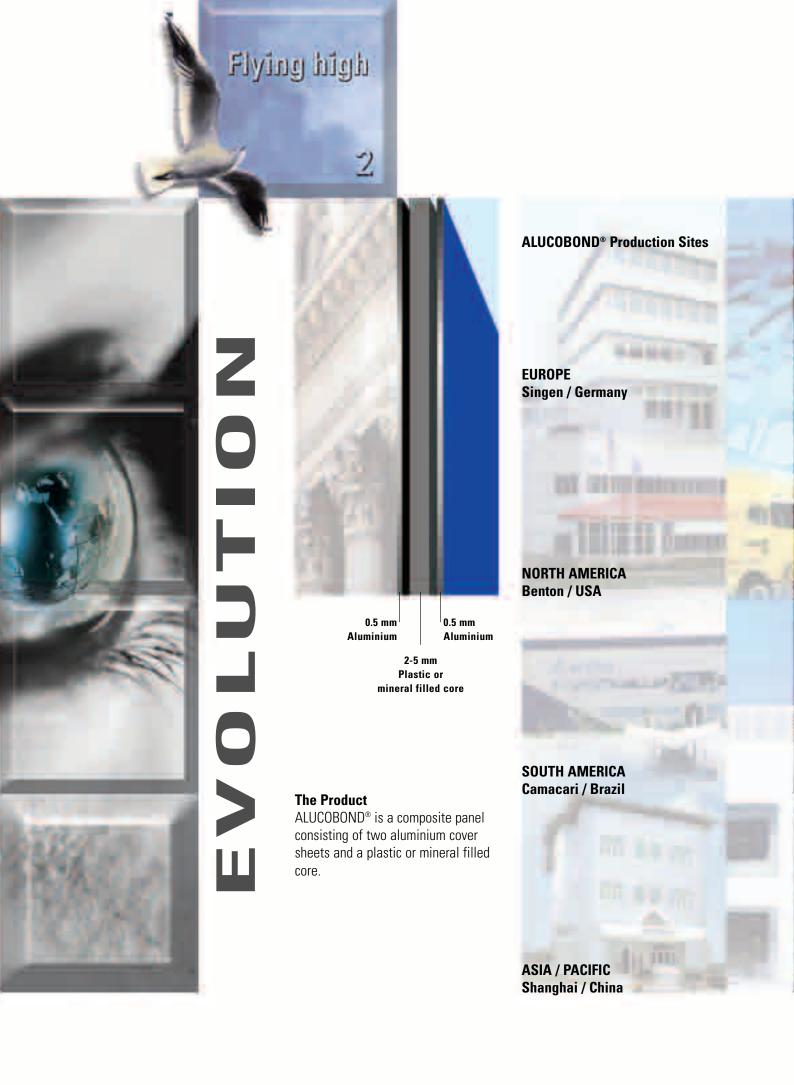


Founded in 1912, Alcan Singen GmbH is one of the leading aluminium processing companies in Germany. It is part of the international Alcan Group which has extensive production facilities in more than 50 countries with various distribution centres located around the world.

With its numerous product innovations and state-of-the-art production facilities, Alcan Singen has been a pioneer in processing of aluminium for more than 90 years. Already in 1969, the production of ALUCOBOND® started on a commercial basis. By the turn of the millennium, 70 million square meters of this light aluminium composite panel had been sold world-wide. For more than 35 years, building owners and architects have successfully chosen our versatile ALUCOBOND® as a construction material to turn their ideas into reality and to give buildings and skylines the shape of the future.

Ancient view of the former castle on top of the 686 m high extinct volcano, the Hohentwiel, near the town of Singen.







### **Comprehensive Service**

The service teams at ALCAN COMPOSITES support architects and building owners right from the planning stage. They provide comprehensive technical information and individual advisory services to assist in the perfect implementation of all ideas and plans. For every project, the proven strategy to achieve a smooth completion lies in an early co-ordination between vision, architectural plans and the many possibilities which our unique panels give to fabricators and installers. Our product and application know-how is the fastest and surest way to success, whether for new buildings, renovation works, interior or exterior applications.

### **Just-in-time Fabrication Centres**

During the past 30 years, qualified, independent fabricators and installers have become firmly established, offering professional service to the building industry. They have acquired deep



knowledge in the processing of ALUCOBOND® and their skilled personnel and specialized processing equipment ensure that your project is completed on time and within budget.

### Worldwide

The close co-operation between ALCAN COMPOSITES and its distributors has led to a finely meshed international marketing network that provides

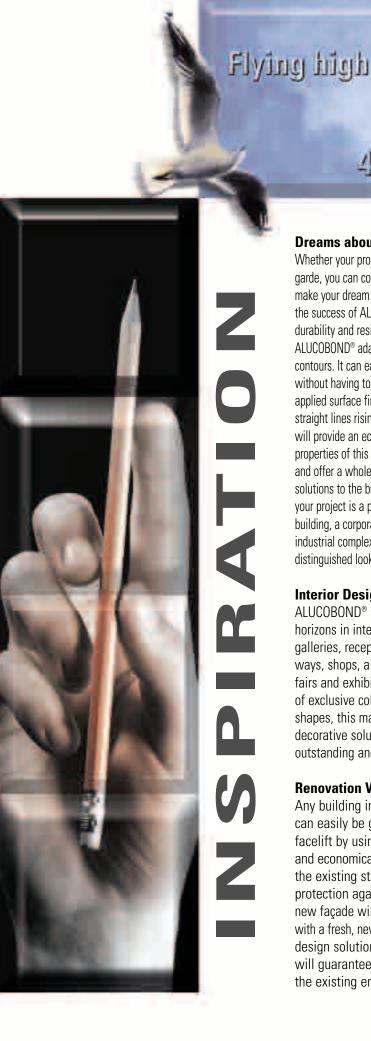


our customers with distinct benefits. Wherever a project is to be realized, ALCAN COMPOSITES and its partners ensure you quick and professional on-site service.

### One thousand ideas - one material

The world-wide success of ALUCOBOND® speaks for itself! Never compromise when it comes to quality and experience! Your nearest fabricator will provide a tailor-made solution which will last!





**Dreams about claddings** 

Whether your project is discreet or avantgarde, you can count on ALUCOBOND® to make your dream façades come true. Part of the success of ALUCOBOND® is due to its durability and resistance against corrosion. ALUCOBOND® adapts' perfectly to the buildings' contours. It can easily be cut and shaped, without having to compromise on the factory applied surface finish. Whether soft curves or straight lines rising into the sky, ALUCOBOND® will provide an economical design. The superb properties of this material boost inspiration and offer a whole new range of innovative solutions to the building industry. Whether your project is a private home, a public building, a corporate headquarter or a trade or industrial complex, ALUCOBOND® can give it a distinguished look which will last forever.

### **Interior Design**

ALUCOBOND® also inspires new horizons in interior decoration, be it for galleries, reception areas, passage ways, shops, airports, banks or trade fairs and exhibitions. Through the use of exclusive colours and innovative shapes, this material offers impressive decorative solutions for the creation of outstanding and unique interior designs.

### **Renovation Work**

Any building in need of renovation can easily be given a rejuvenating facelift by using ALUCOBOND®-fast and economically. In addition to giving the existing structure long-term protection against the elements, the new façade will provide the old building with a fresh, new look. A carefully selected design solution and colour scheme will guarantee subtle integration into the existing environment.







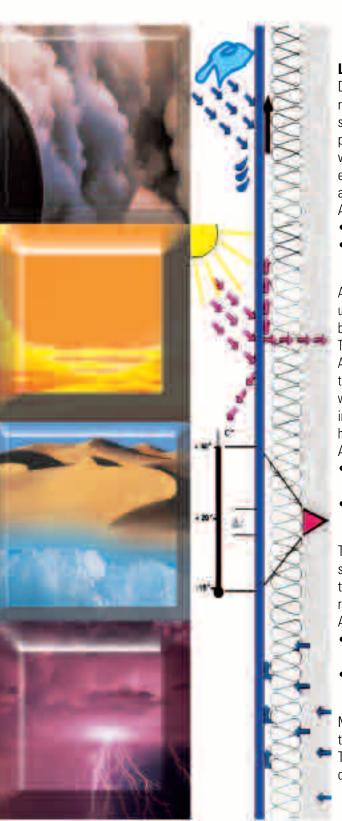
### **Environment, Health and Safety**

For ALCAN, effective, continuing environmental protection is a main priority. The company considers natural resources to be a basic asset to be preserved, in order to ensure forthcoming generations a future worth living. Considering itself a world leader in environmental protection, ALCAN introduced its own Environment, Health and Safety Programme which is strictly monitored and enforced at all production plants. With this, ALCAN commits itself to continuous improvement which by far exceeds existing regulations.

ALCAN was one of the first companies to develop its own Environmental Management System which is regularly reviewed by independent auditors. We have successfully achieved certification according to EN ISO 14001 standards.

### **Ozone Friendly**

During the life cycle of ALUCOBOND® composite panels, no substances containing CFC are set free at any time. The core material does not contain any nitrogen, chlorine or sulphur. Therefore, selecting ALUCOBOND® for projects which require environmental-friendly materials is literally a natural choice.



### Life Cycle

During decades of use in a rear-ventilated cladding system, ALUCOBOND® protects the building from weathering and the harmful effects caused by industrial and environmental pollution. Advantages:

- Lower maintenance costs
- Long-term preservation of the building structure

An external cladding system using ALUCOBOND®, acts as a barrier against solar radiation. The ventilated space between the ALUCOBOND® and the wall or the thermal insulation (in climates which require additional insulation material) reduces the heat transmission.

### Advantages:

- In winter: savings in heating cost
- In summer: savings in air-conditioning cost

The rear-ventilated cladding system protects the wall of the building from high and rapid temperature fluctuations. Advantages:

- Reduction of thermal expansion/contraction
- Reduction in crack formation

Moisture can pass through the wall. The building structure keeps dry.



### Recycling

ALUCOBOND® is fully recyclable, i.e. both the core material and the aluminium cover sheets are recycled and can be used in the production of new material.

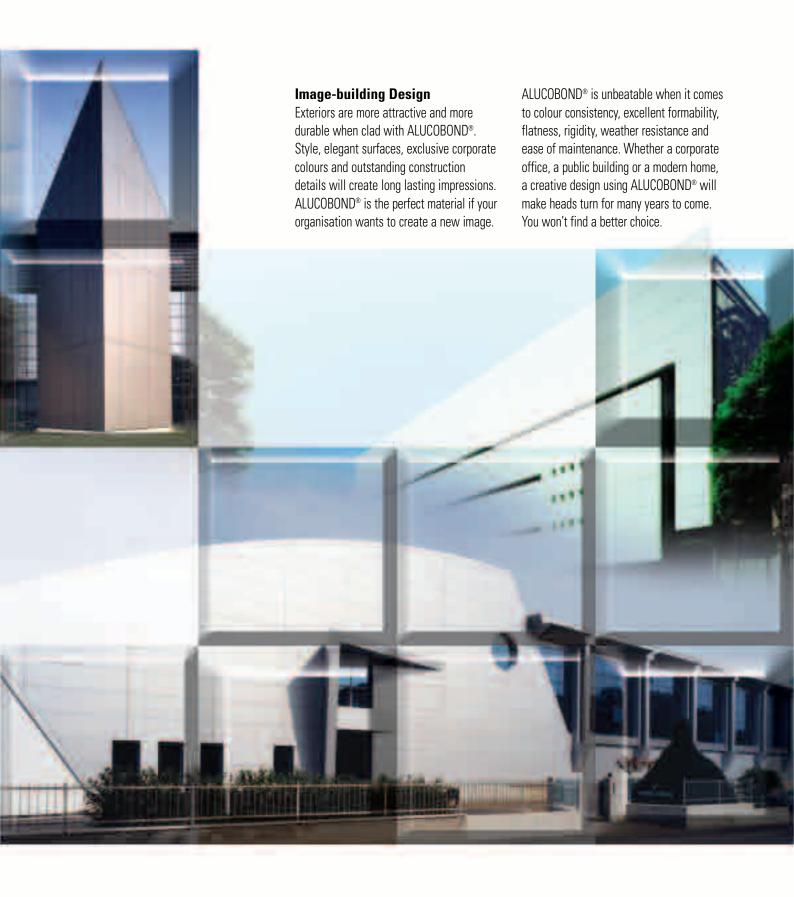




# SURFACES



Welcome to the world of ALUCOBOND® - a world unlike that of other building materials. Designers and architects are attracted by the extraordinary flatness of ALUCOBOND®. Turn the pages and take a look at what the design world is doing today with this flat, formable, prefinished aluminium composite. Embark on a creative journey with ALUCOBOND® and start planning your very own stories of success in a world of innovative solutions. Prefabricated panel elements ensure fast installation. The light weight of ALUCOBOND® cladding elements makes handling on site very easy.





**Flowing Contours** 

Due to its composite structure, ALUCOBOND® can take on many different shapes. It is almost like a different skin wrapping the building structure. The panels can be bent, folded or shaped to form complex, flowing elements using simple, conventional tools and equipment. Its unique product features offer architects design options which are limited only by their imagination. Smooth roof structures, curved roof edgings and attics, balustrades around balconies, circular columns and arches can easily be realized. Its perfect formability does not affect its stability and flatness. The high rigidity of the panel remains. When compared with ALUCOBOND®, forming and shaping of any other material to create the same structure of equal durability could only be done at considerably higher cost. Special cladding systems developed by ALCAN COMPOSITES offer attractive low-cost solutions. Curved elements or column claddings are no problem for the fabricators. We say "even when ALUCOBOND® is curved, it is flat" and it will remain flat for its entire life-span.

Whether you are planning a new building or to refurbish an existing one, colourful surfaces and elegant details will give a building its own individual character.

Using ALUCOBOND® will ensure that it will last.





### The Building Material

The innovative product conception of ALUCOBOND® combines seemingly contradictory properties such as excellent formability and stability, low weight and large sizes, brilliant colours and weather resistance, just to mention only a few.

The combination of all these advantageous characteristics makes ALUCOBOND® one of the most versatile materials for interior and exterior design.

Public buildings, administrative buildings, residential buildings, post offices, hospitals, trade centres, airports, cultural centres and schools greatly influence our social lives and, at the same time, give our cities their individual character. ALUCOBOND® offers a tailor-made solution for every project.



**Variety of Colours** 

From a wide range of standard colours, customers can select both metallic and solid colours. Custom colours are available on request.

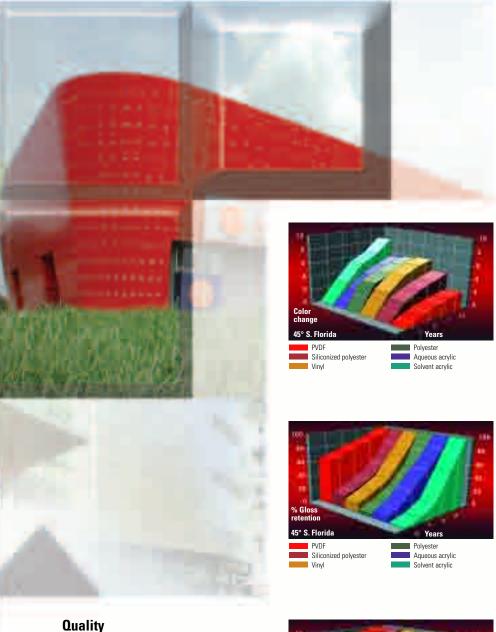
The gloss for solid and for metallic colours is in the range of 30-40% according to Gardner Scale, which is most suitable for architectural applications. For special effect colours, the gloss is in the range of 70-80% according to Gardner Scale. Due to their high gloss, panels coated in special effect colours need special care in the design and during fabrication and installation.

### Lacquering

ALUCOBOND® surfaces are coated using exclusively high-quality lacquer systems which have an optimum resistance against the effects of strong solar radiation, weather and industrial pollution. These properties are achieved by using UV resistant bonding agents. For standard finishes, Fluorpolymer (e.g. PVDF or PVF2) top coats are used. The coating systems combine good formability and excellent surface durability.

Alcan Singen GmbH apply all lacquerbased surface finishes in their own plant to the aluminium coil, prior to lamination into a composite panel. They use a continuous coil coating line which is based on the latest technology. The multiple layers of the coating are individually baked at temperatures of between 200-260°C.



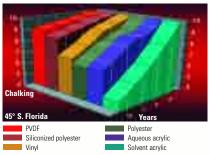


The long-term durability of coatings can be compared by measuring

- Colour change
- Gloss retention and
- Chalking

The superiority of UV resistant lacquer systems (PVDF) is shown in the three graphs. The values indicated are taken from the test conducted by the American Coil Coating Association (NCCA) on lacquered surfaces which were exposed to the extreme climatic conditions of South Florida for several years.

The fully automatic coil coating process is computer controlled throughout all the stages. The quality of the coating is tested according to the standards established by the E.C.C.A. (European Coil Coating Association) of which Alcan Singen GmbH is a member.







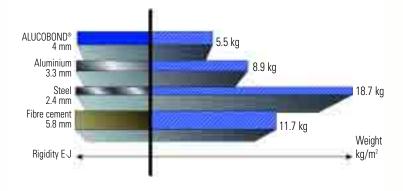
# CLIGHT AND RIGID



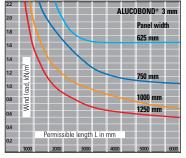
The composite structure of ALUCOBOND® - two aluminium cover sheets and a plastic or mineral filled core - results in an impressive strength-to-weight ratio, even when comparing large panel sizes. Despite its low weight, which makes ALUCOBOND® easy to transport and handle in the factory and on site, its rigidity and high strength make it the most suitable material for exterior wall cladding. When properly designed and installed, ALUCOBOND® panels will keep their shape and remain flat for life, even when exposed to extreme temperature changes.

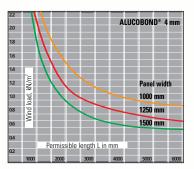


### Comparison of thickness and weight of panels with equal rigidity



ALUCOBOND® compared with solid aluminium Required thickness and actual weights of panels with same rigidity							
	ALUCOBOND®		Aluminium				
Rigidity E-J	Section modulus W	Thickness	Weight	Thickness	Weight		
1250 kN cm <sup>2</sup> /m	1.25 cm³/m	3 mm	4.5 kg/m <sup>2</sup>	2.7 mm	7.3 kg/m²		
2400 kN cm <sup>2</sup> /m	1.75 cm³/m	4 mm	5.5 kg/m <sup>2</sup>	3.3 mm	8.9 kg/m <sup>2</sup>		

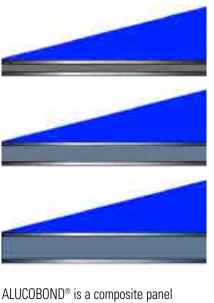




Wind load and permissible panel sizes
The graphs for 3 mm and 4 mm thick ALUCOBOND® indicate the maximum permissible panel length (without having to add a stiffener) based on applicable design wind load and panel width.

- Note: Permissible stress = 53 N/mm² (includes safety)
  - Values apply to 4-side supported panels
  - Values for other systems on request

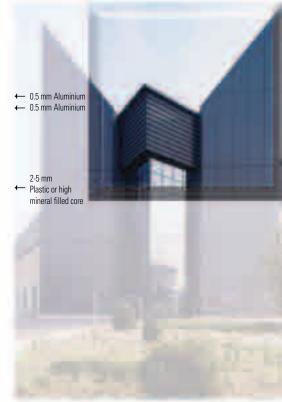




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consisting of two aluminium cover sheets of Peraluman alloy - 100 (AIMg1), EN AW - 5005 A according to EN 485-2 and a plastic or high mineral filled core.

ALUCOBOND® is produced with various core thicknesses in a continuous lamination process.



All painted panels are supplied with a protective peel-off foil.

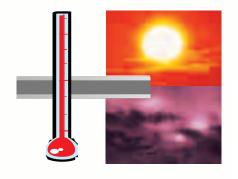
Product Range							
ALUCOBOND®	Thickness	4 mm (3, 6 mm*)					
One side coil coated	Width	1000 mm, 1250 mm, 1500 mm					
lacquer finish	Length	up to 8000 mm					
ALUCOBOND® PLUS	Thickness	4 mm (3 mm*)					
One side coil coated	Width	1250 mm, 1500 mm					
lacquer finish	Length	up to 8000 mm					
ALUCOBOND® A2	Thickness	4 mm (3 mm*)					
One side coil coated	Width	1250 mm, 1500 mm					
lacquer finish	Length	up to 8000 mm					
Upon request:	Other surfaces	mill-finish both sides coil coated lacquer, both sides colourless anodised <sup>1)</sup>					
	Special widths Special lengths						

<sup>\*)</sup> Upon request - 1) Please note: All anodised ALUCOBOND® composite panels have contact lines (about 25 mm width) on their short sides. Please take this into consideration when dimensioning the panels.

Technical data			A	LUCOBONI	<b>D</b> ®	PLUS	А	2
Thickness:			3 mm	4 mm	6 mm	4 mm	3 mm	4 mm
Cover sheet, thickness		[mm]		0.50		0.50	0.5	50
Weight		[kg/m²]	4.5	5.5	7.3	7.6	5.9	7.6
Width		[mm]	10	000/1250/150	00	1250/1500	1250/	1500
Technological data:								
Section modulus	W	[cm³/m]	1.25	1.75	2.75	1.75	1.25	1.75
Rigidity	E∙J	[kNcm²/m]	1250	2400	5900	2400	1250	2400
Alloy					EN AW	- 5005 A (AIMg1	)	
Mechanical properties of the cover sheets			H22/H42, according to EN 573-3					
Modulus of elasticity		$[N/mm^2]$				70,000		
Tensile strength of cover sheets		$[N/mm^2]$				$R_{\scriptscriptstyle m} \geq 130$		
Proof stress (0.2%) [N/mm²]			$R_{p0.2} \ge 90$					
Elongation						$A_{50} \geq 5\%$		
Linear expansion			2.4 mm/m at 100°C temperature difference					

# Thermal insulating properties

Due to its relatively thin and homogeneous core, ALUCOBOND® is not an insulation panel.



### Temperature resistance

From  $-50^{\circ}$  C to  $+80^{\circ}$  C.

Acoustical properties:		A	LUCOBON	D®	PLUS	<b>A2</b>		
Thickness:		3 mm	4 mm	6 mm	4 mm	3 mm	4 mm	
Sound absorption factor $\alpha_{\rm s}$		0.05		0.05	0.05			
						(accord. to EN 20354, ISO 354)		
Sound insulation	$R_{w}$	[dB]	25	26	27	STC = 30, OITC 24	27	27
		(ISO/Di	S 717-1, EN IS	0 140-3)	(accord. to ASTM 90)	(ISO/DIS 717-1,	EN ISO 140-3)	
Loss factor	d	[mm]	0.0072	0.0087	0.0138		0.004	0.005
			(accord. to EN ISO 67		721, frequency range	100-3200 Hz)		

Rear ventilated ALUCOBOND® cladding considerably improves sound insulation. For example, the sound insulation of a light-weight concrete wall is double when clad with ALUCOBOND®. The loss factor (a measure for the acoustic sound-damping behaviour) of ALUCOBOND® is approx. 6 times better than that of solid aluminium sheets.







ALUCOBOND® can be cut with a vertical panel saw, circular or jig saw. Conditions for cutting with a circular saw:

Cutting tools/carbide tipped, blade geometry:

Thickness of cutting teeth approx. 2-4 mm; Tapered from outside to inside to prevent jamming.

Tooth geometry: Trapeze tooth/flat tooth Pitch t: 10-12 mm

Clearance angle  $\alpha$ : 15°

Rake angle  $\gamma$ : 10° (positive) Max. cutting speed v: 5000 m/min.

Max. feed s: 30 m/min.





ALUCOBOND® can be drilled with twist drills normally used for aluminium and plastics on machines common for metals. Drill material:

High-speed steel (HSS) We recommend metal drills with centre-point.



Contour cutting

ALUCOBOND® can be cut to shape using CNC machining centres, water jet cutting machines, copy routers and jig saws.



**Shearing** 

Shearing can be done with a guillotine.

To prevent surface damage, use protective pads between down-holders and ALUCOBOND® surface and adjust to minimum down holding pressure.

Use carpet protection on feeder table. Do not use ball supports as they damage the ALUCOBOND® surface. Shearing will cause a slight deflection of the cut edge on the impact side.





### **Punching**

ALUCOBOND® can be punched using conventional sheet metal punching machines or manual notchers. For clean cuts use sharp tools and dies with minimal cutting clearance. Punching will cause a slight deflection of the cut edge on the impact side.



**Bending** 

Bending is possible with a folding table or a bending press. Min. required inside radius:

- For ALUCOBOND®: r = 10 x t
- For ALUCOBOND® PLUS: r = 10 x t
- For ALUCOBOND® A2: r = 25 x t t = panel thickness

To protect the surface finish of ALUCOBOND® during bending use padding strips. The spring-back of ALUCOBOND® is greater than that of a solid aluminium sheet. To determine spring-back for serial production, make tests on sample panels.





### Roll bending

ALUCOBOND® can be bent using a roll bending machine (pyramid or pinch rollers).

To protect the surface finish of ALUCOBOND® during bending use only polished rollers free of dents and other defects.



### **Riveting**

Riveting is possible using solid or blind rivets with conventional riveting tool. For exterior applications allow for thermal expansion and possible building movements.



### Welding

The plastic core of ALUCOBOND® can be hot-air welded using conventional hot-air welding equipment and plastic filler rod. Hot-air welding provides a water-tight joint for decorative purpose only. It is not suitable for joints where structural strength is required.



### **Screwing**

Use conventional wood. sheet-metal or machine screws made of stainless steel.

For exterior applications allow for thermal expansion and possible building movements.



**Clamping** 

With serrated corner-joint or butt-joint sections or clamped between special aluminium extrusions.



### **Bonding**

For exterior use and structural applications:

- Adhesive sealing compounds
- Double-sided VHB tapes Consult sealant manufacturer for correct application.

For interior applications:

- Metal adhesives
- Double-sided VHB tapes Adhesives and sealants do not adhere to the plastic core! Apply to the aluminium cover sheet only!

For further information please ask for our brochure ALUCOBOND® Processing.



### Method

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A major feature of ALUCOBOND® is the possibility to shape panels using a very simple technique called the routing and folding method. It enables a fabricator to produce shapes of various kinds by hand, without the need for heavy equipment like folding machines or break presses.

A V-shaped or rectangular groove is routed on the reverse side of the ALUCOBOND® composite panel along the proposed folding edge, using a disk or end milling cutter. A thin layer of the core material should be left at the base of the groove, i.e. on the inside of the outer cover sheet. The untouched outer cover sheet can now be bent manually, giving an exact and clean folding line which follows the routed groove. The outer radius of the folded edge depends on the shape of the groove and its depth.

We recommend that the routing be done using a panel saw equipped with ALUCOBOND® grooving accessories or a specially designed portable sheet milling machine. Conventional hand routers with suitable router bits can be used for curves and for very small

jobs. For complicated shapes, a CNC machining centre will provide repetitive accuracy and high output.

The routing and folding method can be used for ALUCOBOND® composite panels with all available standard surface finishes.

### **Advantages**

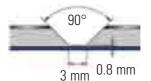
The convincing advantages of this unique technique are:

- Low investment cost
- Simple fabrication technique which can be learnt easily by unskilled workers
- Folding can be done on site, saving packing and transportation cost and reducing damage caused in transit
- Low-cost fabrication of shaped components used in fascia and wall cladding, roof edgings, column cladding, flashings, etc.
- Flexibility in creating shapes
- Very economical, without compromising on quality
- Shapes are not limited by machine capacity
- Components can be easily fabricated and fitted on site

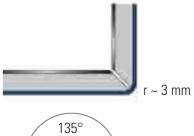
### **Benefits**

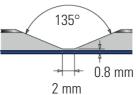
The fabrication of shaped components using ALUCOBOND® only requires a minimal investment outlay. Hand routers and sheet milling machines are inexpensive and can be used either in the workshop or on site. The fabrication of shapes in larger quantities is particularly economical using vertical panel saws equipped with ALUCOBOND® grooving accessories.

Contact roller controls exact groove

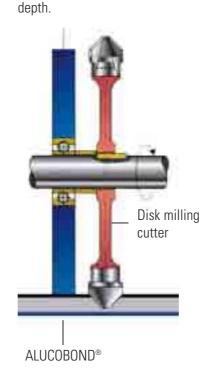


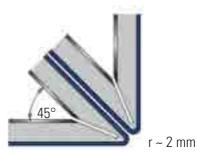
90° V-groove for folds up to 90°





135° V-groove for folds up to 135°





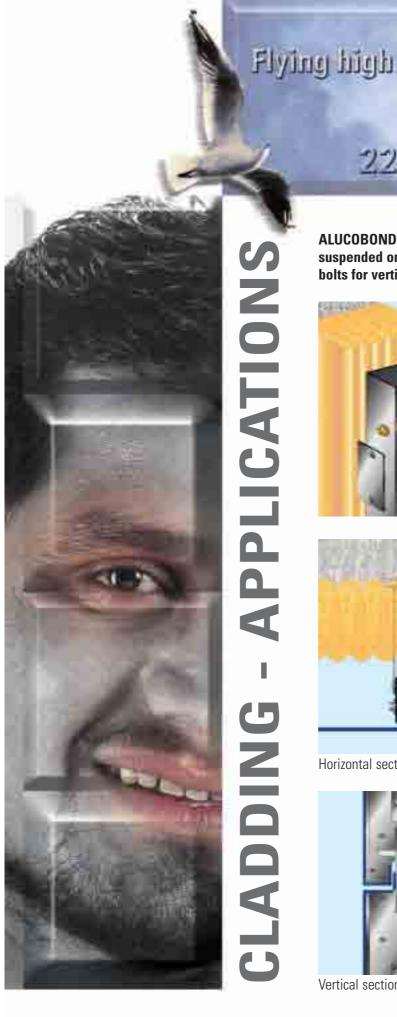


Rectangular (U -) groove for folds up to 150°, depending on panel thickness. Not suitable for ALUCOBOND® A2.



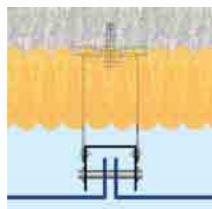






**ALUCOBOND®** tray panels suspended on stainless steel bolts for vertical panel layout





Horizontal section



Vertical section

The following ALUCOBOND® cladding examples are proven solutions which the technical teams of ALCAN COMPOSITES have developed for their clients, hence sharing their know-how and experience in the application of ALUCOBOND® with you. For different environmental and climatic conditions



different details may apply.

ALCAN COMPOSITES do not sell systems, but assist their clients in developing tailor-made solutions most suitable to achieve the required design intent and making use of locally available components, equipment and expertise.

For further information please contact your nearest ALUCOBOND®

Distributor or ALUCOBOND® Support Centre for full details and free advice.

### ALUCOBOND® tray panels Clamped/screwed for vertical panel layout

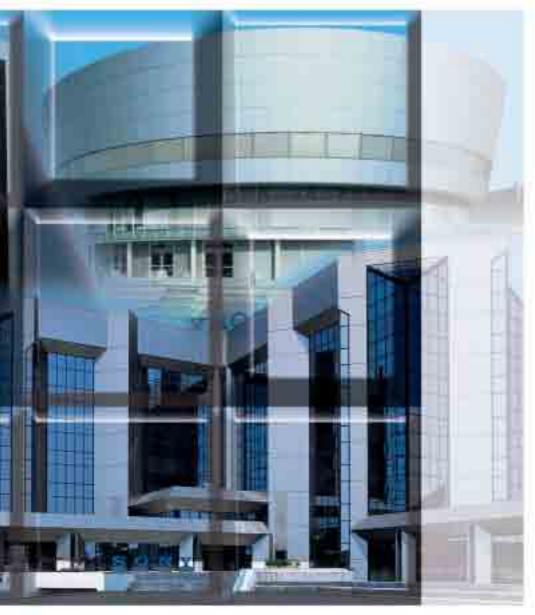


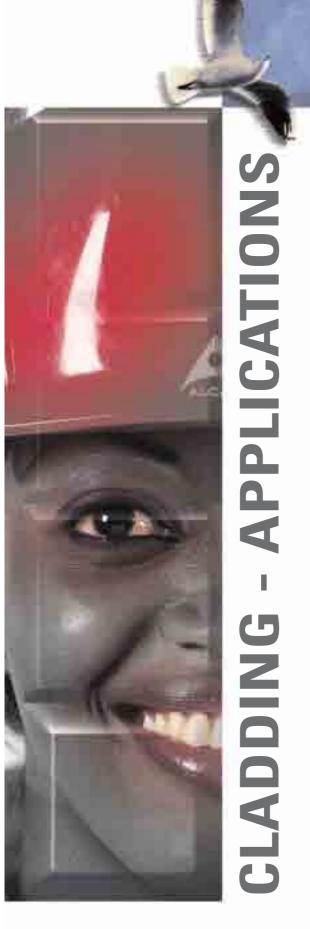


Horizontal section

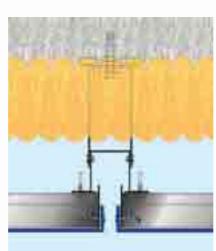


Vertical section





ALUCOBOND® tray panels Tongue and groove design (SZ 20 system) for horizontal panel layout



Horizontal section

Flying high

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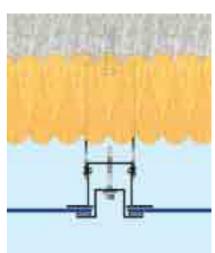


Vertical section



ALUCOBOND® Clamped/screwed Double "top-hat" sections for vertical panel layout

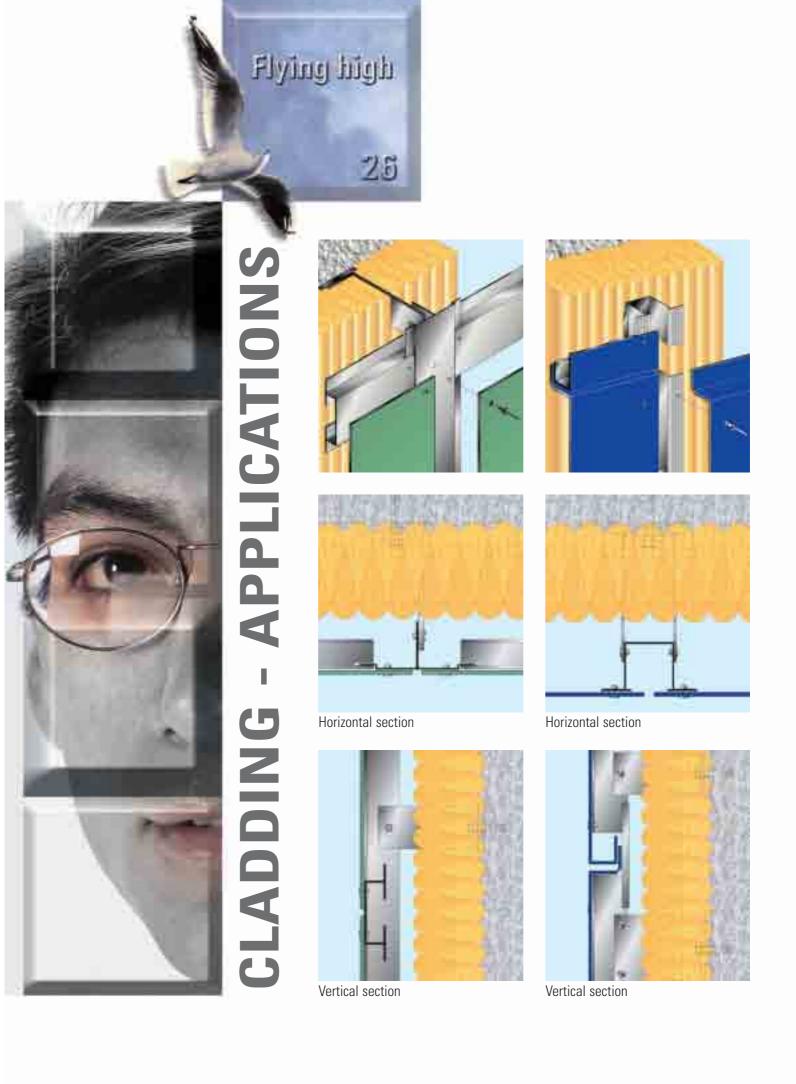




Horizontal section

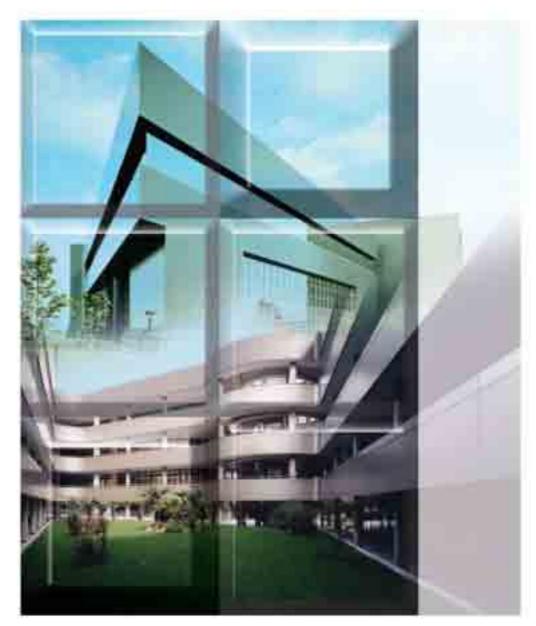






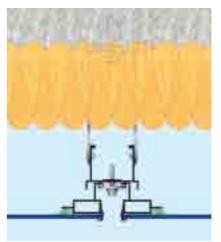
ALUCOBOND® Riveted or screwed to Aluminium substructure

### Bonding of Aluminium sections to ALUCOBOND® panels Structural silicone technique

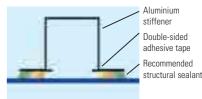




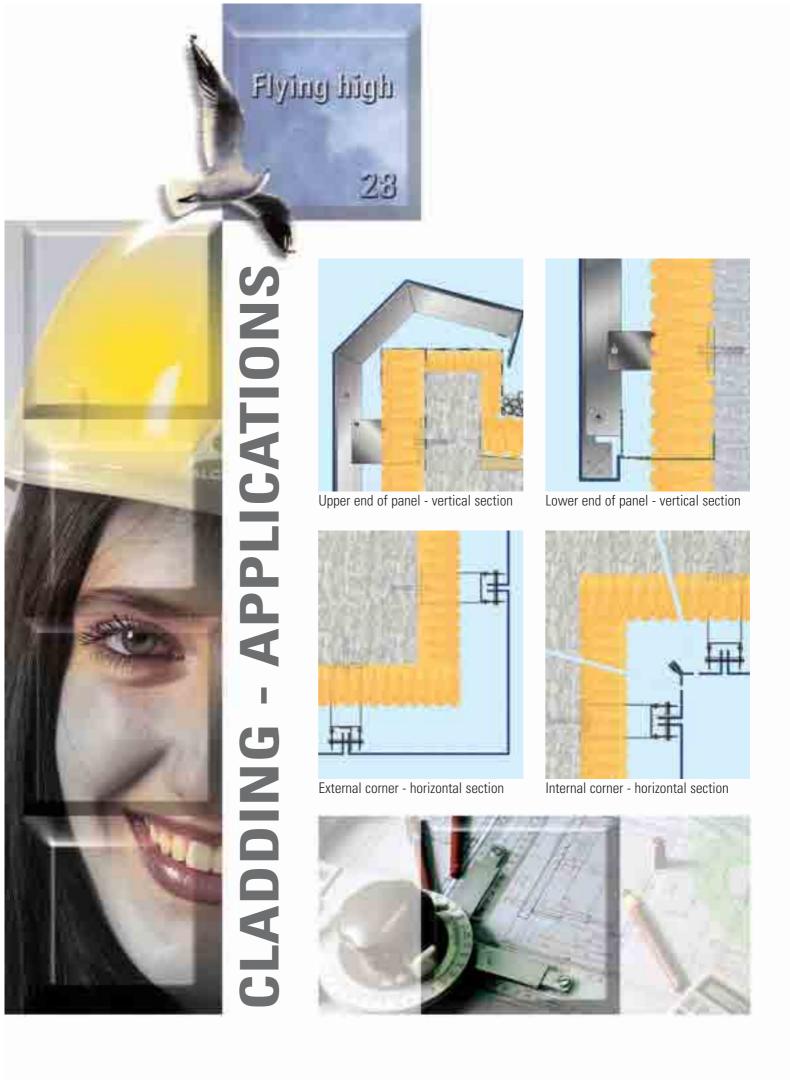
ALUCOBOND® panels framed with bonded edge sections

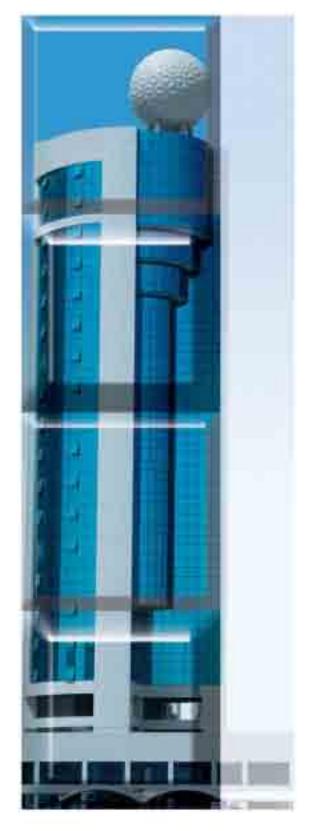


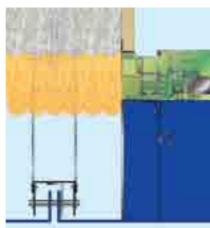
Vertical and horizontal panel layout



Aluminium stiffeners bonded to ALUCOBOND® panels







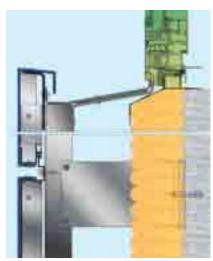
ALUCOBOND® window sill in true alignment with cladding - horizontal section



Vertical section



Panel on top of window - vertical section



ALUCOBOND® window sill with internal drainage - vertical section

In addition, it is possible to combine or vary these systems in any conceivable way.

Our technical service is there to help you implement your visions.





### **Processing/Installation**

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To avoid possible reflection differences (for metallic colours only), we recommend installing the panels in the direction of the marking shown on the protective foil of the individual panels.



### **Dimensional tolerances**

Thickness mill-finish/stove-lacquered/ anodised: ±0.2 mm

Width -0/+4 mm

Length 1000-4000 mm -0/+6 mm

4001-8000 mm -0/+10 mm

Due to the production process, a displacement of the cover sheets of max. 2 mm to one side may occur along the longer sides of the panels if not specially trimmed.

### Removal of protective foil

We recommend removing the protective foil as soon as possible after the installation. Due to UV radiation, it may occur that residual glue sticks to the surface of the panels.

### **Cleaning and Maintenance**

The frequency of cleaning depends largely on the design, the location of the building and the degree of soiling. For further information please ask for our brochure ALUCOBOND® Processing.

### Storage

Protect the ALUCOBOND® panels during storage against rain, moisture penetrating the pallets and condensation.

Store the pallets stacked one on top of the other; stacks must not comprise more than 6 pallets of identical size. Storage exceeding 6 months should be avoided.













# Fire behaviour of ALUCOBOND® panels

ALUCOBOND®							
Country	Test accord. to	Classification					
Germany	DIN 4102-1 DIN 4102-7	Class B2 passed					
Austria	ÖNORM B 3800	Class B1					
Czech Republic	CSN 73 0862	Class B					
Denmark Norway Sweden	NT Fire 002	hardly inflammable					
<b>France</b> NF P 92-501 NF F 16-101		Class M1 Class F0					
Italy CSE RF 2/75/A, RF 3		Class 1					
Switzerland	VKF Fire regulation	Class 4.2					
Great Britain  BS 476, Part 6 BS 476, Part 7		Index 0 Class 0 Class 1 Building Regul.					

ALUCOBOND® Plus						
Country	Test accord. to	Classification				
Germany	DIN 4102-1 DIN 4102-7	Class B1 passed				
Switzerland VKF Fire regulation		Class 5.3				
<b>Great Britain</b> BS 476, Part 5		Class P				

ALUCOBOND® A2						
Country	Test accord. to	Classification				
Germany DIN 4102		Class A2				
Austria	ÖNORM 3800	Class A				
Czech Republic	CSN 73 0862	Class A				
Denmark DS 1065.1		Class A				
France	NF P 92-501	Class M1				
Italy CSE RF 1/75/A, RF 3/3		Class 1				
Switzerland VKF Fire regulation		Class 6q.3				
Great Britain	BS 476, Part 6 BS 476, Part 7 BS 6853	Index 0 Class 0 Class 1 Building Regul. Meets requirements of the London Underground Ltd. code of practice				

# Information (Please ask for our ad ALUCOBOND® P

(Please ask for our additional documentation on)

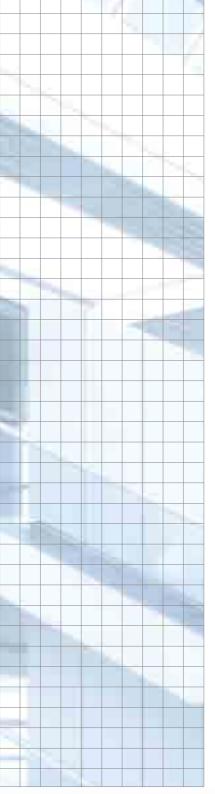
ALUCOBOND® Product Information Folder
ALUCOBOND® The Colours
ALUCOBOND® Range of Products:

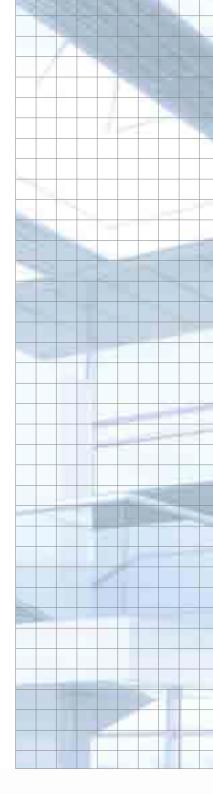
Special Aluminium
Sections and Accessories

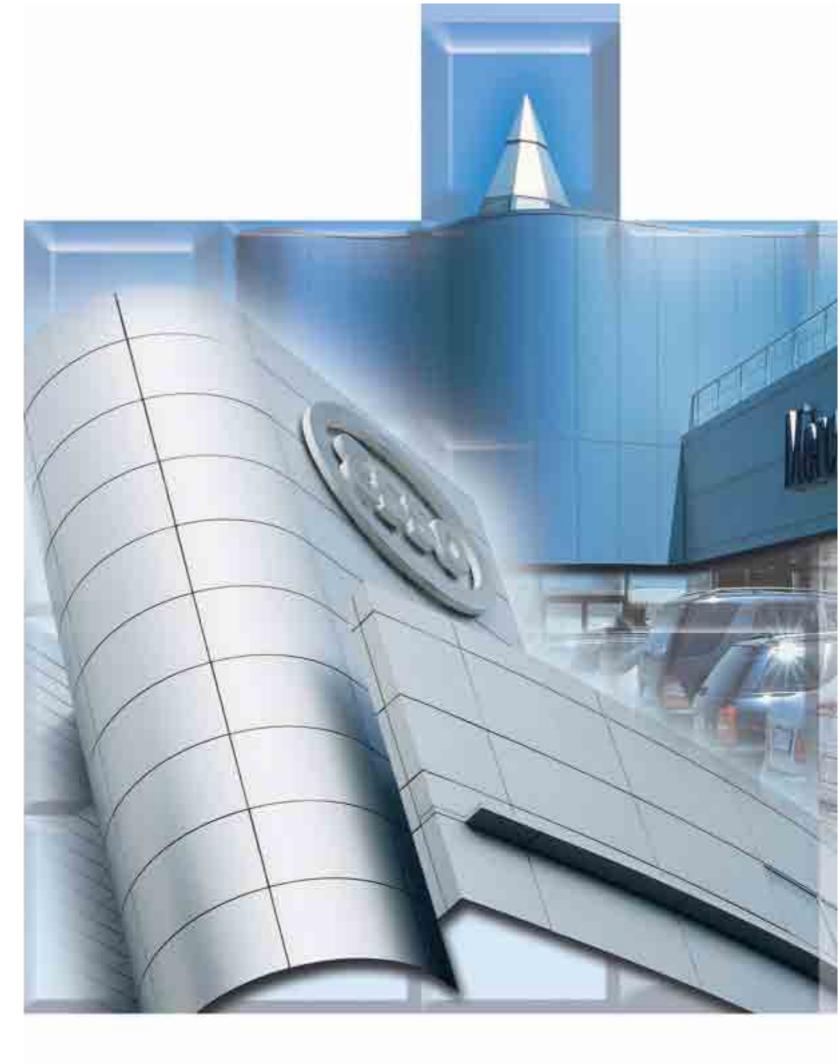
ALUCOBOND® Documentation File
Cladding Samples and
recommended texts for
tender documentation
Incl. CD Rom

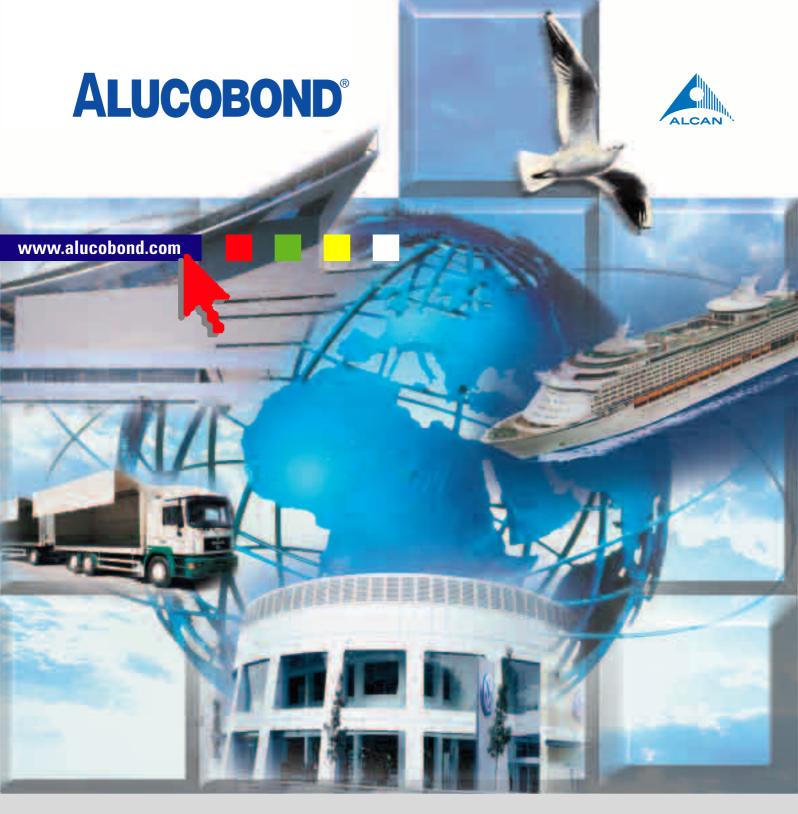
ALUCOBOND® Original samples with standard surfaces













### **ALCAN COMPOSITES -**

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- Alcan Airex AG, Sins, Switzerland
- Alcan Kapa GmbH, Osnabrück, Germany
  Alcan Singen GmbH, Singen, Germany
- Alcan Thermoplastics, Chelmsford, UK
  Alcan Composites USA Inc., St. Louis
- Alcan Composites Ltd., Shanghai, China
- Alcan Composites Brasil S.A., São Paulo

### **ALCAN COMPOSITES -**A true "global player"

- Sales offices and production sites in Europe, North and South America, and Asia
- Large variety of panels
- Partnerships with leading distributors
- Professional sales teams

ALCAN COMPOSITES

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