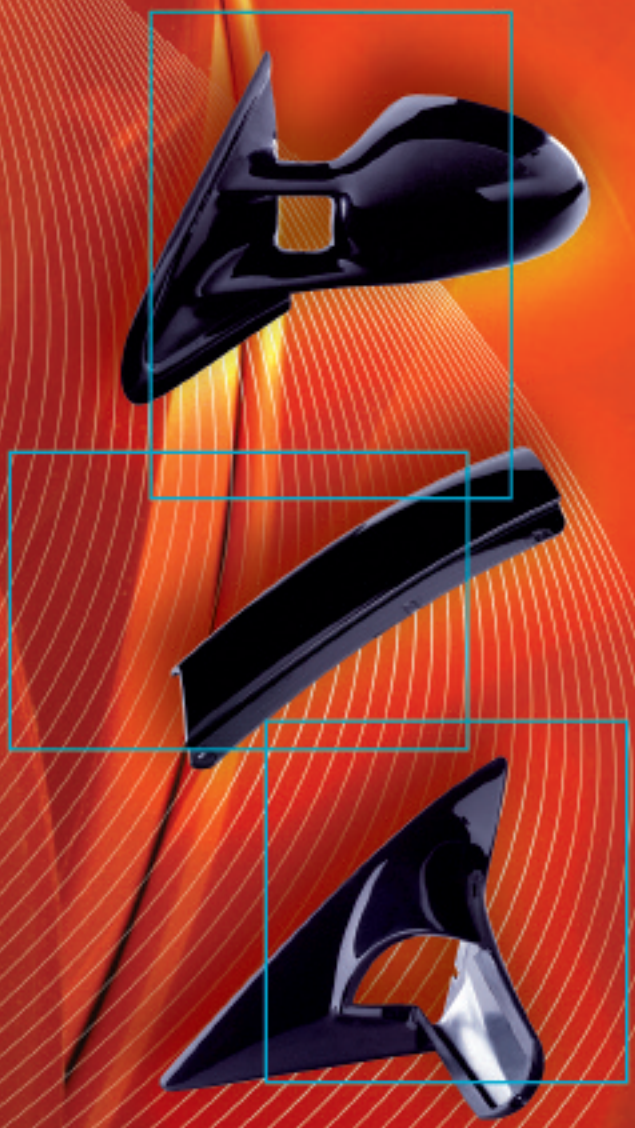
Technology for Brilliant Designs



PLEXIGLAS® ACRYLIC RESIN

Weatherable High Gloss Exterior Trim

Plexiglas® opaque acrylic resin:

- Impact-modified and unmodified grades
- Color brilliance and high gloss without painting
- Proven appearance retention
- Manufacturing flexibility

Plexiglas®

ALTUGLAS INTERNATIONAL
ARKEMA GROUP

For over 60 years, Plexiglas® acrylic resin has been providing the automotive market with outstanding color and gloss retention for demanding exterior applications. Today, process economics, manufacturing emissions, and vehicle weight concerns are driving the use of mold-in-color exterior trim parts on vehicles. The new line of Plexiglas® opaque RB grades allows increased design versatility, styling distinction and vehicle weight reduction, while eliminating the cost and emissions problems and the post-consumer recycling problems associated with painting.

Innovative Solutions. Outstanding Products.

With Plexiglas® opaque RB grade acrylic resin, you can achieve high gloss, jet black and vivid colors that will be retained in harsh UV outdoor environments for many years. There is no need to paint or coat the surface, or to design to mask the loss of gloss associated with other plastics. High gloss surfaces can be used for styling, while chalking and fading can be avoided. Applications include: roof pillars, exterior mirror shell assemblies, exterior mirror shell sails, cowl vent grills, rear deck appliqués, roof trim and side window belts.

All Altuglas International resin production facilities carry the ISO 9001:2000 Registration and comply with applicable operational elements of TS 16949 to assure high-quality and consistent manufacturing. The Plexiglas® acrylic resin product line is backed by a team of Altuglas International engineers and scientists available to provide support in design, color and appearance, material selection, melt processing and fabrication. An on-site technical service and joint project effort with tier 1 and tier 2 suppliers reduces development time and product introduction costs.

1 Grade Property Comparison

In addition to outstanding aesthetic and weathering performance, Plexiglas® opaque impact-modified RB grades possess an attractive balance of physical properties: hard surface for increased scratch resistance; high heat resistance to withstand heat buildup in dark colors; and high modulus and flexibility for ease of assembly and attachment. Plexiglas® opaque acrylic resin is offered in a variety of formulations, including a high heat grade, light impact-modified grade, and a medium-impact grade.

Note: Complete physical property information can be obtained from Altuglas International.

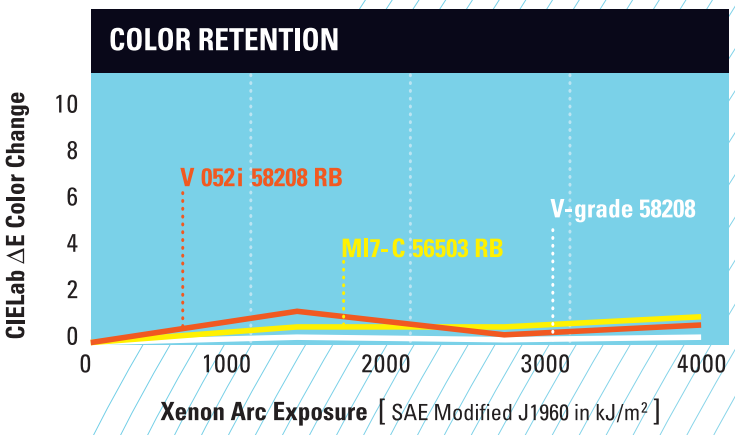
GRADE PROPERTY COMPARISON

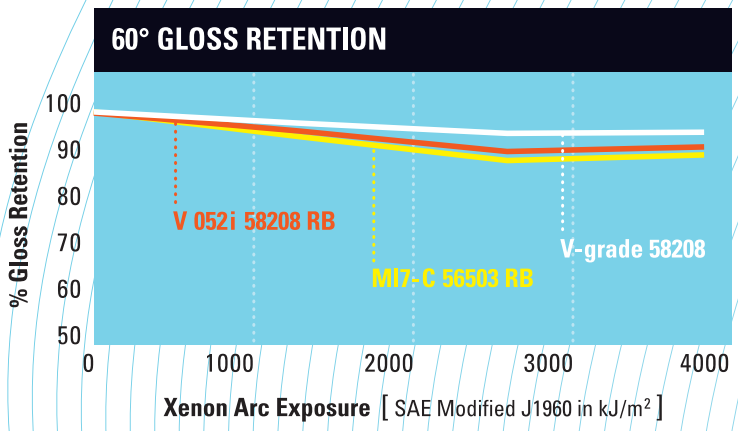
GRADE	MELT FLOW RATE	ROCKWELL HARDNESS	VICAT SOFTENING TEMPERATURE	HEAT DEFLECTION TEMPERATURE	TENSILE ELONGATION	FLEXURAL MODULUS
	ASTM D 1238	ASTM D 785	ASTM D 1525	ASTM D 648	ASTM D 638	ASTM D 790
	230°C / 3.8 Kg	*M Scale*	*50°C/hr., 1kg, °C*	*1.82 MPa, °C*	*Ultimate %*	*MPa*
MI-7C 56503 RB	1.8	70	108	95	35	2,410
V 052i 58208 RB	3.2	86	110	97	18	2,830
V-GRADE SERIES 58208	1.6 - 3.6	91 - 93	103 - 111	93 - 102	6	3,100

2 Appearance & Durability

The inherent transparency of Plexiglas® impact-modified RB acrylic resin provides excellent depth of color and gloss for outstanding jet-black appearance. Plexiglas® acrylic resin is approved to Automotive OEM clear coat paint standards. And unlike other materials, Plexiglas® acrylic resin exhibits virtually no visible change in color or gloss when exposed to nearly 4,000-kJ/m² radiation per modified SAE J1960 procedures. This exposure represents a 50% longer duration than 2,500-kJ/m² typically specified per SAE J1960.

Note: Plexiglas® acrylic resin can meet current OEM exposure test requirements without polishing or "cleaning" the surface prior to gloss and color measurement.





3 Visual Comparison

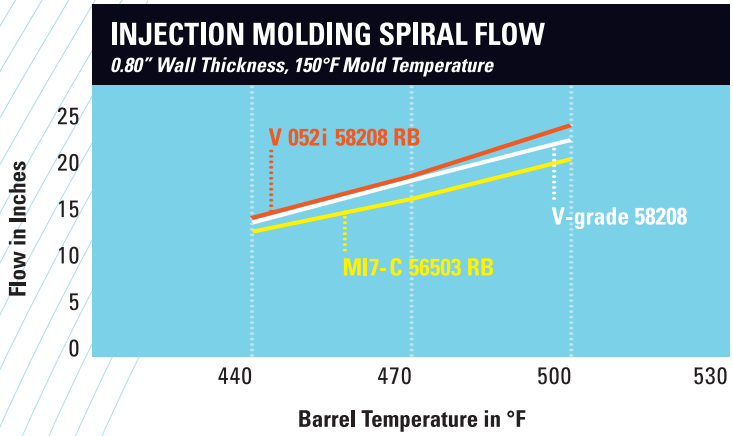
Like the clear grades of unmodified and impact-modified Plexiglas® acrylic resin used to maintain color and appearance in taillight lens applications, Plexiglas® opaque acrylic resin consistently outperforms competitive materials containing styrenics or polycarbonate. In visual evaluations of exposed materials, other polymers fade noticeably within 1-2 years, while Plexiglas® impact-modified acrylic resin remains unchanged even after 5 or more years of exposure.

After 3750 kJ exposure, the Plexiglas® sample still provides a deeper, jet-black appearance than is initially attainable with the competitive materials.

Photographs are actual exposed plaqus. Printing variations may affect appearance. Contact an Altuglas International representative to view actual plaques.

4 Process Versatility

For years, Plexiglas® acrylic resin has been molded into intricate automotive parts, such as taillight lenses, emblems, cluster lenses and light guides. Injection molding of Plexiglas® acrylic resin is readily accomplished with standard injection molding machines, as well as most specialized systems such as hot runner. The broad temperature flow range, plus excellent high temperature and high shear stability, provide an extended processing window, while the melt processing versatility allows options to eliminate flow defects such as visible knit lines.



Exceptional color and gloss retention provides efficiency and flexibility for mold-in color.

5 Secondary Processes & Attachment

Unlike other polymers, Plexiglas® acrylic resin does not require costly coatings to maintain its appearance, weatherability, chemical resistance or surface hardness. Plexiglas® acrylic resin is conducive to secondary processing and multiple attachment methods, including all welding techniques, solvent welding and screw attachment. And due to its excellent thermal stability, Plexiglas® acrylic resin can be recycled with itself or with other plastics.

Note: Although not required or normally practiced, Plexiglas® acrylic resin can be coated with acrylic approved systems. For complete technical information or a dedicated brochure on multiple attachment methods, contact Altuglas International.

ASSEMBLY METHODS FOR PLEXIGLAS®

JOINT REQUIREMENT	THERMAL	MECHANICAL	CHEMICAL
HIGH STRENGTH	YES	OK	OK
LEAK PROOF	YES	NO	YES
REPEAT ASSEMBLY	NO	YES	NO
RECYCLABILITY	YES	OK	OK
DISSIMILAR MATERIALS	OK	YES	YES
CHEMICAL RESISTANCE	YES	OK	YES

WELDING COMPATIBILITY FOR PLEXIGLAS®

POLYMER	ULTRASONIC	VIBRATION	HOT PLATE
PMMA	GOOD	EXCELLENT	EXCELLENT
ABS	GOOD	EXCELLENT	EXCELLENT
ABS/PC	GOOD	VERY GOOD	VERY GOOD
PC	GOOD	VERY GOOD	VERY GOOD
OLEFINS	POOR	POOR	POOR

Weld Strength Ratings based on weld % tensile strength of weaker material: Excellent = 90 - 100%, Very Good = 70 - 90%, Good = 50 - 70%, Poor = < 50%

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