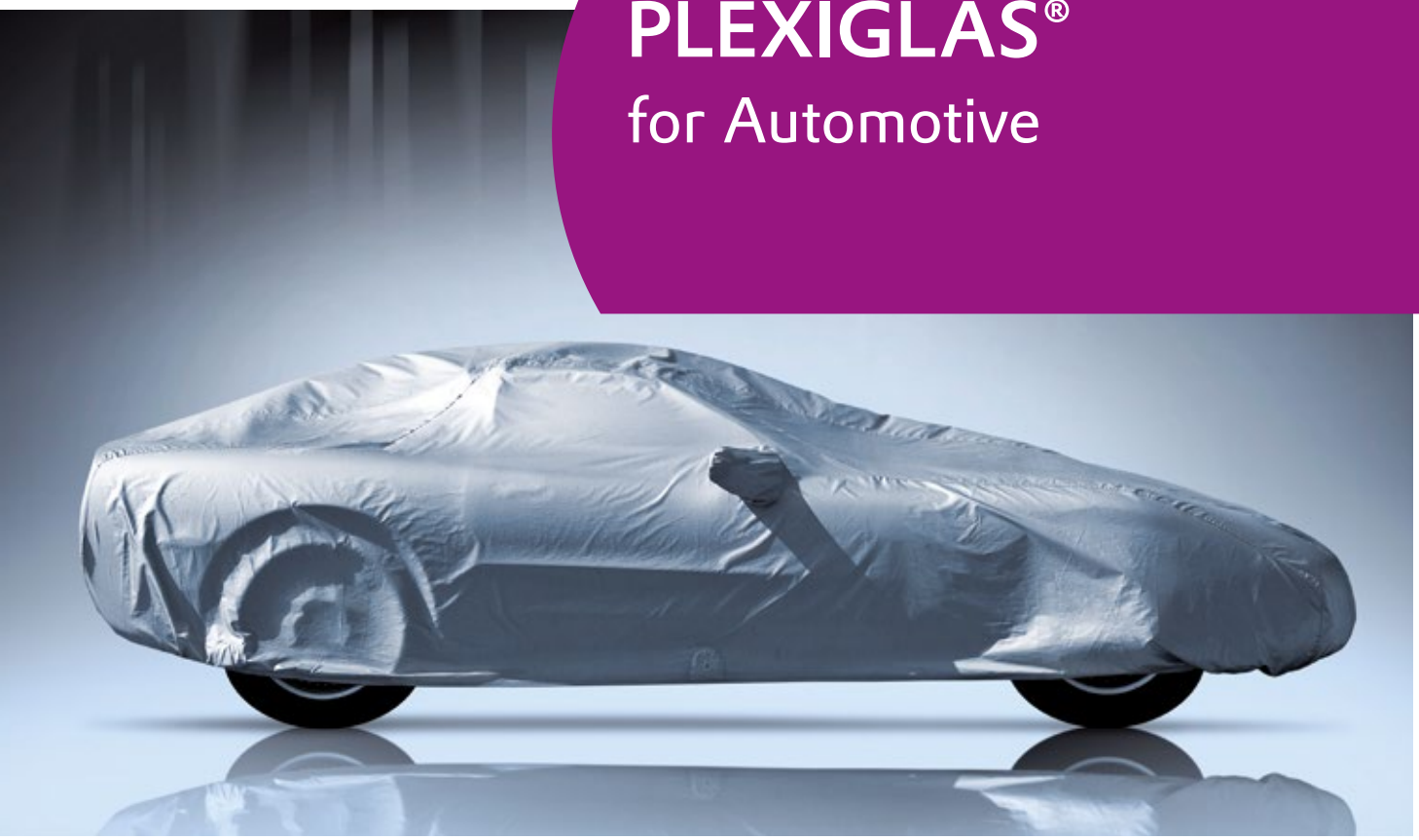
EVONIK INDUSTRIES

PLEXIGLAS®
for Automotive



PLEXIGLAS®

Evonik. Power to create.

Discover the elegant lightness of driving

Automobiles are often more than just a practical means of travel. They are both a means of transport and a status symbol all wrapped into one product. Few people are willing or able to do without their own vehicle. Changing requirements by both drivers and governments make new challenges for automobile designers and manufacturers. This in turn can create the need to find new innovative automotive materials.

Demand for fuel-efficient models is rising, caused by environmental concern, and a desire to save money. This need cannot come at the expense of performance, functionality or design.
Vehicle weight reduction offers great savings potential. The lighter the car, the lower the fuel consumption will be.

Models of the future will have to be lighter in weight, just as safe, comfortable and powerful. This applies both to conventional vehicles and even more so to the growing electromobility segment. Despite all efforts to produce "green" cars, design remains crucial if customer demands are to be met.

High-end interiors, stylish exteriors and light weight: PLEXIGLAS® helps to fulfill these requirements. The material opens up new dimensions in lightweight automotive construction. In optical applications, it offers convincing transparency and is also easy to process into various shapes and forms.

We at Evonik are among the world's leading suppliers of PMMA and acrylic products. When developing products for the automotive sector, Evonik can call on its expertise in other application areas such as in architecture or lighting. These experts regularly exchange their knowledge and transfer ideas and concepts to other market segments. Evonik's products and know-how are available everywhere, either directly or via a global distributor network.

Come to us to rev up your developments!

As chic as can be

From nifty little microcars to luxury limousines and lean, mean machines, customers attach great importance to the external appearance of their cars, whatever technical advantages the engine has to offer. Design is decisive, in terms of colors, shapes and surfaces.

These give cars their individual look and give buyers the chance to put together their personalized model. They also enable carmakers to develop their own design series. PLEXIGLAS® offers innumerable options for modeling a vehicle's appearance.

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PLEXIGLAS®
creative wealth of colors

Individuality is a powerful argument for selling cars. From sober elegance to colorful lifestyle design, a car's interior gives it character, supports brand recognition and makes the driver feel good. It satisfies both trendy first-time car owners, who expect colorful design, and owners of luxury limousines, who set great store by understated elegance. PLEXIGLAS® injects life and color into instrument panels, center bezels, pillar panels, trim strips, interior mirrors and many other non-transparent automotive applications.

Its wide range of color is a key design feature. Since the material is absolutely colorless in its original form, it can be precisely colored in any desired hue. In addition, it is available in three versions: transparent, translucent and opaque. Designers can give free rein to their ideas, from a cheerful riot of color to unobtrusively chic décor.

The results are made to last: PLEXIGLAS® has excellent resistance to weathering and aging. There is no yellowing or embrittlement. The colors stay true for many years, due to the material's inherent UV stability. Long-term quality is guaranteed, this is a prominent selling point of this material.

Another benefit for automakers: injection-molded components with molded-in color are economical and environmentally friendly to produce. There is no further need for painting or laminating, which saves up to 40 % of a component's costs, since the plastic part is ready for installation as soon as it leaves the mold.

PLEXIGLAS®
versatile surfaces

First impressions are crucial. Buyers must find the car interior esthetically pleasing at first glance. What counts is not just the choice of color but also the surface. With its high-gloss, matte or finely textured surfaces, PLEXIGLAS® leaves car designers a choice between entirely different effects that therefore help to support the intended product's image.

High-gloss (Class A)-PLEXIGLAS® surfaces provide a significant depth of color and lend a particularly classy appearance to pillar panels. Satin surfaces appear somewhat more matte and understated. If the material is to be finely textured, the extremely accurate mold surface reproduction of PLEXIGLAS® is essential to prevent optical disturbances from spoiling the effect.

While drivers are impressed by the surface appearance; they are not disappointed by its touch either. The pleasant haptic properties of PLEXIGLAS® make components feel just as warm and high-class as they look.

PLEXIGLAS® is extremely tough which makes for lasting beauty. It has the greatest surface hardness of all thermoplastic materials.

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PLEXIGLAS®
in excellent shape

From curved lines that follow each other or straight edges that stand in sharp contrast, every automobile manufacturer has its own distinctive design expression. The expression can convey, elegance, practicality or a specific lifestyle. PLEXIGLAS® is the ideal material for creating individual shapes and forms.

It is extremely easy to machine and fabricate and provides freedom of design in many sizes by means of all thermoplastic forming processes. The manufactured parts can also be subsequently treated by sawing, routing, drilling or polishing.

PLEXIGLAS® parts offer high dimensional stability that is not affected by temperature extremes. Cars are exposed to cold temperatures in winter and high heat conditions in summer. Decorative panels made of PLEXIGLAS® keep their shape despite exposure to temperature extremes.

PLEXIGLAS®
noble appearance

Glossy surfaces give car interiors a stylish appearance, while colored elements add attractive touches. For even more individual design, there are decorative films that look especially elegant, for example when used on trim strips with a warm wood effect. PLEXIGLAS® is the ideal material whatever the intended impression. There is virtually no end to the options for obtaining different nuances of color and texture.

The material's excellent surface hardness and scratch resistance provide assurance that high-gloss or matte surfaces retain their shape and appearance for many years to come.

PLEXIGLAS®
sends signals

Whatever the design requirements, the functionality and practicality of a car interior must take precedence. A variety of switches and buttons need to be labeled, including warning lights, ABS and seat heating controls. The lettering has to match the model and brand image.

PLEXIGLAS®, makes this simple. The trademarked PMMA can be printed using all conventional processes with excellent results. The printing can be used for lettering or for surface décor.

PLEXIGLAS® provides solutions

While a car's first impression is dependent on appearance, safety is also a crucial consumer concern. In many areas of automotive construction, PLEXIGLAS® combines the highest design standards with the best functionality. Non-transparent, high-gloss elements made from this PMMA brand have become indispensable in many car models.

As side window channels, they blend in with the car body, enabling harmonious design combined with precise guiding of the window pane.

PLEXIGLAS®
for relaxed driving

PLEXIGLAS® not only looks good, it enables a clear distortion-free view. There are no irritating reflections or optical distortions. Drivers have a clear view of the instrument panel. Non-transparent roof elements and glazing made of PLEXIGLAS® also help to make driving a pleasant experience. The material is sound-absorbing and reduces the volume of sound inside the car, even in heavy rain.

PLEXIGLAS®
resistant and durable

Most vehicles are subjected to permanent use and permanent stress. It is important that they withstand wear and tear. Cars are sometimes used to transport cumbersome objects, and the area around the ignition lock gets scraped by the ignition key. PLEXIGLAS® withstands this rough treatment.

The material has the greatest surface hardness of all thermoplastics which assures good properties in use. PLEXIGLAS® is also well protected against detergents and other environmental influences by its good chemical resistance, and can be safely exposed to fuel, acid rain and even aggressive bird droppings.

Its inherent UV resistance offers further protection. The material shows no yellowing or embrittlement.

If the vehicle is to satisfy particularly extreme requirements, the CoverForm® system solution (www.coverform.de) is recommended. This economical process enables the production of molded parts with an additional scratch- and chemical-resistant coating in just one operation.

PLEXIGLAS®

seeing and being seen

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When it gets dark, light is a crucial factor for cars. At night, headlamps show what is ahead. The speedometer can be read thanks to a backlit display. Cars on the road brake in response to the taillights of the car in front of them. PLEXIGLAS® is the ideal medium for displaying light. It is not only the light source that is important, but also the signal effect produced by light guides, lenses and light covers.

The high transparency of PLEXIGLAS® is decisive for a clear view. Its excellent light-guiding properties work well for instrument panel lighting, for instance onboard computer displays which take advantage of the material's non-reflective appearance and its ability to provide uniform backlighting. It also makes a good impression in ambient lighting and spotlighting by use of LED lighting with a variable control. Muted and evenly distributed luminance, combined with pleasant colors in freeform surfaces or subtle lines in the interior, makes the cabin occupants feel at ease.

Headlamps give cars their unmistakable "face". But apart from meeting demands for attractive design, they also have to be efficient and equipped with variable functions. Modern LED technology combined with intelligent sensors and sophisticated optical lens systems sets the standards in this field. Adaptive lights for variable headlamp range control depending on driving speed and ambient conditions are one example. The innovative headlamp designs often place high demands on the lens material – depending on their construction and the LED grades used, the lenses have to withstand very high temperatures for long periods of time.

No problem for PLEXIMID® and other PLEXIGLAS® molding compounds with higher heat deflection temperature under load. Headlamp lenses made from this specialty molding compound on a PMMA base stay clear and light-transmitting even at sustained high temperatures. This prevents diffusion losses.

PLEXIGLAS®
safety on the road

For driving safety at night is very important having good visibility and being visible to others. Headlamps help the driver see what is ahead. Being visible to others is often dependent on turn signal lamps, brake lights and taillights. Over the years, light sources on vehicles have developed from purely functional elements to unmistakable design features providing branding on every car. Whether crystal clear, transparent or translucent colors, PLEXIGLAS® offers excellent light transmission, great design freedom and durability.

PLEXIGLAS® can also be colored in standardized signal colors that withstand weathering and UV radiation. The blue and red warning lamps on emergency vehicles, aircraft position lights and reflectors on reflector posts all meet the same quality requirements.

PLEXIGLAS® has greater impact strength than glass and is therefore the safer option for automotive glazing. Transparent tints also protect drivers from glaring sunlight.

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PLEXIGLAS®
saves resources

Impact strength is not the only property that is important for car glazing. Besides stability, the glazing must not be too heavy.

Light weight saves fuel, reduces the environmental impact and cuts costs too. This is just one way in which PLEXIGLAS® helps to save resources

PLEXIGLAS®
lightweight solutions

While weight is an important consideration for cars with conventional drive systems, it is even more crucial for lightweight construction and the growing electromobility market. PLEXIGLAS® is the ideal material in this respect.

For non-transparent add-on car body parts such as mirror housings, pillar posts or roof elements, metal is now usually replaced by plastics. But glazing too can be made much lighter than conventional glass by using PLEXIGLAS®.

In addition to weight savings of 40 to 50 percent, the main arguments in favor of plastic glazing over conventional glass are freedom of design and the possibility of integrating various functions.

There are virtually no limits to glazing design with PLEXIGLAS®. The material can be freely formed by injection molding and all other thermoplastic processes, and is easier to machine than glass. This makes it possible to obtain curved or pointed shapes.

But the PLEXIGLAS® glazing offers a number of additional benefits, ranging from high break resistance, excellent transparency, very good weather resistance and pleasant acoustic properties.

PLEXIGLAS® components that unite several functions also contribute to attractive design, such as all-in-one elements consisting of non-openable windows, black pillar posts and taillights. Such combined components not only facilitate production and logistics by reducing the number of parts required, they also look more homogeneous than individual parts. At the same time, functional integration can help to reduce fitting depths.

Evonik offers a complete product portfolio of PLEXIGLAS® Resist molding compounds and solid sheets that are customized for vehicle glazing. It goes without saying that the scratch-resistant-coated glazing materials based on these specialty PLEXIGLAS® products are already certified to ECE R 43 for use in side, rear and roof windows.

PLEXIGLAS®
sustainable and environmentally sound

When we do have to say goodbye to our car one fine day, PLEXIGLAS® parts can be 100 % recycled, by chemical conversion back to the starting materials or by direct reuse.

To ensure the sustainability of our products, we have subjected them to a complete life cycle assessment from cradle to grave.

From production to recycling, the different environmental impacts of PLEXIGLAS®, including its greenhouse gas reduction effect due to the material's longevity, were determined and confirmed in this Life Cycle Assessment (LCA) in accordance with DIN ISO 14040ff.

PLEXIGLAS® also makes an essential contribution to reducing the burden on the environment during manufacture. According to recent calculations, the carbon dioxide equivalent is 3.8 kg CO_2 per kg of molding compound.

	Properties
Exterior Vehicle Lighting	
Light covers (rear light, turn signal)	UV-/weather-proof/color fastness, chemical-resistant, freedom of design
Light guides (rear light, headlight)	high optical clarity/transparency, good light guide ability, freedom of design
LED-Prefix-lense (headlight)	high optical clarity/transparency, good light guide ability, higher heat deflection temperature
High-mount brake lights	UV-/weather-proof/color fastness, freedom of design
All-around illuminaton	UV-/weather-proof/color fastness, freedom of design
Reflector, reflex reflector (warning triangle)	UV-/weather-proof/color fastness, freedom of design
Indication mark for outlining trucks	UV-/weather-proof/color fastness, freedom of design
Car body components	
A-, B-, C- Pillar covers	high-gloss (Class A) surface, brilliant color, light weight, freedom of design, cost efficiency (no subsequent coating), surface hardness, polishable, weather-proof
Mirror housing and mirror stem	high-gloss (Class A) surface, brilliant color, light weight, freedom of design, cost efficiency (no subsequent coating), surface hardness, polishable, weather-proof
Spoiler (Tail- and Side Spoiler)	high-gloss (Class A) surface, brilliant color, light weight, freedom of design, cost efficiency (no subsequent coating), surface hardness
Wind deflectors (passenger cars, trucks)	freedom of design, good impact-resistancy, UV-/weather-proof
Sun shades	light weight, freedom of design, good impact-resistance, UV-/weather-proof
Roof elements	high gloss surface (Class A), light weight, freedom of design, cost efficiency (no subsequent coating)
„Signs" (license plates, emblems)	good light-guiding properties, UV-/weather-proof
Glazing	
Side-/rear windows	wide freedom of design, functional integration options, low weight (up to 50 % savings potential), high resistance to UV light and weathering, pleasant acoustics
Roof modules	low weight (up to 50 % savings potential), improved stone-chip resistance, optimized passenger protection, UV-/weather-proof, pleasant acoustics
Windshields (motorcycle)	high impact strength, low weight (up to 50 % savings potential), UV-/weather-proof, high transparency
Dividing windows (interiors)	low weight (up to 50 % savings potential), high impact strength, high transparency
Roof openings/tilt and slide sunroofs (trucks, caravans)	low weight (up to 50% savings potential), UV-/weather-proof, pleasant acoustics particularly in the rain
Interior	
Instrument panels	high transparency, freedom of design, scratch resistant
Door entry ledge	good light-guiding properties, homogeneous light distribution
Decorative panels	high-gloss (Class A) surfaces, wipe-resistant, freedom of design, cost efficiency (no subsequent coating)
Interior Lighting	
Ambient lighting	good light-guiding properties, high light efficiency, freedom of design
Light guides	high opt. clarity/transparency, good light-guiding properties, high rate of use of light, freedom of design

Products, properties and applications

Molding Compound							PLEXIGLAS®	
PLEXIGLAS®	PLEXIGLAS® Resist	PLEXIGLAS® Heatresist	PLEXIGLAS® LED/Satinice	PLEXIGLAS® Hi-Gloss	PLEXIMID®	CoverForm®	Sheet	Film
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® = registered trademark

PLEXIGLAS is a registered trademark of
Evonik Röhm GmbH, Darmstadt, Germany

Certified to DIN EN ISO 9001 (Quality) and
DIN EN ISO 14001 (Environment)

Evonik Industries is a worldwide manufacturer of PMMA products sold under the PLEXIGLAS® trademark on the European, Asian, African and Australian continents and under the ACRYLITE® trademark in the Americas.

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