

Duroplast	Technopolymer	Elastomer
<p>This group includes plastics that solidify by chemical reaction. They closely crosslink into spatial lattice patterns of macromolecules, which gives duroplast materials a high mechanical strength and surface hardness. However, their elasticity is rather low.</p> <p>The curing process is irreversible. Unlike technopolymer plastics, duroplasts cannot be melted because they are rigid up to the degradation temperature. Phenolic resins are among the most commonly used duroplast materials.</p> <p>In general, the molecular crosslinking of duroplasts results in good resistance to chemical influences.</p> <p>The coloring options of components made of duroplast are limited.</p>	<p>When the temperature is increased and once the softening point has been exceeded, technopolymer plastics melt, can be thermoformed and solidify again after cooling.</p> <p>This process can be repeated any number of times. Unlike with duroplasts, there is no chemical reaction during processing.</p> <p>Technopolymer materials can be divided into amorphous and semi-crystalline plastics. The disordered microstructure of amorphous materials allows the production of transparent components by injection moulding right through to crystal-clear components. Semi-crystalline technopolymer has a microstructure resulting in enhanced mechanical properties and operating temperatures.</p> <p>The wide variety of different technopolymer plastics and their modification options allow the production of “tailor-made” construction materials with respect to mechanical properties, chemical resistance, temperature resistance and different colors.</p>	<p>A feature of elastomers is that they can be deformed even under low tensile or compressive stress. When the force decreases or no longer exists, the parts automatically return to their original, undeformed shape. Thus, they demonstrate the typical behavior of rubber.</p> <p>In chemical terms, elastomers are macromolecules that are irreversibly interconnected by only a few chemical crosslinking bridges.</p> <p>With thermoplastic elastomers, these crosslinking bridges soften under the influence of heat, thus demonstrating a thermoplastic behavior.</p> <p>By way of modification, elastomers can be produced in varying degrees of hardness. They can be dyed easily by adding color pigments.</p>

**Information**

The details given are general guide values only or apply to typical representatives of the respective material group without claiming to be complete. The material characteristics may vary widely through additives, modifications and environmental influences.

The details are unsuitable as the sole basis for designs. The data may not be used in place of tests to determine the suitability of a material for a specific purpose.

No warranty or liability is assumed for the specifications and details given.



	Duroplast	Technopolymer			
Code	PF 31	PA 6	PA 6 GF30	PA-HP	PA-T
<b>Description</b>	Phenolic resin	Polyamide	Polyamide with 30% glass fiber	High performance polyamide	Transparent polyamide
<b>Yield stress</b> in MPa	-	80 / 50	- / -	- / -	90
<b>Tensile strength</b> in MPa	60	- / -	180 / 110	240 / 165	-
<b>Tensile e-modulus</b> in MPa	9000	3000 / 1500	9000 / 6500	21000 / 15500	2800
<b>Ball impression hardness</b> in MPa	250	150 / 70	220 / 150	- / -	140
<b>Temperature resistance:</b> • Max. short-term • Max. long-term • Min. application temperature	+356 °F (+180 °C) +284 °F (+140 °C) -4 °F (-20 °C)	+356 °F (+180 °C) +176 °F (+80 °C) -40 °F (-40 °C)	+392 °F (+200 °C) +248 °F (+120 °C) -40 °F (-40 °C)	+419 °F (+215 °C) +302 °F (+150 °C) -40 °F (-40 °C)	+356 °F (+180 °C) +194 °F (+90 °C) -130 °F (-30 °C)
<b>Resistance to:*</b> • Oils, greases • Solvents: Tri Per • Acids: Weak Strong • Alkalines: Weak Strong • Petrol • Alcohol • Hot water • UV light / weather exposure	+ o o + - + - + + o -	+ + + o - + o + o o	+ + + o - + + o o o	+ + + o - + o o o o	+ + + - + + - - o
<b>Fire behaviour (UL 94)</b>	V-0	HB	HB	HB	V-2
<b>General information</b>	<p>This duroplast material on phenolic resin basis with organic filler has the following properties:</p> <p>High stiffness and hardness, low tendency to creep, high heat forming resistance, low thermal linear expansion, high surface slip resilience, low flammability.</p> <p>Phenolic resins are only available in dark color shades. They are not suitable for use with food.</p> <p>Typical applications include thermally insulating operating elements.</p>	<p>The material group "Polyamide 6" (semi-crystalline) offers universal materials for mechanical function components in mechanical engineering.</p> <p>Polyamides are:</p> <ul style="list-style-type: none"> <li>- cold-temperature resistant</li> <li>- impact stress resilient and impact resistant</li> <li>- abrasion resistant</li> </ul> <p>Reinforced polyamides, such as PA 6 GF30 or PA-HP, combine high stiffness and rigidity with extreme impact strength, properties which make them highly robust under mechanical stress.</p> <p>Polyamide PA-T (amorphous) is translucent with a slightly yellow transparency, typically used for fluid sight glass.</p>			

\*+ resistant, o conditionally resistant, - non-resistant

Code	Technopolymer			
	PE-HD	PE-LD	POM-C	POM-H
<b>Description</b>	Polyethylene High density	Polyethylene Low density	Polyacetal (Copolymer)	Polyacetal (Homopolymer)
<b>Yield stress</b> in MPa	30	10	65	72
<b>Tensile strength</b> in MPa	25-30	8-10	-	70
<b>Tensile e-modulus</b> in MPa	1450	200	2700	3100
<b>Ball impression hardness</b> in MPa	57 (Standard H132/30)	15 (Standard H49/30)	145	174
<b>Temperature resistance:</b> • Max. short-term • Max. long-term • Min. application temperature	+212 °F (+100 °C) +194 °F (+90 °C) -112 °F (-80 °C)	+212 °F (+100 °C) +158 °F (+70 °C) -112 °F (-80 °C)	+284 °F (+140 °C) +194 °F (+90 °C) -58 °F (-50 °C)	284 °F (+140 °C) +176 °F (+80 °C) -58 °F (-50 °C)
<b>Resistance to:*</b> • Oils, greases • Solvents: Tri Per • Acids: Weak Strong • Alkalines: Weak Strong • Petrol • Alcohol • Hot water • UV light / weather exposure	+ + + + + + + + + o	+ - - + - + + + + o o	+ - + + - + + + + + o	+ - + + - + + + + + o
<b>Fire behaviour (UL 94)</b>	HB	HB	HB	HB
<b>General information</b>	<p>Polyethylene is a very versatile technopolymer plastic. It is colorless in its basic form.</p> <p>Polyethylene is physiologically safe, practically odorless, and tasteless. These properties make it ideal for the food and packaging industry.</p> <p>Polyethylene is shock-proof and impact-resistant, has good sliding properties and absorbs virtually no moisture.</p>		<p>Polyacetals (semi-crystalline) are universal materials used in function components for precision engineering and in apparatus construction.</p> <p>They feature excellent properties:</p> <ul style="list-style-type: none"> <li>- Low friction resistance</li> <li>- Good abrasion resistance</li> <li>- Good resilience</li> <li>- Good fatigue resistance</li> <li>- Good chemical resistance</li> </ul> <p>Typical applications include snap-fit elements (form-locking connections).</p>	

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Code	Technopolymer			
	PC	PP GF20	PSU	PTFE
<b>Description</b>	Polycarbonate	Polypropylene with 20% glass fiber	Polysulfone	Polytetrafluorethylene
<b>Yield stress</b> in MPa	63	33	70	4
<b>Tensile strength</b> in MPa	-	-	70	20
<b>Tensile e-modulus</b> in MPa	2400	2900	2400	600
<b>Ball impression hardness</b> in MPa	110	80	147 (H358/30)	26
<b>Temperature resistance:</b> • Max. short-term • Max. long-term • Min. application temperature	+284 °F (+140 °C) +257 °F (+125 °C) -148 °F (-100 °C)	+284 °F (+140 °C) +212 °F (+100 °C) +32 °F (0 °C)	+356 °F (+180 °C) +320 °F (+160 °C) -148 °F (-100 °C)	+572 °F (+300 °C) +500 °F (+260 °C) -328 °F (-200 °C)
<b>Resistance to:*</b> • Oils, greases • Solvents: Tri Per • Acids: Weak Strong • Alkalines: Weak Strong • Petrol • Alcohol • Hot water • UV light / weather exposure	o - - + - - - - o - o	+ o o + + + + + + +	+ o o o o + + + + +	+ + + + + + + +
<b>Fire behaviour (UL 94)</b>	V-2	-	V-0	V-0
<b>General information</b>	<p>Polycarbonates (amorphous) are translucent plastic materials with the following properties:</p> <p>High strength, in particular high impact resistance, good optical properties, self-extinguishing.</p> <p>But: Sensitive to chemicals and stress cracking, not suitable for high dynamic stress loads, notch sensitive at edges and corners.</p>	<p>Propylenes (semi-crystalline) are universal standard plastic materials with balanced property levels:</p> <p>Average strength, stiffness, impact resistance, low density, excellent chemical resistance but very bad cold-temperature properties.</p> <p>Additionally embedded glass fiber, e.g. PP GF20, enhances stiffness and strength.</p> <p>Typical applications for propylenes are armatures.</p>	<p>The primary feature of polysulfone is its very high heat resistance and good resistance to chemicals.</p> <p>Typical application areas are electrical engineering, electronics, mechanical engineering, and medical technology where high heat resistance is needed, while also allowing transparency.</p>	<p>Polytetrafluorethylene is characterized in particular by a very low friction coefficient and high chemical and thermal resistance.</p> <p>PTFE is a preferred material for friction bearings, guides, seals, anti-stick coatings and insulators.</p>

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	Elastomer		
Code	NR	CR	FPM, FKM
Trade name		Neoprene®	Viton®
Chemical description	Natural rubber	Chloroprene rubber	Fluorine rubber Fluorine caoutchouc
Hardness (shore A)	30-90	30-90	65-90
Temperature resistance • Short-term • Long-term	-76° to +266 °F (-60° to +130 °C) -40° to +176 °F (-40° to + 80 °C)	-22° to +302 °F (-30° to +150 °C) -13° to +212 °F (-25° to +100 °C)	-22° to +536 °F (-30° to +280 °C) -4° to +446 °F (-20° to +230 °C)
Tensile strength in N/mm <sup>2</sup>	-	25	20
Wear resistance / Abrasion resistance	Good	Good	Good
Resistance to: <sup>*</sup> • Oils, greases • Solvents • Acids • Alkalines • Petrol • UV light / weather exposure	- o o o - -	+ o + + - +	+ + + + + +
General information	NR is a material with very good physical properties and excellent mechanical strength. It is used e.g. for spring elements.	CR is one of the most frequently used synthetic rubbers with a wide range of applications for parts which require exceptional resistance to aging.	FPM is unmatched for applications with contact to fuels, oils, solvents, as well as many acids and alkalines.  Due to its high price its use is restricted to extremely stressed, high-quality rubber parts.  Viton® is a registered trademark of DuPont Performance Elastomers.

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### Information on hardness data for elastomers

Hardness data of vulcanized or thermoplastic elastomers are stated in shore. This value is determined by measuring the indentation depth of a spring-loaded indenter into the material. A low indentation depth is a high shore value, a high indentation depth a low shore value.

Different indenter shapes are used depending on the materials being examined. The elastomer materials used in JW Winco products are measured according to “shore A” with a blunt indenter with a tip angle of 35°.



Code	Elastomer		
	NBR	H-NBR	EPDM
<b>Trade name</b>	Perbunan®	-	-
<b>Chemical description</b>	Acrylonitrile butadiene rubber	Hydrogenated acrylonitrile butadiene rubber	Ethylene propylene diene rubber
<b>Hardness (shore A)</b>	25-95	85	70-85
<b>Temperature resistance</b> • Short-term • Long-term	-40° to +302 °F (-40° to +150 °C) -22° to +248 °F (-30° to +120 °C)	- -13° to +302 °F (-25° to +150 °C)	-40° to +302 °F (-40° to +150 °C) -40° to +248 °F (-40° to +120 °C)
<b>Tensile strength</b> in N/mm <sup>2</sup>	25	11	14
<b>Wear resistance / Abrasion resistance</b>	Good	Good	Very good
<b>Resistance to:*</b> • Oils, greases • Solvents • Acids • Alkalines • Petrol • UV light / weather exposure	+ o o + + -	+ + o + + +	- o + + - +
<b>General information</b>	NBR is a synthetic special rubber for rubber parts with high requirements for resistance to swelling when in contact with oils and fuels.  Standard material for o-rings.	H-NBR is obtained through full or partial hydrogenation of NBR. This significantly improves the resistance to heat, ozone and aging.  The resulting materials are characterized by high mechanical strength and high abrasion resistance. Media resistance is comparable to NBR.	EPDM is a synthetic all-purpose rubber characterized by its high steam and hot water resistance.  Also worth mentioning are its outstanding resistance to aging, weathering and environmental influences as well as acids and alkalines.  The material is used in seals and tubes.

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	Elastomer		
Code	MVQ, VMQ	PUR	TPE
<b>Trade name</b>	Elastosil®	Bayflex®	Santoprene®
<b>Chemical description</b>	Silicone rubber	Polyurethane	Thermoplastic elastomer
<b>Hardness (shore A)</b>	3-90	65-90	55-87
<b>Temperature resistance</b> • Short-term • Long-term	-58° to +482 °F (-50° to +250 °C) -22° to +392 °F (-30° to +200 °C)	-40° to +266 °F (- 40° to +130 °C) -13° to +212 °F (-25° to +100 °C)	-40° to +302 °F (-40° to +150 °C) -22° to +257 °F (-30° to +125 °C)
<b>Tensile strength</b> in N/mm <sup>2</sup>	12	20	8.5
<b>Wear resistance / Abrasion resistance</b>	Good	Excellent	Good
<b>Resistance to:*</b> • Oils, greases • Solvents • Acids • Alkalines • Petrol • UV light / weather exposure	o o - - o +	+ o - - + +	+ + + + + +
<b>General information</b>	<p>MVQ offers very good mechanical properties over a very wide temperature range with satisfactory oil resistance.</p> <p>In comparison with other elastomers, MVQ has exceptionally high purity and is therefore used in particular in food and pharmaceutical applications.</p>	<p>PUR is known for exceptionally good mechanical characteristics.</p> <p>In addition, the extreme resistance to tearing and to wear should also be mentioned.</p>	<p>TPE is a thermoplastic elastomer, the performance characteristics of which are comparable to those of many customary vulcanized special rubbers.</p> <p>TPE is a multi-purpose material with outstanding dynamic fatigue strength.</p>

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	<b>Elastomer</b>
<b>Code</b>	<b>TPU</b>
<b>Trade name</b>	Desmopan® / Elastollan®
<b>Chemical description</b>	Thermoplastic polyurethane
<b>Hardness (shore A)</b>	55-85
<b>Temperature resistance</b> • Short-term • Long-term	-58° to +248 °F (-50° to +120 °C) -22° to +194 °F (-30° to + 90 °C)
<b>Tensile strength</b> in N/mm <sup>2</sup>	50
<b>Wear resistance / Abrasion resistance</b>	Very good
<b>Resistance to:*</b> • Oils, greases • Solvents • Acids • Alkalines • Petrol • UV light / weather exposure	+ - - o o +
<b>General information</b>	<p>TPU has generally good physical properties, making it ideal for demanding applications in virtually any industrial area.</p> <p>In addition to the very high wear and abrasion resistance, the excellent tear growth resistance and cold flexibility of the material at low temperatures should also be mentioned.</p> <p>TPU can be produced for a large hardness range and from an ergonomic point of view it can also be used advantageously due to its good surface feel (Softline).</p>

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