

ALPOLIC[®]/fr LT

Technical Manual



Mitsubishi Chemical Functional Products, Inc.

URL <http://www.alpolic.com>

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ALPOLIC®/fr LT

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Section 1 Outline

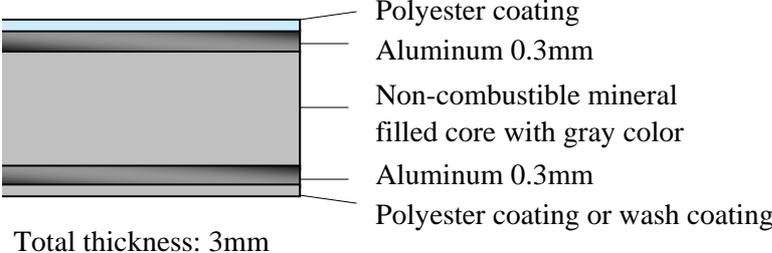
Introducing ALPOLIC®/fr LT, the new lightweight champion of Aluminum Composite Material (ACM). This material is perfect for use on interior walls, columns, ceilings and partitions in shops, offices and factories, and for such light outdoor applications as soffits, awnings, parapets, signs and much more.

1. Material composition

ALPOLIC®/fr LT is composed of a non-combustible mineral core with a small amount of low-density polyethylene sandwiched between two skins of 0.3 mm thick aluminum. The core, indispensable for fire safety of interior application, is gray in color, with a touch of carbon black for an aesthetically pleasing cut edge.

ALPOLIC®/fr LT's effective sides are finished with polyester coatings and covered with translucent protective films. The Reversible Series has effective surfaces front and back, while the Single, Stone, and Timber Series feature the effective surface on the front and a wash coating on back.

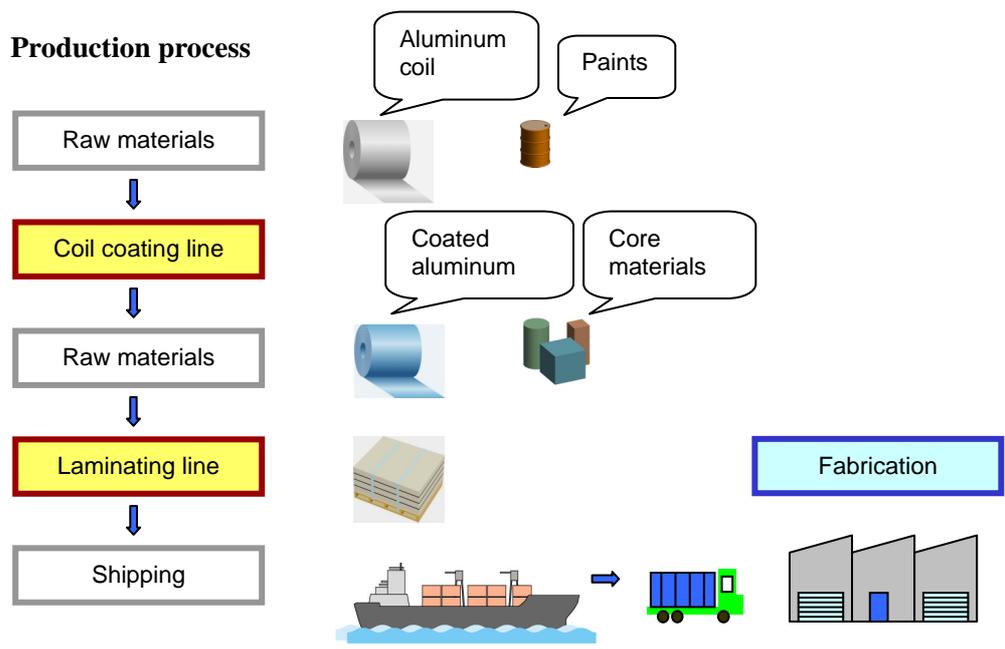
Composition of ALPOLIC®/fr LT



2. Production process

The production process of ALPOLIC/fr LT consists of two lines: a coil coating line and a laminating line. In the coil coating line, polyester paints are applied to continuous aluminum coils. In the laminating line, the mineral-filled fire retardant core is laminated between these coated coils, resulting in the finished composite material.

After laminating, the finished product is packed in wooden cases. Standard products are warehoused for stock, and custom products are immediately shipped to the customer. Thus, ALPOLIC/fr LT products are shipped as flat panels to be processed in local workshops according to project specifications.



3. Features

ALPOLIC/fr LT has all the features you've come to expect from other ALPOLIC ACMs, and then some. Fire safety is an imperative issue for interior materials, and ALPOLIC/fr LT passes the fire tests required for interior materials in the USA and Japan.

ALPOLIC/fr LT is available as a stock item in our full range of standard and metallic colors, as well as in stone and timber-patterned finishes produced with our unique image transfer process.

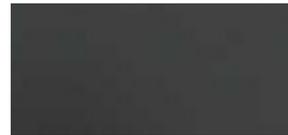
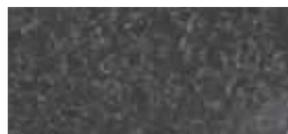
ALPOLIC/fr LT offers the rigidity of heavy-gauge sheet metal in a lightweight material with superior flatness, vibration damping, durability, and ease of maintenance. It is amazingly formable, so it can be easily cut, bent, grooved or shaped with ordinary woodworking and metal working tools.

The panel's twin sheets of 0.3 mm aluminum deliver the rigidity equivalent to an aluminum sheet of 2.4 mm thickness or a steel of 1.6 mm, and offer a weight reduction of 15% for aluminum and 57% for steel of the same rigidity.

4. Surface finishes

ALPOLIC/fr LT is available as a stock item in Reversible, Single, Stone and Timber finishes as follows:

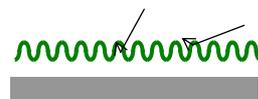
Finishes of stock products:

<p>N1 Pure White-G90</p>  <p>84%, 4%, 7.8BG9.4/0.2</p>	<p>N1 Anodized Silver-G75</p>  <p>32%, 6%, 1.2G8.2/0.1</p>	<p>N2 White-G30</p>  <p>75%, 2%, 2.1PB8.9/0.4</p>	<p>N2 Champagne Metallic-G 30</p>  <p>35%, 3%, 0.2Y7.8/0.2</p>
<p>N3 Light Beige-G30</p>  <p>70%, 3%, 6.2Y8.8/0.7</p>	<p>N3 Silver Metallic-G30</p>  <p>36%, 3%, 3.1G7.7/0.1</p>	<p>N4 Black-G30</p>  <p>1%, 2%, 5.3PB2.6/0.3</p>	<p>N4 Gray-G30</p>  <p>43%, 2%, 0.6B7.2/0.2</p>
<p>N5 Off White-Matte</p>  <p>73%, 1%, 8.3Y8.8/0.7</p>	<p>N6 Gray Metallic-Matte</p>  <p>27%, 1%, 5.4YR6.1/0.3</p>	<p>S1 Black Granite-G80</p>  <p>2%, 3%, 5.5R3.2/0.4</p>	<p>S2 White Granite-G80</p>  <p>33%, 3%, 10.0YR6.8/1.3</p>
<p>S3 Red Granite-G80</p>  <p>5%, 3%, 1.4YR3.7/1.6</p>	<p>S4 Pink Granite-G80</p>  <p>35%, 3%, 6.8YR6.8/1.3</p>	<p>S6 Venetian Marble-G80</p>  <p>57%, 4%, 1.5Y8.2/0.9</p>	<p>S5 White Marble-G80</p>  <p>56%, 4%, 3.8G8.0/0.1</p>
<p>S7 Sandstone-Matte</p>  <p>67%, 1%, 0.3Y8.6/2.0</p>	<p>T1 Maple-Matte</p>  <p>35%, 1%, 6.3YR6.6/5.9</p>	<p>T2 Walnut-Matte</p>  <p>18%, 0%, 4.1YR5.0/5.3</p>	

Legend: Top of color indicates color code, color name and gloss ratio respectively. For example, N1 Pure White-G80 shows N1 Pure White with 80% gloss. Bottom of color indicates diffuse reflectivity, specular (mirror) reflectivity and Munsell number respectively. Values of patterned colors are quite approximate values.
Note: Due to the limitation of photo, the above color does not show the exact colors. Refer to the Color Chart.

Reversible surfaces (N1 to N4) have effective sides on both front and back. **Stone** (S1 to S7) and **Timber** (T1, T2) are coated with a unique image transfer process. **Matte** finish is produced with a new coating technology in which microscopic wrinkles emerge over the entire surface during baking in the coil coating line. All the finishes are coated with polyester paints in ALPOLIC's continuous coil coating line.

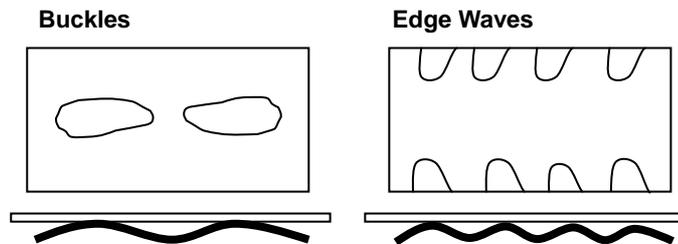
Matte finish: Due to the differing speed of hardening between the outer and inner layers, microscopic wrinkles emerge over the entire surface. The wrinkled surface results in a matte appearance due to irregular light reflection.



5. Flatness

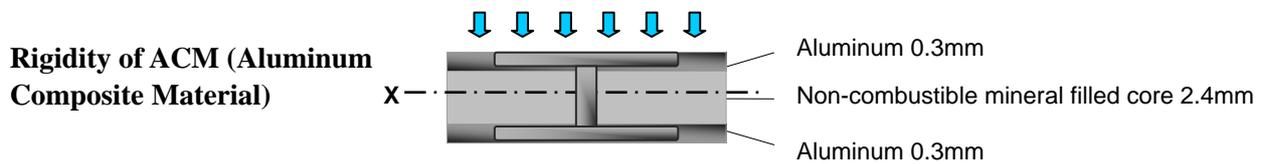
ALPOLIC/fr LT is as flat as it gets. Generally speaking, ensuring the flatness of interior material is very difficult. Solid aluminum sheet, for example, has a slight distortion stemming from its rolling process: buckles, edge waves and overall warping are common. ALPOLIC/fr LT is extremely flat due to the thinness of the aluminum sheets and our lamination process.

Flatness of aluminum sheet (Excerpt from ISO standard)



6. Rigidity and weight

ALPOLIC/fr LT is highly rigid compared to aluminum and other metal sheets. As shown in the diagram below, two sheets of aluminum skin behave like a strong H-section when pressure is applied on ALPOLIC panel. Consisting of 2 sheets of 0.3mm thick aluminum, ALPOLIC/fr LT delivers the rigidity equivalent to an aluminum sheet of 2.4 mm thickness or a steel sheet of 1.6 mm, and is lighter than any other solid metals or plastic materials of the same rigidity.



Comparison of flexural rigidity of various materials

Material	Thickness of equivalent rigidity, mm (inch)	Weight kg/m ² (psf)	Weight ratio (ALPOLIC=100)
ALPOLIC®/fr LT	3.0 (0.118")	5.5 (1.13)	100
Aluminum sheet	2.4 (0.094")	6.5 (1.33)	118
Steel sheet	1.6 (0.063")	12.6 (2.59)	230
Stainless steel (304)	1.7 (0.067")	13.4 (2.75)	244
Acrylic sheet	6.6 (0.260")	7.9 (1.62)	144

7. Fire safety

ALPOLIC/fr LT is a fire-safe interior material, passing all mandatory requirements for interior materials in the United States and Japan. Though the core material does contain a small amount of combustible polyethylene, the main ingredient of the mineral does not permit the proliferation of

flame and restricts the development of the smoke detrimental to the evacuation activities. Refer to Section 2 “Characteristics” for details of each fire test.

ALPOLIC/fr LT passes the following fire tests:

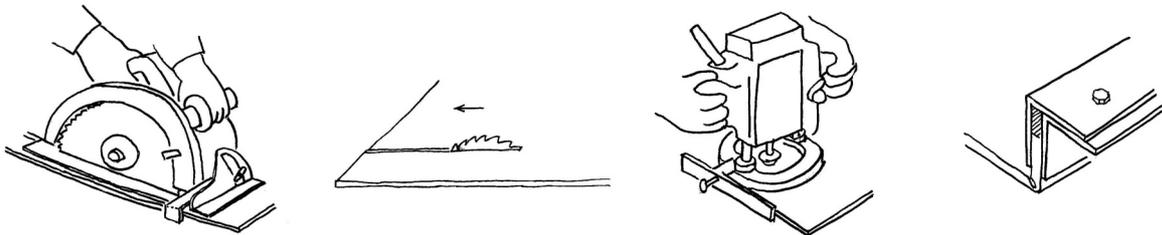
Country	Test standard	Results & classification
United Kingdom	BS476 Part 6 BS476 Part 7	Class 0 Class 1
USA	Tunnel Test (ASTM E-84)	Class A/Class 1
	Interior Room Corner Test (UBC 26-3)	Passed
Japan	Heat Release Test for Non-combustible Material (ISO5660-1) and Toxicity Gas Test	Passed. Certificate No. NM-0209

Interior Room Corner Test



8. Workability

The amazing workability of ALPOLIC/fr LT is one of its most compelling features. It can be cut with circular saws. It can be folded after grooving with a router. It can be bent with a 3-roll bender and press brake, and the core material can be welded with hot-melt adhesive. For details, refer to Section 3 “Fabrication and installation.”



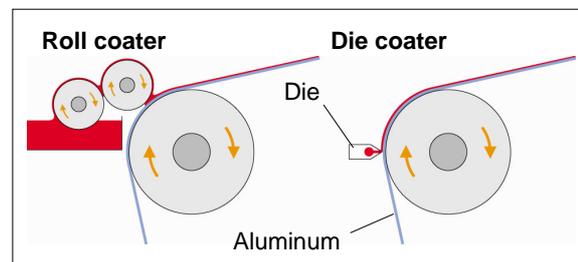
9. Coating quality

(1) Consistent color quality

Consistent color quality is maintained through the continuous application of paints to the aluminum coil in the coil coating line. The “Die Coating” process that occurs on this line employs a unique technology developed by Mitsubishi Chemical that ensures a smooth, fine coating.

(2) Coating type

Stock colors can be classified into the following types:



Roll Coater, widely used in aluminum industry, affords to produce an adequate quality with a reasonable efficiency. But Die Coater excels Roll Coater, permitting direct coating on aluminum surface that ensures more smooth and fine finishes without grain lines.

Coating type	Finish
Solid Color	Pure White-G90, White-G30, Light Beige-G30, Black-G30, Gray-G30, Off White-Matte
Metallic Color	Anodized Silver-G75, Champagne Metallic-G30, Silver Metallic-G30, Gray Metallic-Matte
Stone	Black Granite-G80, White Granite-G80, Red Granite-G80, Pink Granite- G80, White Marble-G80, Venetian Marble-G80, Sandstone-Matte
Timber	Maple-Matte, Walnut-Matte

Note: Numbers following the color name, such as G30, show the gloss in %.

Each finish is coated with polyester paint in ALPOLIC's continuous coil coating line.

Solid and **Metallic Colors** are the product of a 2-coat / 2-bake system consisting of primer and top coating.

Stone and Timber Finishes are created with a unique image transfer process consisting of primer, image-transfer layer and top coating.

Matte finish is produced by a unique method in which microscopic wrinkles emerge uniformly over the surface during the baking stage in the coil coating line.

In addition to the above stock colors, **Custom Colors** are available, subject to minimum quantities and color match. Please contact distributors or our office for custom color request.

(3) Paint performance

The above polyester coatings are resistant to corrosion and moisture in interior applications, and sufficiently show a reasonable weather-ability in outdoor applications such as soffits, parapets, awnings and signs.

However, as widely known, the polyester coatings have less weather-ability than fluorocarbon coatings. With outdoor use, it is possible for polyester coatings to show gradual color fading, a gloss change and a chalking within 3-5 years depending on the intensity of the UV. If such degradation is unacceptable, re-coating may be required. If you require a coating warranty for your project (not available on our polyester-coated products), we recommend ALPOLIC's line of optional fluorocarbon-coated products.

(4) Optional coatings

Apart from the above polyester paints, we can supply ALPOLIC/fr LT in the following distinctive paints as an option. Refer to respective specifications in Section 4.

Paint options

Optional coating	Characteristics	Suitable application
Fluorocarbon coating (Lumiflon-based)	Ultra-weather-ability Coating warranty is available.	Outdoor (awnings, parapets, signs)
Conductive fluorocarbon coating	Electric-conductive ($3 \times 10^{7-8}$ ohms)	Interior walls and partitions in factory
High cross-link polyester coating	High hardness (4H) High reflectivity (80%)	Interior lining of tunnels

(5) Touch-up paint

We can use commercial touch-up paints when we need to repair scratches during fabrication and installation, but please be aware that touched-up portions, especially on patterned (Stone and Timber) and Matte Finishes, may not completely match the original finish in appearance. Refer to Section 3 for detail.

10. Thermal expansion/contraction

ALPOLIC/fr LT has the same linear thermal expansion coefficient as aluminum metal, so movement will not occur between aluminum and ALPOLIC/fr LT due to thermal expansion/contraction.

Thermal expansion/contraction:

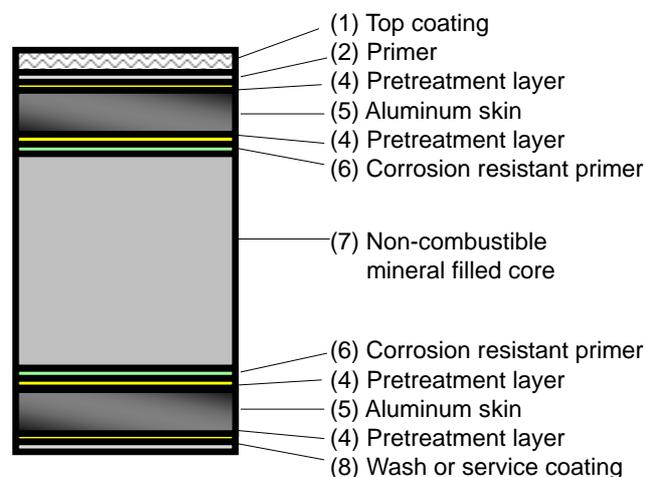
Material	Linear thermal expansion coefficient, /°C	Elongation or shrinkage per 1 meter per 25°C	Linear thermal expansion coefficient, in/in/°F
ALPOLIC303/fr	24×10^{-6}	0.6 mm	13×10^{-6}
Aluminum	24×10^{-6}	0.6 mm	13×10^{-6}
Steel	12×10^{-6}	0.3 mm	7×10^{-6}
Stainless steel (304)	17×10^{-6}	0.4 mm	10×10^{-6}
Concrete	12×10^{-6}	0.3 mm	7×10^{-6}
Glass	9×10^{-6}	0.2 mm	5×10^{-6}
Acrylic sheet	70×10^{-6}	1.8 mm	39×10^{-6}

Since the thermal expansion of steel and concrete is smaller, a certain amount of movement will take place between these materials and ALPOLIC/fr LT. This movement is normally very small (0.5mm/m or 0.02"/3') in case of indoor applications, but it must be relieved with a suitable method such as spacing between panels. In outdoor applications, the larger temperature change will result in movement that is nearly twice of the interior.

11. Prevention from edge corrosion

When used in a corrosive atmosphere, corrosion normally takes place at the cut edge and tends to penetrate inside, finally resulting in de-lamination between the aluminum skin and the core material. To protect the cut edge from this type of corrosion, ALPOLIC/fr LT features a corrosion resistant primer behind aluminum skins. Although protected by the primer, to enhance long-term durability we still recommend that the cut edge is not exposed to corrosive or outdoor atmosphere. If the cut edge is continuously exposed to moist conditions, a suitable corrosion protection will be necessary in design or fixing details.

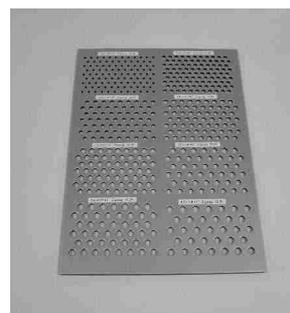
Cross-section of ALPOLIC®/fr LT



12. Perforated panel

ALPOLIC/fr LT Perforated Panel has a pattern of holes at regular intervals. This provides ventilation and permits vision through the panel, making it suitable for balconies, staircases and partitions. Refer to Section 4 for details.

Perforated panel



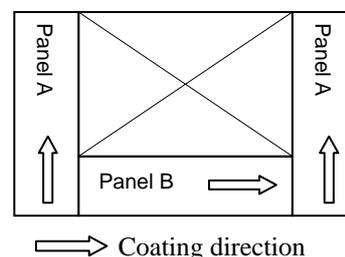
13. Recycling

Scraps of ALPOLIC/fr LT generated from ALPOLIC plants and from nominated fabricators' workshops are collected for recycling at the ALPOLIC plants.

14. General notes

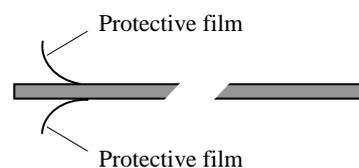
(1) A note on coating direction

In Metallic Colors, Stone and Timber, slight color differences will be noticeable if the panels are installed in different directions (like Panel A and B in the diagram). Install panels in the same direction as marked in the protective film. In our Solid Colors, any color difference due to coating direction is negligible.



(2) A note on protective film

Effective surfaces are protected with protective film. Do not remove this film during handling, fabrication and installation. Remove film immediately after installation in order to avoid any problems due to



degradation of the protective film. With Reversible Panels, peel off the film from both sides. Note that, unlike the protective film applied to ALPOLIC/fr for outdoor applications, this protective film does not resist UV indefinitely.

(3) A note on cleaning

Do not use strong organic solvents, such as MEK (Methyl Ethyl Ketone), MIBK (Methyl Iso Butyl Ketone), Triclene and paint thinner. Do not use strong alkali, strong acid or abrasive cleaners. Use of these solvents and cleaners may result in the paint becoming swollen or removed.



To prevent scratching the coated surface, make sure that cleaning sponges and rags are grit-free. Avoid over cleaning or excessive rubbing.

Refer to Section 3 “Fabrication and installation” for the details of cleaning method.

ISO 9001:2000 Certified

ALPOLIC/fr LT, through the design, development, manufacture and sales, is managed with ISO 9001:2000.

ISO 14000:

ALPOLIC/fr LT is produced in the plant that has ISO14000 certificate.