



**ALUPANEL®**

aluminium composite panel

# Alupanel Fabrication Guidelines



**MULTIPANELUK<sup>LTD</sup>**

a multitude of applications

# Contents

<b>Product Description</b>	<b>3</b>
<b>Safety, Storage &amp; Handling</b>	<b>4</b>
<b>Visual Consistency &amp; Sawing</b>	<b>5</b>
<b>Saw Equipment</b>	<b>6</b>
<b>Routing &amp; Folding</b>	<b>7</b>
Recommendations by Manufacturer	8
Additional Manufacturer Information	9
<b>Corner Cutting &amp; Bending</b>	<b>16</b>
<b>Joining Techniques</b>	<b>17</b>
<b>Coating / Printing / Cleaning Alupanel</b>	<b>20</b>
<b>Thermal Expansion</b>	<b>22</b>
<b>Compensation of Thermal Expansion</b>	<b>23</b>
<b>Wind Load Calculation</b>	<b>25</b>

## UK Head Office

Unit 6, Site 2, Oak Business Units,  
Thorverton Road, Matford, Exeter,  
Devon, EX2, 8FS

**Tel: +44 (0) 1392 823015**

## Northern Europe Office

**Tel: +31 (0) 55 323 09 50**

## USA Office

**Tel: +1 718 841 9940**

**[www.multipaneluk.co.uk](http://www.multipaneluk.co.uk)**

# Product Description

**Alupanel is a high-performance composite material consisting of two aluminium sheets bonded to an extruded thermoplastic core. As a result of this technology, we have created a perfectly flat and very formable material with an excellent strength-to-weight ratio.**

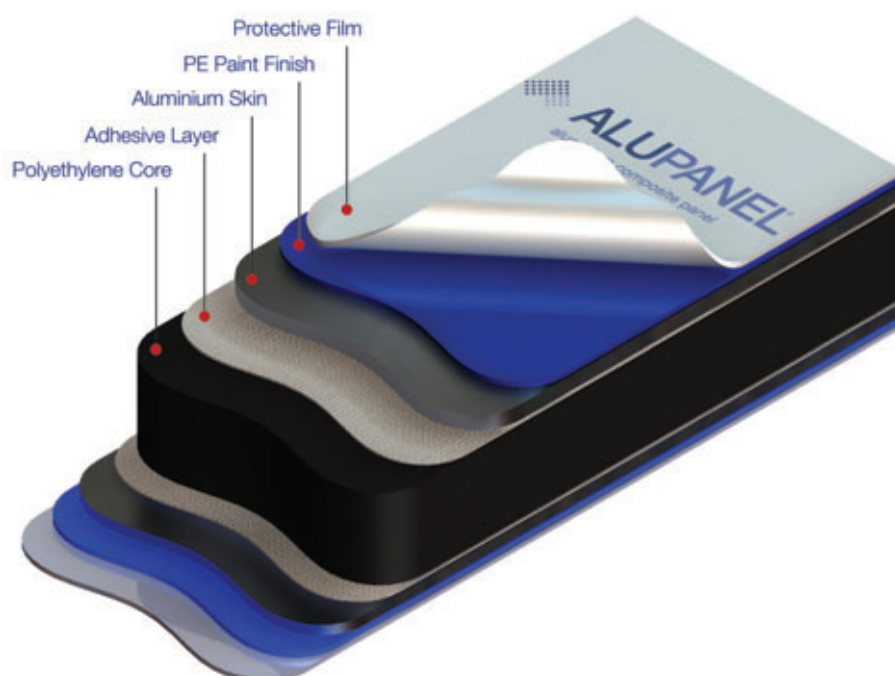
Alupanel is supplied with a face PE paint finish, available in the widest colour range on the market.

The flexibility of the panel makes it a perfect material for sign makers, designers, architects, fabricators and installers.

## Advantages include:

- Exceptional rigidity
- Outstanding strength to weight ratio
- Simple to fabricate
- Easy and quick to install
- High resistance to atmospheric conditions
- Easy to maintain

This manual has been developed to assist fabricators and installers to work with Alupanel in the most efficient manner possible. The following recommendations and product data are based on information



which is, in our opinion, reliable. However, since skill, judgment, and quality of equipment and tools are involved, and since conditions and methods of using Alupanel are beyond our control, the suggestions contained in this manual are provided without guarantee. We recommend that prospective users determine the suitability of both the material and recommendations before adopting them on a commercial

scale. In no event shall Multipanel UK Ltd, have any liability in any way related to or arising out of said suggestions and product data for direct, special, consequential or any other damages of any kind.

# Safety, Storage and Handling

## **Safety:**

Standard health and safety precautions should be adhered to when fabricating Alupanel Material. Goggles or other face protection, as well as hearing protection and gloves should always be worn. An MSDS for Alupanel is available from your local sales representative or distributor.

## **Packaging:**

Alupanel comes as standard with a clear protective film, designed to be removed just before installation to offer protection from surface damage. Although the protective film is UV stabilised, it should be removed as soon as possible after installation, especially in the case of panels exposed to sunlight and adverse weather.

## **Handling:**

Alupanel should be handled with care, especially when dealing with long lengths. It is advisable that a small team carry out the handling. When removing panels from a pallet / stack never drag the panel, always lift clear above the remaining panels on the stack. This will require two or more operatives.

## **Storage:**

When storing unpacked Alupanel please observe the following guidelines:

- To prevent warping or bending, store horizontally.
- Avoid stacking Alupanel of different sizes together, as the surface or panel can be damaged by the edges of the smaller pieces.
- Preferably, store them by size in racks.
- If storing panels vertically by leaning them against a rack, lay a rubber mat underneath and lean the Alupanel closely against the fixed back.
- Alupanel is packed in wooden crates and can usually be stacked up to four crates high.
- It is advisable to store Alupanel in a clean dry area with a minimum temperature of 15°C for a duration of 24 hours before use. After 24 hours of storage you will be able to start the processing requirements for each panel. After Alupanel has been removed from the stack it must be protected from any penetrating moisture.

# Visual Consistency & Sawing

## Visual consistency:

Each of our product types has special characteristics that can affect the visual consistency from batch to batch and even from panel to panel. It is important that these characteristics be considered when planning how to use and install Alupanel.

## Solid colours:

The industry standard for allowable variation for panel to panel and batch to batch is Delta E 1.0 or less in a hunter colour space. Brighter colours, such as reds, yellows, blues, etc, which tend to be less opaque and which depend somewhat on film build (paint thickness) to achieve their appearance, will be more likely to exhibit more variation than subdued colours.

## Projects - same batch

### Metallic colours:

The industry standard for colour variation with metallic is Delta E 2.5 or less, much larger than the standard for solid colours.

### Directional project:

In coating the flakes will tend to align in one direction. This greatly increases the directionality of the panel's appearance.

### Production Batches/Projects:

When working on projects it is

highly recommended that material from the same production batch is used in order to maintain overall visual consistency.

For these reasons the panels must be installed with the directional arrows all aligned in the same direction. Batches should not be mixed on a building face without first contacting Multipanel UK Ltd for a confirmation that they are visually similar enough to be used together.

Before fabrication, remember to use a felt tip pen to draw arrows to indicate the coating direction on any small pieces that might be cut out from areas without the directional arrows.

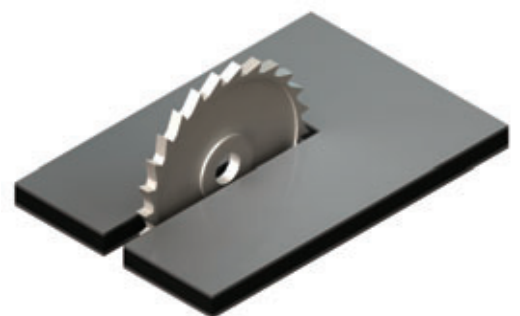
## Sawing:

Sawing Alupanel is an easy process that can be done with ordinary commercial metal and woodworking equipment. Saw blades and router bits are available through independent distributors who handle cutting tools. Prior to processing large quantities, trial saw cuttings should be done to evaluate both the tool working conditions and the recommended cutting speeds. For marking the panels the use of a soft pencil is adequate. Hard marking tools should be avoided as they can fracture the Aluminium surface. It is recommended that

the swarf formed during cutting should be vacuumed away with compressed air.

Due to the nature of the Alupanel it is best to move the saw blade rather than the material as no scratch will remain on the panel. If good saw cutting practices are applied and recommendations followed, the result should be clean cuts with little bur. If despite following the recommendations, ragged cuts are produced check the following causes; poor tool support tool vibration blunt cutting edges high frictional heat at the cutting edge

As Alupanel has low thermal conductivity it cannot be cooled easily with compressed air or any other means. Therefore it is recommended to select the tool geometry and cutting conditions in such a manner so as to minimize the frictional forces developed at the cutting point and keep the resulting heat at a low level.



[www.multipaneluk.co.uk](http://www.multipaneluk.co.uk)

# Saw Equipment

Saw cutting can be accomplished with the following equipment:

## Panel Saws:

Panel saws provide an effective method of cutting. These saws, whether standard equipment or custom made, perform well and have the added advantage of space saving. If a panel saw is to be used as production equipment, an industrial model should be purchased in order to obtain adequate cutting tolerances and increase the longevity of the equipment.

## Table Saws:

Table saws are not recommended for large sheets.

## Multiple Operation

### Rip/V-Grooving Saws:

In high production operations, equipment that is capable of performing more than one operation with a single pass through the machinery is recommended. This equipment can make multiple saw cuts (sizing the panel) and V-Grooves (rout) at the same time.

### Portable Circular Saws:

Cutting Alupanel with portable circular saws is another effective method. As mentioned, this equipment should also be production/industrial standard equipment.

## Jig Saws:

Jig saws work well for cut-outs. Care should be taken with portable jig saws to prevent damage to the Alupanel material surface. More than one sheet can be cut at a time by stacking panels.

If centre cutting (i.e., letter cut-outs) is required, a foam pad may be placed under the material with the blade cutting into the foam. The sheets may be clamped or secured with double-sided tape for the cutting operation. When clamping between jaws, protect the panel surface against damage.

Working Method	Cutting Material	Blade/Band Geometry	Tooth Geometry	Max. Cutting Speed	Max. Cutting Feed
<b>Circular Saws</b>	Carbide tipped or highspeed steel	20 x 35mm blades with maximum number of carbide teeth available, designed for cutting non-ferrous material. The blade should be ground thinner from the rim towards the centre to prevent pinching.	Angle or circular tooth, alternate bevelled, triple ground. Tooth gap wall rounded. Chip angle: 5° to 15°. Clearance angle: 10° to 30°. Tooth spacing: 4 mm to 25 mm, fine spacing preferable.	5500 RPM	0.10 - 40 mm/sec
<b>Band Saws</b>	Tempered spring strip steel.	Thickness: 0.8 mm to 1.2 mm. Width: 15 mm to 25 mm. Use racket or straight set.	Skip teeth, designed for nonferrous and ferrous materials (light metals and plastics). Tooth spacing: minimum 4 teeth per cm.	10000 RPM	25mm/sec
<b>Reciprocating saws</b>	High speed steel.	Thickness: 0.8 mm to 1.2 mm. Width: 5 mm to 15 mm).	Hook or circular tooth with alternate angles, set or waved. Tooth spacing: 2 mm to 6 mm		10 mm/sec

96 and 72 teeth carbon blades with negative teeth (Dents affutage negative). Both work well but 96 is recommended. Suggested Blade Manufacturers: LEITZ / FREUD / AKE / HELLER / LEUCO / ISOCELE



# Routing & Folding

## Introduction

**Alupanel can be routed using conventional Routing machines. For accurate and precise manual folding of the Alupanel composite panels, resulting in a good finish, we recommend to route the rear of the panels to a depth of 2.5mm thick, going through the exterior aluminium layer, and some of the Polyethylene core. Normally the panel is grooved and folded 25-70mm from the edge.**

**In order to route Alupanel the following equipment is necessary:**

### **Vertical panel saw:**

Equipped with specially shaped routing saw blades. The equipment needed is the same vertical saw as the one used for the cutting, but with a different saw blade and relevant equipment for adjusting the routing thickness.

**The use of a chip collector is essential.**

### **Portable circular saw:**

A portable circular saw equipped with a suitable routing disk can be used, but only for a limited amount of processes. Note that special care should be given to the stability of the portable circular

saw during processing of the material, as well as the precision of the routings with the help of the chosen guided system.

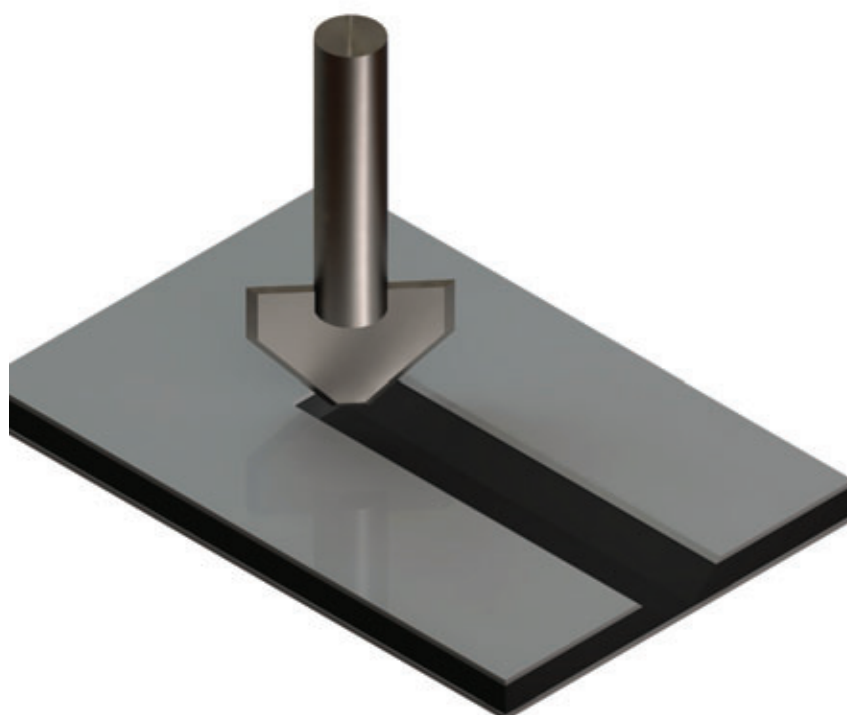
### **Hand operated router:**

These tools consist of routers that are commonly available on the market and are used for wood processing. If they are equipped with special routing bits (carbide tipped cutter) the hand operated router can be used for a limited number of processes. In this case the stability of the tool and the guide-system considerably affect the quality of the routing.

### **Work directions:**

For shaped elements with a radius of between 2-7mm proceed as follows:

- The shape of the groove and its respective depth determines the folding radius. Note that smooth bending (shape forming of elements) cannot be obtained without uniform thickness of polyethylene remaining.



# Recommendations by Manufacturer

							
<b>Maximum RPM of Spindle</b>	40000 rpm	55000 rpm	46600 rpm	50000 rpm	24000 rpm	24000 rpm	24000 rpm
<b>Type of tool (4mm cutter)</b>	BIT - MUS06-4006-50C1	BIT - MUS06-4006-50C1	R104 4 mm	4 mm	CP-AL 4-8-6	90deg V-groove	6mm End Mill
<b>Recommended Feed Rate</b>	83 mm/s	200 mm/s	200 mm/s	250 mm/s	85 mm/s	350 mm/s approx	320 mm/s approx

**Note:**

All data obtained after in-house testing by manufacturer's stated above.

**Material Tested:**

Alupanel 3mm (0.3)

For Alupanel 2mm, Alupanel 2mm Lite and 3mm Lite we would recommend comparable speeds as stated above.

We always recommend that you allow time for your own individual test procedures, depending on Machine Version and always seek advice from an experienced user.

If further detail is required please contact your re-seller.

<b>Recommended Routing Depth:</b>	Material thickness remaining after routing is usually between 1,5 -2 times skin thickness
<b>Alupanel</b>	0.45 - 0.6
<b>Alupanel Light</b>	0.35 (not recommended)
<b>Ecopanel</b>	0.25 (not recommended)



# Additional Manufacturer Information

The additional information contained has  
been supplied by your chosen manufacturer:



# ACM Multipanel Setting Kongsberg



## Bit used for ACM

BIT- MUS06-2006-50C1	2 mm diameter
BIT- MUS06-3006-50C1	3 mm diameter
BIT- MUS06-4006-50C1	4 mm diameter

## 1 kw Spindle

### XP

5 m/min  
50 % ACC  
z : 1m/min  
TR/MN : 40 000

### XN

5 m/min  
80 ACC  
z : 1m/min  
TR/MN : 40 000

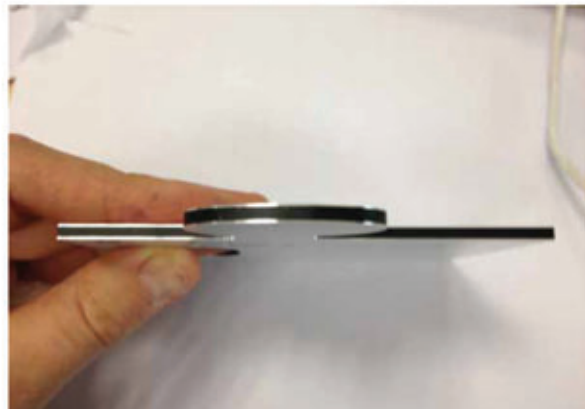
## 3 kw Spindle

### XP

12 m/min  
50 % ACC  
z : 1m/min  
TR/MN : 55 000

### XN

12 m/min  
80 ACC  
z : 1m/min  
TR/MN : 55 000





# MECAPRO

# MÉCA numéric

## DESCRIPTION / TECHNOLOGIES

**Structure :** châssis et portique mobile en acier mécanosoudé de forte section

**Plateau :** table fixe aluminium avec revêtement marbré

**Guidage :** rails rectifiés et patins pré chargés à circulation de billes

**Transmission :** vis à billes sur tous les axes avec double vis à billes pour l'axe X. Sauf MPR 6020, qui a une transmission effectuée par double crémaillère sur l'axe X et vis à billes sur axes Y et Z

**Motorisation :** 3 x moteurs BRUSHLESS de 750 W (X1, X2, Y) + 1 de 750 W (Z)

Nez aspirant à pilotage pneumatique

**Structure :** high inertia steel welded frame and gantry

**Table Top :** slotted aluminium top with consumable covering

**Guidance :** precision linear rails with preloaded ball slides on 3 axis

**Transmission :** ballscrews on all axis with double ballscrews on X axis. Excepted for MPR 6020 that has a transmission by double rack and pinion on X axis and ballscrews on Y and Z axis

**Motorisation :** 3 x 750 W AC BRUSHLESS motors (X1, X2, Y) + 1 x 750 W, Z motor

Automatic suction nozzle

## CARACTÉRISTIQUES / FEATURES

TYPE	MPR 1015	MPR 3015	MPR 3020	MPR 4020	MPR 6020	TYPE
Courses Axe X en mm	1020	3050	3050	4050	6050	X-axis travel in mm
Courses Axe Y en mm	1520	1520	2020	2020	2020	Y-axis travel in mm
Courses Axe Z en mm (standard / option)	250/400	250/400	250/400	250/400	250/400	Z-axis travel in mm (standard / optional)
Passage entre montants	1640	1640	2200	2200	2200	Maximum material width
Passage sous portique (standard / option)	260 / 405	260 / 405	260 / 405	260 / 405	260 / 405	Passage under gantry (standard / optional)
Vitesse maxi en mm/sec	417	417	417	417	500	Maximum speed in mm/sec
Résolution en mm	0,0006	0,0006	0,0006	0,0006	0,001	Resolution in mm
Répétabilité en mm à 20°C +/- 2°	+/-0,025	+/-0,025	+/-0,025	+/-0,03	+/-0,075	Repeatability in mm at 20°C +/- 2°C
OPTIONS ET ACCESSOIRES / OPTIONS AND ACCESSORIES						
Plateau à dépression						Vacuum table
VACT16 (1 turbine - 4.3 kW)	X					VACT16 (1 pump - 6 HP)
VACT23 (2 turbines - 2.2 kW)	X	X				VACT23 (2 pumps - 3 HP)
VACT43 (4 turbines - 2.2 kW)		X	X	X		VACT43 (4 pumps - 3 HP)
VACT26 (2 turbines - 4.3 kW)		X	X	X		VACT26 (2 pumps - 6 HP)
VACT210 (2 turbines - 7.5 kW)		X	X	X		VACT210 (2 pumps - 10 HP)
VACT36 (3 turbines - 4.3 kW)					X	VACT36 (3 pumps - 6 HP)
VACT310 (3 turbines - 7.5 kW)					X	VACT310 (3 pumps - 10 HP)
1V140 (1 pompe à bec, 140 m³/h)	X					1V140 (1 claw pump, 140 m³/h)
1V250 (1 pompe à bec, 250 m³/h)	X	X	X			1V250 (1 claw pump, 250 m³/h)
2V250 (2 pompes à bec, 250 m³/h)		X	X	X		2V250 (2 claw pumps, 250 m³/h)
3V250 (3 pompes à bec, 250 m³/h)					X	3V250 (3 claw pumps, 250 m³/h)
LUB 2/6 (Refroidisseur d'outil - vaporisation d'huile soluble)	X	X	X	X	X	LUB 2/6 (Tool coolant by soluble oil spraying)
AIRGEL (Refroidisseur d'outil par air gelé)	X	X	X	X	X	AIRGEL (Tool coolant by frozen air spraying)
ASP (Aspirateur de copeaux professionnel 2.2, 4 ou 7.5 kW)	X	X	X	X	X	ASP (Professional chip suction device 3, 6 or 10 HP)
Changeur d'outil automatique 6 outils, statique CH6S ou rotatif CH6R	X	X	X	X	X	Automatic tool change with a static 6-tool shop CH6S or rotating CH6R
KCF / KSD (Tête pour découpe au couteau flottant ou tangentiel)	X	X	X	X	X	KCF / KSD (Optional floating or tangential knife cutting head)
OPTISCOUT / LCUT / GTK (Vision de repérage par caméra)	X	X	X	X	X	OPTISCOUT / LCUT / GTK (Vision registration/ compensation system)
Tête multi outils pour découpe couteau tangentiel fixe ou vibrant et rainage	X	X	X	X	X	Multi tool cutting head for fixed or oscillating tangential knives and bending roll
FLOTZ suivi automatique de planéité avec HF80 et DELTA 6	X	X	X	X	X	FLOTZ flatness regulation only with HF80 or DELTA 6 spindles.
DIMENSIONS HORS TOUT / OVERALL DIMENSIONS						
Longueur en mm pompes non comprises	2520	4580	4580	5700	7630	Length in mm (vacuum pumps not included)
Largeur en mm (CH6S/CH6R)	2225/2530	2225/2530	2625/2930	2625/2930	2885/2980	Width in mm (CH6S/CH6R)
Hauteur en mm (min/max) avec Z 250 mm	2090/2280	2090/2250	2090/2250	2090/2250	2090/2250	Height in mm with standard Z 250 mm
Poids moyen en Kg	2000	3400	4500	5300	7500	Average weight in Kg
ENERGIE / ENERGY						
Alimentation pneumatique	Pression : 6 bars / Débit : 6 m³/h à 40 m³/h			Pressure : 6 bars / Flow : 6 m³/h to 40 m³/h		Air supply
Alimentation électrique	400 V triphasé 50 Hz + terre - 20 à 45 A			400 V, 3-phase, 50 Hz + earth, 20 to 45 A		Power supply

## COMMANDE NUMÉRIQUE / NUMERICAL CONTROL

Commande numérique MECANUMERIC CN7000 ISO avec disque dur de 40 Go • IHM sur pupitre mobile avec écran 15 pouces tactile • Entrée donnée par liaison Ethernet ou commande numérique SIEMENS SINUMERIK 840Di en option.

Numerical control MECANUMERIC CN7000 ISO with 40 Gb hard disk • MHI on moving control desk with a 15-inch touch screen • Data input by Ethernet link or optional : SIEMENS SINUMERIK 840Di numerical control.

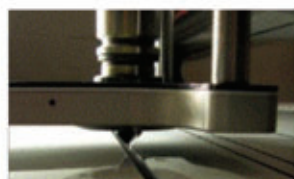
## BROCHES / SPINDLES

Electrobroches à haute fréquence avec variation électronique continue de vitesse / High frequency spindles with continuous electronic speed variation

Marque et type Spindle Type	Puissance S1-S6 Power S1-S6	Vitesse rotation Rotation speed	Refroidissement Cooling	Serrage Outils Collets	Changement d'outil Tool change	Besoin pneumatique Air requirements
	W (S1-S6) / HP	tr / mn - rpm		Type mm		
OMLAT OM-55C	5000 - 6000 / 7	2000 - 24000	Air, convection naturelle/Air, natural convection	ER32 2-20	Automatic ISO 30	12 m³/h
FISCHER ZEN 40	2200 - 2700 / 3	4000 - 24000	Air, convection naturelle/Air, natural convection	EX16 2-10	Manual	6 m³/h
IBAG HF 80	2500 - 3200 / 3,4	8000 - 40000	Eau / Water	EX16 2-10	Automatic SKI20	12 m³/h
HSD SEV 1090	4500 - 5500 / 6	2000 - 24000	Air, convection naturelle/Air, natural convection	ER32 2-20	Manual	12 m³/h
OMLAT ZSC-S	7000 - 10000 / 10	2000 - 28000	Air, convection naturelle/Air, natural convection	ER32 2-20	Automatic ISO 30	12 m³/h
OMLAT DELTA 6.5	6500 - 9000 / 9	2000 - 40000	Eau avec groupe froid/Water with cooling unit	EX20 2-13	Automatic HSK E 32	15 m³/h



Machine Fold Lines



Accurate Depth Control

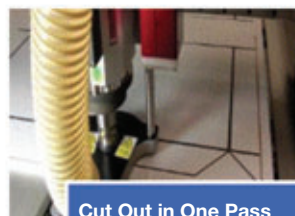


For more information or  
CNC cutter sales:

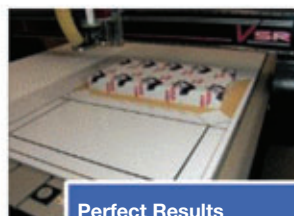
**Email :** info@tekcelcnc.co.uk

**Tél. :** +44 (0) 1275 342 668

**Fax. :** +44 (0) 1275 342 669



Cut Out in One Pass



Perfect Results

## FOLDING / CUTTING MULTIPANEL SHEET PRODUCTS

### General Guidelines

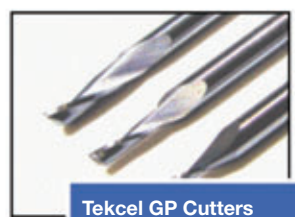
#### Cutter Choice

#### Cutting Multipanel Sheet Materials



Tekcel CP-AL Cutters

Product Code	Cutting Dia.	Max. Cut Length	Shank Dia.
CP-A1 3-6-6	3 mm	6 mm	6 mm
CP-A1 3-6-6	4 mm	8 mm	6 mm
CP-A1 3-6-6	6 mm	14 mm	6 mm



Tekcel GP Cutters

Product Code	Cutting Dia.	Max. Cut Length	Shank Dia.
GP 2-10-6	2 mm	10 mm	6 mm
GP 3-12-6	3 mm	12 mm	6 mm
GP 4-15-6	4 mm	15 mm	6 mm
GP 6-20-6	6 mm	20 mm	6 mm

#### Pliage de matériaux en feuille Multipanel



Tekcel FC Cutters

Product Code	Angle	Shank Dia.
FC-90	3 mm	8 mm
FC-135	4 mm	8 mm



# ACM Multipanel Setting Zund



## Applicable bits:

R104 4 mm diameter  
R105 5 mm diameter  
R106 6 mm diameter

## Routing speeds:

XY speed = 200 mm/s  
Acceleration = 4 (100 %)  
Router speed = 46600 Tr/mn

Method: **Route**  
Name: **APS\_GEOMETRY**  
Color: **Blue**  
Line type: **Standard**  
Cutting mode: **standard**

Router: **R 114 Ø4 (3910764)**

**General** | **Advanced**

Initialisation: **Base**  
Clearing distance: **5.00** mm  
Material thickness: **3.00** mm  
Multipass max. depth: ☒ **4.00** mm  
Multipass last depth: **0.30** mm  
Base depth: **0.20** mm  
Finishing path: ☒ **5.00** %

Acceleration, tool lowered: **4**  
Router Ø: **4.00** mm  
Offset side: **outside**

Speed, tool lowered: **200** mm/s  
Router speed: **46600**  
Speed, lowering tool: **30** mm/s

**Close**





	Part No	Description	RPM	Cut speed
	2091A-90-8	90deg V-groove	24,000	20-22m/min (350mm/sec approx)
	1111A-6	6mm End mill	24,000	18-20m/min (320mm/sec approx)



All ACM tooling can be found at [www.cncroutershop.com](http://www.cncroutershop.com)



# Routing & Folding Methods

## Carbide Saw:

By routing on just one of the sides of Alupanel, it can be bent upwards or downwards to create both an inside or outside corner.

When a groove is bent at a 90° angle the bending radius of the final product will be 3-3.5mm and the element will elongate by 0.5-1.0mm. As such, the original panels should be cut shorter by that proportion.



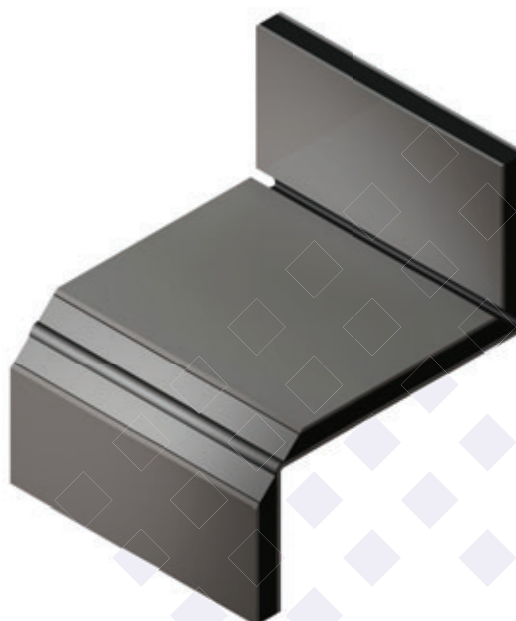
## Grooving equipment:

For processing a small number of panels a manual router with a v-groove blade and trimmer can be used.

For processing large volumes a table circular saw/CNC router and a grooving cutter are needed along with a lifter.

### Technical characteristics of carbide saw-tip:

Outside diameter: 305  
No of the teeth: 24  
RPM: 3000 to 5000



# Corner Cutting & Bending

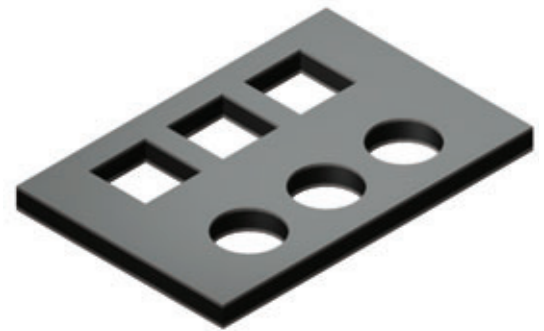
**Two methods are normally used for cutting out corners to allow the forming of a cassette.**

## **Wood chisel:**

A sharp hammer blow to a wood chisel allows you to cut out the small thickness at the bottom of a routing groove with no difficulty. The wood chisel must be wider than the part to be cut out. With a little experience, good clean joints can be easily achieved.

## **Punching:**

This technique is the most productive, with the corners being cut out and the corner fastening holes being achieved in a single operation.



The minimum bending radius for Alupanel without routing the back skin is fifteen times the thickness of the panel being curved i.e., 4 mm = 60 mm minimum radius.

Alupanel can be cold formed in a pyramid roller, a press brake or over a clamped pipe. The process is similar to the forming of aluminium; however, due to the sensitive surface, care should be taken to ensure rollers are clean, smooth and free of defects to avoid damage to the surface.

## **Pyramid Roller:**

As an extra precaution, a protective film should be used between the panel and the rollers to further shield the panel surface. Do not pinch the Alupanel between the rollers. Roll the panel 3° to 5° tighter to allow for a small amount of Spring back that will

occur. Once the sheet is curved; however, it will remain curved.

## **Press Brake:**

When forming with a press brake, use a top die (tubular) with the radius desired and open the bottom die (jaws) approximately two times the thickness of the material plus film wider than the top die. The lower die should always have a protective pad of not less than 3mm film.

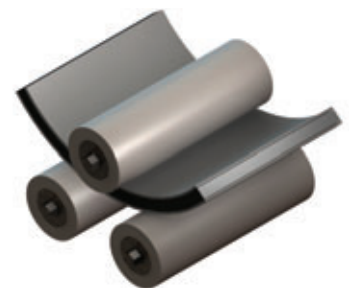
Some adjustment of the lower jaws may be necessary to allow for varying bending properties between anodized and painted finish and for varying thicknesses. The radius of the top die will be the approximate inside radius of the finished panel.

## **Bending Over a Clamped Pipe:**

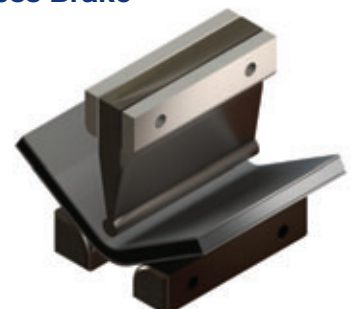
Alupanel may be formed over a

pipe of the proper diameter that is securely clamped to a work table. A hinged “leaf” attached to the end of the table will bend the material easily.

## **Pyramid Roller**



## **Press Brake**



# Joining Techniques

## One

### Drilling:

Alupanel can be drilled with standard drills used for aluminium and plastics.

#### Working Specifications:

##### Drill bit:

Twist drill, high speed steel.

##### Tip Angle:

100-140 degrees, or counter-bore grind with centering tip.

##### Cutting speed:

164 RPM to 984 RPM.

Quick removal of chips can be achieved by a high RPM, slow feed speed and occasional lifting of the bit.

**Please find below some important general information about joining techniques. Use the following guidelines when other elements come in direct contact with the surface of Alupanel Material:**

#### Acceptable joining materials:

aluminium, plastic, stainless steel, plated or coated steel with cadmium, zinc or aluminum.

#### Unacceptable joining materials:

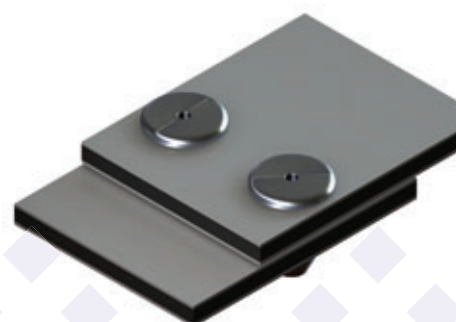
copper, brass, bronze, iron, raw steel. Unacceptable materials cause corrosion of joining surfaces due to electrolysis of dissimilar materials. Therefore, use “heavy” or “red” metals only with an electrically insulating intermediate layer.

When joining elements are to be anodized, assemble the materials after the anodizing process. Proper consideration should be given to the thermal expansion characteristics of Alupanel Material when using any of the joining techniques.

Pop rivets are often used to attach aluminium clip angles and other structural or ornamental elements to Alupanel. Because the rivet body will be in contact with the aluminium skin of the panel, it

is recommended that either aluminium or stainless steel rivets be used to avoid dissimilar metals contacting. Ultimate shear and tensile strengths of various rivets are available from the rivet manufacturer.

**Please be advised that some building code jurisdictions do not endorse the use of pop rivets for structural connections.**



### Joining:

A variety of different fasteners are used to fabricate and install Alupanel. Structural adequacy and selection of these fasteners are the responsibility of qualified engineers and in most instances where architectural panels are used, certified calculations will be required by the Building Official. You may successfully use specific fasteners for panel load testing purposes in obtaining building code recognition.

# Joining Techniques

## Two

### **Screws:**

Screws are also used to perform many of the same applications as rivets. Stainless steel screws are industry standard and are appropriate to avoid corrosion and dissimilar metal contact. Because screws are customarily installed through pre-drilled holes it is recommended that sheet metal screw thread type fasteners be used, especially when the screw is under tension load and this load is resisted by the aluminium skins.

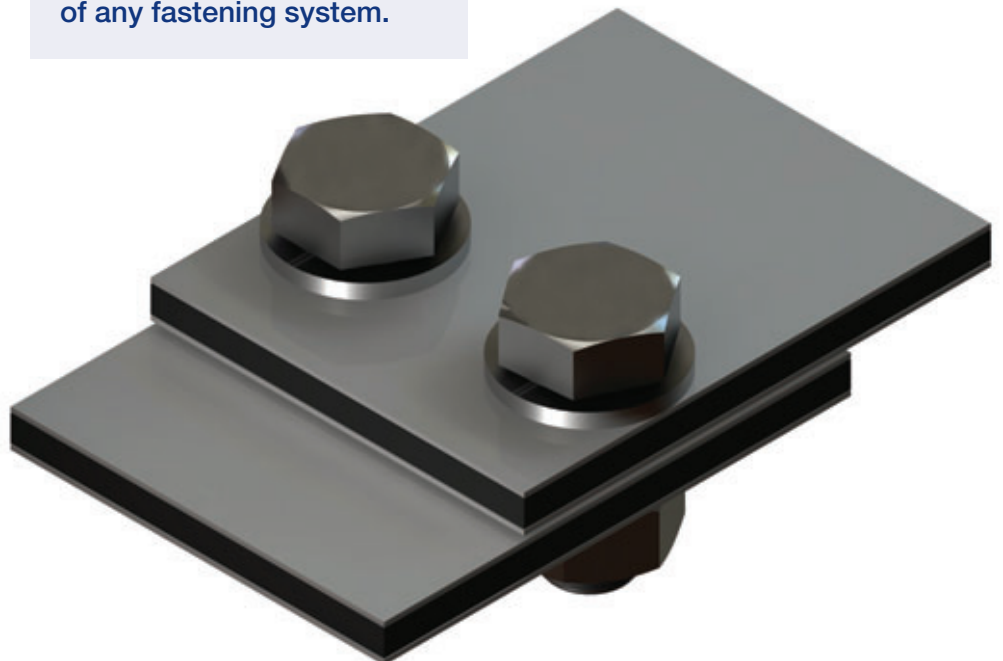
Occasionally, Alupanel is face fastened directly to supports or sub-grids. The type and thickness of the support metal, as well as the applied load, will dictate the size and thread type of the correct fastener.

### **Through bolts:**

These provide an excellent way to join sheets of Alupanel together, or to other elements. Galvanized, stainless steel or aluminium bolts, nuts and washers should be used to avoid dissimilar metal contact.

Caution is recommended in tightening the nut onto the bolt. Because the plastic core material is compressible, over tightening can deform the metal skins. Use lock nuts or double nuts with washers to prevent the nut from loosening over time.

**Testing is advisable to determine the performance of any fastening system.**



# Joining Techniques

## Three

### **Welding:**

This method is frequently used to assemble Alupanel. The filler rod and the polyethylene core are welded together after heating by a jet of hot air projected by an electrically heated welding gun.

### **For good quality welding, you will need:**

- Good preparation of the edges to be welded together
- Adequate filler rod quality
- A good welding speed
- Evenly applied pressure
- Clean hot air
- An appropriate temperature

### **Welding by the to-and-fro method:**

Hold the filler rod at a right angle whilst exerting regular pressure on the rod, make to-and-fro B-B (non-circular) movements. The filler rod and the edges to be welded must be heated in a similar way.

### **Welding using a high-speed nozzle:**

Normal hot air guns fitted with a removable high-speed welding nozzle allow the edges to be welded and the filler rod to be heated at the same time. This makes for better quality welding. The filler rod is pushed by the constant pressure of the high-speed nozzle, and is therefore pressed between the edges to be welded.

### **Preparation of the edges to be welded:**

#### **Butt welding:**

The edges must be bevelled,

#### **Corner assembly:**

Only one of the panels is bevelled.

#### **T-assembly:**

Remove the narrow strip of metal skin to free the areas to be welded.

#### **Welding of a fold:**

Bevel the edges to be welded first of all using a shaped milling cutter.

The polyethylene core oxidizes relatively quickly once exposed to the air. It must be welded within 24 hours max after it is bevelled. Once it has cooled, it is possible to remove the welding flash using a knife or scraper. We recommend that this operation be carried out in a clean, oil and water-free area.

### **The specific welding qualities of the filler rod are:**

**Polyethylene:** low density

**Colour:** unpigmented

**Density:** 0.9 g/cm<sup>3</sup>

**Diameter of rod:** 3, 4 and 5mm

Immediately before welding, remove the outer layer of oxide from the filler rod.

### **Adhesive Bonding:**

In addition to structural adhesives, double sided tape can be used for fixing Alupanel on flat surfaces such as walls, ceilings, furniture, coverings etc.

Extreme care should be given when selecting the adhesive so as to ensure it is chosen according to the application and the environmental conditions.

\* Non shrink on Drying is essential.

It is important that the manufacturer is consulted prior to the usage of the adhesive for further instructions.

The substrate surface should be clean before the application of the structural adhesive.



# Coating / Printing / Cleaning Alupanel - 'Easy Peel' One

**Easy Peel Protective Film ensures no residue is left on the panel, reducing cleaning time and eliminating the risk of interference with the print. An ultra white surface helps to display printed colours with increased brightness and intensity, with a special coating also delivering vastly improved ink adhesion for colour fast prints. Developed for the print market, Alupanel Ultrawhite is suitable for use both indoors and out and, is available with the reverse side milled and covered with transparent digital laquer providing perfect adhesion for prints, achieving an amazing look of aluminium surface with colourfull prints.**

 **ALUPANEL** ULTRAWHITE  
DIGITAL

## **Off-line Coating:**

Alupanel can be coated off-line if necessary. It is advisable to follow instructions as specified by the manufacturer of any paints to be used.

**For off-line coating observe the following guidelines:**

- Surface should be lightly abraded to provide a better coating surface. The Surface should then be cleaned of all contaminates i.e. dust, dirt and oil etc. A soft cloth with a non-petroleum based solvent (e.g. rubbing alcohol) should be used to clean the surface area.
- Curing should be done at room temperature since temperatures above 175°F can cause Alupanel to deform.

## **Screen Printing:**

Alupanel is perfect for printing with an epoxy base or urethane base two-part type ink/paint. When selecting an ink, confirm its weather ability and adhesion with the ink manufacturer. It is recommended to test the ink adhesion on the surface of Alupanel before printing.

**For printing on Alupanel, observe the following guidelines:**

- Remove all dust and dirt on the surface of Alupanel. Oily dirt causes splintering, splitting, or other defects of the paint. It must be completely removed with a soft cloth dipped in alcohol, N-hexane, etc. If storage or drying is not done correctly, the adhesion or other performance may be adversely affected. Therefore, observe the storing conditions of each paint as specified by the manufacturer.
- Since storing in high temperature may cause deformation, ensure the storing temperature is kept below 175°F and store horizontally.



# Coating / Printing / Cleaning

## Alupanel - 'Easy Peel'

### Two

#### **Cleaning:**

Alupanel should be regularly cleaned following the method below. The surface of the panel will commonly accumulate dust, dirt and other airborne particles. In the case of panels used externally, various hydrocarbons from airborne exhausts are also likely to need removal. It is also possible that surfaces could be contaminated with synthetic hydrocarbons from other exhausts such as synthetic grease, oil, hydraulic fluids, lubricants or stains from vegetation like plant or animal matter.

#### **Cleaning Method:**

We recommend a 4-step cleaning method:

- 1 Flush Alupanel with water from a hose.
- 2 Wipe lightly with a soft cloth.
- 3 Use pressure washer.
- 4 Use detergent in a power wash or with a soft cloth for hand wiping and flush with water.

#### **Alupanel & Alupanel UWD- pH test/print life-span**

Tests have been undertaken to determine the acidity of our Alupanel and Alupanel Ultra White Digital panels. An Insta-check pH pencil (by Micro Essential Laboratory) was used to carry out the tests.

The panel surface was moistened with distilled water and left for 3 minutes. Several lines were drawn with the Insta-Check pH pencil on the wet surface. After 15 seconds the color of the lines was compared with a pH color chart. The colours of the lines matched the colour on the chart corresponding to a pH level of 7, which indicates that the substance is neutral. In conclusion, we can state that the surface of our digital panels is not acidic and that coatings/paints applied will last for years. This means that Alupanel is suitable, for example, for archival applications.

#### **Material Compatibility:**

Alupanel is an extremely durable material that has been designed to withstand significant exposure to environmental conditions. It is unlikely to be compromised by any cleaning process that would conceivably be used on the material.

However, in the interests of maintaining the finish of the material, the prudent user will select products with a pH of 10 or less and which do not contain bleaches, ammonia or caustic ingredients such as sodium hydroxide, potassium hydroxide or sodium metasilicate. It is also recommended that users avoid abrasive materials or tools such as scouring powders, fiber pads or brushes.

#### **Easy Peel Protective Film**

- ✓ No residue
- ✓ Reduce cleaning time
- ✓ Elimination of print interference
- ✓ Ultra white surface
- ✓ Bright and intense colours
- ✓ Vastly improved ink adhesion
- ✓ Suitable for indoors and out
- ✓ Available reverse side milled
- ✓ Digital laquer covering option

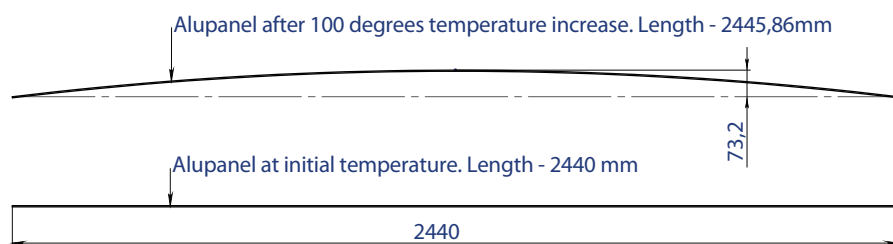
# Thermal Expansion

**All the materials used in construction and sign making will expand when exposed to high temperatures and shrink when the temperature falls. Each material has its own thermal expansion rate. In the metric system it is measured in mm/m/100DC and shows how many millimeters one meter of material will expand when the temperature changes 100 degrees Celcius.**

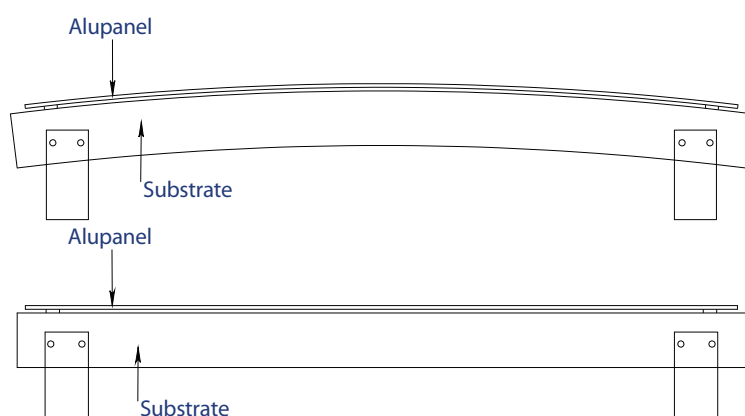
For example, for steel and concrete this rate is around 1,2mm and for PVC it is 5,2mm. When different materials are fixed together it is always necessary to take into account their expansion rates and exposure of those materials to different temperatures.

Alupanel consists of 2 aluminium layers bonded to a polyethylene core. Thermal expansion of Alupanel is determined by the properties of its aluminium skins. Thermal deflection of aluminium is 2,4 mm/m/100DC. So a 2440mm long panel with a 100DC temperature fluctuation will expand 5,86mm and its length will become 2445,86mm under new temperature conditions.

At the same time if 2 edges of the panel are fixed the tension in Aluminium skins will lead to panel bowing. Bowing deflection in this case will be 73,2mm. It is very important to make sure that when installation is done in the conditions where essential temperature fluctuations are expected, fixings shall be designed to allow free thermal expansion of the panels.



Sometimes it may happen that a substrate on which Alupanel is designed to be installed is rigidly fixed without taking thermal expansion into consideration. In this case this substrate can bow and deform causing subsequent bowing of the Alupanel fixed to this substrate. To prevent this substrates on which Alupanel is going to be installed shall be carefully examined.

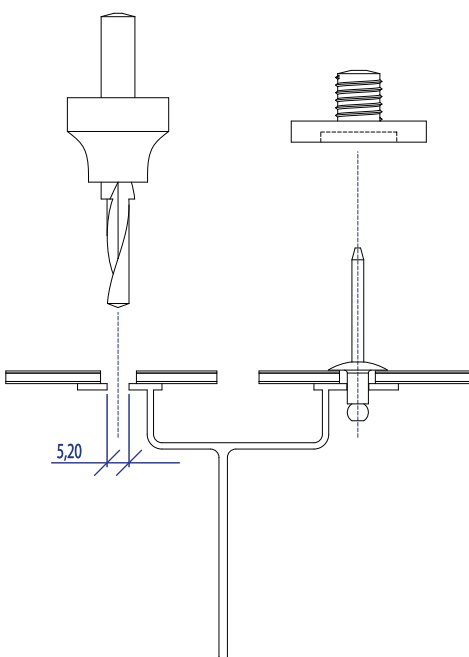
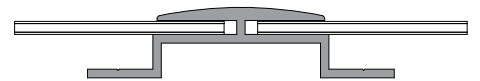


# Compensation of Thermal Expansion One

When installed outdoors under direct sunlight Alupanel surface temperature can achieve up to 75°C for dark colors. Minimum winter value in Northern countries shall be taken as -35°C. Before any installation it is very important to calculate possible thermal movements and choose the right solution to compensate it taking into account materials of the subframe, temperature during installation, minimum

and maximum temperatures in installation area. Compensation of thermal expansion means that Alupanel fixing shall be done to allow some freedom in fixing points so that the panel can independently slide along the subframe when shrinking or expansion of the panel differs from that of the subframe. It allows for the prevention of tension which can lead to panel bending or damage to the fixings.

Channel systems and clipping systems allow free movement of the panel alongside the profile. A fixing gap should always be left between panel edge and channel end to allow the panel to expand perpendicularly to the profile.



Problems with thermal movements often happen when a panel is fixed to the subframe with rivets or screws. To prevent this special tools shall be used during such installation.

When Alupanel is fixed by rivets, an adjusted step drill and riveting gun with special nozzle shall be used. A step drill cuts a  $\varnothing 5,2\text{mm}$  hole in the subframe profile while an 8,5mm or bigger hole is cut in the panel. A special nozzle for riveting guns used to prevent jamming of the rivet head into the panel surface. It fixes the rivet so that a small gap is left between the panel surface and the rivet head to allow free panel movement. Rivets with bigger heads shall also be used. Normally, rivets with 14 or 16mm heads are used.

When screws are used to fix Alupanel it is possible to use a step drill with the first drill radius at least 1mm smaller than the shaft of the screw. Another option will be to cut holes for the screws in Alupanel prior to installation. The radius of such holes shall be calculated depending on a project to allow free panel movement. Normally at least 8,5mm holes shall be made for 5mm screws. Screws shall be carefully centered in the holes during installation. Screws shall not be fixed tightly and should not jam into the Alupanel.

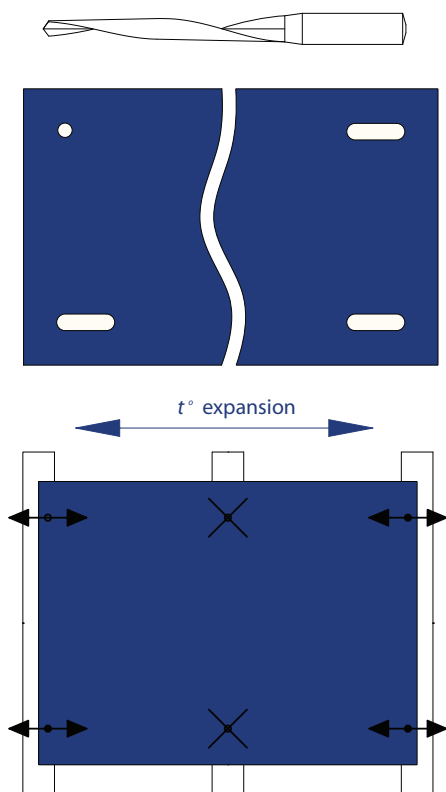
It is recommended to turn the screw 180° to make sure it is not tight. Screws with countersunk heads should not be used.

# Compensation of Thermal Expansion

## Two

Sometimes panel length is too big and holes with a bigger diameter can not compensate thermal movement. In such cases oval holes can be cut into the panel. At the same time one or two round holes should be cut to keep the panel in place. A special cutting drill bit can be used to cut such holes.

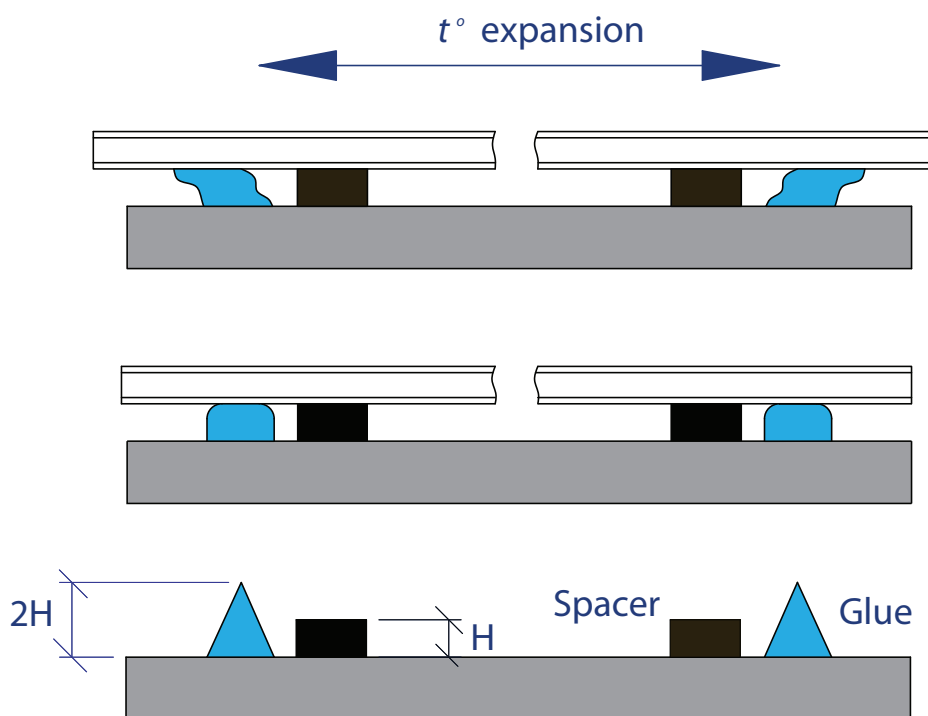
When a panel is fixed to more than 2 profiles it is recommended to make center of the panel tightly fixed while sides of the panel shall be left loose.



### Glue Systems

For projects where essential thermal movements are expected only special flexible glues shall be used. Normally it can be polyurethane based glues with flexibility at break of 300% or more. It is very important to consult a representative of the glue maker to make sure the glue is suitable for the specific project. During installation glue maker's instructions shall be strictly followed.

As a general rule glue thickness shall be 3mm at least to have a flexible joint. This can be achieved by using doublesided adhesive tapes or other spacers with the necessary height. It is recommended to apply the glue with a special nozzle forming triangle glue beads. Height of such a bead shall be at least two times height of the spacer



# Wind Load Calculation

## One

### Alupanel strength calculations:

The composite technology of Alupanel makes the material very light and extremely rigid. For these reasons, Alupanel is used across the world in many different sign and architectural projects, including those at substantial height subjected to high wind load and wind suction conditions.

The following guide has been designed to enable easy calculations for any Alupanel project subject to windy conditions.

Alupanel presents a “truss” where characteristics of the panel are determined by characteristics of its upper and bottom aluminium layers. Our Aluminium layers are made of aluminium alloy AA1100H18 with tensile yield strength of 22000psi. It is the maximum tension material can bear before deformations turn to be irreversible.

Alupanel is available in different thicknesses so, please refer to the below formula and table to calculate apparent thickness of your exact Alupanel type.

**T -**  
apparent thickness  
of Alupanel

**T<sub>panel</sub> -**  
total thickness  
of Alupanel

**T<sub>core</sub> -**  
thickness of  
core material

$$T = \sqrt{\frac{T_{\text{panel}}^3 - T_{\text{core}}^3}{T_{\text{panel}}}}$$

The next considerations are loading and support conditions. Support conditions are determined by the installation methods used. Wind pressure and suction loads are determined by height on which panels are going to be installed and situation of the building. Local building and wind codes should be referred for this information. Depending on support conditions different calculation methods should be used. Please choose your support conditions from the table below and use appropriate formula from the next column to calculate exact figure of the stress.

**W -** unit area load, psf

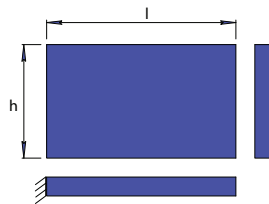
Please see table for apparent thicknesses for Alupanel types:

Product	Panel Thickness (mm)	Aluminium Layer Thickness (mm)	Apparent Thickness
Alupanel 2	2	0.3	0,0638
Alupanel 3	3	0.3	0,0827
Alupanel 4	4	0.3	0,0976
Alupanel 4	4	0.5	0,1197
Alupanel 6	6	0.5	0,1531

# Wind Load Calculation

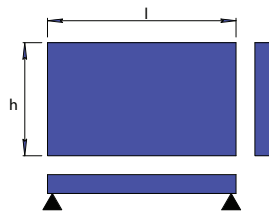
## Two

1. 1 side fixed, 3 sides free; evenly distributed load.



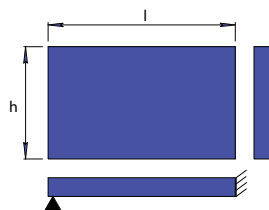
$$\sigma = \frac{3wl^2}{T^2}$$

2. 2 sides simply supported, 2 sides free; evenly distributed load.



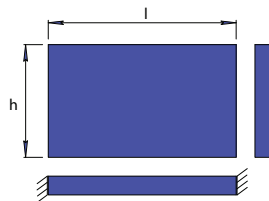
$$\sigma = \frac{3}{4} \times \frac{wl^2}{T^2}$$

3. 1 side fixed opposite side simply supported, 2 sides free; evenly distributed load.



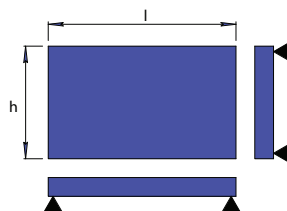
$$\sigma = \frac{3}{4} \times \frac{wl^2}{T^2}$$

4. 2 sides fixed, 2 sides free; evenly distributed load.



$$\sigma = \frac{1}{2} \times \frac{wl^2}{T^2}$$

5. 4 sides simply supported; evenly distributed load.



$$\sigma = \beta \times \frac{wl^2}{T^2}$$

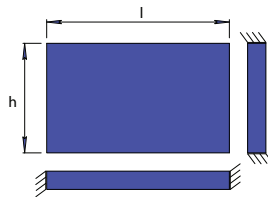
$l/h$	1	1.2	1.4	1.6	1.8	2.0	3.0
$\beta$	0.2874	0.3762	0.4530	0.5172	0.5688	0.6102	0.7134



# Wind Load Calculation

## Three

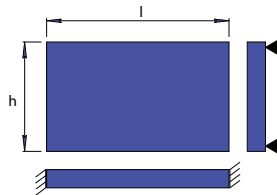
6. 4 sides fixed; evenly distributed load.



$$\sigma = \beta \times \frac{wl^2}{T^2}$$

$l/h$	1	1.2	1.4	1.6	1.8	2.0	$\infty$
$\beta$	0.3087	0.3834	0.4356	0.4680	0.4872	0.4974	0.05

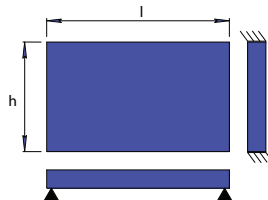
7. Longer sides fixed, shorter sides simply supported; evenly distributed load.



$$\sigma = \beta \times \frac{wl^2}{T^2}$$

$l/h$	1	1.2	1.4	1.6	1.8	2.0	$\infty$
$\beta$	0.4182	0.4086	0.4860	0.4968	0.4971	0.4973	0.5

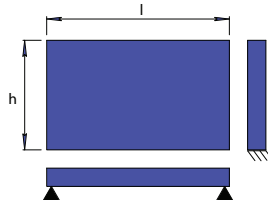
8. Longer sides simply supported, shorter sides fixed; evenly distributed load.



$$\sigma = \beta \times \frac{wl^2}{T^2}$$

$l/h$	1	1.2	1.4	1.6	1.8	2.0	$\infty$
$\beta$	0.4182	0.5208	0.5988	0.6540	0.6912	0.7146	0.75

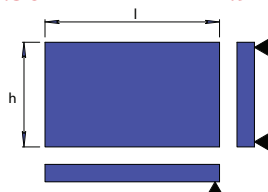
9. 1 longer side fixed, another longer side free, shorter sides simply supported; evenly distributed load.



$$\sigma = \beta \times \frac{wl^2}{T^2}$$

$l/h$	1	1.5	2	3	$\infty$
$\beta$	0.714	1.362	1.914	2.568	3

10. 1 shorter side free, other sides simply supported; evenly distributed load.



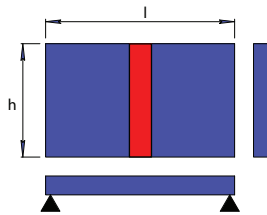
$$\sigma = \beta \times \frac{wl^2}{T^2}$$

$l/h$	1	1.5	2	4
$\beta$	0.67	0.77	0.79	0.8

# Wind Load Calculation

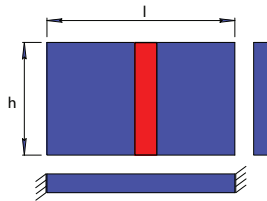
## Four

- 11.** 2 sides simply supported,  
2 sides free, centre load



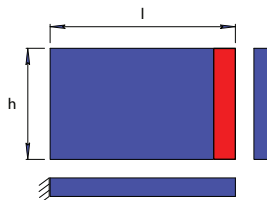
$$\sigma = \frac{3}{4} \times \frac{wh}{lT^2}$$

- 12.** 2 sides fixed, 2 sides free,  
centre load



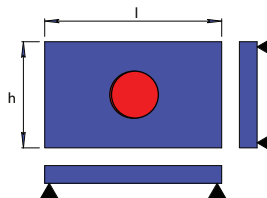
$$\sigma = \frac{3}{4} \times \frac{wh}{lT^2}$$

- 13.** 1 side fixed, other sides free,  
tip load



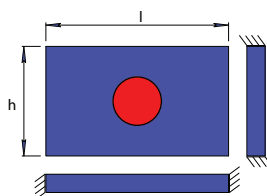
$$\sigma = 6 \times \frac{wh}{lT^2}$$

- 14.** 4 sides simply supported,  
concentrated centre load



$$\sigma = 0.145 \times \frac{W}{T^2} \times (4.3 \log \frac{2l}{\pi r} + 1 - 3.3\beta)$$

- 15.** 4 sides fixed, concentrated  
centre load



$$\sigma = \beta \times \frac{W}{T^2}$$



# ALUPANEL®

aluminium composite panel

#### UK Head Office

Unit 6, Site 2, Oak Business Units,  
Thorverton Road, Matford, Exeter,  
Devon, EX2, 8FS

Tel: +44 (0) 1392 823015

#### Northern Europe Office

Tel: +31 (0) 55 323 09 50

#### USA Office

Tel: +1 718 841 9940

[www.multipaneluk.co.uk](http://www.multipaneluk.co.uk)



## MULTIPANELUK<sup>LD</sup>

a multitude of applications