ALPOLIC®/fr LT

Technical Manual

Section 3 Fabrication & installation

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Section 3 Fabrication & installation

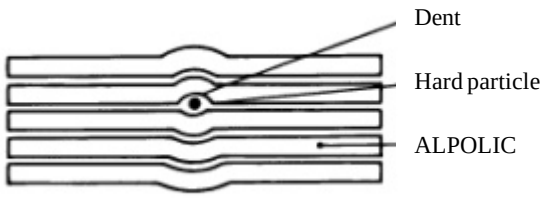
1. General

ALPOLIC/fr LT can be processed with woodworking and aluminium working machines and tools. It can be cut with a circular saw, can be folded after grooving with a router, and can be bent with a 3-roll bender or a press brake. We can use several methods for junction between aluminium extrusions and ALPOLIC/fr LT panels. We are going to introduce these processing methods as well as some examples of installation methods.

The product information such as available panes size and its tolerance, which is required for fabrication and installation works, is summarized in "Appendix 1: Summary of Specification Data" in Section 4. In this section, ALPOLIC/fr LT is often referred to simply as ALPOLIC

2. Notes on handling

ALPOLIC is a rigid material, but it is possible that the panel is damaged with edge deformation by physical impact or dent caused by inclusion of hard particles. Especially, inclusion of hard particles such as grains of sand and cutting chips between ALPOLIC panels will cause a dent, as shown in the diagram. Refer to the following notes through all stages during fabrication and installation.



(1) Unpack and pack

a. Unpack and pack wooden crates in a clean place.
b. Remove dusts and chips from ALPOLIC and packing paper. The hard particles, such as sand and cutting chips, caught between panels will cause a dent on the panel.
c. Do not handle ALPOLIC on a floor. Handle it on a worktable.
d. Handle ALPOLIC carefully by two persons facing the effective surface upward, to avoid possible rubbing of ALPOLIC surface during picking up and piling down panels.

(2) Transport

a. Lay the packed ALPOLIC horizontally and do not place heavy goods on it.
b. Mark clearly "Handle with Care", "Keep Dry", "No Hooks" and "This Side Up" on the packing.

(3) Fabrication

a. Prior to fabrication, clean out the worktable, temporary stand and both sides of ALPOLIC.

b. Especially, take notice of the cutting chips generated from saws, routers and drills, as well as those chips and particles caught between ALPOLIC and tools.

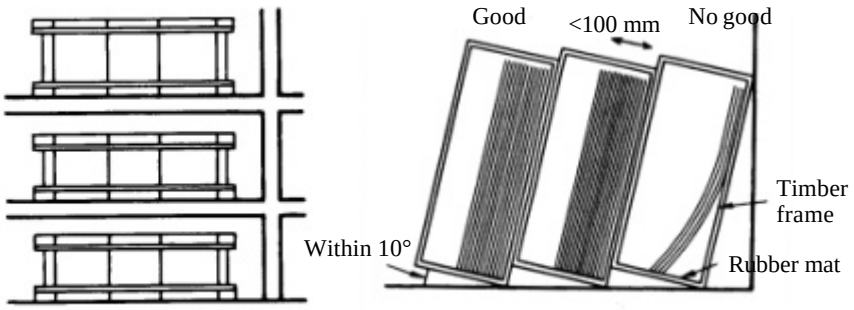
(4) Storing

a. Store ALPOLIC panels indoors with flat rack or vertical rack systems.

b. In flat rack system, pile the same size of panels on a strong palette. Do not pile up different sizes together.

c. In vertical rack system, lean panels closely against an inclined backing material with 10° or less. Total thickness of leaning panels should not exceed 100 mm thick. Use veneer for backing cover and place rubber mat on the bottom. Avoid scratches during pulling a panel out from the rack and restoring it back.

Flat rack **Vertical rack**



(5) Protective film

It is possible that the protective film of ALPOLIC degrades with direct sunlight and moisture, which finally results in a glue-remaining and elasticity-losing problem of the film. Store the panels in dry atmosphere. Remove the film immediately after the installation is completed. Especially, in Reversible Series in which protective films are applied on both sides of the panel, make sure that each film is peeled off from front and back, although the film is translucent (half-transparent) and it may be slightly hard to notice it.

3. Processing method

(1) Summary

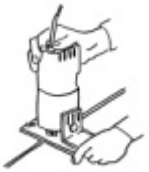
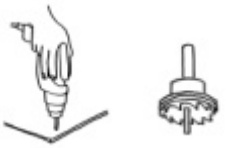
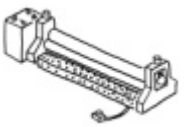
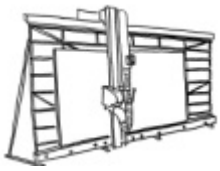
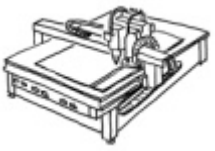
We can use wide variety of machines and tools to process ALPOLIC/fr LT panels. We can classify these machines into conventional ones and modern automated ones. Generally, automated machines enable high efficiency especially in analogous works with large quantity. To the contrary, conventional machines and tools are versatile and flexible. The former requires a costly investment for the machine, and the latter requires a good skill for a quality work. Main machines and tools are as shown in the following table.

Conventional tools and machines

Processing	Tools or machines	No.
Cut	Table saw	1
	Hand circular saw	2
	Hand router	3
	Hand jigsaw	4
Groove	Grooving machine	5
	Hand router	3
Chamfer	Hand trimmer	6
	Plane	7
Make hole	Hand drill	8
Punch	Punching machine	9
Notch	Notching tool	10
Bend	Press brake	11
	3-roll bender	12

Efficient and automated machines

Processing	Tools or machines	No.
Cut	Panel saw	13
	Square shear	14
	CNC router	15
Groove	Panel saw	13
	CNC router	15
Perforate	Turret Puncher	16

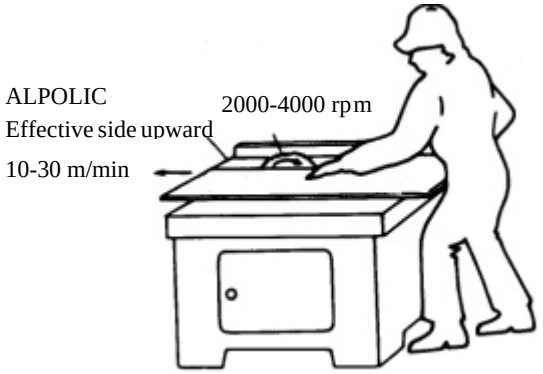
1. Table saw 	2. Hand circular saw 	3. Hand router 	4. Hand jigsaw 
5. Grooving machine 	6. Hand trimmer 	7. Plane 	8. Hand drill 
9. Punching machine 	10. Notching tool 	11. Press brake 	12. 3-roll bender 
13. Panel saw 	14. Square shear 	15. CNC router 	16. Turret puncher 

(2) Saw cutting

Various types of circular saws including table saw, hand circular saw and panel saw can cut ALPOLIC. Suitable saw blade is carbide-tipped blades for aluminum or plastic use

Example of suitable saw blade:

Blade diameter	255 mm
Number of teeth	80 to 100
Cut width	2.0 to 2.6 mm
Rake angle	10°
Tip	Carbide



Operating conditions

Rotation of saw blade	2000-4000 rpm
Feed speed	10-30 m/min

Notes on saw cutting:

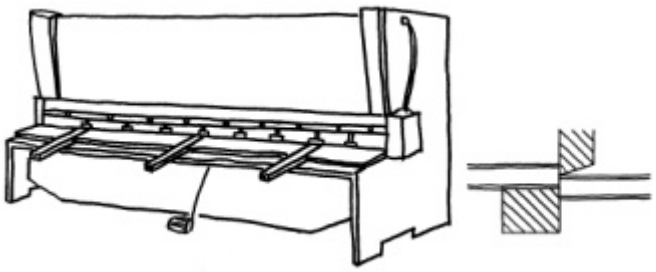
a. Do the cutting operation with facing the effective side upward to prevent the panel from scratch and the protective film from peeling off.
b. Remove cutting chips from ALPOLIC carefully after cut, to avoid dent during storing or assembling.
c. Sharpen or replace the saw blade, when it becomes dull. Dull blade will result in large burr or distortion at cut edge.

(3) Shear cutting

Square shear permits an efficient sizing work. Generally, the most suitable clearance and rake angle are as follows:

Clearance	0.04 - 0.1 mm
Rake angle	1°

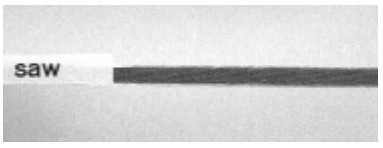
Shear cutting



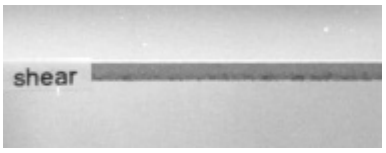
(4) Trimming

In saw cutting, burr appears on both sides of edges. In shear cutting, either droop or burr appears on each edge. If we install the panel with exposed cut edge, we have to take notice of the edge conditions.

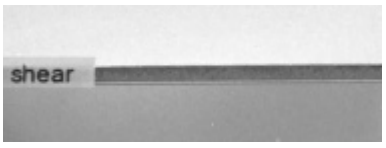
Burr after saw cutting



Droop after shear cutting

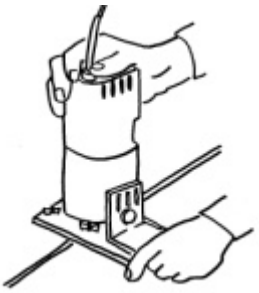


Burr after shear cutting

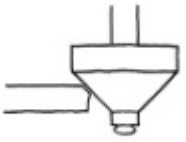


Namely, in saw cutting we should keep the saw blade sharp to have a sharp cut. In shear cutting we should adjust the clearance of die properly.

Hand trimmer



Ball bearing chamfering bit



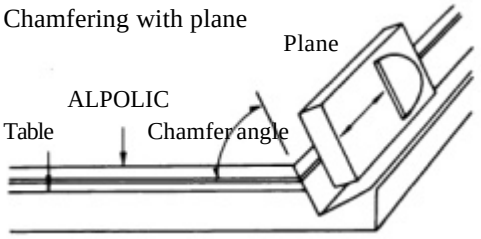
Generally, the condition of edge is more important in interior than in exterior. Sometimes we have to trim the edge after cutting. For trimming, we use trimmer, plane or sandpaper.

Plane

In Solid and Metallic Colors, deep trimming like chamfering has a visual effect. Use a trimmer with a ball bearing chamfering bit or a plane for woodworks. In working with plane, a guide ruler will help to ensure a uniform edge.

In Stone and Timber Finishes, on the other hand, deep trimming is not suitable, because deep trimming harms the appearance of Stone and Timber. If it is possible to hurt a finger with cut edges in Stone and Timber Finishes, make the edge dull with fine sandpaper. Normally, droop edge by shear cutting is mild enough to ensure the safety of edges.

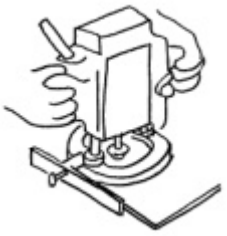
Chamfering with plane



(5) Curving cut

Hand router and trimmer can cut ALPOLIC in curving lines. Guide template will help you to stabilize this work. Jigsaw is also useful for cutting complex shapes.

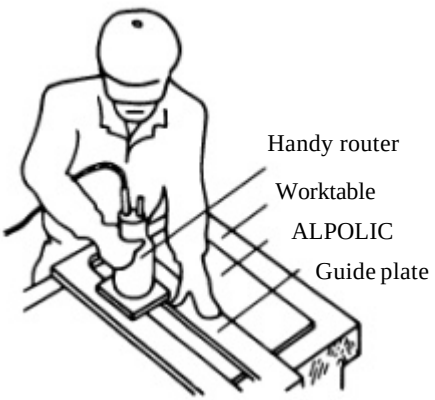
Hand router



Hand jigsaw

Notes on the use of guide plate:

a. Put an appropriate guide plate (template) on the effective side of ALPOLIC to do the routing work through the guide plate.
b. Particles caught between the template and the effective surface of ALPOLIC may cause dent or scratch.



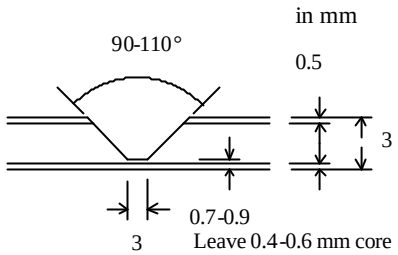
(6) U-grooving

We can fold ALPOLIC after U-grooving in the backside. Two types of machines are available for U-grooving. One is a circular cutter type and the other is a router type. The former includes hand grooving machines and panel saws, and the latter includes hand routers and CNC routers.

U-groove shape

The diagram shows one of the typical U-groove shapes suitable for folding ALPOLIC panels. It is important to leave 0.4-0.6 mm of core. We recommend 110° groove for 90° bending.

Typical U-groove shape



Handy grooving machine

Hand grooving machine can groove ALPOLIC. An example of the suitable cutter blades and operating conditions are as follows:

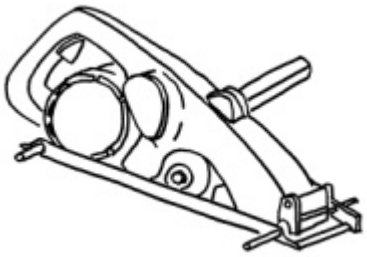
Cutter blade:

Outside diameter	110-120 mm
Number of teeth	4
Material	Carbide tip

Operating conditions

Rotation	5,000-9,000 rpm
Feeding speed	5-20 m/min

Hand grooving machine



Grooving cutter

Handy router

Hand router can groove straight lines and curving lines. Use a custom router bit having the groove shape shown in the above drawing. The suitable bit and operating conditions are as follows:

Handy router

Router bit

Router bit:

Number of teeth	2-4
Material	Carbide tip

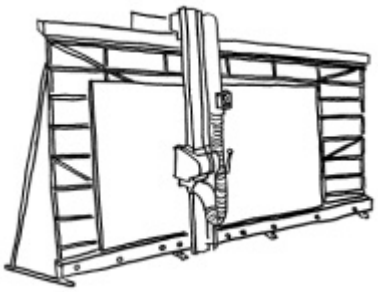
Operating conditions:

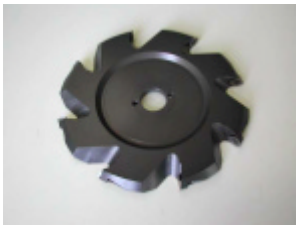
Rotation	20,000-30,000 rpm
Feeding speed	3-5 m/min

Panel saw

Efficient grooving work is possible with panel saw. Typical conditions are as follows:

Panel saw and grooving cutter





Cutter blade:

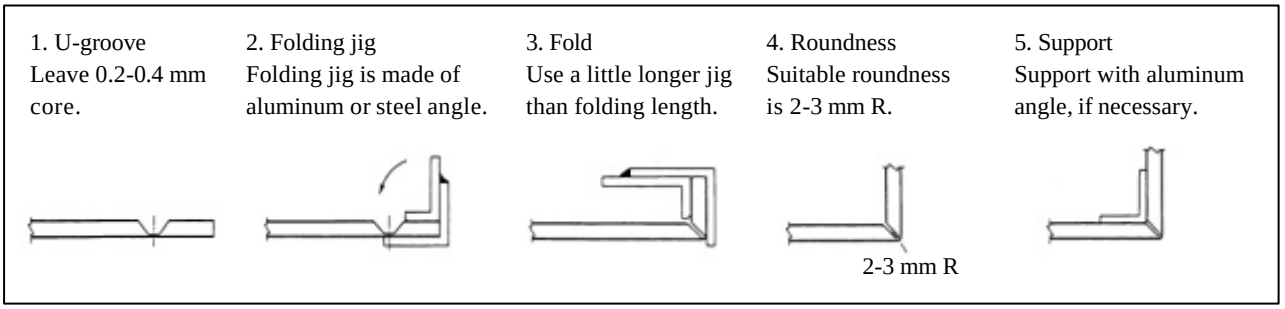
Outside diameter	220 mm
Number of teeth	8
Material	Carbide tip

Operating conditions:

Rotation	2,500-5,000 rpm
Feeding speed	30 m/min

(7) Folding

After U-grooving, we can fold ALPOLIC with folding jig. The typical folding procedures are as follows.



Notes on folding:

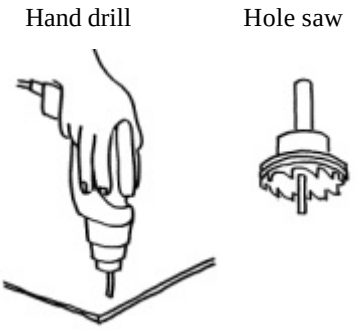
a. Fold ALPOLIC panels on a flat and steady worktable. If we fold the panel with warping, the folded line will not be straight.

b. The folded corner should have a suitable roundness of 2-3 mm in radius. If the roundness is too small, the coating may have a crack on the folded corner. This tendency becomes apparent when we carry out the folding work at low temperature. Have a folding work at 10°C or higher.

c. Folding after U-grooving entails slight elongation. The elongation is 0.5-1.0mm depending on the roundness of the folding corner. Therefore, the position of grooving lines must be pre-adjusted when the fabrication drawings are prepared..

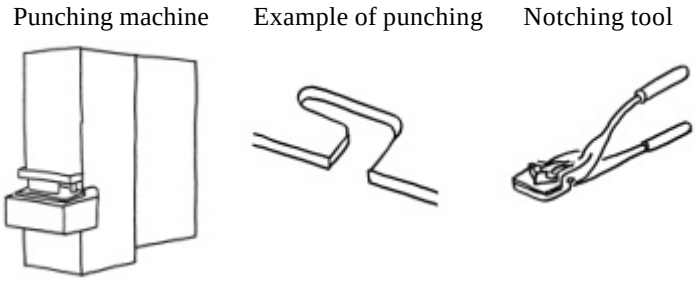
(8) Making hole with drill

We can make holes with a hand drill and a drill press, equipped with drill bit, hole-saw and circle cutter. Use drill bit for metal. Making a hole from the effective side will reduce the burr.



(9) Punching and notching

We use punching machine for notching and cutting out. The suitable clearance between punch and die is 0.1mm or smaller (material thickness × approx. 2%). Small droop will appear at punched edge.

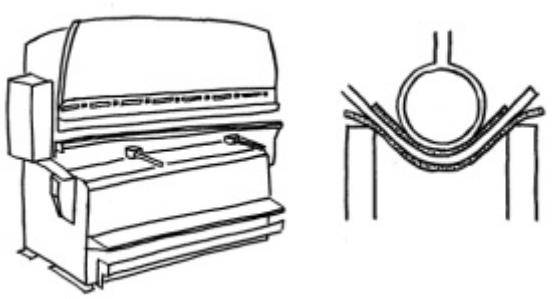


(10) Bending with press brake

We can bend ALPOLIC/fr LT with press brake. The minimum bendable radius with press brake is as follows:

Bending direction	Minimum bendable radius
Traverse	50 mm
Parallel	80 mm

Bending with press brake



Notes on press brake bending:

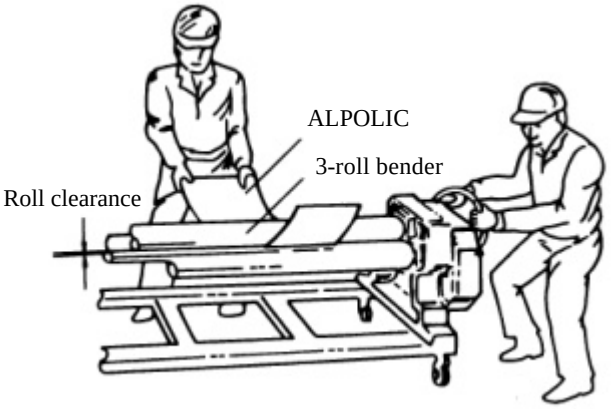
a. "Traverse" and "Parallel" show the bending direction toward the rolling (coating) direction, printed on the protective film.
b. The minimum bendable radius means the limit with which visible wrinkles appear on the aluminum surface of ALPOLIC.
c. Use the top die (punch) with the similar radius to the desired radius. If the radius of the top die is too small, it is possible that the bending radius becomes partially smaller than the above limit.
d. Use a urethane pad for the bottom die, or place a rubber mat between ALPOLIC and the bottom die.
e. Use a scratch-free top die. Polish and wipe the top die. Do the bending work without peeling off the protective film.

(11) Bending with 3-roll bender

We can use manual or electric-drive 3-roll bender for bending ALPOLIC. The minimum bendable limit is normally 250 mm in radius, but it depends on the length of the bender and the type of the machine. The following is an example of relationship between the length of bender and the minimum bendable limit.

Roll length (mm)	Minimum radius (mm R)
500	120
1000	150
2000	180
2500	200

Bending with 3-roll bender

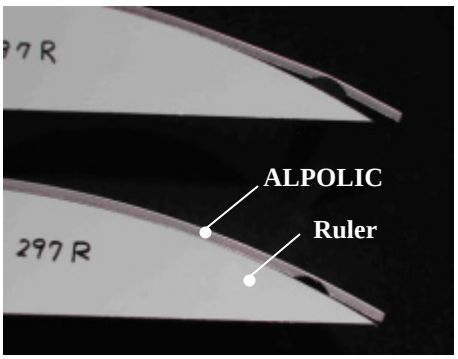


Notes on 3-roll bending:

a. Prior to bending operation, wipe the roll surface carefully.
b. Remove the burr at ALPOLIC edge that may cause dent with rolling.
c. Remove the cut particles stuck on ALPOLIC and rectify the wrinkles of protective film, which may cause dent.
d. Do not tighten ALPOLIC with rolls. If the roll clearance is rigid in the machine, adjust the clearance to panel thickness plus approx. 0.5 mm.

e. If notch is required in a curving panel, make the notch after bending. Making the notch before bending will result in a distorted curving.
f. When bending to small radius, gradual bending is necessary by adjusting the elevation of bending roll.
g. We can reduce the straight portion near edge by means of a subsidiary sheet material, but it remains to some extent. If a consistent curving line is needed near the edge, we have to do additional edge bending after the regular bending.

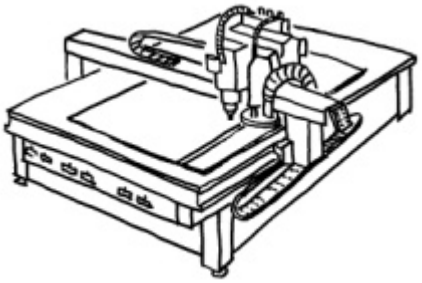
Before (top) and after edge bending



(12) CNC router

CNC router can cut and groove ALPOLIC panels. As a series of processing is controlled by a computer program, CNC router is suitable for repetition of the same processing. The suitable bit and operating conditions are the same as hand routers.

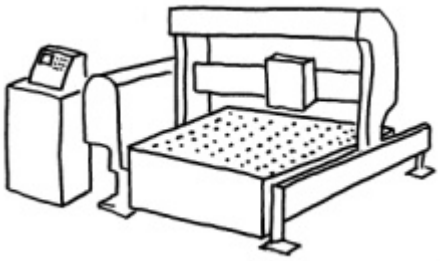
CNC router



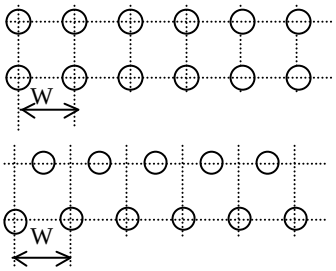
(13) Turret puncher

Turret puncher, also computer-controlled, can be used for perforation of the ALPOLIC.
The suitable clearance between punch and die is 0.1mm or smaller (material thickness × approx. 2%). Small droop will appear at punched edge.

Turret puncher



Example of perforated pattern



(14) Others

Water-jet cutting: Plunge cut (piercing at the starting point) in water-jet cutting may cause a certain extent of de-lamination between aluminum skin and core material. Therefore, we have to plunge at a disposable area or start at panel edge. After penetrating through the panel, water jet can cut ALPOLIC.

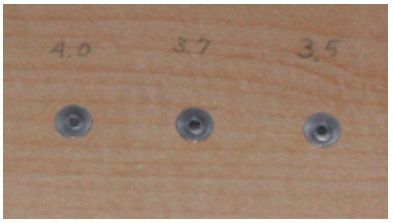
Laser cutting: According to our test, we so far conclude that ALPOLIC is not suitable for laser cutting, because the fume generated from ALPOLIC might harm the sophisticated optical instrument of laser system.

4. Joining method

(1) Rivet and bolt/nut

We often use rivets, bolt/nut and tapping screws for junction between ALPOLIC and aluminum extrusions. Use aluminum blind rivet. We can do riveting work from one direction. Use bolt/nut and tapping screw made of aluminum or stainless steel.

Countersunk rivet



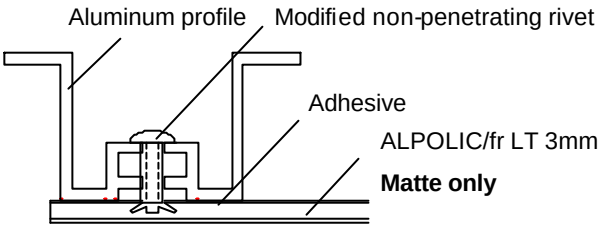
A hole of 3mm in diameter withstands approx. 400 N per point. Refer to "Strength of Junction Hole" in Section 4 for the strength data of hole for your strength design. The strength of junction hole depends on the position of the hole. The junction hole positioned quite near to panel edge will not show sufficient strength. An equation e>2D indicates a suitable relationship between the hole diameter (D) and the distance from the hole center to panel edge (e). Refer to Section 4 for details.

In the installation of interior, countersunk rivets and screws will be used more often than round-head ones. The strength may lessen with countersunk rivets and screws.

(2) Modified non-penetrating rivet

In **Matte** finish products, a non-penetrating rivet is applicable to joining an aluminum profile to ALPOLIC/fr LT. Refer to "Appendix 5: Modified Non-Penetrating Rivet" in Section 4.
Note: This method is applicable only to **Matte** Finish products. If we apply this method to other finishes, the fastened trace is visible from front side.

Modified non-penetrating rivet



(3) Adhesives

We can use commercial adhesives for joining and assembling of ALPOLIC. We can use wide variety of adhesives for ALPOLIC, except for some types of adhesives that may corrode aluminum metal. For example, vinyl acetate type, widely used for timber and styrene foam, corrodes aluminum metal. Main adhesives applicable to an adhesion between ALPOLIC and other materials are as follows.

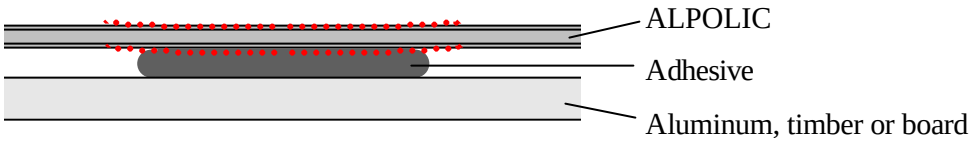
Adhesives applicable to ALPOLIC

Adhesive type		Epoxy	Chloroprene	Silicone RTV	Cyano-acrylate
Example of commercial brand		Araldite	Contact Cement	All Purpose Silicone	Aron Alpha
Suitable material to be adhered	Metal	S	S	S	S
	Timber	S	S	S	S
	Gypsum board	S	S	No	No
	Styrene foam	S	No	No	No

S: Suitable No: Not suitable

Notes on adhesives:

a. Prior to adhesion work, remove all the foreign matters such as dust, particle, grease, water, etc. from the area to be adhered.
b. Select the most appropriate adhesive that ensures the necessary adhesion power in the atmospheric conditions. The adhesion power depends on the surface conditions of the substrate. Follow the adhesive manufacturer's instructions.
c. When ALPOLIC is adhered to different material, it is possible that ALPOLIC shows a deflection due to the thermal expansion difference or dimension change of the material. Pre-test the adhesive before fabrication and installation.
d. Some adhesives may cause a distortion after hardening due to shrinkage of the adhesive, as shown in the diagram. Therefore, pre-testing is necessary for some types of adhesives. Generally, some of epoxy adhesives, polyurethane adhesives and silicone adhesives may show this kind of distortion. This distortion is usually very slight and sometimes it is not visible in low gloss and matte finishes.



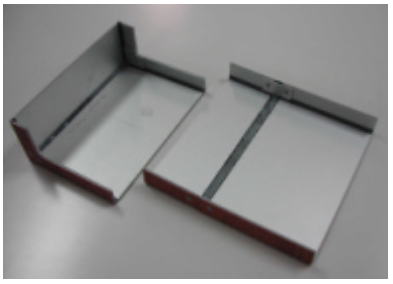
Apart from the above adhesives, we have successfully used the following adhesives for fabrication and assembling work of ALPOLIC. These adhesives, however, are only locally available in Japan. If you are interested in these adhesives, contact our office.

Brand name	Adhesive type	Manufacturer	Remarks
Diabond SG350	Acrylic	Nogawa Chemical	2-part, 5-15 min curing
Super X No.8008	Silyl-modified	Cemedine	1-part, 1-2 hrs curing

(4) Welding of core

One end of ALPOLIC/fr LT can be adhered to another end of ALPOLIC by welding the core with hot melt adhesive (glue). Prior to heating a glue stick, we have to pre-heat the core surface for good adhesion. Normally, mechanical reinforcement is necessary after welding.

Welding of core with hot melt glue



(5) Double-sided tape

Double-sided tape like 3M's VHB tape is effective in joining ALPOLIC to other materials. VHB tape simplifies the joining work and the thicker ones allow a movement of the adhered two materials to some extent.

(6) Hook/loop fastener

Hook/loop fasteners like Vercro tape is useful for guide signs and displays. This type of fastener is removable and restorable.

(7) Sealant

In order to ensure waterproofing of joints between panels, normally a sealing material is used. The sealing material shall meet the performance required for the atmospheric conditions. Silicone, modified silicone, polysulfide and polyurethane sealant are used. General performance of these sealing materials is as follows. Regarding the joint design such as joint width and thickness, please follow the sealant manufacturer's specifications.

General performance		Sealing Materials			
		Silicone	Modified silicone	Polysulfide	Polyurethane
Restoring ability		A	A-B	B	B
Degradation	Due to aging	VS	S-M	M	M
	Due to temperature	VS	S-M	M-L	M
Shrinkage after filling		S	S	S	S
Serviceable temperature (long-term)		-40/120°C -40/248°F	-30/90°C -22/194°F	-20/80°C -4/176°F	-20/70°C -4/158°F
Weather-ability		A	A-B	A-B	B
Fatigue resistance		A	A-B	B	A-B

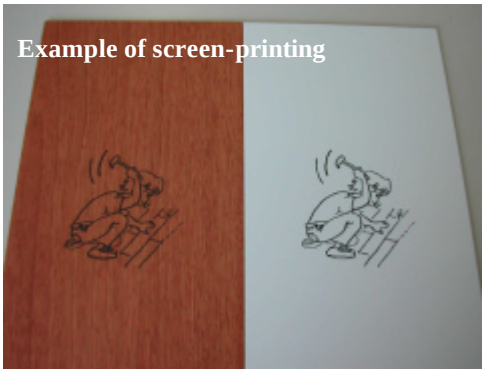
Note 1: A: Excellent B: Good C: Normal
VS: Very small S: Small M: Medium L: Large

Note 2: The above is excerpt from Sealing Material Handbook, Japan Sealant Manufacturers' Association.

5. Surface processing

(1) Screen-printing

In screen-printing, 1-component vinyl type or 2-component polyurethane type inks are suitable for all the finishes of ALPOLIC/fr LT. We obtain normal adhesion with these inks after drying at 80°C for 30 min and curing at room temperature for 24 hrs. The typical printing procedures are as follows:


Example of screen-printing

a. Remove all dust and dirt with soft cloth. Oily dirt, if remaining, causes printing defects.
b. Cure or dry under proper conditions. Follow instructions from ink manufacturer.

Notes on screen-printing:

a. Keep the curing temperature below 90°C (194°F) for less than 30 min. If the curing temperature is higher, deflection of the panel may occur.
b. Select the ink suitable for the atmospheric conditions where the panel is located.

(2) Cutting film

Various types of cutting films are applicable to the ALPOLIC/fr LT surface. If you are going to fold the area where the film is applied, the film may change the color at the folded corner. Confirm with pre-testing.

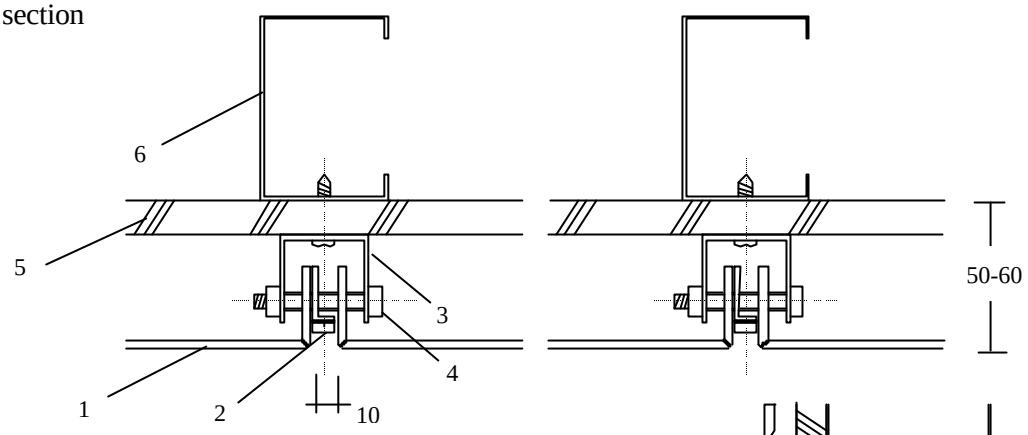
(3) Digital print with ink jet printer

Various types of decorative films and wallpapers printed with ink jet printers can be applied on ALPOLIC/fr LT. Confirm the fire approval conditions of the film. Direct digital print is also possible with special ink jet printers.

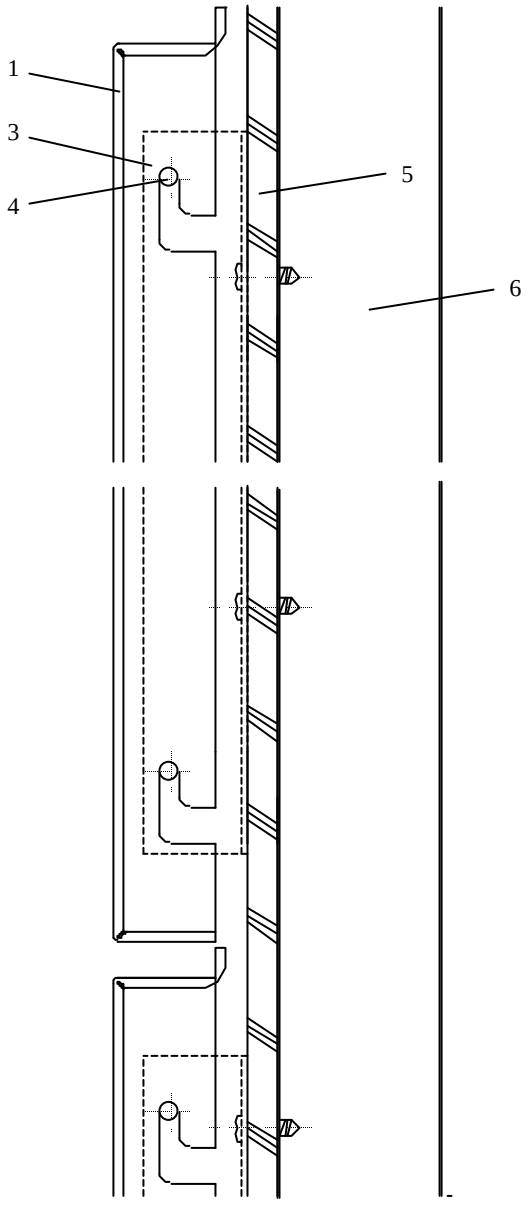
6. Examples of fixing method

(1) Internal wall cladding with hanging system

Horizontal section



Vertical section

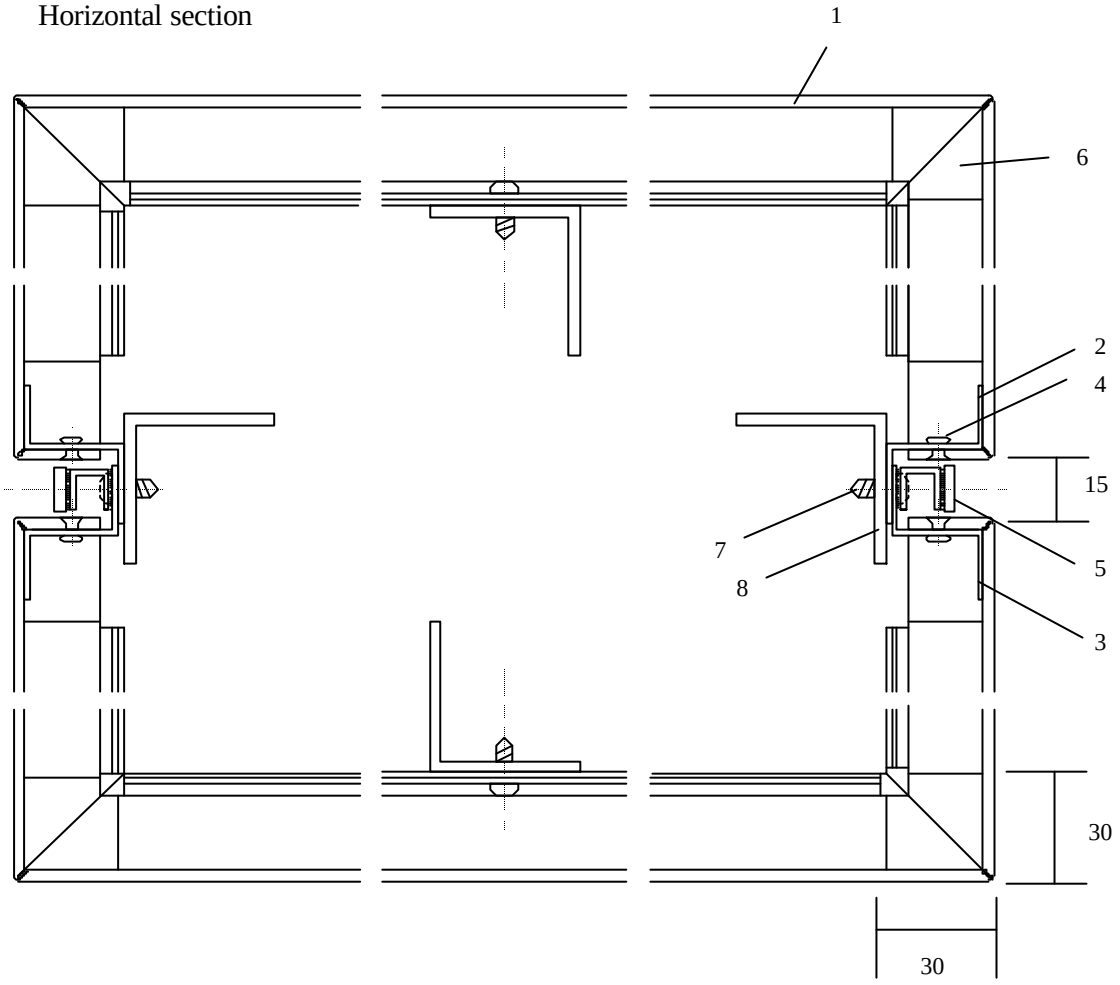


1. ALPOLIC/fr LT 3mm
2. Joint cover, ALPOLIC/fr LT strip adhered on aluminum L-9×20 with VHB tape
3. Holder, aluminum C-30×30
4. Hanging bolt, M5, covered with rubber tube
5. Gypsum board
6. Stud

Note:
In renovation projects, "Stud Detector" will help you to find out the position of studding concealed behind gypsum board. Stud Detector is a small tool working with an electromagnetic sensor.

(2) Column cover with Z-shaped flange system

Horizontal section

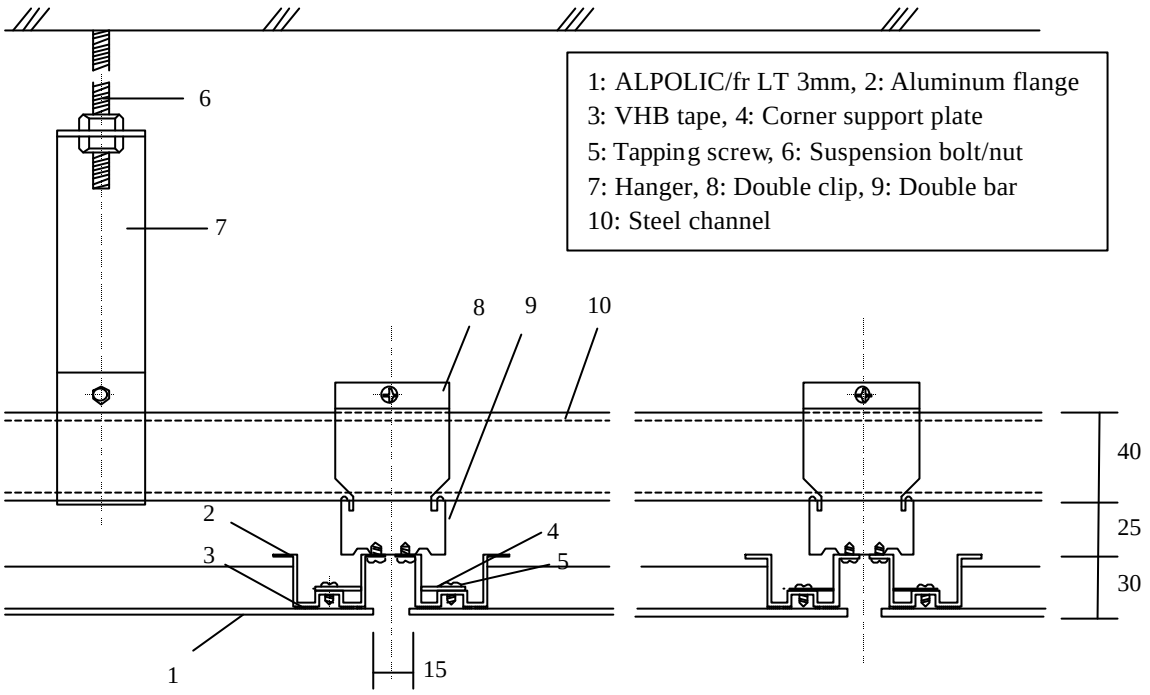


1. ALPOLIC/fr LT 3mm
2. Z-shaped flange (Large)
3. Z-shaped flange (Small)
4. Aluminum rivet, countersunk, 3mm diameter
5. Joint cover adhered to aluminum C-10×10 with VHB tape
6. Corner support plate, aluminum sheet
7. Tapping screw, M4
8. Sub-frame, aluminum L-30×30mm

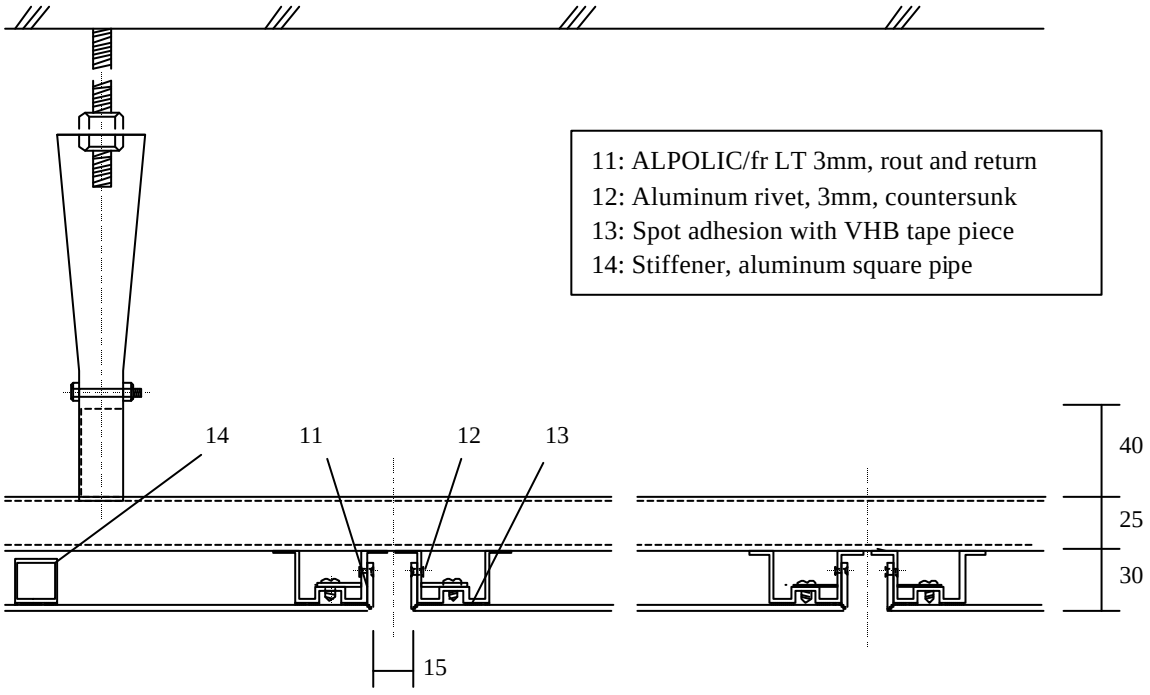
Note:
Use Z-shaped flange for fixing panels. Conceal the joint with joint cover slip of the same panel. Use countersunk rivet for assembling the panel.

(3) Ceiling installed on lightweight suspension bar system

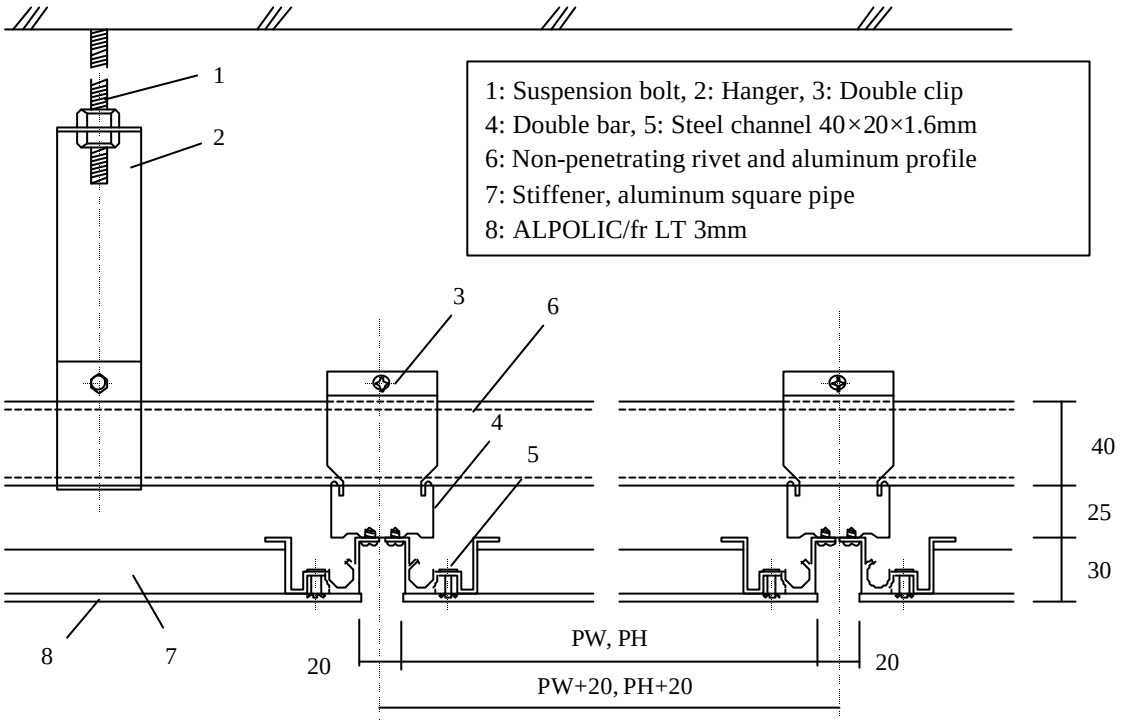
Section of the longer panel side



Section of the shorter panel side



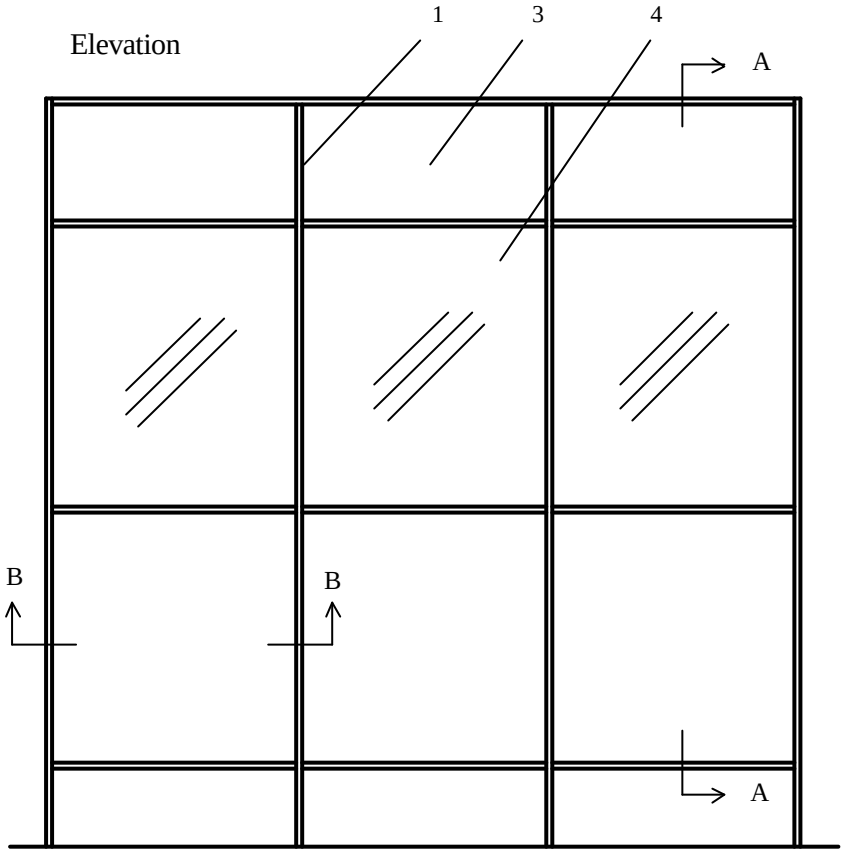
(4) Ceiling panel fixed with non-penetrating rivet



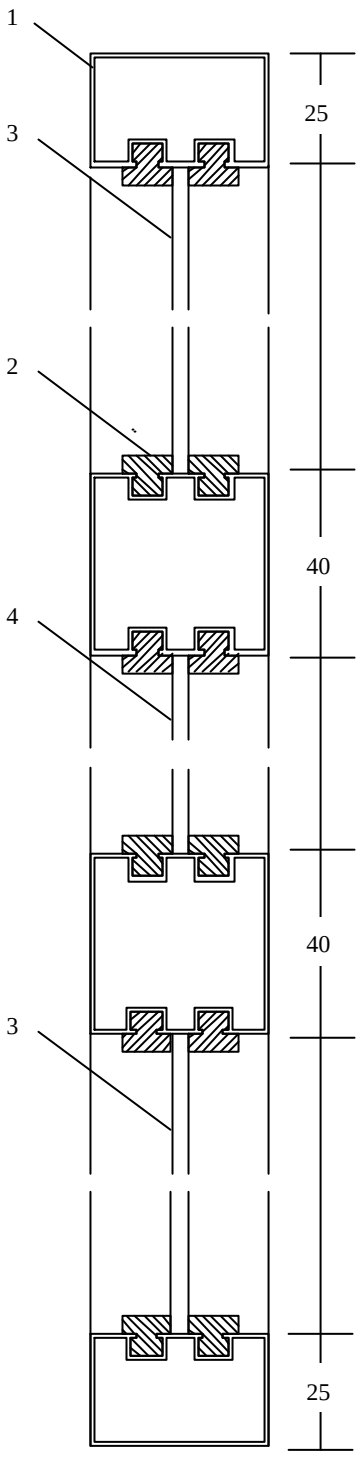
Note:
1. Non-penetrating rivet is applicable **only to Matte Finish**. If this rivet is applied to products other than Matte Finish, the trail of concealed rivet is visible from front.
2. The design strength of the non-penetrating rivet is 160 N per piece not including safety factor. Refer to "Appendix 5: Modified Non-Penetrating Rivet" in Section 4.

(5) Partition of factory (Electric-conductive fluorocarbon coating)

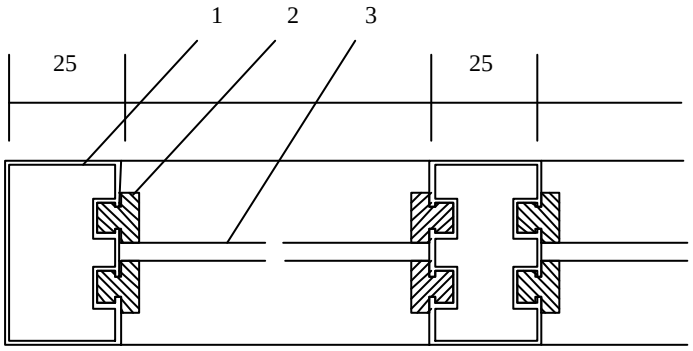
Elevation



A-A section



B-B section

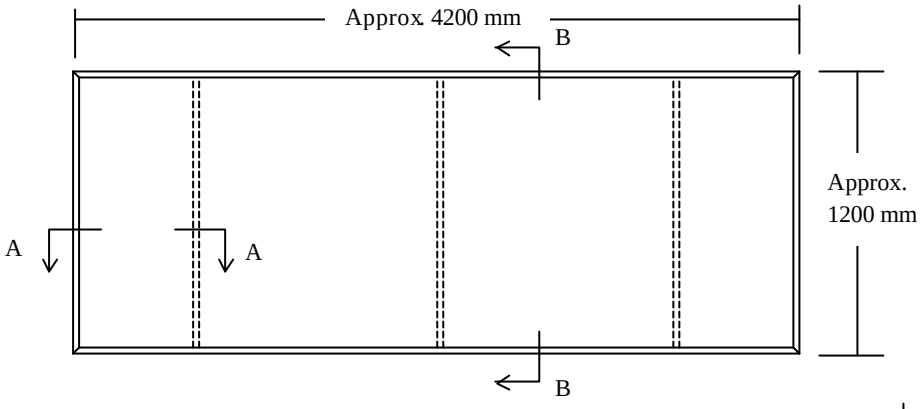


1. Aluminum partition framework system
2. Rubber gasket
3. ALPOLIC/fr LT 3mm, Electric-conductive fluorocarbon coating
4. Sheet glass

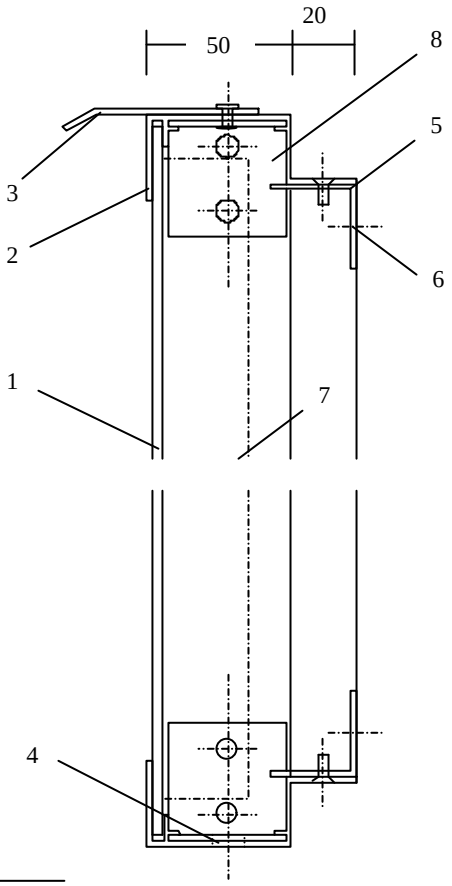
(6) Corporate shop front signboard

Example of installation method for ceiling

Elevation

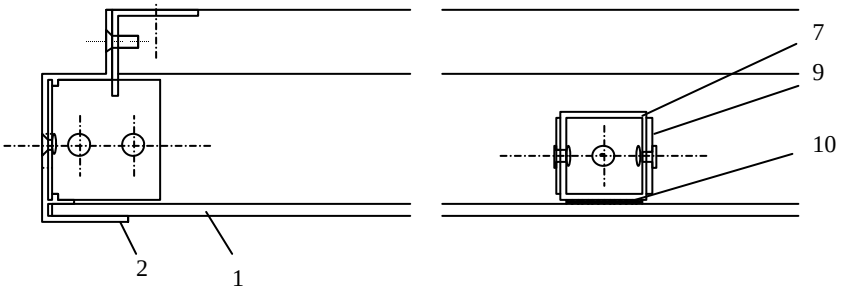


B-B section

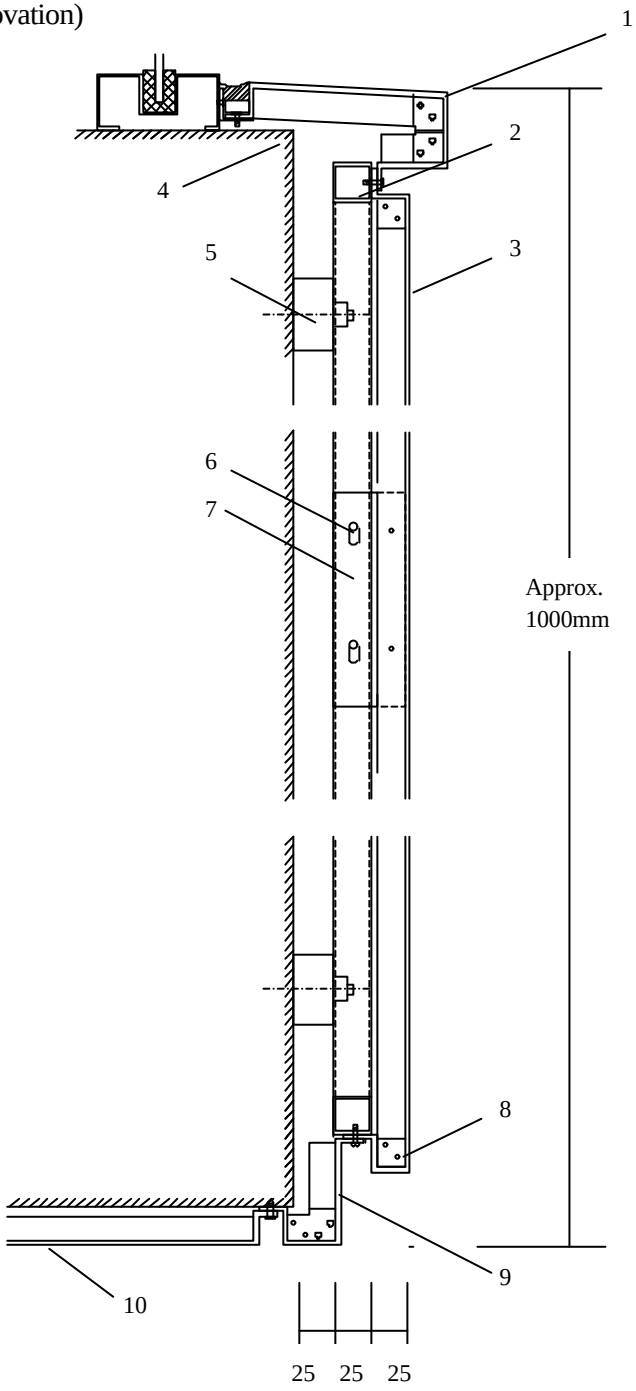


1. ALPOLIC/fr LT 3mm having signs by Scotchcal film
2. Aluminum flange coated with the same color of ALPOLIC
3. Water drip
4. Drain hole
5. Steel sub-structure, L-30×30, coated
6. Anchor
7. Stiffener, aluminum square pipe, 30×30×2
8. Corner support plate, aluminum L-40×40
9. Aluminum channel (top & bottom only)
10. VHB tape

A-A section



(7) Parapet and soffits (renovation)



1: ALPOLIC/fr LT 3mm, water drip 2: Aluminum sub-structure 3: ALPOLIC/fr LT 3mm, parapet 4: Existing external wall 5: Level-adjustment and anchor	6: Suspension bolt 7: Aluminum support plate 8: Aluminum L-shaped support plate 9: ALPOLIC/fr LT 3mm, water drip 10: ALPOLIC/fr LT 3mm, eaves

7. Touch-up coating method

Commercial or custom acrylic paints are suitable for repair coating of all finishes of ALPOLIC/fr LT. Typical procedures are as follows.

a. Clean the surface and remove dirt, if any.
b. Stir the paint well. Apply paint with brush or pencil-type container.
c. Dry and cure at room temperature, as in the instructions from the manufacturer.

Normally acrylic paints show good adhesion after cured, however the touched-up portion may show a slightly different appearance. As appearance of coating depends on coating method, even an exactly matched paint may show a slightly different appearance to some extent.

In Stone and Timber Finishes, use an intermediate solid color diluted with clear paint for touch-up. The suitable dilution rate is, depending on the color, 10-90% of clear content. Munsell Number attached to each color may become a guide to find the intermediate color.

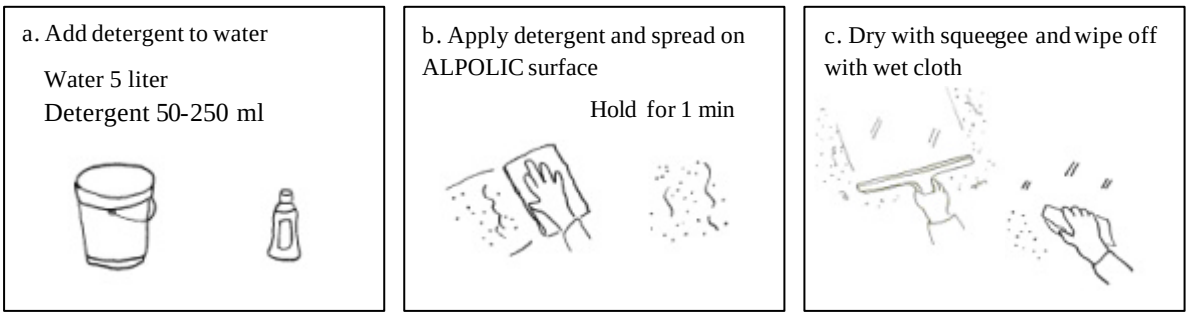
8. Cleaning method

(1) General cleaning

Firstly, try water rinse using soft sponge with modest pressure to remove the stain. If the stain remains after dry, then use neutral detergents or household cleaners diluted with water. Typical cleaning procedures are as follows.

a. Dilute a detergent or a cleaner to 1-5% with water.
b. Apply the solution and spread on ALPOLIC surface with soft rags or sponges. Wait for 1 minute, then the foam will blacken.
c. Dry the solution with a squeegee and wipe the remaining solution with wet cloth containing clean water.

According to our test, dilute Magiclean is suitable for all finishes of ALPOLIC/fr. Magiclean is a household detergent with pH 8 from Kao Corp. If you use other detergent, pre-test it in a small area.



(2) Stubborn stain

According to our test, alkali cleaners such as Sharpshooter and Windex are applicable to strong stain,

however Metallic Colors of ALPOLIC/fr LT requires good rinsing with water afterward. It is because in Metallic Colors, non-rinsing may cause a color change due to remaining alkali. In Solid Colors, Stone and Timber Finishes, rinsing with water is unnecessary especially.

Note: Sharpshooter is a versatile cleaner from 3M (alkali, pH12), and Windex is a glass cleaner from Johnson (alkali, pH11). As these are alkali solutions, prevent eye and skin contact. Follow manufacturer's safety instructions.

1. Apply Sharpshooter or Windex with sprayer, soft cloth or sponge.

2. Rinse with wet cloth containing clean water.

If you use other strong cleaners or stain removers, pre-test in a small area. Generally, strong acid and alkali may cause a gloss change, color change, or swelling of coating film. Do not use cleaners containing abrasives. Do not use strong solvents and paint thinners.