

What is PMMA-GS EN

PMMA-GS (acrylic glass, cast)

PMMA-GS (cast polymethyl methacrylate / acrylic glass) – amorphous, crystal-clear thermoplastic, weather-resistant and premium-machinable

PMMA-GS is cast polymethyl methacrylate – the well-known crystal-clear plastic (acrylic glass, known among others as Plexiglas® GS). "GS" stands for the cast production method (as opposed to extruded XT). Thanks to its higher molecular weight, GS offers a higher heat deflection temperature as well as better chemical and stress-crack resistance than XT, and is particularly suited to thick, machined and high-optical components – at the same transparency of about 92 % and only about half the weight of glass.

Classification and basic character

PMMA belongs to the amorphous thermoplastics and therefore has no defined melting point, but softens above the glass transition temperature (around 110 °C). The cast variant GS is polymerised between glass plates in a cell-casting process. The resulting high molecular weight gives GS a higher heat deflection temperature, better chemical and stress-crack resistance and excellent suitability for polishing and machining – even in large thicknesses. PMMA is stiff, hard and crystal-clear, yet brittle and notch-sensitive.

Optics, weathering resistance and surface

The outstanding feature of PMMA is its optics: with a light transmission of about 92 % it is more transparent than glass and barely yellows even after years of weathering. The surface is high-gloss and considerably more scratch-resistant than that of polycarbonate. Added to this is excellent weathering and UV resistance. Cast PMMA-GS polishes to a particularly high gloss and is therefore the first choice for high-optical viewing and display parts.

How PMMA-GS is made and processed

PMMA-GS is produced by casting (polymerisation) of methyl methacrylate between glass plates into sheets, blocks, rods and tubes. From these semi-finished products we machine precision parts – milling, turning, drilling and sawing produce clean, low-chipping results thanks to the high molecular weight, even in thick-walled parts. GS polishes, bonds and thermoforms excellently. Because of its brittleness we use sharp tools; we avoid aggressive, solvent-based cutting fluids to prevent stress cracking. For laser cutting thin blanks, the extruded variant XT is usually the more economical choice.

Mechanical, thermal and chemical properties

PMMA-GS reaches a tensile strength of about 80 MPa with a tensile modulus around 3,300 MPa and a density of about 1.19 g/cm³ – it is stiff and hard, but brittle (elongation at break about 5.5 %, notched impact strength about 1.6 kJ/m²). The service temperature ranges from about -40 °C up to a continuous +80 °C, short-term to around 100 °C; the Vicat softening temperature is about 115 °C – higher than XT. PMMA is resistant to dilute acids and alkalis, water and fats, but is attacked by many solvents, alcohols and esters; GS is somewhat more resistant to stress cracking than XT.

When PMMA-GS is the right choice

PMMA-GS is worthwhile whenever transparency and weathering resistance must be combined with demanding machining, higher temperature or chemical resistance – for example:

- Thick-walled, machined and polished viewing and display parts
- High-optical components, light guides and displays
- Model, pattern and mould making
- Thermoformed hoods, covers and glazing
- Applications with slightly higher temperature or chemical loads than XT

When PMMA-GS is NOT the right choice

Equally important are the limits of the material:

- Impact- and shatter-resistant applications – PMMA is brittle; use polycarbonate (PC) for high impact strength
- Contact with solvents, alcohols or aggressive cleaners (risk of stress cracking)
- Continuous service above about 80 °C – then use more temperature-resistant materials
- Components with fire-safety requirements – PMMA is only normally flammable (B2 / UL 94 HB)
- Thin blanks with tightest thickness tolerance or laser cutting – then extruded PMMA (XT)

What does PMMA-GS cost?

PMMA-GS is a premium grade and usually more expensive than extruded PMMA (XT), but still below high-performance engineering plastics. As a rough guide, semi-finished stock prices are in the range of about 6–15 €/kg. The component price is determined mainly by the semi-finished shape and dimension, material utilisation (offcut), machining effort and lot size. We are happy to quote binding prices on request based on your drawing.

Note: for thick, machined or high-optical parts GS is usually the better choice; for thin, laser-cut blanks the cheaper XT.

Processing at Liedtke

PMMA-GS machines excellently – milling, turning, drilling and sawing produce clean, dimensionally accurate results, even on thick-walled parts. We also offer polishing (high gloss), bonding and thermoforming. Because of its brittleness and stress-cracking sensitivity, we use sharp tools and adapted cutting parameters and avoid aggressive coolants. This is how we reliably produce transparent precision and visual parts – from single pieces to series production.

Advantages and disadvantages at a glance

An honest assessment – and how the disadvantages can be mitigated in practice:

Advantages

- Crystal-clear with about 92 % light transmission, non-yellowing
- Very good weathering and UV resistance
- Higher heat deflection and chemical resistance than XT
- Excellent machinability and high-gloss polishing (also thick parts)
- Hard, high-gloss surface; suitable for food contact

Disadvantages

- Brittle and notch-sensitive – low impact strength (not shatter-proof)
- Sensitive to solvents, alcohols and esters (stress cracking)
- Continuous service limited to about 80 °C
- Greater thickness tolerance and higher price than XT; only normally flammable (B2 / UL 94 HB)

Practical tip: PMMA-GS plays to its strengths wherever transparency and optics meet demanding machining, thick cross-sections or slightly higher temperatures. For thin, laser-cut blanks the cheaper XT is more sensible; where shatter and impact resistance are the priority, we recommend tough polycarbonate (PC).

Typical Properties

- High light transmission (~92 %), crystal-clear
- Very good weathering and UV resistance
- Higher heat deflection temperature than XT
- Better chemical and stress-crack resistance than XT

Product Examples

- Thick-walled, polished viewing and display parts
- High-optical components and light guides
- Model, pattern and mould making
- Thermoformed hoods and covers
- Displays, luminaires and glazing
- Protective and sneeze-guard screens

Typical Industries

- Advertising and display technology
- Lighting and illumination technology
- Mechanical and plant engineering
- Model and mould making
- Building and architecture
- Food industry

- Excellent machinability and polishability (also thick parts)
- Hard, high-gloss surface
- Low weight
- Suitable for food contact

	Test Method	Unit	Value
General Properties			
Density	DIN EN ISO 1183-1	g / cm ³	1.19
Water absorption (24 h)	DIN EN ISO 62	%	0.2
Light transmission (3 mm)	DIN 5036-3	%	~ 92
Flammability	UL 94 / DIN 4102		HB / B2
Mechanical Properties			
Tensile strength (23 °C)	DIN EN ISO 527	MPa	80
Elongation at break	DIN EN ISO 527	%	5.5
Tensile modulus	DIN EN ISO 527	MPa	3300
Flexural strength	DIN EN ISO 178	MPa	115
Notched impact strength (Charpy)	DIN EN ISO 179	kJ / m ²	1.6
Thermal Properties			
Glass transition temperature	ISO 11357	°C	~ 110
Vicat softening temperature	DIN EN ISO 306, Vicat B 50	°C	115
Heat deflection temperature	DIN EN ISO 75, method A, HDT	°C	105
Service temperature, long-term	Average	°C	-40 ... 80
Coefficient of linear thermal expansion	DIN 53752	10 ⁻⁶ / K	70
Electrical Properties			
Volume resistivity	DIN EN 62631-3-1	Ω * cm	>10 ¹⁵
Dielectric strength	IEC 60243	kV / mm	~ 30

The values stated are typical average values for transparent, cast PMMA (PMMA-GS); they serve as an aid to material selection and are not a legally binding warranty of specific properties. PMMA is amorphous and has no melting point. The material is attacked by many solvents, alcohols and esters and then tends to stress cracking – media resistance must be verified case by case. Food-contact suitability depends on the grade. Price information is a rough, non-binding guide and may vary depending on market situation, grade, dimension and quantity.