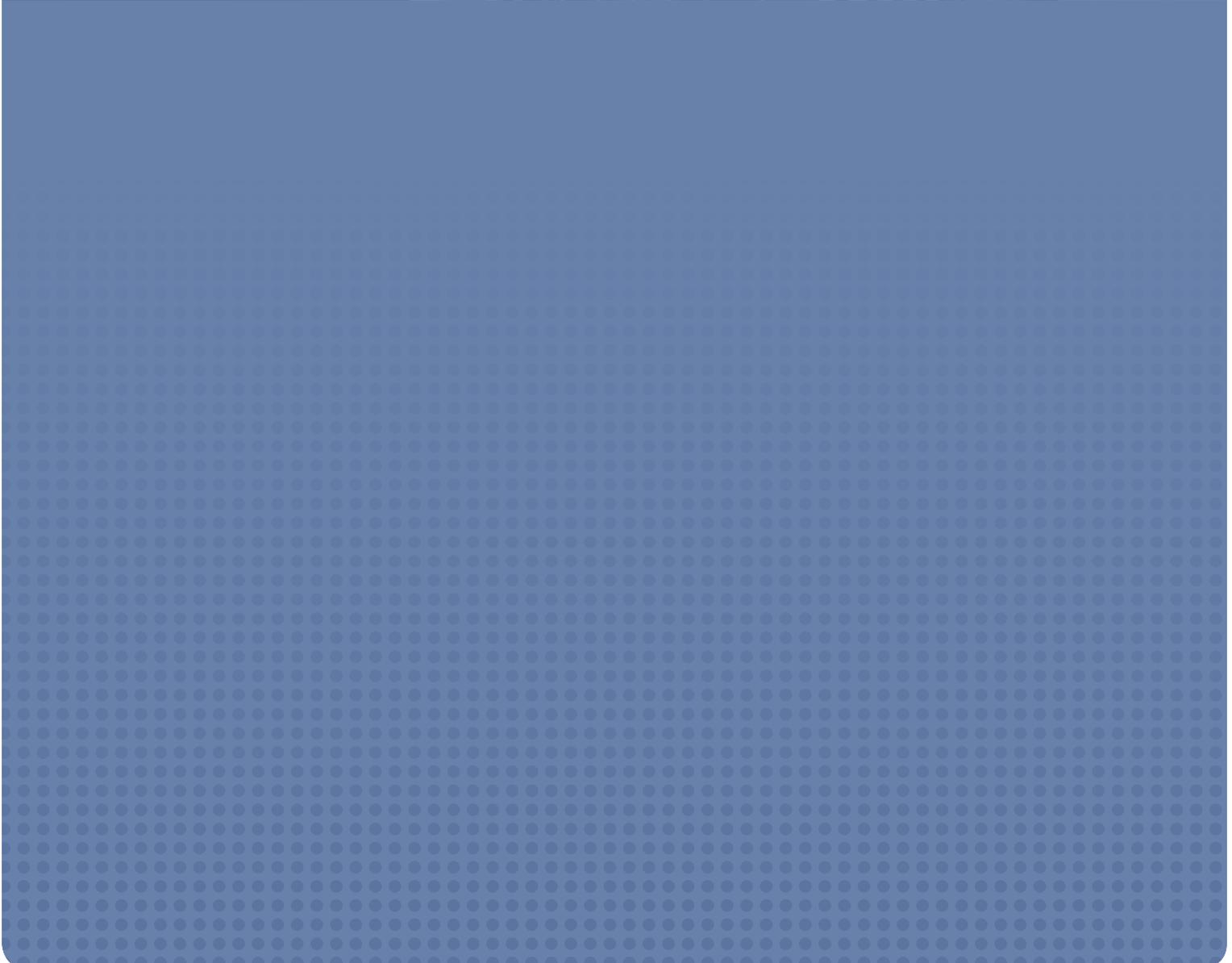


CAPABILITIES BROCHURE

 **makrolon**[®] *Sheet*  **vivak**[®]



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(PETG) SOLID SHEET**
High Impact & Fire Resistance.
Fully recyclable.

Introduction

MAKROLON® POLYCARBONATE SOLID SHEET PRODUCTS

Bayer MaterialScience is one of the world's largest producers of polymers and high-performance plastics. With 30 production sites and 15,000 employees worldwide they manufacture high tech polymer materials and develop innovative solutions for products used in many areas of daily life.

MAKROLON® polycarbonate resins supplied by Bayer MaterialScience, combined with the latest production facilities, ensure that the physical properties of MAKROLON® polycarbonate solid sheet, will meet your functional and aesthetic requirements and offer scope for new ideas.

MAKROLON® POLYCARBONATE SHEET

Only polycarbonate can offer the ideal combination of impact strength, cost effectiveness, and energy efficiency. No glazing alternative can surpass polycarbonate MAKROLON® Sheet for superior all-around performance. It's the right choice for almost any demanding glazing application. MAKROLON® Sheet is as clear as glass and a lot stronger. It's also many times stronger than acrylic sheet—offering a margin of safety that no other clear glazing material can beat. With its inherent design flexibility, MAKROLON® Sheet General Purpose (GP) & Ultra Violet (UV) can be cut or cold-formed on-site during installation (subject to gauge), without the pre-forming and fabrication associated with glass or acrylic. It is lightweight and requires less structural support than all-glass systems, saving additional time and labor costs. Its durability and energy efficiency also add up to long term cost savings. From skylights and barrel vaults to educational and institutional glazing, the question is not why, but where polycarbonate?



MAKROLON® Sheet is clearly the right choice

COST EFFICIENCY

The unique combination of lightweight and high strength attributes inherent in polycarbonate MAKROLON® Sheet allows designs that require less structural support. Since MAKROLON® Sheet GP & UV can be cut and cold-formed on-site, you save time and money that would normally be dedicated to pre installation techniques like oven bending. As MAKROLON® Sheet is much more durable than other material options, the cost of replacement becomes a less immediate (and less costly) concern.

LIGHT AND ENERGY TRANSMISSION

By allowing the transmittance of up to 90 percent of solar energy and 88 percent of visible light, clear MAKROLON® Sheet is an excellent glazing material for a wide range of applications where clarity is essential. MAKROLON® Sheet is also available in diffuser opal and grey tint to help control heat gain.

IMPACT PROTECTION

Unsurpassed by any clear glazing product on the market, MAKROLON® Polycarbonate Sheet is much stronger than plate glass and acrylic. This tough, long lasting material offers attractive protection in areas subject to high traffic, vandalism or burglary. It even withstands natural forces like severe wind, hail, and snow storms.

DESIGN LATITUDE

MAKROLON® Sheet is extremely ductile, it can be cut on-site from flat sheet or cold-formed into curves that would be impossible to construct with laminated glass or acrylic. Forget about costly factory pre-forming and fabrication. With MAKROLON® Sheet you can create cost effective, distinctive structures that feature dramatic expanses of curved glazing.

IMPACT RESISTANCE (Joules) - Steel dart 25.4mm Diameter Tip

6.0 mm Tempered Glass		4.1 Joule
6.0 mm Acrylic		9.5 Joule
6.0 mm MAKROLON® Sheet		over 270 Joule

ENERGY EFFICIENCY

MAKROLON® Sheet is a superior insulating material when compared to equivalent thicknesses of glass. Double-glazing and overglazing offer even more energy savings.

SOUND PROTECTION

Excess noise and continuous, disturbing noise are harmful. That is why the effect of noise needs to be kept down to a minimum. Particularly relevant in this context are sound protection in residential buildings and the shielding of road noise (noise barrier walls). MAKROLON® Sheet can play a pivotal role in achieving excellent sound reduction.

SOUND REDUCTION INDEXES FOR MAKROLON® SOLID SHEETS

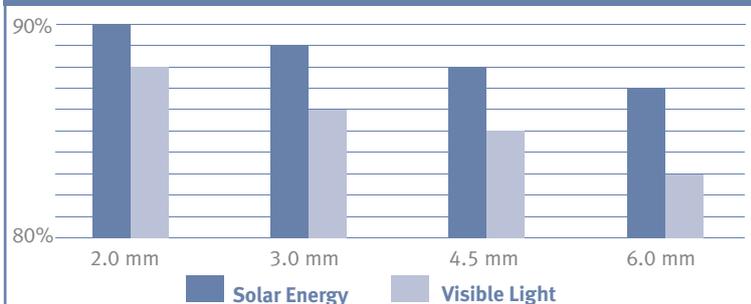
SINGLE SHEET

GAUGE (mm)	R _m / dB	R _w / dB
4	23	26
8	27	30
10	29	32
12	-	33

MULTI SHEET

GAUGE (mm)	AIRSPACE (mm)	R _m / dB	R _w / dB
4	50	31	31
4	150	38	39
6	30	31	32
10	30	38	40
10	60	43	45

LIGHT TRANSMITTANCE % - Clear Sheet



Product Overview

THE MAKROLON® FAMILY

Think of all the places where you tried to use glass or acrylic in your designs but could not due to the environment, building location, or material limitations. Now think of the demanding applications where glass and acrylic have been tried and failed; schools, psychiatric facilities, train stations and bus shelters.

The family of MAKROLON® Sheet products offer superior durability, unmatched design flexibility, and structural integrity that easily surpass laminated glass and acrylic alternatives. When considering total life cycle costs,

MAKROLON® Sheet comes in several grades to suit your every performance requirement: MAKROLON® Sheet GP for industrial applications; MAKROLON® Sheet UV for increased UV protection; MAKROLON® Sheet Abrasion Resistant (AR) when abrasion resistance, impact strength, and graffiti removal are essential; and MAKROLON® Sheet HYGARD® laminates for certified containment glazing and bullet resistant protection.



PRODUCT FEATURES	MAKROLON® Sheet GP	MAKROLON® Sheet UV	MAKROLON® Sheet AR	MAKROLON® Sheet HYGARD®
Superior Impact Strength	●	●	●	●
Enhanced UV Resistance		●	●	●
Forced Entry Protection (UL 972)	●	●	●	●
Enhanced Abrasion Resistance			●	●
Thermoformable	●	●		
Cold-Formable	●	●		
Bullet Resistant (UL 752)				●
Physical Attack Resistance			●	●

BUILT TO PERFORM

- Transportation Glazing
- Institutional Glazing
- Barrel Vaults
- Skylights
- Covered Walkways
- Storefronts
- Privacy Glazing
- Machine Guards

Don't let material limitations compromise your design creativity. MAKROLON® Sheet is designed to perform in a wide range of applications and meets all standard architectural specifications and codes.



MAKROLON® Sheet General Purpose

Superior Impact Protection

For general purpose applications that require superior impact protection without additional abrasion and UV resistance, MAKROLON® Sheet GP is everything you need. Available in Clear, Diffuser opal & Grey tint, MAKROLON® Sheet GP is a high performance, all purpose glazing material that is both durable and cost effective. This performance is backed by a comprehensive 5 year limited warranty against breakage. Request warranty for full details.



STANDARD SIZES

2440mm x 1220mm

2440mm x 1830mm

STANDARD COLOURS

Clear, Diffuser opal & Grey tint

Clear, Diffuser opal & Grey tint

GAUGES (mm)

1.0, 1.5, 2.0, 3.0, 4.5, 6.0, 8.0, 9.5, 12.0

2.0, 3.0, 4.5, 6.0, 8.0, 9.5, 12.0

Other gauges and sizes are available on request, subject to conditions.

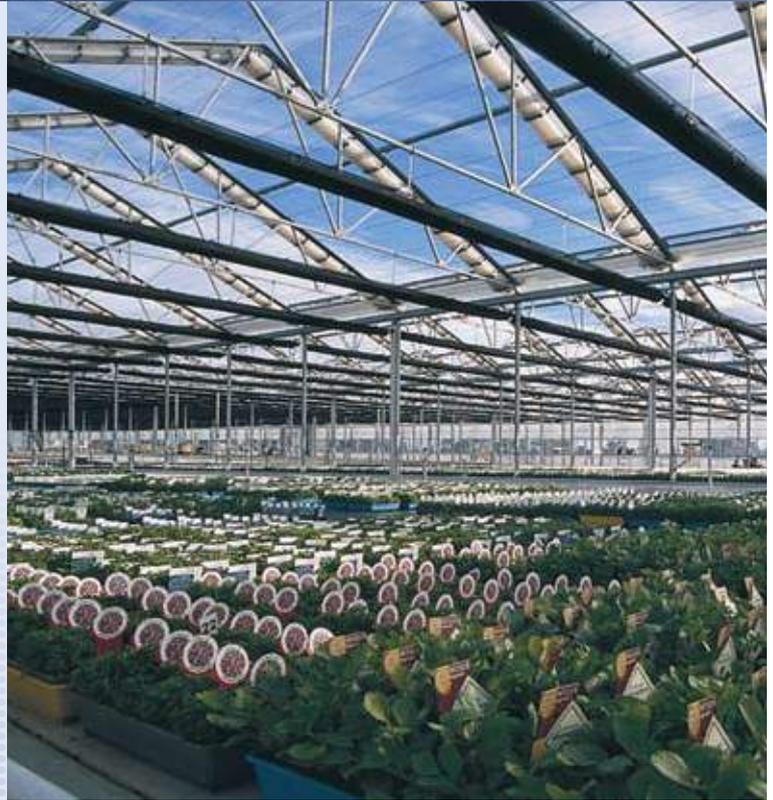
APPLICATIONS - Machine Guards, Workstation Partitions, In-Plant glazing



MAKROLON® Sheet Ultra Violet

Superior UV Resistance

Prolonged exposure to the sun can weather even the most durable of surfaces. In the past, acrylic was often chosen for plastic glazing applications because of its inherent resistance to yellowing over time. But, compared to polycarbonate, the relative brittleness of acrylic made its impact strength insufficient for demanding, vandal resistant applications. To meet this need, MAKROLON® Sheet UV offers the best of both worlds—the impact protection of MAKROLON® Sheet and the UV resistance of acrylic. Utilising advanced formulations combined with state-of-the-art extrusion technology, MAKROLON® Sheet is a tough, high quality product that will exhibit superior performance for years to come. This performance is backed by a comprehensive 10 year limited warranty against breakage, loss of light transmission and excessive yellowing from date of purchase. Request warranty for full details.



STANDARD SIZES

2440mm x 1220mm

2440mm x 1830mm

STANDARD COLOUR

Clear, Diffuser opal & Grey tint

Clear, Diffuser opal & Grey tint

GAUGES (mm)

1.0, 1.5, 2.0, 3.0, 4.5, 6.0, 8.0, 9.5, 12.0

2.0, 3.0, 4.5, 6.0, 8.0, 9.5, 12.0

Other gauges and sizes are available on request, subject to conditions.

APPLICATIONS - Covered Walkways, Barrel Vaults, Sky Lights, Bus Shelters, Balcony Glazing, Signage, Noise Barriers



MAKROLON® Sheet Abrasion Resistant

Superior Abrasion Resistance

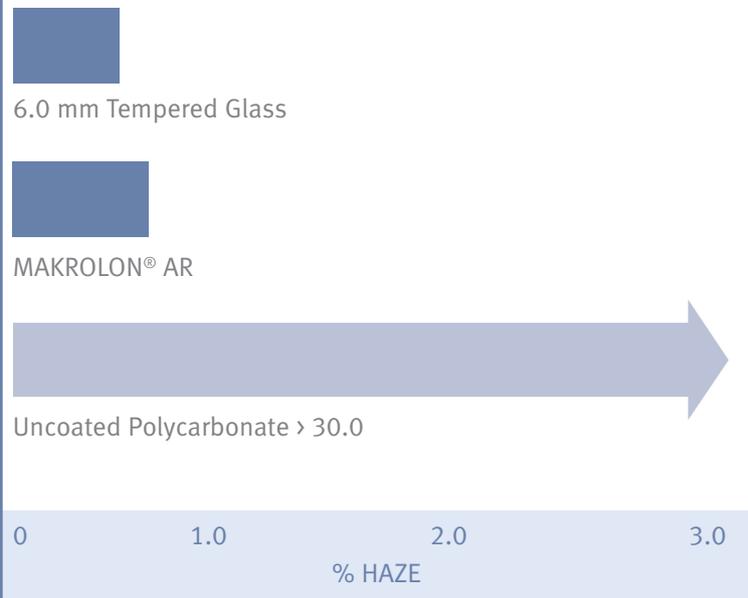
MAKROLON® Sheet AR offers the dual protection you need to ensure long service life in demanding glazing applications. It offers the high impact strength of standard MAKROLON® Sheet GP, coupled with enhanced weatherability and superior abrasion resistance. MAKROLON® Sheet AR features a unique clear hard coat finish on both sides that resists abuse from physical attack to certain chemicals and spray paint. MAKROLON® Sheet GP can not be beaten for impact strength. Add an abrasion and UV resistant surface and the result is MAKROLON® Sheet AR, a polycarbonate glazing material that provides very good clarity when subjected to repeated contact, cyclical cleaning, and vandalism.

STANDING UP TO THE CHALLENGE

MAKROLON® Sheet AR is manufactured to the most demanding specifications in conformance to strict ISO 9001 certified Quality System requirements. Designed for superior performance and long life in high traffic, flat glazing applications, it is available in a range of gauges and sheet sizes. MAKROLON® Sheet AR offers all the strength, durability, and clarity inherent to the MAKROLON® brand with the added dimension of a leading technology hard coat for improved surface hardness, ultraviolet resistance and chemical protection. In addition to superior abrasion resistance, MAKROLON® Sheet AR offers unsurpassed weatherability when subjected to prolonged periods of UV exposure. MAKROLON® Sheet AR comes with a 7 year limited warranty against breakage, delamination and weathering from date of purchase. Request warranty for full details.



TABER ABRASION - Samples tested per ASTM D 1044



STANDARD SIZES

STANDARD COLOUR

GAUGES (mm)

2440mm x 1220mm	Clear	3.0, 4.5, 6.0, 9.5, 12.7
2440mm x 1830mm	Clear	3.0, 4.5, 6.0, 9.5, 12.7

Other gauges and sizes are available on request, subject to conditions.

APPLICATIONS - Safety Glazing, Anti-Vandal Glazing, Noise Barriers, Bus Shelters

MAKROLON® Sheet HYGARD®

The Ultimate Security Product

Increasing violent crime, readily available sophisticated weapons, and larger glazed areas in modern detention centre design, have created a need for higher performing security glazing materials. MAKROLON® Sheet HYGARD® consists of multiple layers of polycarbonate or polycarbonate/acrylic with bonding interlayer's and offer proven resistance to physical and ballistic attack.

The MAKROLON® Sheet HYGARD® range offers six levels of protection ranging from certified containment glazing to UL Level 3 Bullet resistant glazing, capable of withstanding multiple rounds of ammunition fired from Medium Powered Small Arms (MPSA) to Super Powered Small Arms (SPSA). MAKROLON® Sheet HYGARD® will not spall or 'spider web', allowing for complete vision.

This can be critical for an appropriate response in the event of attack.

All MAKROLON® Sheet laminated products feature hard coated surfaces for exceptional resistance to abrasion and UV degradation. Whatever the application, MAKROLON® Sheet offers unsurpassed performance versus competitive glass and glass-clad polycarbonate products.

MAKROLON® Sheet HYGARD® comes with a 7 year limited warranty against coating failure, structural delamination, excessive yellowing or loss of light transmission from date of purchase. Request warranty for full details.



MAKROLON® SHEET HYGARD® PRODUCT	Kg/m ²	LIGHT TRANSMITTANCE (CLEAR)	SHADING COEFFICIENT	U-FACTOR
CG375	12.0	86%	.92	.88
CG500	13.5	83%	.90	.80
CG750	20.0	77%	.87	.70
BR750	20.0	88%	.89	.70
BR1000	32.4	72%	.84	.61
BR1250	39.6	67%	.81	.55

Containment Glazing

Laminated Polycarbonate Sheet

STANDARD SIZES

2440mm x 1220mm

STANDARD COLOUR

Clear

APPLICATIONS

Physical Attack Glazing,
Specialty Vehicle Glazing

CG375

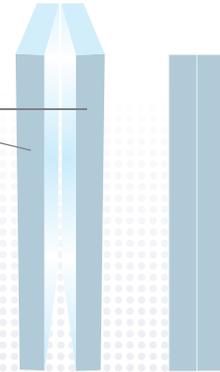
Containment Glazing 9.5mm Gauge Containment (2 ply)

HPW TP0500.01 Level II Step 11

HPW Level A Ballistics (.38 Special)

ASTM F1233 Class III Step 12

4.5mm Makrolon® Sheet AR



CG500

Containment Glazing 12.0mm Gauge Containment (3 ply)

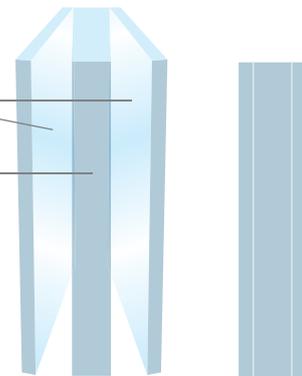
HPW TP0500.01 Level II Step 12

HPW Level A Ballistics (.38 Special)

ASTM F1233 Class III Step 15

3mm Makrolon® Sheet AR

6mm Makrolon® Sheet GP



CG750

Containment Glazing 20.0mm Gauge Containment (3 ply)

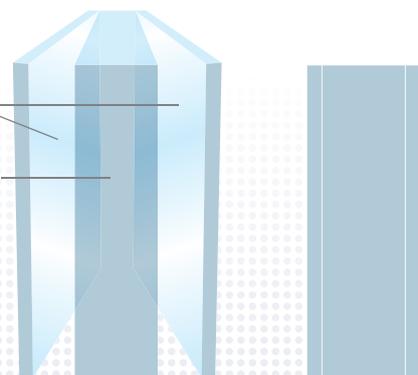
HPW TP0500.01 Level IV Step 31

HPW Level B Ballistics (9mm)

ASTM F1233 Class IV Step 26

3mm Makrolon® Sheet AR

12.7mm Makrolon® Sheet GP



Bullet Resistant

STANDARD SIZES	STANDARD COLOUR	APPLICATIONS
2440mm x 1220mm	Clear	Prisons, Detention Facilities, Banks, Specialty Retailers, Psychiatric Hospitals, Government Buildings

BR750

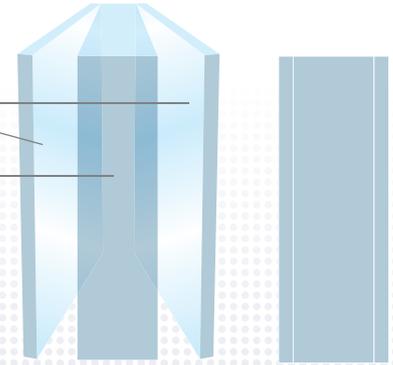
20mm Gauge Bullet Resistant Level 1 (3 ply)

HPW TP0500.02 Level B Ballistics (9mm)

UL752 Level 1MPSA (9mm)

3mm Makrolon® Sheet AR

14mm Acrylic



BR1000

25mm Gauge Bullet Resistant Level 2 (4 ply)

HPW TP0500.02 Level B Ballistics (9mm)

HPW Level V Sequence 42

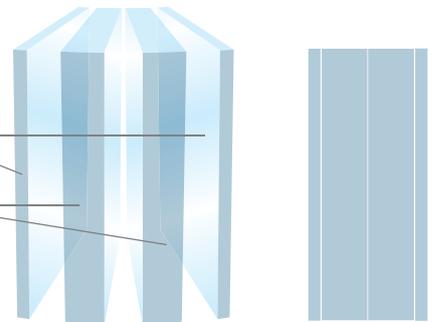
ASTM F1233 Class V

ASTM F1233 Ballistics (.38 Super)

UL752 Level II – HPSA (.357 Magnum)

3mm Makrolon® Sheet AR

9.5mm Makrolon® Sheet GP



BR1250

32mm Gauge Bullet Resistant Level 3 (4 ply)

HPW TP0500.01 Level C Ballistics (.44mm Magnum)

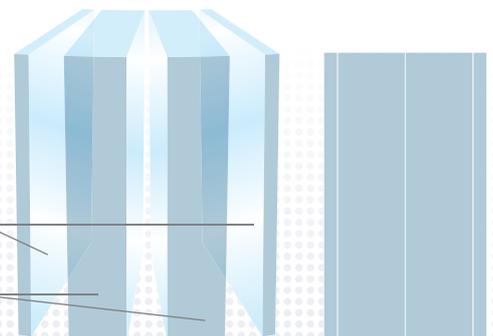
HPW TP0500.01 Level V

ASTM F1233 Class V Step 38 Ballistics (.44mm Magnum)

UL752 Level III SPSA (.44mm Magnum)

3mm Makrolon® Sheet AR

12.7mm Makrolon® Sheet GP



VIVAK® Co-polyester (PETG) Solid Sheet

High Impact & Fire Resistance. Fully recyclable.

Vivak® is a clear transparent sheet made from thermoplastic co-polyester (PETG). It offers extreme clarity and light transmittance and high gloss level. In addition, it has high impact strength, is fire resistant and is 100% recyclable. With superior thermoforming and mechanical properties, Vivak® offers designers a high degree of design freedom.

Vivak® sheet offers deep draws, complex die cuts and precise moulded-in details without sacrificing structural integrity. It can be bonded or fastened with adhesives, tapes, ultrasonic welding or rivets. In addition, Vivak® sheet is easily decorated by painting, silk screening or hot stamping. It is also easy to fabricate, form, bond and decorate.

Vivak® sheet products offer virtually unlimited options for complex shapes and objects in applications that range from industry to visual communications, to specialised purposes in the medical field. With its ease of fabrication even at low temperatures, Vivak® ensures low energy consumption and high productivity.

Vivak® is manufactured in Australia by Bayer MaterialScience under strict quality control, meeting ISO 9001:2000 certification guidelines for both plant and process.



STANDARD SIZES

2440mm x 1220mm

2440mm x 1830mm

STANDARD COLOUR

Clear

Clear

GAUGES (mm)

1.0, 1.5, 2.0, 3.0

2.0, 3.0

Other gauges and sizes are available on request, subject to conditions.

APPLICATIONS - Vacuum-formed and Screen Printed displays, Prostheses, Medical Applications,

All Bayer polycarbonate solid sheet products are manufactured from high-tech, high-quality Bayer MAKROLON[®] polycarbonate resin for high impact resistance, light weight, excellent transparency, UV stability and excellent fire resistance. MAKROLON[®] and Vivak[®] are registered trademarks of Bayer AG. For more information please visit the website or contact your local Bayer MaterialScience sales office.

Product liability clause: This information and our technical advice – whether verbal, in writing or by way of trials – are given in good faith but without warranty, and this also applies where proprietary rights of third parties are involved. Our advice does not release you from the obligation to verify the information currently provided – especially that contained in our safety data and technical information sheets – and to test products as to their suitability for the intended processes and uses. The application, use and processing of our products and the products manufactured by you on the basis of our technical advice are beyond our control and, therefore, entirely your own responsibility. Our products are sold in accordance with the current version of our Terms and Conditions of Sale.



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VIVAK[®]



MAKROLON[®] Sheet