



ACRYLITE® LED light guiding edge lit Extruded Sheet



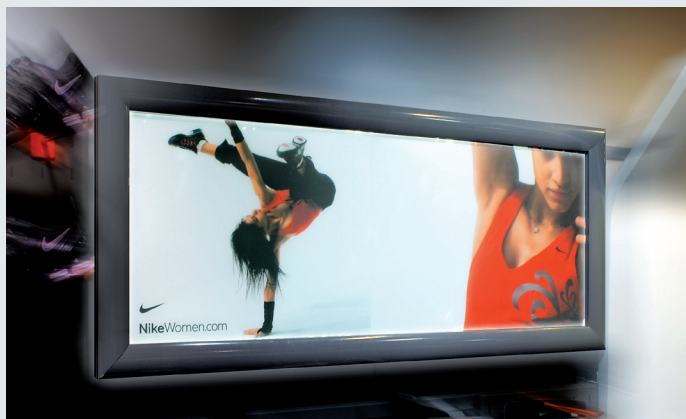
Product

Whether it's in sheet or rod form, ACRYLITE® LED light guiding edge lit shines over the entire surface. When light is introduced at the edge of the products, the patented light guiding material evenly distributes the light across the entire surface. ACRYLITE® LED light guiding edge lit is a transparent colorless material offered in various grades and thicknesses.

Properties

ACRYLITE® LED light guiding edge possesses the following properties:

- Highly efficient light distribution via the perpendicular surfaces
- Uniform luminance across the panel simply by selecting the appropriate grade
- Simple to change panel sizes
- Surface structuring, etching or printing not needed
- Double surface illumination possible without adding materials
- Single surface illumination possible with white reflective material on backside
- Crystal clear material allowing the viewer to see through the panel
- Brightest light rays directed perpendicular from panel surface



Product Applications

Typical applications for ACRYLITE® LED light guiding edge lit include:

- Thin profile single or double sided poster walls, menu boards, and signs for advertising
- Transparent illuminated partitions
- Decorative ambient light panels or rods for architecture and interior design
- Ultra-slim architectural luminaires





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Transparent Applications

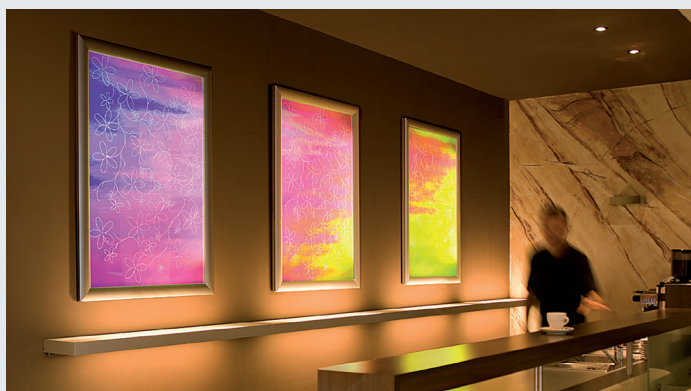
ACRYLITE® LED light guiding edge lit is the ideal material for evenly illuminating a transparent surface with LEDs. The surface glows in the same color as the chosen LED. If no light is fed in, the material offers a clear view without any disturbing optical effects caused by clouding, halftone printing or inscribed textures. This makes it perfectly suited for architecture and design, furniture, store fixtures or exhibition booths. It can be used for example as an illuminated partition or door infill panel, or for ambient lighting.



Transparent application with and without light

Non-transparent Applications

In non-transparent applications, ACRYLITE® LED light guiding edge lit is the ideal material for very slim, large-scale luminous displays and picture frames, luminous ceilings and walls, city light posters and many other uses. In the applications shown here, light is fed in via the edge of the ACRYLITE® LED light guiding edge lit sheet.

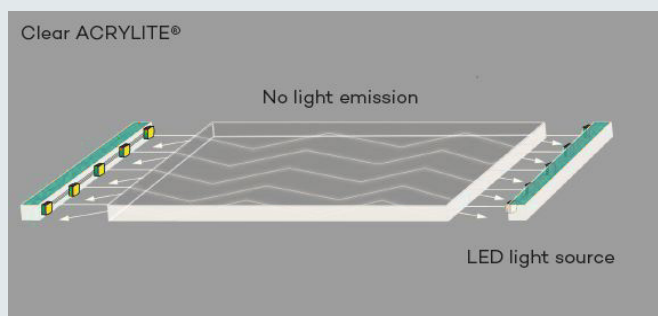


ACRYLITE® Reflections iridescent is used as the patterned sheet

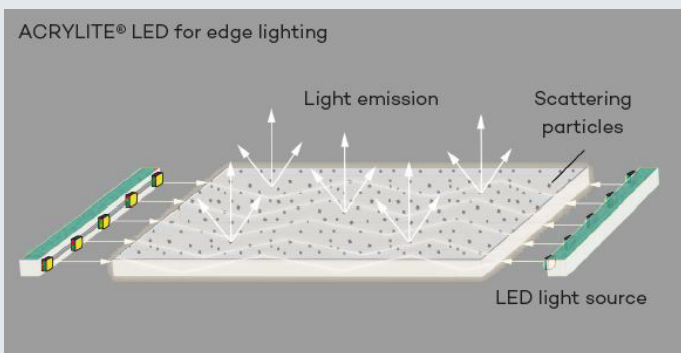
Mode of Operation

Operating Principle

The clear light-diffusing particles embedded in the PMMA deflect the light rays entering the sheet edge. Total internal reflection in the light guide is suppressed, allowing light rays to exit the sheet via the surfaces in a controlled manner. This effect provides a uniformly glowing surface.



Clear ACRYLITE® acrylic conducts light by means of total internal reflection. Light rays remain inside the sheet only exit via the edges.



The diffuser particles embedded in ACRYLITE® LED light guiding edge lit sheet deflect light rays and suppress total internal reflection. Light rays can exit the sheet via the surfaces too.



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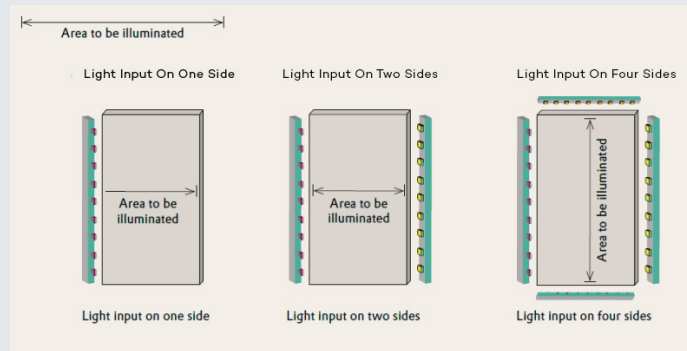
Material Properties

Area to be Illuminated

Depending on the size of the light guide, there are different versions of ACRYLITE® LED light guiding edge lit available.

In order to determine the size of the light guide, it has proved useful to define the area to be illuminated.

Drawings Define the Illuminated Areas



Product Range

	SM OE010 SM	L OE011L	XL OE012XL	XXL OE013 XXL
Single sided edge-lit (inch)	Up to 6"	6-12"	12-24"	24-39"
Two or Four sided edge lit (inch)	Up to 12"	12-24"	24-48"	48-78"
Sheet Thickness (inch)	.157" (4mm) .236" (6mm) .315" (8mm) .394" (10mm)	.157" (4mm) .236" (6mm) .315" (8mm)	.157" (4mm) .236" (6mm) .315" (8mm) .394" (10mm)	.315" (8mm) .394" (10mm)
Rod diameter (mm)	-	0.787" (20mm) 1.574" (40mm)	0.787" (20mm) 1.574" (40mm)	0.787" (20mm) 1.574" (40mm)

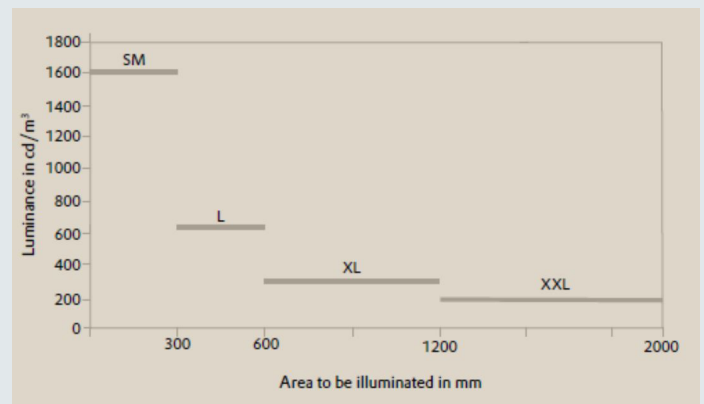
NOTE

- Standard sheet size is 49"x97". Custom sizes and thicknesses upon request
- Recommended for applications with or without graphic overlay
- Reflective edge tape opposite LEDs recommended

Luminance

Depending on the size of the light guide, various grades of ACRYLITE® LED light guiding edge lit are offered. The diagram below shows the average luminance values*.

Average luminance of ACRYLITE® LED light guiding edge lit grades*

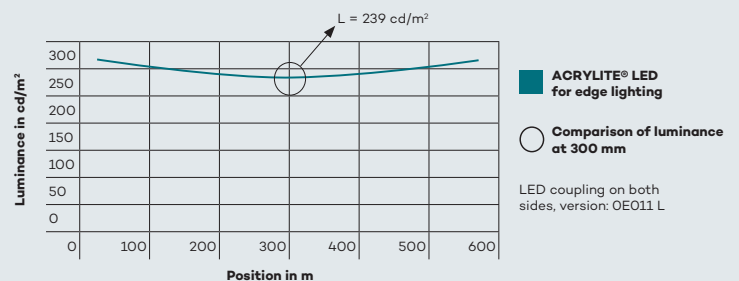


*the graphs in the diagrams above are based on values measured with a one-sided light input of about 1,734 lm/m.

*with lighting on both sides (light input on one side: 1,734 lm/m), using a reflector and a white poster

Grades SM and L provide higher luminance than grades XL or XXL, since the same amount of light that is fed in at the edge is distributed across a smaller surface.

In order to achieve optimal and uniform luminous efficiency, it is very important to use the recommended grade of ACRYLITE® LED light guiding edge lit (SM to XXL).



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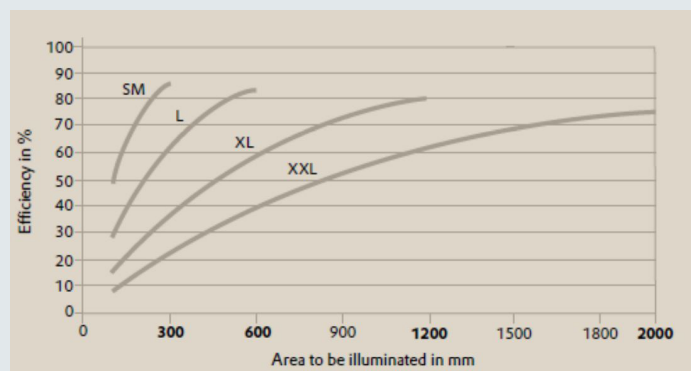
Efficiency and Uniformity

Efficiency describes how much input light is emitted across the surface.

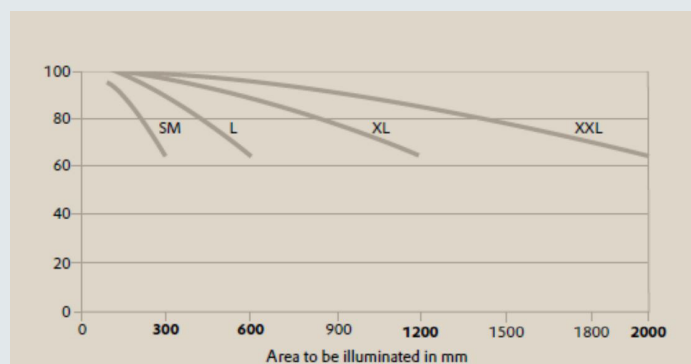
Uniformity refers to even illumination of the sheet, i.e. the relationship between minimal and maximal luminance.

The diagrams show the values measured at the recommended maximum lengths of the respective grades. Measurements show that uniformity and efficiency move in opposite directions, and the grades were optimized correspondingly. Since the human eye perceives brightness logarithmically, it cannot recognize differences less than about 30%.

Efficiency*



Uniformity L_{min}/L_{max} *



Forming & Processing

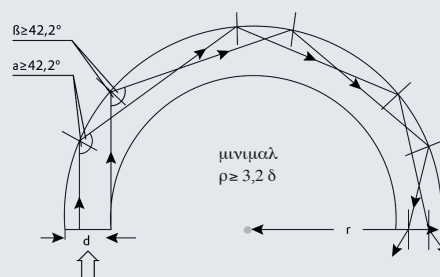
The product can be machined with the same parameters and equipment as ACRYLITE® premium.

ACRYLITE® LED light guiding edge lit can be thermoformed, e.g. curved (see figure below). The lighting properties remain more or less intact. It should be ensured that the radius of curvature r does not fall below the critical value for the given material thickness d . Light rays that are fed into the edge closer to the center of the curvature impinge on the surface at an angle that is smaller than the critical angle of total internal reflection, due to the curved surface.

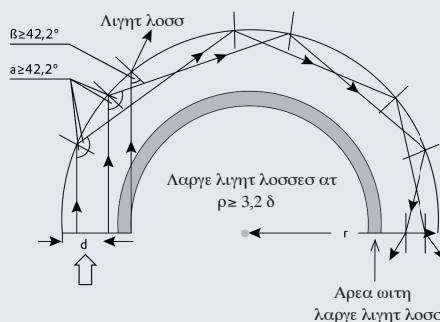
This means the light is not conducted into the sheet at this point, but involuntarily passes across the surface to the outside. At this point, the surface shines brightly, whereas this light is missing further from the point of light input and can no longer reach the surface via the diffuser particles. This may result in an unevenly lit surface.

The following formula therefore has to be borne in mind:

Math. limit value: $r \geq 3.2 \cdot d$



In practice, we recommend a curvature radius of $r \geq 6 \times$ material thickness





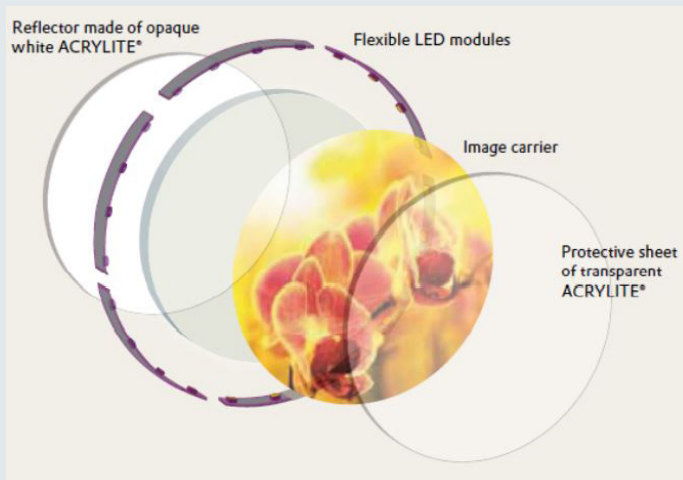
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Free forming

Both rectangular and round displays can be fabricated. Consideration should be given, however, to the mechanism used by the light guide to conduct and distribute the light so that it is uniformly emitted towards the front. This is easy to establish with ACRYLITE® LED light guiding edge lit because the material does not use any patterns in order to achieve the diffusion effect, and the direction of light input is therefore irrelevant.

The diffuser sheet only has to be cut in the same shape as the front display. See page 6 for recommended materials.

In these cases, it is best to use LED modules as the light source. These are mounted on flexible strips to follow the contour of the sheet. This makes it possible to simply feed the light into the edge of the diffuser sheet.



Indications for optimal use of ACRYLITE® LED light guiding edge lit

Transparent Applications

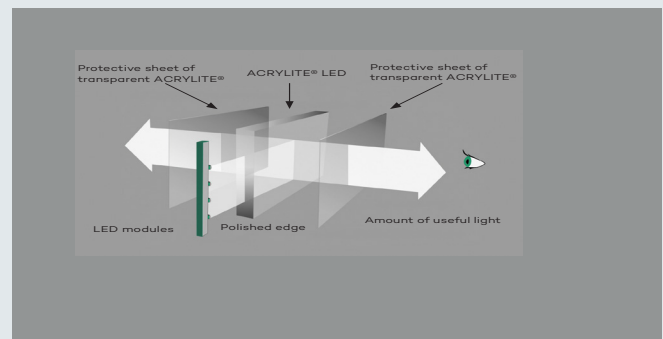
Greater brightness in transparent applications

ACRYLITE® LED light guiding edge lit contains specially optimized diffuser particles that deflect light rays much more effectively than other diffuser particles. This causes light rays to exit the sheet surface of the light guide at a much more vertical angle.

Light Emission and Structure

For transparent applications, all the edges of the illuminated sheet can be clamped in an aluminum frame, for example. The sheet must be covered especially at the points where light is fed in so that the LED strips cannot be seen.

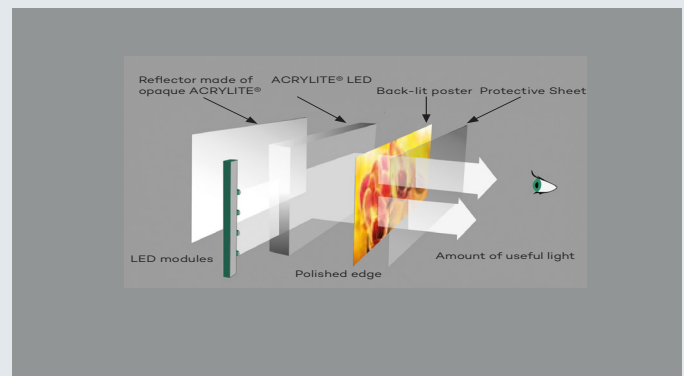
There is no need to use a reflector or diffuser in transparent applications. The light therefore exits both sheet surfaces.



Optimized structure of a transparent application

The light-guiding function ACRYLITE® LED light guiding edge lit may be disturbed by soiling on the sheet, e.g. finger marks, but also by surface scratches or sanding/sand blasting.

Light is refracted at these points and is therefore emitted more strongly. To prevent this, an abrasion resistant coating can be added to one or both sides of the sheet. Since this protective coating does not influence the light-guiding function of ACRYLITE® LED light guiding edge lit, soiling or scratches do not show through.



Poster backlighting



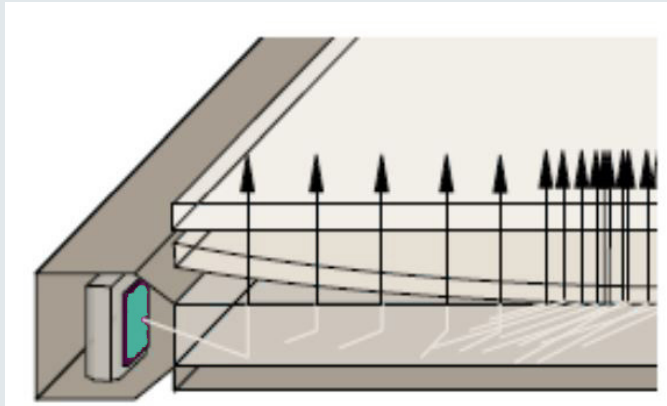
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Structure

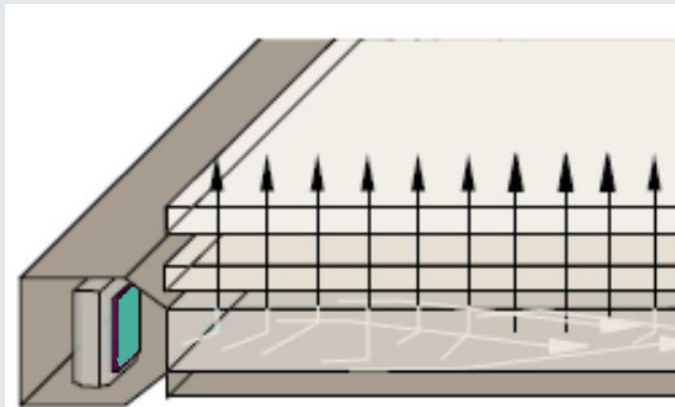
The figure on the previous page shows the optimized structure of an illuminated advertising sign that emits light on one side. This type of structure maximizes the amount of useful light, i.e. the light that is not lost by premature emission at the edges or the surface, in non-transparent applications.

Application of the Image Carrier

The covers or image carriers must not be bonded or laminated onto the entire surface of the ACRYLITE® LED light guiding edge lit, because optical contact would produce disturbing brightening or darkening effects. The correct spacing should therefore be observed during construction.



Optical contact: Sheet/poster: optical disturbances



No optical contact: Sheet/poster: light is only emitted through the ACRYLITE® LED light guiding edge lit sheet.

Even a drop of water (see picture below) can impair light emission and lead to irregular brightening. The light output is always balanced, i.e. to achieve uniform distribution, light is lost in other places. That means a poster may be placed on the sheet, but should not be bonded to it!



Impaired light emission caused by water droplets

Recommended Materials to work with ACRYLITE® LED light guiding edge lit

Material	Company	Product	Website
LED Strips	International Light Technologies	ILT-FLX350-OS50 ILT-FLX350-OS40	www.intl-lighttech.com
White Reflective Backer	Various	Polystyrene * ACRYLITE® premium WT020 * White Optics F23	-
Edge Reflective tape	Find Tape	JVCC MPF-01 Metalized Polyester Film Tape (Reflective) Color: Silver	www.findtape.com
Aluminum Frames	Signcomp	U Channels	www.signcomp.com

*Distributed by most ACRYLITE® Distributors

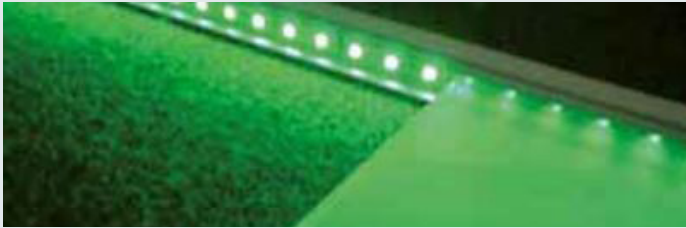
Additional ACRYLITE® Recommended Materials

Item	Product	Product Description
Reflective back sheet (opaque, white)	ACRYLITE® WT020 GT ACRYLITE® Hi-Gloss 7M807 C1	Reflector side white, reverse silver
Diffusers instead of Back-lit Poster + Protection	ACRYLITE® Satinice WD008 DF ACRYLITE® LED optimized WH14 ACRYLITE® Satinice OD010 DF	White appearance White appearance High efficient light scattering
Transparent protective	ACRYLITE® Optical OA000 MR1 ACRYLITE® OA000 GT	Mar-resistant Premium

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Indications on edge lighting with LEDs

Unlike fluorescent tubes, LEDs are spot-shaped light sources. This means that the points at which light is fed in are brighter, though this brightness fades again after a few millimeters. The frame system should therefore cover this area.



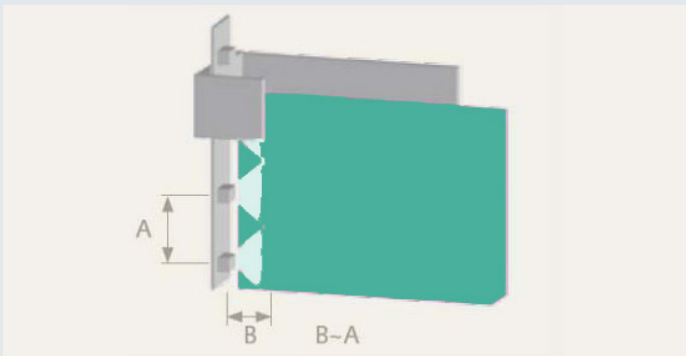
A Practical Rule for Using LEDs

The cover should be as wide as the spacing between the LEDs. As a rule, LEDs emit light at an angle of $120^\circ - 140^\circ$.

Example:

If the space between the LEDs is 25mm, the frame should be about 25mm wide to cover the light source.

The LEDs should be installed as close to the edge as possible to ensure optimal light input.



Polishing the Material Edges

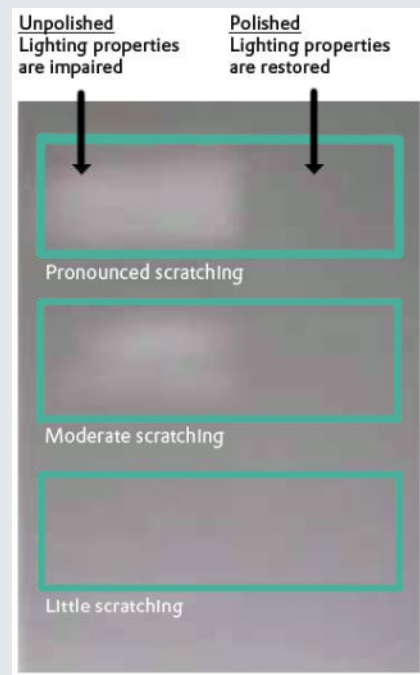
All edges should be polished. To minimize diffusion losses during light input, rough edges are smoothed by means of diamond milling cutters or flame polishing. Laser-cut edges require no further polishing.

Treating Surface Scratches

Scratches can be completely removed from ACRYLITE® LED light guiding edge lit by polishing.

If the surface is damaged due to external influences, more light is emitted and uniform light distribution is impaired (see lighter spots in the picture on the right).

Polishing makes it possible to completely restore the optical properties of ACRYLITE® LED light guiding edge lit. Light is once again uniformly distributed in the sheet.



Optimal Use of Light With ACRYLITE® LED light guiding edge lit

Important Information At a Glance

- Complete functionality is only provided after removing the masking film
- To achieve optimal luminous efficiency, the suitable grade of ACRYLITE® LED light guiding edge lit (SM to XXL) should be used for the desired area to be illuminated – see page 3
- The thickness of the material should be greater than the width of the LEDs to assure optimal light coupling



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- Bonding, laminating and printing on the front or back-side surfaces impair the lighting properties of ACRYLITE® LED light guiding edge lit and therefore create non-homogenous illumination – see page 6
- All edges should be polished or a laser-cut method should be used to minimize diffusion losses – see diagram on previous page
- To avoid light losses via the unlit edges, they should be provided with a reflective surface, e.g. by painting the inside surfaces of the clamping profiles white
- The LEDs should be placed as close to the edge as possible for optimal light input
- In transparent applications, it is advisable to use transparent cover sheets to protect against surface scratching – see page 5
- In non-transparent applications, it is advisable to use a white reflective sheet – see page 2
- One weak link in an LED system design (such as poor LED selection or lack of thermal management) can cause the overall results to be less than optimal



Frequently Asked Questions

What are the advantages of LED technology?

LEDs are energy-efficient and save electricity. Their service life is over four times longer than that of fluorescent tubes. When their service life is over, all that happens is that their brightness slowly fades. There is no display failure. RGB-LEDs allow various color programs to be run. The light can simply be fed into the edge, and almost all the light passes into the sheet.

What can be the cause of undesired brightening at the edges? (Corona effect)

It should be ensured that light is only fed into the edge of the ACRYLITE® light guiding edge sheet, not into the image carrier, the cover sheet, diffuser sheet or reflective sheet.

ACRYLITE® LED light guiding edge lit has been completely installed, but is not uniformly illuminated when the light is switched on. The masking film is still in place to protect the sheet.

The masking film must be completely removed, and then the light will be properly distributed. The masking film impairs light guiding because of its optical contact with the surface.

What happens if I use the smaller grade (L) instead of the recommended grade (XL)?

Illumination is less homogeneous. Since the smaller grade was optimized for smaller surfaces, light no longer reaches the depths of the sheet. Brightness would decrease in the center. See page 3.

What happens if I use the larger grade (XXL) instead of the recommended grade (XL)?

Illumination is still homogeneous. Since the larger grade was optimized for larger surfaces, light will not be as bright as the smaller grade. See page 3.



ACRYLITE® LED light guiding edge lit

Extruded Sheet

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Fire Precautions

ACRYLITE® sheet is a combustible thermoplastic. Precautions should be taken to protect this material from flames and high heat sources. ACRYLITE® sheet usually burns rapidly to completion if not extinguished. The products of combustion, if sufficient air is present, are carbon dioxide and water. However, in many fires sufficient air will not be available and toxic carbon monoxide will be formed, as it will when other common combustible materials are burned. We urge good judgement in the use of this versatile material and recommend that building codes be followed carefully to assure it is used properly.

Compatibility

Like other plastic materials, ACRYLITE® sheet is subject to crazing, cracking or discoloration if brought into contact with incompatible materials. These materials may include cleaners, polishes, adhesives, sealants, gasketing or packaging materials, cutting emulsions, etc. See the Tech Briefs in this series for more information, or contact your ACRYLITE® sheet Distributor for information on a specific product.

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