# **BALCONIES AND RAILINGS**



NOTE
PLEASE CHECK ADDITIONAL AT WWW.FUNDERMAX.AT FOR THE LATEST VERSION OF THIS BROCHURE.

THE DIAGRAMS IN THIS TECHNICAL INFORMATION ARE SCHEMATICAL REPRESENTATIONS AND ARE NOT TRUE TO SCALE. THIS ISSUE REPLACES ALL OTHER ISSUES OF EXTERIOR TECHNIQUES BROCHURES OF FUNDERMAX WHICH WERE PUBLISHED BEFORE.



# General

Max Exterior panels can be mounted in a variety of different designs as panels for balconies, railings or fencing.

# **BASICS**

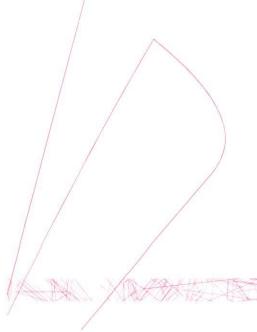
During construction and installation, care is to be taken that the material is not exposed to standing water. This means that the panels must always be able to dry out.

Connections of Max Exterior panels to one another always have to be made in the same panel direction. Max Exterior can show deviations from being flat (see EN 438-6, 5.3), and this is to be compensated for by the sub-construction being executed so that it is stable and flat. All connections to other components or to the background must be executed firmly. Elastic intermediate spacers to the sub-construction elements and also between sub-construction elements which permit a greater tolerance than ±0.5 mm must definitely be avoided. Max Exterior panels can be mounted with rivets or screws. Due

to the material properties of Max Exterior panels, fixed point and sliding points need to be made to mount the panels (page 74, Fig. 3).

## **TECHNICAL NOTES**

The substructure is to be protected against corrosion regardless of the material or system used. Anchoring elements for installation on walls or for installation of the panels must be suitably dimensioned to withstand the local wind loads and meet the local structural requirements. Verifications are to be submitted to the client. The necessary space for expansion according to the manufacturer's recommendations must be taken into account when installing Max Exterior panels.



# General

## SLIDING POINT

The diameter of the drill hole in Max Exterior must be drilled larger than the diameter of the fastening, depending on the required expansion clearance. This is the shaft diameter of the fastening plus 2 mm for every meter of cladding material starting from the fixed point. The head of the fastening must be big enough so that the drill hole in Max Exterior is always covered. The fastening is placed in such a way that the panel can move. Rivets are put in place with flexible mouth-pieces. The defined clearance of the rivet head, allows movement of the elements in the drill hole. Clearance + 0.3 mm (Fig. 8). Screws must not be over-tightened. Do not use any countersunk screws - use washers if necessary. The centre point of the drill hole in the subconstruction must coincide with the centre point of the drill hole in Max Exterior panel. Drill with a centring piece! The fastenings should be put in place starting from the middle of panel outwards.

# **FIXED POINT**

Fixed points are used for uniform distribution (halving) of the expansion and shrinkage movements. The diameter of the drill hole in Max Exterior is the same size as the diameter of the fastening.



SINGLE SPAN PANEL

Fig. 1







DOUBLE SPAN PANEL

Fig. 2

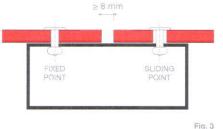
# PANEL JOINTS

The joints must be made at least 8 mm wide so that changes in size can take place without hindrance. In order to be able to design the inner sides of balconies so that they are uniformly sight, it is possible to produce Max Exterior panels with a white (rear) side decor 0890 NT balcony white. Due to the asymetric composition the fixing distances should be reduced by 15%.

# **BALCONY CORNERS**

Especially, in some circumstances, when refurbishing with very uneven subconstructions, it is important to have the front panel protrude about 10 mm in front of

the side panel. In this way, inaccuracies can be concealed from the main viewing side.



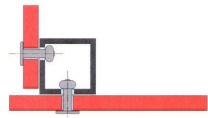


Fig. 4



# **Fastenings for balconies**

It is essential that fastenings are made from non-corrosive materials.

# MAX EXTERIOR BALCONY SCREW (A2)

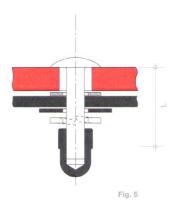
With bare head, can be lacquered. Washer between Max Exterior panel and subconstruction made of polyamide. Diameter of drill hole in Max Exterior Panel:

Sliding points: 8 mm or as required

Fixed points: 6 mm

Diameter of drill hole in substructure: Drill hole for mounting: 6 mm or according to the dimension of fix-point-socket.

Screw length = Clamping thickness  $+ \ge 9 \text{ mm}$ 

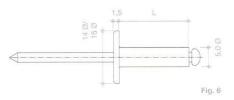


# ALUMINIUM BLIND RIVET

with big head colour lacquered for Aluminium-subconstructions. Rivet sleeve: material-no. EN AW-5019 acc. DIN EN 755-2 Rivet pin: steel material-no. 1.4541 Pull-off strength of rivet pin: ≤ 5,6 KN

# NIRO/NIRO BLIND RIVET

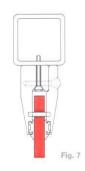
with big head colour lacquered for steel subconstructions.
Rivet sleeve: material-no. 1.4567 (A2)
Rivet pin: steel material-no. 1.4541 (A2)
Pull-off strength of rivet pin: ≤ 5,8 KN

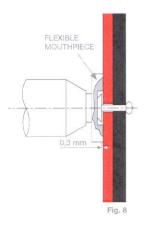


Diameter of the drill hole in the Max Exterior panel.
Sliding points: 8.5 mm or as required.
Fixed points: 5.1 mm
Diameter of drill hole in the metal subconstruction: 5.1 mm

## **GLASS MOUNTING BRACKETS**

may be used for fixing Max Exterior panels also. Clamping jaws should have securing pins which prevent the filler elements from falling if the clamp should slacken.





The rivets must be put in place with a flexible mouthpiece, clearance 0.3 mm.

APPROVALS FROM THE BUILDING AUTHORITIES FOR SCREWS AND RIVETS CAN BE OBTAINED FROM THE RESPECTIVE SUPPLIERS.

SUPPLIERS OF FASTENING AND SUBSTRUCTURES YOU WILL FIND ON PAGES 102/103 OR AT "WWW.FUNDERMAX.AT".

# Principle of fastening the railingstructure

# FASTENING BELOW THE CONCRETE BASE

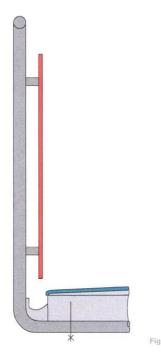
x = Fastening screw according to the static needs.

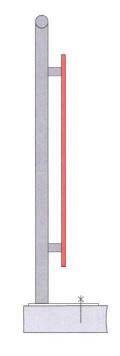
# FASTENING ON THE CONCRETE BASE

x = Fastening screw according to the static needs.

# FASTENING ON THE FRONTSIDE OF THE CONCRETE BASE

x = Fastening screw according to the static needs.





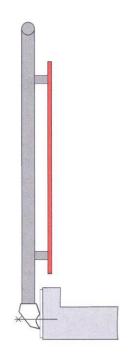


Fig. 3

THE RAILING HEIGHT IS CALCULATED FROM THE UPPER EDGE OF THE CONCRETE UPSTAND AS THIS IS TO BE REGARDED AS THE STEP SURFACE.



# MAX EXTERIOR RIVETED PANELS. RIVETING DONE AS DESCRIBED ON PAGE 75.



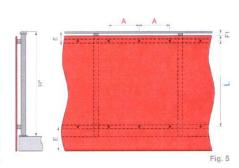
The railing installation variants shown here have been tested at the University of Technology, Hanover in accordance with the ETB guidelines for "Building Components which Safeguard against Falls, June 1985" and passed.

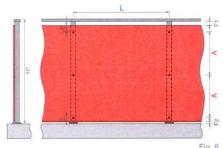
- F1 ≤ 120 mm
- F2 ≤ 40 mm
- Projecting ends E
- for 6 mm panels: 20 mm  $\leq$  E  $\leq$  120 mm
- for 8 mm panels:  $20 \text{ mm} \le E \le 200 \text{ mm}$
- for 10 mm panels: 20 mm ≤ E ≤ 250 mm

Panel thickness	s in mm	Height of railing* H = 900-1100 mm = maximum fastening spacing
6	Α	≤ 350 mm
6 mm	L	≤ 800 mm

	Α	≤ 350 mm	
6 mm	L	≤ 800 mm	
0	A	≤ 350 mm	
8 mm	L	≤ 950 mm	
40	Α	≤ 400 mm	
10 mm	1	≤ 1000 mm	

\*THE HEIGHT OF THE RAILING MUST COMPLY WITH THE LOCAL BUILDING REGULATIONS, E.G. **OIB DIRECTIVE 4 - USE AND ACCESSIBILITY.** THE HEIGHT OF THE RAILING MUST BE AT LEAST 1000 mm; STARTING FROM A HEIGHT OF FALL WITH MORE THAN 12 m, MEASURED FROM THE BASE, MUST BE MINIMUM 110 cm.





# MAX EXTERIOR SCREWED PANELS. BALCONY SCREWS AS DESCRIBED ON PAGE 75.



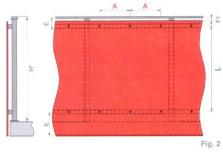
F1  $\leq$  120 mm F2  $\leq$  40 mm Projecting ends E

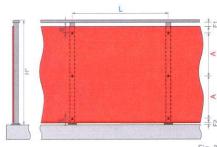
- for 6 mm panels: 20 mm ≤ E ≤ 120 mm
- for 8 mm panels: 20 mm ≤ E ≤ 200 mm
- for 10 mm panels: 20 mm  $\leq$  E  $\leq$  250 mm

Panel thickness mm	I I	Height of railing* H = 900 - 1100 mm = maximum fastening spacing
	Α	≤ 450 mm
6 mm	L	< 850 mm

6 mm	Α	≤ 450 mm	
	L	≤ 850 mm	
8 mm	Α	≤ 500 mm	
	L	≤ 1000 mm	
	Α	≤ 550 mm	
10 mm	L	≤ 1100 mm	

\*THE HEIGHT OF THE RAILING MUST COMPLY WITH THE LOCAL BUILDING REGULATIONS, E.G. **OIB DIRECTIVE 4 - USE AND ACCESSIBILITY.** THE HEIGHT OF THE RAILING MUST BE AT LEAST 1000 mm, STARTING FROM A HEIGHT OF FALL
WITH MORE THAN 12 m, MEASURED FROM THE BASE, MUST BE MINIMUM 110 cm.





# MAX EXTERIOR PANELS WITH ALUMINIUM EDGE STRIPS FIXED. DIMENSIONING ACCORDING TO STRUCTURAL ENGINEERING REQUIREMENTS.



F1 ≤ 120 mm F2 ≤ 40 mm  $B \ge 1300 \text{ mm} = \text{Length of element}$ P ≥ 28 mm Depth of profile D ≥ 8 mm Expansion gap

Attention must be paid to the drainage of the bottom profile!

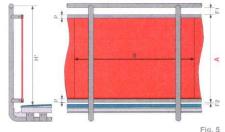
Donal	thickness	in	100 100	
Panei	tnickness	m	mm	

Height of railings\* H = 900-1100 mm

= maximum fastening spacing

6 mm	Α	≤ 950 mm	
8 mm	Α	≤ 1150 mm	
			Table 2

\*THE HEIGHT OF THE RAILING MUST COMPLY WITH THE LOCAL BUILDING REGULATIONS. E.G. **OIB DIRECTIVE 4 - USE AND ACCESSIBILITY.** THE HEIGHT OF THE RAILING MUST BE AT LEAST 1000 mm; STARTING FROM A HEIGHT OF FALL WITH MORE THAN 12 m, MEASURED FROM THE BASE, MUST BE MINIMUM 110 cm.



# MAX EXTERIOR PERFORATED AND RIVETED. BALCONY RIVETED AS DESCRIBED ON PAGE 75.



Centre distances have to be built linear and squarebased (see page 81/fig. 3).

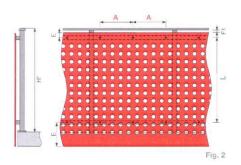
F1  $\leq$  120 mm F2  $\leq$  40 mm Projecting ends E

• for 10 mm panels: 20 mm ≤ E ≤ 250 mm

Fig. 1

Panel thickness in mm		Height of railing* H = 900-1100 mm = maximum fastening spaci		
10	A	≤ 350 mm		
10 mm	L L	≤ 840 mm		
		Table 1		

\*THE HEIGHT OF THE RAILING MUST COMPLY WITH THE LOCAL BUILDING REGULATIONS, E.G. **DIB DIRECTIVE 4 - USE AND ACCESSIBILITY.** THE HEIGHT OF THE RAILING MUST BE AT LEAST 1000 mm; STARTING FROM A HEIGHT OF FALL WITH MORE THAN 12 m, MEASURED FROM THE BASE, MUST BE MINIMUM 110 cm.



RE	RECOMMENDED HOLE PATTERN				
D	Diameter of hole	≤ 40 mm			
G	Hole distance	30 mm			
Н	Centre distance	70 mm			

Table 2

# **Fundamentals of Breast**work Constructions

In buildings where, as a rule, children are expected to be present, these must be functional and prevent being climbed over. Designs that feature openings must adhere to local building regulations.

## **AUSTRIA**

OIB RL 4.1.3/ÖNORM B5371 Point, 12 Maximum horizontal opening size: 12 cm Maximal vertical opening size: 2 cm

## **GERMANY**

# **DIN 18065:**

# 2001-01/State Building Codes

Maximum horizontal opening sizes In constructions using bars: 12 cm Maximal vertical opening size: 2 cm Diagonal size in constructions using horizontal boards or bars, as well as in lattice constructions: 4 cm

# **SWITZERLAND**

# SIA-Standard 358/Specialist brochure of the bfu - Swiss Council for Accident Prevention

In Risk Situation (GF) 1, the diameter of openings in the protective elements up to 75 cm in height may not exceed 12 cm. Climbing should be prevented or impeded by suit able measures such as: Horizontal traverses (openings) should be 1-3 cm max. in size Lattice-like patterns of holes: opening size of max. 4 cm Round drilled holes: opening size of max. 5 cm

When considering project-specific deviations, please consult with the relevant building authority.

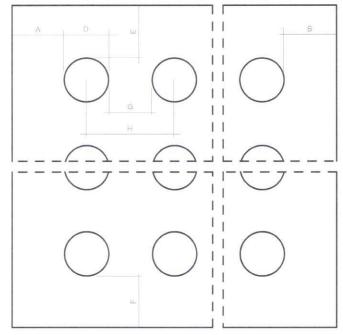


Fig. 3

- LEGEND
  A EDGE DISTANCE HORIZONTAL
  B EDGE DISTANCE HORIZONTAL
  D DIAMETER OF HOLE
  E EDGE DISTANCE VERTICAL
  F EDGE DISTANCE VERTICAL
  G HOLE DISTANCE HORIZONTAL

- AND VERTICAL
  H CENTRE DISTANCE HORIZONTAL
  AND VERTICAL

# MAX EXTERIOR PANELS PANELS WITH CLAMPING. SECTIONS FIXED (glass mounting brackets).



F1  $\leq$  120 mm F2  $\leq$  40 mm 20 mm  $\leq$  E  $\leq$  20 x Panel thickness G  $\geq$  35 mm

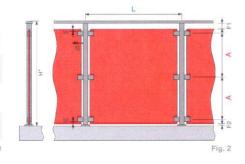
At least 3 fastening points must be positioned per side. For each panel element a bracket with safety pin has to be used.

Panel thickness in mm

Height of railing\*

H = 900-1100 mm = maximum fastening spacing

9 mm	A	≤ 450 mm	
8 mm	L	≤ 950 mm	
10 mm	Α	≤ 500 mm	
10 mm	L	≤ 1100 mm	
10	A	≤ 550 mm	
13 mm	L	≤ 1150 mm	
			Table 1



<sup>&#</sup>x27;THE HEIGHT OF THE RAILING MUST COMPLY WITH THE LOCAL BUILDING REGULATIONS, E.G. **OIB DIRECTIVE 4 - USE AND ACCESSIBILITY.** THE HEIGHT OF THE RAILING MUST BE AT LEAST 1000 mm; STARTING FROM A HEIGHT OF FALL WITH MORE THAN 12 m, MEASURED FROM THE BASE, MUST BE MINIMUM 110 cm.



# CURVED BALCONY WITH MAX EXTERIOR PANELS AND METAL EDGE STRIPS. DIMENSIONING ACCORDING TO STRUCTURAL ENGINEERING REQUIREMENTS.



The top and bottom edge profiles (2 mm thick) must be pre-bent. Only sliding line fastenings are allowed (no point fastenings). The straight ends and joints of the exterior panels must likewise be edged. (U-profile, H-profile).

# **RADIUS AT LEAST 3 m**

F1 ≤ 120 mm F2 ≤ 40 mm

B ≥ 1300 mm = Length of element

P ≥ 28 mm Depth of profile

Attention must be paid to the drainage of the bottom profile!

Panel thickness mm

Height of railing\*

H = 900-1100 mm = maximum fastening spacing

6 mm A ≤ 1000 mm

Table 2

THE HEIGHT OF THE RAILING MUST COMPLY WITH THE LOCAL BUILDING REGULATIONS, E.G. **DIB DIRECTIVE 4 - USE AND ACCESSIBILITY.** THE HEIGHT OF THE RAILING MUST BE AT LEAST 1000 mm; STARTING FROM A HEIGHT OF FALL WITH MORE THAN 12 m, MEASURED FROM THE BASE, MUST BE MINIMUM 110 cm.

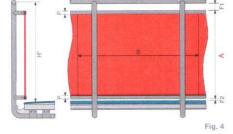




Fig. 5

# **Balcony partition wall**

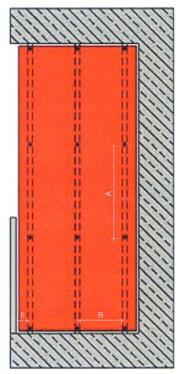
# **GENERAL INFORMATION**

Dividing walls made from Max Exterior F-quality panels are used to protect individual areas in long balcony-complexes or in access-balcony. The screens are standing vertically to the Building walls and are mounted in several ways like balcony claddings. The height is maximum from the top of the balcony floor to the ceiling of the next level. Like for the railing-subconstruction there is a difference between the fixing:

- · Fixing on end-to-end profiles
- Fixing on brackets

The substructure made from hollow-profile has to be realized according to the structural analysis and to be fixed on the reinforced-concrete plates with permitted dowels or with other mounting-parts. The profiles have to function as a statically line-bearing. The fixing of the Max Exterior F-quality panels has to be done with the same fastenings like on railing-panels. The screens have to be fixed with minimum 3 fastening points on each side.

F ≥8 mm  $20 \text{ mm} \le G \le 30 \text{ mm}$  Projecting ends E: for 6 mm panels 20 mm  $\le$  E  $\le$  120 mm for 8 mm panels 20 mm  $\le$  E  $\le$  250 mm for 10 mm panels 20 mm  $\le$  E  $\le$  250 mm



VARIANT 1 Fig.

TABLE FOR LOAD ON SINGLE SPAN/WIND LOAD*  MAX EXTERIOR PANELS RIVETED ON ALUMINIUM SUBSTRUCTURE						
PANEL THICKNESS	6 n	nm	8 n	nm	10	mm
LOAD q (kN/m²)	MAX B (mm)	MAX A (mm)	MAX B (mm)	MAX A (mm)	MAX B (mm)	MAX A (mm)
GERMANY/AUSTRIA/SWITZE	RLAND					
0,50	600	600	700	700	800	800
1,00	600	431	700	539	800	551
1,50	600	311	700	373	800	455
2,00	537	261	700	280	800	337

Values acc. to DIN 1055-T4 or DIN 18516 or ÖNORM B 4014-1,2 or EN 1991-1-4 or SIA-Norm 261 and permit Z 33,2-16

Table 1

Table 2

PANEL THICKNESS	6 n	nm	8 r	nm	10	mm
LOAD q (kN/m²)	MAX B (mm)	MAX A (mm)	MAX B (mm)	MAX A (mm)	MAX B (mm)	MAX A (mm)
MANY/AUSTRIA/SWITZE	RLAND					
0,50	600	600	700	700	800	800
1,00	600	373	700	400	800	420
1,50	600	249	700	320	800	280
2,00	537	208	700	240	800	210

Values acc. to DIN 1055-T4 or DIN 18516 or ÖNORM B 4014-1.2 or EN 1991-1-4 or SIA-Norm 261 and permit Z 33.2-16

VARIANT 2 Fig

<sup>\*</sup>ASSESSEMENT TABLES FOR THE WIND LOADING OF 0,3 kN/m² TO 2,6 kN/m² YOU WILL FIND IN THE DOWNLOAD SECTION OF OUR WEBSITE WWW.FUNDERMAX.AT





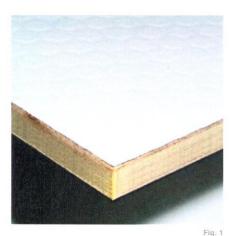






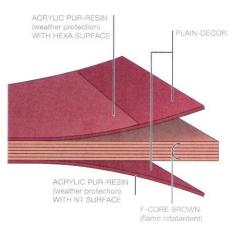
Fig.

# **Max Exterior Balcony Floor Panel**





SURFACE HEXA Fig. 2



STRUCTURE OF BALGONY FLOOR PANEL

## MATERIAL DESCRIPTION

The Max Exterior balcony floor panel is a high-quality construction product that is perfect for permanent use on balconies, loggias, staircases, landings and the like because of its anti-slip hexagon surface among other things.

Max Exterior panels are duromer high-pressure laminates (HPL) conforming to EN 438-6 Type EDF with additional, extremely effective, weather protection. This weather protection is made from double hardened Acrylic-Polyurethan-resins. They are produced in lamination presses at great pressure and high temperature Max Exterior panels carry the necessary CE label for applications in the construction sector.

# SURFACE

Front side: NH - Hexa Rear side: NT

# **DECORS**

two-sided; see our valid Max Exterior delivery programme or at www.fundermax.at

# **FORMAT**

on request or on our website - www.fundermax.at - you may find the up-to-date information.

 $XL = 4100 \times 1854 \text{ mm} = 7.6 \text{ m}^2$ Tolerances +10 - 0 mm (EN 438-6, 5.3)

Panel formats are production formats. If exact dimensions and angles are necessary, we recommend an all-sided blank. Depending on the method of trimming, net size is reduced by ca. 10 mm.

F-Quality, flame-retardant, colour brown

# **THICKNESS**

6,0 - 20,0 mm

(depending on the static requirement)

Thicknesses Tolerances (EN 438-6.5.3) 6,0 - 7,9 mm ±0,4 mm 8,0 - 11,9 mm ±0.5 mm 12.0 - 15.9 mm ±0.6 mm

±0,7 mm

NOTE FOR HORIZONTAL USE ONLY.

16,0 - 20,0 mm

## BASICS

Max Exterior balcony floor panels can be screwed or glued to a variety of suitable substructures with an incline. During construction and installation it is important to ensure that the material is not subjected to accumulating moisture. This means that the panels must always be able to dry off. Generally, balconies should be provided with an incline of 1.5 - 2%. Due to the material properties of Max Exterior balcony floor panels, suitable room for expansion must be taken into account. The joints between panels must be at least 8 mm wide. For substructures that run parallel to joints, the gaps between the panels must always be placed above a substructure, and can additionally be held at the same height by suitable joints, such as tongue and groove joints for example, that allow the appropriate room for expansion. Elastic intermediate layers between the panel and the substructure, as well as between parts of the subconstruction, that allow a tolerance of greater than ± 0.5 mm are absolutely to be avoided. When installing Max Exterior balcony floor panels on a wooden

substructure with screws, fixed and sliding points must be formed. Pay attention to the advises on pages 50/51. The wood-substructure has to be constructed according to the national standard specifications (wood moisture 15%±3). Pay attention to a qualified structural or chemical wood preservation! Suitable rear-ventilation is to be ensured so that the panels can be conditioned on both sides. The panels should not be allowed to rest fully on the ground below. The substructure is to be protected against corrosion regardless of the material or system used.

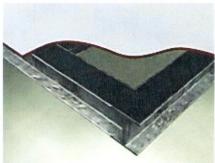
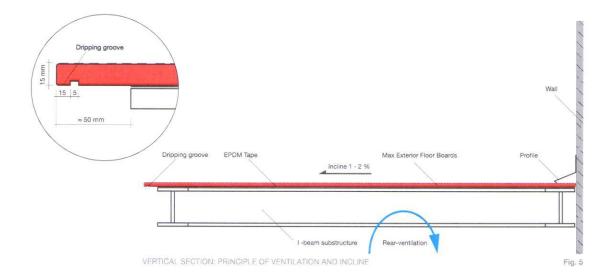


Fig. 4



# Guidelines for laying the floor panels

## **FIXING DISTANCES**

The substructure battens must have a width of  $\geq$  60 mm, in the joint area  $\geq$  100 mm.

# **EDGE DISTANCES**

For installation with screws, the edge distance can be 20 - 100 mm.

# BEARING/BEAM BEARING/BEAM BEARING/BEAM Fig. 1

## PANEL JOINTS AND JOINT FORMATION

The joints must be at least 8 mm wide so that changes in size can take place without hindrance. The joints are filled with permanently elastic sealant SIKAFlex 221 (colours: black, white, gray). To ensure a lasting surface adhesion, it is absolutely necessary to pre-treat the panels with Sika Primer 209N. For designs with tongue and groove joints, it must be observed that the sealant only sticks to the edges of the Max Exterior balcony floor panels and not to a third edge (tongue) in order to ensure the necessary space for expansion. A permanently elastic rubber band can also be placed in the groove.

MAX. ALLOWABLE DEFLEC-			
TION OF 1/300	3,0	4,0	5,0
PANEL THICKNESS	SU	IPPORT SPACING IN r	nm
		A ≤ 500	
12 mm	X	-	
16 mm	X	×	X
18 mm	X	X	X
20 mm	X	X	×
		A ≤ 600	
16 mm	X	X	
18 mm	X	×	X
20 mm	X	X	X
		A ≤ 800	
20 mm	X	×	~



BALCONY FLOOR PANEL SITE IN ST. VEIT/GLAN, AUSTRIA





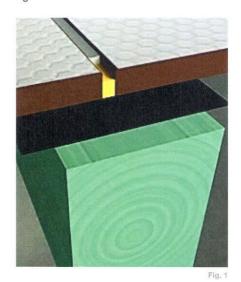


EXTERNAL CORNER AND EDGES

# Mounting of Max Exterior balcony floor panels mechanical non visible fixed

# **FIXED POINT**

Fixed points serve the uniform distribution (halving) of the swelling and shrinkage movements.



# **SLIDING POINT**

Based on how much space is needed for expansion, the diameter of the drill hole in the substructure should be that much larger than the diameter of the fastening means. The diameter of the shank of the fastening means plus 2 mm per meter of paneling from the fixed point. The fastening means is set such that the panel can move. Screws must not be overtightened. Do not use counter sunk screws. The center of the drill hole in the substructure must coincide with the center of the drill hole in the Max Exterior panel. Suitable drilling aids (drilling equipment) should be used. The fastenings should be put in place starting from the middle of the panel outwards.



DOUBLE SPAN PANEL

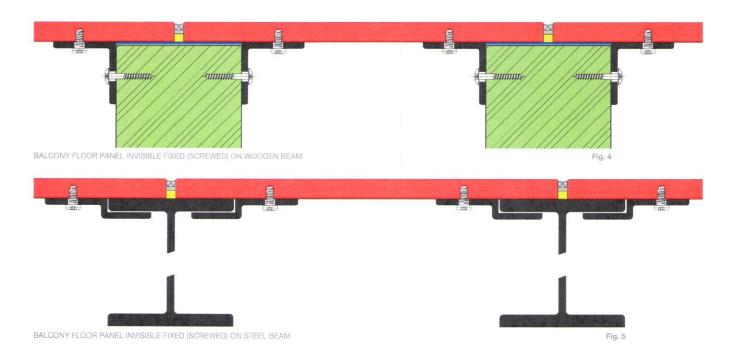
Fig.





SINGLE SPAN PANEL

Fig. 3



# Mounting of Max Exterior balcony floor panels with gluing system



## GLUING

An alternative to mechanical fastening is gluing the Max Exterior balcony floor panel with the gluing system SIKA-Plastiment - the Sika Tack Panel which was specially developed for this purpose. This works on conventional planed wood substructures or on metal.

## Note:

Ensure that the Max Exterior (balcony floor-) panel is not subjected stress when gluing it into place. When installing the Max Exterior panel, be sure to take the expansion and shrinkage behavior into account.



Fig. 7



BALCONY FLOOR PANEL WITH SECRET FIXING (GLUED) ON STEEL BEAM

