

Product Data Sheet, November 2014

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
- museums
- jeweler’s shops
- security vehicles
- penal institutions
- night desks
- court buildings
- 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%
BR 750	20 mm	24 kg/m ²	88%
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
EN 356 Forced entry test	CG 375 CG 500	P7B P8B
ASTM F 1233.08 Forced entry test	CG 375 CG 500	Class 1.4 Contraband Passage Class 2.8 Body Passage
HPW TP 0500.02 Forced entry test	CG 375 CG 500	Level I, Step 15

Ballistic protection		
Standard	Product	Security Class
PM 2000 ^(*) Ballistic impact test	BR 750 MS 1250	Level PM1-NS Level PM4-NS & SG2
UL 752 Ballistic impact test	BR 750 MS 1250	Level I Level VI

(*) Because of the composition of this material (only thermoplastic and no glass) a classification according EN 1063 is not allowed, since EN 1063 only refers to glass/PVB combinations. The tests procedures according to PM 2007 are equivalent to EN 1063.

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Ideas, innovative, intelligent, interesting...

Bayer MaterialScience 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 EN 356, 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 HPM 1-54).

Forced entry testing

EN 356	P1	P2A	P3A	P4A	P5A
Ball Test: 10 cm steel ball (4.1 kg) 3 hits:					
drop height (m)	1.5	3	6	9	9 (9hits)
Axe Test:	P6B	P7B	P8B		
number of hits	>30	>50	>70		
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

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/ PM 2000	Caliber	Ammunition	Weight in g.	min. velocity	No. of shots
BR1/ PM 1	22 long rifle	leaded round nose	2.6	360 m/s	3
BR2/ PM 2	9 mm luger	full steel jacket	8	400 m/s	3
BR3/ PM 4	357 magnum	full steel jacket	10.2	430 m/s	3
BR4/ PM 4	44 rem. magnum	full copper jacket	15.6	440 m/s	3



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