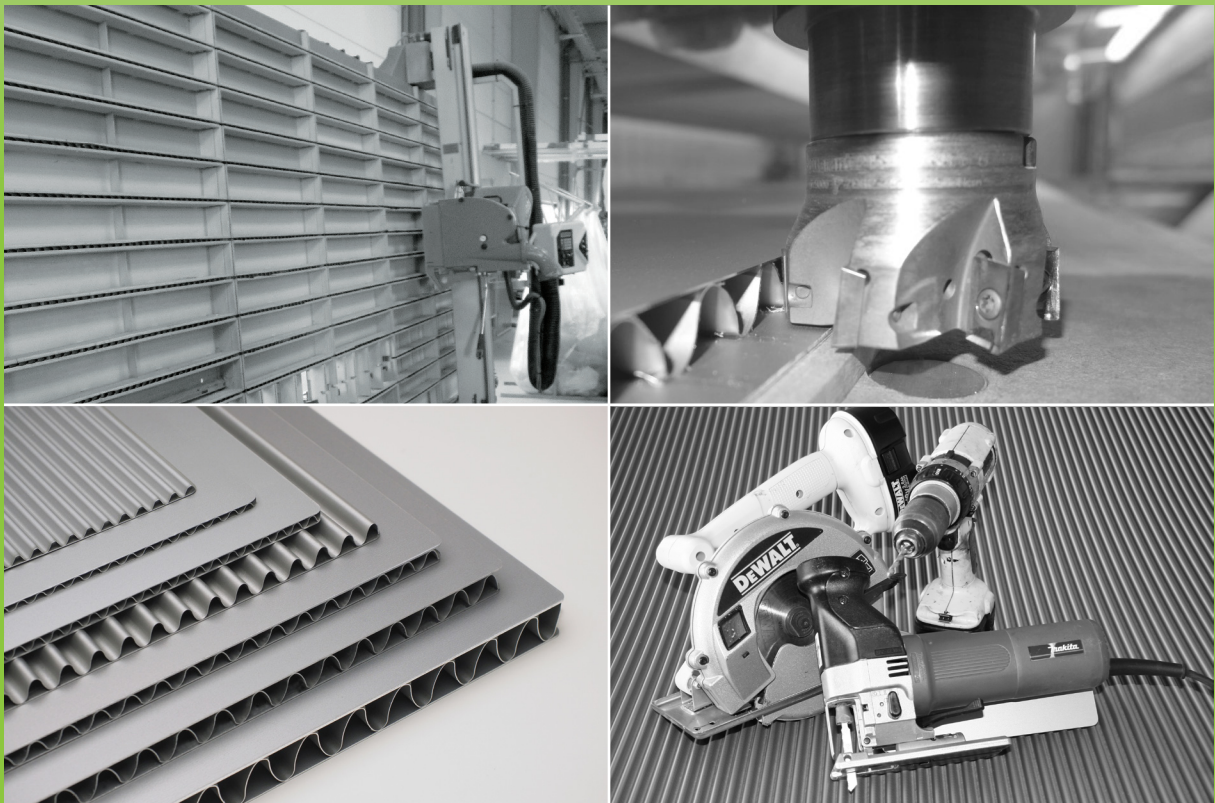




processing and design tips



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EDGE FORMS

Edge designs

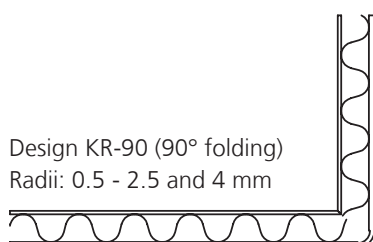
Metawell® offers other possibilities for edge finishes than sheet metal, which is due to its specific panel structure. More significant characteristics can be created at the edge of a sandwich panel by use of an application-matching edge design:

- optical adjustment of the edge to the application
- increase of the element's stiffness in the edge areas
- reduction of the risk of injuries caused by sharp metal edges
- reduction of assembly work by „automatic“ fitting e.g. by integrated drill holes for connectors
- concealed attachment of profiles and fittings at the back of an edge finish

In order to obtain an attractive edge the panel has to be mechanically processed. Therefore the panel is milled through back sheet and corrugation to the cover sheet. The milling geometry is dependend on the final edge form and the machining tools. In view of the requested narrow tolerances for double foldings and foldings at the corners the relevant panels should be processed with CNC-work stations only. Once the panels are milled, the folding itself can be done either by hand or with simple edging aids. Like this flat (milled) panels, that take less space during transport, can be sent to the assembly site where they are further processed and folded. Only panels with a cover sheet thickness of min. 0.8 mm can be milled and folded. The max. folding angle with single milling is 135°.

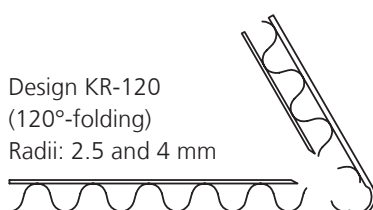
Note

It is strongly recommended to make a preliminary test or ask for processed samples to judge the technical and optical suitability of the chosen edge design. Please contact the plant for any further technical questions.



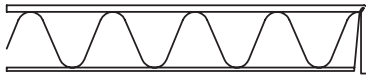
Edge design KR-90

Use: ceiling elements, linings
Tool: CNC-work station, vertical saw, hand-tool (limited)
Particularity: folding radii of 2.5 and 4 mm can also be realized with coil-coated panels



Edge design KR-120

Use: ceiling elements
Tool: CNC-work station, vertical saw, hand-tool (limited)
Particularity: folding radii of 2.5 and 4 mm can also be realized with coil-coated panels



Design BK (sheet covered edge)
Radius: approx. 1 mm

Edge design BK

Use: ceiling elements, linings, doors, covers
Tool: CNC-work station
Particularity: can also be realized with coil-coated panels



Design EP/S (hammer shear cut edge)

Edge design EP/S

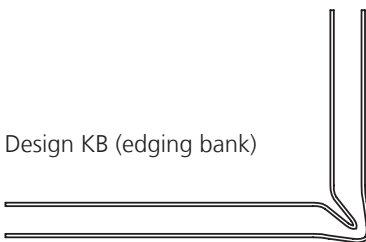
Use: ceiling elements, linings
Tool: rotary jars
Particularity: ideally suited for coil-coated panels (no cuttings)



Design EP/D (cover sheet pressed)

Edge design EP/D

Use: gapless ceilings, big joint-less surfaces
Tool: CNC-work station
Particularity: perfectly suited for subsequent sealing/jointing



Design KB (edging bank)

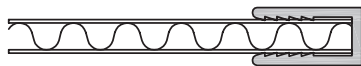
Edge design KB

Use: structural parts
Tool: edging bank
Particularity: folding without preparatory milling, no cutting of cover sheets, only for applications with no visual demands
Note: bending only possible right-angled to corrugation

Border finishes



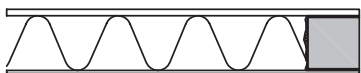
Plastic beading



Edge cap



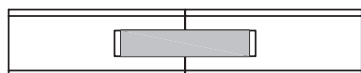
Edge profile



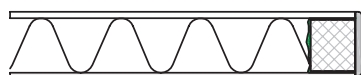
Glued insert



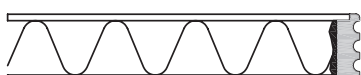
Postforming edge



Tongue-and-groove system



Edge-banding



Injection-molded edge

Besides foldings many other border finishes are possible with Metawell® panels. When choosing an appropriate finish the following aspects should be considered:

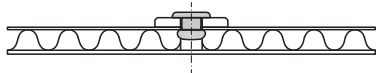
- Optical requirements (design, type of surface)
- General constructional conditions (flush connection to the panel surface, fixing of accessories or connection with other elements)
- Ambient parameters (temperature, pressure, affecting media)
- Load on the borders during operation (mechanic stress, thermal loads, type of element – mobile or fixed mounting)
- Requirements with regard to tightness
- Production efforts and quantity (single production, project-wise production, serial production, available tools and devices)

The combination of Metawell® panels with other elements or materials is possible and has been done successfully for years in consideration of the relevant individual conditions. For interior constructions, for instance, postforming edges with glued-in wood, plastic or aluminium profiles and HPL-surfaces can be realized.

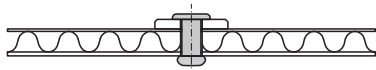
In order to have a defined base it may be necessary to machine the panels, e.g. to mill the corrugation off along the edges and to fill them with foam or inserted plastic ribbons before applying the final edge ending. This preparation is mainly necessary when edge bandings or injection-molded borders are wanted. Further technical questions regarding these border finishes can be discussed with the plant.

RIVETING

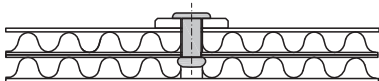
Specifications



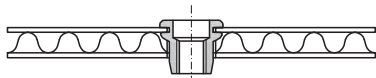
Blind rivet – concealed fixing



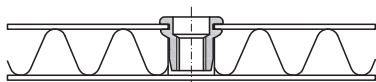
Blind rivet - throughgoing



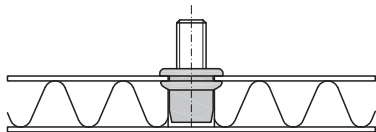
Blind rivet – riveting in double panel



Blind rivet nut - throughgoing



Blind rivet nut - concealed



Blind rivet screw

Metawell® panels can be connected to each other or to other materials by conventional rivets. The rivets' length and diameter depend mainly on the combination of the components involved.

The core structure of Metawell® also allows concealed riveting on one side. The use of blind rivets enables the visible surfaces to be mechanically secured without detracting from their visual appearance. Such methods are used, for instance, in interior constructions and façade technology.

Mounting blind rivet nuts and screws into Metawell® is possible. When piercing through completely they provide increased resistance against bending moments since the back sheet holds the blind rivet nut and withstands deformation. Blind rivet nuts should have at least four turns of thread.

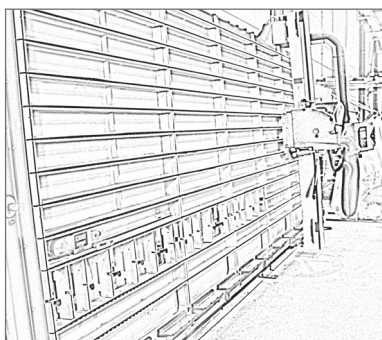
The rivet's extraction strength depends on the combination of materials and additional factors, the determination of which might make a test necessary. The rivets' mechanical parameters can be found in the relevant supplier's production description.

Source of supply

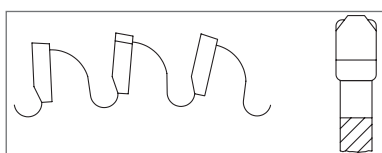
- Titgemeyer GmbH, D-49084 Osnabrueck
<http://www.titgemeyer.de>
Blind rivets, blind rivet nuts
- Boellhoff GmbH, D-33622 Bielefeld
<http://www.boellhoff.de>
Blind rivets, blind rivet nuts
- Gesipa GmbH, D-64546 Moerfelden-Walldorf
<http://www.gesipa.com>
Blind rivets, blind rivet nuts

SAWING

Specifications



Vertical saw (panel saw)



Negative flat trapezoidal tooth
Leitz-circular saw blade

Metawell® can be worked with circular, jig and band saws with conventional saw blades: dihedral saw blades should not be used, however, since the teeth may become entangled between the cover sheet and the corrugation producing an unclear cut. Flat trapezoidal teeth with a negative tooth position and hard metal cutting edges have proven ideal when using circular saws.

A format-cutting sliding table or the use of vertical saws is advantageous when processing large panels. For optimum results, we recommend the use of end stops. Sawing in packs to rationalize processing is possible.

The fixation of the panels and the suitability of the suction device (e.g. ATEX Directive, volume flow, etc.) should be considered particularly.

Grooves that allow subsequent edging without the help of a folding machine can also be introduced into the panels by using circular or vertical saws. For this, however, in addition to the use of a prismatic mill cutter, a roller must also be used to press down the panel to ensure a defined cutting depth.

Preliminary tests with suitable samples are recommended.

Tool parameters

Saw type	Circular saw	Band saw	CNC- saw blade
Saw blade	80 teeth / D = 250 mm	14 teeth / 1"	D = 160 mm
Feed	10 m/min	20 m/min	10 m/min
Speed	3500 - 6500 U/min	-	12.000 U/min

Different dimensions at Leitz-circular saw blades with neg. FZ / TR.

Source of supply

Leitz GmbH & Co. KG
<http://www.leitz.org>

MILLING AND DRILLING

Specifications

Metawell® panels can be processed with hand tools and machine tools. Wood-working tools are ideal, especially if equipped with the relevant protection device against metal cuttings, since processing Metawell® is more closely related to processing wood than to processing metal. This refers particularly in terms of the large surface area, the clamping techniques, the feed speed and the lack of requirement for coolants and lubricants. In addition, the usability of the existing suction device must be checked in advance. In addition, the usability of the existing suction device (e. g. ATEX, volume flow, etc.) has to be checked in advance.

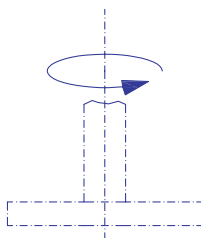
Generally we distinguish between the following types of processing, for which different types of machines or tools are required:

- Milling contours
(both cover sheets and the corrugation are removed)
 - hand tool - end mill with router
 - machine - CNC-work station with router
- Milling grooves
(one cover sheet and the corrugation are removed)
 - hand tool - panel router (limited applications)
 - machine - CNC-work station with prismatic cutter
 - vertical saw with prismatic cutter (limited applications)
- Milling out the corrugation
(the corrugation is removed on the panel sides only)
 - hand tool - trimmer with slit cutter
 - machine - CNC-work station with slit cutter
- Drilling
 - hand tool - drilling machine or router
 - machine - CNC-work station with driller or router

Tool parameters

The tool parameters listed below are based on long-term experience. In view of the many different tools and machines available it is highly recommendable to make some processing trials with the tools and machines that will be used later on.

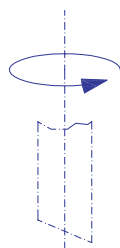
Slit cutter



Removing the corrugation
(slit cutter)

Tools	Slit cutter (removing the corrugation at the sides)	Slit cutter (removing the corrugation at the sides)
Type	Grooving cutter 22.5 x 4 (milling depth max. 8 mm per operational step)	T-Grooving cutter 45 x 8,2 (has to be ground to the requested width)
Speed	10.000 min ⁻¹	10.000 min ⁻¹
Feed	5 m/min	5 m/min
Supplier	Hoffmann GmbH http://www.hoffmann-tools.com	Leitz GmbH & Co. KG http://www.leitz.org

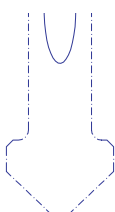
Router



Milling contours (router)

Tool	Router 8 mm (mill cutting of contours)	End mill 4 mm (Inner corners, bottom holes and drill holes)
Type	VHM contour miller 8 x 30 x 80 mm solid carbide contour cutter, one blade, right hand twist, right-cutting, TiAlN-coating	VHM contour miller 4 x 15 x 40 mm solid carbide contour cutter, oneblade, right hand twist, right-cutting, TiAlN-coating
Speed	18.000 min ⁻¹ to 30.000 min ⁻¹	8.000 min ⁻¹ to 30.000 min ⁻¹
Feed	5 m/min to 10 m/min	0,5 m/min to 10 m/min
Supplier	REXIM GmbH http://www.rexim.de	REXIM GmbH http://www.rexim.de

Prismatic cutter



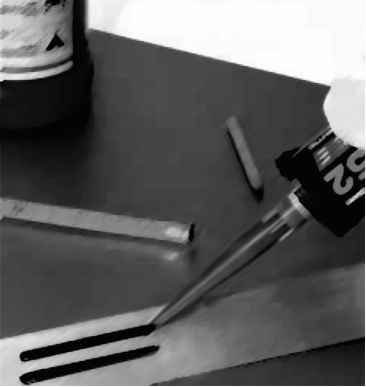
Milled groove for folding
(prismatic cutter)

Tools	CNC V-groove cutter (0.5 mm folding radius)	CNC V-groove cutter (2.5 mm folding radius)	CNC V-groove cutter (approx. 4 mm folding radius)
Type	V-groove cutter (with changing blades)	V-groove cutter (with changing blades)	V-groove cutter (with changing blades)
Speed	max. 10.000 min ⁻¹	max. 10.000 min ⁻¹	max. 6.200 min ⁻¹
Feed	6 m/min	6 m/min	5 m/min
Supplier	Leitz GmbH & Co. KG http://www.leitz.org	Leitz GmbH & Co. KG http://www.leitz.org	Leitz GmbH & Co. KG http://www.leitz.org

Note

Depending on the required radii and the available surface of the panel, the appropriate milling tools have to be defined.

Potential restrictions and instructions of the relevant suppliers have to be observed.

	<h2>BONDING</h2>
<p>Specifications</p> 	<p>Bonding is the connection technique best suited to the nature of a sandwich panel:</p> <ul style="list-style-type: none"> • The uniform stress distribution over the whole of the bonded surface ensures static and dynamic rigidity. Bonding across the whole surface provides better vibration dampening than riveted or screwed connections. • The use of bonding ensures that the surfaces remains mechanically and visually unimpaired. • Adhesives are particularly popular for light constructions since very thin components can be fixed to each other without a problem. • Adhesives can also serve as sealant against fluids. • When connecting different metals, the adhesive's insulating effects prevent the build-up of local effects and the formation of contact corrosion. • A great variety of contact adhesives (constructional glues), surface adhesives and adhesive strips are available on the market and have proved their performance in the most different applications for years. <p>Adhesives are normally magnetically neutral and provide electrical and thermal insulation. Since the individual layers of Metawell® panels are bonded to each other and therefore already optimally prepared for bonding at the factory, only little additional time and expense is required for this connection technique.</p> <p>The choice of the best adhesion system for a particular application depends on the materials being joined and the requirements that have to be met. The traditional gluing systems offer a great choice with regard to strength, adhesion, lifetime, processing conditions and further technological characteristics.</p> <p>Please contact our factory or the adhesive manufacturer to determine the best suitable adhesion system.</p>
<p>Source of supply</p>	<p>Sika Deutschland GmbH http://www.sika.com Systems: SikaFlex and SikaTack</p> <p>3M Deutschland GmbH www.3mdeutschland.de</p>
<p>Modifications and errors reserved</p>	<p>9</p>

FORMING

Metawell®



Formed Metawell® panels

Metawell® panels, as e.g. the panel type Alu CC 08-02-05 / H6 which is frequently used in interior constructions, can be plastically shaped around one axis with appropriate devices. The forming process creates tensile strain in one cover sheet of the panel and crushing strain in the opposite cover sheet. The loading direction has also an influence on the panel, which is due to the fact that the core of Metawell® panels is a corrugated sheet:

- When bending parallel to the corrugation tops, the cover sheet which is under crushing strain may buckle between the corrugation peak. Therefore only large bending radii can be realized in that direction. Mostly it is advantageous to use a thicker cover sheet.
- Bending perpendicularly to the corrugation tops is considerably easier. The behaviour is dependent on the cover sheets (tensile strength, thickness) as well as on the corrugation. Too narrow bendings may lead to optical impairments because the cover sheets deform a bit more between the corrugation.
- The plastic deformation of the panels lead to inherent tensions in the panels which may have an effect on the further processing steps. Particularly after subsequent cutting inherent tensions could become noticeable in the form of distortions.

Note

In order to determine appropriate working parameters it is recommended to make bending trials with suitable samples. In view of the problem of inherent tensions the model sample should be as close to the real element as possible. This refers in particular to mechanic processing steps after the bending process such as changing contours, making cut-outs or inserting slots.

Metawell® Aluflex

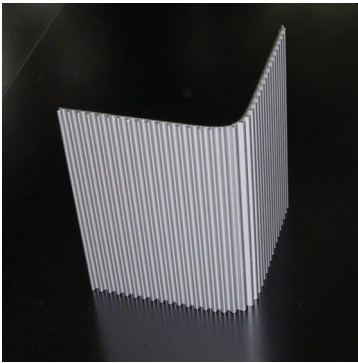


Fig. 1: Transformation parallel to the corrugation tops

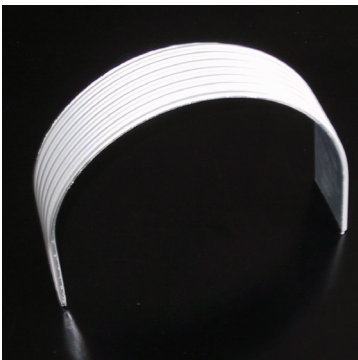


Fig. 2: Transformation perpendicularly to the corrugation

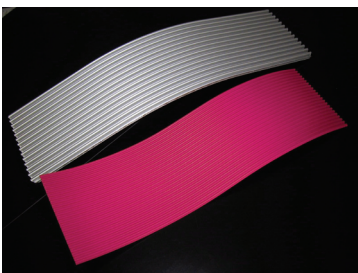


Fig 3: Formed structures

Metawell® Aluflex consists of a thin corrugated aluminium sheet that is glued to one flat cover sheet. This makes for a panel that is very flexible in one direction but rigid in the other, which is ideal for formed structures.

Forming parallel to the corrugation

Thanks to its special structure Metawell® Aluflex can be very easily transformed around the axis parallel to the corrugation tops, with smaller bending radii (e.g. for Metawell® Aluflex 05-02 / H4.7 smaller than 200 mm) even plastically (see fig. 1). The bending parameters have to be determined case-wise to make sure that both bending radii and bending angle can be reproduced. In order to compensate the spring-back effect of the material, the 'over-bending' is very important. The rigidity around this bending axis is relatively small. It may be necessary to additionally stiffen the element e.g. by gluing a metal sheet or other surface material to the corrugation in order to obtain a two-dimensionally formed „panel“. With this bending technique radii of 30 mm and more can easily be realized with Metawell® Aluflex 05-02 / H4.7.

Forming perpendicularly to the corrugation

Any transformation perpendicularly to the corrugation makes the structural element considerably stiffer so that it can frequently be mounted directly (e.g. for curved ceiling linings in rail vehicles). Particularly advantageous is to have the corrugation exposed to the outside (fig. 2). Metawell® Aluflex 05-02 / H4.7 is thus suitable for bending radii of more than approx. 100 mm. With smaller radii the corrugation tends to be „pulled flat“ and the corrugation is seen through the cover sheet. Is the bending done with the corrugation on the inner side, higher min. bending radii are requested to avoid that the corrugated sheet buckles.

Note

It is strongly recommended to make trials with suitable samples in order to determine the working parameters as e.g. the overbending angle.

INDIVIDUAL COLOURING

Painting



Thanks to their even surfaces Metawell® panels are particularly suited as design material for surfaces that have to meet high demands regarding their visual effect. With the multiple possibilities there are some important aspects which have to be considered:

- The maximum temperature the panels can be exposed to is 100° C. Higher working temperatures might be tolerable for special paint procedures, but must be verified by the plant.
- To receive an optically even surface the minimum thickness of the cover sheet (visible side) should not be less than 0.8 mm.
- The type of painting is dependend on various parameters, but also on the total quantity and the geometry of the panels that have to be painted.

Bascially, there are three different painting techniques:

• Coil-Coating

Certain colours are available ex stock. Special colours can be supplied with bigger purchase quantities.

• Powder-coating

New techniques allow powder-coating for bigger order volumes. If necessary, please contact the us directly.

• Spray painting

Spray painting offers a maximum flexibility regarding surface design. Paint system, thickness and number of layers as well as many other characteristics can be individually adjusted to the application.

Metawell® panels with a primered top sheet can normally be lacquered with a coating varnish directly after removal of the protection foil or after cleaning the surface from oil and dirt without any additional pretreatment.

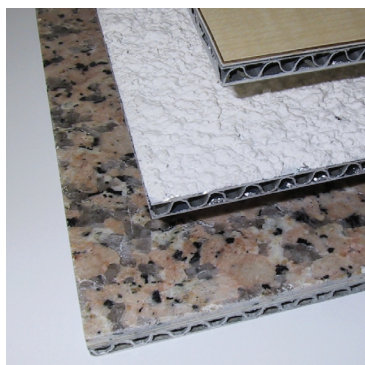
Working steps with spray painting

Paint preparation and painting should be performed in the following steps (steps 1 to 3 can be omitted if primered panels are used):

1. Roughen or sand the surface.
2. Primer the panels, using primer or paint base.
3. Apply a layer of fillers as vapour diffusion barrier if the panel is for exterior use.
Commercially available primers for metal surfaces tend to be watersensitive and must be sealed with such a coating.
4. Apply a min. 30 µm layer of coating varnish. When colours are critical (e.g. RAL 9016) please check with the paint supplier.
5. If needed the coating varnish can also be covered with a clear coat.

The relevant paint manufacturer's processing instructions must be observed when selecting and processing the paint system. Paint trials with the preferred paint system are highly recommended before use.

Coating



Because of its flat surface Metawell® panels are an ideal substrate for a variety of coatings. However, basic aspects have to be considered:

- The maximum temperature the panels can be exposed to is 100° C. Higher working temperatures may be possible on request.
- When selecting a coating the different expansion coefficients of panels and coating material must be taken into account.

Preliminary tests should always be carried out to check the suitability of the selected combined system.

Filler and plaster coatings

In principle, any fillers suitable for metal substrates, such as those used in the automobile industry, are suitable for filling Metawell® panels. Preparing the panel edges by appropriate measures (e.g. pressing down the cover sheet) helps to avoid sharp joints and improves the adhesion of the filler considerably. Therewith the risk of cracks is enormously reduced, too. Separate working instructions regarding smoothing and plastering works for interior constructions are available on request.

Foil coating

There are three methods to apply decorative foils on Metawell® panels:

1. Laminating with self-adhesive foils, e.g. for labelling and decorative purposes
2. Foil lamination using transfer adhesive foils (doublesided adhesive foils)
3. Foil lamination using a paint-on or spray-on surface adhesive

The most appropriate foil and coating technique should be chosen with respect to the final ambient parameters the system panel-glue-foil will be exposed to. Here particularly climatic influences have to be considered and possibly preliminary tests should be made.

High pressure laminates

When applying HPL the choice of an appropriate gluing system is particularly important. Dependend on the final place of use of the panel it must be examined if a double-sided coating of the panel with laminate and backpull is necessary in order to avoid deformations caused by the different material extension of the two panel sides. The processing instructions of the suppliers of both gluing system and HPL must be strictly observed.

Other coatings

Please contact the factory for advice before coating with any other material such as e.g. wood, glass, tiles, stone etc.

Note

For surfaces with carpets, as is mainly used for floors and platforms, Metawell® panels with a higher compressive strength are available.