ALUCOBOND®

PLANNING – PROCESSING – ASSEMBLY

Screwed on wooden substructure

COMPOSITES

ALUCOBOND® screwed to a timber frame

GENERAL INFORMATION ON ALUCOBOND®

With its high quality, durability and unique appearance, ALUCOBOND® is synonymous with sustainable architectural excellence and top aesthetic standards. The façade material boasts outstanding product properties such as accurate flatness, a range of different surfaces and colours plus excellent formability.

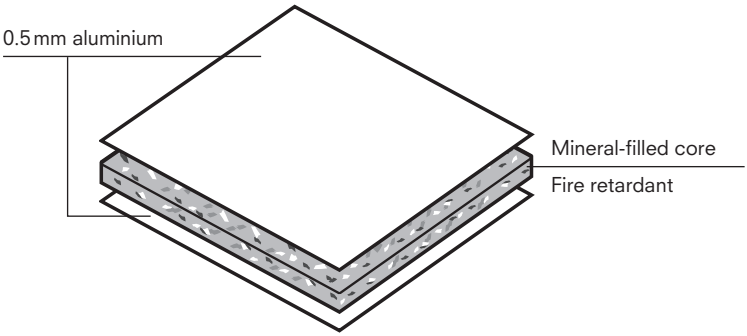
ALUCOBOND® for curtain-type rear-ventilated façades combines the aspects of energy-efficient construction, cost-effectiveness and architectural quality. The constructive curtain wall technology is suitable for designing façades on both new and existing buildings and is also ideal for roof systems and interior applications.

People usually have a clear idea of what a perfect building envelope should look like and what it should fulfil. A long service life, ease of maintenance and a combination of insulation, ventilation and moisture regulation are no less important than aesthetics. ALUCOBOND® is the best choice for achieving this goal.

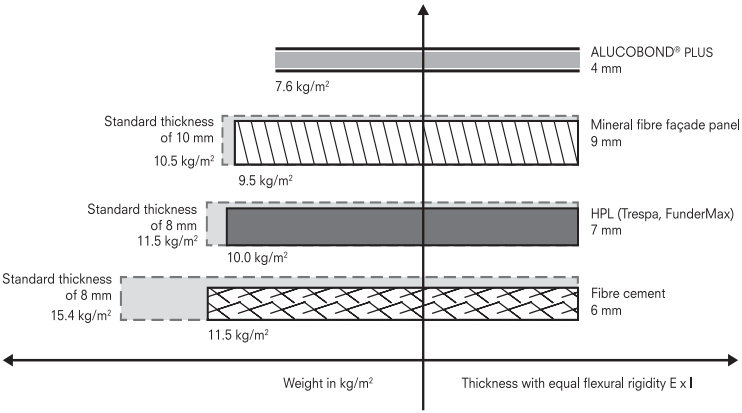
GENERAL INFORMATION ON ALUCOBOND®

ALUCOBOND® PLUS

ALUCOBOND® PLUS was specially developed for more demanding fire safety requirements in architecture. Thanks to its mineral core, ALUCOBOND® PLUS is fire retardant (class B-s1, d0 according to EN 13501-1) and retains the proven product properties of the ALUCOBOND® family, such as flatness, formability, resistance to weather and ease of processing.



Comparison of weight and thickness with equal flexural rigidity



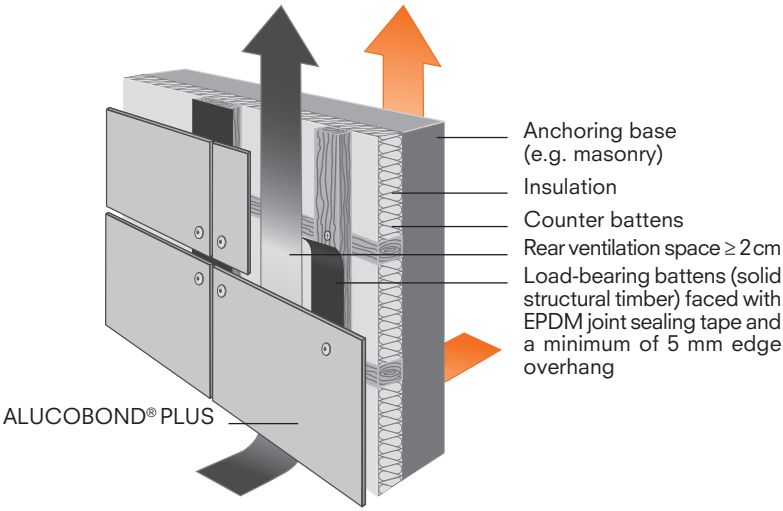
GENERAL INFORMATION ON ALUCOBOND®

ALUCOBOND® PLUS

Thickness	Standard	Unit	4 mm
Cover sheet thickness		mm	0.5
Weight		kg/m²	7.6
Production width		mm	1,250 / 1,500
Technological values			
Resistance torque **(W)**	DIN 53293	cm³/m	1.75
Flexural rigidity **(E·I)**	DIN 53293	kNcm²/m	2,400
Alloy	EN 573-3		EN AW-5005/A (AlMg1)
Cover sheet condition	EN 515		H22 / H42
Elasticity modulus	EN 1999-1-1	N/mm²	70,000
Tensile strength of cover sheets	EN 485-2	N/mm²	$R_m \geq 130$
Yield point (0.2 limit)	EN 485-2	N/mm²	$R_{p0.2} \geq 90$
Elongation at break	EN 485-2	%	$A_{50} \geq 2$
Linear expansion coefficient	EN 1999-1-1		2.4 mm/m at 100 K temperature difference
Core			
Mineral-filled polymer			
Surface			
Paintwork			High-quality polymer paint systems applied using the coil coating process
Acoustic characteristics			
Sound absorption coefficient **(α_s)**	ISO 354		0.05
Sound reduction index **(R_W)**	ASTM E90	dB	STC = 30, OITC 24
Thermal characteristics			
Thermal resistance **(R)**	ASTM C518	m²K/W	0.009
Temperature resistance		°C	-50 … +80
Building material class	EN 13501-1		Class B-s1, d0

CURTAIN-TYPE REAR-VENTILATED FAÇADE

Principle of curtain-type rear-ventilated façades (RVF)



Physical and structural advantages

- When it comes to physical and structural characteristics, the curtain-type façade is the optimum external wall construction.
- The overall construction is breathable, thus allowing diffusion. Moisture is dissipated through the rear ventilation space. Both the insulation and construction itself remain dry.

Utilisation advantage

- The façade cladding in the curtain-type rear-ventilated façade system is durable and ensures the durability of the building.
- The insulation maximises the heat storage of the internal components. The result is a cosy indoor climate.
- It prevents cooling and heat loss in winter and warming in summer.

PHYSICAL BUILDING REQUIREMENTS

Processing advantages

- The insulation thickness can vary.
- Assembly is not affected by weather conditions.
- RVFs can easily compensate for tolerances in the building fabric (e.g. protruding concrete shells).
- Thanks to the anchoring elements, they can be assembled on any surface.
- The system can be completely dismantled into its individual components and thus separated for recycling.

Ventilation, extraction and rear ventilation

- When it comes to heat, moisture, sound insulation and fire safety, the interaction of the exterior wall with the exterior wall cladding must be taken into account.
- Rear ventilation is generally required for the safe dissipation of building moisture, the removal of any penetrating precipitation, the capillary separation of the cladding from the thermal insulation or the wall surface and for the removal of condensation build-up on the inside of the cladding.
- The design rules set out in DIN 18516-1 must be observed:
  - The façade cladding should be positioned at a minimum spacing of 20 mm from the thermal insulation or wall surface.
  - The spacing may be reduced down to 5 mm in some areas, e.g. due to the substructure (e.g. horizontal load-bearing battens) or wall unevenness.
  - To ensure that the façade cladding functions reliably in the long term, ventilation openings with cross-sections of at least 50 cm^2 per metre of wall length must be provided (corresponds to a gap of 5 mm or corresponding perforated sheet).

STRUCTURAL REQUIREMENTS

The façade cladding must be installed without any tension. Tensile stresses due to dimensional changes must not cause damage to the cladding or substructure at connection and fastening points. Tension-free fastening of the façade panels is achieved if all drill holes in the panel are drilled larger than the shank diameter of the fasteners (e.g. Ø 9.5 mm).
The minimum spacing between the drill hole and the edge of the panel is 15 mm. Insulation materials must be installed permanently, without gaps and retain their shape, even if they were to become damp from climatic influences.
Timber and wood-based materials must be protected in accordance with DIN 68800-1, -2, -3 and -5. To prevent continuous moisture penetration through vertical load-bearing timber battens, open joints in the area of the timber battens must be backed with water-impermeable tapes between the load-bearing timber battens and ALUCOBOND® PLUS.
Constructive measures must be in place and suitable building materials must be selected so as to exclude damaging actions, e.g. interactions between different building materials – even without direct contact, especially in the direction of water flow.

Requirements for assembly:
The geometric design criteria of the static calculation and the execution planning must be adhered to during installation.

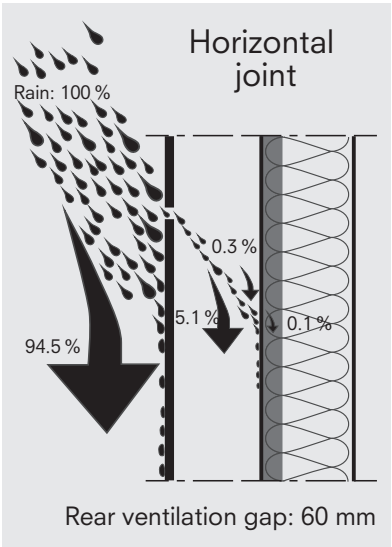
STRUCTURAL REQUIREMENTS

Moisture protection – open joint of the RVF

The RVF is designed with an open joint in the area of the horizontal panel joint to ensure air circulation behind the façade. The optimum width of the joint between large-format panels should ideally be 10 mm wide. The choice of a 10 mm wide joint means that the façade has both an aesthetically pleasing joint pattern and technically flawless functionality with a good finish. Neither joints less than 8 mm wide nor open joints greater than 12 mm should be created. DIN 18516-1 states that joints must not be wider than 20 mm.

An open design with horizontal joints significantly reduces the susceptibility of the façade surfaces to soiling.

These additional ventilation cross-sections increase the functional reliability of the RVF. Results of extensive investigations by recognised testing institutes and practical experience show that the function of the façade (rain protection) is fully achieved with an open joint (8–10 mm). Most of the rainwater is channelled away on the surface of the façade. Small amounts of water that have penetrated open joints and condensation are dissipated in the rear ventilation space. The permanent air circulation allows these areas to dry off quickly.



WIND LOAD CALCULATION

Calculation of the action of wind loads on supporting structures

The following information is a non-binding guideline for determining the maximum wind loads in accordance with DIN EN 1991-1-4. The proof of stability and the implementation planning based on it must always be provided individually for the specific property.

To calculate the wind loads on an RVF, the following individual parameters must be taken into account in accordance with DIN EN 1991-1-4:

- the shape of the building
- the height of the building
- the geometry of the building
- the regional wind load zone
- the terrain category from I. 'Flat land without obstacles' to IV. 'Urban area' and, derived from this, the mixed profiles – 'Inland', 'Coastal areas including islands of the Baltic Sea' – and the mixed profile 'Islands of the North Sea'
- the terrain shape 'Cliff or hilltop'
- the altitude above sea level (< 800 m or ≥ 1,100 m above sea level)

Note:

The FVHF wind load software for curtain-type rear-ventilated façades can be obtained from the FVHF* (DIN EN 1991-1-4).

Wind loads

Wind zone 4 encompasses the area of the German Bight including all islands and dams as well as a 5 km wide strip inland along the entire coast.

A list of wind zones according to administrative boundaries can be found at www.dibt.de/en (non-binding, since the definitions are made by the German federal states).

Wind zone	q_{ref} kN/m²
WZ 1	0.32
WZ 2	0.39
WZ 3	0.47
WZ 4	0.56

Wind velocity pressures depending on the wind zone

The safety value on the action side is already taken into account in the values given in the table.

* Association for Materials and Components for Rear-Ventilated Facades

WIND LOAD CALCULATION

Determination of wind loads

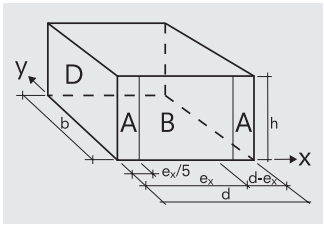
Wind velocity pressures for structures up to 50 m high

Wind zone		Wind velocity pressure q in kN/m² for a building height h within the limits of			
		h ≤ 10 m	10 m < h ≤ 18 m	18 m < h ≤ 25 m	25 m < h ≤ 50 m
1	Inland	0.54	0.68	0.76	0.99
2	Inland	0.66	0.82	0.93	1.20
	Coast and islands of the Baltic Sea	0.90	1.05	1.15	1.39
3	Inland	0.80	0.99	1.12	1.45
	Coast and islands of the Baltic Sea	1.08	1.27	1.38	1.67
4	Inland	0.95	1.18	1.34	1.73
	Coast of the North Sea and Baltic Sea and islands of the Baltic Sea	1.29	1.51	1.65	1.99
	Islands of the North Sea	1.50	1.68	1.79	2.04

To determine the edge area A and the centre area B, the wall surface must be considered parallel x and parallel y (see drawing).

Observation of parallel x wall area

To determine the edge area A_x and the centre area B_x
Determination of:
Building width w, building depth d and building height h
$e_x = b$ or $e_x = 2 \cdot h$
(the lower value is decisive)
A_x = length of $e_x/5$ from edge
(if $e_x/5 \geq d/2$, the entire wall is considered A_x)
B_x = length in the centre area = $d-2A_x$



Observation of parallel y wall area

To determine the edge area A_y and the centre area B_y
Determination of: Building width w, building depth d and building height h
$e_y = d$ or $e_y = 2 \cdot h$ (the lower value is decisive)
A_y = length of $e_y/5$ from edge (if $e_y/5 \geq b/2$, the entire wall is considered A_y)
B_y = length in the centre area = $b-2A_y$

WIND LOAD CALCULATION

Wind suction for structures up to 50 m high,
building area A, h/d ≥ 5, c_{pe} = -1.70 for A ≤ 1.0 m²

Wind zone		Wind suction qs in kN/m² for a building height h within the limits of			
		h ≤ 10 m	10 m < h ≤ 18 m	18 m < h ≤ 25 m	25 m < h ≤ 50 m
1	Inland	-1.39	-1.72	-1.95	-2.52
2	Inland	-1.69	-2.10	-2.37	-3.07
	Coast and islands of the Baltic Sea	-2.29	-2.68	-2.93	-3.53
3	Inland	-2.04	-2.53	-2.86	-3.70
	Coast and islands of the Baltic Sea	-2.76	-3.23	-3.53	-4.26
4	Inland	-2.43	-3.02	-3.41	-4.40
	Coast of the North Sea and Baltic Sea and islands of the Baltic Sea	-3.28	-3.85	-4.21	-5.07
	Islands of the North Sea	-3.83	-4.28	-4.55	-5.19

Wind suction for buildings up to 50 m high,
building area B, h/d ≥ 5, c_{pe} = -1.10 for A ≤ 1.0 m²

Wind zone		Wind suction qs in kN/m² for a building height h within the limits of			
		h ≤ 10 m	10 m < h ≤ 18 m	18 m < h ≤ 25 m	25 m < h ≤ 50 m
1	Inland	-0.90	-1.12	-1.26	-1.63
2	Inland	-1.09	-1.36	-1.54	-1.98
	Coast and islands of the Baltic Sea	-1.48	-1.73	-1.90	-2.29
3	Inland	-1.32	-1.64	-1.85	-2.39
	Coast and islands of the Baltic Sea	-1.78	-2.09	-2.28	-2.75
4	Inland	-1.57	-1.95	-2.20	-2.85
	Coast of the North Sea and Baltic Sea and islands of the Baltic Sea	-2.13	-2.49	-2.72	-3.28
	Islands of the North Sea	-2.48	-2.77	-2.95	-3.36

WIND LOAD CALCULATION

Wind pressure for buildings up to 50 m high,
building area D, h/d ≥ 5, c_{pe} = 1.0 for A = 10 m²

Wind zone		Wind pressure qd in kN/m² for a building height h within the limits of			
		h ≤ 10 m	10 m < h ≤ 18 m	18 m < h ≤ 25 m	25 m < h ≤ 50 m
1	Inland	0.81	1.02	1.14	1.49
2	Inland	0.99	1.23	1.40	1.80
	Coast and islands of the Baltic Sea	1.35	1.58	1.73	2.09
3	Inland	1.20	1.49	1.68	2.18
	Coast and islands of the Baltic Sea	1.62	1.91	2.07	2.51
4	Inland	1.43	1.77	2.01	2.60
	Coast of the North Sea and Baltic Sea and islands of the Baltic Sea	1.94	2.27	2.48	2.99
	Islands of the North Sea	2.25	2.52	2.69	3.06

STANDARDS AND GUIDELINES

- DIN EN 1991-1 Actions on structures
- DIN 1960 VOB – Part A: General provisions relating to the award of construction contracts
- DIN 1961 VOB – Part B: General conditions of contract relating to the execution of construction work
- DIN 4102 Fire behaviour of building materials and building components
- DIN EN ISO 7345 Thermal performance of buildings and building components
- DIN 4109 Sound insulation in buildings
- DIN 4420 Service and working scaffolds
- DIN EN 10088 Stainless steels
- DIN EN 13162 Thermal insulation products for buildings – Factory made mineral wool (MW) products
- DIN EN 13501 Fire classification of construction products and building elements
- DIN 17611 Anodized products of wrought aluminium and wrought aluminium alloys
- DIN 18202 Tolerances in building construction – Buildings
- DIN 18299 VOB – Part C: ATV – General rules applying to all types of construction work
- DIN 18338 VOB – Part C: ATV – Roofing work
- DIN 18351 VOB – Part C: ATV – Work on back-ventilated curtain walling
- DIN 18360 VOB – Part C: ATV – Metal construction works
- DIN 16516 Cladding for external walls, ventilated at rear
- DIN EN 62305 Protection against lightning (VDE 0185)

For timber substructure

- DIN EN 1995-1-1/NA Design of timber structures
- DIN 4074-1 Strength grading of wood – Part 1: Coniferous sawn timber
- DIN EN 338 Structural timber – Strength classes
- DIN 66365 Structural timber for carpentry; quality conditions
- DIN 68800-1 Wood preservation – General

STANDARDS AND GUIDELINES

Additional standards, regulations and guidelines

For aluminium substructure

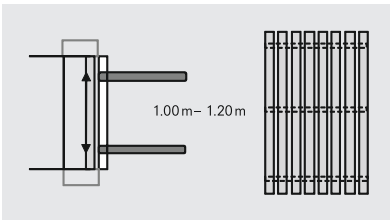
- DIN EN 1999-1-1/NA Design of aluminium structures
- DIN EN 485 Aluminium and aluminium alloys – Sheet, strip and plate
- DIN EN 755 Aluminium and aluminium alloys – Extruded rod/bar, tube and profiles

- German building regulations of the federal states (LBO)
- German Energy Saving Ordinance (EnEV)
- Accident prevention regulations of the employers' liability insurance association
- German Guidelines for the execution and tendering of aluminium component cleaning
- (Information leaflet no. 01 of the Bundesverband Metall (German Metal Association), Essen)
- FVHF guideline for determining the thermal influences of thermal bridges in curtain-type rear-ventilated façades
- FVHF-FOCUS 4, sound insulation with RVF
- Standard Service Log for the Building Industry (STLB-Bau)
- Performance area 038, curtain-type rear-ventilated façades
- Airtightness in accordance with DIN 4108 Part 2 and Part 7, Supplement 2

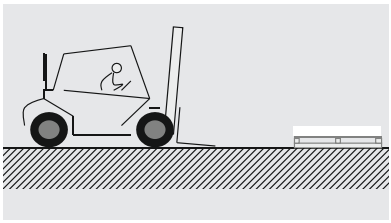
General information

The following instructions must be observed to protect ALUCOBOND® PLUS composite panels from mechanical damage and harmful effects of weather and moisture:

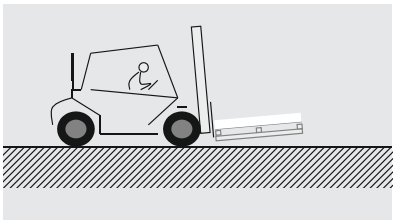
- The pallets must be handled with care during transport and unloading. (Caution: do not move open pallets)



Set the maximum possible fork width



Take up the stack, lift the fork slightly



Pick up the entire stack; do not pull, do not push

- Check delivered pallets for damage during transport and moisture (ALUCOBOND® PLUS panels that have become wet must be dried to avoid possible staining or corrosion). Damage must be reported immediately and confirmed by the freight forwarder.
- Store pallets away from rain and water splashes, protect against moisture penetration and avoid condensation (e.g. when transporting cold panels to warmer rooms).

TRANSPORT AND STORAGE

- Store pallets stacked on top of each other (do not store ALUCOBOND® PLUS panels vertically); do not stack more than 6 pallets of the same format on top of each other (heavy pallets at the bottom).
- 2 people are required to lift individual panels from the pallet at the corners; do not pull them on top of each other. Carry panels vertically. Wear gloves to avoid staining the panels.
- When stacking panels, do not place anything between the panels to avoid leaving marks.

To ensure that the ALUCOBOND® PLUS protective foil fulfils its function properly, please note the following:

- Storage periods exceeding 6 months should be avoided. Strong temperature fluctuations and direct sunlight further reduce the durability in the long term. The foils can then become difficult to remove.
- Do not mark the foils with inks (markers), adhesive strips or stickers, as solvents or plasticisers can penetrate the foils and damage the painted surface.
- If the protective foil is partially removed for processing or after installation, soiling marks may appear over time and these are difficult to remove.
- After assembly, the protective foil must be removed as soon as possible because foils that have been exposed to the weather for a long time can be very difficult to remove.
- The protective foil should not be removed at temperatures below 10 °C.

PANEL DIMENSIONING

Dimensional tolerances (standard)
In terms of production technology, a lateral offset of the cover sheets up to max. 2 mm is possible at the manufactured edges.
Thickness ±0.2 mm (mill finish | stove-enamelled | anodised)
Width -0/+4 mm
Length 2,000–4,000 mm -0/+6 mm

The thermal linear expansion of ALUCOBOND® PLUS must be taken into account when cutting and milling to maintain the dimensional stability of the elements during assembly. We therefore recommend storing the panels at room temperature for at least one day before processing.

Manufactured edges
In terms of production technology, a lateral offset of the cover sheets up to max. 2 mm is possible at the manufactured edges.

Trimming
The panels must be trimmed:
- This must be done on all sides to maintain perpendicularity and neatly cut edges when using open cut edges, e.g. for the riveted façade version.
- On three sides to maintain perpendicularity for further processing.

The trimmed cuts must be taken into account when dimensioning the panels.

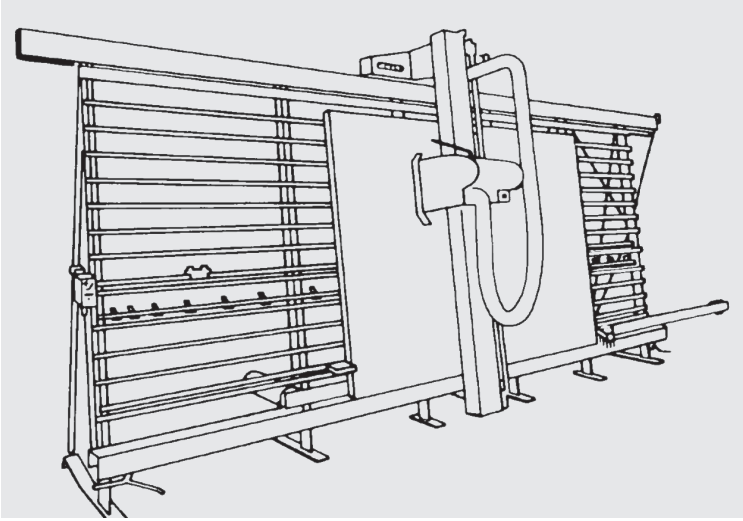
Calculating the statics of elements
- For static values, see the technical data sheets
- See pages 38–41 for statics tables

PROCESSING METHODS

Sawing
ALUCOBOND® PLUS can also be cut using conventional hand-held circular saws fitted with the recommended saw blades. It should be noted that processing should be carried out from the back side to avoid damage to the painted front. Diamond-tipped saw blades can be used to increase the service life of the saw blades. These saw blades produce a very clean cut during use, which does not need to be post-processed. It is therefore possible to cut the panels effectively and efficiently in bundles (up to five panels on top of each other).

Our standard panel formats are optimally cut using a vertical panel saw. To achieve a longer service life when cutting ALUCOBOND® PLUS panels, the rotational speed of the sawing unit should be set to 2,500 rpm.

Sawing with vertical circular panel saws
- **HOLZ-HER vertical circular panel saws with milling attachment**
  The following type of circular panel saw is recommended when purchasing a new machine:
- **HOLZ-HER circular panel saw**, PK 1255 ALUCOBOND®, with pole-changing 2-speed motor.



Vertical circular panel saw

Striebig vertical circular panel saws with milling attachment
The following type of circular panel saw is recommended when purchasing a new machine:

- **Striebig circular panel saw**, Standard II for ALUCOBOND® PLUS with pole-changing 2-speed motor (please order them together).

Dust extractor for circular panel saws
We recommend using **AL-KO** and **SCHUKO** dust extractors.

- **AL-KO POWER UNIT 200P / 250P**
- **SCHUKO Vacomat 200XP**

These types are equipped with automatic compressed air filter cleaning to ensure continuous operation.

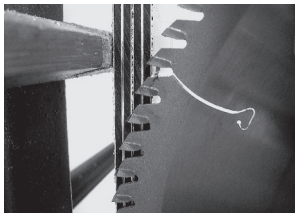
Saw blades for ALUCOBOND® PLUS

- Trapezoidal/flat tooth circular saw blades
- 45° chamfered flat teeth
- Carbide saw blade, Ø = 300 mm for Striebig Standard II saw type **Order no. 10168187 (AKE)**
- **Diamond saw blade** Ø = 300 mm **Order no. 10170336 (AKE)**
- Carbide saw blade Ø = 250 mm for HOLZ-HER Saw type 1255 ALUCOBOND® **Order no. 10168158 (AKE)**
- **Diamond saw blade** Ø = 250 mm **Order no. 10170332 (AKE)**
- Drill hole Ø = 30 mm
- T = 72 (Ø = 300 mm)
- T = 60 (Ø = 250 mm)
- Tooth thickness 3.2 mm
- Clearance angle 15°
- Rake angle 10°, positive

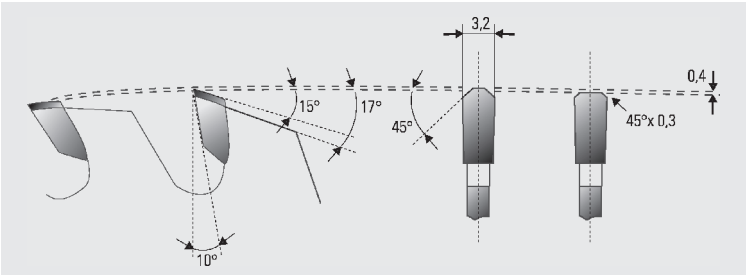
Trapezoidal/flat tooth geometry

Note: Reducing the rotational speed to 2,400 rpm = ½ rotational speed, which can be achieved with panel saws using a pole-changing saw motor, significantly increases the service life.

- Feed rate:
  Single cut 25 m/min
  Bundle cut 20 m/min (3–4 panels)



Bundle cut



Sketch of the cutting edge geometry for professional resharpening

PROCESSING METHODS

Sawing with hand-held circular saws
Machine
The following hand-held circular saw is suitable for processing ALUCOBOND® PLUS in terms of cutting speed:

- **FESTOOL hand-held circular saw**, type TS 55 EBQ-Plus-FS, rotational speed 2,000–5,200 rpm

Make sure you reduce the speed when cutting ALUCOBOND® PLUS! The tool is not included in the scope of delivery. Please order it separately:

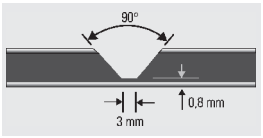
- **FESTOOL carbide saw blade**, trapezoidal/flat teeth, positive rake angle, saw blade Ø 160 mm, T = 48, **Order no. 496308**

Sawing with jigsaws
Tools – ALUCOBOND® PLUS
Saw blades for aluminium, tooth pitch = 2 mm,
e.g. FESTOOL saw blade HS 60/2 bi

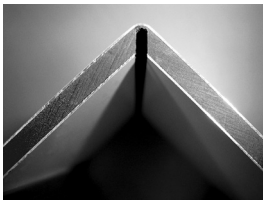
Jigsaw blade

Milling cutters
ALUCOBOND® PLUS can easily be machined on conventional milling machines and CNC machining centres. It is preferable to use vacuum tables with MDF sheets as sacrificial boards.

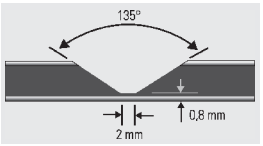
Milled/edged elements



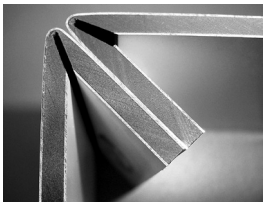
90° milled groove (V-shape) for folds up to 90°



r = 3 mm



135° milled groove (V-shape) for folds up to 135°



r = 3 mm

Milled-edge method

ALUCOBOND® PLUS composite panels can be shaped using an extremely simple processing technique. The process – the milled-edge method – enables the production of various types and sizes of shaped parts.

V-shaped or rectangular grooves are milled into the rear side of the ALUCOBOND® PLUS composite panels using sheet or profile cutters. The aluminium cover sheet on the front and part of the core material remain intact. The low thickness of the remaining material then allows the material to be folded 'by hand'. No bending bench is necessary. The groove shape determines the bending radius.

The grooves can be produced using a vertical circular panel saw with a milling attachment for ALUCOBOND® PLUS, on a CNC machining centre, or with a panel milling machine or conventional hand-held router.

The milled-edge method is suitable for composite panels with all standard surfaces.

Advantages

The convincing advantages of the milled-edge method are:

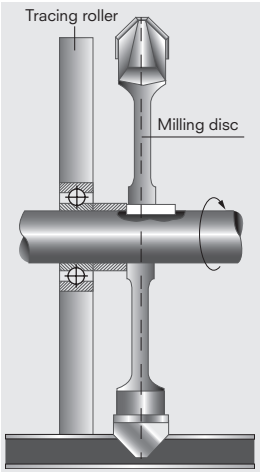
- Minimal investment.
- Simple working method.
- Folding does not have to be carried out in the workshop, but can be done on site, resulting in lower transport costs.
- Cost-effective production of shaped components such as façade elements, frames, roof edge and attic cladding, borders, corner elements and much more.
- Various design possibilities.
- Highly cost-effective.
- Folding is not limited by machine dimensions.
- Stress-free folding with no warping in the corner area, thus resulting in flat elements.

Machines for the milled-edge method

Vertical panel saws with milling attachment for milling ALUCOBOND® PLUS (special accessory)

- **HOLZ-HER vertical circular panel saw,** PK 1255 ALUCOBOND®
- **Striebig** Standard II vertical circular panel saw for composite panels

Other circular panel saws can also be supplied or retrofitted with an additional milling attachment by the manufacturer. It may be necessary to raise the frame.



Principle of the milled-edge method

PROCESSING METHODS

Enquiries about
- New machines with accessories for milling ALUCOBOND® PLUS.
- Options for retrofitting existing machines (specify machine type/ number and year of manufacture).
- Accessories such as milling discs, tracing rollers etc.

Please contact the manufacturer of the circular panel saw directly.

Important: When making enquiries and placing orders, always include the note 'for processing ALUCOBOND® PLUS composite panels'.

General notes for the milled-edge method
Processing temperature:
The ambient and material temperature should not be below 0 °C when edging.

CNC machining centres
ALUCOBOND® PLUS can easily be machined on CNC machining centres. Different processing steps can be carried out depending on the equipment of the machines: sawing, milling (milled-edge method), contour milling, drilling.

PROCESSING METHODS

Mobile dust extractors
E.g. Festool mobile dust extractor CTM types with dust class M approval for dusts with MAK values greater than 0.1 mg/m³ for panel milling machines, hand-held routers and hand-held circular saws.

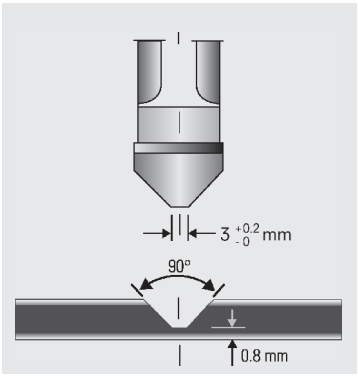
Tools for the milled-edge method
Disc milling cutter with carbide cutting edges for vertical circular panel saws
The milling disc and tracer roller diameters are aligned in such a way that a residual core thickness of 0.3 mm (V-groove) is retained for the nominal panel thickness. The dimensions given in the drawings are the sum of the cover sheet thickness of 0.5 mm and the residual core thickness.

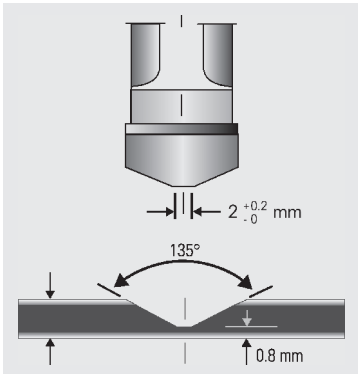
Milling disc cutters with indexable inserts suitable for ALUCOBOND® PLUS processing for **circular panel saws** (type PK 1255 ALUCOBOND®, number of teeth = 8, milling disc cutter Ø = 244 mm) can be obtained from Reich/HOLZ-HER or LEUCO.

The 90° V-groove and 135° V-groove milling disc cutters with indexable inserts for all **types of Striebig circular panel saws** and the corresponding tracing rollers can be ordered directly from Striebig AG.

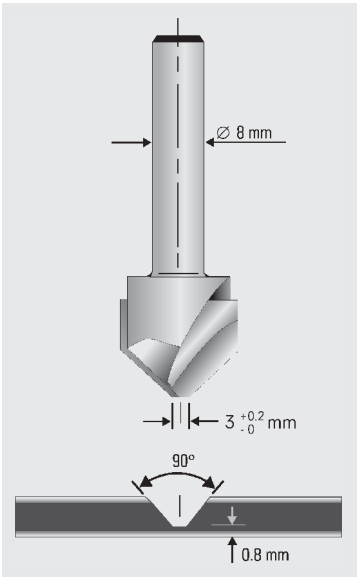
Please state the type of circular panel saw and year of manufacture when ordering.

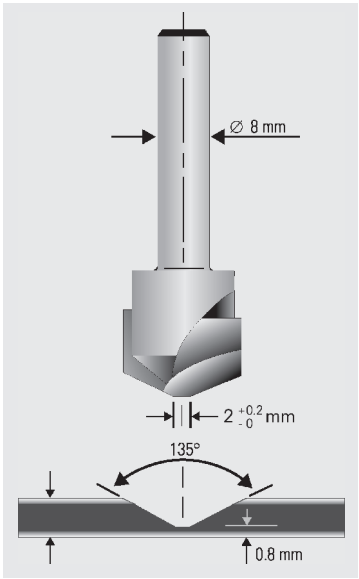
Disc milling cutter with carbide cutting edges for vertical circular panel saws





Shaped milling cutter for CNC machines





Milling cutter for V-grooves 90°
CM* cutter no. 491 444 (Festool)
CM* cutter no. FV09.01.090 (GIS)
CM* cutter no. 79 803 (KWO)

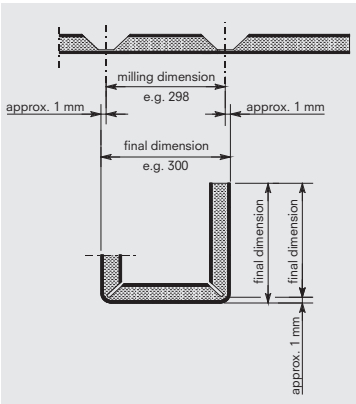
Milling cutter for V-grooves 135°
CM* cutter no. 491 443 (Festool)
CM* cutter no. FV09.01.135 (GIS)
CM* cutter no. 79 804 (KWO)

Determination of processing and cutting dimensions

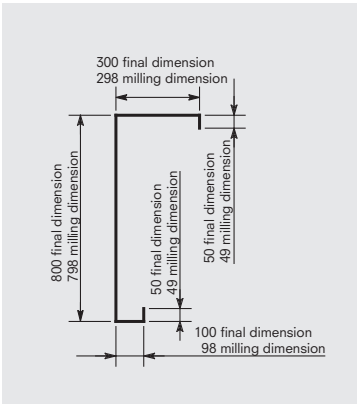
The processing and milling dimensions are determined from the drawing dimensions (final dimensions). Approx. 1 mm is subtracted from the final dimension for each fold. The sum of the milling dimensions gives the cutting dimensions. In each case, the final dimensions should be checked using a test strip before going into series production. The stops on the circular panel saw can then be adjusted to produce elements with identical dimensions.

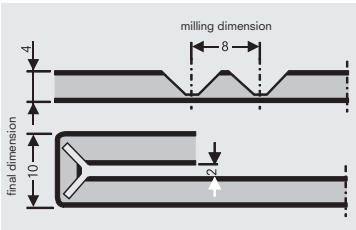
Determination of milling dimensions

Example of ALUCOBOND® PLUS roof edge:
Sum of milling dimensions = cutting dimension = 1,292 mm



Determination of milling dimensions



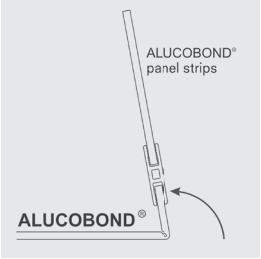


Minimum double fold

* Carbide milling

Edging aid

To make it especially easier to bend narrow ALUCOBOND® folds that have been milled using the milled-edge method, it is recommended to use bending aids, which can be made from ALUCOBOND® butt joint profiles and panel strips.



- Butt joint profile **Profile no. 31343**
  4 mm

- Butt joint profile **Profile no. 31344**
  6 mm

Sanding block
with sanding pad

Edge processing

The edges can be processed using the sanding block with sanding pad (3M).

PROCESSING METHODS

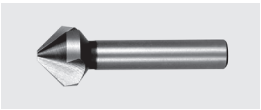
Bending
ALUCOBOND® PLUS can be bent round on roller bending machines. It can also be formed on bending presses. The minimum bending radius for ALUCOBOND® PLUS is r = 10 x panel thickness.

To avoid damaging the surface when processing with bending presses, the protective foil must always be left on the panel surface during the entire process. The visible surface can also be protected by a 1–2 mm thick plastic insert.

Drilling/countersinking

ALUCOBOND® PLUS can be machined with the twist drills commonly used for aluminium and plastic. The following drill bits are particularly suitable:

- Drill bit with centre point, e.g. De Walt Extreme 2TM HSS-G metal drill bit according to DIN 338
- Cobalt HSS drill bit for stainless steel according to DIN 338



Countersink bits are used for deburring, countersinking holes and for drilling out wider holes.

General information

When assembling ALUCOBOND® PLUS, it is important to take the thermal expansion of the panels into account. There are important aspects to consider:

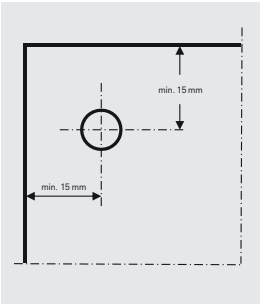
• The fastening hole in the panel must have a larger diameter (e.g. 9.5 mm) than the screw diameter of the fastening screw. The panel drill holes must be dimensioned with due regard to the thermal expansion expected from the panel dimensions.

• When fastening the panels, the screws must be screwed in without forcing them, i.e. the screws must not be tightened applying full force.

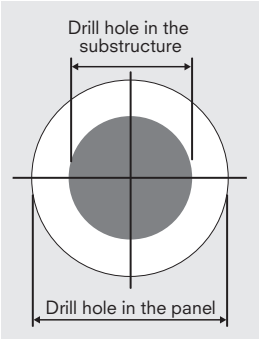
• It is essential to pre-drill the screw hole in the timber frame.

• The drill hole should have a diameter of 3.3 mm. For centred drilling, we recommend using a bracket drilling jig (MBE 3.3 to 9.5 for timber substructures). In the case of surfaces with high gloss grades, particular care must be taken when aligning the substructure and placing screws if fasteners are going to remain exposed.

Important: The protective foil should always be removed from the area around the screw head before it is screwed in.



Edge distances
(for max. cantilever lengths see statics tables)



Centric drilling/tension-free panel expansion

Thermal expansion and contraction

The linear thermal expansion of ALUCOBOND® PLUS at a panel length of 1 m and a temperature difference of 100 K (Kelvin) is 2.4 mm. Compared to other materials used in construction:

Material	Linear coefficient of thermal expansion α_T (m/K)	Elongation at 1 m panel length/width and 50 K temperature difference
PVC	~ 70 x 10^{-6}	3.5 mm
ALUCOBOND®	24 x 10^{-6}	1.2 mm
Aluminium	24 x 10^{-6}	1.2 mm
Steel	12 x 10^{-6}	0.6 mm
Concrete	12 x 10^{-6}	0.6 mm
Timber	5 x 10^{-6}	0.25 mm

Maximum panel heating approx. 70 °C (measurement taken on a black panel at an air temperature of 40 °C).

Example with a panel length of 3 m

Expected panel heating	max. 70 °C
Assumed installation temperature at	20 °C
Temperature difference	Δt = 50 K

Calculation

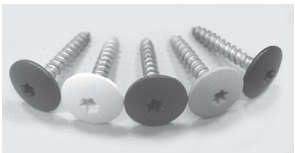
2.4 mm x 3 (m) x 0.5 (Δ t = 50 K) = 3.6 mm panel expansion, i.e. half of the panel expansion must be taken into account at the opposing edges of the panel.

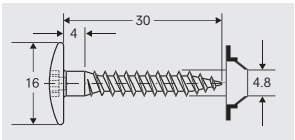
Joints

Joints in the range of 8–10 mm are usually selected.

Screws on timber substructures

ALUCOBOND® stainless steel façade screws are used. Colour-matching screws are supplied by MBE in Menden, Germany (tel: +49 2373-174300). It is essential to pre-drill the timber substructure. Drill holes in the timber substructure for the screw connections must be centred in relation to the holes in the panel and drilled vertically using a drilling jig.



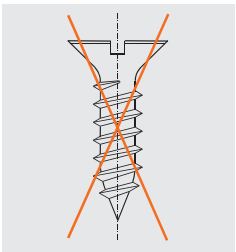


ALUCOBOND® façade screw with pan head and sealing ring

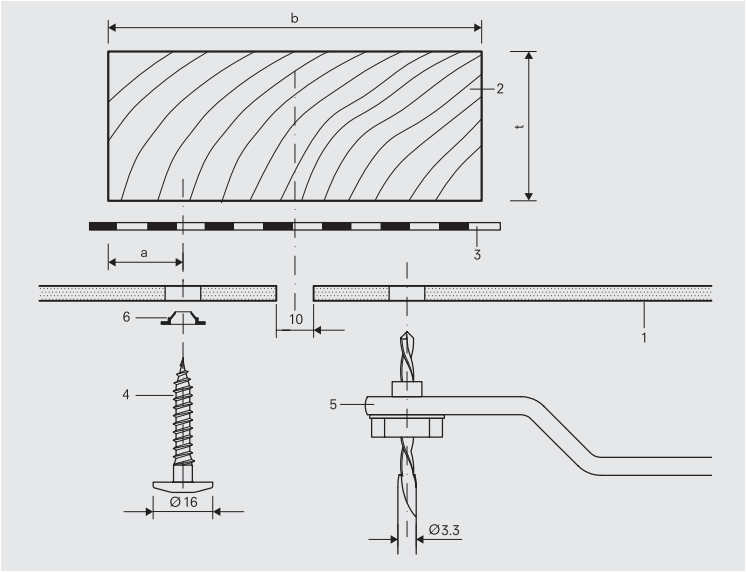
Drilling jig

The screws should be tightened in such way that the screw head rests on the sealing washer without deforming it, so that no further torque or pressure is exerted on the panel. With timber, particular attention must be paid to the yielding of the material.

Planed solid structural timber (KVH) should be used for the substructure. The entire surface of the timber must be covered with a non-compressible joint sealing tape.



Do not use countersunk screws!



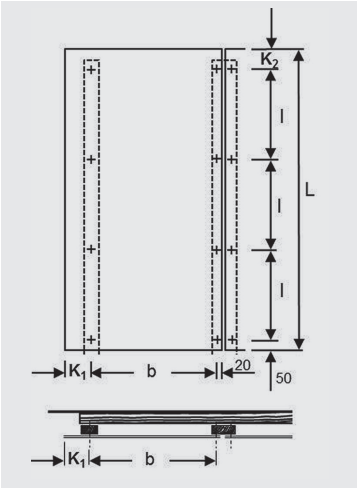
1 ALUCOBOND® PLUS
2 Solid structural timber (KVH) or glued laminated timber (glulam/BSH)
3 EPDM joint sealing tape with 5 mm edge overhang
4 ALUCOBOND® façade screw 4.8 x 30 -K16, stainless steel
5 MBE drilling jig 9.5/3.3 mm
6 Sealing ring FA 4/14 x 4

Minimum dimensions of the load-bearing battens according to DIN EN 1995

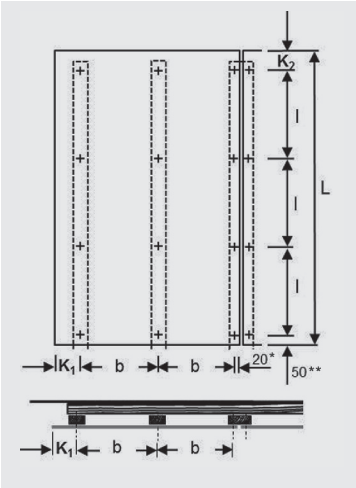
ALUCOBOND® façade screw 4.8 x 30 -K16	**pre-drilled***
Minimum timber thickness t	≥ 40
Edge spacing s	≥ 25
Batten width w – span	≥ 60
Batten width w – joint	≥ 100

* Also applies to self-drilling screws

Load table (wind loads),
flat façade panels screwed to a timber frame



Panels on 2 supports (single-span panels)



Panels on 3 supports
(two-span panels)
* *Minimum spacing*
** *Recommended edge spacing*

Measurement based on:

- DIN 18516-1 and German National Technical Approval No. Z-10.3-774
- Wind loads according to DIN EN 1991-1-4
- Maximum screw spacing l ≥ 500 mm
- ALUCOBOND® façade screw Ø 4.8 x 30 mm, K16 (MBE)
- Drill hole Ø in the ALUCOBOND® panels 9.5 mm

Please follow the instructions in the brochure ‘Screwed to a timber frame, planning – processing – assembly’.

Static guide values for panels on 2 supports (single-span panels)

d = 4 mm	1-span system – maximum support width 'w' [mm]													
Load* in [kN/m²]	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20	1.40	1.60	1.80	2.00
Suction: max. w	928	843	783	736	700	669	643	621	602	584	555	531	511	493
max. l [mm]	500	500	500	500	500	500	500	500	500	500	500	500	500	500
Pressure: max. w	1,118	1,016	943	887	843	806	775	748	725	704	669	640	615	594
max. l [mm]	500	500	500	500	500	500	500	500	500	500	500	500	500	500

Static guide values for continuous panels on 3 supports (two-span panels)

d = 4 mm	2-span system – maximum support width 'w' [mm]													
Load* in [kN/m²]	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20	1.40	1.60	1.80	2.00
Suction: max. w	1,243	1,129	1,048	986	937	896	862	832	806	783	*728*	*681*	*642*	*609*
max. l [mm]	500	500	500	500	500	500	485	452	424	400	361	330	305	285
Pressure: max. w	1,498	1,361	*1,243*	*1,137*	*1,055*	*988*	*933*	*887*	*847*	*812*	*753*	*706*	*668*	*635*
max. l [mm]	500	500	500	500	500	500	500	500	500	500	500	500	500	500

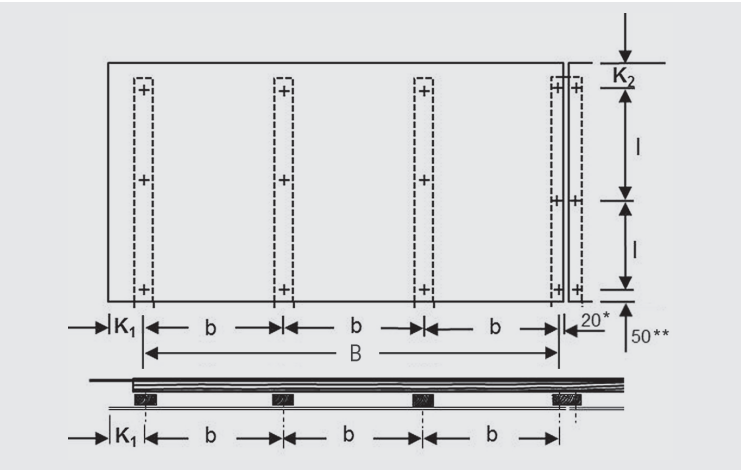
Max. cantilever lengths K_1 ($K_2 \leq 10$ cm)

K_1 [cm]	30	27	25	24	23	22	21	20	19	19	18	17	16	16

* Load without safety factor (γ_M = 1.5 included in table values)

Remark:
– Screw spacing is limited to 500 mm by design!
– Reduced values if the width 'max. w' is utilised, otherwise the distance must be recalculated.
– Numerical values are also valid for the horizontal panel arrangement.
– Values in *italics*: limitation due to excessive tension.

Load table (wind loads),
flat façade panels screwed to a timber frame



Continuous panels (3–5 spans – horizontal installation)
** Minimum spacing*
*** Recommended edge spacing*

Measurement based on:

- DIN 18516-1 and German National Technical Approval No. Z-10.3-774
- Wind loads according to DIN EN 1991-1-4
- Maximum screw spacing l ≥ 500 mm
- ALUCOBOND® façade screw Ø 4.8 x 30 mm, K16 (MBE)
- Drill hole Ø in the ALUCOBOND® panels 9.5 mm
  Max. W = 3,800 mm (see page 33)

Please follow the instructions in the brochure ‘Screwed to a timber frame, planning – processing – assembly’.

Static guide values for continuous panels on 4 supports

d = 4 mm	3-span system – maximum support width 'w' [mm]													
Load* in [kN/m²]	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20	1.40	1.60	1.80	2.00
Suction: max. w	1152	1,047	972	914	869	831	799	771	747	726	689	659	634	612
max. l [mm]	500	500	500	500	500	500	500	500	500	491	443	405	375	349
Pressure: max. w	1,388	1,261	1,171	1,102	1,047	1,001	963	929	900	875	*814*	*7,961*	*718*	*681*
max. l [mm]	500	500	500	500	500	500	500	500	500	500	500	500	500	500

Static guide values for continuous panels on 5 supports

d = 4 mm	4-span system – maximum support width 'w' [mm]													
Load* in [kN/m²]	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20	1.40	1.60	1.80	2.00
Suction: max. w	1,170	1,063	987	929	882	811	783	759	747	726	700	670	644	622
max. l [mm]	500	500	500	500	500	500	500	500	491	466	420	384	355	331
Pressure: max. w	1,410	1,281	1,189	1,119	1,063	1,017	978	944	*888*	*850*	*787*	*736*	*694*	*658*
max. l [mm]	500	500	500	500	500	500	500	500	500	500	500	500	500	500

Max. cantilever lengths K_1 ($K_2 \leq 10$ cm)

K_1 [cm]	30	27	25	24	23	22	21	20	19	19	18	17	16	16

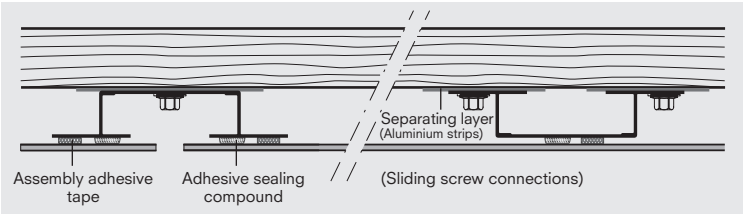
* Load without safety factor (γ_M = 1.5 included in table values)

Remark:
– Screw spacing is limited to 500 mm by design!
– Reduced values if the width 'max. w' is utilised, otherwise the distance must be recalculated.
– Numerical values are also valid for the horizontal panel arrangement.
– Values in *italics*: limitation due to excessive tension.

Gluing

The panels may only be glued by companies that possess a certificate of suitability.

The maximum transverse expansion is limited to 1 mm, therefore a maximum support width of 1.35 m can be achieved.



Glue	**SikaTack-Panel-System**, mono-component PUR sealing adhesive	
Cleaner	**Sika Aktivator 205**	
Primer	**SikaTack-Panel Primer**	
Assembly adhesive tape*	**SikaTack-Panel assembly tape**	**With PCS Innotec International Z-10.8-483 approval Innotec Project System bonding system** Adhesive: Adheseal Project Assembly tape: Fixation Tape 2100 Primer: Impriso

*Thickness 3 mm, width 12 mm
(to fix the profiles to the panels and to maintain the exact adhesive thickness)

CONNECTION/FASTENING TECHNOLOGY

Please note:

- Adhesives or sealants do not adhere to the ALUCOBOND® PLUS core.
- If ALUCOBOND® PLUS panels are bonded to other materials over their entire surface on one side, it is possible that the composite may deform (different expansion behaviour/bimetal effect).
- As with mechanical fastening, special care must be taken when processing or installing high-gloss and/or dark surfaces.
- The manufacturer's instructions and regulations must be observed for the application and processing of glues/adhesive tapes.
- Training must be provided pursuant to the building authority approvals of the adhesive manufacturer.

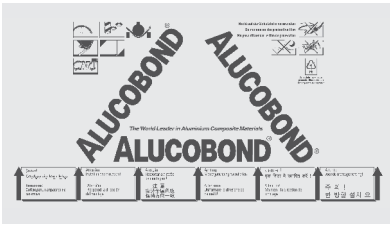
INSTALLATION INSTRUCTIONS/CLEANING AND CARE

Installation instructions

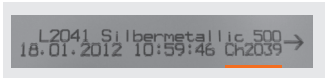
This must be taken into account when installing the panels:

Installation direction

To avoid reflective differences, the composite panels must be installed in the direction indicated by the direction arrows on the protective foil. There might be slight colour variations in panels originating from different production batches. Therefore, to make sure that a uniform colour tone is achieved, the total quantity required for a project should be acquired in a single order, or building elevations/storeys should only be covered with one batch (see pallet label or stamp on reverse side).



Protective foil with direction arrows

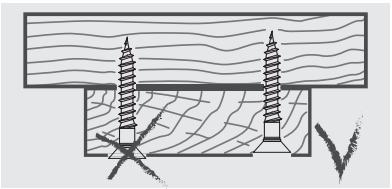


Batch no. on stamp on reverse side

Batch no. on pallet label

Connection of the timber frame

To avoid marks caused by protruding fasteners during panel installation, screws/nails must be driven flush with the battens.



INSTALLATION INSTRUCTIONS/CLEANING AND CARE

Cleaning and care of stove-enamelled surfaces

Expert and regular cleaning not only maintains the aesthetic and representative finish of stove-enamelled surfaces, but also preserves their value and service life by removing dirt and aggressive deposits that are not washed away by rainwater.

Annual inspection

The roof and wall should be inspected at least once annually. This depends on the location.

Cleaning

Regular cleaning is recommended. Cleaning should be carried out by hand with a soft brush or by means of a high-pressure device (max. 50 bar) with clear water. If necessary, a mild (pH 6–7) cleaning agent may be added up to a max. concentration of 10 %. Please discuss the details with your supplier. Cleaning should be carried out from top to bottom, followed by rinsing to remove any cleaning agent residues. Generally, we recommend trying out the cleaning agent on an inconspicuous part of the object to check whether the surface appearance is affected.

Do not clean surfaces that are warmed by the sun (>40 °C) as this may cause blemishing due to rapid drying!

Cleaning agent

Information, such as a list of neutral cleaning agents for organically coated aluminium components or addresses of cleaning companies holding quality certification, can be obtained directly from the Quality Assurance Association for the Cleaning of Facades and Metal Facade Renovation (GRM), www.grm-online.de.

Please follow the manufacturer's cleaning and safety instructions!

Unsuitable cleaning agents

Do not use strongly alkaline cleaning agents such as caustic potash, soda, caustic soda, or strongly acidic products or highly abrasive scouring substances such as household detergents and cleaning agents that may dissolve the film of paint.

NOTES

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INGENIOUSLY SIMPLE – SIMPLY INGENIOUS

The advantages of ALUCOBOND® rear-ventilated façades on timber substructures – at a glance:

- Large panel formats with high dimensional stability and low weight
- Easy handling during processing and assembly, thus reducing assembly-related risks
- Edges do not need to be processed and no impregnation necessary
- Soffits and corners can be produced and prefabricated from a single panel at low cost, saving on complex and expensive substructures
- The milled-edge method enables the creation of mitre corners up to 135°
- The material has proven itself in outdoor use for over 40 years
- The generous spacing of the timber substructure strips saves both material and labour time
- Application-related safety in relation to ETICS
- ALUCOBOND® can unlock completely new horizons thanks to its round bending characteristics
- Very good formability and flexural rigidity of the material, suitable for curved assembly and integration of parapets, trims and curves
- Low susceptibility to damage
- Premium-quality paint systems guarantee durability over a long time
- Reduced maintenance requirements, therefore lower maintenance costs
- ALUCOBOND® is fully recyclable
- Sustainability: 3A Composites is one of the original founders of the German Sustainable Building Council (DGNB) and a member of the German Institute for Building and the Environment (IBU)

FVHF

DGNB
Deutsche Gesellschaft für Nachhaltiges Bauen
German Sustainable Building Council

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