Altuglas International
Automotive
Acrylics

High Efficiency Light Guide Design

Automotive light guides made from PLEXIGLAS® V825 acrylic resin offer:

- Increased light transmitting efficiency.
- High heat resistance.
- Versatility of assembly design.
- Reduced system cost.

Automotive light guide applications demand a combination of exceptional optical clarity, high heat resistance, moldability, high surface hardness and assembly versatility. PLEXIGLAS V825 acrylic resin from Altuglas International meets these demands.

PLEXIGLAS V825 resin offers clarity unsurpassed by any other thermoplastic molding material. Its low extinction coefficient permits efficient light transmission over an extended distance. This efficiency allows the designer to minimize lumen input while maintaining the required illumination thereby reducing cost and energy requirements.

PLEXIGLAS V825 provides long term service at elevated temperatures. With a maximum service temperature of 100°C, it can satisfy the most demanding light guide applications.

PLEXIGLAS V825 is processed at temperatures significantly lower than polycarbonate, thereby improving process economics and extending tool life. Its melt rheology permits the molding of difficult-to-fill, intricate and long path length parts.

The high surface hardness of parts molded from PLEXIGLAS V825 offers the best scratch resistance of any clear thermoplastic resin used in light guide applications.

PLEXIGLAS resin provides flexibility in attachment design. A variety of welding (sonic, ultrasonic, spin, and hot plate), cementing, screw fastening, or snap fitting techniques may be used to join like or dissimilar materials.

Its optimum balance of properties, low cost, and processing efficiency make PLEXIGLAS V825 the most cost effective material for light guides.

All Altuglas International resin production facilities carry the QS 9000/ISO 9002 certification. This assures that when PLEXIGLAS resins are specified, you receive the quality your application demands.

Altuglas International offers a staff of engineers ready to assist you with design, material selection and processing recommendations.

For more information on PLEXIGLAS acrylic resin, call **1-215-419-7506**

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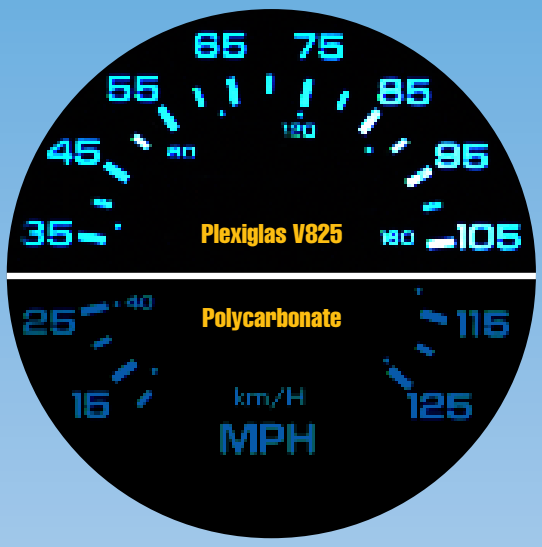
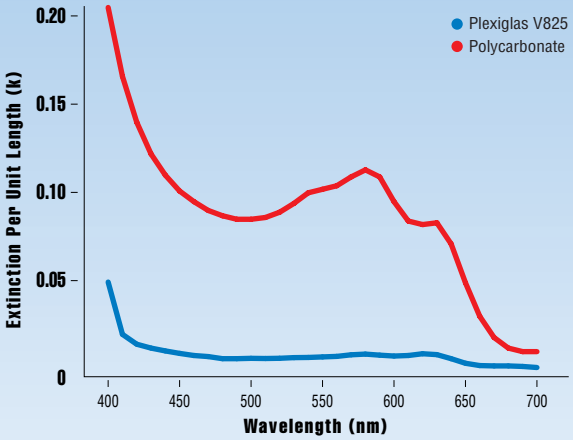
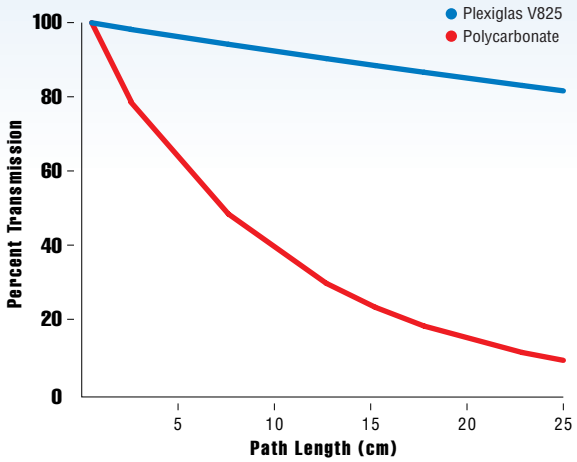


The composite photograph to the left illustrates the visual performance difference in identically illuminated subdials molded from Plexiglas V825, and polycarbonate. The lower light transmission of polycarbonate results in a reduced illumination level relative to the level achieved with Plexiglas V825.

I Internal Spectral Extinction Coefficient



II Internal* Transmission vs. Path Length (@ 555** nm Wavelength)



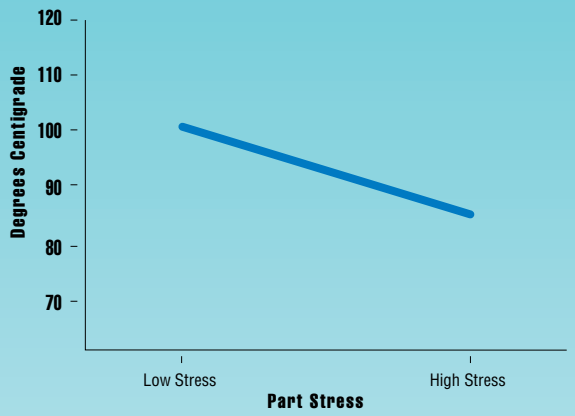
* Does not include surface reflection losses
** 555 nm is the wavelength of light to which the eye is most sensitive

I Internal Spectral Extinction is a useful property for comparing the light transmitting efficiency of polymeric materials. It is independent of length and is a function of the material alone. A high extinction coefficient equates to high absorption or poor light transmission. Internal absorption can be estimated from the extinction coefficient (k) using the following relationship:

$$\text{absorbance}_{(nm)} = \text{path length} \times (k)_{(nm)}$$

II The low extinction coefficient of PLEXIGLAS V825 allows efficient light transmission throughout the full spectrum of visible light. Over a 16 cm optical path length, PLEXIGLAS V825 resin can internally transmit 4 times more light (@ 555 nm) than polycarbonate. This increased light transmission allows designers to minimize light input requirements thereby simplifying and reducing the cost of a given lighting system.

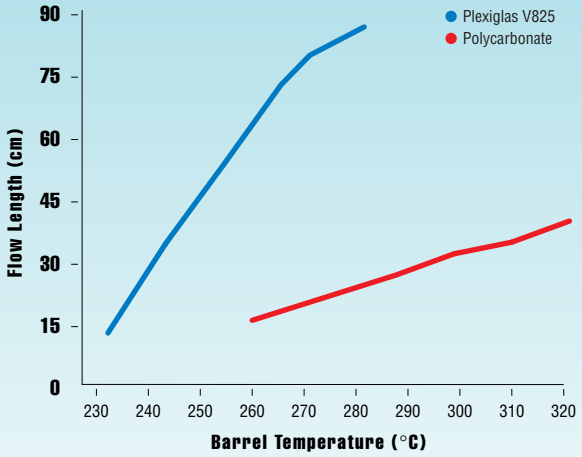
III Maximum Service Temperature* of Plexiglas V825



* For incandescent light source conditions

IV Spiral Flow at Maximum Injection Pressure

(2 mm deep x 15.9 mm wide channel)



III The maximum service temperature of light guides molded from PLEXIGLAS resin is a function of part stress. As stress increases, the maximum service temperature of the part decreases. Optimal service temperature is obtained through good design practice and low stress molding conditions.

IV PLEXIGLAS V825 resin has good flow properties over a wide range of melt temperatures. The filling of complex molds is possible by adjusting melt temperature, fill speed, and injection pressure.

I The weldability of polymeric materials is primarily dependent on molecular structure and melt temperature. Amorphous thermoplastics such as PLEXIGLAS acrylic resin are well suited to various welding techniques. PLEXIGLAS V825 has excellent compatibility with a variety of resins commonly used in automotive applications.

Tables II and III are provided as general guidelines for use in light guide design. For more specific information or design assistance, contact an Altuglas International representative.

I Welding Compatibility*

Material	Plexiglas V825	PC
Plexiglas V825	Excellent	Fair
PC	Fair	Excellent
ABS	Excellent	*Poor*
SAN	Excellent	*Poor*
PS	Good	*Poor*

*Compatability refers to ultrasonic, sonic, and spin welding techniques. Generally, all combinations may be hot plate welded.

II Mechanical Assembly of Plexiglas Resin

Type	Recommended Guideline
Screw Assembly	
Preferred Screw Type	Thread Cutting
Boss Outside Diameter	≥2x Major Diameter of Screw
Pilot Hole Diameter	0.9x Major Diameter of Screw
Snap Fit Assembly	
Permissable Deformation	2% in Flexure

III Design Information

Property	Plexiglas V825	PC
Refractive Index, N_D	1.49	1.59
Critical Angle for Internal Reflection	42.2	39.2
Surface Hardness (Rockwell M-Scale)	97	75

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Plexiglas resins are combustible thermoplastics. Observe fire precautions appropriate for comparable forms of wood and paper. For building uses, check fire code approvals. Impact resistance is a factor of thickness. Avoid exposure to heat or aromatic solvents. Clean with soap and water. Avoid abrasives.

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