Mitsubishi Chemical Infratec Co.,Ltd.

Summary of Technical Data Sheet – ALPOLIC™/fr (PVDF Finish)

1. General

ALPOLIC™/fr is an aluminum composite material (ACM) with a fire-retardant core, suitable for exterior or interior claddings and roof covering in new buildings and retrofit applications. The ALPOLIC/fr material is manufactured by Mitsubishi Chemical Infratec Co., Ltd. and is furnished by approved distributors and authorised dealers.

Note: Technical data may be changed in part without affecting the material quality.

2. Product composition

ALPOLIC/fr is composed of a fire-retardant core sandwiched between two skins of 0.5mm thick aluminum alloy:

Composition	Skin material:	0.5mm thick aluminum alloy (3105-H14 or 3005-H14)
	Core material:	mineral-filled fire-retardant core

ALPOLIC/fr consists of approx. 70% of mineral ingredients within the core material. The core contains a trace of carbon black additives that improves its durability.

The surface is finished with a fluoropolymer coating containing PVDF resin. ALPOLIC/fr is available in finishes of Solid Colors and Metallic Colors. In these finishes, PVDF fluoropolymer paints are applied in manufacturer's continuous coil coating lines.

The back side 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 co-extruded (white/black) removable, self-adhesive protection film. 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 1620 mm subject to minimum quantity. Please contact local distributors or our office.

(3) Product tolerance

Width: ±2.0 mm

Length: ±1.0 mm/ m

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

Both ALPOLIC/fr with white core and gray core have the following properties in common.

(1) Panel weight:

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

(2) Thermal expansion:

	Unit	3mm	4mm	6mm
Thermal expansion (ASTM D696)	1/°C	22×10^{-6}	23×10^{-6}	22×10^{-6}

(3) Mechanical properties of ALPOLIC/fr:

	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 (Calculation)	GPa or kN/mm^2	49.0	39.8	29.1

(4) Mechanical properties of aluminum alloy:

0.2% proof stress (ASTM E8): 150 MPa or N/mm^2

Flexural elasticity (ASTM E8): 70 GPa or kN/mm^2

(5) Deflection temperature: 120°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)	27	29

5. Summary of fire tests

Extensive fire tests have been performed in accordance with standards in various countries. ALPOLIC/fr has passed or classified the following fire tests around the world:

Table 5-1 Fire test for a building material

Country	Test standard	ALPOLIC/fr specimen	Results & classification
EU	EN 13823, EN ISO 11925-2, EN 13501-1	4mm, 6mm	Class B-s1, d0
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 E108, 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) & Toxicity Gas Test	3, 4, 6mm	Passed. Certificate No. NM-1933

Table 5-2 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 & 6mm	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

Table 5-3 Flammability characteristics of core materials

Test standard	Specimen	Results
ASTM D7309-07a, Microscale Combustion Calorimetry	2 types of core Gray and white	Performed similarly and heat release of the both cores are within the repeatability of the standard

The gray core does not impair the original fire performances based on ALPOLIC/fr with white core.

6. Paint finish

(1) Coating system

The surface is finished with a fluoropolymer coating containing PVDF resin and the back side is a wash coating or a service coating. ALPOLIC/fr is available in finishes of Solid Colors and Metallic/ Mica Colors. In these finishes, PVDF fluoropolymer paints are factory applied in the manufacturer's coil coating lines.

The coating system of all the PVDF finishes is two-coat two-bake system. The film thickness is 23 microns (0.91 mils) minimum and consists of a conversion coating, an inhibitive primer, and a PVDF fluoropolymer coating.

Note: PVDF fluoropolymer coating has basically a coating warranty for 10 years.

(2) Color and gloss

In general, common PVDF paint colors are available. Custom colors are also available upon request subject to respective minimum quantities. The standard gloss level is 30 to 40%. Matte finish is also available. Please contact local distributors or our office for custom color requests.

(3) Coating performance

The PVDF coating meets the following criteria in accordance with AAMA2605-13:

Table 6-1 Coating performance of PDVF finish in accordance with AAMA2605-13

Item	Test method	Performance
Dry film hardness (by pencil)	ASTM D3363	Pass, No rapture F minimum
Film adhesion		No removal of film
Dry	ASTM D3359 Method B	Pass
Wet	38°C, 24 hrs.	Pass
Boiling water	100°C, 20 min.	Pass
Impact resistance	Gardner impact test	Pass, No removal of film
Abrasion resistance	ASTM D968	Pass, abrasion coefficient ≥ 40
Chemical resistance:		
Muriatic acid resistance	10% HCl, 15min. spot	Pass, No blistering or visual change
Mortar resistance	38°C, 24-hour pat test	Pass, No loss of film or visual change
Nitric acid resistance	30 min. vapor exposure	Pass, Color change ≤ 5 delta E(Hunter) units
Detergent resistance	ASTM D2248	Pass, No adhesion loss, no blistering, no visual change
Window cleaner resistance	24-hour immersion	Pass, No blistering or visual change, no removal of film
Corrosion resistance		
Humidity resistance	ASTM D 2247 or D 4585, 4000 hrs.	Pass, Blisters ≤ "few" size no. 8 rating
Cyclic corrosion resistance	ASTM G85, 2000 hrs.	Pass, Creep from scribe ≥ 7, Field blisters ≥ 8

(Cont'd)

Item	Test method	Performance
Weathering, 10 years 45° South Florida		
Colour retention:	ASTM D2244	Pass, Color change ≤ 5 delta E(Hunter) units
Chalk resistance	ASTM D4214	Pass, #8 or better for colors, #6 for whites
Gloss retention	ASTM D523	Pass, 50% minimum
Resistance to erosion	ASTM B244	Pass, Less than 10% film loss

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