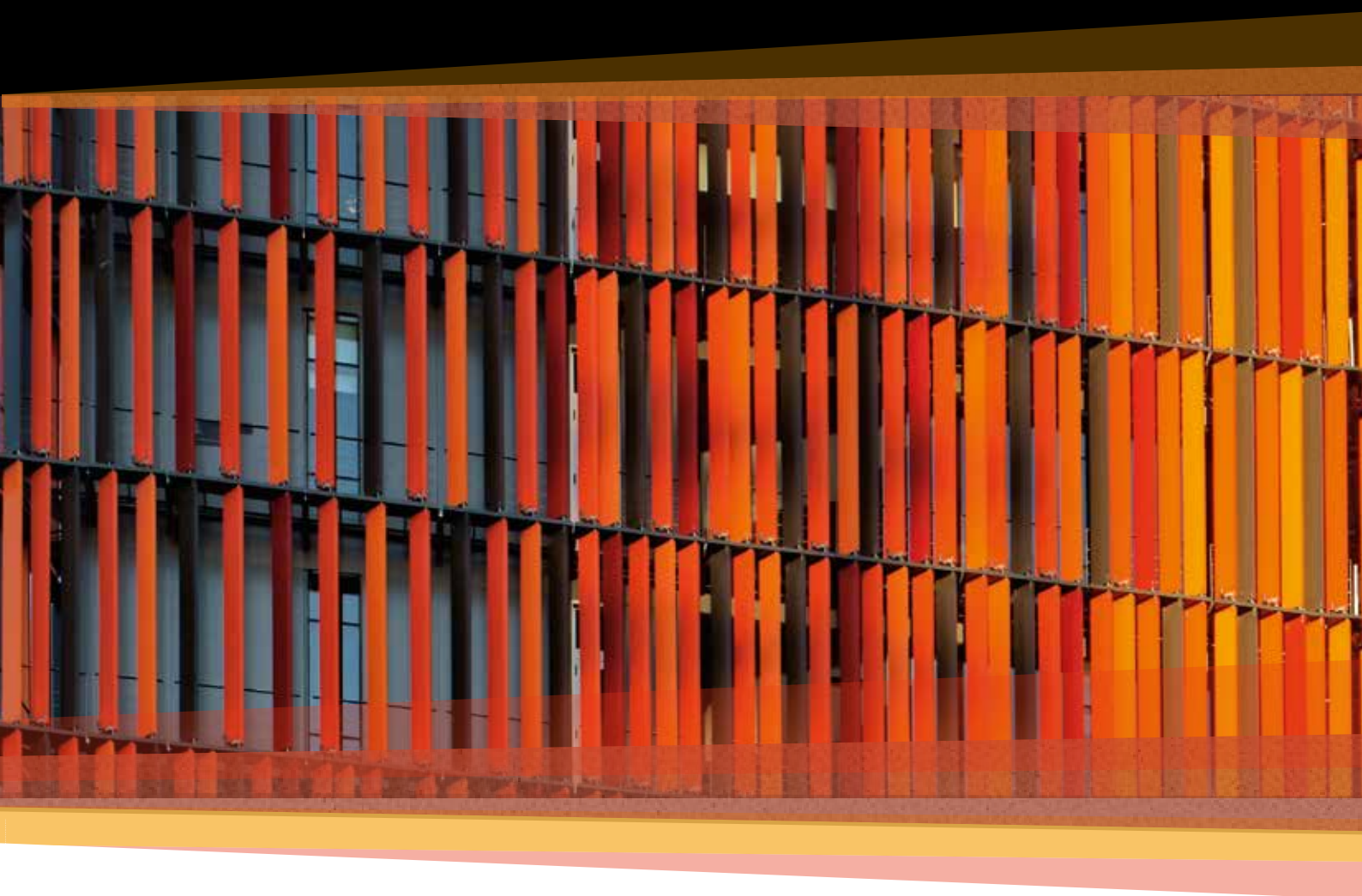
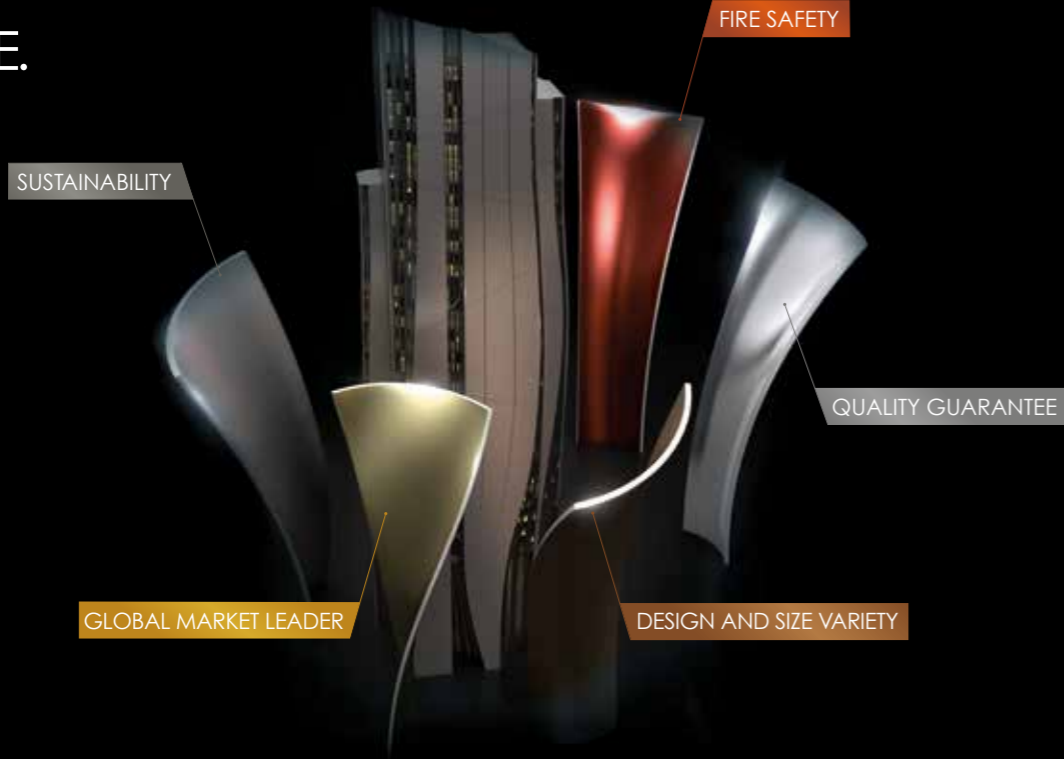


ALPOLIC™



PROCESSING AND PLANNING MANUAL



WITH FIVEFOLD SAFETY IN FAÇADE CONSTRUCTION

GLOBAL MARKET LEADER

ALPOLIC™ is backed by over 50 years of know-how and experience in the development and production of aluminium composite panels. As the global market leader, our name stands for the safety of innovative, high-quality products and for perfect service.

FIRE SAFETY

When it comes to maximum safety in fire protection, ALPOLIC™ leaves no stone unturned. We have already proven this in countless international tests. ALPOLIC™ A1 is the first aluminium composite panel in the world to be classified according to DIN EN 13501-1, fire protection class A1. ALPOLIC™ also sets standards here.

DESIGN AND SIZE VARIETY

ALPOLIC™ offers architects and fabricators the security of the greatest variety of designs and colours on the market. Whether trend colours, surface designs or real metals - our portfolio opens up an inexhaustible scope for design. Our range of size variants is also almost unlimited. With a maximum size of more than 2,000 x 7,000 (W x L), we are unique in the market and thus offer even more flexibility.

QUALITY GUARANTEE

ALPOLIC™ is always the first choice when it comes to protecting the façade from weathering, corrosion and scratching. And we give you that in black and white. With a quality guarantee of up to 20 years.

SUSTAINABILITY

Based on our unique KAITEKI philosophy, we make our daily contribution to a safe and sustainable future. For example, all our materials used are almost 100% recyclable. Furthermore, the positive eco-balance of our aluminium composite panels has been certified in the form of an Environmental Product Declaration (EPD).

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→ **Notice**

Please note that the information in this manual only applies to ALPOLIC™ aluminium composite panels with painted surfaces. For our products ALPOLIC™ reAL Anodised, ALPOLIC™ TCM (Titanium Composite), ALPOLIC™ SCM (Stainless Steel Composite), ALPOLIC™ CCM (Copper Composite), ALPOLIC™ ZCM (Zinc Composite) separate technical manuals are available on request. The material properties and technical data listed are presented as general information only and are not product specifications.



ALPOLIC™ – high-quality aluminium composite panels for architecture

ALPOLIC™ is a brand of the Mitsubishi Chemical Group, and which has been setting trends and standards for building architecture worldwide for over 50 years with excellent quality products.

ALPOLIC™ aluminium composite panels consist of two aluminium sheets with a flame-retardant or non-combustible core. They are characterized by outstanding product properties such as excellent flatness, easy formability, high flexural strength and enormous color variety. At the same time, they are lighter in weight than solid aluminium sheets. The ideal material for the sophisticated design of rear-ventilated façades.

ALPOLIC™ aluminum composite panels are available in three material versions, which differ in their fire protection classification according to EN 13501-1. ALPOLIC™/fr with a flame-retardant polymer core corresponds to class B-s1, d0. ALPOLIC™ A2 with a non-combustible mineral core corresponds to class A2-s1, d0.

Even more safety is offered by ALPOLIC™ A1 (non-combustible), which is currently the only composite material classified for the highest fire protection class A1.

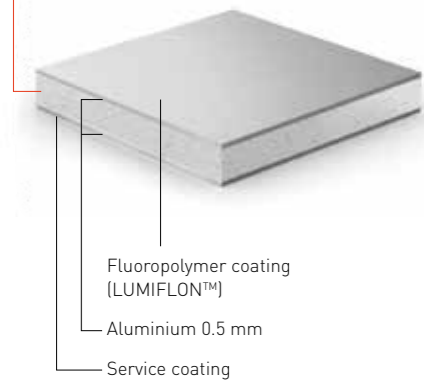
- Benefits:
- Excellent flatness
 - Easy to process
 - High bending strength
 - Dirt resistant
 - Surface coating with LUMIFLON™
 - Up to 20 years quality guarantee
 - Greatest variety of colours and designs
 - Consistent colour quality and consistency

ALPOLIC™ composite panels are manufactured under the strictest safety and environmental conditions in Germany, Japan and the USA and are only distributed only by authorised specialist dealers.

Product variants

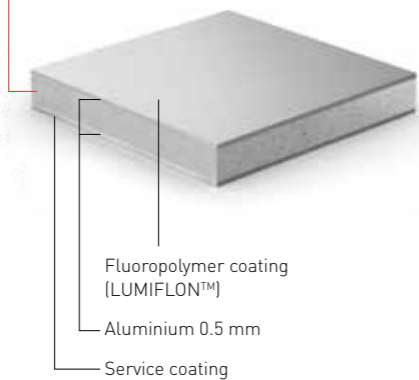
ALPOLIC™ A1

- 1 Non-combustible, mineral core, 3.0 mm
Euroclass A1
Total thickness: 4 mm



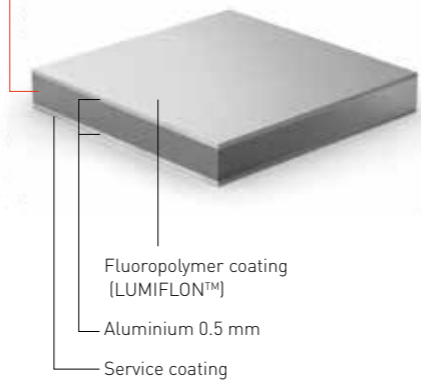
ALPOLIC™ A2

- 2 Non-combustible, mineral core, 3.0 mm
Euroclass A2-s1, d0
Total thickness: 4 mm



ALPOLIC™/fr

- 3 Flame-retardant Polymer core, 2.0 - 5.0 mm
Euroclass B-s1, d0
Total thickness: 3, 4 or 6 mm



Dimensional tolerances of ALPOLIC™ aluminum composite panels

Width	± 2.0 mm
Length	± 1 mm/m
Thickness	± 0.2 mm for 3 and 4 mm thickness, ± 0.3 mm for 6 mm thickness
Bend	Maximum 0.5% (5 mm/m) of the length or width
Diagonal deviation	Maximum 5.0 mm

Technical Data ALPOLIC™ A1

ALPOLIC™ A1

ALPOLIC™ A1 is the first aluminium composite material to be classified for building material or fire protection class A1 („Euroclass A1“) according to the European fire protection standard DIN EN 13501-1. This means that the product is non-combustible and does not produce any smoke in the event of a fire. It therefore offers an ideal sustainable alternative to metal façade materials or other claddings for rear-ventilated façades.

ALPOLIC™ A1 is made of two 0.5 mm thick aluminium cover sheets. These are applied to the non-combustible mineral core (3.0 mm) in a special fusing process. The particularly durable fluoropolymer resin coating (FEVE) LUMIFLON™ is applied to one side of the surface of the cover sheets in a coil coating process using the latest coil coating technology.

Specifications

Dimensions	Standard	Unit	Value
Total Thickness	–	mm	4 (± 0.2 mm)
Cover sheet thickness	–	mm	0.5
Core thickness	–	mm	3
Width	–	mm	1.250/1.500 (± 2 mm)
Length	–	mm	1.800 – 7.200 (± 1 mm/m)
Bow tolerance	–	mm	max. 0.5 % (5 mm/m) of the length or width
Squareness tolerance	–	mm	max. 5
Technological Value			
Weight	–	kg / m²	8.6
Specific gravity	–		2.15
Tensile strength	ASTM E8	N / mm²	48.2
0.2 % proof stress	ASTM E8	N / mm²	46.5
Elongation	ASTM E8	%	2.7
Flexural elasticity, E	ASTM D7250	kN / mm²	45.6
Deflection temperature	ISO 75-2	°C	115
Thermal expansion	ASTM D696	10 ⁻⁶ / °C	20.6
Thermal Conductivity	Calculated Value	W / m·K	0.4
Acoustical Properties			
Sound Transmission Loss	ASTM E413	STC	27
Surfaces			
Coil-Coating Lacquering	–	–	LUMIFLON™ (FEVE) based fluoropolymer coating
Aluminium alloy	–	–	3105-H44 and 3005 H44
Gloss (measured at 60°)	ASTM D523	%	15 – 80
Pencil hardness	ASTM D3363	–	H

International fire classification

Country	Test Standard...	Results & Classification	Remarks
EU	EN 13501-1 (below tests as required)	Class A1	
	EN ISO 1182	Passed	Core test
	EN ISO 1716	Passed	Heat potential value
	EN 13823	Passed	Panel test
Australia	AS 1530.1	Classified as non-combustible	Core test
	AS 1530.3	Ignitability Index 0, Spread of Flame Index 0, Heat Evolved Index 0, Smoke Developed Index 0	Panel test
Singapore	BS 476 Teil 4	Passed	Core test

Core material combustibility comparison

	ALPOLIC™ A1	ALPOLIC™ A2	ALPOLIC™/fr
Portion of combustible ingredients within the core material	≤ 5 %	≤ 10 %	≤ 30 %
Heat potential of the core material	≤ 1 MJ/kg	≤ 3 MJ/kg	≤ 14 MJ/kg



ALPOLIC™ A2

The aluminium composite panels ALPOLIC™ A2 consist of two 0.5 mm thick aluminium cover sheets, which are applied to a non-combustible mineral core in a fusing process. They can be supplied up to a width of 2 m, which is unique worldwide.

They are colour-coated on one side with LUMIFLON™ based on a fluoropolymer resin (FEVE). They are manufactured using a coil coating process with the latest coil coating technology. The composite panels are approved by the building authorities and meet the fire protection requirements of EN 13501-1, class A2 - s1, d0 (non-combustible). They are therefore particularly suitable for all areas where a high level of fire protection is required. Thanks to the special product properties such as high flatness, easy formability, low weight and high UV and corrosion resistance, they offer unlimited design possibilities for exterior and interior applications of sophisticated building architecture.

Specifications

Dimensions	Standard	Unit	Value
Total Thickness	–	mm	4 (± 0.2 mm)
Cover sheet thickness	–	mm	0.5
Core thickness	–	mm	3
Width	–	mm	1.000/1.250/1.500/ 1.750/2.015 (± 2 mm)
Length	–	mm	max. 7.300 (±1 mm/m)
Bow tolerance	–	mm	max. 0.5 % [5 mm/m] of the length or width
Squareness tolerance	–	mm	max. 5
Technological Value			
Weight	–	kg/m²	8.4
Tensile strength	ASTM E8	N/mm²	43
0.2% proof stress	ASTM E8	N/mm²	41
Elongation	ASTM E8	%	3.8
Flexural elasticity, E	ASTM D393	kN/mm²	38.5
Deflection temperature	ISO 75-2	°C	110
Thermal expansion	ASTM D696	10 ⁻⁶ /°C	19
Heat potential of the core	–	MJ/kg	≤ 3
Surfaces			
Coil-Coating	–	–	LUMIFLON™ (FEVE)-based fluoropolymer coating / real Anodised
Aluminium alloy	–	–	3105 H44 und 3005 H44
Gloss (measured at 60°)	EN 13523-2	%	15–80
Pencil hardness	EN 13523-4	–	H
Resistance to rapid deformation	EN 13523-4	–	Rear impact deepening at 7.5Nm/mm: No cracks
Resistance to immersion in water	EN 13523-9	–	After 500 hours: No influence
Chalking resistance	EN 13523-14	–	Chalking out after 1.000 Q-UV test hours (= 500 hours UV-B): ≤ 10%

*3 mm does not correspond with the General Construction Regulation DIBt, Berlin



ALPOLIC™ /fr

The aluminium composite panels ALPOLIC™/fr consist of two 0.5 mm thick aluminium cover sheets applied to a flame-retardant mineral polymer core.

They are colour-coated on one side with LUMIFLON™, based on a fluoropolymer resin (FEVE). They are manufactured using a coil coating process with the latest coil coating technology. The composite panels meet the fire protection requirements of EN 13501-1, class B - s1, d0 (flame retardant) and are approved by the building authorities. The special product properties such as high flatness, easy formability, low weight and high UV and corrosion resistance make them the ideal material for exterior and interior applications of sophisticated building architecture.

Specifications

Dimensions	Standard	Unit	Value
Total Thickness	–	mm	3*/4/6 (± 0.2 and 3 and 4) (± 0.3 in 6)
Cover sheet thickness	–	mm	0.5
Core thickness	–	mm	2/3/5
Width	–	mm	1.035/1.285/1.535/1.785/ 2.050 (± 2 mm)
Length	–	mm	max. 7.300 (±1 mm/m)
Bow tolerance	–	mm	max. 0.5 % [5 mm/m] of the length or width
Squareness tolerance	–	mm	max. 5
Technological Value			
Weight	–	kg/m²	6.0/7.6/10.9
Tensile strength	ASTM E8	N/mm²	61/49/29
0.2% proof stress	ASTM E8	N/mm²	53/44/26
Elongation	ASTM E8	%	4/5/2
Flexural elasticity, E	ASTM D393	kN/mm²	49/39.8/29.1
Deflection temperature	ISO 75-2	°C	115/116/109
Thermal expansion	ASTM D696	10 ⁻⁶ /°C	24
Heat potential of the core	–	MJ/kg	< 15
Surfaces			
Coil Coating	–	–	LUMIFLON™ (FEVE)-based fluoropolymer coating/ reAL Anodised
Aluminium alloy	–	–	3105 H44 und 3005 H44
Gloss (measured at 60°)	EN 13523-2	%	15–80
Pencil hardness	EN 13523-4	–	H
Resistance to rapid deformation	EN 13523-4	–	Rear impact deepening at 7.5 Nm/mm: No cracks
Resistance to immersion in water	EN 13523-9	–	After 500 hours: No influence
Chalking resistance	EN 13523-14	–	Chalking out after 1.000 Q-UV test hours (= 500 hours UV-B): ≤ 10 %

*3 mm does not correspond with the General Construction Regulation DIBt, Berlin

International fire classifications

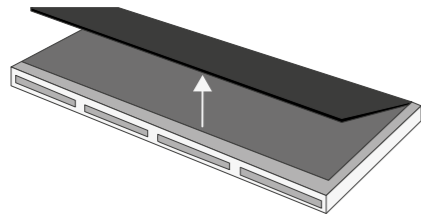
Country	Test standard ...	Results & Classification
EU (applicable in Europe, Switzerland and Turkey)	EN 13823, EN ISO 11925-2, EN 13501-1	Class B-s1, d0
Germany	DIN 4102-1	B 1
Switzerland	VKF	RF 2
France	–	M 1
Great Britain	BS 476 Part 6 & 7, BS 8414-1, BS 8414-2	BR 135
Poland	PN/B-02867	–
Czech Republic	CSN 73 0862, CSN 73 0863	Class C1
Hungary	MSZ 14800-6:2009	passed
Austria	OENORM B 3800-5	passed
Russia	GOST 30244-94 method II, SNIP 21-01-97, TsNIISK Natural Fire Test	Class G1 „Hardly Inflammable Materials“
USA	NFPA 259-93 (British Thermal Unit)	passed
	ASTM D1781-76 (Climbing Drum Peel Test)	passed
	ASTM E-84 (Steiner Tunnel Test)	Class A/Class 1
	ASTM E-108 Modified	passed
	UBC 26-9 & NFPA 285 (ISMA Test)	passed
	ASTM E108 (Fire Test for Roof Covering)	Klasse A
	ASTM E119 (1 hr and 2 hrs Fire Rating)	passed
	UBC 26-3 (Interior Room Corner Test)	passed
	Combustion Toxicity Test New York State Uniform Fire Prevention and Building Code	passed

To protect ALPOLIC™ composite panels from mechanical damage during transportation, storage and handling, it is essential to observe the following rules.

Handling

General handling

- In case of damage, the panels should be considered as possible culprits.
- When storing or packing the panels, nothing should be pushed between them to avoid marks on the surface.
- The processing of the boards should not be done on the floor, but on a work table.
- Nothing else should be placed on the worktable or on the machine bed while the panels are being processed.
- Do not stick or apply PVC adhesive tapes, polyurethane sealants or modified silicone sealants on the protective film in order not to damage the surfaces.
- Provide the surfaces of the packed panels with clearly legible labels „Handle with care“, „Protect from moisture“, „No hooks“ and „This side up“.
- Place the packed panels horizontally on top of each other and do not place heavy objects on them.



Safety instructions

- When handling ALPOLIC™ panels, it is always recommended to wear cut-resistant gloves to avoid cuts.



Cleaning the workspace

- Before unpacking the ALPOLIC™ panels, the intended working area should be thoroughly cleaned of dirt, stones, aluminium chips or other objects. The same applies to further processing.

Electrostatic charge

- Machine-stacked sheets in particular are usually electrostatically charged.
- To dissipate this charge, the existing packaging must first be opened and the ALPOLIC™ panel adhering to it released before repackaging/processing.

Contact with other materials

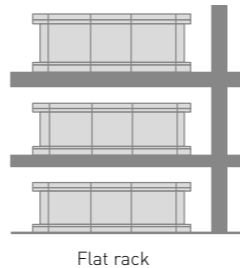
- If ALPOLIC™ composite panels come into direct contact with heavy metals (e.g. copper, iron), there is an increased risk of corrosion.
- When used outdoors, it is essential to ensure correct material separation.

Storage

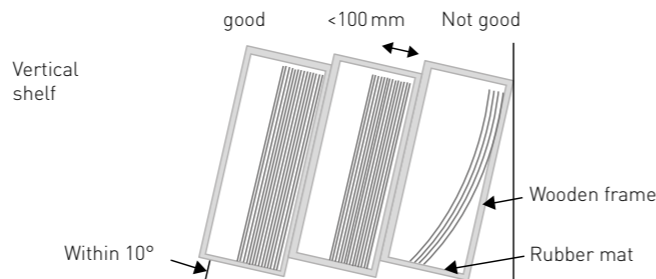
- If possible, store the panels in dry indoor areas to avoid decomposition of the protective film by moisture and direct sunlight.
- When storing in a flat rack system, always stack the same size of panels on a rigid palette. Do not pile up different sizes on top of each other. Up to four-six of our wooden crates can usually be stacked up to four crates high.
- When storing in a vertical shelf system, lean panels closely against an inclined support material a maximum inclination of 10°. The total thickness of leaned panels should not exceed 100 mm. Use veneer as backing cover and place a rubber mat on the bottom edge. When pulling out our placing on the shelf, take care not to scratch.
- Before processing, store the panels for at least 24 hours in a tempered and dry place at approx. 20° C or higher to avoid size changes caused by weather and climate and to optimize forming operations.

Stacking

- It is recommended that pallets in original packaging are stacked no more than 6 units high.
- To avoid printouts, nothing should be between the ALPOLIC™ panels when stacking individual pallets.



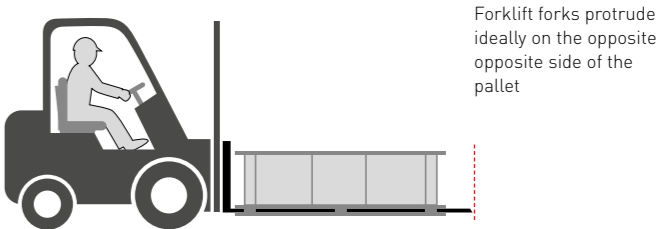
Flat rack



Transport by forklift truck

- Sufficient lifting power must be ensured.
- Spread the forks to maximum width to avoid bending of the pallet, slipping of the ALPOLIC™ panels and damage to the product or packaging.
- Lifting or transporting the pallet with the forks extended may cause the pallet to bend, which could damage the pallet and the product.
- Use forks of sufficient length. If necessary, use fork extensions.
- The forks should ideally protrude on the opposite side of the pallet or be at least 2/3 inserted in the pallet to ensure safe transport.
- Lift the pallet first and only then tilt it to prevent the tine tips from being pushed through.
- The load's centre of gravity should be as close as possible to the lift mast and centrally between the forks.
- Do not lift the pallet with the fork tips. It may cause damage to the packaging or the product.
- Stacked pallets must be secured against slipping when transported in closed trucks or containers.

- Adequate edge protection should be used to prevent damage.
- As a rule, only lift or lower the pallet slowly to avoid bending. This prevents damage to the product.



Forklift forks protrude ideally on the opposite side of the pallet

Onward transport

Lifting

- Ideally, the ALPOLIC™ panels should be lifted with a suitable aid, such as a vacuum lifter. If this is not possible, the following instructions for manual lifting should be taken into account.

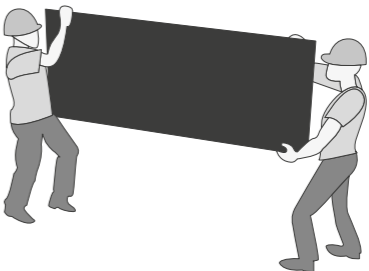


Figure 1

Required number of persons for repacking/relocating

- Panel length ≤ 4.500 mm: 4 persons required
- Panel length > 4.500 mm: 6 persons required

Transport

- For further transport, the ALPOLIC™ panels should always be lifted and carried vertically by two people. To do this, grasp the panel at the four corners as shown in figure 1 and lift it (do not pull it over each other).

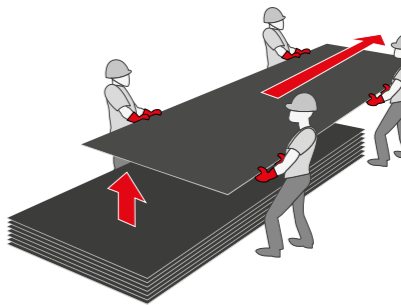
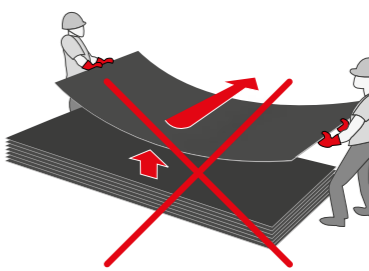


Figure 2

Repositioning

- Single ALPOLIC™ panels must be lifted completely from the panels below, they must not be pushed over each other. We recommend the use of a vacuum lifter.
- Lifting and transporting the ALPOLIC™ panels should be done via the long side, as shown in figure 2.

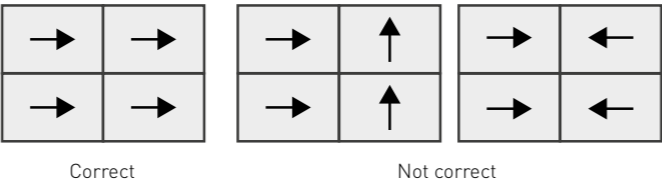


Reflective direction

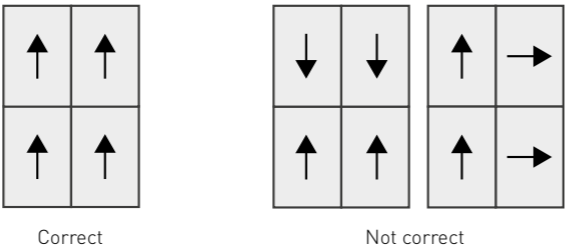
Direction arrows are indicated on the protective film of the ALPOLIC™ composite panels which specify the reflective direction.

- Pay attention to the reflective direction so that no difference in brightness occurs in the overall surface when several panels are arranged on the same level.
- In the case of composite panels with a granite or marble design, the reflective direction must be broken so that the pattern is not repeated. To do so, turn the respective following composite panel by 90°.

Horizontal direction



Vertical direction



Processing notes

- Check the ALPOLIC™ composite panels for possible damage and deformation immediately after unpacking.
- The composite panels always have a punched edge due to the production process. The aluminium is pushed in on this edge.
- The panels must be trimmed as follows:
 - on all sides in order to guarantee the perpendicularity and cleanly cut edges when open cut edges are used
 - on three sides in order to guarantee the perpendicularity for further processing

Avoidance of colour deviations

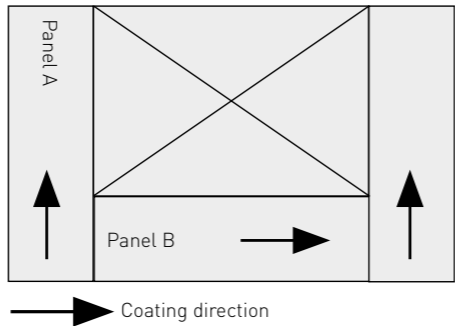
- When using panels from different batches, colour deviations may occur. It is therefore recommended to order the total quantity required from one production batch.
- Panels and coils in stock may come from different batches. Before ordering, the colours should therefore be checked by an ALPOLIC™ employee and jointly agreed and approved.

Protective film

- The batch number is printed on the rear side. If processing has rendered the imprint illegible, relabel the panel accordingly to ensure traceability.
- Leave the protective film on the composite panel for as long as possible to prevent damage.
- The protective film must be removed immediately after assembly.
- In the case of cassette production, it is recommended to remove the film in the area of the fixing element in the factory.
- When the composite panels are attached outdoors, remove the protective film at the latest after 20 days in order to guarantee residue-free removal.
- Do not use markers, adhesive tapes or labels on the protective film. The plasticizers it contains may penetrate the film and affect the painted surface.

Laying direction

In Metallic Colours, Sparkling Colours, Prismatic Colours and Patterns (Stone, Timber, Metal, and Abstract), slight colour differences are perceptible if the panels are mounted in different directions (like panel A and B in the diagram). Therefore, the panels should be mounted in the same direction as marked on the protective film. As for Solid Colours, any colour difference due to coating direction is negligible.



Examples of ALPOLIC™ façade fixing systems



Rivet/Face fixed system



Cassette system (horizontal)



Cassette system (vertical)

JOINTING AND FIXING TECHNIQUE

Edge distances, thermal expansion

Edge distances

Distance from the edges

The distance from the rivet to the panel edges must be at least 16 mm.

Panel gaps

The width of the gaps between the panels must be limited to max. 20 mm.

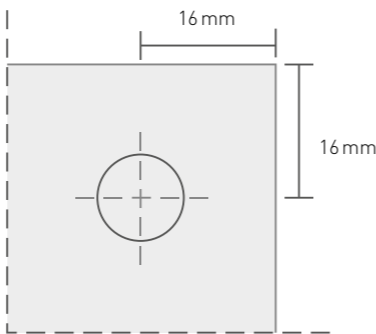
Thermal expansion and contraction

The influence of thermal expansion on all the components of each façade system must be considered. For examples, in riveted system, the expected thermal expansion has to be absorbed at each riveted point with the specified diameters.

Linear thermal expansion coefficient

Material	Linear thermal expansion coefficient, 1 / °C	Expansion per 1 meter with 50 °C difference, mm / m
ALPOLIC™ A1	21×10^{-6}	1.1 mm
ALPOLIC™ A2	19×10^{-6}	1.0 mm
ALPOLIC™/fr	24×10^{-6}	1.2 mm
Aluminium	24×10^{-6}	1.2 mm
Concrete	12×10^{-6}	0.6 mm

Edges distances



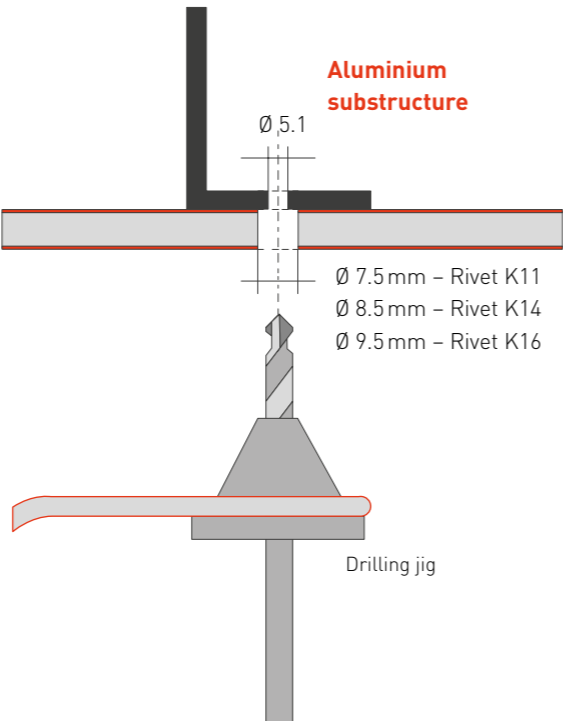
Thermal expansion

Limit temperature and assembly temperature

In accordance with DIN 18516-1, the limit temperatures and the assembly temperatures must be used for determination of the temperature difference. Independent of the above, a reduced temperature difference of $\Delta T = 10 \text{ K}$ can be used for the calculation in the direction of the supporting profiles of the substructure, if the façade panels and the substructure have a direct contact, which means that a thermal stop does not exist (see the General Construction Regulation Z-10.3-701 of DIBt, Berlin).

Calculation example

- Expected max. temperature of ALPOLIC™ A2 → 80 °C
- Assembly temperature → 20 °C
- Length of the panel → 2.000 mm
- The thermal expansion is calculated as follows:
 $\Delta L = 19 \times 10^{-6} \times (80 - 20) \times 2.000 = 2.25 \text{ mm}$



Cassette systems

Cassette systems vertical

The cassettes must be fastened at the longitudinal edges by means of the following subframe on bolts:

- ALPOLIC™ panels with an aluminium sheet thickness of 3 mm

Bolts

The bolts suspending the above materials are specified as follows:

- $\varnothing 8 \text{ mm}$ made of A4 stainless steel with $\varnothing 12 \times 1.9$ (PA66) sleeves
- $\varnothing 10 \text{ mm}$ bolts made of A4 stainless steel without sleeves

Corner connector

The following materials have to be used as the corner connector of the cassettes:

- ALPOLIC™ panels
- Aluminium sheet with a thickness of at least 2 mm

Blind rivets

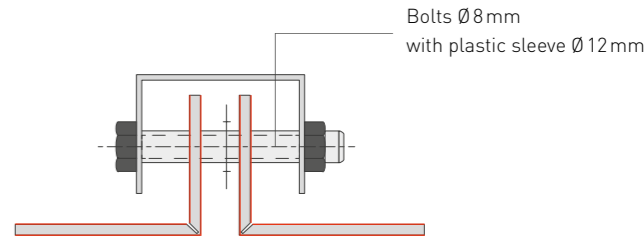
For fastening the ALPOLIC™ panels to the above connector, the following blind rivet must be used:

- Aluminium blind rivet with $\varnothing 5 \text{ mm}$ with $\varnothing 11$, $\varnothing 14$ or $\varnothing 16 \text{ mm}$ stainless steel mandrel shaft

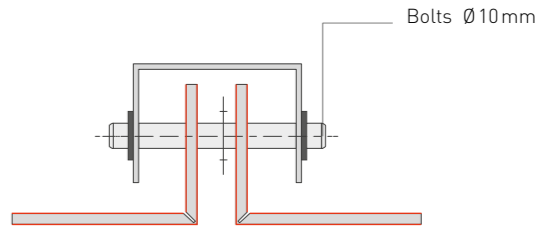
Supplier

- Gesipa / SFS
- MBE GmbH
- Ipex GmbH

Suspension in bolts and plastic sleeve



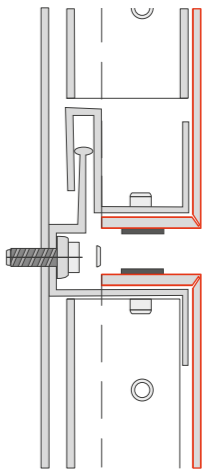
Suspension in bolts



Cassette systems horizontal

The cassettes are laid in a horizontal format (HC system). The system-specific aluminium profiles riveted onto the top and bottom horizontal edges of the cassettes are interlocked. Plastic anti-vibration elements are placed at specific points between the profiles.

The top HC Z profile and the HC basic profile are generally either riveted at two points or fastened onto the HC hat profile with thread-forming screws and drill screws made of stainless steel.



→ Please ask us for the detail drawings.

Riveting systems

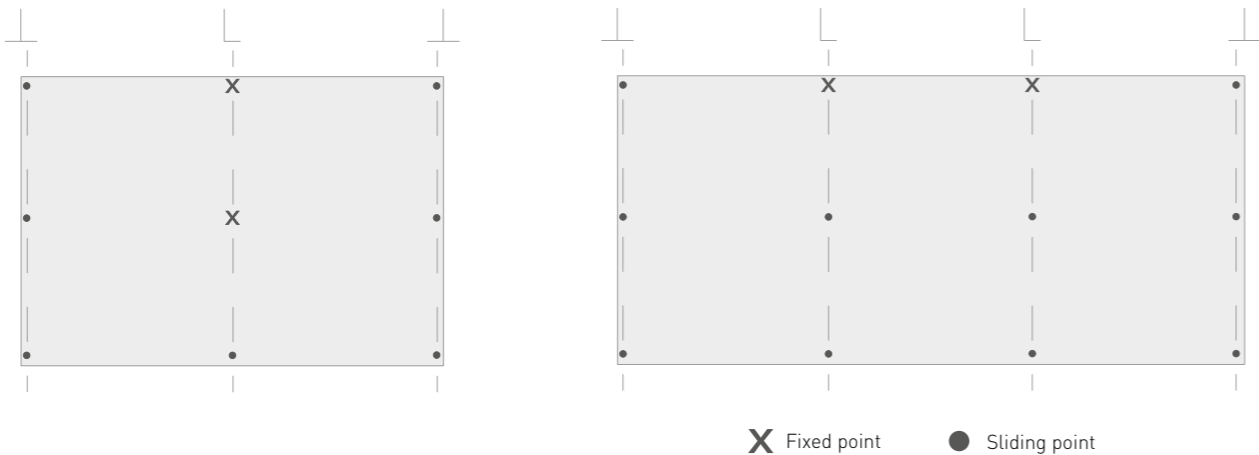
Substructures

The support profiles of the substructures for the riveting systems must be aluminum profiles with a thickness of at least 2.0 mm with a tensile strength $R_m \geq 245 \text{ N / mm}^2$ and an elastic limit $RP 0.2 \geq 200 \text{ N / mm}^2$ [alloy EN AW-6063 T66 in accordance with DIN EN 755-2].

Specifications for riveted systems

Fixed and sliding points

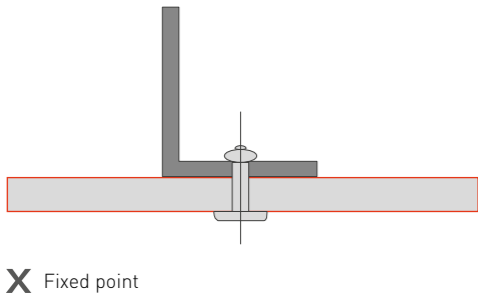
When attaching ALPOLIC™ composite panels, ensure that there is sufficient allowance for expansion and create fixed and sliding points.



Fixed points

- Take into account at least one fixed point.

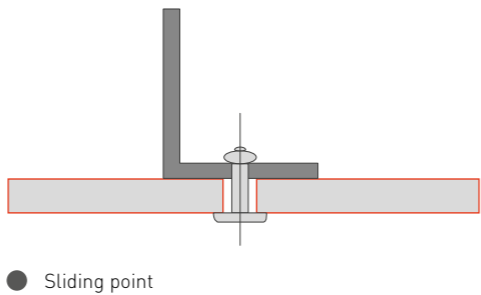
Ø Drill hole	Ø Rivet
5.1 mm	5.0 mm



Sliding points

- Depending on the size of the composite panels, you will need an appropriate number of sliding points.

Ø Drill hole	Ø Rivet
7.5 mm / 8.5 mm / 9.5 mm	5.0 mm



Blind rivets

For fastening the ALPOLIC™ panels to the above connector, the following blind rivet must be used:

- Aluminium blind rivet with Ø 5 mm with Ø 11, Ø 14 or Ø 16 mm stainless steel mandrel shaft

Supplier:

- Gesipa / SFS
- MBE GmbH
- Ipex GmbH

Installation of riveted systems

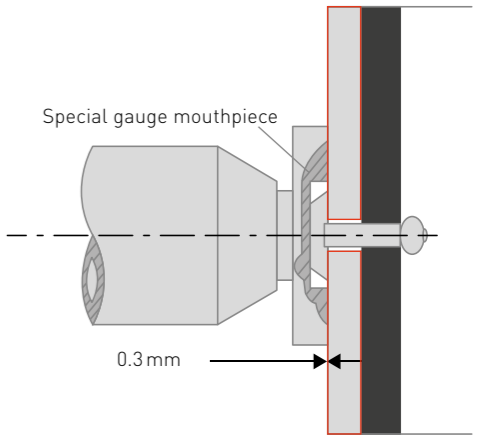
ALPOLIC™ panels can be fastened to the substructure by the blind rivet. To prevent tension from occurring at the riveting point, following techniques are specified:

Riveting

To avoid galvanic corrosion on ALPOLIC™ composite panels, all rivets, screws or nuts used for the connection must be made of aluminium or stainless steel. If the composite panels are made of dissimilar materials such as steel, ensure that there is material separation.

Drilling

The blind rivets must be fastened at the center of the panel holes. A drill jig is used to drill the holes in the panel and substructure centrally (for both the fixed and sliding points).



The rivets must be placed using a rivet gauge with a play of 0.3 mm.

Processing information

- A special rivet attachment jig is used for making space over 0.3 mm thick between the rivet flange and the panel.
- Use only approved rivets with a washer head.
- Remove the protective film before riveting.
- Observe the drill hole sizes for fixed and sliding points given on page 14.

CONNECTION AND FASTENING TECHNOLOGY

Riveted systems on aluminium substructures

Riveted systems on aluminium substructures

According to the AbZ Z-10.3-701 and DIN 18516-1, the ALPOLIC™ façade panels must be installed without any constraints.

[Point 3.1.1.2 of the AbZ] The hole diameters [D + o] in the façade panel are to be selected in such a way that the hole tolerance [o] occurring in relation to the shaft diameter [d] of the fastener can absorb deformations due to temperature changes of the flat composite panel without constraint. The hole tolerance [o] must be >=1.0 mm and <=4.5 mm (see Table 4 in [3.1.1.2,a]). Centre the fasteners in the drill holes, using suitable drill jigs when drilling the holes in the substructure.

To ensure the horizontal position of the ALPOLIC™ façade panels, e.g. 2 drill holes with D = 6 mm can be provided in the panel when using the fasteners according to Annex 7 (AbZ). In order to avoid constraints due to thermal linear expansion, the distance between the drill holes should be as small as possible (see C examples for securing the position). To ensure that the drill holes are covered, choose correspondingly larger rivet head diameters [K 11 / K 14 / K16].

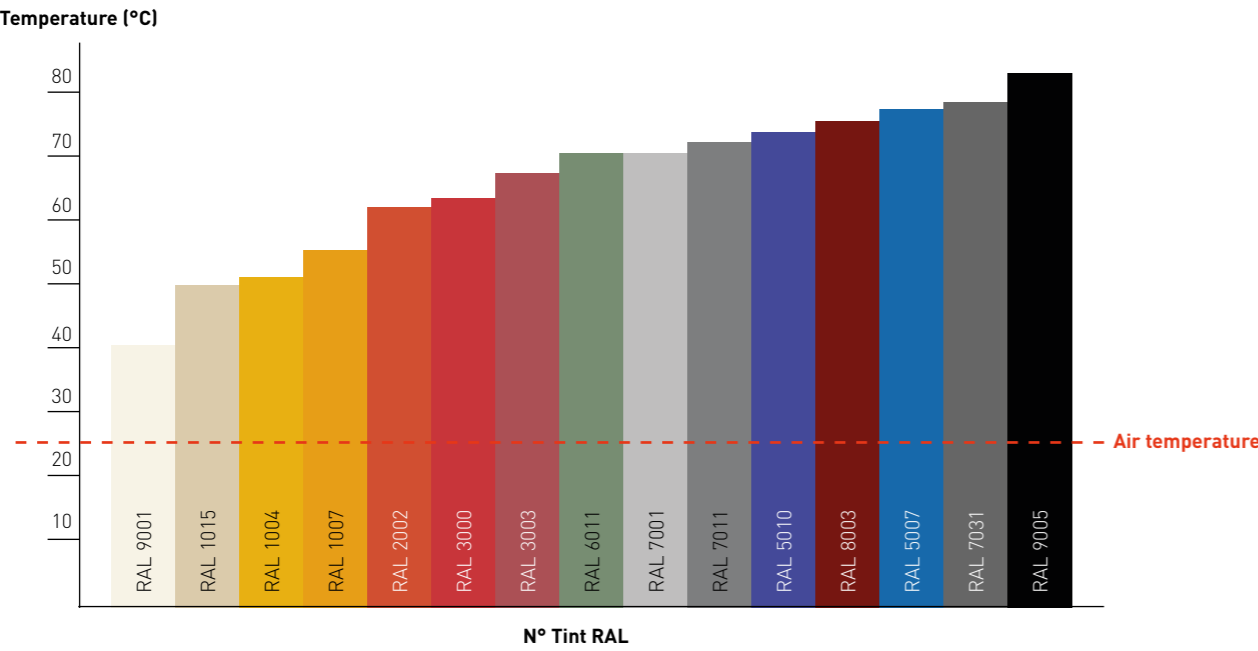
Temperature of different coloured surfaces

Temperature of different coloured surfaces, colour shade according to RAL, aligned at an angle of 45° to the solar radiation at an air temperature of 25 °C.

Examples

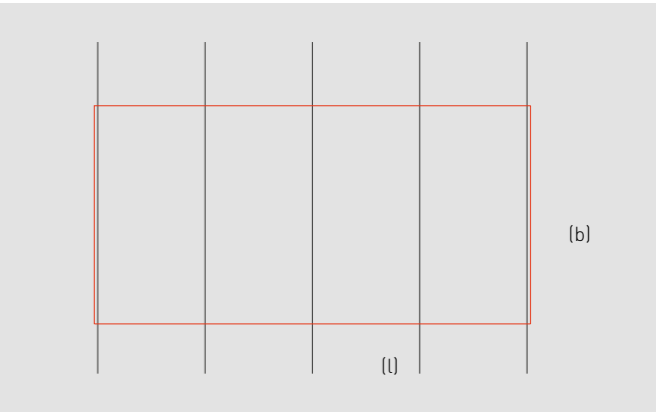
Examples can be found in the following tables:

- A** Horizontal formats
Substructure orthogonal to the longitudinal side of the panel [l]
- B** Horizontal formats
Substructure parallel to the longitudinal side of the panel [l]
- C** Examples for securing the position



Tables for the installation situation **A**

Horizontal formats - substructure orthogonal to the longitudinal side of the panel [l]



With reference to DIN 18516-1 and an **installation temperature of 20 °C** as well as the extreme temperature with a **black surface of 80 °C**.

max. l [mm]	ΔT	δ [mm]	Dn rivet [mm]	Drill hole diameter D in the plates [mm]	Dn rivet head [mm]
1.410	60	2	5	7	11
1.760	60	2.5	5	7.5	11
2.110	60	3	5	8	14
2.470	60	3.5	5	8.5	14
2.820	60	4	5	9	16
3.170	60	4.5	5	9.5	16

Chart 1

With reference to DIN 18516-1 and an **installation temperature of 10 °C** as well as the extreme temperature with a **black surface of 80 °C**.

max. l [mm]	ΔT	δ [mm]	Dn rivet [mm]	Drill hole diameter D in the plates [mm]	Dn rivet head [mm]
1.210	70	2	5	7	11
1.510	70	2.5	5	7.5	11
1.810	70	3	5	8	14
2.110	70	3.5	5	8.5	14
2.420	70	4	5	9	16
2.720	70	4.5	5	9.5	16

Chart 2

With reference to DIN 18516-1 and an **installation temperature of 20 °C** as well as the extreme temperature with a **light surface of 60 °C** (In coordination with the planner!).

max. l [mm]	ΔT	δ [mm]	Dn rivet [mm]	Drill hole diameter D in the plates [mm]	Dn rivet head [mm]
2.110	40	2	5	7	11
2.640	40	2.5	5	7.5	11
3.170	40	3	5	8	14
3.700	40	3.5	5	8.5	14
4.230	40	4	5	9	16
4.760	40	4.5	5	9.5	16

Chart 3

With reference to DIN 18516-1 and an **installation temperature of 10 °C** as well as the extreme temperature with a **light surface of 60 °C** (In coordination with the planner!).

max. l [mm]	ΔT	δ [mm]	Dn rivet [mm]	Drill hole diameter D in the plates [mm]	Dn rivet head [mm]
1.690	50	2	5	7	11
2.110	50	2.5	5	7.5	11
2.540	50	3	5	8	14
2.960	50	3.5	5	8.5	14
3.390	50	4	5	9	16
3.810	50	4.5	5	9.5	16

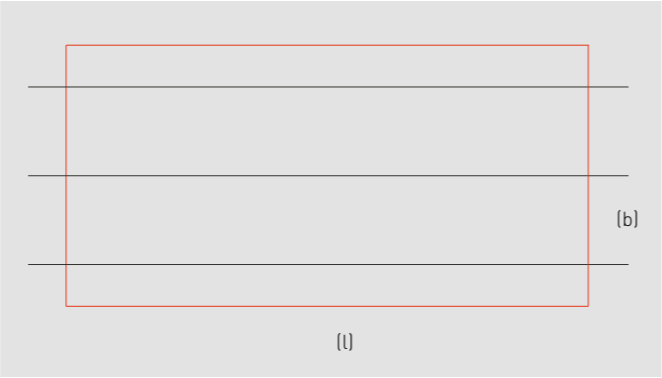
Chart 4

CONNECTION AND FASTENING TECHNOLOGY

Riveted systems on aluminium substructures

Tables for installation situation **B**

Horizontal formats - substructure parallel to the longitudinal side of the panel (l)

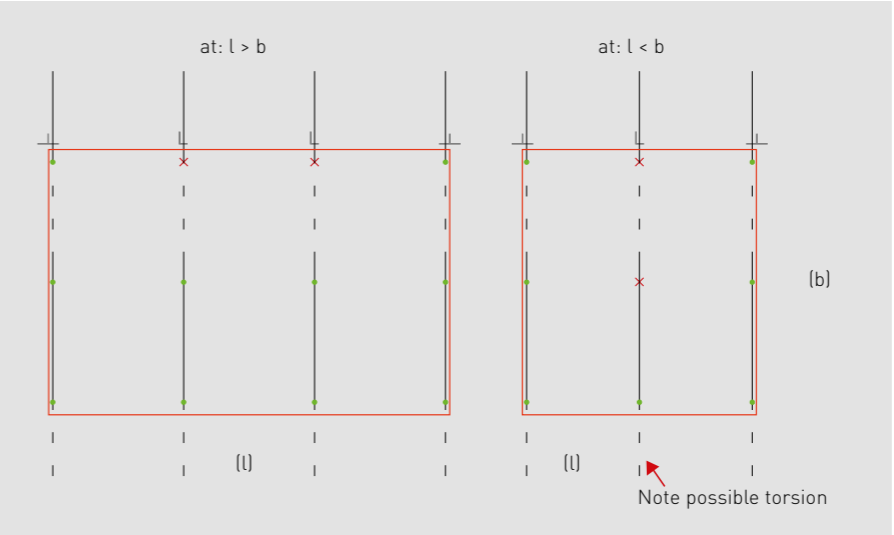


With reference to DIN 18516-1 and [3.1.1.1] with a reduction $\Delta T = 10\text{ K}$, when the ALPOLIC™ composite panel and the aluminum substructure are in direct contact.

max. l [mm]	max. b [mm]	ΔT	Dn rivet [mm]	Drill hole diameter D in the plates [mm]	Dn rivet head [mm]
4.093	1.153	20	5.0	7.0	11
4.093	1.153	20	5.0	7.5	11
7.300	1.543	20	5.0	8.0	14
7.300	1.543	20	5.0	8.5	14
7.300	2.050	20	5.0	9.0	16
7.300	2.050	20	5.0	9.5	16

Chart 5

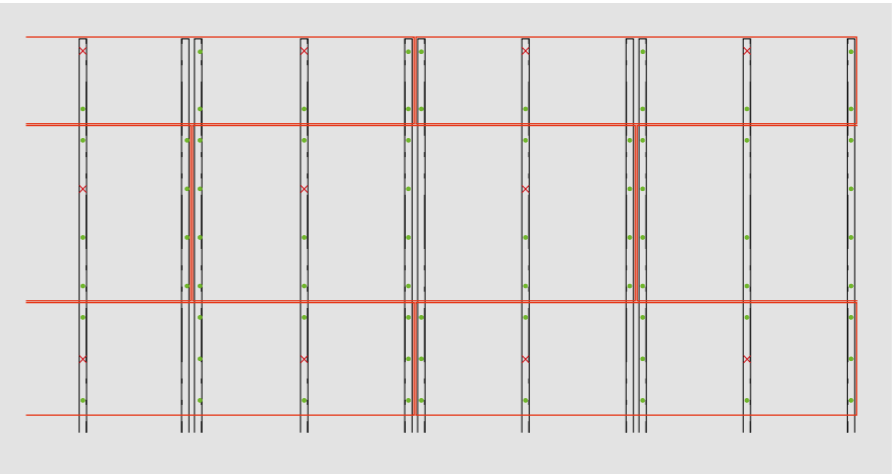
Examples for securing the position **B**



To ensure that the drill holes are covered, choose correspondingly larger rivet head diameters (K 11 / K14 / K16). (see charts for **A** and **B**).

✗ Fixed points drill hole with position assurance

● Sliding point drill hole with hole clearance



Special precautions must be taken when laying in a bond. It is recommended to point out possible construction-related offsets in the nitebilg already during planning. (In the example $l \leq 2,000\text{ mm}$)

✗ Fixed points drill hole with position assurance

● Sliding point borehole with hole clearance

→ Note

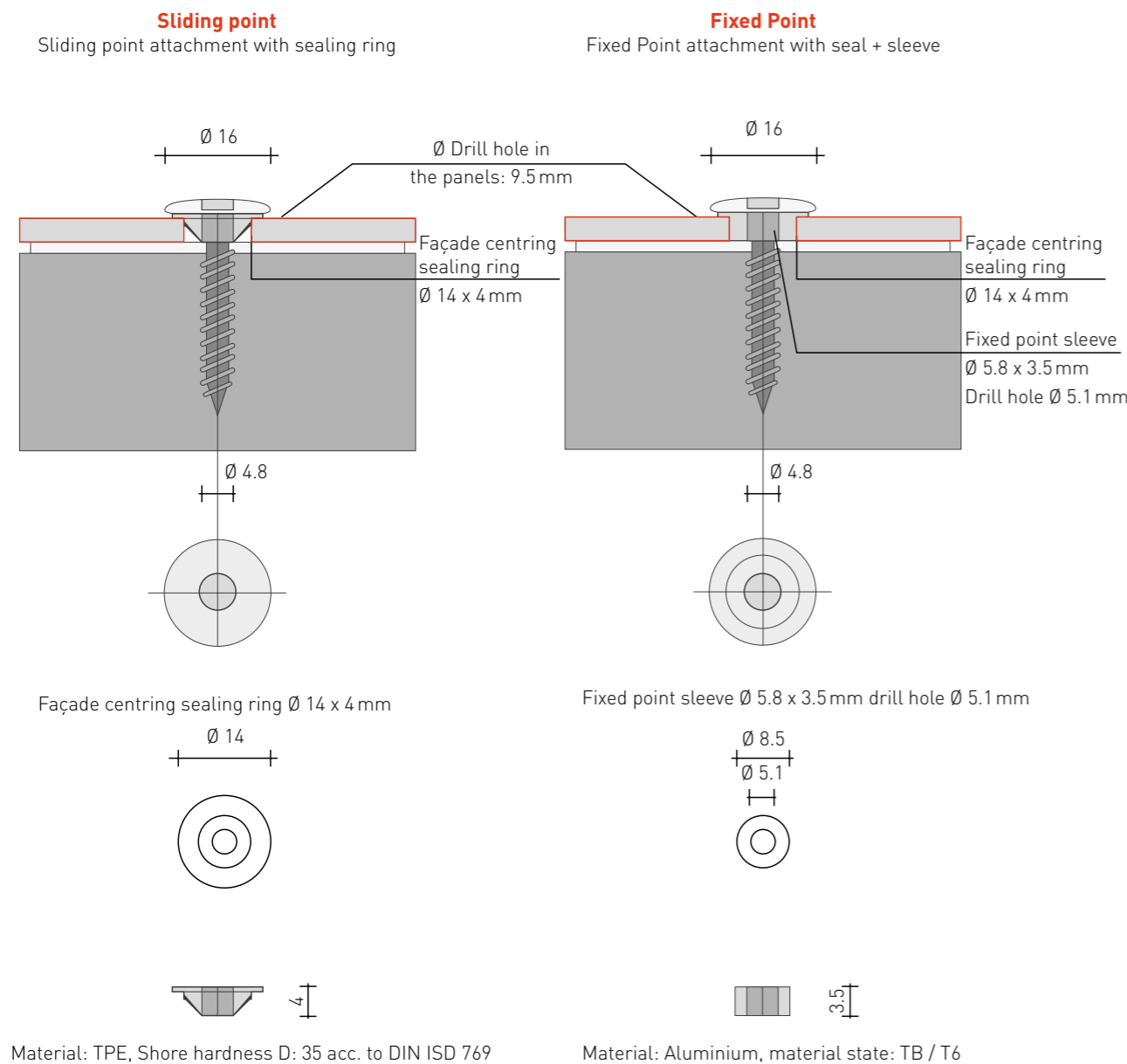
All information from the above tables is exclusively applicable to the products ALPOLIC™ A1, A2 and /fr. The substructure must be dimensioned and selected in accordance with AbZ Z-10.3-701, as well as in accordance with the current ALPOLIC™ examples for planning and execution. Only suggestions are given here, which are to be assessed by experts according to the structural analysis of the object. The use of the above information is your own responsibility. ALPOLIC™/ Mitsubishi Polyester Film GmbH does not guarantee the completeness, correctness and accuracy of the stated permissions. Any liability is excluded. It is recommended that a joint declaration be obtained from the parties involved in the construction (client, planner/architect, company carrying out the work and, if applicable, the lower building supervisory authority) in order to agree on this minor deviation from the AbZ.

CONNECTION AND FASTENING TECHNOLOGY

Bolted systems on wooden substructures

Bolted systems on wooden substructures

Sliding and fixed point of screw fastening on wooden substructure



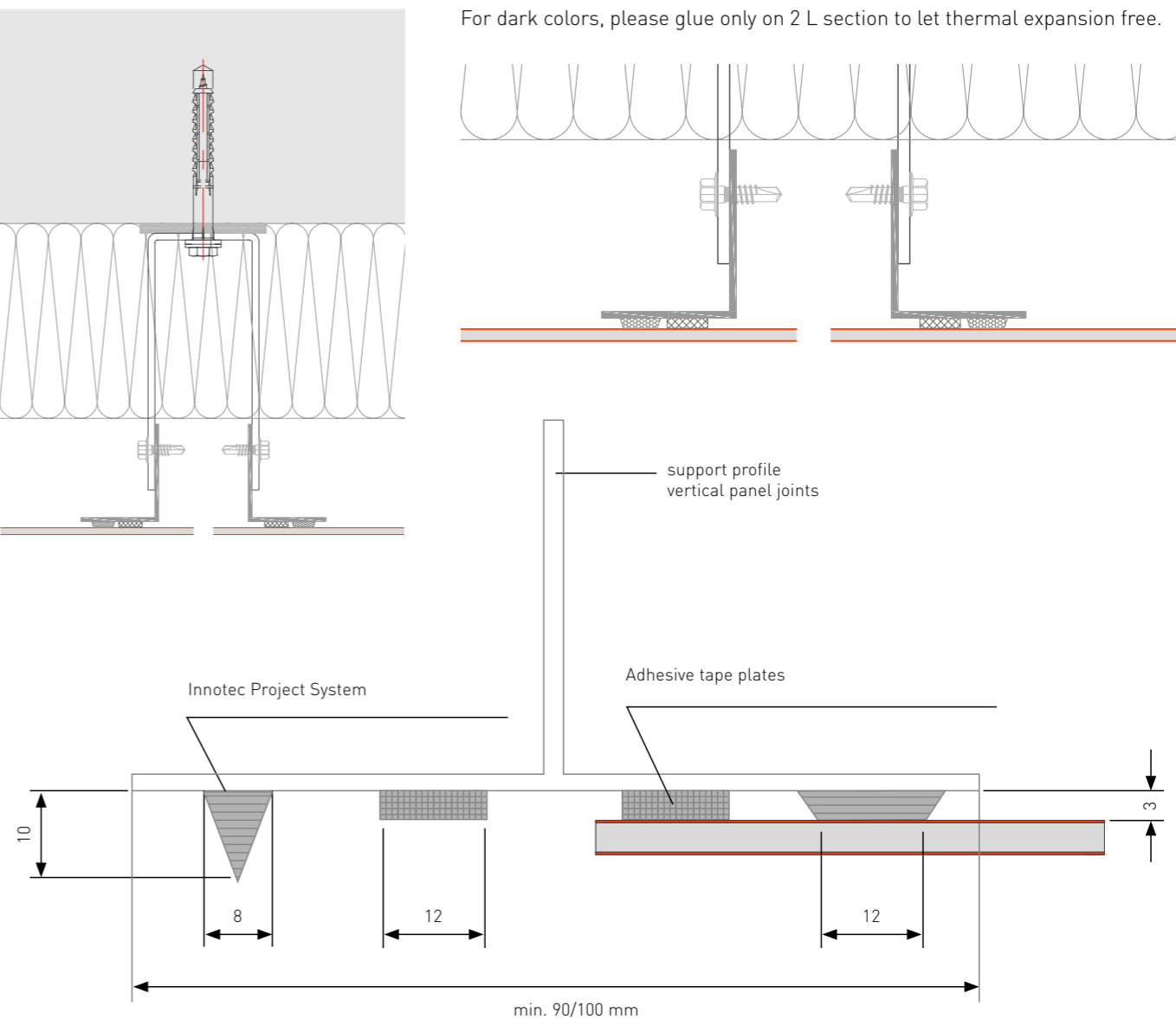
Glued systems

Glued systems

Gluing

When applying and using building sealants or adhesive tapes, please observe the manufacturer's instructions and local regulations. For the Innotec Project System from PCS Innotec International N. V., bonding with ALPOLIC aluminium composite panels with a special back coating is approved by the Dibt in Germany (in accordance with Innotec approval). The ALPOLIC™ composite panels can be supplied with different service coatings or different backings. It is the customer's responsibility to order the panels with the appropriate service coatings and to check whether the adhesive of these has already been tested and validated by the manufacturer*. When processing the adhesives, the instructions of the adhesive manufacturer must be followed. Bonding of ALPOLIC™ with stiffening profiles is feasible for cassette constructions of larger formats. The bonding must not be used to fix the façade cladding alone. Forces on the stiffening profile must be transferred to the substructure in a suitable manner. If the adhesive fails, no one must be endangered by falling façade parts. If the stiffening profiles are arranged horizontally, the adhesive must be protected against standing water.

*If you have any questions, please contact ALPOLIC™ and order a new panel sample to organise the bonding tests by the manufacturer.



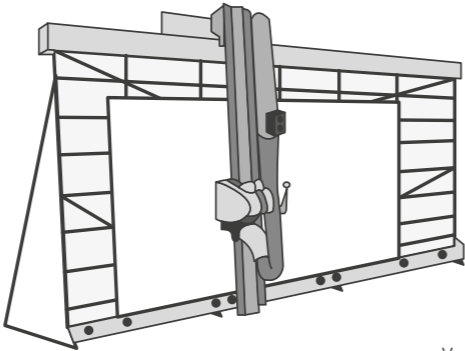
Tools and machines

ALPOLIC™ A1, ALPOLIC™ A2 and ALPOLIC™/fr can be processed with common types of tools such as stable saws, hand-held circular saws, vertical panel saws or CNC machines.

Circular saw blade

An example of the suitable blade:

Blade	Carbide tip circular saw blade (e.g. 300 mm dia.)
Number of teeth	80 – 100
Cut width	2.0 – 2.6 mm
Rake angle	10°



Vertical panel saw

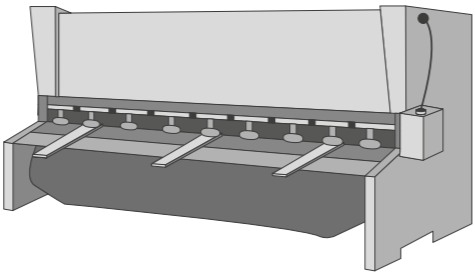
An example of the operation conditions:

Spindle speed	2.000 – 4.000 rpm
Feed speed	10 – 30 m/min.

Guillotine shears

An example of the suitable clearance and rake angle:

Panel thickness	Clearance	Rake angle
4 mm	0.04 – 0.1 mm	1° 30'
6 mm	0.2 mm	2° 30'

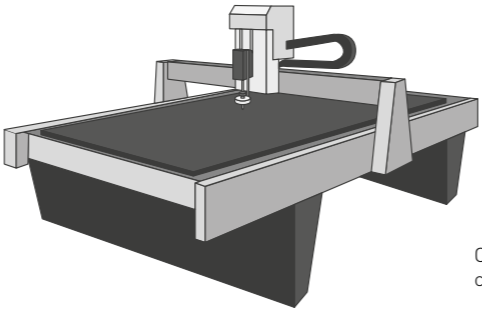


Square shear

End-mill

An example of the suitable end-mill and operating conditions:

End-mill	Square end-mill solid carbide (Eg. ø 4 – 6 mm dia.)
Spindle speed	12.000 – 24.000 rpm
Feed speed	5 – 8 m/min.



CNC machining centres

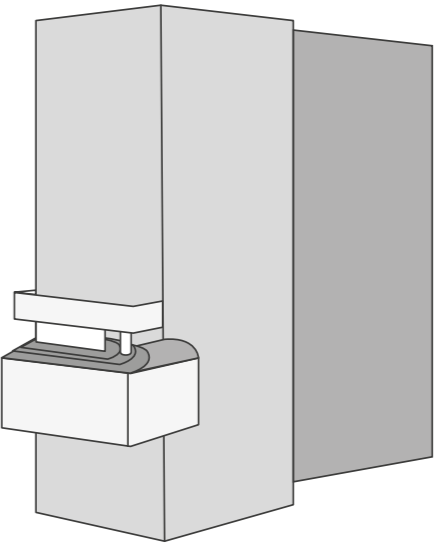
Cut edges

Cutting edges

- Three sides of the panels should be trimmed for getting more accurate rectangularity of fabricated panel.
- In case of the riveted systems, all sides of the panels should be trimmed for getting more accurate rectangularity and cut edges.
- If it is possible that passers-by may hurt their fingers on the cut edges make the edges dull with fine sandpaper. Normally, droop edges by shear cutting are mild enough to ensure the safety.

Curved cut

- Hand routers and trimmers can cut ALPOLIC™ panels in curving lines.
- A guide template will help you to stabilize this work.
- Jigsaws are also useful for cutting complex shapes.

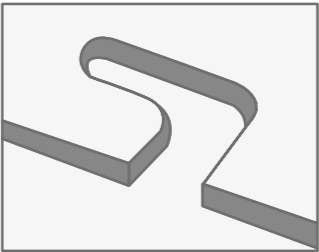


Punchig press

Punching / notching

Notes on guide templates

- Put the guide template on the external side of the panel, to do the routing work through the guide template.
- Remove the particles caught between the template and the panel surface, to prevent dents and scratches.

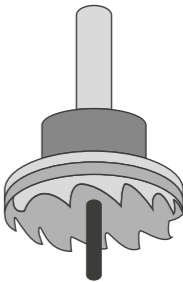
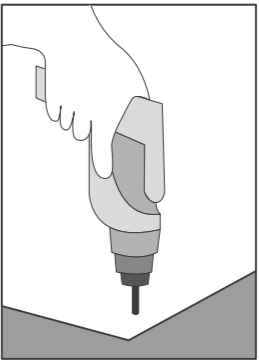


Example of punching

- We can use a punching press for nothing an cutting out, and a notching tool for removing the corner.
- The suitable clearance between punch and die is 0.1 mm or smaller (material thickness x approx. 2 %).
- A small droop will appear at the punched edge.

Drilling

- We can make holes with a hand drill, equipped with a drill bit, a hole-saw and a circle cutter.
- To reduce the burr at the edge of the hole, drill the hole from the visible side.



Drill a hole

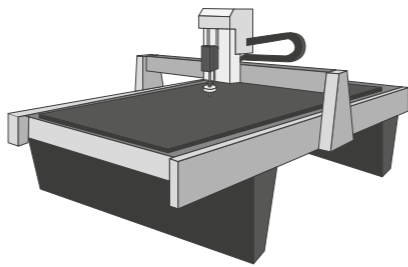
Fräsen

ALPOLIC™/fr can be grooved with various types of tools such as hand grooving machines (blade), hand routers and panel saws. As for ALPOLIC™ A1 and ALPOLIC™ A2, CNC is suitable.

CNC

An example of the suitable end-mill and operating conditions:

Bit	Carbide tip router bit
Rotation	12.000 – 24.000 rpm
Feeding speed	5 – 8 m/min.

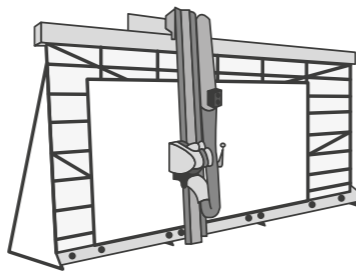


CNC machining centres

Panel saw
(not suitable for ALPOLIC™ A1 and ALPOLIC™ A2)

An example for the suitable blade and operating conditions:

Blade	Carbide tip cutter blade
Outside diameter	110 – 220 mm
Number of teeth	8
Rotation	2.500 – 5.000 rpm
Feeding speed	30 m/min.

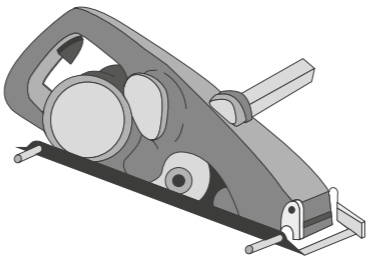


Panel saw

Hand grooving machine
(not suitable for ALPOLIC™ A1 and ALPOLIC™ A2)

An example of the suitable blade and operating conditions:

Blade	Carbide tip cutter blade
Outside diameter	110 – 120 mm
Number of teeth	4
Rotation	5.000 – 9.000 rpm
Feeding speed	5 – 20 m/min.

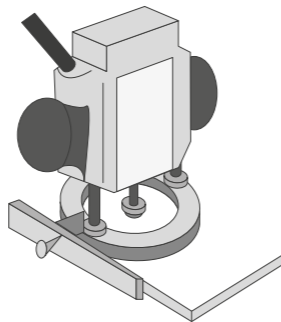


Hand grooving machine and groove cutter

Hand router
(not suitable for ALPOLIC™ A1 and ALPOLIC™ A2)

An example of the suitable bit and operating conditions:

Blade	Carbide tip cutter blade
Number of teeth	2 – 4
Rotation	20.000 – 30.000 rpm
Feeding speed	3 – 5 m/min.



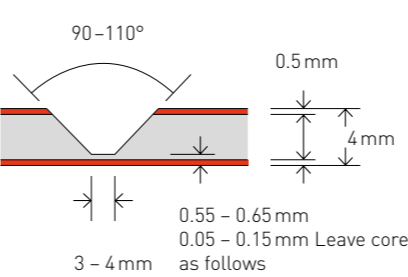
Hand router and router bit

Groove shapes, folding

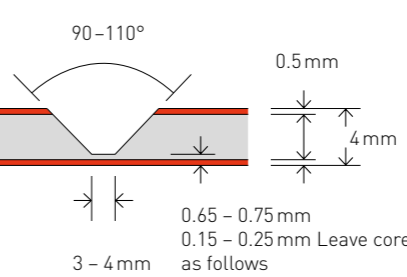
Grooves

The typical groove shape is slightly different between ALPOLIC™ A1, ALPOLIC™ A2 and ALPOLIC™/fr. The following figures show the shapes which are suitable for 90° folding:

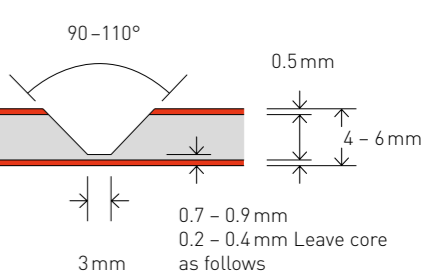
ALPOLIC™ A1



ALPOLIC™ A2



ALPOLIC™/fr



Folding

The illustrations opposite show typical foldings for ALOLIC™ A1, ALPOLIC™ A2 and ALPOLIC™/fr composite panels.

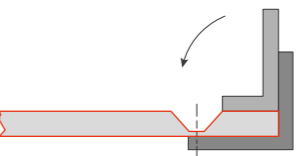


V-groove

Leave core as follows:
ALPOLIC™ A1 | 0.05 – 0.15 mm
ALPOLIC™ A2 | 0.15 – 0.25 mm
ALPOLIC™/fr | 0.20 – 0.40 mm

Notes on folding

- Fold the panels on a flat and stable worktable, because, if we fold a warping panel, the folding centerline will not be straight.
- The folded corner should have the suitable roundness as the above – mentioned figure. If the roundness is too small, the coating may have a crack on the folded corner. Check your V-shape and grooving depth.
- Cracks may occur when carry out the folding work at a low temperature. Have your folding work at 20 °C or higher.
- Folding after V-grooving entails slight elongation. The elongation is 0.5 – 1.0 mm per fold. Pre-adjust the position of the grooving line in your fabrication drawing.
- If the plates are bent several times, there is a risk that the aluminum skin will crack.



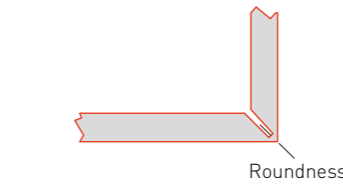
Folding jig

Use a folding jig made of aluminium or steel angle or H-profile.



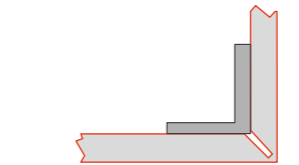
Fold

Folding by a jig nearly fits to the folding length.



Roundness

A suitable roundness is:
ALPOLIC™ A1 | 1.5 – 2 mm R
ALPOLIC™ A2 | 1.5 – 2 mm R
ALPOLIC™/fr | 2 – 3 mm R

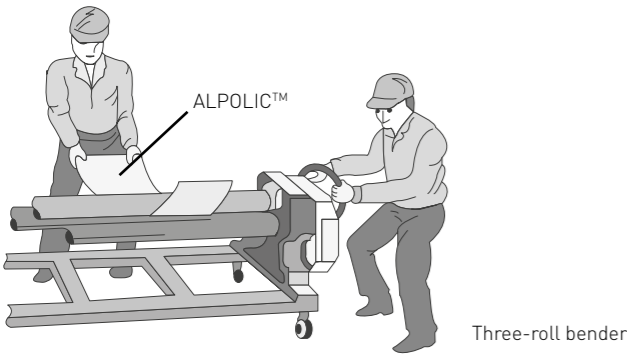


Support

Support with aluminium angle, if necessary.

Bending

Roll bending is suitable for ALPOLIC™ A1, ALPOLIC™ A2 and ALPOLIC™/fr.



Three-roll bender

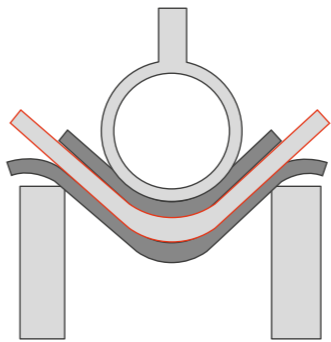
Panel thickness	ALPOLIC™ A1	ALPOLIC™ A2	ALPOLIC™/fr
4 mm	2.500 mm R	600 mm R	300 mm R

Notes on three-roll bending

- The exact bendable limit depends on the bending roll diameter, roll length and the type of bending machine.
- Wipe the surface of the roller carefully before bending.
- Remove any burrs at the panel edge that may cause dents while rolling.
- Remove the cut particles stuck on the panels and smooth any wrinkles on the protective film, which may cause dents.
- Do not constrict the panels between rolls (in thickness direction). Extreme compression may cause a physical damage of the core. Adjust the clearance between rolls to be the panel thickness plus an addition of approx. 0.5 mm.
- If a groove is desired in the panel, cut the notch after bending. Cutting the notch before bending will result in a distorted curving.
- For a small radius, gradual bending is required, during which the height of the bending roll is adjusted several times.
- In most three-roll benders, the curve near the edge tends to be straight. We can reduce this straight portion to some extent by overlapping another auxiliary sheet material and bending together with ALPOLIC™ panels. If we require a consistent curve near the edge, we have to do additional edge bending after regular bending.
- When we carry out the bending work at a low temperature e.g. 15 °C and with small radius e.g. 300 mm R, the coating surface may change to a haze-like appearance. Warm the panel to 20 °C or higher, and the haze-like appearance will disappear.
- In metallic colours, slight colour difference can be seen between bent and flat surfaces due to the difference of reflection angle.

Press brake

A press brake is not suitable for ALPOLIC™ A1 and ALPOLIC™ A2 and should only be used for ALPOLIC™/fr.

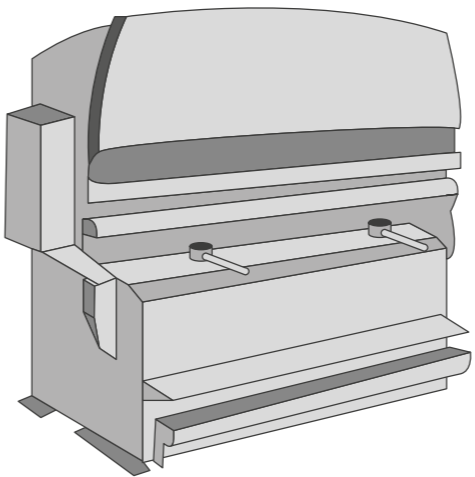


The smallest internal bendable radius of ALPOLIC™/fr is as follows

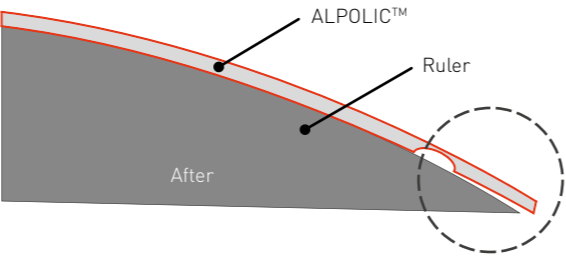
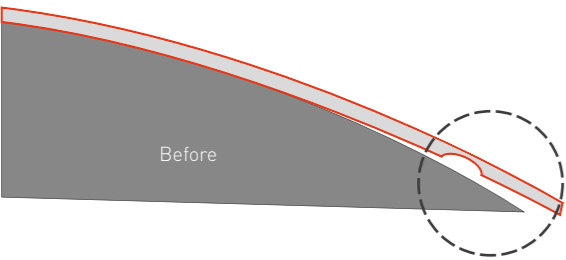
Thickness	Smallest bendable radius ALPOLIC™/fr	
	600 mm R	300 mm R
4 mm	80 mm	100 mm
6 mm	100 mm	140 mm

Notes on press brake bending

- Transverse” and ”Longitudinal” show the bending direction toward the rolling (coating) direction printed on the protective film.
- The smallest bendable radius means the limit at which visible wrinkles appear on the aluminum surface of the panel. Cracks will appear at a slightly smaller radius than this value.
- Use the top segment (punch) with an almost similar radius to the desired radius. If the radius is much smaller, the bending radius partially goes beyond the above limit, and cracks may occur.
- Use a urethane pad for the bottom segment, or place a rubber mat between the panel and the bottom segment.
- Use a scratch-free top segment. Polish and clean the upper cutting tool. Do the bending work without peeling off the protective film of the panel.
- If you carry out the bending work at a low temperature e.g. 15 °C, the coating surface may change to a haze-like appearance. Warm the panel to 20 °C or higher, and the haze-like appearance will disappear.
- With metallic colours, slight colour difference can be seen between bent and flat surfaces due to the difference of reflection angle.

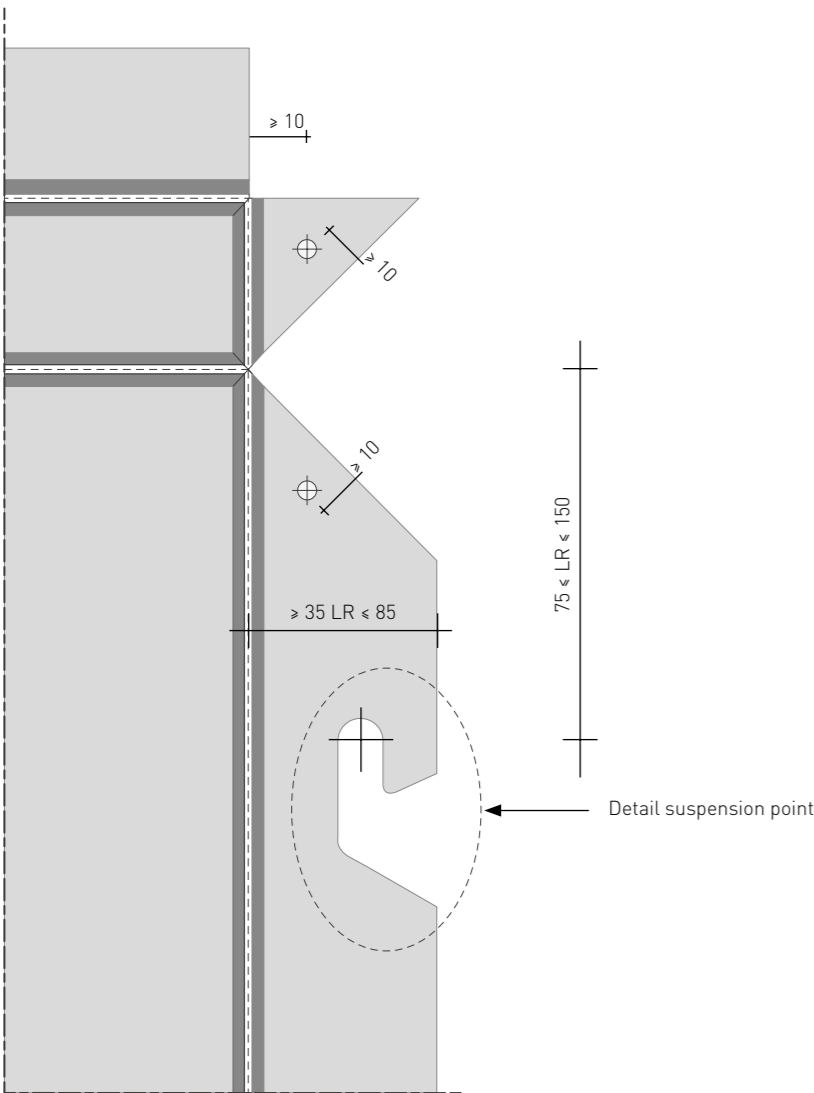


Press brake bending

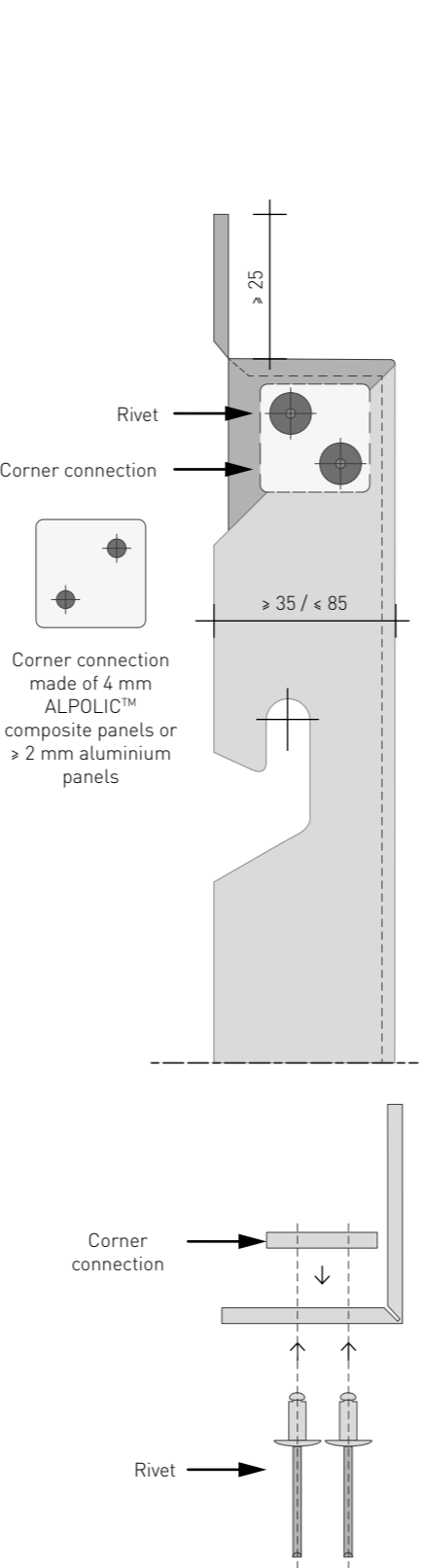


Cassette systems

Milling image - back side



Milling image - side view

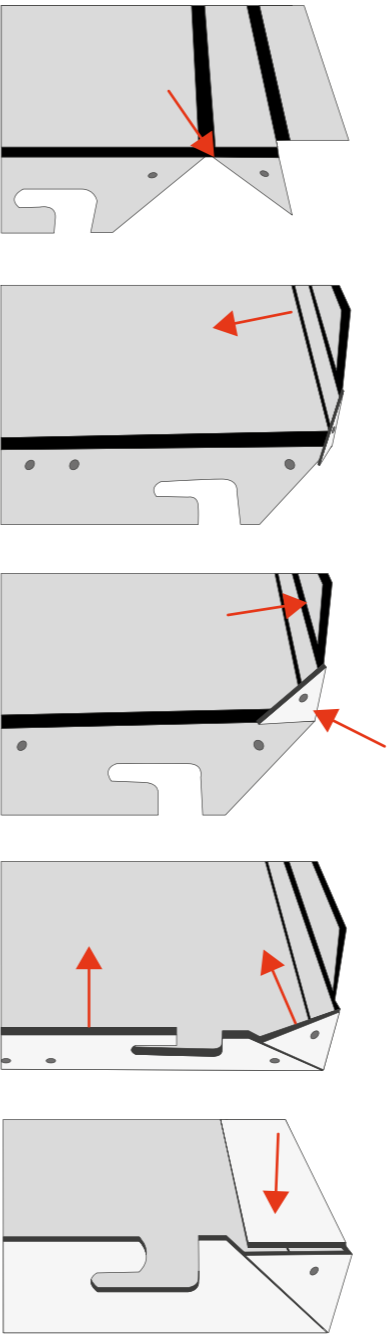


Edge-milling technique of cassette systems

You can edge the ALPOLIC™ composite panels either with a self-constructed rail or a bending bench.

- Fold the composite panels on a flat and stable work surface to avoid warping the panel around the centre axis.
- Perform bending at temperatures of min. 20 °C to avoid cracking.

Folding sequence



- 1 Cut V-grooves
- 2 Fold the narrow side more than 90°
- 3 Fold back to slightly more than 90° and fold the corner piece
- 4 Fold the corner piece with the longitudinal edge
- 5 Folding the upper edges
Due to the pre-stressing when over folding of the narrow side, the two edges of the V-grooves fit tight.

Perforated panels

Due to the mineral structure of the core, perforation with punching machines is not recommended for the ALPOLICA™ A1 and A2 composite panels. As an alternative, perforation can be done by drilling. As an alternative, we recommend perforation by CNC milling. Please contact us for further details.

Perforation process

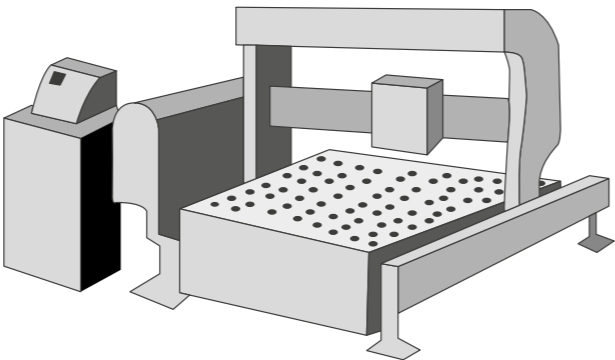
For the perforation of ALPOLIC™ composite panels a turret punching machine is usually used for perforating is used. An appropriate distance between punch and cutting tool is 0.1 mm or smaller (material thickness × 2 %). A small bevel is created on the punched edge a small slant.

Example of perforation pattern

On the right there is shown a typical hole-arrangement of circle-shaped holes.

Panel stability

Depending on the perforation ratio (ratio of perforated area to total panel), the load capacity and stability of the panels is reduced.



Direction	Pattern	Hole diameter	Interval (W)	Perforation ratio
Square		20 mm	40 mm	19.6 %
60° Zig Zag		5 mm	10 mm	22.6 %
		6 mm	10 mm	32.6 %
		7 mm	10 mm	44.4 %
		7 mm	12 mm	30.8 %
		8 mm	12 mm	40.2 %
		8 mm	16 mm	22.6 %
		10 mm	15 mm	40.2 %
		15 mm	25 mm	32.6 %

Note: perforation ratio is % of the total area that is perforated.

Guidelines for cleaning and maintenance

ALPOLIC™ aluminium composite panels enable high-quality façade design and require only minimal maintenance. For professional and quality-assured cleaning, we recommend using a company approved in accordance with GRM (Quality Association for the Cleaning of Metal Façade).

To maintain the optimal appearance of the aluminium composite panels, we recommend regular cleaning of the surface. All dirt should be removed in order to restore the original appearance of the surface as far as possible. In addition, environmental influences should be prevented from affecting the surface for too long, as they can cause corrosion or permanent stains.

It is worth investing in regular cleaning, not only to maintain the optimal appearance of the façade, but also to protect the aluminium composite panels against external influences in the long term. Professional cleaning should be carried out only by the persons responsible for the care and maintenance of the building façade. This cleaning guideline provides suggestions to assist in carrying out safe cleaning and maintenance of exterior applications from roof to façade.

Recommended frequency of cleaning

Frequent and regular cleaning of ALPOLIC™ aluminium composite panels is recommended. The frequency depends on how aggressively external influences act on the façade surface. These include, for example, the geographical location of the

building, soil conditions, weather, air pollution and the use of air conditioning. In addition, there are the owner's requirements with regard to surface quality.

Environmental influences

The effects of external influences on aluminium composite panels depend mainly on two factors: humidity (i.e. the period of time during which moisture is on the surface) and pollution (i.e. the presence of industrial fumes in the air, mainly sulphur dioxide, carbon, etc.).

Safety during cleaning

When cleaning aluminium composite panels, safety precautions are a top priority to ensure your personal safety. Always ensure that protective equipment is worn: Eye and skin protection, work shoes and gloves. Always pay attention to your surroundings.

Preparation before cleaning

Cleaning should be done on a mild, cloudy day. It always starts with the gentlest cleaning method. If you are unsure about the dosage of the cleaning agent, test the product and the procedure in an inconspicuous place. Always follow the manufacturer's recommendations regarding the mixing and dilution ratio of the cleaning agents. Only use the cleaner where it can be rinsed off immediately before chemical drying.

Selection of suitable tools

Cleaning should be done manually or with the help of special machines. If you use automatic wall cleaning devices for a building, please follow the manufacturer's instructions. Before cleaning the entire aluminium panel, you should test the selected cleaning product on an inconspicuous area. This is the only way to ensure that the procedure does not adversely affect the coating.

Selection and application of the cleaning product

The choice of cleaning product depends on the location and degree of soiling of the aluminium composite panels. Only water-based, mild cleaning agents should be used to clean the aluminium composite panels. The wrong cleaning agent can have a negative effect on the substrate and the protective layer and cause irreversible damage to the façade. If façades are contaminated with water-insoluble dirt, solvents are the only effective alternative.

Type of pollution	Recommended product	Type of use of the product
Water soluble	Water rinsing	Apply moderate pressure and rub with soft, damp brushes, sponges or cloths.
Not water soluble	Mild detergent	If the product is suitable for use on bare hands, it can also be used for cleaning the aluminium composite panels. Apply with brushes and sponges. Then rinse with water and dry.
	Stronger detergents	Should be tested in one place and may require appropriate gloves. Same use as above. Then rinse with water and dry.
	Mild solvent	Follow the manufacturer's recommendations. The mild solvent should be tested on one spot first. Use appropriate protective equipment. Use a clean cloth to apply and remove the solvent. Wash off any remaining residue with a mild detergent. Finally, rinse with clean water and dry.

Unsuitable cleaning agents and materials

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- Acid or alkaline cleaning agents
- Organic solvents
- Cleaners with unknown chemical composition
- Cleaners containing abrasives
- Bleaching agents
- Steel or wire wool, abrasive cleaners or other materials that could abrade or rub off the painted surface

Carrying out the cleaning

Make sure that the cleaning agent and the façade are „cold“ (max. 20 °C) and not directly exposed to the sun. The cleaning process must be carried out step by step from the bottom up. Please note that excessively frequent cleaning, in combination with strong friction, can damage the aluminium composite panels. Cleaning agents should never be mixed together as this can lead to the emission of toxic gases. Follow the guidelines according to the products selected above.

- Removing light surface contamination

The following steps can be used to remove light soiling from the surface of the ALPOLIC™ composite panels.

1

Perform a water rinse with moderate pressure to remove the dirt. If this does not help, use a sponge during the water rinse. If the dirt is still present after drying, remove it with a diluted mild detergent.

2

Apply the diluted mild detergent with a soft sponge or cloth. Wash the surface with even pressure, first with horizontal, then with vertical movements.

3

Prevent drops and splashes of the mild detergent as much as possible and rinse off any running detergent immediately to prevent streaking. Clean the surface from top to bottom and then rinse thoroughly with clean water.

- Removing medium to heavy surface contamination

To remove medium to heavy soiling caused by grease or sealing material, use alcohol, e.g. IPA (isopropyl alcohol), ethanol or N-hexane.

1

Dilute the alcohol with water to 50%. Strong solvents or cleaners containing solvents can have a harmful effect on the coating.

2

Carry out a test cleaning on a small test area.

3

Wash off the residue with mild soap and rinse with water.

- After cleaning

1

Rinse the surfaces carefully and systematically from top to bottom with clear water to remove the remains of the cleaning product.

2

Wipe the surface dry and remove the excess rinse water with a sponge, squeegee or wash leather to remove the residue.

Measures for repair

Fine work and retouching

This procedure is specifically for repairing very small areas damaged during assembly or handling, such as scratches or minor defects. Small scratches can be retouched with air-drying paint and a brush. Small deformations can be corrected

with a car spatula before painting. However, we recommend testing on a standard sample before carrying out a large-scale paint job. For fine work and retouching on larger areas, please contact your ALPOLIC field representative.

Procedure for the repair

1

- Ensure that the surface to be treated is clean, dry and free from contamination.
- Wash the area with a mild cleansing solution.
- Rinse the surface with clean water and make sure that the cleaning agent has been completely removed.
- Dry the surface carefully.
- Clean the affected area lightly with a cloth impregnated with xylene or toluene.

- Wait until the surface is completely dry.
- Ensure that the ambient air and the surface temperatures are above 10 °C.
- Prepare the touch-up paint according to the instructions for use.
- Carefully apply the touch-up varnish to the prepared surface with a small artist's brush.

→ **Note**
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ALPOLIC™
WORLDWIDE



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Italy



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Marina Bay Sands, Singapore



Medpark International Hospital,
Chisinau, Moldova



City Green Court, Prague,
Czech Republic



Mercator Shopping Center, Ljubljana,
Slovenia



Burj Al Arab, Dubai,
United Arab Emirates



Residential house, Gava, Spain



Civil Justice, Manchester,
Great Britain



Mosae Forum, Maastricht,
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Schutgebäude,
Amersfoort, Hungary © Sorba



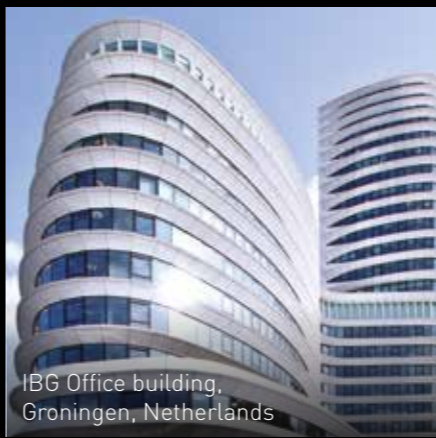
Eisai Tsukuba Knowledge Center,
Ibaraki, Japan



Mahler Office Tower,
Amsterdam, Netherlands



OZ Retail & Shopping Mall, Krasnodar, Russia



IBG Office building,
Groningen, Netherlands



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