
Appendix 1: Summary of specification data-ALPOLIC®/fr

1. General

ALPOLIC®/fr is an aluminum composite material (ACM) with a non-combustible mineral-filled core, used as an exterior and interior cladding and roof covering on new buildings and retrofit applications. The material is manufactured by Mitsubishi Chemical Functional Products, Inc., and furnished by approved dealers or distributors.

Note: This summary of specification data is about ALPOLIC/fr. If you need specifications of ALPOLIC composed of polyethylene core and mainly used for signage, contact local distributors or our office.

2. Product composition

ALPOLIC/fr is composed of a non-combustible mineral-filled core sandwiched between two skins of 0.5mm thick aluminum alloy (3105-H14):

Composition	Skin material:	0.5mm thick aluminum alloy (3105-H14)
	Core material:	Non-combustible mineral filled core

The surface is finished with a high-performance Lumiflon-based fluorocarbon coating as standard, and the back is a wash coating or service coating. ALPOLIC/fr is available in four finishes: Solid Colors, Metallic Colors, Sparkling Colors and Stone-Timber-Metal Series. In these finishes, Lumiflon-based fluorocarbon paints are applied in manufacturer's continuous coil coating lines.

The back of ALPOLIC/fr, which will face the structural wall or steel when it is installed as a cladding panel, has a polyester-based wash coating or a service coating to protect it from possible corrosion problems.

The surface is protected with a self-adhesive peel-off protective film consisting of two polyethylene layers of white and black. According to weathering tests under normal outdoor conditions, the protective film will withstand six months' exposure without losing its original peel-off characteristic or causing stains or other damages.

3. Product dimension and tolerance

- (1) Panel thickness: 3 mm, 4 mm and 6 mm
- (2) Panel size: Width = 965, 1270 and 1575 mm
 Length = less than 7200 mm

Note: Custom width can be accepted between 914 mm and 1575 mm subject to minimum quantity. Please contact local distributors or our office.

(3) Product tolerance

Width: ± 2.0 mm

Length: ± 4.0 mm

Thickness: ± 0.2 mm in 3 and 4 mm thick, ± 0.3 mm in 6 mm thick

Bow: Maximum 0.5% (5mm/m) of the length or width

Square-ness (diagonal difference):

Maximum 5.0 mm

Surface defect: The surface shall not have any irregularities such as roughness, buckling and other imperfections in accordance with our visual inspection rules. ALPOLIC/fr is supplied with a cut edge and without aluminum sheet displacement or core protrusion.

4. Principal properties

(1) Panel weight:

	Unit	3mm	4mm	6mm
Panel weight	kg/m ²	6.0	7.6	10.9

(2) Thermal expansion: $24 \times 10^{-6} / ^\circ\text{C}$

(3) Mechanical properties of Aluminum Composite Material (ACM):

	Unit	3mm	4mm	6mm
Tensile strength (ASTM E8)	MPa or N/mm ²	61	49	29
0.2% proof stress (ASTM E8)	MPa or N/mm ²	53	44	26
Elongation (ASTM E8)	%	4	5	2
Flexural elasticity, E (ASTM C393)	GPa or kN/mm ²	49.0	39.8	29.1
Flexural rigidity, E×I, (ASTM C393)	kNmm ² /mm	72	137	347

(4) Mechanical properties of aluminum alloy (3105-H14):

0.2% proof stress (ASTM E8): 152 MPa or N/mm²

Flexural elasticity (ASTM E8): 70 GPa or kN/mm²

(5) Deflection temperature: 115°C in 3mm, 116°C in 4mm and 109°C in 6mm

(6) Sound transmission loss (ASTM E413):

Thickness	4mm	6mm
STC (Standard Transmission Class)	26	26

5. Summary of fire tests

Extensive fire tests have been performed in accordance with standards in various countries.

ALPOLIC/fr has passed the following fire tests around the world:

Table 4-1 Fire tests for general and external cladding material

Country	Test standard	ALPOLIC/fr specimen	Results & classification
United Kingdom	BS476 Part 7	4mm, 6mm	Class 1
	BS476 Part 6	4mm, 6mm	Class 0
Germany	DIN4102 Part 1	4mm, 6mm	Class B1
USA	NFPA 259-93 British Thermal Unit	4mm	Passed
	ASTM D1781-76 Climbing Drum Peel Test	4mm, 6mm	Passed
	ASTM E84, Steiner Tunnel Test	4mm, 6mm	Class A / Class 1
	ASTM E-108, Modified	4mm	Passed
	UBC 26-9 & NFPA 285, ISMA Test (Intermediate Scale Multi-story Apparatus)	4mm, 6mm	Passed
Canada	CAN/ULC-S 134-92, Full-scale Exterior Wall Fire Test	4mm	Passed
China	GB8625, GB8626 & GB8627	4mm	Class B1
Japan	Heat Release Test for Non-combustible Material (ISO 5660-1)	4mm, 6mm	Passed. Certificate No. NE-0001

Table 4-2 Fire tests for other categories

Category	Country	Test Standard	ALPOLIC/fr specimen	Results & classification
Fire resistant rating wall	USA	ASTM E119, 1-hr Fire Rating and 2-hr Fire Rating	4mm	Passed
Roof material	USA	ASTM E108, Fire Test for Roof Covering	4mm	Passed Class A
Interior material	USA	UBC 26-3, Interior Room Corner Test	4mm	Passed
		Combustion Toxicity Test, New York State Uniform Fire Prevention and Building Code	4mm	Passed
	Japan	Heat Release Test for Non-combustible Material (ISO 5660-1) & Toxicity Gas Test	3, 4, 6mm	Passed. Certificate No. NE-209

6. Paint finish

(1) Coating system

The surface is finished with Lumiflon-based fluorocarbon coating as standard; the back is a wash coating or service coating. ALPOLIC/fr is available in four finishes: Solid Colors, Metallic Colors, Sparkling Colors and Stone-Timber-Metal Series. In these finishes, Lumiflon-based fluorocarbon paints are applied in the manufacturer's coil coating lines. The coating system of each finish is:

A. “Solid Colors” are a two-coat two-bake system.

The total dry film thickness is 25 microns (0.98 mils) minimum and consists of a conversion coating, an inhibitive primer and a Lumiflon-based fluorocarbon coating.

B. “Metallic Colors” and “Sparkling Colors” are a three-coat three-bake system.

The thickness is 32 microns (1.26 mils) minimum and consists of a conversion coating, an inhibitive primer, a Lumiflon-based metallic coating and clear coating.

C. “Stone-Timber-Metal Series” is coated with a unique image transfer process.

The thickness is 45 microns (1.77 mils) minimum and consists of a conversion coating, an inhibitive primer and a Lumiflon-based fluorocarbon coating including the image transfer layer.

Note 1: Lumiflon-based fluorocarbon coating has a coating warranty for 10 years.

Note 2: ALPOLIC/fr is finished with Lumiflon-based fluorocarbon paint as standard, but polyester and other coatings are also available as an option.

(2) Color and gloss

Standard colors are provided in the Color Chart. Custom colors are available for all finishes upon request subject to respective minimum quantities. The standard gloss is 30% for Solid and Metallic Colors, and 15-80% for Sparkling Colors and for Stone-Timber-Metal Series. Custom gloss is available between 15 and 80% in all colors upon request subject to minimum quantities. Please contact local distributors or our office for custom color requests.

(3) Coating performance

The Lumiflon-based fluorocarbon coating meets the following criteria:

Table 4-3 General properties

Dry film property	Test method	Criteria
Gloss (60°)	ASTM D523-89	15 to 80%
Formability (T-bend)	NCCA 11-19 ASTM D1737-62	2T, no cracking
Reverse impact-crosshatch	NCCA 11-5	No pick off
Hardness-pencil	ASTM D3363-92a	H
Adhesion		
Dry	ASTM D3359, method 8	No pick off
Wet	37.8°C, 24 hrs.	No pick off
Boiling water	100°C, 20 min.	No pick off
Abrasive resistance	ASTM D968-93 (Falling sand)	40 liters/mil
Chemical resistance:		
Muriatic acid, 10%HCl, 72hrs	ASTM D1308-87	No change
Sulphuric acid, 20%H ₂ SO ₄ , 18hrs	ASTM D1308-87	No change
Sodium hydroxide, 20%NaOH, 1hr	ASTM D1308-87	No change
Mortar, pat test, 24hrs	AAMA	No change
Detergent, 3% solution, 38°C, 72hrs	ASTM D2248-93	No change

Table 4-4 Weatherability

Dry film property	Test method	Criteria
Weather-o-meter test		
Colour retention:	ASTM D2244-93	Maximum 5 units after 4000 hrs.
Gloss retention:	ASTM D523-89	70% after 4000 hrs.
Chalk resistance:	ASTM D4214-89	Maximum 8 units after 4000 hrs.
Salt spray resistance:	ASTM B117-90	Blister-10, scribe-8, after 3000 hrs, 35°C salt fog
Humidity-thermal	ASTM D2246-87	No blister, no cracking After 15 cycles of 38°C 100%RH for 24hrs and -23°C for 20hrs
Humidity resistance:	ASTM D2247-94	No change After 3000 hrs, 100%RH, 35°C