WIRTHEIM

קטלוג לוחות

פוליקרבונט

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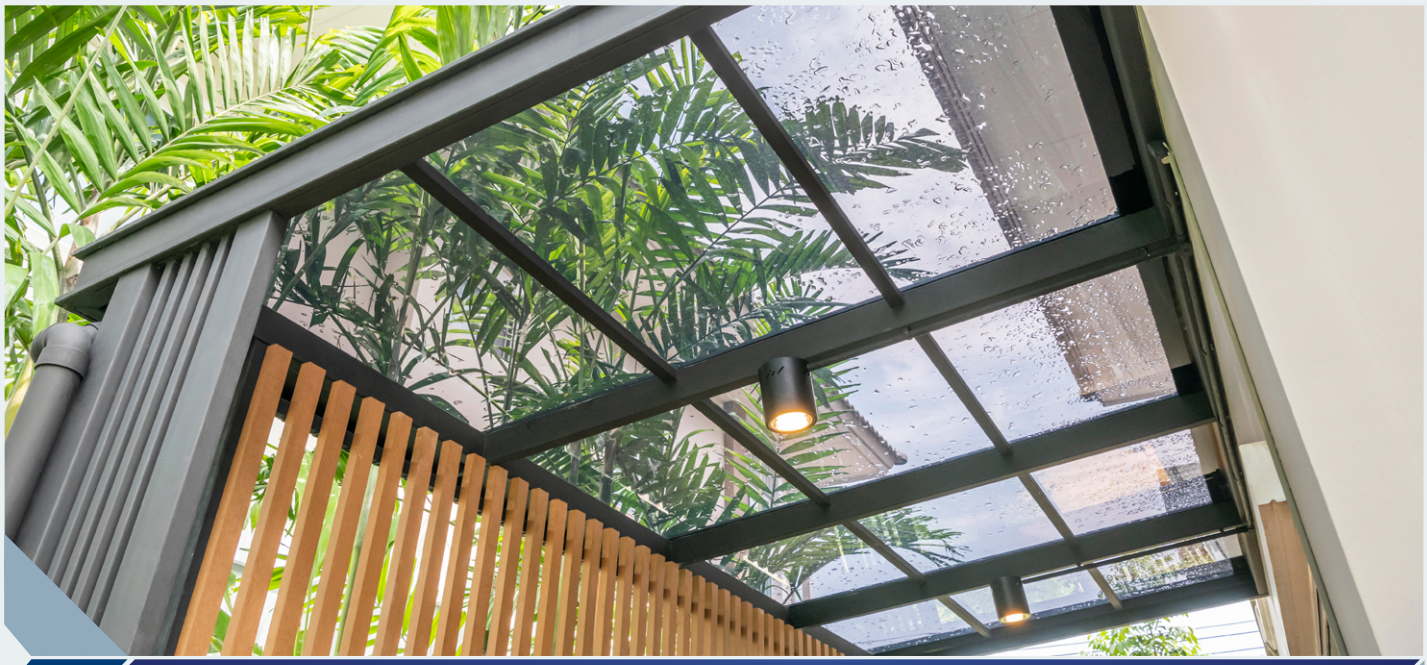


Makrolon
solid polycarbonate sheet

מקרולון
לוח פוליקרבונט שקוף/חלבי אופל/ברונזה/אפור

With its great clarity and surface quality, is a popular substitute for glass and other transparent plastics.

The solid polycarbonate sheet is available in a range of different variants and including is a MAKROLON UV variations include (a UV-protected sheet), MAKROLON FR (a fire-resistant sheet, v(0) for t>3mm), and COLOR (a transparent colour sheet). The sheets are also available In opal color.

MAKROLON has many popular uses including, but not limited to; machine protection, safety glazing, ice hockey rinks, and vandal protection. The Sheet is also easy to thermoform and, as a result, is often used in signs, displays, riot shields, windows, medical equipment, and bicycle helmets.

MAKROLON can also be cold-bended into complex shapes while, at the same time, still maintaining an impact strength of more than ten times that of high-impact PMMA and twice that of PETg.

לוחות פוליקרובנט שטוחים הינם תחליף זכוכית פופולארי ביותר הינם בעלי תכונות מכאניות מצוינות ועמידות גבוהה לתנאי חוץ ומזג אויר, לוחות הפוליקרבונט מיוצרים מחומר הגלם MAKROLON ET3113 .

יתרונות:

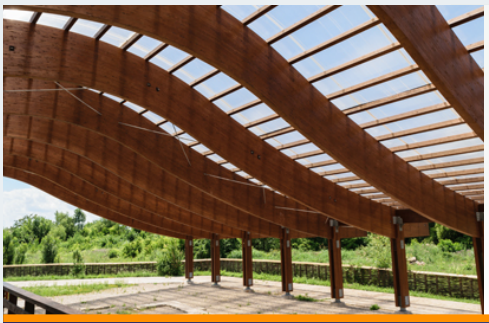
- משקל נמוך בהשוואה לזכוכית
- עמידות מעולה בתנאי חוץ ומזג אויר
- העברת אור גבוהה
- עמידות גבוהה במיוחד בפני שבירה
- ניתן לעיבוד בחום, בכרסום בכיפוף

שימושים מכרזיים:

- תחליף זכוכית
- קירוי ופתחי תקרה
- בידוד אקוסטי
- שילוט
- מגני מכונות

סוגי לוחות פוליקרבונט:

- עמיד UV
- פוליקרבונט FR
- פוליקרבונט אנטיסטטי
- מגוון צבעים
- מגוון מעברי אור שונים



עמידה בכל תנאי מזג האוויר והגנה נגד קרינת השמש

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Mechanical properties (23 °C/50 % r. h.)

Property	Test Condition	Unit	Standard	Typical Value
Tensile modulus	1 mm/min	MPa	ISO 527-1,-2	2350
Yield stress	50 mm/min	MPa	ISO 527-1,-2	65
Yield strain	50 mm/min	%	ISO 527-1,-2	6.3
Nominal strain at break	50 mm/min	%	ISO 527-1,-2	> 50
Stress at break	50 mm/min	MPa	ISO 527-1,-2	70
Strain at break	50 mm/min	%	b.o. ISO 527-1,-2	130
Tensile creep modulus	1 h	MPa	ISO 899-1	2200
Tensile creep modulus	1000 h	MPa	ISO 899-1	1900
Flexural modulus	2 mm/min	MPa	ISO 178	2350
Flexural strength	2 mm/min	MPa	ISO 178	96
Flexural strain at flexural strength	2 mm/min	%	ISO 178	7.2
Flexural stress at 3.5 % strain	2 mm/min	MPa	ISO 178	72
Charpy impact strength	23°c	kJ/m²	ISO 179-1eU	N
Charpy impact strength	-30°c	kJ/m²	ISO 179-1eU	N
Charpy impact strength	-60°c	kJ/m²	ISO 179-1eU	N
Charpy notched impact strength	23°c; 3 mm	kJ/m²	ISO 7391/b.o. ISO 179-1eA	80P
Charpy notched impact strength	-30°c; 3 mm	kJ/m²	ISO 7391/b.o. ISO 179-1eA	18C(P)
Izod notched impact strength	23°c; 3 mm	kJ/m²	ISO 7391/b.o. ISO 180-A	70P
Izod notched impact strength	-30°c; 3 mm	kJ/m²	ISO 7391/b.o. ISO 180-A	20C(P)
Puncture maximum force	23°c	N	ISO 6603-2	5600
Puncture maximum force	-30°c	N	ISO 6603-2	6500
Puncture energy	23°c	J	ISO 6603-2	60
Puncture energy	-30°c	J	ISO 6603-2	70
Ball indentation hardness		N/mm²	ISO 2039-1	113

Thermal properties

Glass transition temperature	10 °C/min	°C	ISO 11357-1,-2	148
Temperature of deflection under load	1.80 MPa	°C	ISO 75-1,-2	128
Temperature of deflection under load	0.45 MPa	°C	ISO 75-1,-2	141
Vicat softening temperature	50 N; 50 °C/h	°C	ISO 306	148
Vicat softening temperature	50 N; 120 °C/h	°C	ISO 306	149
Coefficient of linear thermal expansion, parallel	23 to 55 °C	10^{-4}/K	ISO 11359-1,-2	0.65

Thermal properties

Property	Test Condition	Unit	Standard	Typical Value
Coefficient of linear thermal expansion, transverse	23 to 55 °C	10^{-4}/K	ISO 11359-1,-2	0.65
Burning behavior UL 94 (1.5 mm) [UL recognition]	1.5 mm	Class	UL 94	HB
Burning behavior UL 94 [UL recognition]	0.75 mm	Class	UL 94	V-2
Oxygen index	Method A	%	ISO 4589-2	28
Thermal conductivity, cross-flow	23 °C; 50 % r. h.	W/(m·K)	ISO 8302	0.20
Resistance to heat (ball pressure test)		°C	IEC 60695-10-2	140
Relative temperature index (Tensile strength) [UL recognition]	1.5 mm	°C	UL 746B	125
Relative temperature index (Tensile impact strength) [UL recognition]	1.5 mm	°C	UL 746B	115
Relative temperature index (Electric strength) [UL recognition]	1.5 mm	°C	UL 746B	125
Glow wire test (GWFI)	0.75 mm	°C	IEC 60695-2-12	875
Glow wire test (GWFI)	1.5 mm	°C	IEC 60695-2-12	875
Glow wire test (GWFI)	3.0 mm	°C	IEC 60695-2-12	960
Glow wire test (GWIT)	0.75 mm	°C	IEC 60695-2-13	875
Glow wire test (GWIT)	1.5 mm	°C	IEC 60695-2-13	875
Glow wire test (GWIT)	3.0 mm	°C	IEC 60695-2-13	900
Application of flame from small burner	Method K and F; 2.0 mm	Class	DIN 53438-1,-3	K1, F1
Needle flame test	Method K; 2.0 mm	s	IEC 60695-11-5	5
Needle flame test	Method K; 3.0 mm	s	IEC 60695-11-5	10
Needle flame test	Method F; 1.5 mm	s	IEC 60695-11-5	60
Needle flame test	Method F; 2.0 mm	s	IEC 60695-11-5	120
Needle flame test	Method F; 3.0 mm	s	IEC 60695-11-5	120
Burning rate (US-FMVSS)	>=1.0 mm	mm/min	ISO 3795	passed
Flash ignition temperature		°C	ASTM D1929	480
Self ignition temperature		°C	ASTM D1929	550

Electrical properties (23 °C/50 % r. h.)

Relative permittivity	100 Hz	-	IEC 60250	3.1
Relative permittivity	1 MHz	-	IEC 60250	3.0
Dissipation factor	100 Hz	10^{-4}	IEC 60250	8
Dissipation factor	1 MHz	10^{-4}	IEC 60250	100

Electrical properties (23 °C/50 % r. h.)

Property	Test Condition	Unit	Standard	Typical Value
Volume resistivity		Ohm·m	IEC 60093	1E14
Surface resistivity		Ohm	IEC 60093	1E16
Electrical strength	1 mm	kV/mm	IEC 60243-1	34
Comparative tracking index CTI	Solution A	Rating	IEC 60112	250
Comparative tracking index CTI M	Solution B	Rating	IEC 60112	125M
Electrolytic corrosion		Rating	IEC 60426	A1

Other properties (23 °C)

Water absorption (saturation value)	Water at 23 °C	%	ISO 62	0.30
Water absorption (equilibrium value)	23 °C; 50 % r. h.	%	ISO 62	0.12
Density		kg/m³	ISO 1183-1	1200
Water vapor permeability	23 °C; 85 % RH; 100 µm film	g/(m²·24 h)	ISO 15106-1	15
Gas permeation	Oxygen; 100 µm film	cm³/(m²·24 h·bar)	b.o. ISO 2556	650
Gas permeation	Oxygen; 25.4 µm (1 mil) film	cm³/(m²·24 h·bar)	b.o. ISO 2556	2760
Gas permeation	Nitrogen; 100 µm film	cm³/(m²·24 h·bar)	b.o. ISO 2556	120
Gas permeation	Nitrogen; 25.4 µm (1 mil) film	cm³/(m²·24 h·bar)	b.o. ISO 2556	510
Gas permeation	Carbon dioxide; 100 µm film	cm³/(m²·24 h·bar)	b.o. ISO 2556	3800
Gas permeation	Carbon dioxide; 25.4 µm (1 mil) film	cm³/(m²·24 h·bar)	b.o. ISO 2556	16900
Bulk density	Pellets	kg/m³	ISO 60	660

Material specific properties

Refractive index	Procedure A	-	ISO 489	1.587
Haze for transparent materials	3 mm	%	ISO 14782	< 0.8
Luminous transmittance (clear transparent materials)	1 mm	%	ISO 13468-2	89
Luminous transmittance (clear transparent materials)	2 mm	%	ISO 13468-2	89

Material specific properties

Property	Test Condition	Unit	Standard	Typical Value
Luminous transmittance (clear transparent materials)	3 mm	%	ISO 13468-2	88
Luminous transmittance (clear transparent materials)	4 mm	%	ISO 13468-2	87

Processing conditions for test specimens

Injection molding-Melt temperature		°C	ISO 294	300
Injection molding-Melt temperature		°C	ISO 294	80
Injection molding-Injection velocity		mm/s	ISO 294	200

Disclaimer

Typical value

These values are typical values only. Unless explicitly agreed in written form, the do not constitute a binding material specification or warranted values. Values may be affected by the design of the mold/die, the processing conditions and coloring/pigmentation of the product. Unless specified to the contrary, the property values given have been established on standardized test specimens at room temperature.

General

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