



PLEXIGLAS® and EUROPLEX® Films for Face Visor Applications

General information on PLEXIGLAS® and EUROPLEX® Films for face visor applications

PLEXIGLAS® Films

PLEXIGLAS® Films for face visor applications are made of impact modified Polymethyl methacrylate (PMMA). Thanks to its glossy and extremely smooth surface, the film has an excellent graphic quality. Transparent PLEXIGLAS® films exhibit their outstanding optical properties in applications such as face visors. In addition the films can also be produced in various transparent colours.

PLEXIGLAS® Films are easy to cut by slitting and die-cutting methods. Due to its good flexibility, the films can be easily formed into face visors.

EUROPLEX® Films

EUROPLEX® Films are made of different polymers such as Polycarbonate (PC) or Polyphenylenesulfone (PPSU).

EUROPLEX® PC Film is a clear, transparent PC film. This film provides excellent impact resistance, heat distortion resistance and optical clarity. It also complies with the US Food and Drug Administration and EU food contact regulations.

EUROPLEX® PPSU Film shows excellent mechanical properties over a wide temperature range – also at low temperatures. Face visors manufactured from PPSU are virtually unbreakable. EUROPLEX® PPSU Film shows extraordinary chemical resistance for an amorphous material. This grade also offers decisive advantages in all applications with demanding requirements on tem-

perature resistance, chemical resistance or mechanical resistance. EUROPLEX® PPSU is already used in medical technology. It is particularly suitable, not only due to its FDA approval, conformity to ISO 10993 and USP class VI but also due to its property to withstand all common sterilization methods, amongst others, more than 1000 cycles of steam sterilization

Film Masking

All PLEXIGLAS® and EUROPLEX® Films are protected with a PE/PP based film masking on both sides. The films are also available with one side film masking or without any protective film.

Sustainability/Disposal

Another noteworthy feature that is increasingly gaining importance is that PLEXIGLAS® Film components can be recycled. The PLEXIGLAS® and EUROPLEX® PC face visors should be collected in domestic waste.

Cleaning

PLEXIGLAS® and EUROPLEX® Films can be cleaned using warm soap-water or special cleaners such as "Plano CLEAR" (www.planol.de/reinigungsmittel/gastronomieeiniger/allzweckreiniger-plano-clear.html).



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Film Grades

Product name	Thicknesses available [µm]	Remarks
PLEXIGLAS® Film 99524	175, 250, 375, 500, 750, 1000	Clear PMMA film with a smooth surface on both sides.
LJ 21123/126/C	250	Transparent gray PMMA film with smooth surface on both sides.
LJ 21123/126/E	250	Transparent yellow PMMA film with smooth surface on both sides.
LJ 21123/126/F	250	Transparent blue PMMA film with smooth surface on both sides.
LJ 21123/126/M	250	Transparent orange PMMA film with smooth surface on both sides.
EUROPLEX® PC Film 99501	175, 250, 375, 500, 750	Clear PC film with a smooth surface on both sides.
EUROPLEX® PPSU Film 99055	800	Clear PPSU film with a smooth surface on both sides, other thicknesses on request.

Technische Daten für PLEXIGLAS® Folien

Property	Test method	Unit	PLEXIGLAS® Film 99524 (250 µm)	LJ 21123/126/C	LJ 21123/126/E	LJ 21123/126/F	LJ 21123/126/M
Optical							
Transparent colour			clear	gray	yellow	blue	orange
Luminous transmittance (D65/10°)	DIN EN ISO 11664	%	> 91	23.2	61.4	36.6	48.1
Max. UVB-transmittance (280–315 nm)	DIN EN 410	%	< 10	0.03	0.04	0.04	0.66
Max. UVA-transmittance (315–380 nm)	DIN EN 410	%	< 50	0.07	0.06	0.07	0.27
Refractive index	DIN EN ISO 489		1.49	1.49	1.49	1.49	1.49
Mechanical							
Tensile yield stress (σ_y)	DIN EN ISO 527-3	MPa	> 54	55	55	55	55
Nominal tensile strain at break (ϵ_{tb})	DIN EN ISO 527-3	%	> 35	50	50	50	50



Technical information on PLEXIGLAS® and EUROPLEX® Films for face visor applications

Scoring and Breaking

PLEXIGLAS® and EUROPLEX® Films can be scored with a scribing knife along a ruler or a curve template with radii not too narrow, and then neatly broken. This method is popular among do-it-yourselfers, but also at construction sites if no other tools are available.

Cutting

PLEXIGLAS® and EUROPLEX® Films can be cut with a variety of common hand-held and table mounted sawing equipment. Attention must be paid to blade design and cutting speed in order to obtain high quality finish.

Circular Saws

The blade should be designed to minimize blade body rubbing during sawing. Fine tooth hollow ground blades and triple chip carbides are excellent choices and will yield a good quality surface finish. .

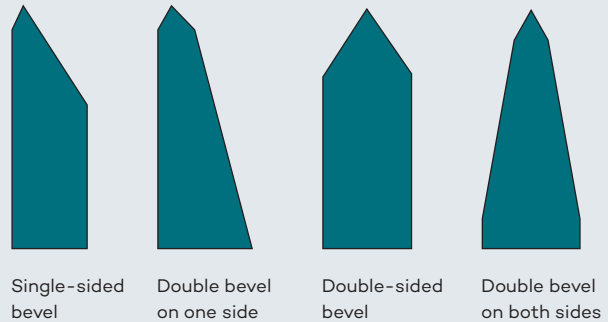
Die-cutting

For die-cutting of PLEXIGLAS® and EUROPLEX® Films, certain conditions must be satisfied to obtain good results:

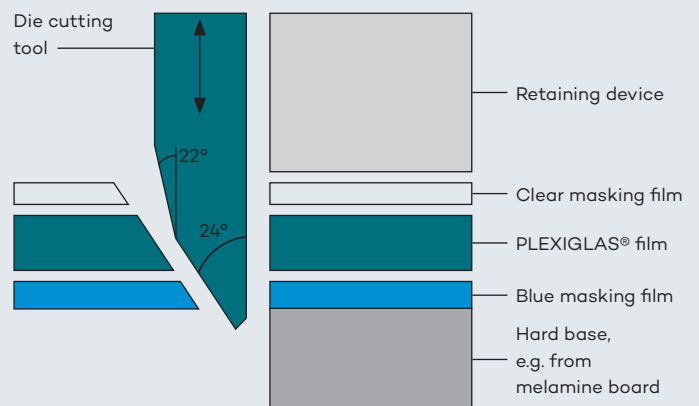
- Use of high-speed punch presses
- Use of dies with sharp, unchipped edges
- Die-cutting of PLEXIGLAS® and EUROPLEX® Films at room temperature or higher

A one-sided double bevel is the most suitable geometry for a die-cutting tool in die-cutting of PLEXIGLAS® Films.

Geometries for cutting tools



Structure of a die cutting unit



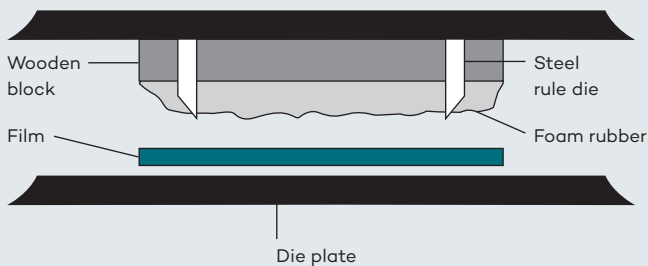


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Three options for die cutting PLEXIGLAS® and EUROPLEX® Films are described below:

Steel rule dies

Steel rule dies are not very suitable for die-cutting of PLEXIGLAS® and EUROPLEX® Films because they lead to fairly large tolerances of up to ± 0.2 mm. However, die-cutting with steel rule dies is a relatively cost-effective option.



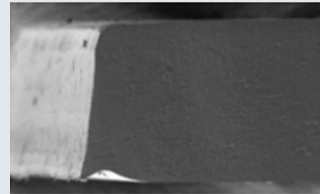
Column-guided tools with male and female dies

Column-guided tools with male and female dies attain a precision of ± 0.02 mm. Hydraulic presses are to be preferred here over eccentric presses. For good results with PLEXIGLAS® and EUROPLEX® Films, an accurately designed die clearance is necessary.

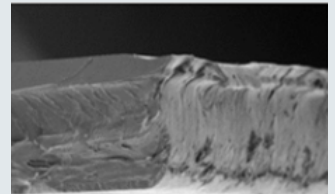
The die clearance should lie between 0.01 and 0.03 mm; larger die clearances lead to untidy die-cut edges. It is recommended in every case that the die-cutting tool be heated, with the set temperature lying between 60 and 90 °C.

The cut edges of PLEXIGLAS® and EUROPLEX® Films can also be improved by heating the material to a temperature between 60-70 °C. Special hard coatings on the tool inserts, such as with titanium nitride, have also proven useful. In general, the masking film should remain on PLEXIGLAS® and EUROPLEX® Films during die-cutting as this further improves cutting properties.

These pictures show the differences between a well-executed die-cutting process and a non-optimal process:



Perfect cutting edge, high-speed cutting, sharp cutting tool



Example of an edge with remains of slow cutting/shearing, edgeless tool

Laser cutting

Laser cutting is being used increasingly as a method of cutting polymer films. This method offers an advantage of very clean, precise cut edges over die-cutting. PLEXIGLAS® Films are well-suited for laser cutting with a CO₂ laser. Optimal exhaust ventilation must be provided during laser cutting, otherwise powder may deposit on the cut material.

Laser cutting of EUROPLEX® PC and PPSU Film requires a fast cutting speed to avoid edge yellowing. Exhaust ventilation with filter systems is very important.



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Normal parameters for laser cutting of PLEXIGLAS® Film

Laser power:

- 50 watts

Cutting speed:

- 120 to 150 mm/s (for film thicknesses between 0.125 mm – 0.5 mm)
- 60 to 70 mm/s (for film thicknesses between 0.5 mm – 1.0 mm)

Normal parameters for laser cutting of EUROPLEX® PC Film

Laser power:

- 50 watts

Cutting speed:

- 30-40 mm/s (for film thicknesses between 0.125 – 1.0 mm)

Note: This recommendation applies for an initial basic setting. Setting for optimal results may differ significantly, depending on tools and machines used.

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® = registered trademark

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