AUTOMOTIVE LIGHTING

Plexiglas®

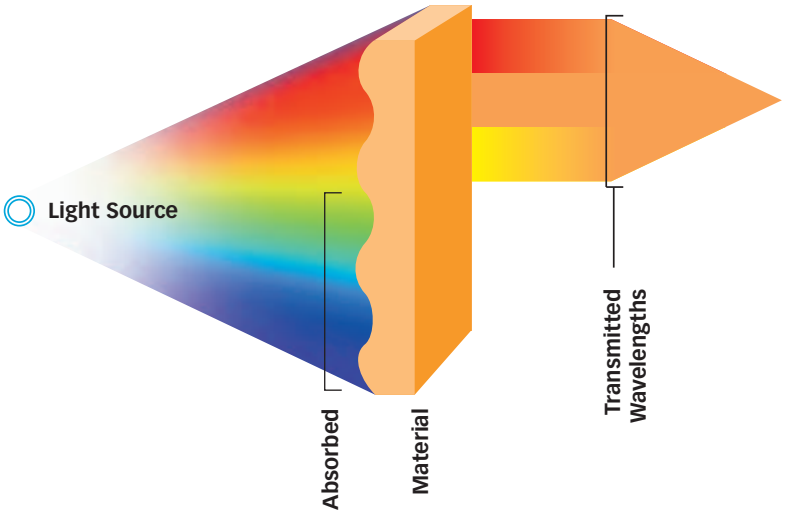
Color technology and service

ALTUGLAS INTERNATIONAL
ARKEMA GROUP

COLOR

Color perception is dependent on a source of light, an object and an observer. The characteristics of the light source and the object must be considered during color development.

1- Physical objects have the capacity to modify light in three fundamental ways: through transmittance, reflection and/or absorption. Generally, objects owe their color to absorption of different wavelengths of light within the visible spectrum. Wavelengths that are not absorbed are either reflected or transmitted and are visible to the observer. This selective absorption determines the color of an object.



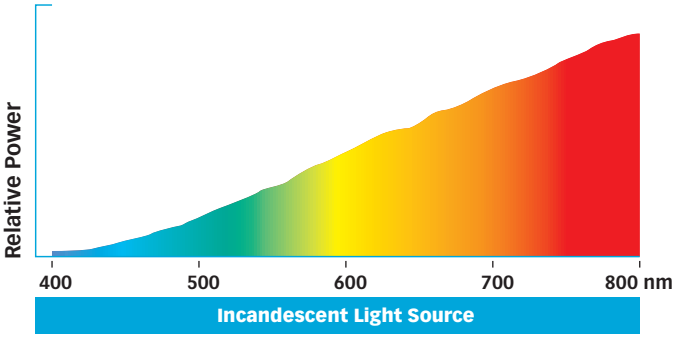
Plexiglas® Color Number Cross-Reference

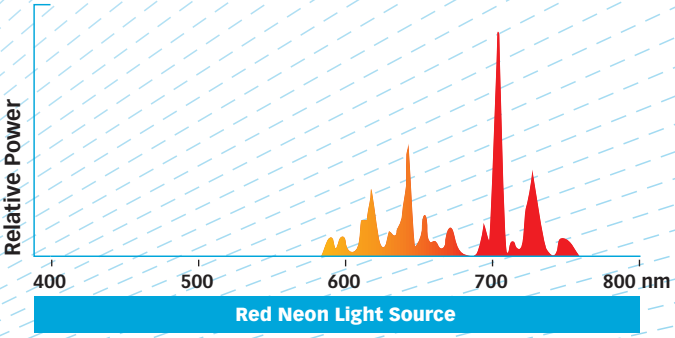
PLEXIGLAS® *V-SERIES*	PLEXIGLAS® MI-7 *Medium Impact*	PLEXIGLAS® DR *High Impact*
461 Red	16500	16020
756 Red	16501	16021
883 Amber	26505	26022
28033 Amber	26500	26038
58102 Gray	56507	56075
P2 Gray	56523	56076
58200 Gray	56072	56072

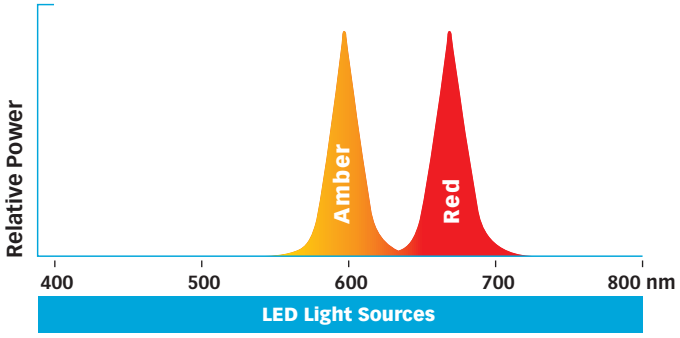
Equivalent color formulations are available in both Plexiglas® MI-7 (medium impact) and Plexiglas® DR (high impact) acrylic resins. These resins are particularly well suited to insert molding and rough service applications (wraparound lenses, light trucks, sports utility vehicles, etc.), where their added toughness increases process yields and reduces parts breakage.

2- Light from a source can be described with a curve showing the spectral energy distribution versus wavelength. Incandescent lamps provide a continuous spectrum with more energy in the yellow-red region. Other sources of light, LED and neon lamps, for example, are not continuous, but they provide spikes of intense energy at certain finite wavelengths.

Tailoring lens color to the spectral distribution of the light source is critical to maximizing performance and creating the desired effects in a lighting assembly. Plexiglas® acrylic color technology is compatible with each of these light sources.







A WORLDWIDE LEADER

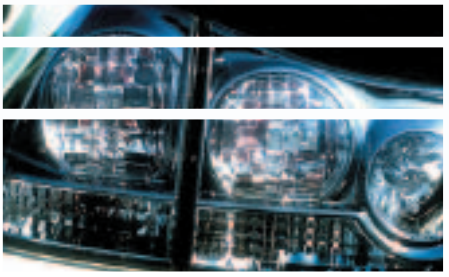
WORLDWIDE SUPPLY

Altuglas International is a world leader in polymethylmethacrylate (PMMA), producing 20% of the world market. We are also a leading supplier of acrylic resins to the automotive industry, including OEMs and parts manufacturers. Our Plexiglas® brand acrylic resins are widely known for their excellent durability, gloss and transparency in automotive lighting.

Still, a truly inventive company goes beyond meeting its customers' material needs. It anticipates the future with innovative solutions. Altuglas International works in close partnership with this industry to develop new applications and resins that enable next-generation lighting technologies. Plexiglas® acrylics are also the materiav ls of choice for instrument cluster lenses, indicators and repeaters, light guides and interior lighting.

Altuglas International can provide you with a full range of injection and extrusion resins in standard and impact grades. All are manufactured to exacting standards and warehoused at strategic locations worldwide - your assurance of the highest product quality and availability. Our products are further enhanced by dedicated customer service and technical support.

In Altuglas International, you have a trusted global partner that shares your vision of outstanding performance and long-term business growth. Discover the many ways our people and products can serve you.



Plexiglas® ACRYLIC RESIN COLOR TECHNOLOGY OFFERS:

- Proven color stability
- Large selection of colors
- Long-term performance
- Worldwide color development and applications support

Altuglas International automotive color technology dates back to 1944 when Plexiglas® acrylic resin was used to make taillights and reflectors, which were previously made of glass. Since then, 50 years of experience and refinement of color technology have been incorporated into every colored Plexiglas® acrylic resin formulation.

Automotive applications demand long-term performance under severe operating conditions. Colored plastic parts must demonstrate stability upon exposure to the harsh realities of varying climatic conditions and severe duty applications. Colored Plexiglas® acrylic resins from Altuglas International meet these demands.

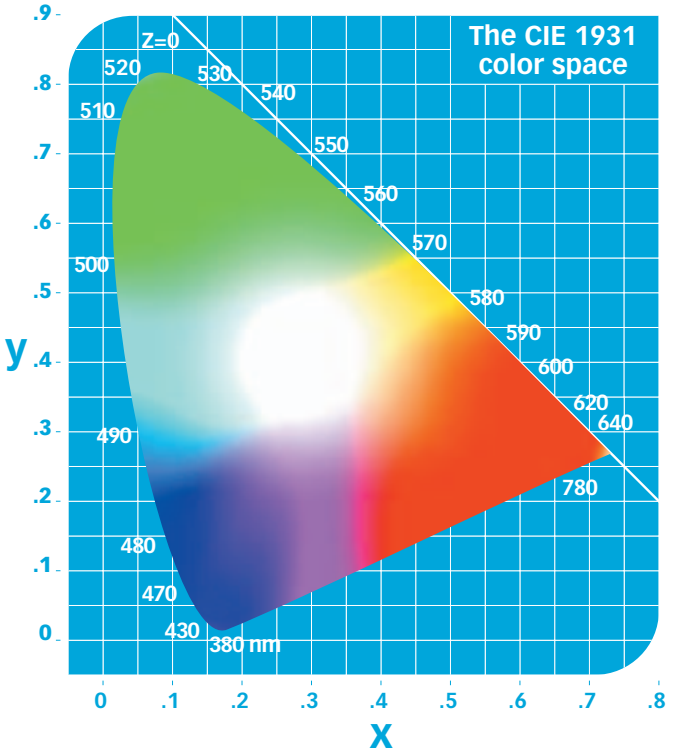
Altuglas International offers the broadest selection of colored automotive acrylic resins. There are several standard Plexiglas® acrylic resin colors in addition to a variety of custom colors available. This wide selection of colors provides the designer with the flexibility to meet the latest styling needs.

Plexiglas® acrylic automotive formulations comply with the weatherability requirements of SAE J576c, FMVSS 108 and numerous automotive company specifications worldwide. More than 100 formulations are listed by AAMVA for use in automotive lighting applications.

All colored Plexiglas® acrylic resin formulations are developed in-house. This allows Altuglas International to maintain tight performance standards for color consistency and uniformity. Altuglas International resin production facilities carry the QS 9000/ISO 9002 certification. This ensures that when Plexiglas® acrylic resins are specified, you receive the quality your application demands.
Altuglas International offers a staff of color technologists ready to assist you with design and material selection.

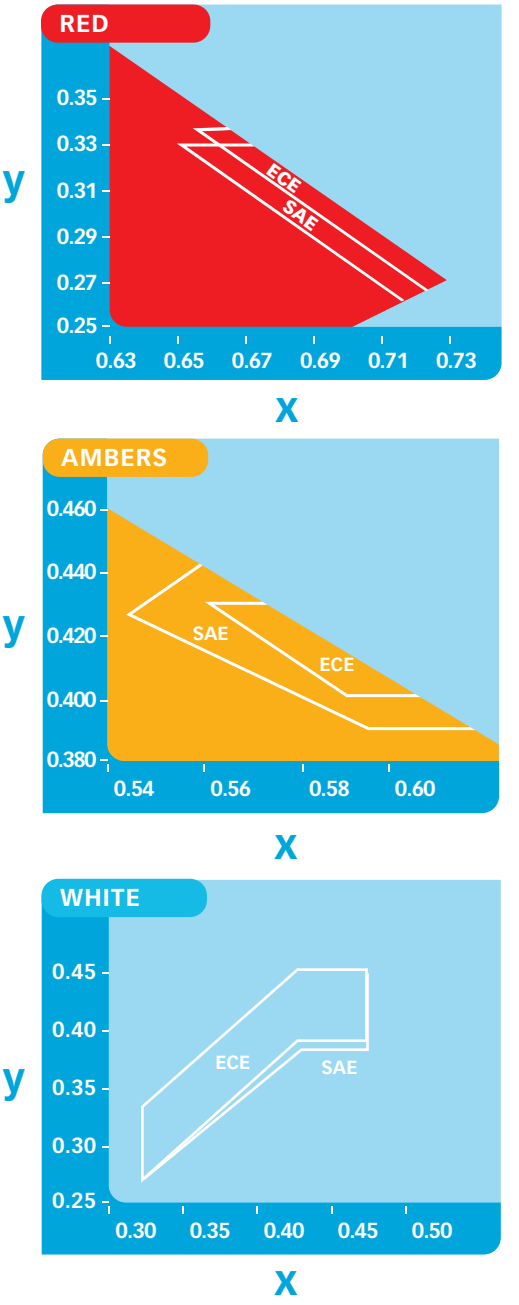
COLOR SPECIFICATION

CIE 1931 SYSTEM FOR COLOR SPACE



The CIE 1931 system for describing color is universally used for color measurement and specification of plastic material used in automotive lighting devices.

INTERNATIONAL AUTOMOTIVE COLOR REQUIREMENTS



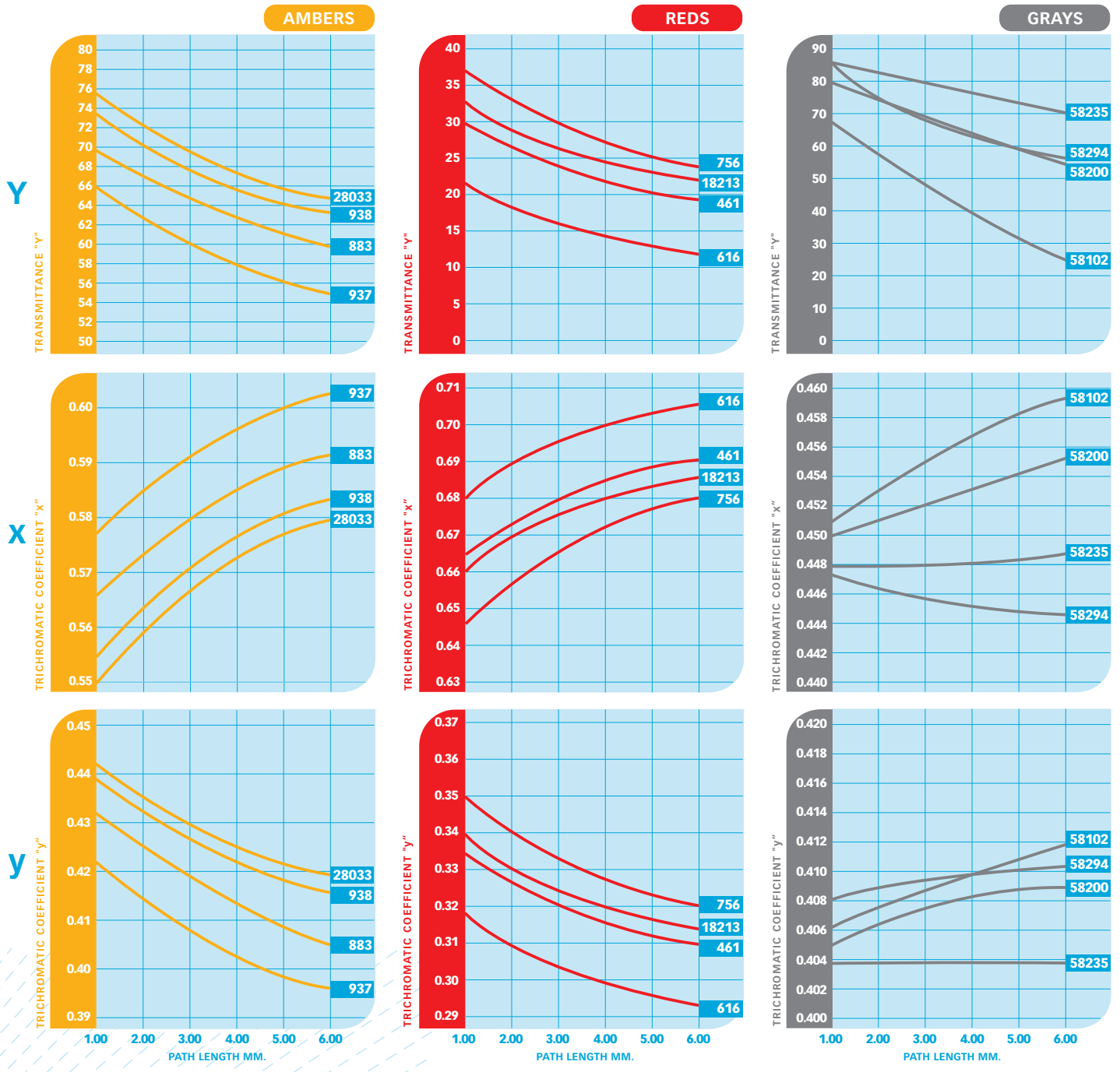
TRENDS

Automotive lighting has come a long way since Plexiglas® acrylic resin was first introduced as an automotive lens material. Although the primary function of signal lighting has always been safety, it is now also a means of imparting distinctive styling to a vehicle. Through subtractive color technology, lenses can be made to match or contrast with the body color for styling purposes yet function as a combination signal lighting module when the lights are on.

Recently CHMSLs (center high mount stop lamps) and appliques have made use of LEDs. The fast rise time of LEDs provides an added margin of safety by improving driver response time and potentially avoiding a rear-end collision. LEDs also provide increased styling freedom, low power consumption and long life. Neon is the latest light source to be used in automotive signal lighting. Like LEDs, neon offers a fast rise time, increased styling freedom, low power consumption and long life.

Plexiglas® ACRYLIC COLOR DESIGN DATA

These graphs may be used to determine CIE 1931 illuminant-A chromaticity coordinates and luminous transmission for lenses molded from colored Plexiglas® acrylic resin.



Start by drawing a vertical line corresponding to the application path length (use lens thickness for a simple lens or 2X overall thickness for a reflex lens) through the color curve of interest. The intersection of this line by the Plexiglas® color curve indicates the luminous transmission and chromaticity coordinates for the lens. This process can be performed in reverse order to find the specific color or application thickness that satisfies a given requirement.

Data for additional colors are available upon request.

Headquarters Americas
Altuglas International
Arkema Inc.
2000 Market Street
Philadelphia, PA 19103
T 215.419.7000
F 215.419.5512

Arkema Canada Inc.
700 Third Line
Oakville, ON
L6J 5A3
T 905.847.4789
800.567.5726
F 905.825.9296
mauricio.fernandes@arkema.com

Detroit Office
Altuglas International
Arkema Inc.
1786 Hidden Valley Drive
Milford, MI 48380
T 248.887.2245
F 248.887.0452

Arkema Quimica Ltda.
Av. Ibirapuera 2033
Sao Paulo, SP
04029-901
T +5511 2148 8562
F +5511 5051 4780
carlos-de.lion-neto@arkema.com
plexiglas.brasil@arkema.com

Arkema Mexico SA de CV
Via Gustavo Baz 2160 Edif 3
54060 Tlalnepantla, Mexico
T +55 5002 7115
F +55 5002 7137
agustin.xoconostle@arkema.com
Monterrey:
Hidalgo 444-A, Col. Centro
66050 Escobedo, N.L.
T +81 8058 1903
F +81 1367 0968
teresa.lopez@arkema.com
T +55 5002 7130

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