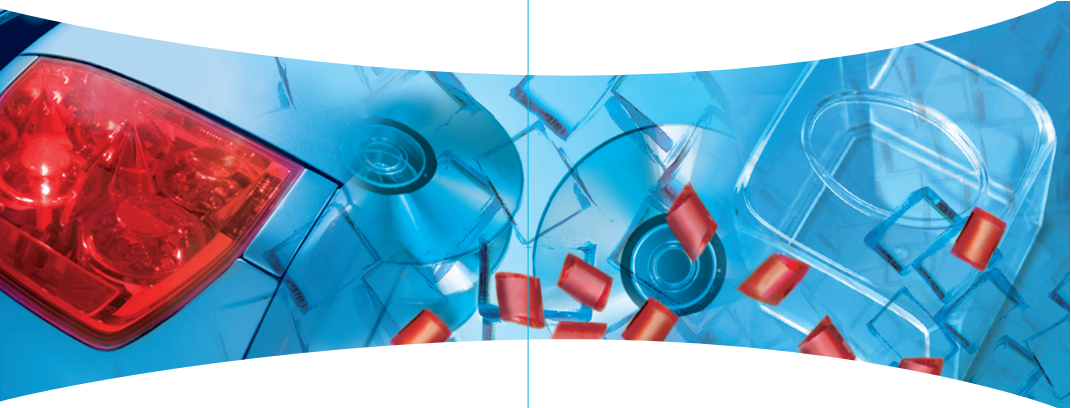




Acrylic Molding and Extrusion Resins

Plexiglas® V-Series Resins
Plexiglas® Impact-Modified Resins



THE RIGHT RESIN FOR EVERY JOB

Wherever there's a need for good-looking, precise, tough, molded parts, you'll find an outstanding combination of performance properties and value in the Altuglas International family of acrylic thermoplastic resins: excellent optical clarity, exceptional weatherability, and design flexibility. These resins are available in many grades and colors to meet your specific applications. Assemblies can be drilled, machined, engraved or embossed. Decorative coatings can be sprayed, silk-screened, hot-stamped, vacuum-metallized or chrome-plated. No matter what the job, Altuglas International has an acrylic resin that's exactly right.

Plexiglas® V-Series Acrylic Molding and Extrusion Resins

Plexiglas® V-series resins are a family of thermoplastic acrylics for injection molding and extrusion applications. They offer excellent weatherability and optical properties which make them outstanding materials for applications requiring outdoor stability, high-quality surface appearance and/or precision optics.

Plexiglas® V-series resins are offered in a variety of formulations differentiated primarily by processing characteristics and thermal properties. There are also improved impact formulations (i-series) when added toughness is required. Plexiglas® V-series resins are characterized by exceptional thermal stability, extrusion melt strength, excellent tool surface reproduction and release properties.

Plexiglas® V-series resins have excellent resistance to many chemicals including solutions of inorganic acids and alkalis and aliphatic hydrocarbons such as VM & P naphtha and heptane. In addition, Plexiglas® V-series resins are virtually unaffected by a wide range of commercial products including many beverages, foodstuffs, detergent solutions and cleaners.

Colorless Plexiglas® V-series resins are naturally water-like in appearance but are also available in a complete range of transparent, translucent and opaque colors. Colors can be formulated to meet stringent specification requirements.



Plexiglas® Impact-Modified Acrylic Resins

Plexiglas® Impact-Modified acrylic resins offer 7 to 10 times the impact resistance of standard acrylics while maintaining excellent optical properties. When toughness is critical, Plexiglas® Impact-Modified acrylic resins offer a good balance between flow and increased resistance to breakage, while providing weatherability superior to that provided by other high-impact plastics.

Plexiglas® DR resin is an all-acrylic molding and extrusion pellet formulation combining the greater toughness normally associated with other impact plastics and the outstanding transparency and UV resistance of conventional acrylic materials.

Plexiglas® IM-7 resin is formulated to provide a unique combination of excellent transparency, good moldability, heat resistance, and practical impact strength. Plexiglas® IM-7 acrylic resin is an outstanding candidate for applications requiring standard acrylic performance and appearance with increased toughness.

Plexiglas® HFI-7 and Plexiglas® HFI-10 resins are a series of impact-resistant acrylics noted for excellent flow and mold release properties. They were specifically developed for difficult injection molding applications. They offer 25 to 30% more flow and two to three times better mold release than conventional high- and medium-impact materials.

Plexiglas® SG-7 and Plexiglas® SG-10 resins are special gamma-radiation-resistant formulations designed for use in medical devices. These products minimize the discoloration that typically accompanies gamma-radiation sterilization.

Other Important Properties

Clear Plexiglas® acrylic resins, V-series and Impact-modified, are available that comply with U.S. FDA Regulations for use in repeated food contact applications, specifically with 21 CFR 177.1010: Acrylic and modified acrylic plastics, semirigid and rigid under room temperature conditions and below, with all types of food, except for food with an alcoholic content greater than 8% (subject to the extractive limitations on the finished food contact articles as described in the regulation). Plexiglas® resins containing additives have to be examined on a case-by-case basis.

It is the responsibility of the medical device manufacturer to determine the suitability of all component parts and raw materials, including any Altuglas International product, used in its final product in order to ensure safety and compliance with requirements of the United States Food and Drug Administration (FDA) or other international regulatory agencies. Altuglas International products have not been designed for, nor are they promoted for, end uses that would be categorized by either the U.S. FDA or by the International Standards Organization (ISO) as implant devices. Altuglas International products are not intended for use in the following applications: (1) in any bodily implant applications for greater than 30 days, based on FDA Modified ISO-10993, Part 1, "Biological Evaluation of Medical Devices" tests (including any cosmetic, reconstructive or reproductive implant applications); or (2) as any critical component in any medical device that supports or sustains human life.

Altuglas International products offered for the medical market have met the biological reactivity testing requirements for a USP Plastic, Class VI.

All Plexiglas® resins except SG-7, SG-10 and VMI are recognized by Underwriters Laboratory as having a UL flame class of 94HB. Plexiglas® resins are manufactured in Bristol, PA and Louisville, KY; both plants have ISO 9902 registration and QS 9000 certification.

Please contact Marie Rippey, Altuglas International Product Safety Manager, at 215-419-5728 for additional information, or compliance statements on specific resins.

Typical Physical Properties^(a) of Plexiglas® Acrylic Resins

PROPERTY	TEST METHOD	V-SERIES					IMPACT-MODIFIED			
		HIGH HEAT APPLICATIONS Plexiglas® V825 / V826	MEDIUM FLOW GENERAL PURPOSE Plexiglas® V045 / V052 / V920 UVT	GENERAL FLOW Plexiglas® VM / VH / VS / VUT		IMPROVED IMPACT Plexiglas® V052 ⁽ⁱ⁾ / VMI	HIGHEST IMPACT Plexiglas® DR	HIGH IMPACT Plexiglas® SG-10	MEDIUM FLOW GOOD IMPACT Plexiglas® MI-7	HIGH FLOW GOOD IMPACT Plexiglas® HFI-7 / SG-7
Refractive Index N _D	ASTM D-542	1.49	1.49	1.49	1.49	1.49	1.49	1.49	1.49	1.49
Specific Gravity	ASTM D-792	1.19	1.19	1.18	1.18	1.18	1.15	1.15	1.17	1.17
Melt Flow Rate, g/10 min.	ASTM D-1238, 230°C/3.8 kg	3.7	2.3/2.8	8.0	14.5	27.0	1.0	3.3/4.1	3.2	10/12.3
Luminance Transmittance, %	ASTM D-1003, 0.125" thickness	92	92	92 ^(b)	92	92 ^(b)	91	90	91	91
Haze, %	ASTM D-1003, 0.125" thickness	<2	<2	<2	<2	<2	<2	<2	<2	<2
Rockwell Hardness, M Scale	ASTM D-785	93	91	90	89	84	45	38	68	65/60
MECHANICAL										
Tensile Strength ^(c) , psi (MPa)	ASTM D-638, 0.2"/min pull speed (5 mm/min)	10,200 (70)	10,200 (70)	10,000 (69)	9,600 (66)	9,400 (65)	5,500 (38)	5,500 / 5,300 (38) / (37)	7,000 (48)	6,800 (47)
Flexural Strength ^(c) , psi (MPa)	ASTM D-790, Span-depth ratio 16:1, 0.05"/min (1.3 mm/min)	15,000 (103)	15,000 (103)	15,000 (103)	14,000 (97)	14,000 (97)	10,300 (71)	10,300 (71)	14,400 (99)	12,400 85
Flexural Modulus ^(c) , psi (MPa)	ASTM D-790	450,000 (3,100)	450,000 (3,100)	450,000 (3,100)	435,000 (3,000)	430,000 (2,970)	270,000 (1,860)	270,000 (1,860)	380,000 (2,620)	355,000 (2,450)
Impact Strength ^(c) , ft-lb/in (J/m)	ASTM D-256, IZOD Milled Notch	0.3 (16)	0.3 (16)	0.3 (16)	0.3 (16)	0.3 (16)	1.1 (59)	0.9 (48)	0.6 (32)	0.6 (32)
Falling Dart, 6" x 6" x 1/8", 3-lb dart, 1/4" radius (152 mm x 152 mm x 3 mm, 1.36 kg dart, 6.4 mm radius)		1 (1.4)	1 (1.4)	1 (1.4)	1 (1.4)	1 (1.4)	10 (13.6)	10 (13.6)	7 (9.5)	7 (9.5)
THERMAL										
Deflection Temperature Under Load, F (C)	ASTM D-648, Annealed ^(d) , 3.6°F/min, 264 psi (2°C/min, 1.82 MPa)	216 (102)	199 (93)	195 (91)	171 (77)	169 (76)	175 (79)	175 / 181 (79) / (83)	185 (85)	179 (82)
Vicat Softening Point, F (C)	ASTM D-1525, Unannealed, 90°F/hr, 2.2 lbs (50°C/hr, 1 kg)	232 (111)	217 (103)	212 (100)	191 (88)	189 (87)	208 (98)	201 (94) / 199 (93)	210 (99)	203 (95) / 201 (94)
Continuous Service Temperature Range F (C)	Dependent on part "molded-in" stresses	219 (104)	207 (97)	196 (91)	180 (82)	178 (81)	187 (86)	181 (83) / 176 (80)	194 (90)	184 (84) / 182 (83)
Shrinkage from Mold Dimensions, %	ASTM D-955, Cold mold to cold piece, 48 hrs	185-215 (85-102)	165-190 (74-88)	160-185 (71-85)	145-170 (63-77)	145-170 (63-77)	160-180 (71-82)	160-180 (71-82)	165-185 (74-85)	165-185 (74-85)
Water Absorption, %	ASTM D-570, Wt gain on 24 hrs water immersion	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.2-0.6	0.3-0.8	0.3-0.8	0.3-0.6	0.3-0.6
ASTM Classification	ASTM D-788 PMMA	0141V3	0131V2	0121V4	0111V5	0111V6	0211V3	0231V2 / 0230V2	0221V3	0221V4 / 0220V4
Chemical Resistance		Chemical resistance of Plexiglas® acrylic resins varies with stress level, temperature, reagent and resin grade. Altuglas International recommends that selected Plexiglas® acrylic resins be tested with applicable solvents under appropriate conditions for the end-use application.								

(a) Data given are average values and should not be used for specification purposes.
(b) Samples conditioned per ASTM D-698 procedure B

(c) Plexiglas® V920 UVT resins and VS UVT resins differ from standard resins in luminous transmittance in ultraviolet region only as follows: minimum transmittance @ 270 nm = 1.2%, @ 290 nm = 50%, @ 310 nm = 70%, @ 340 nm = 85%.
(d) Annealing cycle: Plexiglas® V825, V826 resins – 4 hrs at 233°F (95°C); Plexiglas® V045, V052, V920, DR, HFI-10, MI-7, SG-7, SE-10 resins – 4 hrs at 178°F (80°C); Plexiglas® VM, VH, VS resins – 4 hrs at 188°F (70°C).

Plexiglas® Acrylic Molding and Extrusion Resins

RESIN	DESCRIPTION
Plexiglas® V825	Excellent heat resistance.
Plexiglas® V825 HID	Lighting-grade, excellent heat and UV resistance.
Plexiglas® V826	Excellent heat resistance and chemical resistance.
Plexiglas® V052	High-molecular-weight resin. Slightly less heat resistance and slightly stiffer flowing than Plexiglas® V825 acrylic. Excellent mold release.
Plexiglas® V825 UVA5A	High-heat lighting-grade resin that offers additional UV light absorption properties.
Plexiglas® V045	Equivalent to Plexiglas® V052 resin but with less lubricant; also used for extrusion.
Plexiglas® V045i	Higher impact strength than Plexiglas® V045 extrusion grade for improved fabrication.
Plexiglas® V052i	50% higher impact strength than Plexiglas® V052 resin, injection molding grade, high heat grade.
Plexiglas® VMI	50% higher impact strength than Plexiglas® VM resin, injection molding grade, high flow grade.
Plexiglas® V920	General-purpose injection molding resin. Well suited for decorated applications.
Plexiglas® VM	Medium heat resistance and easy flow.
Plexiglas® VH	Medium heat resistance with excellent flow for large, thin-walled light diffusers.
Plexiglas® VS	Maximum flow and lowest heat resistance grade for injection molding only.
Plexiglas® V920 UVT	Ultraviolet-transmitting resins for injection molding. Used primarily for medical diagnostic components.
Plexiglas® VS UVT	
Plexiglas® DR	High-impact acrylic resin with good chemical resistance for injection molding and extrusion.
Plexiglas® HFI-10	High-impact acrylic resin with improved injection molding characteristics.
Plexiglas® MI-7	Medium-impact acrylic resin.
Plexiglas® HFI-7	Medium-impact acrylic resin with improved injection molding characteristics.
Plexiglas® SG-7	Gamma-resistant, high-flow, high-impact, medical-grade molding resin.
Plexiglas® SG-10	Gamma-resistant, high-flow, medium-impact, medical-grade molding resin.

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Caution: Plexiglas® acrylic resin is a combustible thermoplastic. In general, the same fire precautions that are observed in connection with the handling and use of any ordinary combustible material should be observed when handling, storing or using Plexiglas® resin. The fire hazard of uses of Plexiglas® resin can be kept at an acceptable level by complying with building codes and applicable Underwriter's Laboratories standards, and observing established principles of fire safety. Impact resistance is a factor of thickness. Avoid exposure to extreme heat or aromatic solvents.

See MSDS for Health & Safety Considerations.

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