Material Characteristics Chart - of Duroplast and Technopolymer Plastics

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The plastic materials used for Winco/Elesa products can be classed in three main groups:

Duroplast
This group includes plastic materials which solidify by chemical reactions. They closely crosslink into spatial lattice patterns of macromolecules which gives Duroplast material high mechanical strength and surface hardness. Their elasticity is low, however.
The curing process is irreversible. Unlike Technopolymer, Duroplast cannot be melted because it is rigid up to degradation temperature. Phenolic resins are among the most commonly used Duroplast materials.
In general, the molecular crosslinking of Duroplast creates good chemical stability.
The coloring and dyeing options of components made of Duroplast are limited.

Technopolymer
With increasing temperature and once the softening point is exceeded, this group of technopolymer melts, can be heat distorted and solidifies again after cooling. This process can be repeated any number of times. Unlike Duroplast, there is no chemical reaction during processing.
Technopolymer materials can be subdivided into amorphous and partially crystalline plastics. The disordered structure of amorphous materials allows the production of transparent components by injection molding right through to crystal-clear parts. Partially crystalline thermoplastics have a structure resulting in enhanced mechanical properties and temperatures of use.
The wide variety of different technopolymers and the options of modifications allow the production of “tailor-made” construction tools with respect to mechanical properties, chemical resistance, temperature resistance and different colors.

Elastomers/Thermoplastic Elastomers
The group of elastomers includes materials which can be stretched and bent without exerting great force. Once the deforming force relaxes or no longer acts at all, the parts take their original shape.
In chemical terms, these are macromolecules which are interconnected by only a few chemical crosslinking bridges.
By way of modification, elastomers can be made in varying degrees of hardness. They can be dyed easily by adding color pigments.

Note
The above details are general values without claiming to be complete. Material properties may vary widely through additives, modifications and environmental influence factors.
The details are unsuitable as the sole basis for product manufacturing. The data may not be used in place of tests to determine the suitability of a material for a specific purpose.
Reference is made at this point to the mechanical strength values of various plastic products which have been determined by tests.
No warranty or liability will be accepted for the above specifications and details.
The essential plastic materials used for Winco/Elesa products are listed in the tables below.

	Duroplast	**Technopolymer**		
Symbol	**PF31**	**PA6**	**PA 6 GF30**	**PA 6-T**
Description	Phenolic resin	Polyamide	Polyamide with 30% glass fiber	Polyamide transparent
Specimen condition	--	Dry / air humid	Dry / air humid	--
Yield stress	--	80 / 50	-- / --	90
Tensile strength [M Pa]*	60	-- / --	180 / 110	--
Tension-E-module [M Pa]*	9000	3000 / 1500	9000 / 6500	2800
Ball indentation hardness [M Pa]*	250	150 / 70	220 / 150	140
Temperature resistance:				
Max. short-term	180°C	180°C	200°C	130°C
Max. longer-term	140°C	90°C	120°C	90°C
Min. temperature in use	--	-40°C	-40°C	-70°C
Resistance to:	+ = resistant o = conditionally resistant - = non-resistant			
Oil, grease	+	+	+	+
Solvents (Tri / Per)	o / o	+ / +	+ / +	+ / +
Acids (Strong / Weak)	+ / -	o / -	o / -	- / -
Alkalines (Strong / Weak)	+ / -	+ / o	o / -	+ / +

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	Duroplast	Technopolymer		
Gasoline	+	+	+	+
Alcohol	+	+	+	+
Hot water	o	o	o	-
UV light/weather exposure	-	o	o	o
Fire behavior (UL 94)	V-0	HB	HB	V-2
General	This Duroplast material on phenolic resin basis with organic filler has the following properties: high stiffness and hardness, low tendency to creep, high heat forming resistance, low thermal linear expansion, high surface slip resilience, low flammability. Phenolic resins are available only in dark colored shades. They are not suitable for use with food. Typical applications include thermally insulating operating elements.	The material group including polyamide 6 (partially crystalline) offers all-round materials for mechanical function components in mechanical engineering. Polyamides are: Cold temperature resistant, impact stress resilient and impact resistant, abrasion resistant. Reinforced polyamides such as PA 6 GF30 combine high stiffness and rigidity with extreme impact strength, properties which make them highly robust under mechanical stress. Polyamide 6-T (amorphous) is translucent with a slightly yellow transparency parent. Typically used for oil-level sight glasses.		

*Mpa = Megapascal

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	Technopolymer			
Symbol	**PP GF20**	**PC**	**POM-C**	**POM-H**
Description	Polypropylene with 20% glass fiber	Polycarbonate	Polycacetal (copolymer)	Polycacetal (homopolymer)
Yield stress	33	63	65	72
Tensile strength [M Pa]*	--	--	--	70
Tension-E-module [M Pa]*	2900	2400	145	174
Ball indentation hardness [M Pa]*	80	110	220 / 150	140
Temperature resistance:				
Max. short-term	140°C	140°C	140°C	140°C
Max. longer-term	100°C	125°C	90°C	80°C
Min. temperature in use	0°C	-100°C	-50°C	-50°C
Resistance to:	+ = resistant o = conditionally resistant - = non-resistant			
Oil, grease	+	o	+	+
Solvents (Tri / Per)	o / o	- / -	- / +	- / +
Acids (Strong / Weak)	+ / +	+ / -	+ / -	+ / -
Alkalines (Strong / Weak)	+ / +	- / -	+ / +	+ / +
Gasoline	+	-	+	+
Alcohol	+	o	+	+
Hot water	+	-	+	o
UV light/weather exposure	o	o	o	o
Fire behavior (UL 94)	--	V-2	HB	HB
General	Polypropylenes (partially crystalline) are universal standard plastic materials with balanced property levels: Average strength, stiffness, impact resistance, low density, excellent chemical resistance but very bad cold temperature properties. Embedded glass fiber (e.g. PP GF20, enhances stiffness and strength. Typical applications for polypropylene are fittings and armatures.	Polycarbonates (amorphous) are translucent plastic materials with following properties: High strength, in particular high impact resistance, good optical properties self-extinguishing. But: sensitive to chemicals and stress cracking not suitable for high dynamic stress loads notch sensitive at edges and corners.	Polycacetals (partially crystalline) are universal materials used in function components for precision engineering and in apparatus construction. They feature excellent properties: low friction resistance good abrasion resistance good resilience good fatigue resistance good chemical resistance Typical applications include snap-fit elements (formlocking connecting elements).	

*Mpa = Megapascal

	Technopolymer			
Symbol	**PMMA**			
Description	Polymethyl-methacrylate			
Yield stress	--			
Tensile strength [M Pa]*	75			
Tension-E-module [M Pa]*	3000			
Ball indentation hardness [M Pa]*	195			
Temperature resistance:				
Max. short-term	100°C			
Max. longer-term	80°C			
Min. temperature in use	--			
Resistance to:	+ = resistant o = conditionally resistant - = non-resistant			
Oil, grease	+			
Solvents (Tri / Per)	-			
Acids (Strong / Weak)	+ / -			
Alkalines (Strong / Weak)	+ / -			
Gasoline	+			
Alcohol	o			
Hot water	+			
UV light/weather exposure	+			
Fire behavior (UL 94)	HB			
General	Polymethyl-methacrylates are crystal-clear plastic materials with the following properties: hard, stiff, scratch-proof weather resistant But brittle. Typical applications include dials, scales, lamp glass, optical glasses.			

*Mpa = Megapascal

The characteristics described should be treated as guidelines only. No guarantee is made. The exact conditions of use have to be taken into account individually.