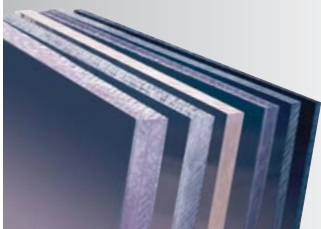




Product Data Sheet, December 2008

Makrolon Hygard® Laminated polycarbonate sheet



Your benefits:

- low inherent weight
- very good transparency
- anti-spall protection
- high abrasion resistance
- optimal UV protection

Makrolon Hygard® stands for transparent, multilayer laminated polycarbonate sheets. They meet all security requirements with regard to protection against forced entry and ballistic impact.

The CG (containment glazing) grades are particularly suitable for protection against forced entry with heavy tools such as sledge hammers and axes.

The BR (bullet-resistant) and the MS (multiple shots) grades were specially developed for ballistic protection and withstand even sustained fire from heavy automatic firearms.

Fields of Application:

Makrolon Hygard® sheets offer maximum protection without forming dangerous slivers or "spider webs." They are ideally suited for use in all high-level security areas. The main fields of application are:

- banks
- jeweler's shops
- penal institutions
- court buildings
- museums
- security vehicles
- night desks
- and many others

Product	Thickness	Weight	Light Transmission
CG 375	10 mm	12 kg/m ²	86%
CG 500	13.5 mm	16.2 kg/m ²	83%
CG 750	20 mm	24 kg/m ²	77%
BR 750	20 mm	24 kg/m ²	88%
BR 1000	27 mm	32.2 kg/m ²	72%
BR 1250	33 mm	39,6 kg/m ²	67%
MS 1250	33 mm	39,6 kg/m ²	75%

The sheets are available in the following sizes:
1,520 x 2,440 mm
Other dimensions on request.

PROTECTION AGAINST FORCED ENTRY

Standard	Product	Security Class
ASTM F 1233	CG 375	Class II, Step 12
Forced entry test	CG 500	Class II, Step 15
	CG 750	Class III, Step 26
	BR 1000	Class V
	BR 1250	Class IV, Step 38
HPW	CG 375	Level II, Step 11
TP 0500.02	CG 500	Level II, Step 12
Forced entry test	CG 750	Level IV, Step 31
	BR 1000	Level V, Step 42
	BR 1250	Level V

BALLISTIC PROTECTION

Standard	Product	Security Class
ASTM F 1233	BR 1000	.38 Super
Ballistic impact test	BR 1250	.44 Magnum
HPW	CG 375	Level A
TP 0500.02	CG 500	Level A
Ballistic impact test	CG 750	Level B
	BR 750	Level B
	BR 1000	Level B
	BR 1250	Level C
UL 752	BR 750	Level I
Ballistic impact test	BR 1000	Level II
	BR 1250	Level III
	MS 1250	Level VI
EN 1063	MS 1250	Level BR4
Impact test		

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makrolon®
Hygard



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i-line

Ideas, innovative, intelligent, interesting...

Bayer Sheet Europe i-line represents the next generation of quality products. This seal guarantees innovative and intelligent first-class solutions at all times for a multitude of requirements.

The protection against forced entry offered by **Makrolon Hygard®** is classed according to standards ASTM F 1233 and HPW TP0500.02. During these tests, the sheets are exposed to physical and chemical attack. The tables below show the order in which such attack takes place (to ASTM 1-41, to HPM 1-54).

For example, **Makrolon Hygard® CG 500** is rated as Class III, Step 15, according to ASTM F1233. That means the sheets have first withstood attack in Class I and Class II in the order 1-7, and then in Class III in the order 8-15.

FORCED ENTRY TESTING

ASTM F 1233	Class I	Class II	Class III	Class IV	Class V
Blunt tool impacting (impacts)					
Sledge hammer (25)		5	10, 16	19, 22, 27	30, 33, 36, 39
4" dia. pipe/sledge (25)			9	18	29
Ram (10)			8	17	28
Ball peen hammer (10)	1	2			
Sharp tool impacting (impacts)					
Ripping bar		7	12	23	
Chisel/hammer (25)			13	25	35, 40
Angle iron/sledge (25)			15		
1-1/2" dia. pipe/sledge (25)		3			
Fire axe (25)				24	32, 38
Wood splitting maul (25)				21	34, 41
Thermal stress (minutes)					
Extinguisher, Co ₂ (1)		4			
Propane torch (5)		6	11	20	31
Chemical deterioration (amount)					
Gasoline (8 oz.)			14		
Aceton (8 oz.)				26	37
Total forced entry sequences			16	27	41
HPW TP 0500.02	Level I	Level II	Level III	Level IV	Level V
Blunt tool impacting (impacts)					
Sledge hammer/wedge (25)	1, 4	8, 10	18, 24, 26	29, 32, 39	42, 45, 48, 51, 54
4" dia. pipe/sledge (25)	2	7	17	28	41
Ram (10)		6	16	27	40
Sharp tool impacting (impacts)					
Chisel/hammer (25)		12	21, 23	33, 36, 38	47, 52
Angle iron/sledge (25)		13	22		
1-1/2" dia. pipe/sledge (25)	5				
Fire axe (25)				35	44, 50
Wood maul (25)		15	20	31	46, 53
Thermal stress (minutes)					
Fire extinguisher, Co ₂ (1)	3	9			
Propane torch (5)		11	19	30	
Acetylene (5)					43
Chemical deterioration (amount)					
Gasoline (8 oz.)		14			
Windshield washer (8 oz.)			25	34	
Acetone (8 oz.)				37	49
Total forced entry sequences	5	15	26	39	54

BALLISTIC IMPACT TEST

ASTM F 1233	Caliber	Weight	Velocity (fps*)	No. of shots	Distance
.38 super	.38 super auto	8.4 g.	1,230 min. 1,330 max.	3	25 feet
.44 mag	.44 magnum	15.5 g.	1,400 min. 1,500 max.	3	25 feet
HPW TP 0500.02	Level A	Level B	Level C	Level D	Level E
Caliber	.38 Special	9 mm	.44 mag	7.62 mm	.30-06 AP
No. of Shots	3	3	3	3	3
UL 752	Caliber	Ammunition	Weight in g.	min. velocity	No. of shots
Level 1	9 mm	full metal jacket	8.0	1.175 ft./sec.	3
Level 2	.357 magnum	jacketed lead soft point	10.2	1.250 ft./sec.	3
Level 3	.44 magnum	lead semi-wadcutter	15.6	1.350 ft./sec.	3
Level 6	9 mm	full metal jacket	8.0	1.400 ft./sec.	5
EN 1063	Caliber	Ammunition	Weight in g.	min. velocity	No. of shots
Level BR 4	0.44 magnum	full metal jacket	15.6 (+/-0.1)	1.444 ft/sec (+/-32.81)	3

*feet per second

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