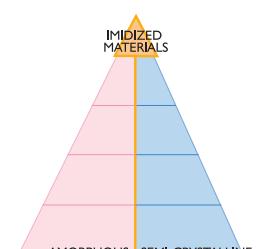
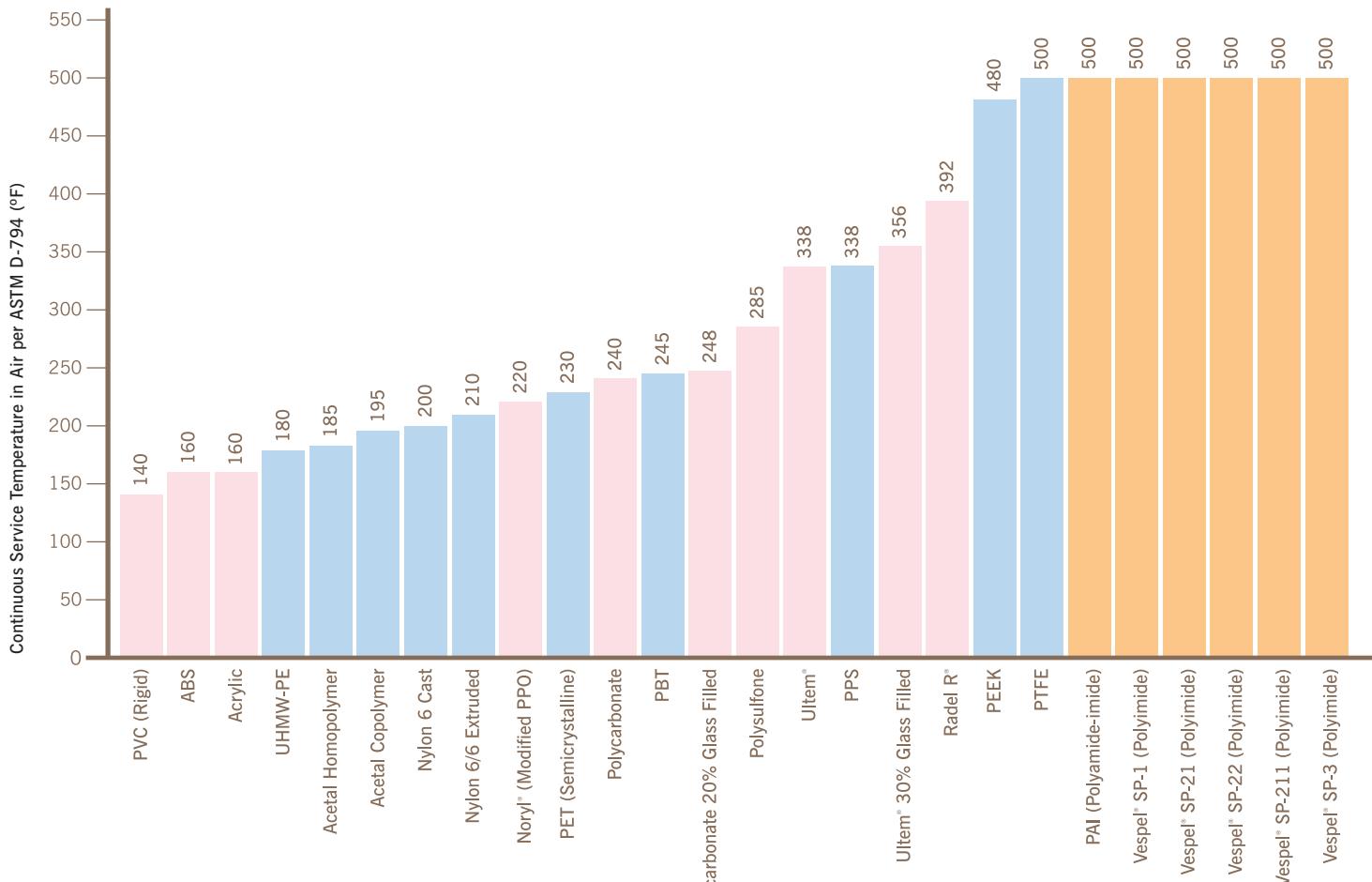
THE TEMPERATURE AT WHICH A STANDARD TEST BAR, CENTRALLY LOADED WITH A STANDARD LOAD, WILL DEFLECT A STANDARD AMOUNT.



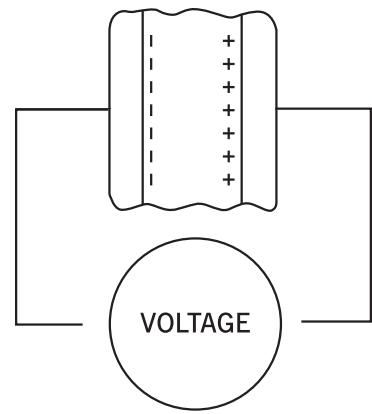
For a more detailed version of the thermoplastic triangle see page 88

# CONTINUOUS SERVICE TEMPERATURE

THE APPROXIMATE TEMPERATURE ABOVE WHICH A PLASTIC MATERIAL MAY NOT BE APPROPRIATE FOR SERVICE.



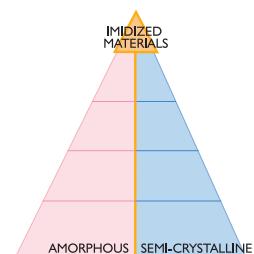
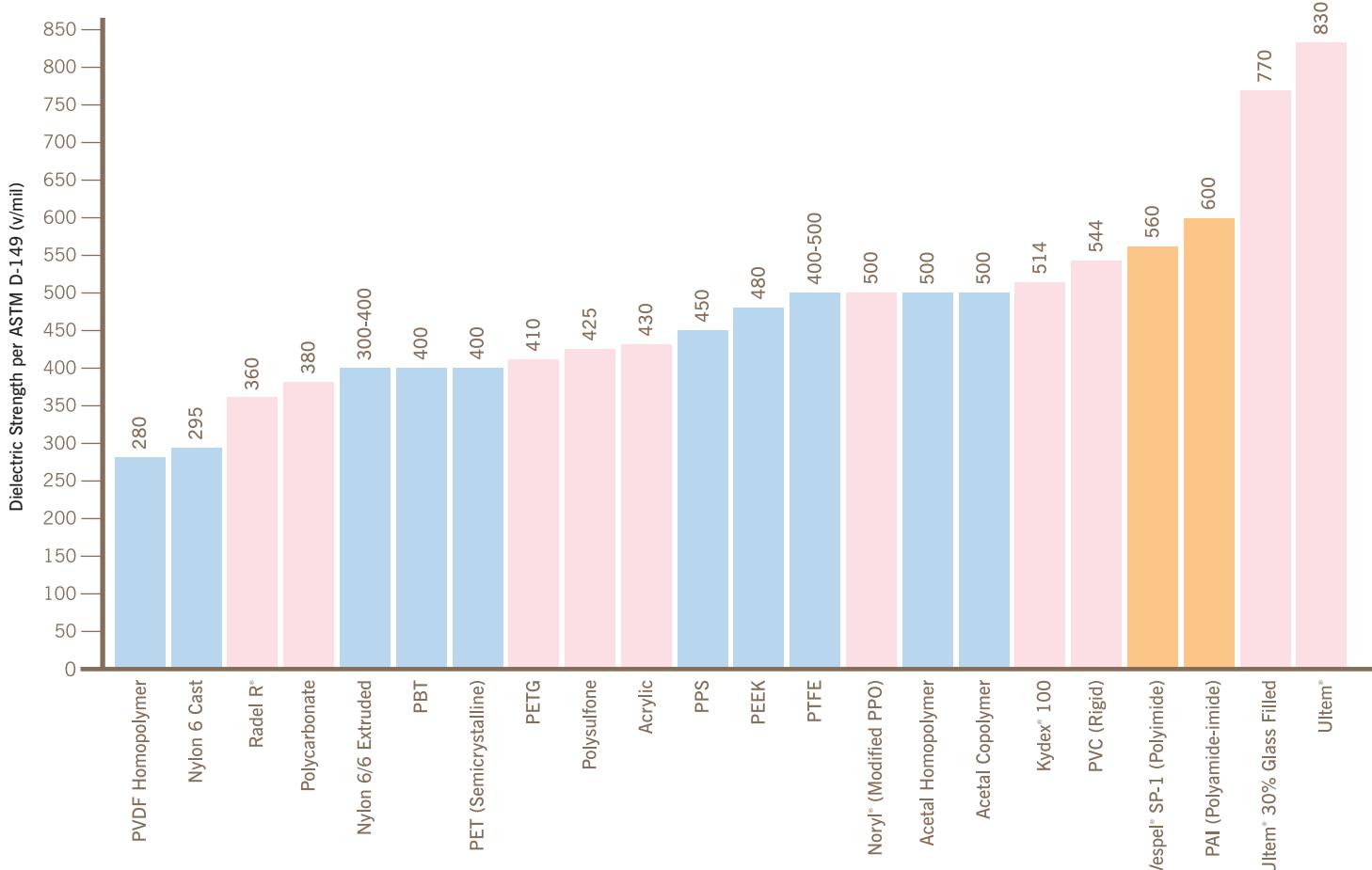
For a more detailed version of the thermoplastic triangle see page 88



# DIELECTRIC STRENGTH

(ELECTRICAL INSULATION)

A MEASURE OF THE VOLTAGE REQUIRED TO PUNCTURE AN INSULATING MATERIAL, EXPRESSED IN VOLTS PER MIL (V/MIL) OF THICKNESS.

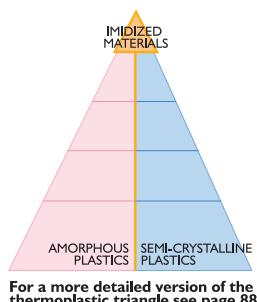
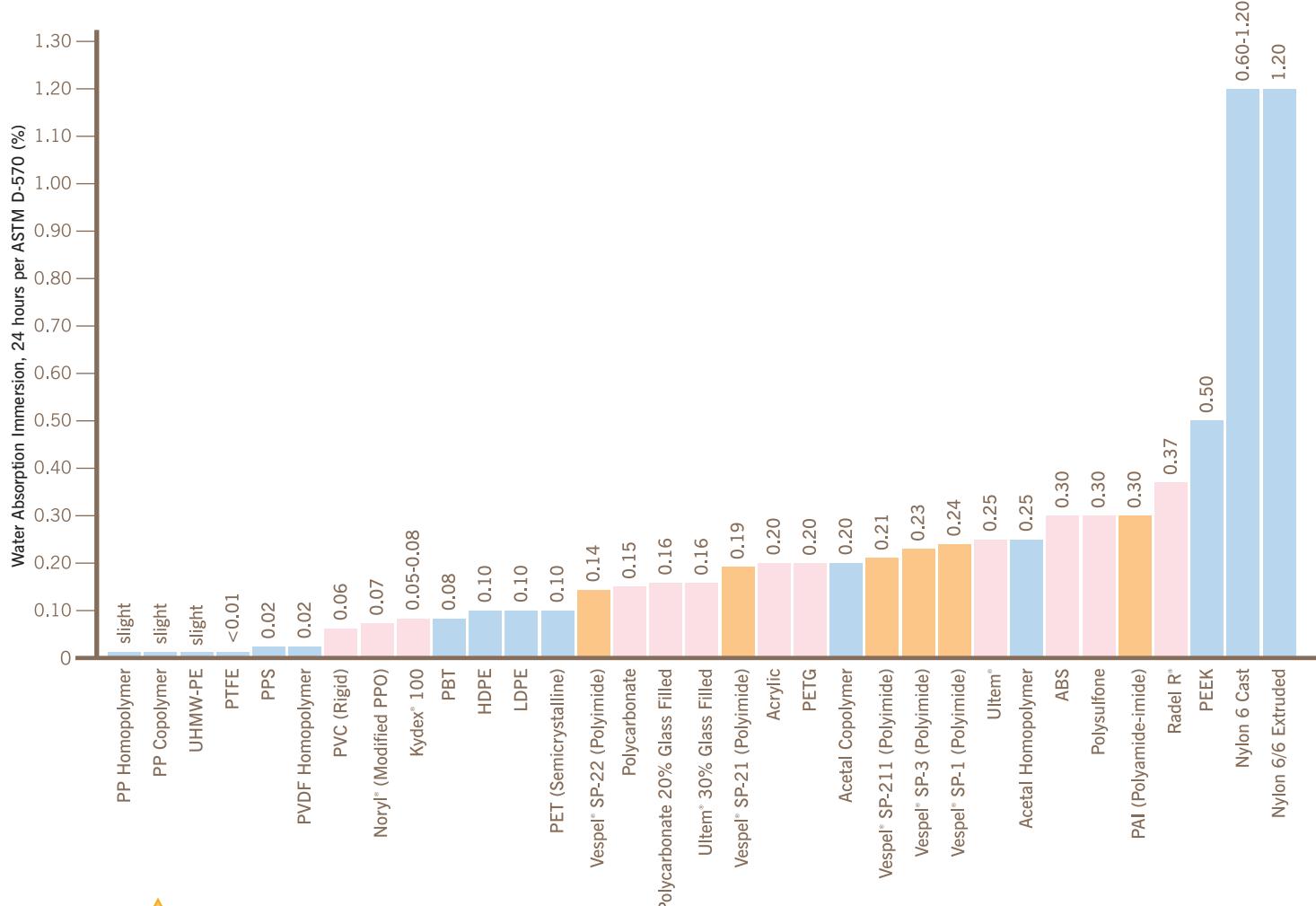


For a more detailed version of the thermoplastic triangle see page 88

# WATER ABSORPTION

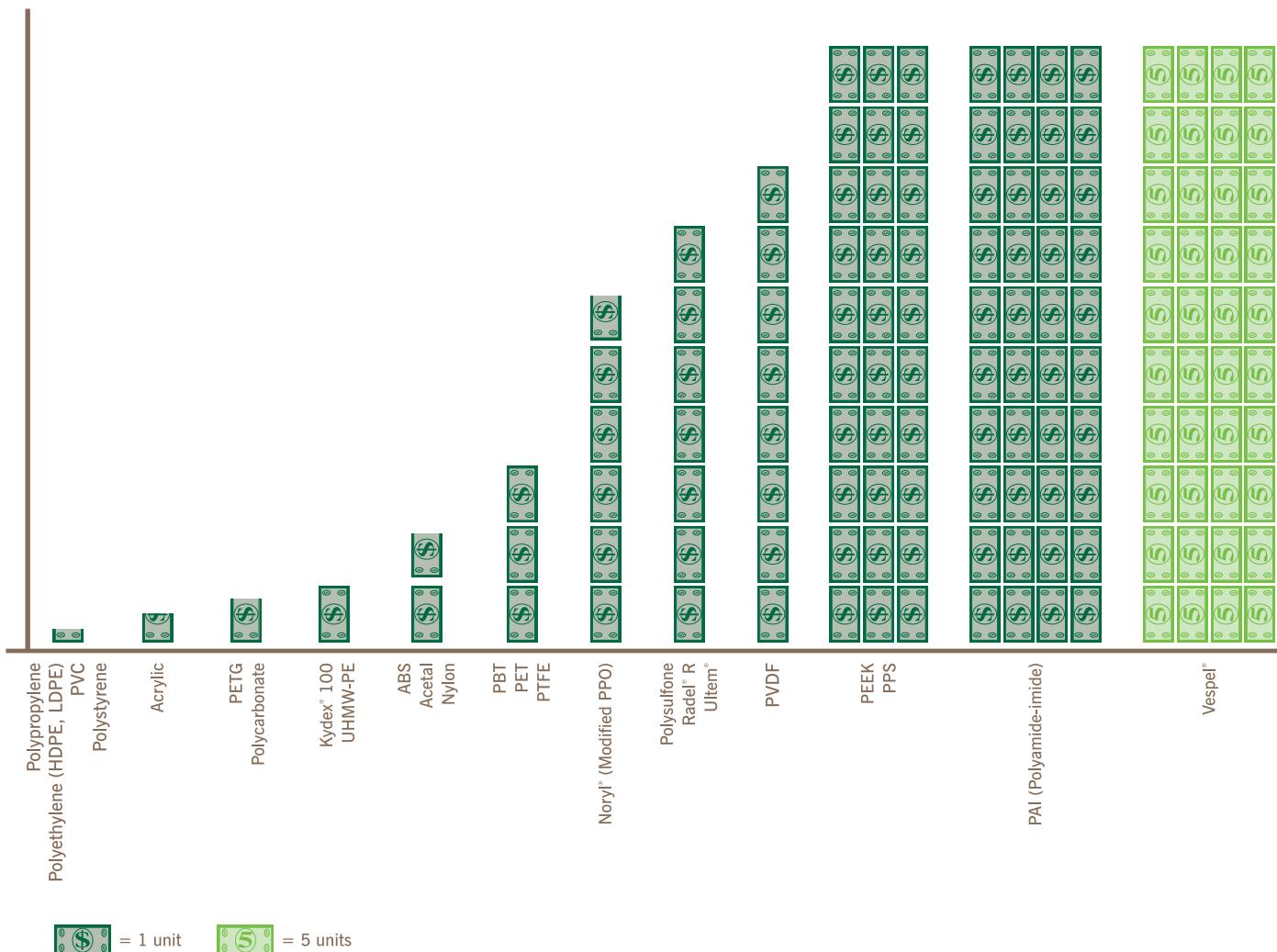
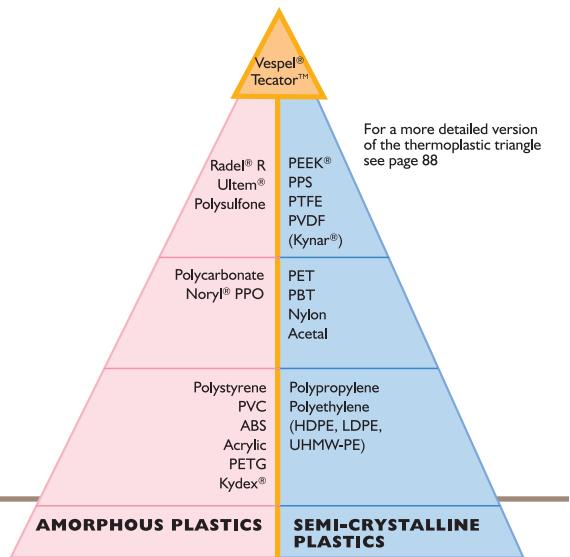
(HOW MUCH WATER GETS SOAKED UP)

THE PERCENTAGE INCREASE IN WEIGHT OF A PLASTIC ARTICLE WHEN IMMERSED IN WATER FOR A SPECIFIED TIME AND AT A SPECIFIED TEMPERATURE



For a more detailed version of the thermoplastic triangle see page 88

# APPROXIMATE RELATIVE COST COMPARISON



# CHEMICAL RESISTANCE

Factors like temperature, concentration of the driving forces, duration and mechanical load are important criterions for the examinations of chemical resistance. In the following table, you can see the materials resistance to different chemicals. These details correspond to the present state of our knowledge and are meant to provide information about our products and their applications. They do not mean that the chemical resistance of products or their suitability for a particular purpose is guaranteed in a legally binding way. Any existing commercial proprietary rights are to be taken into account. We guarantee perfect quality within the scope of our general terms and conditions. For specific applications it is recommended to establish suitability first. Standard testing is performed in normal climatic conditions 23/50 according to DIN 50 014. All statements, technical information and recommendations contained in this publication are presented in good faith, based upon tests believed to be reliable and practical field experience. The reader is cautioned, however, that Curbell Plastics, Inc. cannot guarantee the accuracy or completeness of this information, and it is the customer's responsibility to determine the suitability of specific products in any given application.

### Agents, concentration:weight-%

\* Resistance also dependent upon concentration, time, and temperature

## CHEMICAL RESISTANCE

Factors like temperature, concentration of the driving forces, duration and mechanical load are important criterions for the examinations of chemical resistance. In the following table, you can see the materials resistance to different chemicals. These details correspond to the present state of our knowledge and are meant to provide information about our products and their applications. They do not mean that the chemical resistance of products or their suitability for a particular purpose is guaranteed in a legally binding way. Any existing commercial proprietary rights are to be taken into account. We guarantee perfect quality within the scope of our general terms and conditions. For specific applications it is recommended to establish suitability first. Standard testing is performed in normal climatic conditions 23/50 according to DIN 50 014. All statements, technical information and recommendations contained in this publication are presented in good faith, based upon tests believed to be reliable and practical field experience. The reader is cautioned, however, that Curbell Plastics, Inc. cannot guarantee the accuracy or completeness of this information, and it is the customer's responsibility to determine the suitability of specific products in any given application.

### Agents, concentration:weight-%

\* Resistance also dependent upon concentration, time, and temperature

## FDA COMPLIANCE

---

The virgin, natural, unfilled formulations of the sheet, rod, tube, and film products listed here are available from Curbell Plastics, Inc. in grades that comply with one or more of the FDA's guidelines for direct food contact at room temperature.

**It is important to specify FDA compliant material at the time of the order to ensure that FDA compliant material is provided.**

- Acetal
- Acrylic  
(non-UV stabilized)
- HDPE (High Density Polyethylene)
- LDPE (Low Density Polyethylene)
- Nylon
- PBT
- PEEK
- PET (semicrystalline)
- PETG
- Polycarbonate  
(non-UV stabilized)
- Polypropylene
- Polystyrene
- Polysulfone
- PTFE
- PVC
- PVDF (Kynar®)
- Radel R®
- UHMW-PE  
(Ultra High Molecular Weight Polyethylene)
- Ultem (Polyetherimide)

## GENERAL INFORMATION:

Un-reinforced thermoplastics can be machined using high speed steel tools. For glass-reinforced materials, carbide-tipped tools are necessary. In all cases, only correctly sharpened tools should be used.

Due to the low thermal conductivity and low melting temperatures of plastics, good heat removal must be ensured through proper chip removal and cooling with clean dry air or a mild water-based cooling fluid.

# MACHINING GUIDELINES

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## DIMENSIONAL STABILITY:

To produce dimensionally accurate parts, it is important to use stress-relieved raw materials. Otherwise, machining operations may result in the release of stresses, which can distort part geometry.

If large volumes of material must be removed, intermediate annealing may be necessary after rough machining to relieve thermal stresses. Annealing times and temperatures for specific materials can be obtained from Curbell Plastics upon request.

Materials with high moisture absorption such as nylon may have to be conditioned before processing. This involves drying the material and then allowing it to reach equilibrium moisture content.

Most plastics have a much higher coefficients of thermal expansion than metals. Close tolerance parts should be manufactured in temperature-controlled environments. Parts intended for use in high temperature or low temperature environments should be designed with tolerances that allow for dimensional changes due to thermal expansion.

## MACHINING METHODS:

### 1. TURNING

Fine, C-2 grade carbide inserts are recommended for turning.

Polished top surfaces will help to reduce material build-up, allowing for better surface finishes.

Cutting edges should have generous relief angles and negative back rake to minimize any rubbing action.

Rough cuts should be run at a feed rate of 0.015 IPR and finish cuts should be run at a feed rate of 0.005 IPR or less.

### 2. MILLING

HSS tooling works well for most thermoplastics. Carbide tooling is recommended for reinforced materials.

High spindle speeds and table travel are possible with adequate clamping. Care is required when clamping stock to the mill bed to prevent deformation/springing of the material.

Standard roughing end mills work well for roughing cuts. Finish cuts should be made using either 2 flute or 4 flute mills, depending on the material and chip characteristics.

For inside pockets, end mills with rounded corners should be used whenever possible. This will prevent the finished piece from having sharp inside corners, which can potentially be areas of stress concentration.

### 3. DRILLING

More heat is generated in drilling than in most other machining processes. Heat reduction is critical to minimize machined-in stress.

A 90° to 118° drill point angle with a 9° to 15° lip angle is usually sufficient for most plastic materials. Acrylic drilling requires a 0° rake angle.

The back side of plastic parts should be supported to prevent chipping during drilling. Drilling into unsupported areas should be avoided.

The feed rate should be reduced when the drill gets close to exiting the material.

Deep hole drilling requires "peck drilling" for proper chip clearance and heat dissipation. The drilling depth should not be allowed to exceed 3-4 times the drill diameter before withdrawal.

Drills must be sharp. Incorrectly sharpened or dull drills can induce high levels of stress into the workpiece.

Proper chip ejection is critical. Poor chip ejection will cause frictional heat buildup.

Signs of improper drilling techniques include:

- Cracks
- Crazing
- Melted surfaces
- Poor finishes
- Dimensional changes (typically undersize holes)

### 4. SAWING

Thick-walled parts should be sawed with relatively thin blades to avoid excessive frictional heat generation.

Well-sharpened, strongly offset saw blades are recommended.

Specially designed blades are available to optimize cutting for many plastic materials including nylon and acrylic.

### 5. THREAD CUTTING

Threads are best cut using thread chasers. Burring can be avoided by using twin-toothed chasers.

Die cutters are not recommended as re-cutting can be expected during removal of the cutter.

A machining allowance, dependent on the material and hole diameter, should be taken into account when using tap drills.

### 6. SAFETY PRECAUTIONS

Failure to use proper machining techniques can result in localized overheating, which can degrade plastic materials. This may result in the release of potentially harmful decomposition products, which should be removed from the air by an appropriate exhaust system. Tobacco products should be kept out of the production area due to the risk of poisoning from the decomposition products of certain plastics.

All statements, technical information, and recommendations contained in these machining guidelines are presented in good faith, based upon tests believed to be reliable and practical field experience. The reader is cautioned, however, that Curbell Plastics, Inc. cannot guarantee the accuracy or completeness of this information, and it is the customer's sole responsibility to determine the proper machining methods for a given material and part geometry.

# MACHINING GUIDELINES

SAWING				DRILLING					
$\alpha$	$\gamma$	V	t	$\alpha$	$\gamma$	$\varphi$	V	S	
Clearance Angle (°)	Rake Angle (°)	Cutting Speed (ft/min)	Pitch (in)	Clearance Angle (°)	Rake Angle (°)	Point Angle (°)	Cutting Speed (ft/min)	Feed (mils/rev)	
ABS	15-30	0-5	980	0.078-0.315	8-12	10-30	90	165-650	0.008-0.012
Acetal (copolymer)	20-30	0-5	1640-2600	0.078-0.197	5-10	15-30	90	165-650	0.004-0.012
Acetal (homopolymer)	20-30	0-5	1640-2600	0.078-0.197	5-10	15-30	90	165-650	0.004-0.012
Noryl	15-30	5-8	980	0.118-0.315	8-10	10-20	90	165-320	0.008-0.012
Nylon 6	20-30	2-5	1640	0.118-0.315	5-15	10-20	90	165-490	0.004-0.012
PAI	5-10	0-3	2600-2950	0.118-0.50	5-10	5-10	120	260-320	0.008-0.004
PBT	15-30	5-8	980	0.118-0.315	5-10	10-20	90	165-320	0.008-0.012
PEEK	15-30	0-5	1640-2600	0.118-0.197	5-10	10-30	90	160-650	0.004-0.012
PET	15-30	5-8	980	0.118-0.315	5-10	10-20	90	165-320	0.008-0.012
Polycarbonate	15-30	5-8	980	0.118-0.315	8-10	10-20	90	165-320	0.008-0.012
Polyethylene	20-30	2-5	1640	0.118-0.315	5-15	10-20	90	165-490	0.004-0.012
Polypropylene (homopolymer)	20-30	2-5	1640	0.118-0.315	5-15	10-20	90	165-490	0.004-0.012
Polysulfone	15-30	0-4	1640	0.078-0.197	3-10	10-20	90	65-260	0.004-0.012
PPS	15-30	0-5	1640-2600	0.118-0.197	5-10	10-30	90	160-650	0.004-0.012
PTFE	20-30	5-8	980	0.078-0.197	10-16	5-20	130	790-650	0.004-0.012
PVDF	20-30	5-8	980	0.078-0.197	10-16	5-20	130	790-650	0.004-0.012
Radel® R	15-30	0-4	1640	0.078-0.197	3-10	10-20	90	65-260	0.004-0.012
Ultem®	15-30	0-4	1640	0.078-0.197	3-10	10-20	90	65-260	0.004-0.012
Vespel®	5-10	0-3	2600-2950	0.100	0.50	5-10	90-120	260-320	0.022-0.006
Reinforced materials	15-30	10-15	650-980	0.118-0.197	6	5-10	120	260-320	0.004-0.012

The angle of twist of the drill bit should be approximately 12° to 16°.

## SPECIAL MEASURES:

Preheat material to 250°F

Caution when using coolants, susceptible to stress cracking

Use carbide-tipped tools

Heat before sawing:  
From 2.25" - PEEK, PPS  
From 3.25" - PET, PBT  
From 4.00" - Nylon 6

Heat before drilling:  
From 60mm diameter - PEEK, PPS  
From 80mm diameter - PET, PBT  
From 100mm diameter - Nylon 6

MILLING					TURNING				
	$\alpha$	$\gamma$	V		$\alpha$	$\gamma$	$\chi$	V	S
	Clearance Angle (°)	Rake Angle (°)	Cutting Speed (ft/min)		Clearance Angle (°)	Rake Angle (°)	Side Angle (°)	Cutting Speed (ft/min)	Feed (mils/rev)
ABS	5-10	0-10	980-1640		5-15	25-30	15	650-1640	0.008-0.020
Acetal (copolymer)	5-15	5-15	920-1640		6-8	0-5	45-60	980-1960	0.004-0.015
Acetal (homopolymer)	5-15	5-15	920-1640		6-8	0-5	45-60	980-1960	0.004-0.015
Noryl	10-20	5-15	980		5-10	6-8	45-60	980	0.004-0.020
Nylon 6	10-20	5-15	920-1640		6-10	0-5	45-60	920-1640	0.004-0.020
PAI	2-5	0-5	300-330		2-5	0-5	7-10	320-390	0.002-0.003
PBT	5-15	5-15	980		5-10	0-5	45-60	980-1300	0.008-0.015
PEEK	5-15	6-10	920-1640		6-8	0-5	45-60	920-1640	0.004-0.020
PET	5-15	5-15	980		5-10	0-5	45-60	980-1300	0.008-0.015
Polycarbonate	10-20	5-15	980		5-10	6-8	45-60	980	0.004-0.020
Polyethylene	10-20	5-15	920-1640		6-10	0-5	45-60	920-1640	0.004-0.020
Polypropylene (homopolymer)	10-20	5-15	920-1640		6-10	0-5	45-60	920-1640	0.004-0.020
Polysulfone	2-10	1-5	920-1640		6	0	45-60	1140-1300	0.004-0.012
PPS	5-15	6-10	920-1640		6-8	0-5	45-60	920-1640	0.004-0.020
PTFE	5-15	5-15	920-1640		10	5-8	10	490-1640	0.004-0.012
PVDF	5-15	5-15	920-1640		10	5-8	10	490-1640	0.004-0.012
Radel® R	2-10	1-5	920-1640		6	0	45-60	1140-1300	0.004-0.012
Ultem®	2-10	1-5	920-1640		6	0	45-60	1140-1300	0.004-0.012
Vespel®	2-5	0-5	300-330		2-5	0-5	7-10	320-390	0.002-0.010
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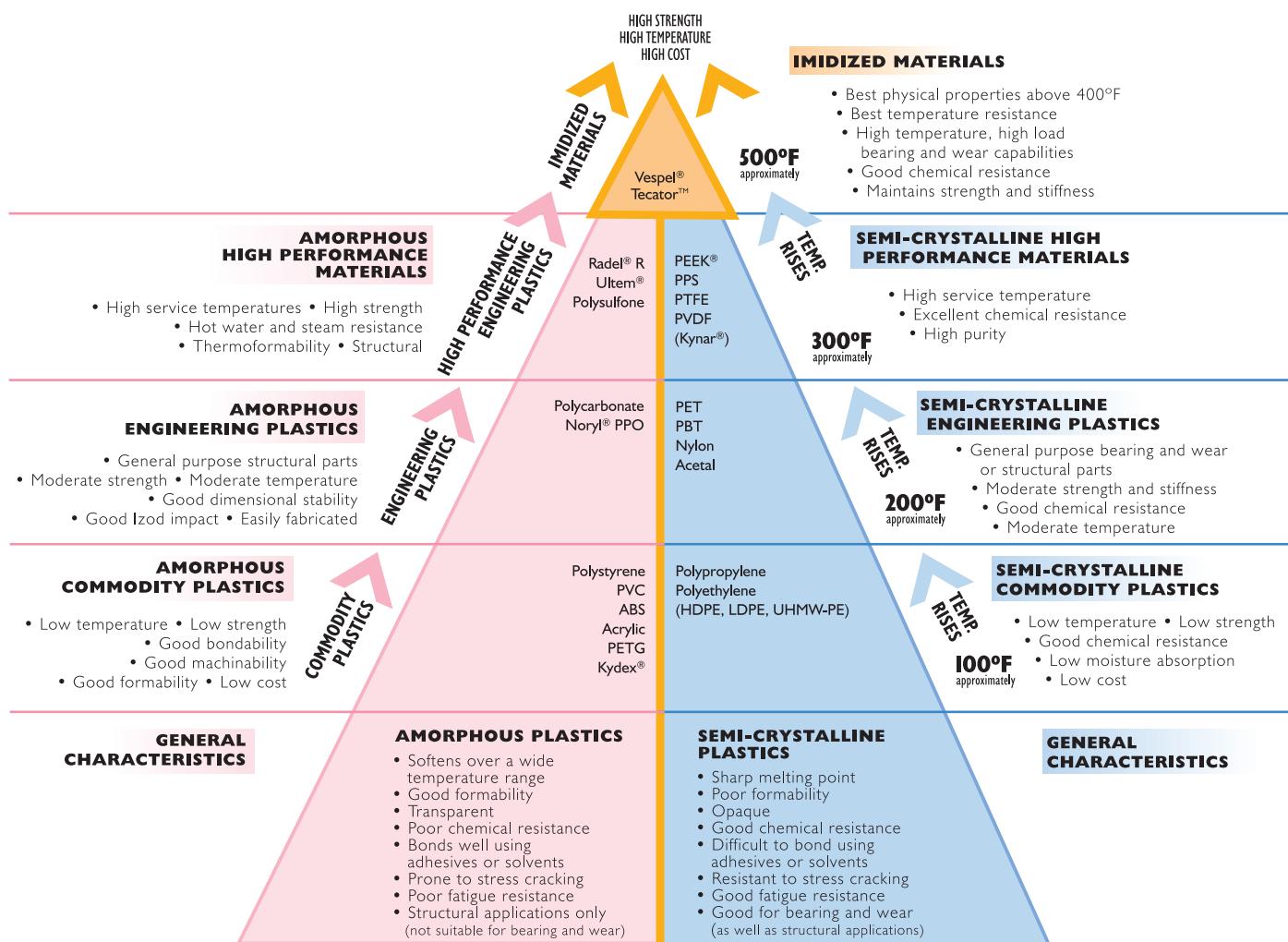
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# THERMOPLASTICS TRIANGLE



All statements, technical information and recommendations contained in this publication are presented in good faith, based upon tests believed to be reliable and practical field experience. The reader is cautioned, however, that Curbell Plastics, Inc. cannot guarantee the accuracy or completeness of this information, and it is the customer's responsibility to determine the suitability of specific products in any given application.

# Typical Property Comparison Chart

	PROPERTY	SPECIFIC GRAVITY	TENSILE STRENGTH	TENSILE MODULUS OF ELASTICITY	TENSILE ELONGATION	FLEXURAL STRENGTH	FLEXURAL MODULUS OF ELASTICITY	COMPRESSIVE STRENGTH	MATERIALS	HARDNESS	IZOD IMPACT	COEFFICIENT OF FRICTION	COEFFICIENT OF LINEAR THERMAL EXPANSION	HEAT DEFLECTION TEMPERATURE	MAX CONTINUOUS SERVICE TEMPERATURE IN AIR	DIELECTRIC STRENGTH	WATER ABSORPTION		
		73° F	73° F	73° F	%	73° F	73° F	10% deformation 73° F		Rockwell 73° F	(notched) 73° F		in/in°F × 10 <sup>-5</sup>	66psi / 264psi	°F	V/mil	Immersion 24 Hours		
pg. #	UNITS		psi	psi	%	psi	psi	psi	scale as noted		ft-lbs/in								
ASTM TEST	D-792	D-638	D-638	D-638	D-638	D-790	D-790	D-695		D-785	D-256	Dynamic	D-696	D-648		D-149	D-570		
AMORPHOUS THERMOPLASTICS	6-7	ABS	1.04	4,100	294,000	32	9,100	304,000	-	ABS	R102	7.7	-	5.6	200	177	160	-	0.30
	10-II	ACRYLIC (Continuously Processed)	1.19	10,000	400,000	4.5	17,000	480,000	17,000	ACRYLIC (Continuously Processed)	M93	0.4	-	4.0	-	195	160	430	0.20
	12-13	KYDEX® 100	1.35	6,100	317,500	160	9,100	335,000	-	KYDEX® 100	R94	18.0	-	4.2	-	173	-	514	0.05-0.08
	14-15	NORYL® (Modified PPO)	1.08	9,600	350,000	25	14,400	370,000	-	NORYL® (Modified PPO)	R119	3.5	-	3.3	279	254	220	500	0.07
	26-27	PETG	1.27	7,700	320,000	210	11,200	310,000	-	PETG	R115	1.7	-	3.8	164	157	-	410	0.20
	28-29	POLYCARBONATE	1.20	9,500	345,000	135	13,500	345,000	12,500	POLYCARBONATE	M70, R118	12.0-16.0	-	3.8	280	270	240	380	0.15
	28-29	POLYCARBONATE (20% Glass Filled)	1.35	16,000	860,000	5	19,000	800,000	-	POLYCARBONATE (20% Glass Filled)	M91, R122	2.0	-	1.5	300	295	248	-	0.16
	36-37	POLYSTYRENE (High Impact)	1.04	3,500	270,000	52	7,000	310,000	-	POLYSTYRENE (High Impact)	L68	2.0	-	4.5	-	185	-	-	-
	38-39	POLYSULFONE	1.24	10,200	360,000	50-100	15,400	390,000	13,900	POLYSULFONE	M69, R120	1.3	-	3.1	358	345	285	425	0.30
	46-47	PVC (Rigid)	1.42	7,500	411,000	-	12,800	481,000	-	PVC (Rigid)	R115	1.0	-	3.2	-	158	140	544	0.06
	50-51	RADEL R®	1.29	10,100	340,000	60-120	13,200	350,000	14,350	RADEL R®	R123	13	-	3.1	-	405	392	360	0.37
	54-55	ULTEM®	1.27	15,200	430,000	60	22,000	480,000	21,900	ULTEM®	M109	1.0	-	3.1	410	392	338	830	0.25
	54-55	ULTEM® (30% Glass Filled)	1.51	24,500	1,300,000	13	33,000	1,300,000	-	ULTEM® (30% Glass Filled)	M114	1.6	-	1.1	414	410	356	770	0.16
SEMICRYSTALLINE THERMOPLASTICS	8-9	ACETAL (Copolymer)	1.41	9,800	430,000	75	13,000	370,000	-	ACETAL (Copolymer)	M80	1.0	0.21	6.1	316	230	195	500	0.20
	8-9	ACETAL (Homopolymer)	1.42	10,000	450,000	75	14,300	420,000	-	ACETAL (Copolymer)	M94, R120	1.5	0.20	6.8	336	257	185	500	0.25
	30, 32	HDPE	0.96	4,000	-	600	-	200,000	-	HDPE	-	-	-	7.0	172	-	-	0.10	
	30-31	LDPE	0.92	1,400	-	500	-	30,000	-	LDPE	-	no break	-	-	122	-	-	0.10	
	16-17	NYLON (6 Cast)	1.15-1.17	10,000-13,500	400,000-550,000	20-55	15,500-17,500	420,000-500,000	-	NYLON (6 Cast)	R115-125	0.7-0.9	0.22	5.0	400-430	200-400	230	500-600	0.60-1.20
	16-17	NYLON (6/6 Extruded)	1.14	12,400	470,000	90	17,000	410,000	-	NYLON (6/6 Extruded)	M80, R121	1.2	0.28	4.5	-	194	210	300-400	1.20
	20-21	PBT	1.30	8,690	416,000	300	12,000	330,000	-	PBT	M72	1.5	0.25	-	310	130	245	400	0.08
	22-23	PEEK	1.32	14,000	490,000	60	24,600	590,000	-	PEEK	M99, R126	1.6	0.25	2.6	-	306	480	480	0.50
	24-25	PET (Semicrystalline)	1.38	11,500	400,000	70	15,000	400,000	-	PET (Semicrystalline)	R117	0.7	0.25	3.9	240	175	230	400	0.10
	34-35	PP (Homopolymer)	0.91	5,400	-	-	-	225,000	-	PP (Homopolymer)	R92	1.2	-	-	210	-	-	-	slight
	34-35	PP (Copolymer)	0.90	3,800	-	-	-	215,000	-	PP (Copolymer)	R92	12.5	-	-	190	-	-	-	slight
	42-43	PPS	1.35	12,500	480,000	4	21,000	600,000	-	PPS	M93	0.5	0.24	4.0	400	220	338	450	0.02
	44-45	PTFE	2.15	1,500-3,000	-	100-200	-	72,000	-	PTFE	-	3.5	0.10	5.5	250	-	500	400-500	<0.01
	48-49	PVDF (Homopolymer)	1.78	7,800	350,000	35	10,750	310,000	-	PVDF (Homopolymer)	R100	3.0	-	7.1	300	235	-	280	0.02
	30, 33	UHMW-PE	0.93	3,100	-	350	-	110,000	-	UHMW-PE	-	18.0 <sup>1</sup>	0.10-0.20	11.1	-	-	180	-	slight
IMIDIZED MATERIALS	18-19	POLYAMIDE-IMIDE TECATOR® 2154	1.41	21,000	-	15	33,000	711,000	-	POLYAMIDE-IMIDE	M119	2.3	-	1.7	-	532	500	600	0.30
	56-59	POLYIMIDE VESPEL® SP-1	1.43	12,500 <sup>2</sup>	-	7.5 <sup>2</sup>	16,000	450,000	19,300	POLYIMIDE VESPEL® SP-1	E45-60	0.8	0.29 <sup>3</sup>	3.0	-	~ 680	-	560	0.24
	56-59	POLYIMIDE VESPEL® SP-2I	1.51	9,500 <sup>2</sup>	-	4.5 <sup>2</sup>	16,000	550,000	19,300	POLYIMIDE VESPEL® SP-2I	E25-45	0.8	0.24 <sup>3</sup>	2.7	-	~ 680	-	-	0.19
	56-59	POLYIMIDE VESPEL® SP-22	1.65	7,500 <sup>2</sup>	-	3.0 <sup>2</sup>	13,000	700,000	16,300	POLYIMIDE VESPEL® SP-22	E5-25	-	0.20 <sup>3</sup>	2.1	-	-	-	-	0.14
	56-59	POLYIMIDE VESPEL® SP-2II	1.55	6,500 <sup>2</sup>	-	3.5 <sup>2</sup>	10,000	450,000	14,800	POLYIMIDE VESPEL® SP-2II	E1-20	-	0.12 <sup>3</sup>	3.0	-	-	-	-	0.21
	56-59	POLYIMIDE VESPEL® SP-3	1.60	8,200 <sup>2</sup>	-	4.0 <sup>2</sup>	11,000	475,000	18,500	POLYIMIDE VESPEL® SP-3	E40-55	0.4	0.25 <sup>3</sup>	2.9	-	-	-	-	0.23
	56-59	POLYIMIDE VESPEL® SCP-5000	1.46	23,600 <sup>2</sup>	-	7.5 <sup>2</sup>	36,800	836,000											

# Curbell's Full Line of Materials

## PLASTIC MATERIALS

- ABS
- Acetal
- Acetate film and sheet
- Acrylic
- Acrylic accessories
- Acrylic, impact modified
- Acrylic mirror
- ACRYLITE® acrylic sheet
- Bollard covers
- Calendered vinyl
- Cast acrylic sheet
- Celtec® expanded PVC
- Coextruded colored acrylic
- Conductive engineering plastics
- Coroplast™
- Corner guards
- Delrin®
- Dibond®
- Double patterned acrylic sheet
- DP-32 patterned acrylic sheet
- DuPont™ SentryGlas®
- DuPont™ Vespel® Polyimide Shapes
- Duraplast®
- Engraving stock
- Ergonomic/Anti-fatigue matting
- Eslon DC glazing
- ETFE
- Expanded PVC
- Fabbac® mirror
- FEP
- Fiberglass grating
- Flexible tubing
- Fluoroplastics
- FM4910 materials
- Fome-Cor®
- Gatorfoam®
- GatorPlast®
- Glass-filled engineering plastics
- Glastic® thermosets
- Halar® (ECTFE)
- Heat shrink tubing
- High density polyethylene
- HIPS film
- Hydex® 4101 (PBT)
- InteCel®
- InteClear®
- InteFoam®
- Jetmount®
- Komacel®
- Komadur®
- Komatex®
- KYDEX® thermoplastic sheet
- Kynar® PVDF
- Light diffusing film
- Low density polyethylene
- Makrofol® polycarbonate film
- MAKROLON® HYGARD®
- MAKROLON® polycarbonate sheet
- MAKROLON® 15 polycarbonate sheet
- Marine board
- Medical grade plastics
- Mirror
- Noryl®
- NYCAST® (Nylon)
- NYLOIL® oil filled
- Nylon
- Nylon MD
- NYMETAL™ (Nylon)
- Opti-Sphere™ mirror
- OPTIX® acrylic sheet
- PBT
- PEEK®
- PEEK® bearing grade
- PET
- PETG film and sheet
- PFA
- Phenolic
- Plastic lumber
- Plastic welding rods
- Platforms
- Plexiglas® acrylic
- Plexus®
- Poly II UVA acrylic sheet
- Poly 76 acrylic sheet
- Poly 84 acrylic sheet
- Poly bags
- Polyamide-imide
- Polycarbonate film, sheet, and mirror
- Polycarbonate mirrors
- Polyethylene
- Polyester film
- Polyimide
- Polyphenylene sulfide
- Polyphenylene sulfide, bearing grade
- Polypropylene
- Polystyrene
- Polysulfone
- PPS
- Press polished vinyl
- Printable polyethylene
- Print grade polystyrene
- PTFE
- PVC
- Radel® R
- Reinforced PTFE
- Rexolite®
- Rigid foams
- Rigid PVC film
- RTV silicones
- Ryton® (PPS)
- Scratch resistant vinyl
- See-thru mirror
- Sign grade materials
- Sign vinyl
- Sintra® expanded PVC
- Soft foams
- Solacryl™ UV transmitting sheet
- Starboard®
- Static cling vinyl
- Static dissipative ABS, Acetal, Polycarbonate, Polyetherimide, and PTFE
- Styrene
- TECAFORM™ (Acetal)
- TECAFORM™ HPV-13 (PTFE filled acetal)
- TECAMID™ 6/6 (Nylon)
- TECANAT™ (Polycarbonate)
- TECAPEEK™
- TECAPEEK™, bearing grade
- TECAST VEKTON™ (Nylon)
- TECATOR™ (PAI)
- TECATRON™ (PPS)
- TECATRON™ (PPS), bearing grade
- Thermoset laminates
- Tuffak® polycarbonate sheet
- Twin wall polycarbonate sheet
- UHMW-PE
- Ultem® (PEI)
- Urethane
- UV adhesives
- Vinyl
- VIVAK HT® PETG
- Welding curtains

## PLASTIC FILMS

- Acetate
- Acrylic
- HDPE
- HIPS
- Kynar® PVDF
- LDPE
- Light diffusing film
- Makrofol®
- Polycarbonate film
- Nylon
- PEEK
- PEN
- PETG
- Polycarbonate
- Polyester
- Polyimide
- Polypropylene
- PVC
- UHMW
- Ultem®
- Vinyl (calendered, press polished, pressure sensitive, scratch resistant, sign, and static cling)

## PROTOTYPING, MOLDMAKING, AND TOOLING MATERIALS

- DSM Somos® SLA resins
- Momentive silicone mold making materials
- PTM&W liquid casting and laminating urethanes
- PTM&W liquid casting and laminating epoxies
- Rampf® modeling and tooling board
- RTV silicones

## ADHESIVES AND SEALANTS

- 3M™ adhesives
- 3M™ tapes
- Aerosols
- Anaerobics
- Bostik®
- Cyanoacrylates
- Dispensing equipment-bulk, cartridge
- Epoxies
- Hot melts
- IPS Weld-on®
- Latexes
- Loctite®
- Methacrylates
- Momentive
- RTV silicones
- Plexus®
- Polyurethane foam
- RTV silicone
- Silicones
- Structural adhesives
- Urethane
- UV adhesives
- 3M™

## TAPES, FABRICS, AND BELTS

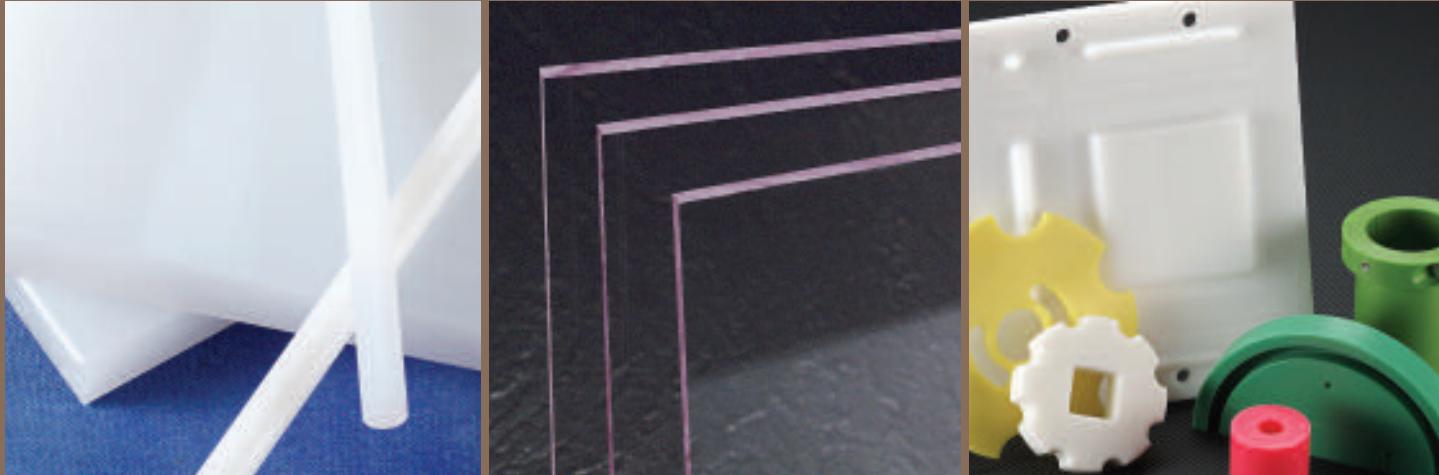
- 3M™ foam tapes
- 3M™ masking products
- 3M™ MRO tapes
- 3M™ packaging products
- 3M™ transfer tapes
- 3M™ VHB tapes
- Aisle marking tapes,
- Aluminum foil, adhesive backed
- Anti-static UHMW and PTFE coated fiberglass fabric
- Application tape
- ATG transfer tapes
- Carton sealing tape
- Circuit board tapes (polyester, polyimide, fiberglass)
- Copper foil, adhesive backed
- Crepe paper masking tapes
- Differential adhesive tapes
- Double-coated tapes (paper, polyester, polypropylene, scrim, and tissue)
- FEP tapes
- Fiberglass cloth tape
- Filament reinforced strapping tapes
- Flame/plasma spray tapes
- Flat back paper tapes
- Fluorescent cloth duct and gaffers tapes
- Friction tape
- Gaffer tapes
- Glow-in-the-dark, polyester tapes
- Heat sealing tapes
- Kapton® polyimide tape
- Lead foil, adhesive backed
- Litho graphic arts tape
- Magnetic tapes, one face flexible
- Mechanical grade PTFE coated fiberglass fabrics
- Mylar/polyester tapes
- Pipe thread seal (PTFE)
- Pipe wrap tapes, heavy duty SPVC
- Plating tapes, polyester and vinyl
- Polyester splicing tapes
- Polypropylene high clarity label protection/lamination tapes
- PTFE coated fiberglass cloth
- PTFE fabric belts
- PTFE film tapes
- PVC foam tape
- Reflective tapes
- Safety tapes
- Tear/crease resistant PTFE coated fiberglass fabrics
- Transfer tapes
- UHMW tapes
- Very high bond acrylic tapes
- Vinyl (SPVC) tapes
- Vinyl electrical tapes
- Vinyl electroplating tapes
- Vinyl-cloth duct tapes
- Window glazing tapes
- Very high bond
- Vinyl (SPVC)

Curbell Plastics, Inc. has received ISO 9001:2008 certification through BSI Quality Management Systems. Several Curbell locations and the corporate headquarters have been certified.

ISO 9001:2008 certification assures customers that Curbell Plastics has a fully functioning and well-documented quality management system in place. Conducting business in accordance with this management system ensures traceability for products and services that Curbell Plastics provides.



ISO 9001:2008  
FM 509823



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Curbell Plastics has been supplying plastic sheet, rod, tube, films, adhesives, sealants, tapes, prototyping and tooling materials, and fabricated parts for over 70 years

For a complete list of addresses, contact information, materials,  
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