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What is Exolon® FR EN

Exolon® FR

Exolon® FR – flame-retardant solid polycarbonate sheet (PC), UL 94 V-0 / EN 45545-2 / FAR 25.853, extremely impact-resistant

Exolon® FR is a flame-retardant solid sheet made of polycarbonate (PC). It combines the extremely high impact strength and high optical clarity typical of polycarbonate with an excellent fire classification: from 2 mm it is rated UL 94 V-0 and meets the requirements of EN 45545-2 (fire protection for rail vehicles) and FAR 25.853 (aviation). The material can be used from -100 °C to +120 °C, making it ideal for fire-safety applications in rail, lighting and electrical engineering.

Classification and basic character

Exolon® FR consists of polycarbonate, an amorphous engineering thermoplastic with no defined melting point that softens above the glass transition temperature (around 147 °C). Compared with standard PC, the FR grade is flame-retardant and thus reaches significantly higher fire classes. Its hallmark remains the extreme toughness: in the unnotched Charpy test the material does not break ("no break"), and it stays impact-resistant even at low temperatures. The clear 099 grade is highly transparent; DX white 139 is a diffuser sheet for lighting.

Fire protection, impact strength and temperature

The outstanding feature of Exolon® FR is the combination of fire protection and toughness. From a thickness of 2 mm the sheet is classified UL 94 V-0; for rail vehicles it meets EN 45545-2 in the requirement sets R1/HL1, R3/HL2, R4/HL3 and R22–R24/HL3, and in aviation FAR 25.853. At the same time the material is virtually unbreakable and temperature-resistant from -100 °C to +120 °C (continuous use without load around 120 °C). The light transmission of the clear 099 grade is around 88 % (3 mm).

How Exolon® FR is processed

Exolon® FR is supplied as an extruded solid sheet. From this semi-finished product we machine parts – milling, turning, drilling and sawing give clean results. The DX grade can also be easily thermoformed and cold-bent. Before thermoforming, PC must be pre-dried due to its hygroscopy; after machining, annealing can relieve internal stresses. Contact with solvents and aggressive cleaners must be avoided because of the risk of stress cracking.

Mechanical, thermal and electrical properties

Exolon® FR reaches a yield stress of over 60 MPa with a modulus of elasticity around 2,400 MPa and a density of 1,200 kg/m³ (1.20 g/cm³). Characteristic are the high nominal strain at break (>50 %) and the very high impact strength. The Vicat softening temperature is 146 °C, the heat deflection temperature (1.8 MPa) is 127 °C. Electrically the material is a good insulator (dielectric strength 34 kV/mm, surface resistivity 10^16 Ω).

When Exolon® FR is the right choice

Exolon® FR is worthwhile whenever transparency and impact resistance must be combined with high fire protection – for example:

- Lighting fixtures and covers on rail vehicles (EN 45545-2)
- Electrical components and protective guards with UL 94 V-0
- Fire-safety transparent parts and viewing windows
- Aviation applications (FAR 25.853)
- Diffuser and light-guiding sheets (DX white 139)

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When Exolon® FR is NOT the right choice

Equally important are the limits of the material:

- Food contact – Exolon® FR is a flame-retardant grade, not intended for this
- Contact with solvents, alkalis or hydrocarbons (risk of stress cracking)
- Permanent outdoor use only with the UV grade (UV clear 2099)
- Scratch- and abrasion-loaded surfaces – PC is soft (hard-coat if needed)
- When only highest optical clarity without fire protection matters – then PMMA or standard PC

What does Exolon® FR cost?

Exolon® FR is a flame-retardant specialty sheet and is priced above standard polycarbonate (GP) and well above acrylic (PMMA). The part price is mainly determined by grade (clear/UV/DX), sheet thickness and dimension, material utilisation (offcut), machining effort and lot size. We are happy to quote binding prices on request based on your drawing.

Processing at Liedtke

Exolon® FR machines well – milling, turning, drilling and sawing produce clean, dimensionally accurate results; the DX grade can also be thermoformed and cold-bent. Before thermoforming we pre-dry the sheets because of hygroscopy; after machining, annealing can relieve internal stresses. Because of the stress-cracking sensitivity we avoid solvent-based cutting fluids. This is how we reliably produce impact-resistant, fire-safety precision and protective parts – from single pieces to series production.

Advantages and disadvantages at a glance

An honest assessment – and how the disadvantages can be mitigated in practice:

Advantages

- Excellent fire protection (UL 94 V-0, EN 45545-2, FAR 25.853)
- Extremely high impact strength – virtually unbreakable, even in cold
- Wide temperature range (-100 … +120 °C)
- High optical clarity (grade clear 099)
- Good machinability, thermoformable and cold-bendable (DX)

Disadvantages

- Not intended for food contact (flame-retardant grade)
- Soft, scratch-sensitive surface (without hard coating)
- Sensitive to solvents/alkalis (stress cracking)
- Outdoor use only with UV grade (UV clear 2099)
- Higher price than standard PC and PMMA

Practical tip: Exolon® FR is the right choice when transparent, impact-resistant parts must also meet high fire-protection requirements – for example in rail vehicles, lighting and electrical engineering. If only impact resistance without fire protection matters, Exolon® GP (standard PC) is more economical; for highest scratch resistance and weathering, acrylic (PMMA) is the better choice.

Typical Properties

- Excellent fire protection (UL 94 V-0, EN 45545-2, FAR 25.853)
- Extremely high impact strength (virtually unbreakable)
- Wide temperature range (-100 … +120 °C)
- High optical clarity (clear 099)
- Good electrical insulator
- Good machinability and thermoformable (DX)

Product Examples

- Lighting fixtures on rail vehicles
- Electrical protective guards (UL 94 V-0)
- Fire-safety viewing windows and covers
- Aviation components (FAR 25.853)
- Diffuser and light-guiding sheets (DX)
- Transparent, impact-resistant protective parts

Typical Industries

- Rail vehicle and railway industry
- Lighting technology
- Electrical engineering and electronics
- Aerospace
- Mechanical and plant engineering
- Safety and fire-protection technology

- Grades: clear 099, UV clear 2099, DX white 139

	Test Method	Unit	Value
Mechanical Properties (typ. values)			
Yield stress	ISO 527-1, -2	MPa	>60
Nominal strain at break	ISO 527-1, -2	%	>50
Modulus of elasticity	ISO 527-1, -2	MPa	2400
Charpy impact strength (unnotched)	ISO 179-1eU	kJ / m²	no break
Fire protection / Thermal			
UL 94 (≥ 2 mm)	UL 94		V-0
Rail vehicles	EN 45545-2		R1–R4 / HL1–HL3
Continuous service temperature		°C	~ 120
Temperature range		°C	-100 … +120
General Properties			
Density	ISO 1183-1	kg / m³	1200
Light transmission (clear 099, 3 mm)	DIN 5036	%	88
Refractive index	ISO 489		1.587
Colour			transparent (clear) / white (DX)

Exolon® FR is a flame-retardant polycarbonate sheet (grades clear 099, UV clear 2099, DX white 139). The values stated are typical characteristic values (measured on injection-moulded specimens, not for specification purposes); they serve as an aid to material selection and are not a legally binding warranty of specific properties. Fire certificates are limited in time and scope and must be confirmed for the specific thickness/grade. Exolon® FR is not intended for food contact. Exolon® is a registered trademark.

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