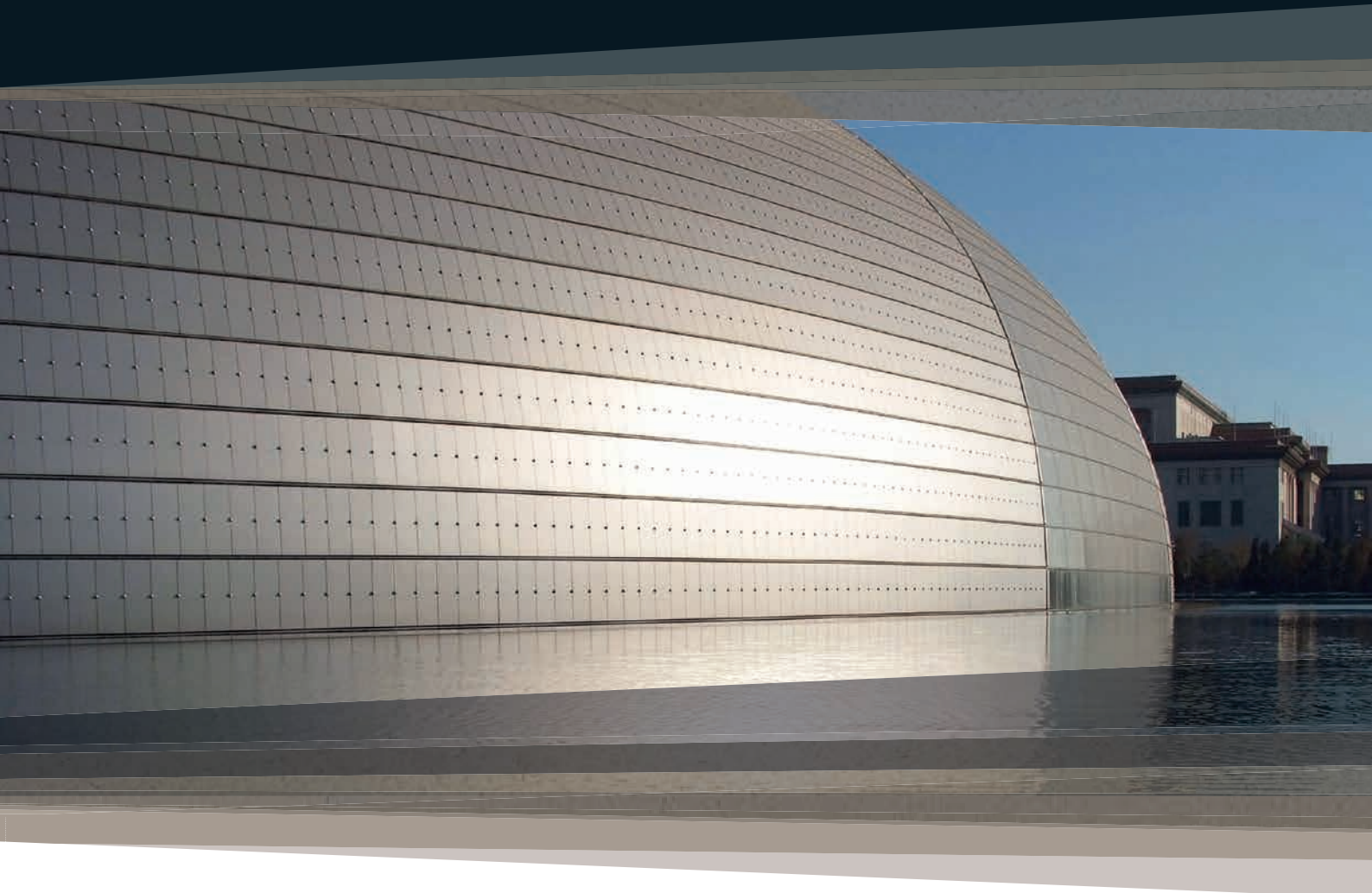


# ALPOLIC™








## PRODUCT INFORMATION & TECHNICAL DATA

# ALPOLIC™

ALPOLIC™ is a brand of the Mitsubishi Chemical Corporation and has been setting trends and standards for building architecture with its exceptional quality products for more than 45 years. ALPOLIC™ aluminium composite panels consist of two aluminium sheets which are applied to a mineral core. They are manufactured in a coil coating process using the most stringent safety and requirements. These are the only panels in the industry that are almost 100% recyclable. In terms of fire protection they provide the maximum safety.

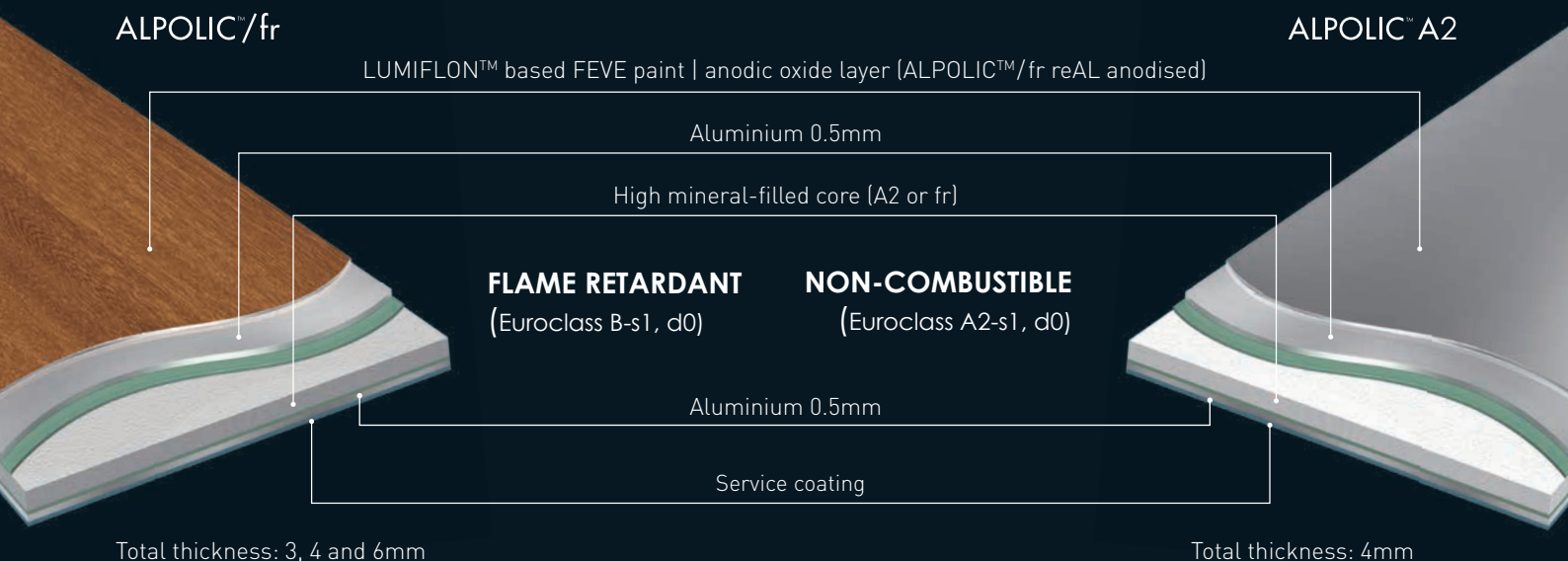
## FEATURES

 <p><b>Flatness</b></p>	Excellent flatness derived from the continuous laminating process	 <p><b>Color uniformity</b></p>	The coil coating process ensures complete color consistency	 <p><b>Rigidity</b></p>	ALPOLIC™ is rigid and lightweight
 <p><b>Workability</b></p>	Easy to process with ordinary fabrication machines and tools	 <p><b>Fire safety</b></p>	With its high mineral-filled core, ALPOLIC™ has been ranked up to class A2 which is one of the highest fire-safety grades in accordance with European Norm (EN) standard		

## COMPOSITION

ALPOLIC™/fr

ALPOLIC™ A2



## Products

Product	Description	Standard Surface Finish	Fire Classification (EN 13501-1:2010)
ALPOLIC™ A2 ACM	ALUMINIUM Composite Materials	LUMIFLON™ based FEVE paint (coil coated)	A2-s1, d0
ALPOLIC™/fr ACM	ALUMINIUM Composite Materials	LUMIFLON™ based FEVE paint (coil coated)	B-s1, d0
ALPOLIC™/fr ACM reAL anodised	ALUMINIUM Composite Materials	Anodic oxide layer (coil anodised)	B-s1, d0
ALPOLIC™/fr SCM	STAINLESS STEEL Composite Materials	* Dull (DL) * Hair Line (HL) * Mirror (MR) * Linen (LN)	B-s1, d0
ALPOLIC™/fr TCM	TITANIUM Composite Materials	Dull (DL)	B-s1, d0

## Dimension (Standard)

		ALPOLIC™ A2 ACM	ALPOLIC™/fr ACM	ALPOLIC™/fr ACM reAL anodised	ALPOLIC™/fr SCM	ALPOLIC™/fr TCM
<b>Thickness (tolerance: ± 0.2mm)</b>		4mm	3mm, 4mm, 6mm	3mm, 4mm, 6mm	4mm	4mm
<b>Metal skin (thickness)</b>	<b>Surface</b>	Aluminium (0.5mm)	Aluminium (0.5mm)	Aluminium (0.5mm)	Stainless steel (0.3mm)	Titanium (0.3mm)
	<b>Back</b>	Aluminium (0.5mm)	Aluminium (0.5mm)	Aluminium (0.5mm)	Stainless steel (0.3mm)	Stainless steel (0.3mm)
<b>Standard width (tolerance: ± 2.0mm)</b>		1,250mm, 1,500mm	1,285mm, 1,535mm	1,535mm	DL, HL MR LN	1,000mm, 1,219mm
<b>Maximum width</b>		2,015mm	2,050mm	1,575mm	DL, HL, LN	Standard width only
<b>Length (tolerance: ± 4.0mm)</b>		1,800mm – 7,300mm	1,800mm – 7,300mm	1,800mm – 7,300mm	MR	1,800mm – 7,200mm 1,800mm – 5,000mm
<b>* Remarks</b>				A2 core is possible upon request	DL: Dull HL: Hair Line MR: Mirror LN: Linen	Dull finish only
<b>(Bow tolerance)</b>		± 5mm/m (0.5%) of the length and/or width				
<b>(Squareness tolerance)</b>		± 5mm				

## Characteristics (4mm thick)

	(4mm)	Method	Unit	ALPOLIC™ A2 ACM	ALPOLIC™/fr ACM	ALPOLIC™/fr reAL anodised	ALPOLIC™/fr SCM	ALPOLIC™/fr TCM
<b>Physical properties</b>	Weight	-	kg/m <sup>2</sup>	8.4	7.6	7.6	10.2	9.3
	Thermal expansion	ASTM D696	x 10 <sup>-6</sup> /°C	19	24	24	10.4	10.4
	Thermal conductivity	ASTM D696	W/(m.K)	0.63	0.45	0.45	0.4	0.4
	Thermal resistance	ASTM D976	m <sup>2</sup> .K/W	0.15	0.16	0.16	0.16	0.16
	Deflection temperature	ASTM D648	°C	110	116	116	117	112
<b>Mechanical properties of composite material</b>	Tensile strength	ASTM E8	MPa, N/mm <sup>2</sup>	43	49	49	84	69
	0.2% proof stress	ASTM E8	MPa, N/mm <sup>2</sup>	41	44	44	69	60
	Elongation	ASTM E8	%	3.8	5	5	12.6	11.1
	Flexural elasticity, E	ASTM C393	GPa, kN/mm <sup>2</sup>	38.5	39.8	39	70.6	49
	Flexural rigidity, EI	ASTM C393	kN.mm <sup>2</sup> /mm	204	137	137	372	265
	Punching shear resistance	ASTM D732	MPa, N/mm <sup>2</sup>	37	32	32	55	48
<b>Sound transmission loss</b>	ASTM E413		dB	27	27	27	30	25
<b>Metal thickness with equivalent rigidity</b>				Aluminium 3.3mm	Aluminium 3.3mm	Aluminium 3.3mm	Stainless Steel 2.9mm	Titanium 3.1mm
<b>Minimum bendable radius</b>				600mm	100mm	Not applicable	100mm	100mm

ALPOLIC™ A2 and ALPOLIC™/fr is a safe exterior cladding material, passing most of all mandatory requirements for exterior wall applications in the following countries and test standards. The main ingredient of the core material does not permit the proliferation of flame and restricts the development of smoke detrimental to evacuation activities. Always consult local building codes before actual use.

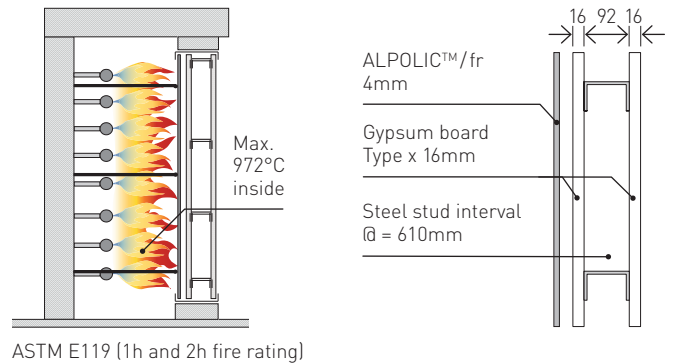
## Example of fire tests



EN 13823 (EU)



TsNIIISK Natural Fire Test (Russia)



Test duration:  
1h



Allowable temperature to pass:  
139°C + room temperature



Actual peak temperature during the test: 109°C

## Fire test standards in the world applicable for ALPOLIC™ A2 and /or ALPOLIC™/fr

Country	Test Standard
EU (applicable in Europe, Switzerland and Turkey)	EN 13823, EN ISO 11925-2, EN 13501-1
United Kingdom	BS 476 Part 6 & 7, BS 8414-1, BS 8414-2, BR 135
Poland	PN/B-02867
Czech Republic	CSN 73 0862, CSN 73 0863
Hungary	MSZ 14800-6:2009
Austria	OENORM B 3800-5
Russia	GOST 30244-94 method II, SNIP 21-01-97*, TsNIIISK Natural Fire Test
USA	NFPA 259-93 (British Thermal Unit), ASTM D1781-76 (Climbing Drum Peel Test), ASTM E-84 (Tunnel Test), ASTM E-108 Modified, UBC 26-9 & NFPA 285 (ISMA Test), ASTM E108 (Fire Test for Roof Covering), ASTM E119 (1-hr and 2-hrs Fire Rating), UBC 26-3 (Interior Room Corner Test), Combustion Toxicity Test New York State Uniform Fire Prevention and Building Code
Canada	CAN/ULC-S 134-92 (Full-scale Exterior Wall Fire Test)
Japan	ISO 5660-1 (Heat Release Test for Non-combustible Material)
China	GB8625, GB8628, GB8627
Singapore	BS 476 Part 6 & 7, Local fire regulation
Malaysia	BS 476 Part 6 & 7, ISO 9705:1993, Local fire regulation






Walnut



Astra Gebäude, Sofia, Bulgarien

## Classification of fire behavior – the core material and the paint layers determine the fire classifications

Classification in accordance with DIN 4102	European Classification in accordance with EN 13501-1			Remarks	General	Product reference	Appx. Portion of combustible ingredients within the core material	Heat potential of the core material
	General grade	Smoke emission grade	Droplets grade					
A2	A2	s1	d0	The highest fire classification for ACM, without any building height limitation	"Non-combustible" "Limited combustible" (UK)	ALPOLIC™ A2	< 10% 	< 3 MJ/kg
B1	B	s1	d0	Regular ACM for the building facades with fire safety	"Hard to burn" "Very low flammability" (UK)	ALPOLIC™ /fr	< 30% 	< 15 MJ/kg
B1 with remarks	A2, B, C	s2/s3	d1/d2	Remarks of smoke and/or Flaming droplets		ACM core with more combustible ingredients		
B2	D, E	s1/s2/s3	d0/d1/d2	Not recommended or restricted in terms of fire safety for the building facades	"Flammable"	ACM core with 100% plastics (combustible ingredients)	100% 	> 45 MJ/kg

Note: Mitsubishi Polyester Film GmbH is not responsible for terminology or accuracy information. Always follow the local fire code regulations.

## Fire retardant mechanism – chemical reaction of ALPOLIC™/fr during combustion

Ingredient	Ratio	Chemical Reaction	Status
Polyethylene	≅ 30%	$PE + Fire \rightarrow Carbon\ Dioxide + Water$ $[-CH_2-] + O_2 \rightarrow CO_2 + H_2O$ (combustion = oxidization) (in case of perfect combustion)	Heat Generation
Aluminium Hydroxide	≅ 70%	$Aluminium\ Hydroxide \rightarrow Alumina + Water$ $2Al(OH)_3 \rightarrow Al_2O_3 + 3H_2O$ (decomposition)	Heat Absorption

## Comparison of melting point of various metals

Metal	Titanium	Stainless Steel	Copper	Aluminium	Zinc
Melting Point	1,668°C	1,424°C	1,084°C	660°C	420°C

Note: The same core material is used for ALPOLIC™/fr SCM, TCM, CCM and ZCM, as ALPOLIC™/fr ACM



# PAINT SYSTEM (ACM Standard)



ALPOLIC™ panels offer coatings with a variety of colors and patterns, including a wide gloss range from 15% to 80% at 60 degree. LUMIFLON™ based FEVE (Fluoro Ethylene Vinyl Ether) coil-coated paint is applied to ALPOLIC™ as the standard coating system.

LUMIFLON™ based paint systems are considered to be the best in the world, not only exceeding PVDF 70/30 (70% PVDF + 30% Acrylic) in durability standards, but also offering a wide gloss and color range and the availability of repair coatings to be applied at normal temperature.

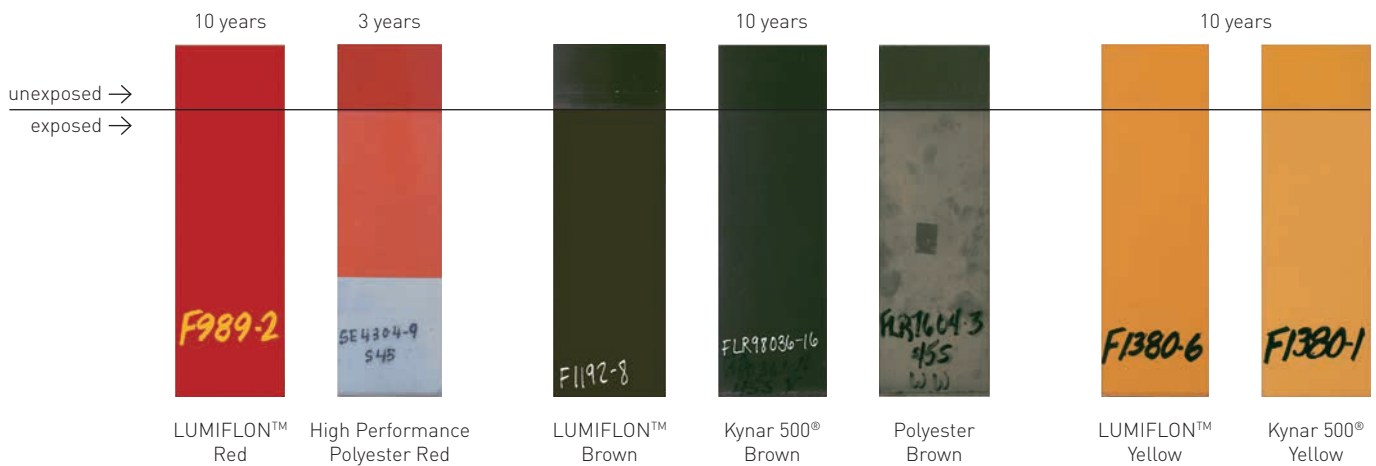


During transportation, fabrication or installation of the panels, there is always the risk for scratches. So far repairing these scratches at the job site has been difficult or even impossible with a high temperature curing paint system. LUMIFLON™ paint system allows you to repair or even overcoat a whole panel under normal temperatures. Room temperature cured type repair spray cans (for small scratch repair) and/or UL cans (for overcoating wider area by spray guns) can be provided upon request.

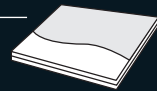
## General comparison between conventional paints and LUMIFLON™

	LUMIFLON™ for ALPOLIC™	PVDF 70/30	Polyester
Weatherability	20 years	20 years	3 - 5 years
Gloss	15 - 80%	25 - 35%	25 - 90%
Color Range	Wider	Limited	Wider
Repair Coating	Can be done	Difficult	Can be done
Pencil Hardness	H - 2H	F	2H
Bendability	2T	1T	2T

## South Florida exposure test panels



ALPOLIC™ Paint Coating is usually evaluated with chamber tests such as accelerated weathering test, salt spray etc., but it is also checked regularly by means of actual exposures over decades in the harsh climate coastal areas (Numazu, Japan and Florida, USA).



Custom White

Long lasting project in a harsh environment (UV + Salt spray + Sand blast)

- Project: Burj Al Arab
- Location: Dubai, UAE
- Qty: 55,000m<sup>2</sup>
- Completion: 1999

### Accelerated weathering test 1

Solar radiation energy (M Langley)	Gloss retention				
	0	0.5	1	1.5	2
LUMIFLON™ (for ALPOLIC™)	100%	95%	90%	85%	83%
PVDF 70/30	100%	85%	70%	60%	58%
Acrylic urethane	100%	70%	15%	-	-
Baked acryl	100%	18%	-	-	-

Natural light condensing type: Emmaqua test in Arizona, USA Irradiation of 2 million Langley (amount of lights is equivalent to irradiation for 20 years)

### Accelerated weathering test 2

Exposure time (hours)	Gloss retention				
	0	2,000	4,000	6,000	8,000
LUMIFLON™ (for ALPOLIC™)	100%	95%	95%	83%	82%
PVDF 70/30	100%	85%	70%	60%	58%
Acrylic urethane	100%	70%	15%	-	-
Baked acryl	100%	70%	15%	-	-
Polyester	100%	18%	-	-	-

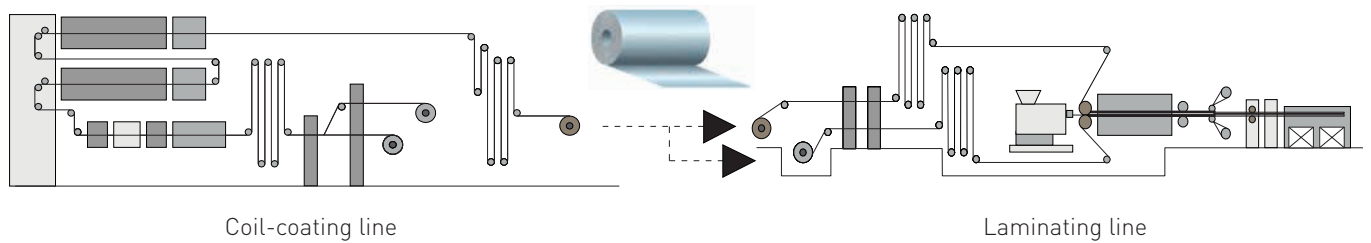
Sunshine Weather-O-Meter (SWOM)



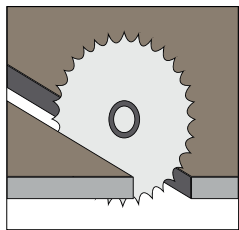
Natural exposure test in Florida, USA

# PRODUCTION PROCESS AND FABRICATION

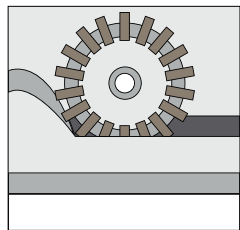
## Production process



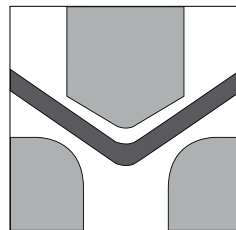
## Fabrication methods



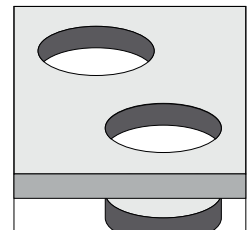
Sawing



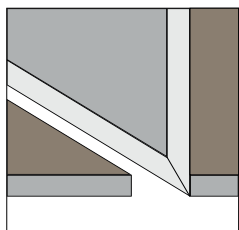
Perforation



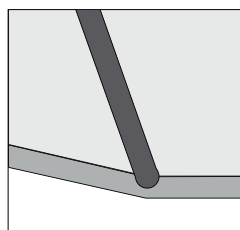
Bending



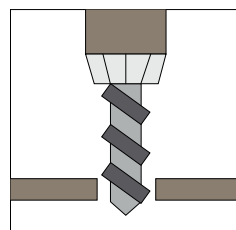
Punching



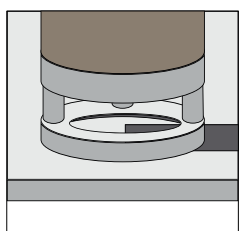
Shearing



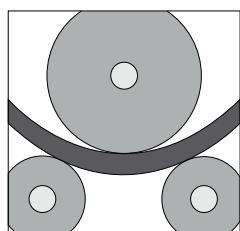
Folding



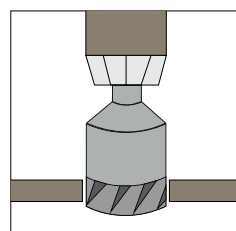
Drilling



Embossed



Roll bending

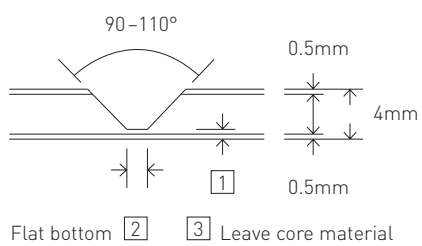


Milling





### U-grooving shape



	ALPOLIC™/fr	ALPOLIC™ A2
[1]	0.7mm - 0.9mm	0.65mm - 0.75mm
[2]	3mm	3mm - 4mm
[3]	0.2mm - 0.4mm	0.15mm - 0.25mm

# JOINTING AND FIXING TECHNIQUE

## Dimensional tolerances of ALPOLIC™ aluminium composite panels:

<b>Width</b>	± 2mm
<b>Length</b>	± 4mm
<b>Thickness</b>	± 0.2mm in 3 and 4mm thick, ± 0.3mm and 6mm thick
<b>Bow</b>	Maximum 0.5% (5mm/m) of the length or width
<b>Diagonal difference</b>	Maximum 5mm

## Examples of ALPOLIC™ facade fixing systems



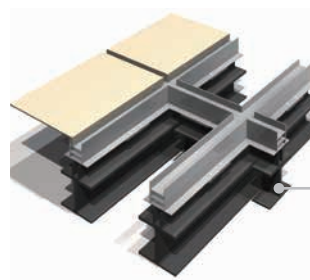
External wall cladding  
Visible Rivet System  
(Face Fixed)



External wall cladding  
(non-visible cassette  
system)



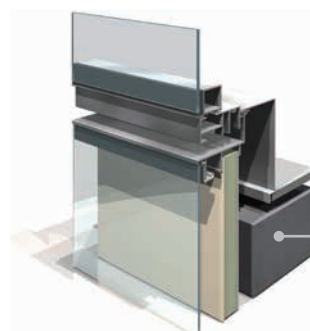
External wall cladding  
(non-visible hanging  
cassette system)



Roof covering



Unitized Curtain  
Wall System



Back panel of  
Glass Curtain  
Wall System

Data embodied herein is intended only for estimate by technically skilled persons, with any use thereof to be at their own discretion and risk. Mitsubishi Polyester Film shall have no responsibility or liability for results from such use or infringement of any patent or other property right.



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Quality  
made in  
Germany



#### Recycling

Our materials are almost 100 % recyclable. Even waste from ALPOLIC™ plants is collected and recycled.



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