Material characteristics of Duroplast and Technopolymer

The plastic materials used for GANTER / ELESA products can be classed in three main groups:

Duroplast	Technopolymer	Elastomers Thermoplastic Elastomers
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 colouring options of components made of Duroplast are limited.	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 moulding right through to crystal-clear parts. Partially crystalline Technopolymer have a structure resulting in enhanced mechanical properties and temperatures of use. The wide variety of different Technopolymer and their options of modifications allow the production of “tailor-made” construction materials with respect to mechanical properties, chemical resistance, temperature resistance and different colours.	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 colour pigments.

Information

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 constructions. 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. → *Page 1138 ff.*

No warranty or liability will be accepted fort the above specifications and details.

The essential plastic materials used for GANTER / ELESA products are listed in the tables below.

Material characteristics of Duroplast and Technopolymer

	Duroplast	Technopolymer		
Symbol	PF 31	PA 6	PA 6 GF30	PA-T
Description	Phenolic resin	Polyamide	Polyamide with 30 % glass fibre	Polyamide transparent
Specimen condition	–	dry / air humid	dry / air humid	–
Yield stress	–	80 / 50	– / –	90
Tensile strength in MPa*	60	– / –	180 / 110	–
Tension-E-Module in MPa*	9000	3000 / 1500	9000 / 6500	2800
Ball indentation hardness in MPa*	250	150 / 70	220 / 150	140
Temperature resistance:				
• max. short-term	180 °C	180 °C	200 °C	180 °C
• max. long-term	140 °C	90 °C	120 °C	90 °C
• min. application temperature	–20 °C	–40 °C	–40 °C	–30 °C
Resistance to:				
• Oil, greases	+	+	+	+
• Solvents (Tri / Per)	o	+ / +	+ / +	+ / +
• Acids (weak/strong)	+ / –	o / –	o / –	– / –
• Alkalines (weak/strong)	+ / –	+ / o	o / –	+ / +
• Petrol	+	+	+	+
• Alcohol	+	+	+	–
• Hot water	o	o	o	–
• UV light / weather exposure	–	o	o	o
Fire behaviour (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 colour shades. They are not suitable for use with food. Typical applications include thermally insulating operating elements.	The material group polyamide 6 (partially crystalline) offers universal 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 PA-T (amorphous) is translucent with a slightly yellow transparency. Typically used for oil level sight glass.		

*MPa = Megapascal, + resistant, o conditionally resistant, – non-resistant

Material characteristics of Duroplast and Technopolymer

	Technopolymer			
Symbol	PP GF20	PC	POM-C	POM-H
Description	Polypropylene with 20 % glass fibre	Polycarbonate	Polyacetal (Copolymer)	Polyacetal (Homopolymer)
Specimen condition	–	–	–	–
Yield stress	33	63	65	72
Tensile strength in MPa*	–	–	–	70
Tension-E-Module in MPa*	2900	2400	2700	3100
Ball indentation hardness in MPa*	80	110	145	174
Temperature resistance:				
• max. short-term	140 °C	140 °C	140 °C	140 °C
• max. long-term	100 °C	125 °C	90 °C	80 °C
• min. application temperature	0 °C	–100 °C	–50 °C	–50 °C
Resistance to:				
• Oil, greases	+	o	+	+
• Solvents (Tri/Per)	o/o	–/–	–/+	–/+
• Acids (weak/strong)	+/+	+/–	+/–	+/–
• Alkalines (weak/strong)	+/+	–/–	+/+	+/+
• Petrol	+	–	+	+
• Alcohol	+	o	+	+
• Hot water	+	–	+	o
• UV light / weather exposure	o	o	o	o
Fire behaviour (UL 94)	–	V-2	HB	HB
General	Propylenes (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 fibre, e.g. PP GF20, enhances stiffness and strength. Typical applications for propylenes are 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.	Polyacetals (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 (form-locking connecting elements).	

*MPa = Megapascal, + resistant, o conditionally resistant, – non-resistant