

MATERIALS SELECTION GUIDE FOR

Automotive Applications



DECADES OF PLEXIGLAS® RESIN COLOR TECHNOLOGY EXPERTISE



Altuglas International color technology in the automotive industry dates back to 1944 when Plexiglas® acrylic resin was used to make tail lights and reflectors, which were previously made of glass. Today, every colored Plexiglas® resin incorporates decades of Altuglas International's color technology experience.

PLEXIGLAS® AUTOMOTIVE COMPLIANCE LISTINGS

Altuglas International's Plexiglas® acrylic resins are compliant with the standards and OEM specifications listed in the table below.

Grade	Chrysler	Ford	GM	Other
Plexiglas® V825T	On Drawing	WSS-M4D776-B1 WSS-M4D776-B2	GMW16335-T2HF	FMVSS 108 SAE J576
Plexiglas® V826	MSDB-75 CPN 4232	WSS-M4D776-B1 WSS-M4D776-B2	GMW16335-T2	FMVSS 108 SAE J576
Plexiglas® V825	MSDB-75 CPN 4231 CPN 4232	WSS-M4D776-B1 WSS-M4D776-B2	GMW16335-T2HF	FMVSS 108 SAE J576
Plexiglas® V040	On Drawing	WSS-M4D776-B1 WSS-M4D776-B2	GMW16335-T2	FMVSS 108 SAE J576
Plexiglas® V052i	MSDB-75 CPN 4237	WSS-M4D776-B1	GMW16335-T3*	FMVSS 108 SAE J576
Plexiglas® DR®	MSDB-75 CPN 4235	On Drawing	GMW16335-T5*	FMVSS 108 SAE J576
Plexiglas® MI7	MSDB-75 CPN 4236	WSB-M4D687-A	GMW16335-T4	FMVSS 108 SAE J576
Plexiglas® MI7T	MSDB-75 CPN 4236	WSB-M4D687-A	GMW16335-T4	FMVSS 108 SAE J576
Plexiglas® V052i Piano Black	MSDB-75 CPN 4237	WSS-M4D776-B5	GMW16335-T3	N/A

*Pending



WELCOME TO THE WORLD OF ALTUGLAS INTERNATIONAL

Altuglas International, a business unit of Arkema Inc., is a global leader in PMMA (polymethylmethacrylate). It is focused on the technical plastics sector, developing, manufacturing, and marketing innovative products to meet and exceed customers' needs. Its global staff of 1,300 is highly committed to providing product solutions every day.

Our main markets include automotive, building and construction, capstocks, LED lighting, and consumer goods.

Altuglas International has three development priorities:

- Create innovative technologies to expand the properties of our sheet and resins.
- Maintain close partnerships with our customers to understand their needs and quickly deliver solutions.
- Focus on new developments for medical, transportation, capstocks, optics, and biopolymers.

Our development teams in the U.S. and France specialize in solving customers' problems, from expanding their process windows to developing new high performance materials. Altuglas International is a reliable, responsible, collaborative manufacturer. Our hallmark is sustained product quality and an experienced worldwide staff. Altuglas products are manufactured in safe, clean facilities that are respectful of their communities and the environment.

THE RIGHT PLEXIGLAS® RESIN FOR EVERY AUTOMOTIVE APPLICATION

The Altuglas International family of Plexiglas® thermoplastic acrylic resins provides:

excellent light transmission • exceptional optical clarity
outstanding weatherability • superb heat resistance • first-rate scratch resistance

Plexiglas® resins can be injection molded, extruded, and thermoformed. They also offer great design flexibility, as they can be drilled, machined, engraved, and embossed to create a custom look for your automotive application.

The transparent Plexiglas® resins outlined in this literature meet the requirements of FMVSS 108 and do not require a post-mold UV-protective coating. Our resins are available in a variety of grades and colors to suit your design and processing needs.

PLEXIGLAS® V-SERIES resins 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® IMPACT-MODIFIED resins offer seven to ten times the impact resistance of standard acrylic resins while maintaining excellent optical properties. These grades offer a good balance between melt flow rate and increased resistance to breakage, but still provide weatherability superior to other high-impact plastics.

PLEXIGLAS® MOLD-IN COLOR resins are used for exterior trim and appliqué. They provide excellent weatherability, while maintaining their color and gloss without post-mold treatment.

PLEXIGLAS® HIGH-HEAT OPTICAL resins are formulated for high heat, inner optics, and long path length applications.

**PLEXIGLAS® FROSTED DR®
AND PLEXIGLAS®
DIFFUSE™** resins are formulated to diffuse light for interior and exterior optical applications.



PLEXIGLAS® ACRYLIC RESIN

A LEADER IN AUTOMOTIVE MATERIALS TECHNOLOGY

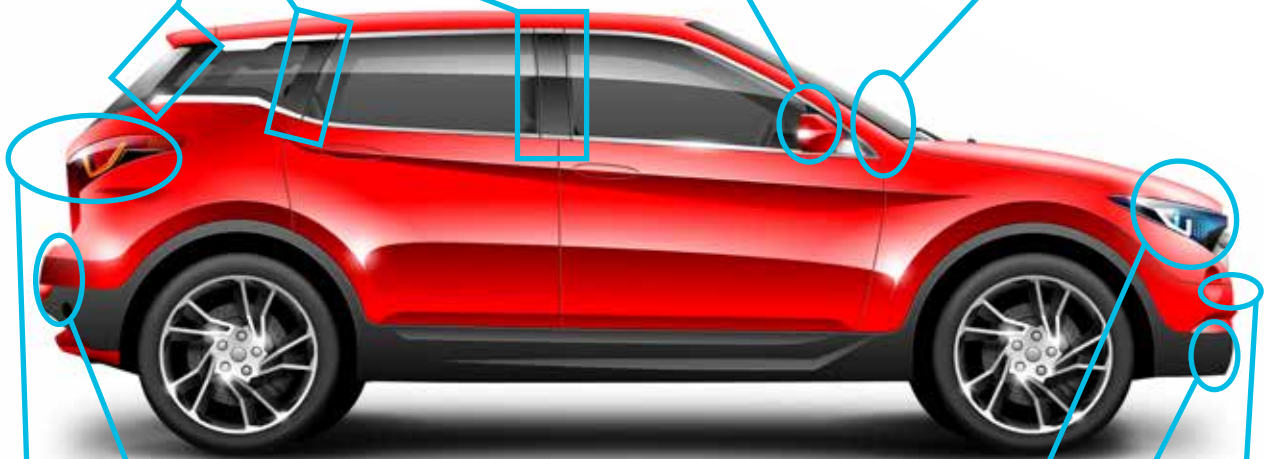
Mirror Housings



Instrument Cluster Lenses
Interior Lighting · Instrument Panel Optics



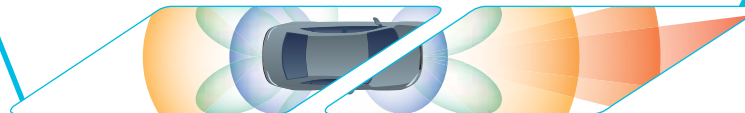
Pillar Trim · Spoiler Trim · Mold-In Color



Thick Optic Lenses
Light Guides · Signature Lighting



Autonomous Driving Sensor Lenses



Rear Outer Lenses · Light Guides
Reflex Optics · Signature Lighting



Badging
(front and rear)



OVERVIEW OF PLEXIGLAS® GRADES

By Key Characteristics & Automotive Application

V-SERIES GRADES

Plexiglas® V Grade resins are formulated for general injection molding and extrusion applications.

Plexiglas® HT121 has the highest heat resistance of any Plexiglas® grade. It is typically specified for inner lenses, reflex plates, light guides, and light pipes where high heat resistance and excellent optical properties are required.

Plexiglas® V825T is a high-heat grade with excellent melt flow. It is produced in Europe and is typically used for instrument cluster lenses, light guides, thick optics, and exterior rear combination lenses.

Plexiglas® V826 is a high-heat grade with excellent chemical resistance. This grade is the material of choice for exterior lighting lenses where standard acrylic impact strength is acceptable.

Plexiglas® V825 is a high-heat grade with excellent melt flow for thin-walled and intricate parts. This grade is typically used for instrument cluster lenses, sub dials, and light guides.

Plexiglas® V040 is a high-heat grade with excellent melt flow characteristics. It is available in the Asia Pacific region, where it is typically used for instrument cluster lenses, light guides, thick optics, and exterior rear combination lenses.

Plexiglas® V052i is a lightly impact-modified grade with high heat resistance. It is typically used for two-shot molding and applications where design constraints result in a part that is difficult to process or eject under standard conditions.

MOLD-IN COLOR GRADES

Plexiglas® mold-in color grades replace painted components in applications such as rear pillars and aero strakes because they maintain their deep jet-black color and gloss despite extreme weathering.

Plexiglas® V052i Piano Black has the same properties as Plexiglas® V052i but is formulated in a deep piano black color that eliminates the painting process.





IMPACT-MODIFIED GRADES

Plexiglas® Impact-Modified acrylic resins offer seven to ten times the impact resistance of standard acrylics while maintaining excellent optical properties. When resin toughness is critical, Plexiglas® Impact-Modified acrylic resins provide exceptional weatherability while offering a good balance between melt flow rate and increased resistance to breakage.

Plexiglas® DR® has the highest impact resistance of any Plexiglas® grade. It is specified primarily on trucks, sport utility vehicles, and vans where the lamp will be subjected to high abuse. This grade offers impact strength that is ten times that of standard unmodified grades with the combined benefit of excellent weatherability.

Plexiglas® MI7 is a medium impact grade with medium heat resistance. It is often used for insert molding and multi-shot rear combination lenses to minimize breakage during production. This grade offers impact strength that is seven times that of standard unmodified grades with the combined benefit of excellent weatherability.

Plexiglas® MI7T is a medium impact grade with high heat resistance. It is often used for insert molding and multi-shot rear combination lenses to minimize breakage during production. This grade offers impact strength that is seven times that of standard unmodified grades with the combined benefit of excellent weatherability.



LIGHT-DIFFUSING GRADES

Plexiglas® acrylic resins have been used in lens applications for more than 70 years. They played a vital role in the development of durable, weatherable commercial lenses, and they are used to provide a custom, diffused look in conjunction with incandescent and light-emitting diode (LED) light sources.

Plexiglas® Frosted DR® and Plexiglas® Diffuse™ grades are available with and without impact modifier. These grades are used in interior and exterior applications where light diffusion is desired.

THINK FORWARD.
BE FORWARD.
MOVE FORWARD.

**WITH
PLEXIGLAS®
RESIN
TECHNOLOGY**

Altuglas International partners with industry leaders and applies decades of experience in the plastics industry to formulate innovative material solutions for the automotive market.

**PLEXIGLAS® PIANO BLACK RESIN
FOR MOLD-IN COLOR**

For piano black, weatherable, scratch-resistant, high gloss, mold-in color applications such as in D-pillars and appliqué.

**PLEXIGLAS® LONG PATH
LENGTH RESINS**

Optimized for long path length lenses.

PLEXIGLAS® HT121 RESIN

For high-heat applications.



PLEXIGLAS® ACRYLIC RESIN

SELECTION GUIDE

for Automotive Applications

		Property						Applications							
		Light Transmission/Clarity	Weatherability	Heat Resistance	Impact Resistance	High Melt Flow Rate	Chemical Resistance	Hardness/Scratch Resistance	Inner Lens	Reflex Lens	Light Guides	Instrument Cluster Lens	Thick Optics	Exterior rear Combination Lens	Exterior Trim
V-Grades	Plexiglas® Grade HT121	++++	++++	++++	++	+++	++	++++	•	•	•		•	•	•
	V825	++++	++++	+++	++	++++	++	+++	•	•	•	•	•	•	•
	V825T*	++++	++++	+++	++	++++	++	++++	•	•	•	•	•	•	•
	V826	++++	++++	+++	++	++	++++	+++	•	•	•		•	•	
	V040**	++++	++++	+++	++	++++	++	+++	•	•	•	•	•	•	
	V052i	++++	++++	+++	++	+++	+++	+++		•				•	
Impact-Modified	DR®	++++	++++	++	++++	+	++++	+						•	
	MI7	++++	++++	++	+++	++++	+++	++		•				•	
Mold-in Color	MI7T	++++	++++	+++	+++	++	+++	++		•				•	
	V052i Piano Black		++++	+++	++	+++	++	+++							•

*Available in Europe.

**Available in Asia.

TYPICAL PHYSICAL PROPERTIES OF PLEXIGLAS® ACRYLIC RESINS

for Automotive Applications

Property	Test Method	Units	V-Series Grades		
			HT121-102	V825T-101*	V826-100
Rheological					
Melt Flow Rate	ISO 1133, 230°C/ 3.8 kg	g/10 min	2.7	3.5	2.0
Mechanical					
Tensile Modulus	ISO 527-2/1A/1	MPa	3500	3300	3300
Tensile Strength @ Yield	ISO 527-2/1A/5	MPa	60	70	70
Tensile Strength @ Break	ISO 527-2/1A/5	MPa	60	70	70
Tensile Strain @ Yield	ISO 527-2/1A/5	%	3	5	5
Tensile Strain @ Break	ISO 527-2/1A/5	%	3	5	5
Flexural Stress @ Conventional Deflection	ISO 178, Method A	MPa	95	95	95
Flexural Modulus	ISO 178, Method A	MPa	3400	3200	3000
Izod Notched Impact Strength	ISO 180/A	kJ/m ²	2	2	2
Charpy Unnotched Impact Strength	ISO 179-1/1eU	kJ/m ²	20	20	20
Charpy Notched Impact Strength	ISO 179-1/1eA	kJ/m ²	1	2	2
Rockwell Hardness	ISO 2039-2	M-Scale	99	97	93
Thermal					
Temperature of Deflection Under Load	ISO 75-2, Method A, 1.8 MPa	°C	105	99	98
Temperature of Deflection Under Load	ISO 75-2, Method B, 0.45 MPa	°C	109	104	102
Vicat Softening Temperature	ISO 306/A50, 10N	°C	119	113	111
Vicat Softening Temperature	ISO 306/B50, 50N	°C	114	106	105
Optical					
Refractive Index	ISO 489, Nd @ 23°C	-	1.49	1.49	1.49
Luminous Transmittance	ASTM D1003, 3.2 mm	%	92	92	92
Haze	ASTM D1003, 3.2 mm	%	<1	<1	<1
Other					
Water Absorption	ISO 62, Method 1, 23°C	% weight gain	0.3	0.3	0.3
Density	ISO 1183	g/cm ³	1.19	1.19	1.19
Mold Shrinkage	ISO 294	%	0.2-0.6	0.2-0.6	0.2-0.6

*Available in Europe. **Available in Asia.



V-Series Grades			Impact Modified Grades			Mold-in Color Grades	
V040**	V825-100	V052i-100	DR-101	MI7-101	MI7T-101	V052i-Piano Black	M17C-Piano Black
3.6	4.3	3.1	1.1	4.3	2.0	3.2	1.8
3300	3300	3000	1800	2500	2500	2900	2400
65	65	70	45	55	60	60	50
65	65	60	40	45	50	55	45
4	4	5	5	5	5	5	6
4	4	20	45	35	35	10	20
95	95	85	50	70	70	85	70
3000	3000	2700	1800	2400	2400	2900	2400
2	2	3	6	5	5	3	3
20	20	20	65	40	40	20	40
2	2	2	6	3	4	2	3
93	93	84	45	68	68	86	70
97	95	91	78	83	93	91	89
101	100	95	84	88	98	95	93
111	111	108	98	99	108	108	106
105	104	100	88	92	102	100	98
1.49	1.49	1.49	1.49	1.49	1.49	NA	NA
92	92	92	91	91	91	NA	NA
<1	<1	<1	<2	<2	<2	NA	NA
0.3	0.3	0.4	0.4	0.3	0.3	0.3	0.3
1.19	1.19	1.18	1.16	1.17	1.17	1.18	1.17
0.2-0.6	0.2-0.6	0.2-0.6	0.3-0.8	0.3-0.6	0.3-0.6	0.3-0.6	0.3-0.6



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It is the sole responsibility of the manufacturer of the medical device to determine the suitability (including biocompatibility) of all raw materials, products and components, including any medical grade Arkema products, in order to ensure that the final end-use product is safe for its end use; performs or functions as intended; and complies with all applicable legal and regulatory requirements (including without limitation FDA or other national drug agencies). It is the sole responsibility of the manufacturer of the medical device to conduct all necessary tests and inspections and to evaluate the medical device under actual end-use requirements and to adequately advise and warn purchasers, users, and/or learned intermediaries (such as physicians) of pertinent risks and fulfill any postmarket surveillance obligations. Any decision regarding the appropriateness of a particular Arkema material in a particular medical device should be based on the judgment of the manufacturer, seller, the competent authority, and the treating physician.

See SDS for Health & Safety Considerations.

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