Plastics for Orthotics & Prosthetics

Make someone well. And happy.
Contents

Plastic sheet materials offer a lightweight alternative. From flexible to semi-rigid, to stiff and anywhere in between, many plastics have excellent drape and blister forming characteristics. Curbell O&P stocks HDPE, Polypro, Copoly, OP-TEK® Flex, PETG, LDPE, and more.

ABS
Outstanding impact resistant low cost plastic, easy to machine and thermoform

CAB
Clear plastic sheet with excellent drape and blister forming characteristics

EVA (OP-TEK® Flex Family, Proflex, Orfitrans™)
Soft, flexible copolymer with low-temperature toughness, and stress-crack resistance

HDPE
Easy to fabricate, durable, lightweight, low cost plastic material

High Impact Polystyrene (Orfitrans™ Stiff)
Tough plastic material that is easy to thermoform and fabricate

KYDEX® Thermoplastic Sheet
High impact, thermoplastic sheet that is tough, durable, and easy to form

LDPE
Soft, flexible, lightweight plastic material that is easy to fabricate and form

PETG
Transparent plastic sheet with good impact resistance and outstanding thermoforming

Polypropylene
Low cost, chemical resistant plastic with excellent aesthetic qualities

Surlyn®
Soft, clear polymer is tough and durable with excellent thermoforming characteristics

TPE
Fatigue resistant, flexible, opaque, lightweight, thermoplastic elastomer sheet.
ABS

Outstanding impact resistant low cost plastic, easy to machine and thermoform

ABS is a low cost plastic material with outstanding impact resistance, machinability, and thermoforming characteristics.

ABS plastic is available in general purpose, machine grade, fire-rated, UV resistant, orthotic grade and scratch resistant grades in a variety of textures and colors.

ABS Sheet for O&P – ABS has excellent thermoforming characteristics. Because of this, it is commonly used for back braces and fabric brace stiffening panels.

ABS Sheet for O&P is widely used for:
- Back braces
- Fabric brace stiffening panels
- Inserts offering structural support
- Posterior panels

Performance characteristics:
- Strong and stiff
- Low cost
- Easy to thermoform
- Easy to fabricate
- Easy to bond with adhesives

Standard sizes
- Dimensions: 12 in x 12 in – 48 in x 96 in
- Thickness: 0.60 in – 4 in
- Colors: Black, White

Length, width, thickness, and diameter tolerances vary by size, by manufacturer, brand, and grade. Custom sizes and colors available upon request.

<table>
<thead>
<tr>
<th>TYPICAL PROPERTIES OF ABS</th>
<th>UNITS</th>
<th>ASTM Test</th>
<th>ABS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tensile strength</td>
<td>psi</td>
<td>D638</td>
<td>4100</td>
</tr>
<tr>
<td>Flexural modulus</td>
<td>psi</td>
<td>D790</td>
<td>304000</td>
</tr>
<tr>
<td>Izod impact (notched)</td>
<td>ft-lbs/in of notch</td>
<td>D256</td>
<td>7.7</td>
</tr>
<tr>
<td>Heat deflection temperature @ 264 psi</td>
<td>°F</td>
<td>D648</td>
<td>177</td>
</tr>
<tr>
<td>Maximum continuous service temperature in air</td>
<td>°F</td>
<td></td>
<td>160</td>
</tr>
<tr>
<td>Water absorption (immersion 24 hours)</td>
<td>%</td>
<td>D570</td>
<td>0.30</td>
</tr>
<tr>
<td>Coefficient of linear thermal expansion</td>
<td>in/in/°F x 10^-5</td>
<td>D696</td>
<td>5.6</td>
</tr>
</tbody>
</table>

Values may vary according to brand name. Please ask your Curbell Plastics representative for more specific information about an individual brand.
CAB

Clear plastic sheet with excellent drape and blister forming characteristics

CAB (cellulose acetate butyrate) Sheet (Uvex®) is a clear, easy to thermoform polymer. CAB sheet offers resistance to ultra-violet rays which makes it a good option for outdoor applications.

Tech Tip– Buffing scratches out of CAB is very difficult; be careful not to scratch during fabrication.

TYPICAL PROPERTIES OF CAB

<table>
<thead>
<tr>
<th>PROPERTY*</th>
<th>UNITS</th>
<th>ASTM TEST METHOD</th>
<th>VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tensile strength @ yield</td>
<td>MPa psi</td>
<td>D638</td>
<td>35.6 5,163</td>
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<tr>
<td>50 mm/min (2 in/min)</td>
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<td></td>
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<tr>
<td>Tensile strength @ break</td>
<td>MPa psi</td>
<td>D638</td>
<td>36.3 5,221</td>
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<td>50 mm/min (2 in/min)</td>
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<td></td>
<td></td>
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<tr>
<td>Elongation @ break</td>
<td>%</td>
<td>D638</td>
<td>33.9</td>
</tr>
<tr>
<td>50 mm/min (2 in/min)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flexural modulus of elasticity</td>
<td>MPa 10⁶ psi</td>
<td>D790</td>
<td>1.579 2.3</td>
</tr>
<tr>
<td>1.27 mm/min (0.05 in/min)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Izod impact strength notched</td>
<td>23°C J/m 73°F ft-lbf/in</td>
<td>D256</td>
<td>235 4.4</td>
</tr>
<tr>
<td>-40°C J/m -40°F ft-lbf/in</td>
<td></td>
<td></td>
<td>78 1.5</td>
</tr>
</tbody>
</table>

* Mechanical properties are corrected for thickness and therefore apply to all thicknesses of sheet, although slight deviations may be found in thin gauges. Values for any given specimen of sheeting may be approximated by means of a suitable conversion factor based on the dimensions of the specimen.
EVA (OP-TEK® Flex, Proflex, Orfitrans™)

Soft, flexible plastic with low-temperature toughness and stress-crack resistance

Flexible EVA (ethylene vinyl acetate) is the copolymer of ethylene and vinyl acetate. It’s an extremely elastic material that can be processed like other thermoplastics. The material has low-temperature toughness, stress-crack and UV radiation resistance. In the Orthotic and Prosthetic market, fabricators know this material as either: OP-TEK® Flex, Proflex, or Orfitrans™ Excel. (Note: Each brand may exhibit slight variations of grades and flexibility.)

EVA Material Options

OP-TEK® Flex – is a soft, flexible EVA copolymer that provides for outstanding patient comfort when used as a liner for rigid socket frames. OP-TEK® Flex is specially formulated to maintain more consistent walls during forming compared with many other flexible plastics.

OP-TEK® Flex Comfort – soft, flexible EVA copolymer with a proprietary additive that gives the material a softer feel. This enhanced surface provides superior patient comfort when used as a liner for rigid socket frames. The additive greatly reduces friction when patients don and doff prosthetic devices. Unlike EVAs with silicone, OP-TEK® Flex Comfort exhibits excellent seaming characteristics during drape forming and more consistent walls during blister/bubble forming compared with many other EVA copolymer materials.

OP-TEK® Flex BiLam – provides added comfort and improves aesthetics for patients wearing carbon socket frames. The inner layer contains a hypoallergenic, FDA compliant additive that reduces friction, and the outer layer helps hide trim lines and window cut-outs of carbon socket frames.

Proflex – is a soft, flexible EVA copolymer that provides a superior level of patient comfort when used as a liner for rigid socket frames.

Proflex with Silicone (Proflex-S) – is a soft, flexible EVA copolymer with a silicone lubricant. Like Proflex it provides a superior level of patient comfort when used as a liner for rigid socket frames. The silicone reduces friction when patients don and doff prosthetic devices.

Orfitrans™ Excel – is available in semi-transparent and black. The material pulls very easily and offers outstanding comfort for the patient.

Tech Tip – Be aware that certain solvents can cause cracks to propagate with EVA materials.

See typical properties of EVA on next page.
## TYPICAL PROPERTIES OF EVA

<table>
<thead>
<tr>
<th>PHYSICAL PROPERTIES</th>
<th>UNITS</th>
<th>ASTM Test</th>
<th>EVA SHEET</th>
</tr>
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<tr>
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<td>g/cm³</td>
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<td>0.952</td>
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<tr>
<td>Tensile strength @ yield</td>
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<td>3580</td>
</tr>
<tr>
<td>Elongation @ break</td>
<td>%</td>
<td>D638</td>
<td>770</td>
</tr>
<tr>
<td>Flexural modulus</td>
<td>psi</td>
<td>D790</td>
<td>2470</td>
</tr>
<tr>
<td>Impact brittleness temp</td>
<td>°F</td>
<td>D746</td>
<td>&lt;-121</td>
</tr>
<tr>
<td>DTUL</td>
<td>A Scale</td>
<td>D648</td>
<td>79A</td>
</tr>
<tr>
<td>Vicat softening point</td>
<td>°F</td>
<td>D1525</td>
<td>111</td>
</tr>
</tbody>
</table>

Values may vary according to brand name. Please ask your Curbell Plastics representative for more specific information about an individual brand.
HDPE

Easy to fabricate, durable, lightweight, low cost, plastic material for orthotics and prosthetics

HDPE (high density polyethylene) is available in sheet for applications that require greater strength and stiffness than LDPE (low density polyethylene).

**HDPE for O&P** – is somewhat stiffer and tougher than polypro (homopolymer polypropylene) and often used for applications where additional durability and support are required.

**HDPE Sheet for O&P** is widely used for:
- Orthotics and prosthetics – AFOs, KAFOs
- Spinal orthoses
- Body jackets
- Crow boots

**Performance characteristics:**
- Durable and strong
- Resists cracking
- Good chemical resistance
- Easy to fabricate
- Lightweight

**Common brands:**
- Orthoform®

**Standard sizes:**
- Dimensions: 24 in x 48 in – 48 in x 96 in
- Thickness: 0.0312 in – 0.250 in
- Colors: Natural

Length, width, thickness, and diameter tolerances vary by size, by manufacturer, brand, and grade. Custom sizes and colors available upon request.

**TYPICAL PROPERTIES OF HDPE**

<table>
<thead>
<tr>
<th>Property</th>
<th>UNITS</th>
<th>ASTM Test</th>
<th>HDPE</th>
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<tbody>
<tr>
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<td>psi</td>
<td>D638</td>
<td>4,000</td>
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<tr>
<td>Flexural modulus</td>
<td>psi</td>
<td>D790</td>
<td>200,000</td>
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<tr>
<td>Izod impact (notched)</td>
<td>ft-lbs/in of notch</td>
<td>D256</td>
<td>1.3</td>
</tr>
<tr>
<td>Heat deflection temperature @ 264 psi</td>
<td>°F</td>
<td>D648</td>
<td>172</td>
</tr>
<tr>
<td>Maximum continuous service temperature in air</td>
<td>°F</td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>Water absorption (immersion 24 hours)</td>
<td>%</td>
<td>D570</td>
<td>0.10</td>
</tr>
<tr>
<td>Coefficient of linear thermal expansion</td>
<td>in/in/°Fx10^-5</td>
<td>D696</td>
<td>7.0</td>
</tr>
</tbody>
</table>

Values may vary according to brand name. Please ask your Curbell Plastics representative for more specific information about an individual brand.
High Impact Polystyrene (Orfitrans™ Stiff)

Tough plastic material that is easy to thermoform and fabricate

High Impact Polystyrene (HIS) is a tough plastic that is easy to thermoform and fabricate.

High Impact Polystyrene Material Options

Orfitrans™ Stiff High Impact Poly Sheet for O&P – is a material used for the production of check sockets and flexible sockets. It has good impact resistance, fatigue resistance, and moderate stiffness.

FDA Compliant Material – HIS sheet is available in FDA compliant grades.

TYPICAL PROPERTIES OF HIGH IMPACT POLYSTYRENE

<table>
<thead>
<tr>
<th>Property</th>
<th>UNITS</th>
<th>ASTM Test</th>
<th>HIGH IMPACT POLYSTYRENE</th>
<th>ORFITRANS™ STIFF</th>
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<tr>
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<td>psi</td>
<td>D638</td>
<td>3,500</td>
<td>3,770</td>
</tr>
<tr>
<td>Tensile elongation at break</td>
<td>%</td>
<td>D638</td>
<td>55</td>
<td>250</td>
</tr>
<tr>
<td>Flexural modulus</td>
<td>psi</td>
<td>D790</td>
<td>310,000</td>
<td>167,000</td>
</tr>
<tr>
<td>Izod impact (notched)</td>
<td>ft-lbs/in of notch</td>
<td>D256</td>
<td>2.8</td>
<td>-</td>
</tr>
<tr>
<td>Heat deflection temperature @ 264 psi</td>
<td>°F</td>
<td>D648</td>
<td>196</td>
<td>-</td>
</tr>
<tr>
<td>Coefficient of linear thermal expansion</td>
<td>in/in/^°Fx10^-</td>
<td>D696</td>
<td>4.5</td>
<td>-</td>
</tr>
</tbody>
</table>

Values may vary according to brand name. Please ask your Curbell Plastics representative for more specific information about an individual brand.
KYDEX® Thermoplastic Sheet

High impact, thermoplastic sheet that is tough, durable, and easy to form

KYDEX® Thermoplastic Sheet is an excellent choice for applications where appearance, toughness, or complex thermoforming is required. It is used for thermoformed equipment housings, airplane, bus and train interior parts, kiosks, medical devices, and POP displays.

KYDEX® T Sheet for O&P – Used by fabricators in the orthotics industry for neck braces, body jackets and upper extremity orthoses. KYDEX® Sheet provides rigidity, excellent formability, and mar-resistance.

KYDEX® T Thermoplastic Sheet for O&P is widely used for:
- Medical device and closures
- Neck braces
- Body jackets
- Back braces
- Fabric brace stiffening panels
- Upper extremity orthoses

Performance characteristics:
- Easy to thermoform deep-draw parts
- Rigid
- Good strength and stiffness
- Consistent color throughout the KYDEX® material helps hide scratches and wear

Standard sizes:
- Dimensions: 24 in x 48 in – 48 in x 96 in
- Thickness: 0.030 in – 0.900 in
- Colors: Beige, Cadet Blue, Calcutta Black, Flesh, Green, Pewter Gray, Polar White, White

Length, width, thickness, and diameter tolerances vary by size, by manufacturer, brand, and grade. Custom sizes and colors available upon request.

<table>
<thead>
<tr>
<th>TYPICAL PROPERTIES OF KYDEX® THERMOPLASTIC SHEET</th>
<th>UNITS</th>
<th>ASTM TEST</th>
<th>KYDEX® 100</th>
<th>KYDEX® T</th>
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<tbody>
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<td>Tensile strength</td>
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<td>D638</td>
<td>6,100</td>
<td>6,100</td>
</tr>
<tr>
<td>Flexural modulus</td>
<td>psi</td>
<td>D790</td>
<td>335,000</td>
<td>360,000</td>
</tr>
<tr>
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<td>ft-lbs/in of notch</td>
<td>D256</td>
<td>18.0</td>
<td>15.0</td>
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<tr>
<td>Heat deflection temperature @ 264 psi</td>
<td>°F</td>
<td>D648</td>
<td>173</td>
<td>168</td>
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<tr>
<td>Maximum continuous service temperature in air</td>
<td>°F</td>
<td></td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Water absorption (immersion 24 hours)</td>
<td>%</td>
<td>D570</td>
<td>0.05-0.08</td>
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<tr>
<td>Coefficient of linear thermal expansion</td>
<td>in/in/°F×10⁻⁵</td>
<td>D696</td>
<td>4.2</td>
<td>3.8</td>
</tr>
</tbody>
</table>

Values may vary according to brand name. Please ask your Curbell Plastics representative for more specific information about an individual brand.
LDPE (and Modified LDPE)

Soft, flexible, lightweight plastic material that is easy to fabricate and form

LDPE (low density polyethylene) is a soft, flexible, lightweight plastic material. It is often used for orthotics and prosthetics. LDPE has good chemical and impact resistance and is easy to fabricate and form.

**LDPE Material Options**

**LDPE Sheet for O&P** – Low Density Polyethylene is more flexible than HDPE, polypro, or copoly PP, making it an excellent choice for pediatric AFOs, some splints, and flexible socket interfaces.

**Modified LDPE Sheet for O&P** – Modified polyethylene is slightly stiffer than LDPE, but more flexible than HDPE, polypro, or copoly PP. It is used for applications where flexibility and light support are required.

**LDPE Sheet for O&P is widely used for:**
- Spinal orthoses
- Upper extremity orthoses
- Flexible prosthetic liners
- AFOs

**Performance characteristics:**
- Soft, pliable & flexible
- Formable
- Easy to weld with heat
- Good chemical resistance
- Low moisture absorption

**Common brands:**
- Orthoform®

**Standard sizes:**
- Dimensions: 12 in x 12 in – 48 in x 96 in
- Thickness: 0.030 in – 0.500 in
- Colors: Natural, Black

Length, width, thickness, and diameter tolerances vary by size, by manufacturer, brand, and grade. Custom sizes and colors available upon request.

**TYPICAL PROPERTIES OF LDPE**

<table>
<thead>
<tr>
<th>Property</th>
<th>Units</th>
<th>ASTM Test</th>
<th>LDPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tensile strength</td>
<td>psi</td>
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<td>1,400</td>
</tr>
<tr>
<td>Flexural modulus</td>
<td>psi</td>
<td>D790</td>
<td>30,000</td>
</tr>
<tr>
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<td>ft-lbs/in of notch</td>
<td>D256</td>
<td>no break</td>
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<tr>
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<td>°F</td>
<td>D648</td>
<td>122</td>
</tr>
<tr>
<td>Maximum continuous service temperature in air</td>
<td>°F</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Water absorption (immersion 24 hours)</td>
<td>%</td>
<td>D570</td>
<td>0.10</td>
</tr>
<tr>
<td>Coefficient of linear thermal expansion</td>
<td>in/in/°F×10^{-5}</td>
<td>D696</td>
<td>-</td>
</tr>
</tbody>
</table>

Values may vary according to brand name. Please ask your Curbell Plastics representative for more specific information about an individual brand.
PETG

Transparent plastic sheet with good impact resistance and outstanding thermoforming characteristics

PETG has outstanding thermoforming characteristics for applications that require deep draws, complex die cuts and precise molded in details, without sacrificing structural integrity. It is used often in the O&P market for fabricating face masks, burn management devices, and check sockets. PETG is FDA compliant.

PETG Sheet for O&P – used where transparency is important for evaluation interfaces.

PETG Sheet for O&P is widely used for:
- Check sockets
- Sports masks
- Burn management orthoses

Performance characteristics:
- Outstanding deep draw thermoforming
- Formed by hand drape or with a frame
- Optically clear providing view of underlying tissues & pressure points
- Tough & rigid with a lower temp softening point
- Low water absorption

Common brands:
- VIVAK®

Standard sizes:
- Dimensions: 12 in x 12 in – 48 in x 96 in
- Thickness: 0.060 in – 0.787 in
- Colors: Clear

Length, width, thickness, and diameter tolerances vary by size, by manufacturer, brand, and grade. Custom sizes and colors available upon request.

TYPICAL PROPERTIES OF PETG

<table>
<thead>
<tr>
<th>Property</th>
<th>Units</th>
<th>ASTM Test</th>
<th>PETG</th>
</tr>
</thead>
<tbody>
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<td>7,700</td>
</tr>
<tr>
<td>Flexural modulus</td>
<td>psi</td>
<td>D790</td>
<td>310,000</td>
</tr>
<tr>
<td>Izod impact (notched)</td>
<td>ft-lbs/in of notch</td>
<td>D256</td>
<td>1.7</td>
</tr>
<tr>
<td>Heat deflection temperature @ 264 psi</td>
<td>°F</td>
<td>D648</td>
<td>157</td>
</tr>
<tr>
<td>Maximum continuous service temperature in air</td>
<td>°F</td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>Water absorption (immersion 24 hours)</td>
<td>%</td>
<td>D570</td>
<td>0.20</td>
</tr>
<tr>
<td>Coefficient of linear thermal expansion</td>
<td>in/in/°Fx10⁶</td>
<td>D696</td>
<td>3.8</td>
</tr>
</tbody>
</table>

Values may vary according to brand name. Please ask your Curbell Plastics representative for more specific information about an individual brand.
Polypropylene (Homopolymer & Copolymer)

Low cost, chemical resistant plastic with excellent aesthetic qualities

Polypropylene is a low cost, chemical resistant plastic with excellent aesthetic qualities. Polypropylene used in the manufacturing of upper and lower extremity orthoses and prosthetics offers the O&P fabricator a material that is easy to drape, blister form and seam. Polypropylene is easy to decorate with transfer patterns for O&P applications. FDA compliant polypropylene grades are available.

Polypropylene Material Options

Homopolymer Polypropylene (Polypro) – Homopolymer polypropylene is stronger and stiffer than copolymer. It is a very durable, rigid plastic available in natural (a translucent white) and a variety of colors. Easily formed, polypropylene is widely used for body jackets, upper and lower extremity orthoses (especially AFO’s), and rigid outer prosthetic sockets.

Copolymer Polypropylene (Copoly PP) – 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 polypropylene. Used in many of the same applications as homopolymer polypropylene, but where slightly more flexibility is needed.

Tech Tip for O&P Fabricators – Homopolymer recommended oven temperatures are 325°F to 350°F. Copolymer recommended oven temperatures are 300°F to 350°F.

Polypropylene (Copoly) is widely used for:
- Rigid, outer prosthetic sockets
- Lower extremity orthoses requiring flexibility
- Upper extremity orthoses
- Helmets, body jackets, spinal braces

Performance characteristics:
- Good formability
- Easy to fabricate, seam, drape, and blister form
- Low moisture absorption
- Good chemical resistance
- Extremely tough (copoly), rigid yet flexible

Polypropylene (Homopolymer) is widely used for:
- Body jackets
- Upper & lower extremity orthoses
- AFOs
- Rigid, outer prosthetic sockets

Performance characteristics:
- Rigid
- Excellent formability
- Stress & crack resistance
- Excellent durability

Common brands:
- Orthoform®
- SIMOLIFE

Standard sizes:
- Dimensions: 12 in x 12 in – 49 in x 96 in
- Thickness: 0.030 in – 0.750 in
- Colors: Natural, Black, Brown, Flesh, Blue, Pink, Purple, Red, Silver, Lime Green, Neon Pink, Royal Blue

Length, width, thickness, and diameter tolerances vary by size, by manufacturer, brand, and grade. Custom sizes and colors available upon request.

TYPICAL PROPERTIES OF POLYPROPYLENE

<table>
<thead>
<tr>
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<th>Copolymer</th>
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<td>215,000</td>
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<td>D648</td>
<td>210</td>
<td>190</td>
</tr>
<tr>
<td>Maximum continuous service temperature in air</td>
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<td>-</td>
<td>-</td>
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<tr>
<td>Water absorption (immersion 24 hours)</td>
<td>%</td>
<td>D570</td>
<td>slight</td>
<td>slight</td>
</tr>
<tr>
<td>Coefficient of linear thermal expansion</td>
<td>in/in/°F x 10^{-5}</td>
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<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Values may vary according to brand name. Please ask your Curbell Plastics representative for more specific information about an individual brand.
Surlyn®

Soft, clear polymer is tough and durable with excellent thermoforming and impact characteristics

For Prosthetics – Surlyn® can be used as an evaluation interface or definitive transfemoral flexible interface (check socket).

For Orthotics – Surlyn® can be used for spinal upper limb orthoses, burn masks and helmets.

Surlyn® can be challenging to edge finish due to the low melting temperature of the material.

Surlyn® is widely used for:
- Cranial helmets
- Face masks for sports and burns
- Upper limb orthoses
- Upper and lower extremity orthotics
- Scoliosis braces and body jackets
- Flexible prosthetic sockets
- Check sockets

Performance characteristics:
- Excellent drape forming and blister forming characteristics
- Good Impact resistance
- Good seaming characteristics
- Good clarity
- Good fatigue resistance
- Outstanding thermoforming characteristics

Standard sizes:
- Dimensions: 12 in x 12 in – 48 in x 96 in
- Thickness: 0.125 in – 0.500 in
- Colors: Clear

Length, width, thickness, and diameter tolerances vary by size, by manufacturer, brand, and grade. Custom sizes and colors available upon request.

<table>
<thead>
<tr>
<th>TYPICAL PROPERTIES OF SURLYN®</th>
<th>UNITS</th>
<th>TEST METHOD</th>
<th>SURLYN®</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specific gravity</td>
<td></td>
<td>ASTM D792</td>
<td>0.94 - 0.97</td>
</tr>
<tr>
<td>Hardness</td>
<td></td>
<td>Shore D, ASTM D2240</td>
<td>39 - 68</td>
</tr>
<tr>
<td>Flex modulus</td>
<td>room temp, kpsi</td>
<td>ASTM D790</td>
<td>4.3 - 75</td>
</tr>
<tr>
<td>Tensile strength</td>
<td>kpsi</td>
<td>ASTM D638</td>
<td>2.1 - 5.4</td>
</tr>
<tr>
<td>Elongation at break</td>
<td>%</td>
<td>ASTM D638</td>
<td>285 - 660</td>
</tr>
<tr>
<td>Melting point</td>
<td>°C / °F</td>
<td>DSC*</td>
<td>70°C - 100°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>158°F - 212°F</td>
</tr>
<tr>
<td>Freeze point</td>
<td>°C</td>
<td>DSC*</td>
<td>37 - 69</td>
</tr>
<tr>
<td>Optical haze</td>
<td>0.25 in (6.4 mm)</td>
<td>ASTM D1003A</td>
<td>4 - 27</td>
</tr>
</tbody>
</table>

* As determined by differential scanning calorimetry

Values may vary according to brand name. Please ask your Curbell Plastics representative for more specific information about an individual brand.
TPE (thermoplastic elastomer) is a fatigue resistant sheet which is a combination of rubber and polypropylene. Because of its rubber content, TPE is more heat resistant requiring heating to a higher temperature than polypropylene for thermoforming. After forming, uniform cooling is required to minimize warpage and distortion. TPE provides more flexibility than polypropylene or co-polymer, but more rigidity than LDPE.

TPE is used for AFOs, spinal orthoses, scoliosis jackets, and body jackets.

**Tech Tip** – TPE is hygroscopic, meaning it will absorb moisture from the air, and marred surfaces on formed parts may occur unless stored properly. TPE should be stored in a cool, dry area in a polyethylene bag or with polyethylene masking intact. Material that has been subjected to high humidity or left in storage for an extended period of time should be pre-dried. Pre-drying is accomplished by heating the sheet in an oven for 3 to 4 hours at 150°F. Marring (pits) on the surface of formed parts is a clear indication that the material needs to be pre-dried. (Hint: Some of our customers store their TPE on top of their oven so that the heat from the oven keeps it pre-dried and ready for use.)

### TYPICAL PROPERTIES OF TPE

<table>
<thead>
<tr>
<th>PHYSICAL</th>
<th>TEST METHOD</th>
<th>TYPICAL VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specific gravity</td>
<td>ASTM D792</td>
<td>0.950</td>
</tr>
<tr>
<td>Shore hardness</td>
<td>ISO 868</td>
<td>51</td>
</tr>
<tr>
<td>Shore D, 15 sec, 73°F (23°C), 0.0787 in (2.00mm)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tensile strength at yield - across Flow (73°F (23°C))</td>
<td>ASTM D638</td>
<td>1740 psi</td>
</tr>
<tr>
<td>Elongation at yield - across Flow (73°F (23°C))</td>
<td>ASTM D638</td>
<td>31%</td>
</tr>
<tr>
<td>Brittleness temperature</td>
<td>ASTM D746</td>
<td>-18°F</td>
</tr>
</tbody>
</table>

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