



## **Stainless Steel Composite Material**

 Mitsubishi Chemical Functional Products, Inc.

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

AUGUST 2006

# ALPOLIC®/fr SCM

## Stainless Steel Composite Material

ALPOLIC/fr SCM is a stainless steel composite panel composed of non-combustible mineral filled core and two sheets of 0.3mm thick stainless steel. The topside stainless steel is YUS 220M, a highly rust-resistant ferric stainless steel, which has an outstanding rust resistance comparable to stainless steel 316. ALPOLIC/fr SCM is suitable for external claddings and roof coverings of buildings.

### 1. Features

ALPOLIC/fr SCM has the following features:

- (1) Flatness: SCM panel has the excellent flatness derived from the continuous laminating process.
- (2) Rigidity: As one of the attributes of composite panels, SCM is rigid and lightweight. SCM 4mm is equivalent to stainless steel 2.9mm thick in rigidity, and reduces the weight by 55%.
- (3) Corrosion resistance: The topside YUS 220M, with Mo, Nb, Ti contents, has an outstanding rust-resistance comparable to SUS316.
- (4) Fire safety: The core has the same contents as ALPOLIC/fr, and SCM has a fire approval for exterior and interior uses in Japan.

**Note on processing method:** To cope with the low machinability of stainless steel, we need special machines and tools for cutting and grooving SCM panel. Refer to “6. Processing method” below.



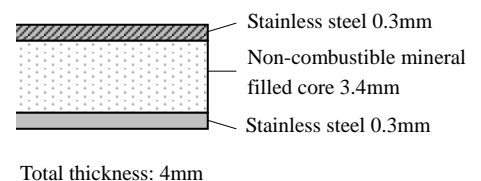
30 Church Street, Singapore  
SCM is used for vertical fin panels.

### 2. Material composition

ALPOLIC/fr SCM is composed of non-combustible mineral filled core sandwiched between 0.3mm thick stainless steel sheets.

Topside skin:	0.3mm thick stainless steel sheet, YUS 220M, a highly rust-resistant ferric stainless steel
Core material:	Non-combustible mineral filled core
Backside skin:	0.3mm thick stainless steel sheet, SUS430, with a clear service coating on the backside.

#### Material composition



### 3. Surface finish

Hairline Finish and Dull Finish <sup>Note</sup>

**Note:** For other finishes, please contact local distributors or our office.

SCM, Hairline



SCM, Dull



### 4. Panel dimension and tolerance

Panel thickness: 4mm

Standard panel size Width: 1000mm <sup>Note</sup>  
Length: Less than 5000mm

**Note:** 1219mm wide product is available upon request. Contact local distributors or our office.

Product tolerance Width: +/-2.0mm  
Length: +/-4.0mm  
Thickness: +/-0.2mm  
Bow: +/-0.5% (5mm/m) of the length and/or width  
Square-ness (diagonal difference): Maximum 5.0mm

## 5. Characteristics

### (1) Physical properties

	Method	Unit	SCM 4mm
Specific gravity	-	-	2.5
Weight	-	kg/m <sup>2</sup>	10.2
Thermal expansion	ASTM D696	×10 <sup>-6</sup> /°C	10.4
Thermal conductivity	ASTM D976	W/(m.K)	0.40
Thermal resistance	ASTM D976	m <sup>2</sup> .K/W	0.16
Deflection temperature	ASTM D648	°C	117

### (2) Mechanical properties of composite material

	Method	Unit	SCM 4mm
Tensile strength	ASTM E8	MPa, N/mm <sup>2</sup>	84
0.2% proof stress	ASTM E8	MPa, N/mm <sup>2</sup>	69
Elongation	ASTM E8	%	12.6
Flexural elasticity, E	ASTM C393	GPa, kN/mm <sup>2</sup>	70.6
Flexural rigidity, E×I	ASTM C393	k N.mm <sup>2</sup> /mm	372
Punching shear resistance			
Shear resistance	ASTM D732	MPa, N/mm <sup>2</sup>	55

### (3) Impact resistance by Du-pont method

Steel ball weight, kg	Height, mm	Dent depth, mm
0.3	300	0.5
0.5	500	1.1
1.0	300	1.3
1.0	500	1.6

### (4) Mechanical properties of skin metals

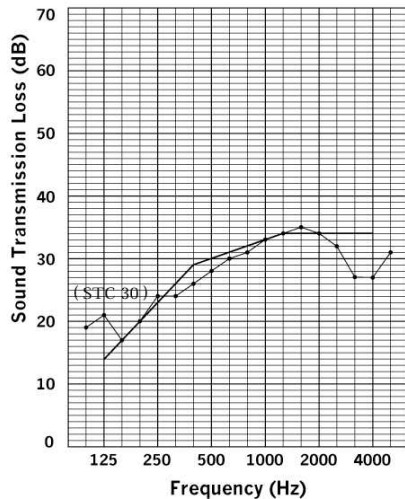
	Method	Unit	Stainless steel
<b>Topside: YUS220M</b>			
0.2% proof stress	ASTM E8	MPa, N/mm <sup>2</sup>	295
Flexural elasticity	ASTM C393	GPa, kN/mm <sup>2</sup>	201
<b>Backside: SUS430</b>			
0.2% proof stress	ASTM E8	MPa, N/mm <sup>2</sup>	205
Flexural elasticity	ASTM C393	GPa, kN/mm <sup>2</sup>	200

### (5) Sound transmission loss

The chart shows the airborne sound transmission loss measured on SCM 4mm. The STC (sound transmission

class) is 30dB in accordance with ASTM E413.

#### Sound transmission loss



#### (6) Fire performance

In Japan, SCM is approved as a non-combustible material for exterior and interior surfaces, based on the fire test results of the heat release test (ISO 5660-1) and the gas toxicity test. The tests done in accordance with the UK and USA standards are only general tests for building materials, but SCM is virtually approved as an eligible material for external claddings and roof coverings in most countries on the basis of the extensive fire test results on ALPOLIC/fr. SCM 4mm has passed the following fire tests.

Country	Test standard	Result & Classification
U.K.	BS476 Part 6 BS476 Part 7	Class 0 Class 1
U.S.A.	Tunnel test (ASTM E-84)	Class A/Class 1
Japan	Heat release test (ISO 5660-1) & gas toxicity test	Non-combustible material. Certificate No. NM-0229

#### 6. Processing method

The machinability of stainless steel is low, and we need special machines and tools for cutting and grooving SCM panels. We recommend the following processing methods for SCM:

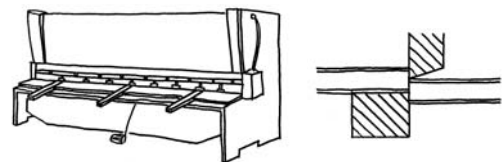
##### (1) Cutting

Use square shear for straight cutting. Small clearance (0.1mm or less) and 1°30' rake angle is suitable. Comparatively large droop appears at cut edge.

We can also use CNC router for cutting SCM panels. Complicated cutting as well as strait cutting is possible with CNC router. Use square end mill made of ceramic-coated super hard alloy.

**Note:** Panel saws and regular circular saws are not suitable for SCM panels.

##### Cutting by shear



##### Grooving with CNC router

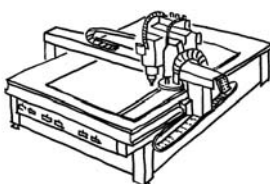


##### (2) Grooving

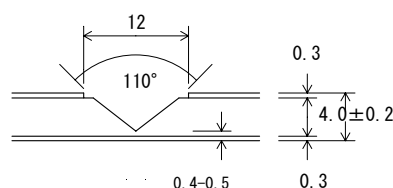
Use CNC router for grooving SCM panels. Firstly cut the backside skin with square end mill, and secondly remove the core with regular carbide-tipped bit. And then we obtain the V-shaped groove shown in the diagram. Use a square end mill made of ceramic coated super hard alloy to cut the backside skin.

We can also use V-cut machine (planer) for stainless steel sheet for grooving SCM panels.

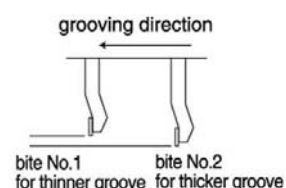
##### CNC router



##### V-groove by CNC router



##### Grooving by V-cut machine (planer)

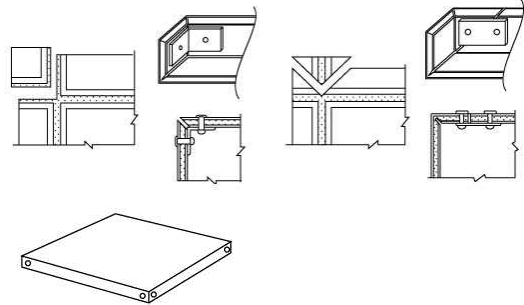


**Note:** Panel saws equipped with V-cutter are not applicable to SCM panels.

### (3) Folding and assembly

We can fold V-grooved panels with a folding jig in the same manner as ACM panels. To produce a tray type panel (rout & return panel), we normally groove the panel at 25mm from edges, remove the four corners by notching tool and fold the four sides. After assembly, the corners are sealed with sealant from backside to prevent from water penetration, if necessary.

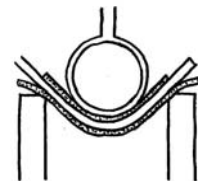
**Folding & assembly after grooving**



### (4) Bending with press brake

We use press brake or 3-roll bender for bending SCM panels. In bending with press brake, use a top die having almost the same radius as the final bending radius. The smallest bendable limit is approx. 100mmR. In bending with press brake, edges tend to extend like a saddle. Confirm the curved shape with pre-testing.

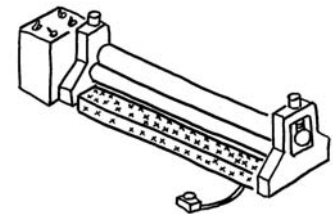
**Bending with press brake**



### (5) Bending with 3-roll bender

We can use 3-roll bender for curving SCM panels. The smallest bendable radius is approx. 200mmR. The gap between rolls should have some allowance (0.3-0.5mm) in order not to constrict SCM panel between rolls.

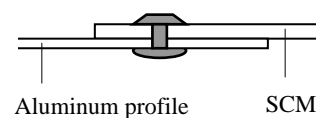
**3-roll bender**



### (6) Joining with accessories - in terms of galvanic corrosion

If we use dissimilar metals for assembly, we have to design the panel detail to prevent the dissimilar metals from galvanic corrosion. Stainless steel is a noble metal in corrosion potential, and it is likely that the less noble metal corrodes with galvanic corrosion in a moist condition. Use rivet and bolt/nut made of stainless steel for joining. Use angle and flange made of stainless steel for accessory, if possible. When aluminum extrusions are used for accessory, insulate the aluminum surface electrically with anodizing or paint coating.

**Joining with accessory**



### (7) Safety precautions on fabrication work

- The panel edge is as sharp as a knife. Wear gloves for safety in handling SCM.
- During working with CNC router, wear safety glasses for protection of eyes.

## 7. Cleaning

The topside YUS220M is hardly rust, but not rust-free. Rust is in most cases caused by cohesion of harmful components such as floating metal particles, a detrimental component from exhaust gas and a salty component in coastal area. We have to remove these components from the SCM surface with periodic cleaning. Refer to the separate cleaning manual.

## 8. General notes

### (1) Optical difference by direction

SCM shows optical difference between directions as metallic-paint colors do. Therefore, it is important to

arrange SCM panels in the same direction to avoid the optical (color) difference.

**(2) Color variation among production lots**

It is possible that the color of SCM slightly varies among production lots and the inconsistent color is visible after installation. This is caused by the slight color difference between stainless steel coils. In order to prevent this problem, we recommend placing the total requirement in one order or allotting the panels with a grouping arrangement.

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