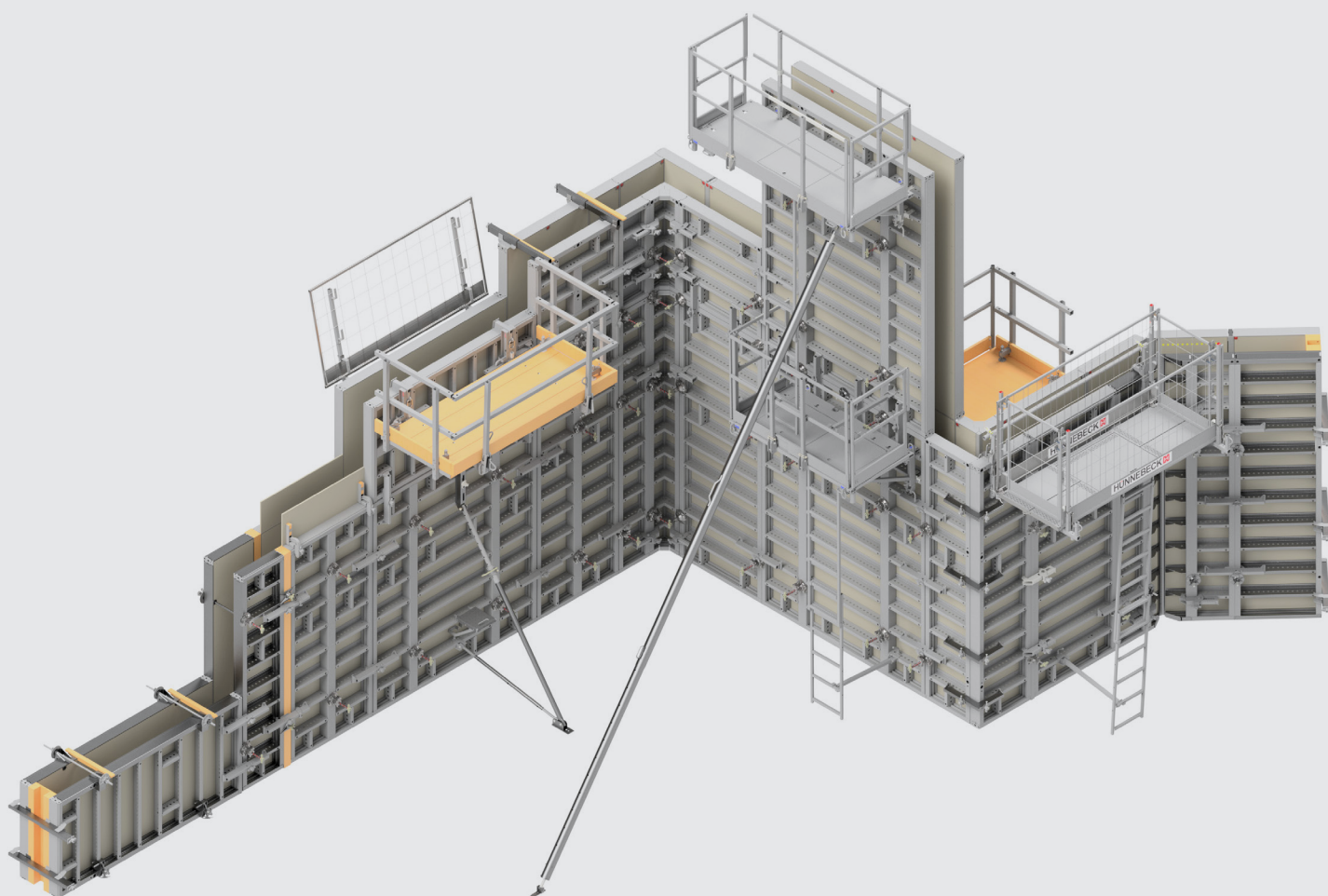




# Large-frame panel formwork

## User Guide



## Contents

<b>1</b>	<b>MANTO formwork .....</b>	<b>5</b>
1.1	Intended use .....	5
1.2	Important information regarding intended and safe use .....	6
1.3	Special safety instructions .....	7
1.4	About this document.....	7
1.5	Other relevant documents.....	9
<b>2</b>	<b>Overview.....</b>	<b>10</b>
<b>3</b>	<b>Quick reference guide .....</b>	<b>12</b>
3.1	Panels.....	12
3.2	Corners .....	20
3.3	Infills.....	22
3.4	Connectors .....	22
3.5	Brackets and platforms.....	25
3.6	Struts and props .....	29
3.7	Tying components .....	34
3.8	Accessories .....	39
3.9	Lifting accessories .....	40
3.10	Fasteners.....	42
3.11	Transport equipment.....	42
<b>4</b>	<b>MANTO panels.....</b>	<b>44</b>
4.1	MANTO panels G1.....	44
4.2	MANTO panels G2.....	45
4.3	MANTO panels G3.....	48
4.4	MANTO Panels G3 M.....	51
4.5	Using MANTO panels of different generations.....	54
4.6	Tie pattern.....	57
<b>5</b>	<b>Connecting panels horizontally .....</b>	<b>58</b>
5.1	Height offset.....	58
5.2	Using the MANTO Aligning Panel Clamp .....	59
5.3	With the PM Aligning Wedge Clamp.....	62
5.4	Using the Adjustable Aligning Clamp.....	67
5.5	Using the Multipurpose Waler 100 .....	68
5.6	MANTO XXL panels .....	69
<b>6</b>	<b>Horizontal infills.....</b>	<b>70</b>
6.1	General rules.....	70
6.2	Typical solutions .....	72
6.3	Openings for windows and doors .....	75
<b>7</b>	<b>Vertical panel extensions .....</b>	<b>76</b>
7.1	Extensions up to 100 mm (with Panel Clamp).....	76
7.2	Extensions up to 300 mm (with Panel Clamp and MANTO Add-on Piece).....	76



7.3	Extensions up to 400 mm (with MANTO Aligning Panel Clamp).....	77
7.4	Extensions up to 500 mm (with Multipurpose Waler 100).....	78
7.5	Extensions up to 500 mm.....	78
<b>8</b>	<b>Connecting (extending) panels vertically.....</b>	<b>79</b>
8.1	General rules .....	79
8.2	Extensions with MANTO Aligning Panel Clamp.....	81
8.3	Extensions in height of MANTO XXL panels .....	92
8.4	Extensions in height using PLATINUM 100 MANTO Extension Bar .....	94
<b>9</b>	<b>Tie systems.....</b>	<b>99</b>
9.1	Using MANTO G3 plastic inserts .....	99
9.2	One-sided tying with Taper Tie System 15.....	102
9.3	One-sided tying with the PLATINUM 100 tie system.....	110
9.4	One-sided tying with the MR tie system .....	118
9.5	Conventional (two-sided) tying.....	123
9.6	Creating watertight tie holes.....	124
9.7	FU Tightener and Edge Tie Fastener MR .....	127
<b>10</b>	<b>Corners .....</b>	<b>129</b>
10.1	90° corners .....	129
10.2	Oblique-angled corners .....	141
<b>11</b>	<b>Wall offsets.....</b>	<b>143</b>
11.1	Wall offset.....	143
11.2	Pilasters .....	144
11.3	T-walls .....	146
11.4	T-wall connection.....	148
<b>12</b>	<b>Stopends.....</b>	<b>150</b>
12.1	With Outer Corner Clamps .....	150
12.2	Using the PLATINUM 100 Bulkhead Clamp .....	152
12.3	Using the Multipurpose Waler 100 .....	156
<b>13</b>	<b>Column formwork.....</b>	<b>158</b>
13.1	Using MANTO MP panels .....	158
13.2	Using MANTO Column Frames .....	160
13.3	Using the MANTO Column Angle Waler.....	162
<b>14</b>	<b>Formwork restraint.....</b>	<b>165</b>
14.1	Tying panels to the ground .....	165
14.2	Bracing panels.....	170
<b>15</b>	<b>Constructing working platforms .....</b>	<b>179</b>
15.1	PLATINUM 100 platform and access system.....	179
15.2	Universal Formwork Platform .....	180
15.3	Walkway brackets .....	181
15.4	Counter Post.....	182
15.5	Pouring platform.....	184

15.6	PLATINUM 100 Platform Step .....	188
<b>16</b>	<b>Shaft formwork .....</b>	<b>190</b>
16.1	Using the MANTO shaft corner .....	190
16.2	Using MANTO Hinged Corner .....	198
16.3	MANTO shaft formwork with an external and internal platform .....	201
16.4	Platform Beams .....	202
16.5	Using Platform Beam 200 – 300 Telescopic .....	203
<b>17</b>	<b>Assembling formwork .....</b>	<b>207</b>
17.1	Assembling formwork with one-sided tie system .....	207
17.2	Assembling formwork with conventional tie method .....	215
<b>18</b>	<b>Stripping .....</b>	<b>218</b>
<b>19</b>	<b>Cleaning on-site .....</b>	<b>220</b>
<b>20</b>	<b>Storage and transport .....</b>	<b>221</b>
20.1	MANTO Panels .....	221
20.2	Corners .....	227
20.3	Shaft formwork .....	231
20.4	Other components .....	233
<b>21</b>	<b>Disposal .....</b>	<b>233</b>
<b>22</b>	<b>Technical data .....</b>	<b>234</b>
22.1	Permitted fresh concrete pressure for MANTO .....	234
<b>23</b>	<b>Chronology .....</b>	<b>235</b>

# 1 MANTO formwork

MANTO formwork by Hünnebeck is rugged, ready-to-use frame panel formwork for all fields of concrete construction. All MANTO panels have sturdy 14 cm thick steel frame profiles that are hot dip galvanized on the inside and outside. The maximum fresh concrete pressure permitted is 80 kN/m<sup>2</sup>.

The design of the MANTO panels permits the use of the panels in vertical or horizontal orientation. Extension panels and other accessories further expand the scope of use and assure safe and economical shuttering and concrete works. The leverage edge in the lower edge profiles allows alignment of the erected panels using a crowbar. Interior H-ribs as well as V-ribs (only MANTO G3/G3 M) offer several different ways to attach accessories and support the form sheet.

The various connectors available can be used to ensure that all vertical, horizontal and extended panel joints fit tightly together and the panels are aligned perfectly without any mismatch. This also allows large-area panels to be repositioned without having to install any additional stiffening walers. Many connectors can be operated with the MANTO Ratchet (code:408780) or with a hammer. Using the MANTO Ratchet reduces fatigue when working from ground level (with single-storey formwork).

The permissible fresh concrete pressure for MANTO Giant Panels 240, Inner Corners 120 and 270, and Hinged Corners 120 and 270 built until 1991 is 60 kN/m<sup>2</sup>.

## 1.1 Intended use

MANTO formwork and the corresponding system components are used to wet-pour concrete structures of various geometries, e.g. walls or columns. Only the components shown in this manual may be used to connect the panels to one another. The permissible fresh concrete pressure of 60 kN/m<sup>2</sup> may not be exceeded (Refer to page 234).

Hünnebeck products are intended to be used only by competent personnel and only for commercial purposes.

## 1.2 Important information regarding intended and safe use

- Risk assessment  
The contractor is responsible for the preparation, documentation, implementation and revision of a risk assessment for each construction site. His employees are obliged to implement the resulting measures in accordance with all legal requirements.
- Assembly instructions  
The contractor is responsible for compiling written assembly instructions. The User Guide is a fundamental aspect of the assembly instructions.
- User Guide  
Formwork is a type of equipment intended only for commercial applications. The equipment may be used only by properly trained personnel under the authority of qualified supervisors.  
The User Guide is an integral component of the formwork construction. It contains safety notes, information on the standard configuration, the intended use and a description of the system. The functional instructions (standard configuration) contained in the User Guide are to be complied with as stated. Enhancements, deviations or changes represent a potential risk and therefore require separate verification (with the help of a risk assessment) or a set of assembly instructions which comply with the relevant laws, standards and safety regulations. The same applies in cases where formwork/falsework components are provided on site.
- Accessibility of the User Guide  
The contractor shall ensure that site personnel are familiar with the User Guide and that it is readily accessible at all times.
- Illustrations  
Some of the illustrations in the User Guide show incomplete assembly and do not necessarily show all aspects relevant to safety.  
Safety devices may not always appear in the illustrations, but they are nevertheless mandatory.
- Material check  
Formwork material deliveries shall be checked upon arrival at the construction site / destination as well as before each use to ensure that they are in serviceable condition and function correctly. Modifications to the formwork materials are not permitted. The formwork material may not be used if it is damaged or defective.
- Spare parts and repairs  
Only original parts may be used as spare parts. Repairs can be performed only by the manufacturer or authorised facilities.
- Use of other products  
Combining formwork components from different manufacturers poses certain risks. Examine such components individually for suitability; they may require a separate User Guide.
- On-site preparations  
The contractor shall ensure the appropriate environment and conditions for storage and the particular application of the system(s) supplied.

### 1.3 Special safety instructions

- Work at height regulations – hierarchy of controls avoiding work at height  
Work at height can be reduced/eliminated by considering the method of assembly and how the equipment is used.
- Walkways that are designed to be re-used reduce the amount of time and effort required for dismantling and re-erecting.
- Walkways that can be pre-assembled on the ground and then raised by crane to an elevated position will eliminate the work at height.
- Installing completed walkways when the walkway is on the ground will eliminate work at height associated with construction later on.
- Use of PPE / safety harnesses  
Suitable PPE shall be used at all times during assembly and dismantling of this equipment. Lanyards shall always be secured to a suitable part of the structure. Always consider the attachment level and deployment (extension) of the lanyard when under load.
- Transportation of loads  
Always observe and comply with the maximum working load limit (WLL) of the lifting accessories used!
- The lifting accessory may be used to transport only the loads expressly permitted by the operating instructions.
- Before beginning transport, always check that the lifting accessory is properly attached to the load.
- Strong winds  
The contractor is responsible for monitoring the weather forecast and wind conditions as well as implementing any preventive measures that may be required. Depending on the local conditions, e.g. the surrounding area, structure height and building geometry, safety measures to prevent the structure from uplift, possibly even dismantling the formwork, may be required and should be determined on site.








### 1.4 About this document

This User Guide contains important information regarding the assembly and use of Hünnebeck MANTO formwork as well as safety procedures that are important for safe erection and use on site. This User Guide is intended to serve as an aid to working effectively with MANTO formwork.

- Read this User Guide carefully prior to commencing work with the MANTO formwork!
- Keep the User Guide nearby and save it for future reference!

The information and procedures described here comply with the laws and the occupational health and safety regulations of Germany and Austria. Hünnebeck assumes no liability for deviations from the contents and processes described or for use outside this area of application.

## 1.4.1 Warnings and notes

	<b>DANGER</b>	<b>Danger!</b> DANGER indicates a hazardous situation that, if not avoided, will cause death or serious injury.
	<b>WARNING</b>	<b>Warning!</b> WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.
	<b>CAUTION</b>	<b>Caution!</b> CAUTION indicates a hazardous situation that, if not avoided, can cause minor or moderate injury.
	<b>NOTE</b>	<b>Note!</b> NOTE indicates a hazard that can cause property damage.
		This symbol indicates that an additional inspection is required.
		This symbol indicates practical experience that will help the user, e.g. how to perform a task more easily or quickly.
		This symbol indicates particularly important information, e.g. that a requirement shall fulfilled.
		This symbol indicates that additional information from other documents is required. These documents could be User Guides or operating instructions for other products.

## 1.4.2 Instructions

Instructions are always identified in this document with the word “Step”, e.g.

- Step 1** Insert the locking bolt into the hole from the outside.
- Step 2** Secure the pin with the spring cotter pin.

## 1.4.3 Brand names

The following brand names are the property of Hünnebeck. The symbol indicating a registered trademark is omitted throughout the document.

- Hünnebeck®
- EUROPLUS®
- ECOPLY®
- MANTO®.
- PLATINUM®
- PROTECTO®



## 1.5 Other relevant documents

This User Guide should be read in conjunction with the following documents:

### User Guides

- PROTECTO edge protection
- Alignment struts
- EUROPLUSnew steel props
- PLATINUM 100 platform and access system
- Universal Formwork Platform

### Operating instructions

- MANTO Transport Hook G2
- MANTO Crane Adapter
- PLATINUM 100 Lifting Device
- MANTO G3 Lifting Pin
- MANTO Loading Adapter
- Euro Trolley

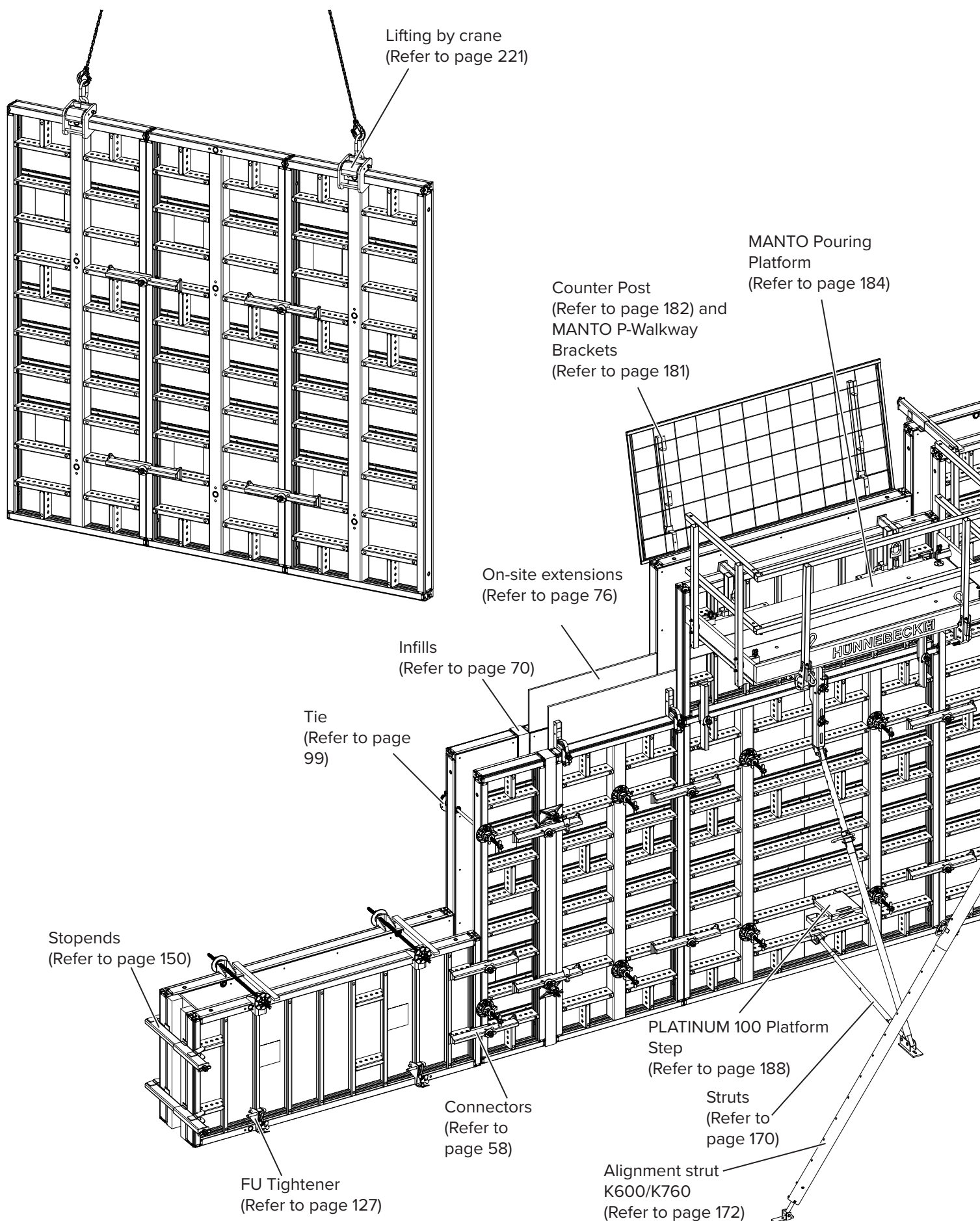
### Technical approvals

- T-211.6-1854

All of these documents can be downloaded at [www.huennebeck.com/downloads](http://www.huennebeck.com/downloads).

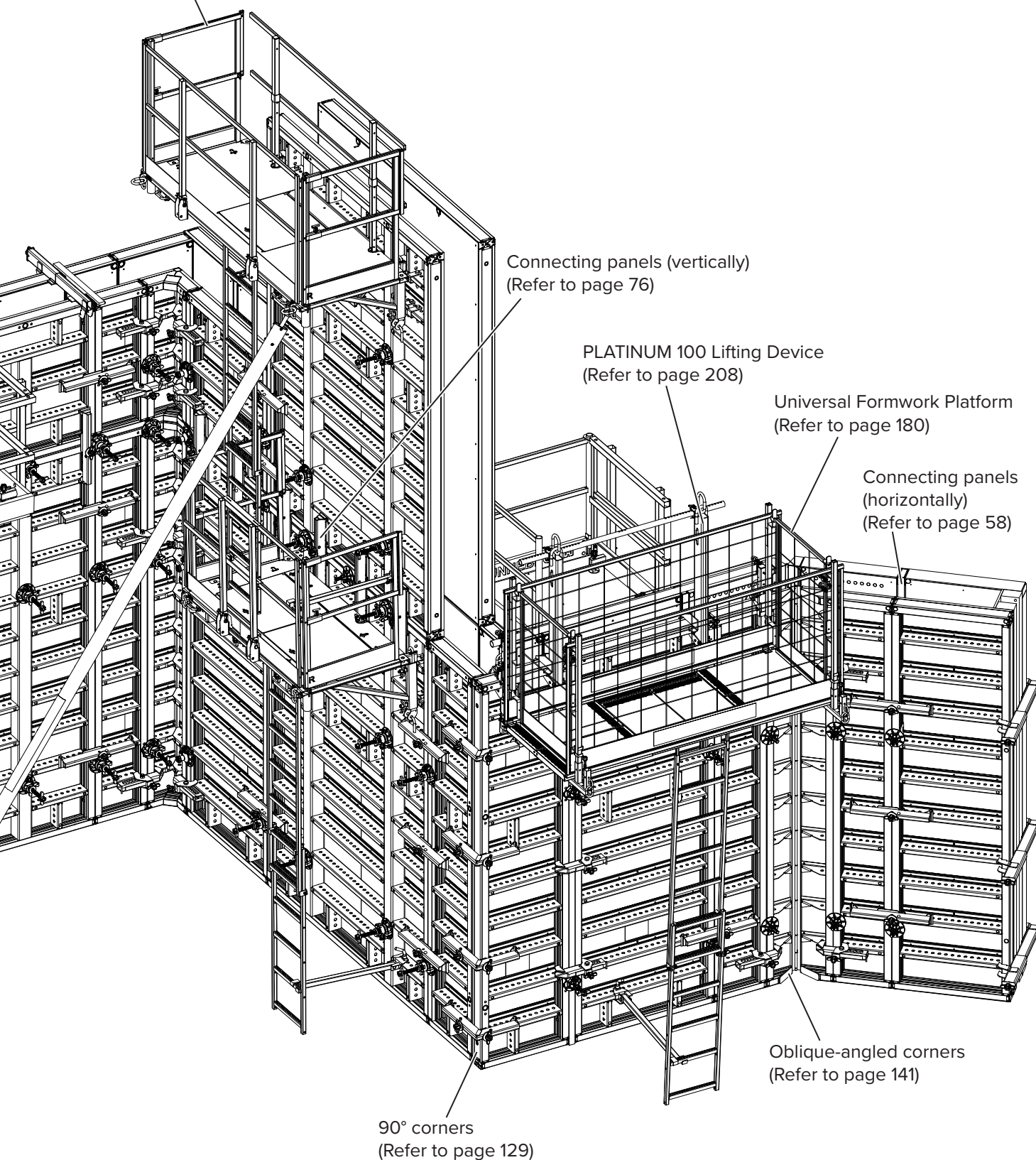


## 2 Overview



PLATINUM 100 platform system  
(Refer to page 179)

*The assembly shown is for illustration purposes only. Not all components are shown. All local requirements and regulations are to be complied with.*



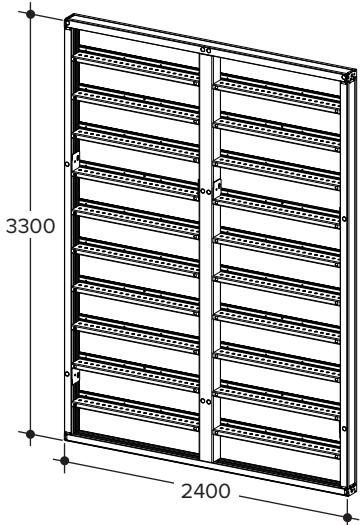
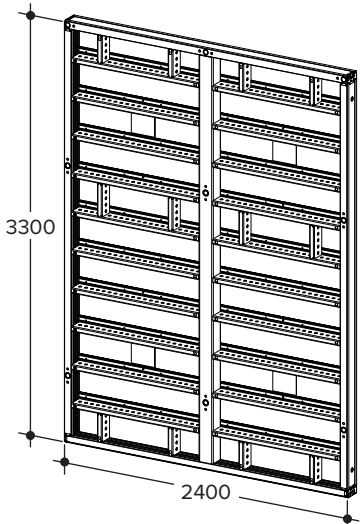
## 3 Quick reference guide

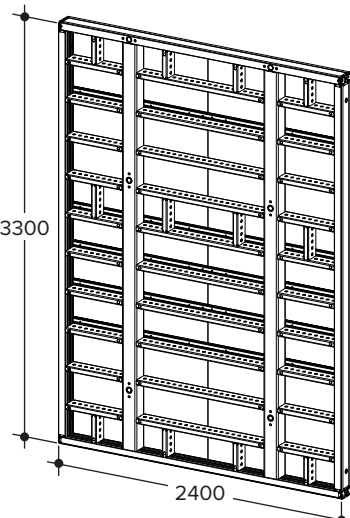
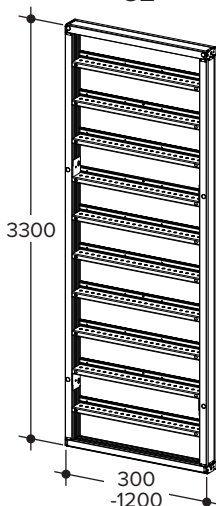
MANTO panels have either an 18 mm form sheet made of birch plywood coated with phenolic resin or a 19 mm ECOPLY full plastic form sheet. Panels with an ECOPLY form sheet are marked as such in the following list.

### 3.1 Panels

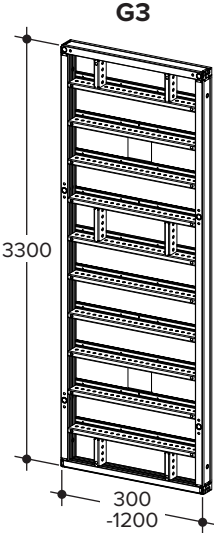
More information on the panels can be found here:

- Generation G2, beginning on page 45,
- Generation G3, beginning on page 48,
- Generation G3 M, beginning on page 51.

	Component	Code	Weight [kg]
<b>G2</b>	<b>MANTO Giant Panel 240/330 (7.92 m<sup>2</sup>)</b>	<b>525759</b>	<b>371.18</b>
	<b>Generation 2</b>		
	<p>The largest panel with a height of 3.30 m.</p> <p>With 4no. tie holes per tie position.</p> <p>This allows 1no. MANTO Giant Panel to be used with 2no. opposing panels with a width of 1.20 m each.</p> <p>Also available with the ECOPLY full plastic form sheet (19 mm).</p>		
<b>G3</b>	<b>MANTO G3 Giant Panel 240/330 ECOPLY (7.92 m<sup>2</sup>)</b>	<b>608280</b>	<b>410.49</b>
	<b>MANTO G3 Giant Panel 240/330 (7.92 m<sup>2</sup>)*</b>	<b>609100</b>	<b>410.55</b>
	<b>Generation 3</b>		
	<p>Like the 2nd generation MANTO Giant Panels 240/330, but with additional V-ribs, e.g. to connect struts.</p> <p>With 3no. tie holes per tie position.</p> <p>Suitable for use with one-sided tie systems.</p>		

	Component	Code	Weight [kg]
<b>G3 M</b> 	<b>MANTO G3 M Panel 240/330 ECOPLY (7.92 m<sup>2</sup>)</b>	<b>607820</b>	<b>441.79</b>
	<b>MANTO G3 M Panel 240/330 (7.92 m<sup>2</sup>)*</b>	<b>609250</b>	<b>447.15</b>
	<b>Generation 3</b> Like the MANTO G3 Giant Panels 240/330, but with 2no. centre profiles. With 2no. tie holes per tie position. Suitable for use with one-sided tie systems.		
<b>G2</b> 	<b>MANTO Panel 120/330 (3.96 m<sup>2</sup>)</b>	<b>525760</b>	<b>179.56</b>
	<b>MANTO Panel 105/330 (3.47 m<sup>2</sup>)</b>	<b>525770</b>	<b>163.63</b>
	<b>MANTO Panel 90/330 (2.97 m<sup>2</sup>)</b>	<b>525781</b>	<b>146.14</b>
	<b>MANTO Panel 75/330 (2.48 m<sup>2</sup>)</b>	<b>525792</b>	<b>130.26</b>
	<b>MANTO Panel 60/330 (1.98 m<sup>2</sup>)</b>	<b>525829</b>	<b>114.23</b>
	<b>MANTO Panel 45/330 (1.49 m<sup>2</sup>)</b>	<b>525840</b>	<b>96.98</b>
	<b>MANTO Panel 30/330 (0.99 m<sup>2</sup>)</b>	<b>600009</b>	<b>80.73</b>
	<b>Generation 2</b> MANTO panels 3.30 m high. With 2no. tie holes per tie position. Also available with the ECOPLY full plastic form sheet (19 mm).		



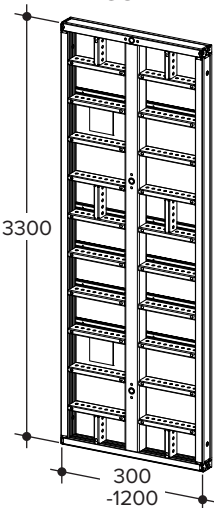
	Component	Code	Weight [kg]
 <p><b>G3</b></p>	MANTO G3 Panel 120/330 ECOPLY (3.96 m <sup>2</sup> )	608015	198.86
	MANTO G3 Panel 105/330 ECOPLY (3.47 m <sup>2</sup> )	608020	181.75
	MANTO G3 Panel 90/330 ECOPLY (2.97 m <sup>2</sup> )	608025	164.74
	MANTO G3 Panel 75/330 ECOPLY (2.48 m <sup>2</sup> )	608030	141.80
	MANTO G3 Panel 60/330 ECOPLY (1.98 m <sup>2</sup> )	608040	124.43
	MANTO G3 Panel 45/330 ECOPLY (1.49 m <sup>2</sup> )	608045	101.60
	MANTO G3 Panel 30/330 ECOPLY (0.99 m <sup>2</sup> )	608050	89.85
	MANTO G3 Panel 120/330 (3.96 m <sup>2</sup> )*	609101	199.07
	MANTO G3 Panel 105/330 (3.47 m <sup>2</sup> )*	609102	181.95
	MANTO G3 Panel 90/330 (2.97 m <sup>2</sup> )*	609103	164.91
	MANTO G3 Panel 75/330 (2.48 m <sup>2</sup> )*	609104	141.93
	MANTO G3 Panel 60/330 (1.98 m <sup>2</sup> )*	609107	124.54
	MANTO G3 Panel 45/330 (1.49 m <sup>2</sup> )*	609109	101.70
	MANTO G3 Panel 30/330 (0.99 m <sup>2</sup> )*	609110	89.92

## Generation 3

Like the 2nd generation MANTO panels, but with additional V-ribs, e.g. to connect struts.

With 2no. tie holes per tie position.

Suitable for use with one-sided tie systems.

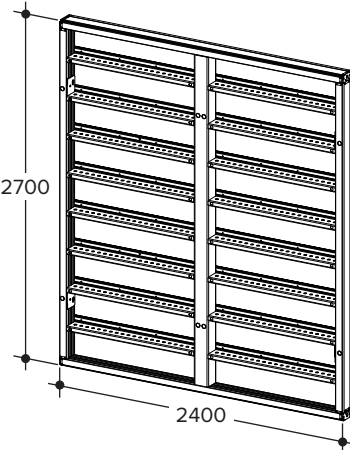
 <p><b>G3 M</b></p>	MANTO G3 M Panel 120/330 ECOPLY (3.96 m <sup>2</sup> )	607830	244.70
	MANTO G3 M Panel 90/330 ECOPLY (2.97 m <sup>2</sup> )	607840	197.93
	MANTO G3 M Panel 60/330 ECOPLY (1.98 m <sup>2</sup> )	607850	142.05
	MANTO G3 M Panel 120/330 (3.96 m <sup>2</sup> )*	609251	247.53
	MANTO G3 M Panel 90/330 (2.97 m <sup>2</sup> )*	609252	200.05
	MANTO G3 M Panel 60/330 (1.98 m <sup>2</sup> )*	609253	143.45

## Generation 3

Like the MANTO G3 panels, but with a centre profile.

With 1no. tie hole per tie position.

Suitable for use with one-sided tie systems.

 <p><b>G2</b></p>	MANTO Giant Panel 240/270 (6.48 m <sup>2</sup> )	534990	319.39
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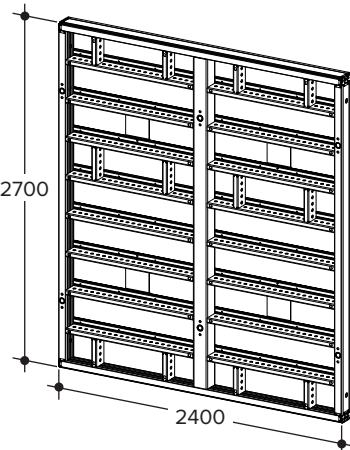
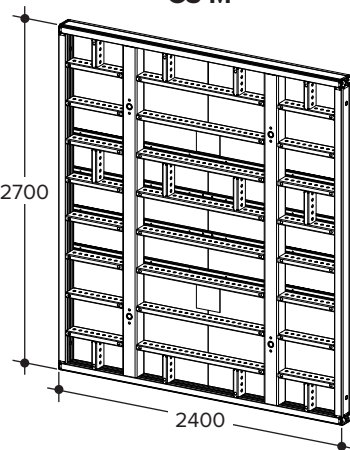
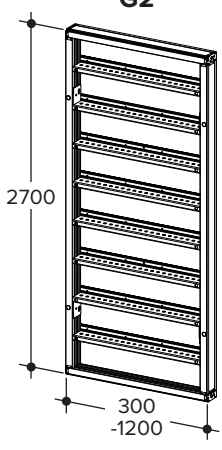
## Generation 2

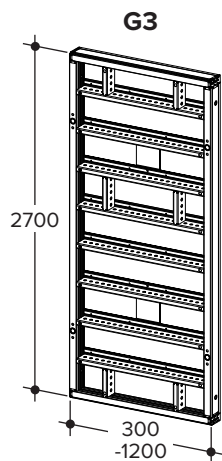
With 4no. tie holes per tie position.

This allows 1no. MANTO Giant Panel to be used with 2no. opposing panels with a width of 1.20 m each.

Also available with the ECOPLY full plastic form sheet (19 mm).



	Component	Code	Weight [kg]
<b>G3</b> 	<b>MANTO G3 Giant Panel 240/270 ECOPLY</b> (6.48 m <sup>2</sup> )	<b>608290</b>	<b>357.32</b>
	<b>MANTO G3 Giant Panel 240/270</b> (6.48 m <sup>2</sup> )*	<b>609111</b>	<b>357.37</b>
	<b>Generation 3</b> Like the 2nd generation MANTO giant panels 240/270, but with additional V-ribs, e.g. to connect struts. With 3no. tie holes per tie position. Suitable for use with one-sided tie systems.		
<b>G3 M</b> 	<b>MANTO G3 M Panel 240/270 ECOPLY</b> (6.48 m <sup>2</sup> )	<b>607860</b>	<b>370.19</b>
	<b>MANTO G3 M Panel 240/270</b> (6.48 m <sup>2</sup> )*	<b>609254</b>	<b>374.55</b>
	<b>Generation 3</b> Like MANTO G3 Giant Panel 240/270. With 2no. tie holes per tie position. Suitable for use with one-sided tie systems.		
<b>G2</b> 	<b>MANTO Panel 120/270</b> (3.24 m <sup>2</sup> )	<b>446000</b>	<b>162.61</b>
	<b>MANTO Panel 105/270</b> (2.84 m <sup>2</sup> )	<b>446022</b>	<b>149.31</b>
	<b>MANTO Panel 90/270</b> (2.43 m <sup>2</sup> )	<b>446033</b>	<b>120.08</b>
	<b>MANTO Panel 75/270</b> (2.03 m <sup>2</sup> )	<b>446044</b>	<b>106.73</b>
	<b>MANTO Panel 60/270</b> (1.62 m <sup>2</sup> )	<b>446055</b>	<b>93.35</b>
	<b>MANTO Panel 45/270</b> (1.22 m <sup>2</sup> )	<b>450786</b>	<b>80.11</b>
	<b>MANTO Panel 30/270</b> (0.81 m <sup>2</sup> )	<b>600007</b>	<b>65.45</b>
	<b>Generation 2</b> Additional panels 3.30 m high. With 2no. tie holes per tie position. Also available with the ECOPLY full plastic form sheet (19 mm).		



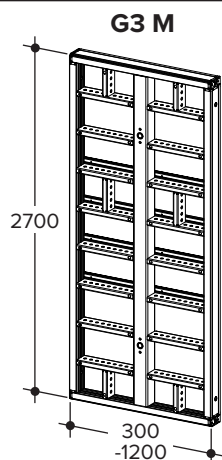
Component	Code	Weight [kg]
<b>MANTO G3 Panel 120/270 ECOPLY</b> (3.24 m <sup>2</sup> )	<b>608055</b>	<b>180.08</b>
<b>MANTO G3 Panel 105/270 ECOPLY</b> (2.84 m <sup>2</sup> )	<b>608060</b>	<b>165.77</b>
<b>MANTO G3 Panel 90/270 ECOPLY</b> (2.43 m <sup>2</sup> )	<b>608065</b>	<b>138.45</b>
<b>MANTO G3 Panel 75/270 ECOPLY</b> (2.03 m <sup>2</sup> )	<b>608070</b>	<b>118.34</b>
<b>MANTO G3 Panel 60/270 ECOPLY</b> (1.62 m <sup>2</sup> )	<b>608080</b>	<b>103.96</b>
<b>MANTO G3 Panel 45/270 ECOPLY</b> (1.22 m <sup>2</sup> )	<b>608085</b>	<b>83.92</b>
<b>MANTO G3 Panel 30/270 ECOPLY</b> (0.81 m <sup>2</sup> )	<b>608090</b>	<b>73.85</b>
<b>MANTO G3 Panel 120/270</b> (3.24 m <sup>2</sup> )*	<b>609112</b>	<b>180.26</b>
<b>MANTO G3 Panel 105/270</b> (2.84 m <sup>2</sup> )*	<b>609113</b>	<b>165.93</b>
<b>MANTO G3 Panel 90/270</b> (2.43 m <sup>2</sup> )*	<b>609114</b>	<b>138.59</b>
<b>MANTO G3 Panel 75/270</b> (2.03 m <sup>2</sup> )*	<b>609115</b>	<b>118.45</b>
<b>MANTO G3 Panel 60/270</b> (1.62 m <sup>2</sup> )*	<b>609118</b>	<b>105.10</b>
<b>MANTO G3 Panel 45/270</b> (1.22 m <sup>2</sup> )*	<b>609120</b>	<b>83.99</b>
<b>MANTO G3 Panel 30/270</b> (0.81 m <sup>2</sup> )*	<b>609121</b>	<b>73.91</b>

## Generation 3

Like the 2nd generation MANTO panels but with additional V-ribs, e.g. to connect struts.

With 2no. tie holes per tie position.

Suitable for use with one-sided tie systems.



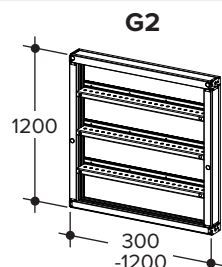
<b>MANTO G3 M Panel 120/270 ECOPLY</b> (3.24 m <sup>2</sup> )	<b>607870</b>	<b>204.45</b>
<b>MANTO G3 M Panel 90/270 ECOPLY</b> (2.43 m <sup>2</sup> )	<b>607880</b>	<b>163.67</b>
<b>MANTO G3 M Panel 60/270 ECOPLY</b> (1.62 m <sup>2</sup> )	<b>607890</b>	<b>121.01</b>
<b>MANTO G3 M Panel 120/270</b> (3.24 m <sup>2</sup> )*	<b>609255</b>	<b>206.77</b>
<b>MANTO G3 M Panel 90/270</b> (2.43 m <sup>2</sup> )*	<b>609256</b>	<b>165.40</b>
<b>MANTO G3 M Panel 60/270</b> (1.62 m <sup>2</sup> )*	<b>609257</b>	<b>122.16</b>

## Generation 3

Like the MANTO G3 panels, but with a centre profile.

With 1no. tie hole per tie position.

Suitable for use with one-sided tie systems.



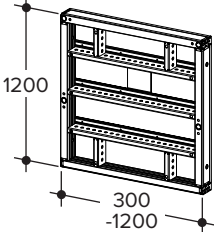
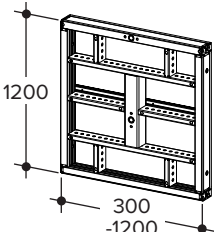
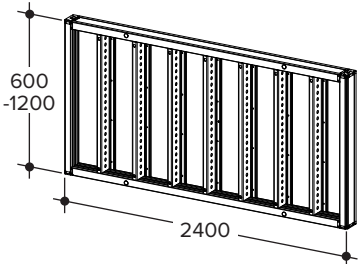
<b>MANTO Panel 120/120</b> (1.44 m <sup>2</sup> )	<b>458175</b>	<b>72.86</b>
<b>MANTO Panel 105/120</b> (1.26 m <sup>2</sup> )	<b>458186</b>	<b>66.02</b>
<b>MANTO Panel 90/120</b> (1.08 m <sup>2</sup> )	<b>458197</b>	<b>59.21</b>
<b>MANTO Panel 75/120</b> (0.90 m <sup>2</sup> )	<b>458201</b>	<b>52.35</b>
<b>MANTO Panel 60/120</b> (0.72 m <sup>2</sup> )	<b>458223</b>	<b>45.39</b>
<b>MANTO Panel 45/120</b> (0.54 m <sup>2</sup> )	<b>458245</b>	<b>38.58</b>
<b>MANTO Panel 30/120</b> (0.36 m <sup>2</sup> )	<b>600002</b>	<b>32.04</b>

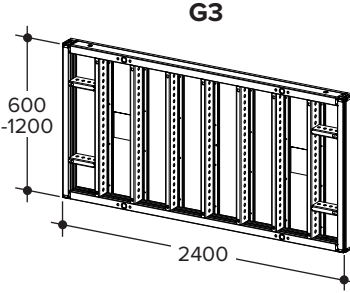
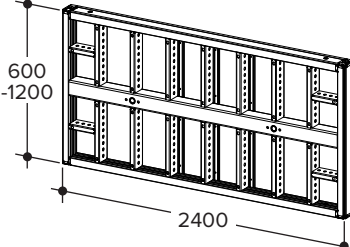
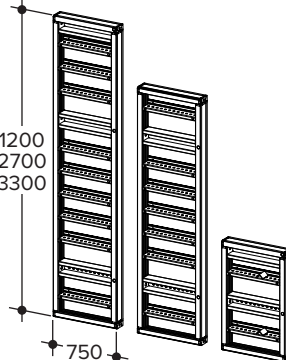
## Generation 2

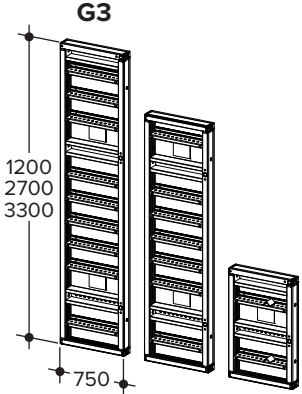
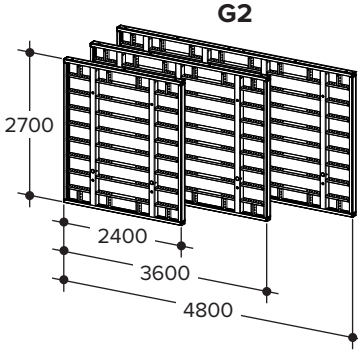
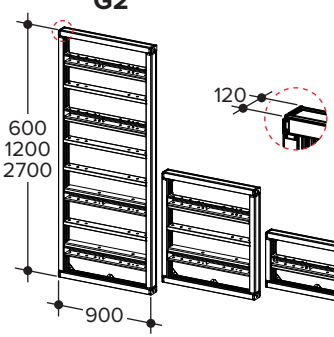
Panels 1.20 m high.

With 2no. tie holes per tie position.

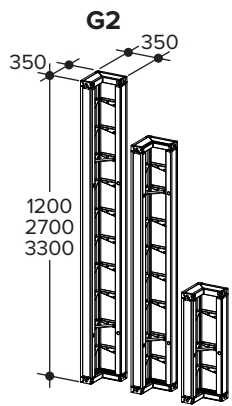
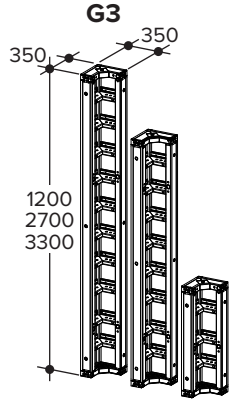
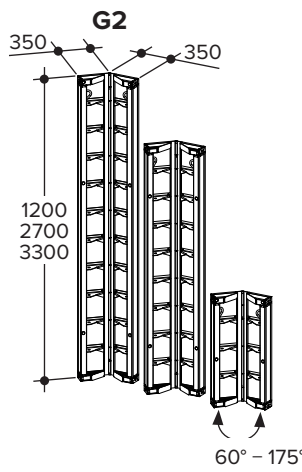
Also available with the ECOPLY full plastic form sheet (19 mm).

	Component	Code	Weight [kg]
<b>G3</b> 	MANTO G3 Panel 120/120 ECOPLY (1.44 m <sup>2</sup> )	608095	82.90
	MANTO G3 Panel 105/120 ECOPLY (1.26 m <sup>2</sup> )	608100	73.14
	MANTO G3 Panel 90/120 ECOPLY (1.08 m <sup>2</sup> )	608105	69.49
	MANTO G3 Panel 75/120 ECOPLY (0.90 m <sup>2</sup> )	608110	58.61
	MANTO G3 Panel 60/120 ECOPLY (0.72 m <sup>2</sup> )	608120	51.30
	MANTO G3 Panel 45/120 ECOPLY (0.54 m <sup>2</sup> )	608125	41.16
	MANTO G3 Panel 30/120 ECOPLY (0.36 m <sup>2</sup> )	608130	35.55
	MANTO G3 Panel 120/120 (1.44 m <sup>2</sup> )*	609122	82.98
	MANTO G3 Panel 105/120 (1.26 m <sup>2</sup> )*	609123	73.21
	MANTO G3 Panel 90/120 (1.08 m <sup>2</sup> )*	609124	69.55
	MANTO G3 Panel 75/120 (0.90 m <sup>2</sup> )*	609125	58.66
	MANTO G3 Panel 60/120 (0.72 m <sup>2</sup> )*	609128	51.79
	MANTO G3 Panel 45/120 (0.54 m <sup>2</sup> )*	609130	41.21
	MANTO G3 Panel 30/120 (0.36 m <sup>2</sup> )*	609131	35.58
<b>Generation 3</b> Like the 2nd generation MANTO panels but with additional V-ribs, e.g. to connect struts. With 2no. tie holes per tie position. Suitable for use with one-sided tie systems.			
<b>G3 M</b> 	MANTO G3 M Panel 120/120 ECOPLY (1.44 m <sup>2</sup> )	607900	94.66
	MANTO G3 M Panel 90/120 ECOPLY (1.08 m <sup>2</sup> )	607910	78.89
	MANTO G3 M Panel 60/120 ECOPLY (0.72 m <sup>2</sup> )	607920	61.09
	MANTO G3 M Panel 120/120 (1.44 m <sup>2</sup> )*	609258	95.68
	MANTO G3 M Panel 90/120 (1.08 m <sup>2</sup> )*	609259	79.65
	MANTO G3 M Panel 60/120 (0.72 m <sup>2</sup> )*	609260	61.60
<b>Generation 3</b> Like the MANTO G3 panels, but with a centre profile. With 1no. tie hole per tie position. Suitable for use with one-sided tie systems.			
<b>G2</b> 	MANTO Panel 240/120 (2.88 m <sup>2</sup> )	446066	131.90
	MANTO Panel 240/90 (2.16 m <sup>2</sup> )	479194	107.85
	MANTO Panel 240/60 (1.44 m <sup>2</sup> )	453437	83.88
<b>Generation 2</b> Range of extension panels that can be used as height extensions or as independent elements for smaller heights. With 2no. tie holes per tie position. Also available with the ECOPLY full plastic form sheet (19 mm).			

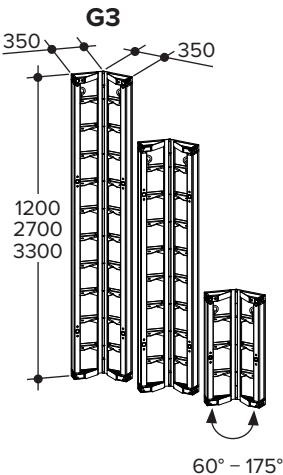
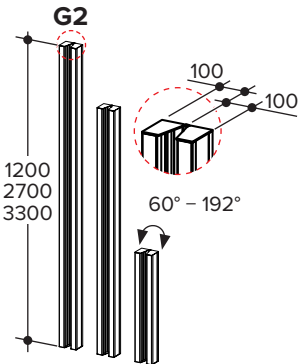
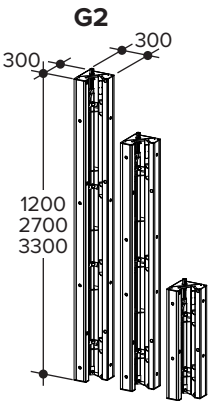
	Component	Code	Weight [kg]
	<b>MANTO G3 Panel 240/120 ECOPLY</b> (2.88 m <sup>2</sup> )	<b>608135</b>	<b>147.01</b>
	<b>MANTO G3 Panel 240/90 ECOPLY</b> (2.16 m <sup>2</sup> )	<b>608140</b>	<b>121.26</b>
	<b>MANTO G3 Panel 240/60 ECOPLY</b> (1.44 m <sup>2</sup> )	<b>608145</b>	<b>91.64</b>
	<b>MANTO G3 Panel 240/120</b> (2.88 m <sup>2</sup> )*	<b>609132</b>	<b>147.16</b>
	<b>MANTO G3 Panel 240/90</b> (2.16 m <sup>2</sup> )*	<b>609133</b>	<b>121.39</b>
	<b>MANTO G3 Panel 240/60</b> (1.44 m <sup>2</sup> )*	<b>609134</b>	<b>91.73</b>
	<b>Generation 3</b> Like the 2nd generation MANTO panels but with additional V-ribs, e.g. to connect struts. With 2no. tie holes per tie position. Suitable for use with one-sided tie systems.		
	<b>MANTO G3 M Panel 240/120 ECOPLY</b> (2.88 m <sup>2</sup> )	<b>607960</b>	<b>180.71</b>
	<b>MANTO G3 M Panel 240/90 ECOPLY</b> (2.16 m <sup>2</sup> )	<b>607970</b>	<b>146.17</b>
	<b>MANTO G3 M Panel 240/60 ECOPLY</b> (1.44 m <sup>2</sup> )	<b>607980</b>	<b>110.44</b>
	<b>MANTO G3 M Panel 240/120</b> (2.88 m <sup>2</sup> )*	<b>609261</b>	<b>182.77</b>
	<b>MANTO G3 M Panel 240/90</b> (2.16 m <sup>2</sup> )*	<b>609262</b>	<b>147.70</b>
	<b>MANTO G3 M Panel 240/60</b> (1.44 m <sup>2</sup> )*	<b>609263</b>	<b>111.44</b>
	<b>Generation 3</b> Like the MANTO G3 panels, but with a centre profile. With 2no. tie holes per tie position. Suitable for use with one-sided tie systems.		
	<b>MANTO MP Panel 75/330</b> (2.48 m <sup>2</sup> )	<b>533561</b>	<b>151.50</b>
	<b>MANTO MP Panel 75/270</b> (2.03 m <sup>2</sup> )	<b>454340</b>	<b>123.30</b>
	<b>MANTO MP Panel 75/120</b> (0.90 m <sup>2</sup> )	<b>454946</b>	<b>67.23</b>
	<b>Generation 2</b> Multi-purpose panels with a horizontal tie hole grid. The 50 mm tying increments allow even the most difficult of formwork tasks to be accomplished. These panels can also be used for shuttering square and rectangular columns. Because the panels are available in three different heights, the height of the structure can be easily adjusted. Also available with the ECOPLY full plastic form sheet (19 mm).		

	Component	Code	Weight [kg]
 <p><b>G3</b></p>	<b>MANTO G3 MP Panel 75/330 ECOPLY</b> (2.48 m <sup>2</sup> )	<b>608150</b>	<b>160.22</b>
	<b>MANTO G3 MP Panel 75/270 ECOPLY</b> (2.03 m <sup>2</sup> )	<b>608155</b>	<b>127.28</b>
	<b>MANTO G3 MP Panel 75/120 ECOPLY</b> (0.90 m <sup>2</sup> )	<b>608160</b>	<b>68.92</b>
	<b>MANTO G3 MP Panel 75/330</b> (2.48 m <sup>2</sup> )*	<b>609135</b>	<b>160.81</b>
	<b>MANTO G3 MP Panel 75/270</b> (2.03 m <sup>2</sup> )*	<b>609136</b>	<b>127.40</b>
	<b>MANTO G3 MP Panel 75/120</b> (0.90 m <sup>2</sup> )*	<b>609137</b>	<b>68.98</b>
	<b>Generation 3</b> Like 2nd generation MANTO MP panels. Suitable for use with one-sided tie systems.		
 <p><b>G2</b></p>	<b>MANTO Panel 240/270 L</b> (6.48 m <sup>2</sup> )	<b>600860</b>	<b>423.48</b>
	<b>MANTO Panel 360/270 XL</b> (9.72 m <sup>2</sup> )	<b>600861</b>	<b>616.78</b>
	<b>MANTO Panel 480/270 XXL</b> (12.96 m <sup>2</sup> )	<b>600862</b>	<b>810.29</b>
	<b>Generation 2</b> MANTO giant panels. These panels can be used in vertical or horizontal orientation; they must, however, be arranged in such a way that they are facing each other. Panels are tied using the conventional tie method; refer to page 123. ECOPLY full plastic form sheets (19 mm) are available upon request. No longer produced.		
 <p><b>G2</b></p>	<b>MANTO Column Frame 90/270**</b>	<b>470470</b>	<b>160.60</b>
	<b>MANTO Column Frame 90/120**</b>	<b>470480</b>	<b>68.40</b>
	<b>MANTO Column Frame 90/60**</b>	<b>490900</b>	<b>46.10</b>
	<b>Generation 2</b> Special frames for column formwork, used to form columns with edge lengths ranging from 200 mm to 900 mm (in 50 mm increments). Supplied without a form sheet. Any plywood sheet with a sufficient load-bearing capacity can be nailed or bolted to the MANTO column frame on site. Three panel heights are available for optimal height adjustment. Permitted fresh concrete pressure: 100.00 kN/m <sup>2</sup> . Refer to page 160. No longer produced.		

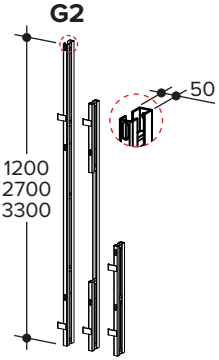
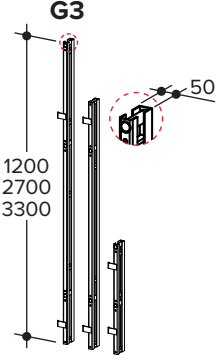
## 3.2 Corners

	Component	Code	Weight [kg]
	<b>MANTO Inner Corner 35/330</b> (2.31 m <sup>2</sup> )	<b>525851</b>	<b>113.80</b>
	<b>MANTO Inner Corner 35/270</b> (1.89 m <sup>2</sup> )	<b>535001</b>	<b>94.46</b>
	<b>MANTO Inner Corner 35/120</b> (0.84 m <sup>2</sup> )	<b>535012</b>	<b>45.86</b>
	<b>Generation 2</b> This 90° inner corner is equipped with a releasing aid to shutter rectangular inner corners. The 90° angle can be decreased by 2° simply by unlatching the corner stiffener. Refer to page 129.		
	<b>MANTO G3 Inner Corner 35/330 ECOPLY</b> (2.31 m <sup>2</sup> )	<b>607990</b>	<b>128.44</b>
	<b>MANTO G3 Inner Corner 35/270 ECOPLY</b> (1.89 m <sup>2</sup> )	<b>608000</b>	<b>106.25</b>
	<b>MANTO G3 Inner Corner 35/120 ECOPLY</b> (0.84 m <sup>2</sup> )	<b>608010</b>	<b>51.70</b>
	<b>MANTO G3 Inner Corner 35/330</b> (2.31 m <sup>2</sup> )*	<b>609138</b>	<b>128.59</b>
	<b>MANTO G3 Inner Corner 35/270</b> (1.89 m <sup>2</sup> )*	<b>609139</b>	<b>106.38</b>
	<b>MANTO G3 Inner Corner 35/120</b> (0.84 m <sup>2</sup> )*	<b>609140</b>	<b>51.66</b>
	<b>Generation 3</b> The 90° inner corner with tie positions operated from only one side of the formwork. The legs of the G3 inner corner can be latched to the formwork with Panel Clamps (code:448010) or with PLATINUM 100 Universal Connectors (code:606209). Suitable for use with one-sided tie systems. Refer to page 129.		
	<b>MANTO Hinged Corner 35/330</b>	<b>532188</b>	<b>135.39</b>
	<b>MANTO Hinged Corner 35/270</b>	<b>534588</b>	<b>112.07</b>
	<b>MANTO Hinged Corner 35/120</b>	<b>534577</b>	<b>54.26</b>
	<b>Generation 2</b> Flexible 350 mm wide corner panels for inner corners with angles from 60° to 175°. Connect the hinged with corners < 90° with PLATINUM 100 Universal Connectors (code:606209) or Panel Clamps (code:448010). Refer to page 141.		

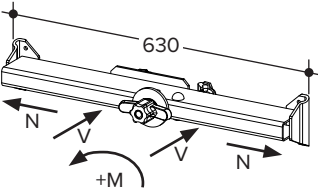
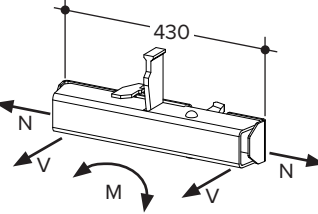


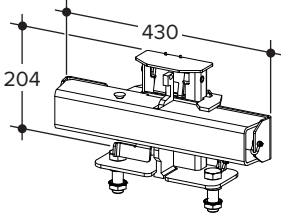
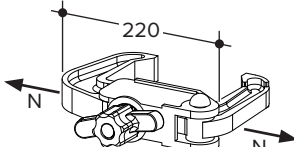
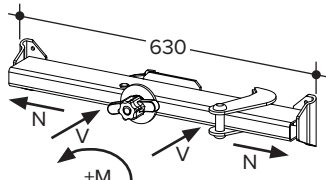
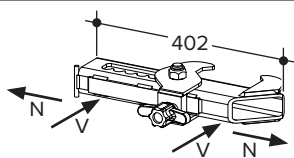
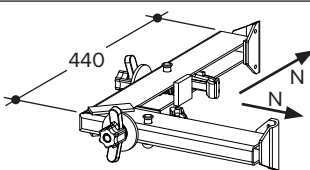
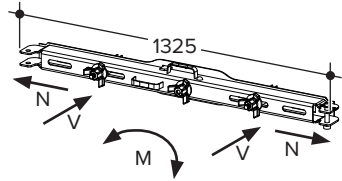
	Component	Code	Weight [kg]
	<b>MANTO G3 Hinged Corner 35/330 ECOPLY</b>	<b>608255</b>	<b>140.99</b>
	<b>MANTO G3 Hinged Corner 35/270 ECOPLY</b>	<b>608265</b>	<b>116.81</b>
	<b>MANTO G3 Hinged Corner 35/120 ECOPLY</b>	<b>608275</b>	<b>57.07</b>
	<b>MANTO G3 Hinged Corner 35/330*</b>	<b>609141</b>	<b>141.12</b>
	<b>MANTO G3 Hinged Corner 35/270*</b>	<b>609142</b>	<b>116.93</b>
	<b>MANTO G3 Hinged Corner 35/120*</b>	<b>609143</b>	<b>57.13</b>
	<p><b>Generation 3</b></p> <p>Flexible 350 mm wide corner panels for inner corners with angles from 60° to 175°.</p> <p>Use PLATINUM Universal Connectors (code:606209) or Panel Clamps (code:448010) to connect corners &lt; 90° to the panels.</p> <p>Suitable for use with one-sided tie systems.</p> <p>Refer to page 141.</p>		
	<b>MANTO Outer Corner 330</b>	<b>534040</b>	<b>84.10</b>
	<b>MANTO Outer Corner 270</b>	<b>462358</b>	<b>69.30</b>
	<b>MANTO Outer Corner 120</b>	<b>462222</b>	<b>31.40</b>
	<p><b>Generation 2</b></p> <p>Used as an outer corner. The legs are 100 mm long. (Refer to page 141).</p> <p>Can also be used in conjunction with MANTO hinged corners and shaft spindles to construct shaft formwork. (Refer to page 198).</p> <p>Adjustable from 60° to 192°.</p>		
	<b>MANTO Shaft Corner 330</b>	<b>602402</b>	<b>191.00</b>
	<b>MANTO Shaft Corner 270</b>	<b>602400</b>	<b>157.12</b>
	<b>MANTO Shaft Corner 120</b>	<b>602401</b>	<b>74.00</b>
	<p><b>Generation 2</b></p> <p>Shaft formwork can be easily designed, assembled and lifted when using the MANTO shaft corners.</p> <p>The formwork is released from the concrete using the integrated mechanism.</p> <p>The whole shaft formwork can then be transported as a single unit by crane.</p> <p>Refer to page 190.</p>		

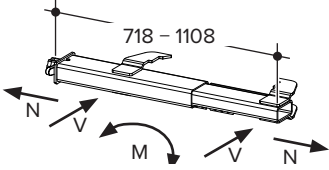
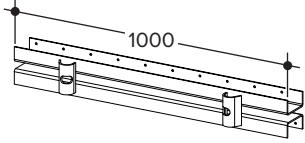
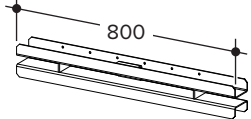
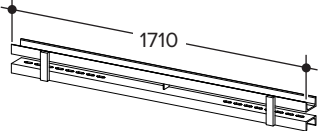
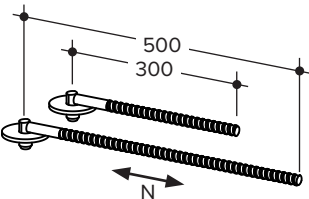
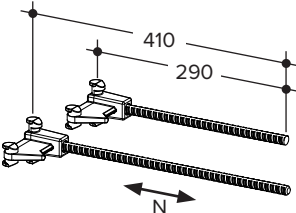
## 3.3 Infills

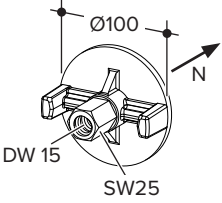
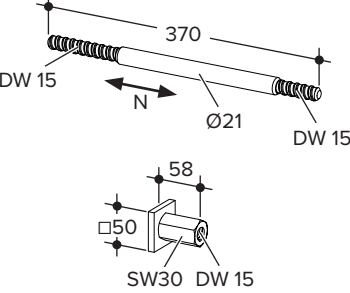
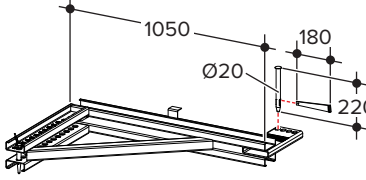
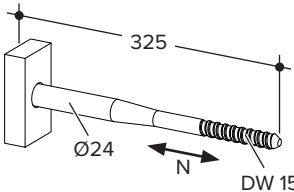
	Component	Code	Weight [kg]
	<b>MANTO Corner Adjustment 5/330</b>	<b>530156</b>	<b>32.50</b>
	<b>MANTO Corner Adjustment 5/270</b>	<b>450606</b>	<b>20.40</b>
	<b>MANTO Corner Adjustment 5/120</b>	<b>450617</b>	<b>11.90</b>
	<p><b>Generation 2</b></p> <p>The MANTO corner adjustment is used for adapting differing wall dimensions in corners and T-wall connections.</p> <p>Refer to page 129 and 143.</p>		
	<b>MANTO G3 Corner Adjustment 5/330</b>	<b>608165</b>	<b>31.52</b>
	<b>MANTO G3 Corner Adjustment 5/270</b>	<b>608170</b>	<b>25.74</b>
	<b>MANTO G3 Corner Adjustment 5/120</b>	<b>608175</b>	<b>12.56</b>
	<p><b>Generation 3</b></p> <p>The MANTO G3 corner adjustment is used for adapting differing wall dimensions in corners and T-wall connections.</p> <p>Suitable for use with one-sided tie systems.</p> <p>Refer to pages 130 – 143.</p>		

## 3.4 Connectors

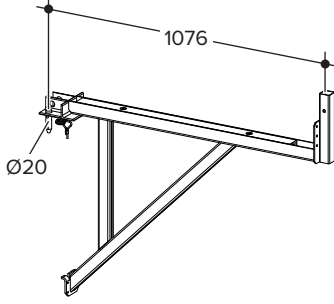
	Component	Code	Weight [kg]
	<b>MANTO Aligning Panel Clamp</b>	<b>448000</b>	<b>5.50</b>
	<p>The MANTO Aligning Panel Clamp ensures that joints are closed securely and the panels are properly connected and aligned without offset, all in one process. This applies to both horizontal and vertical MANTO Panel connections.</p> <p>Safe Working Moment (-M, facing down): 1.70 kNm.</p> <p>Safe Working Moment (+ M, facing up): 1.20 kNm.</p> <p>SWL (N): 11.20 kN.</p> <p>SWL (V): 6.70 kN.</p> <p>Refer to page 59.</p>		
	<b>PM Aligning Wedge Clamp</b>	<b>606900</b>	<b>6.33</b>
	<p>The PM Aligning Wedge Clamp ensures that joints are closed securely and the panels are properly connected and aligned without offset, all in one process. This applies to all horizontal and some vertical MANTO panel connections.</p> <p>Safe Working Moment (M): 2.00 kNm.</p> <p>SWL (N): 15.00 kN.</p> <p>SWL (V): 15.00 kN.</p> <p>Refer to page 62.</p>		

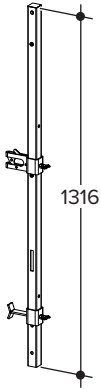
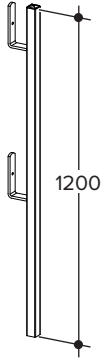
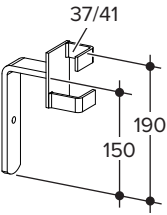
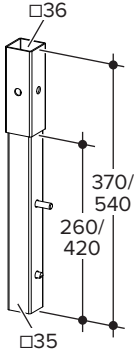
	Component	Code	Weight [kg]
	<b>Panel Connection Unit</b> The Panel Connection Unit is made up of the PM Aligning Wedge Clamp (code:606900) and the Aligning Wedge Clamp Holder (code:606970). The Aligning Wedge Clamp Holder secures the PM Aligning Wedge Clamp to the panel, where it is always readily available. Refer to page 62.	<b>609080</b>	<b>9.82</b>
	<b>Panel Clamp</b> Used to connect timber beams and plywood extensions as well as panels and shaft spindles. SWL (N): 8.00 kN. Refer to page 76.	<b>448010</b>	<b>3.01</b>
	<b>Adjustable Aligning Clamp</b> Same as the MANTO Aligning Panel Clamp (code:448000) but allows for length adjustment of up to 150 mm. Safe Working Moment (-M, facing down): 1.70 kNm. Safe Working Moment (+ M, facing up): 1.20 kNm. SWL (N): 8.10 kN. SWL (V): 9.50 kN. Refer to page 67.	<b>467898</b>	<b>6.00</b>
	<b>PLATINUM 100 Universal Connector</b> For joining MANTO panels and infills, and for connecting inner corners (Refer to page 133) and MANTO shaft corners (Refer to page 190). Permissible N: 20.0 kN. Permissible V: 20.0 kN.	<b>606209</b>	<b>6.34</b>
	<b>Outer Corner Clamp</b> The Outer Corner Clamp connects and aligns MANTO panels at right angles to create an outer corner. SWL (N): 17.50 kN. Refer to page 130.	<b>448227</b>	<b>8.80</b>
	<b>PLATINUM 100 MANTO Extension Bar</b> The PLATINUM 100 MANTO Extension Bar is used to extend MANTO panels for formwork heights of 5.40 m and more. Extended panels are connected securely at the panel joint and are aligned. Additional struts can be connected directly to the PLATINUM 100 Extension Bar. Safe Working Moment (M): 4.50 kNm. SWL (N): 15.00 kN. SWL (V): 11.00 kN. Refer to page 94.	<b>607000</b>	<b>18.83</b>

	Component	Code	Weight [kg]
	<b>PLATINUM 100 Bulkhead Clamp</b> The tension-resistant PLATINUM 100 Bulkhead Clamp is used to create a stopend without any additional ties or other components, e.g. using timber beams and a form sheet. Safe Working Moment (M): 5.00 kNm. SWL (N): 36.00 kN. SWL (V): 36.00 kN. Refer to page 152.	<b>604328</b>	<b>11.02</b>
	<b>Multipurpose Waler 100</b> The Multipurpose Waler 100 spans infills and transfers the loads into the MANTO panels. Secure with 2no. PLATINUM 100 Multi Bolts (code:605820) or waler spanners. The result is a panel connection that is resistant to tension. It can also be used in stopends and with height extensions. The integrated nail holes facilitate formwork assembly. Refer to pages 68 and 156.	<b>450764</b>	<b>13.10</b>
	<b>Waler 80</b> A Waler 80 can be used instead of the Multipurpose Waler 100 (code:450764).	<b>586980</b>	<b>6.30</b>
	<b>Steel Waler F 171</b> The Steel Waler F 171 is required to connect MANTO XL panels and XXL panels that have been extended. The PLATINUM 100 MANTO Extension Bar (code:607000) can be used as an alternative. The Steel Walers F 171 are connected to the panels using 4no. multi bolts or waler spanners and 4no. Tension Nuts (DW 15) (code:197332) per waler. Refer to page 92.	<b>503908</b>	<b>38.86</b>
	<b>Waler Spanner (300 mm)</b>	<b>452053</b>	<b>0.76</b>
	<b>Waler Spanner (500 mm)</b> Used to secure Multipurpose Walers 100(code 100 (code:450764) or any other walers and profiles. Simply hook the waler spanner into the grid holes of the H-ribs or V-ribs on the panel. An additional Tension Nut (DW 15) (code:197332) is needed. SWL (N): 16.50 kN. Refer to page 156.	<b>454410</b>	<b>1.07</b>
	<b>PLATINUM 100 Multi Bolt DW 15/29</b>	<b>605820</b>	<b>1.35</b>
	<b>PLATINUM 100 Multi Bolt DW 15/41</b> The PLATINUM 100 multi bolt is used to connect ribs for stopends and for length adjustments on site. It is used in conjunction with the MANTO Tension Nut (DW 15) (code:464600). SWL (N): 40.0 kN. Refer to page 156.	<b>605810</b>	<b>1.52</b>

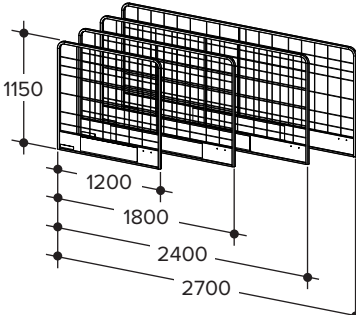
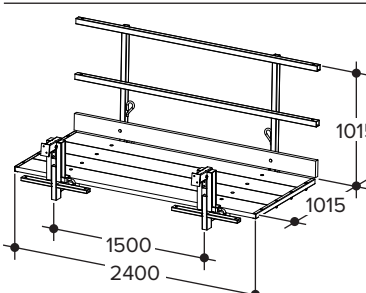
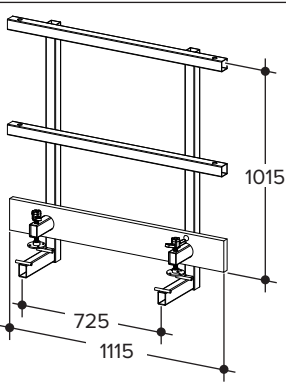
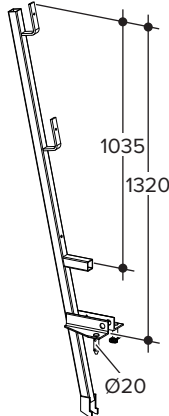
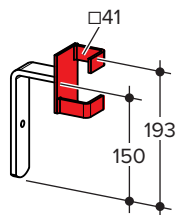
	Component	Code	Weight [kg]
	<b>Tension Nut (DW 15)</b>	<b>197332</b>	<b>0.65</b>
	Used in conjunction with a waler spanner and a PLATINUM 100 multi bolt. SWL (N): 40.00 kN. Refer to page 156.		
	<b>MANTO MP Bolt (DW 15)</b>	<b>454442</b>	<b>0.80</b>
	<b>MANTO MP Nut (DW 15)</b> For connecting MANTO MP panels when used as column formwork. Always use in conjunction with the Tie Nut 230 (code:48344). SWL (N): 50.00 kN. Refer to page 158.	<b>454670</b>	<b>0.34</b>
	<b>MANTO Column Angle Waler **</b>	<b>540005</b>	<b>23.80</b>
	<b>Column Waler Wedge</b>	<b>540049</b>	<b>0.20</b>
	<b>Column Waler Bolt</b> Used in conjunction with the MANTO panels to form columns from 200 mm to 650 mm (in 10 mm increments). The assembly is made of 4no. MANTO Column Angle Walers (code:540005), which is attached to the MANTO panels at the height of the tie position. Refer to page 162.	<b>569189</b>	<b>0.54</b>
	<b>S Bolt (DW 15)</b> Used to connect MANTO Column Frames. Always use in conjunction with the MANTO tie nut. SWL (N): 60.00 kN. Refer to page 160.	<b>479724</b>	<b>1.90</b>

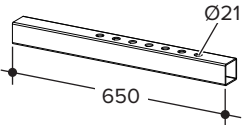
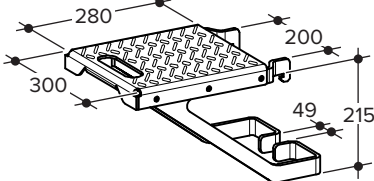
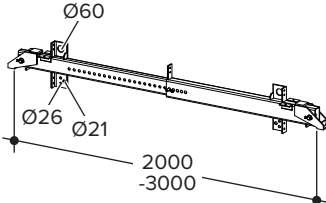
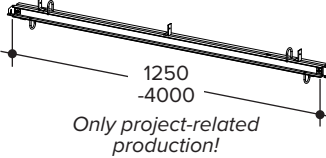
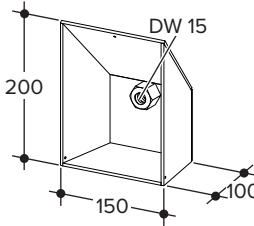
### 3.5 Brackets and platforms

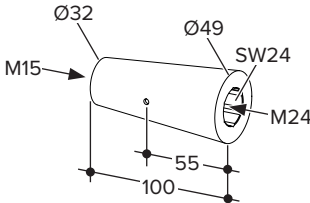

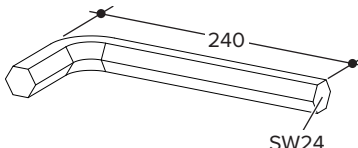
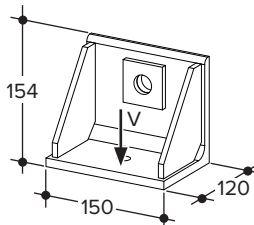
	Component	Code	Weight [kg]
	<b>MANTO P-Walkway Bracket</b>	<b>606240</b>	<b>11.92</b>
	Used to install a 900 mm wide platform. Simply attach the MANTO P-Walkway Bracket at the required height to the MANTO panel by inserting the pins into a rib of the panel and securing with the SPRING Cotter Pin 4 (code:173776). Using an additional Waler Bolt D20 (code:420000), it can be tied to either an upright or a horizontal formwork panel. Planks provided on site have to be nailed to the integrated timber strip to secure against uplift and tilting. Refer to page 181.		

	Component	Code	Weight [kg]
	<b>PROTECTO Post 130 Adjustable</b> <p>The PROTECTO Post 130 Adjustable is used in combination with the PROTECTO Panel G2.</p> <p>An integrated safety device secures the post automatically to the various retaining elements.</p> <p>The PROTECTO Post 130 Adjustable complies with EN 13374 Class A when used with the PROTECTO Panels G2.</p> <p>Refer to page 181.</p>	<b>692750</b>	<b>4.50</b>
	<b>PROTECTO Railing Post</b> <p>The PROTECTO Railing Post is used in conjunction with PROTECTO Panels G2 and timber planks. An integrated safety device secures the post automatically to the various retaining elements.</p> <p>The PROTECTO Railing Post complies with DIN EN 13374 Class A when used with PROTECTO panels G2 and timber planks. The planks used for railing must be 30 mm thick, 150 mm high and meet the requirements of strength class C24 according to EN 338 (formerly S10).</p>	<b>601225</b>	<b>3.67</b>
	<b>PROTECTO Toe Board Retainer</b> <p>This additional part for the PROTECTO Railing Post (code:601225) holds the toe board of the board railing.</p> <p>The PROTECTO Toe Board Retainer can be easily attached even when the PROTECTO Railing Post is already in place.</p>	<b>601227</b>	<b>0.69</b>
	<b>PROTECTO Post Extension 26</b> <b>PROTECTO Post Extension 42</b> <p>The PROTECTO Post Extensions are used to increase the height of the PROTECTO Railing Post (601225) or the PROTECTO Post 130 Adjustable (692750) by 260 mm or 420 mm.</p> <p>When the PROTECTO Post Extension 26 is used, post spacing may not exceed 1.70 m.</p> <p>When the PROTECTO Post Extension 42 is used, post spacing may not exceed 1.30 m.</p>	<b>602111</b> <b>602580</b>	<b>0.96</b> <b>1.21</b>

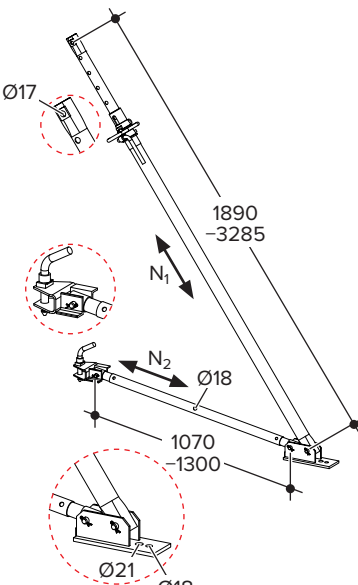


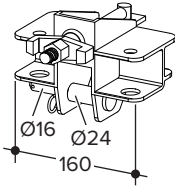
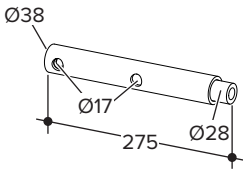
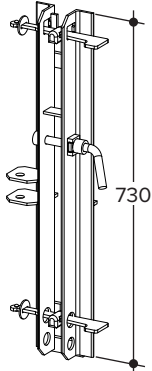
	Component	Code	Weight [kg]
	<b>PROTECTO Panel G2 270</b>	<b>692778</b>	<b>21.00</b>
	<b>PROTECTO Panel G2 240</b>	<b>692772</b>	<b>19.50</b>
	<b>PROTECTO Panel G2 180</b>	<b>692766</b>	<b>14.50</b>
	<b>PROTECTO Panel G2 120</b>	<b>692760</b>	<b>10.00</b>
	<p>Used in conjunction with the PROTECTO Post 130 Adjustable (code:692750) or the PROTECTO Railing Post (code:601225) to provide edge protection.</p> <p>Maximum allowable post spacing is 2.40 m.</p> <p>When used in conjunction with the PROTECTO Post 130 Adjustable or the PROTECTO Railing Post, the PROTECTO panel G2 complies with the standard DIN EN 13374 class A.</p>		
	<b>MANTO Pouring Platform</b> A complete 2.4 m long x 1.20 m wide deck with planks and edge protection. Once the railing is unfolded, the pouring platform can be lifted by crane and hung on the MANTO formwork. The platform is automatically secured against uplift. Refer to page 184.	<b>547165</b>	<b>140.79</b>
	<b>Platform Railing</b> Used to erect the transverse railing for use on both ends of the MANTO Pouring Platform (code:547165). It is fixed to the Pouring Platform (code:547165) using the integrated clamping screws. Refer to page 187.	<b>587252</b>	<b>24.23</b>
	<b>Counter Post</b> The Counter Post is hooked to the upper horizontal rib of the panel and secured with the attached spring pin. Installation is similar to the MANTO P-Walkway Bracket (code:606240). With an additional Waler Bolt D (code:420000) the Counter Post can also be mounted to horizontal panels. Used to secure the toe board using the Toe Board Retainer (code: 603609). Refer to page 182.	<b>600814</b>	<b>9.20</b>
	<b>Toe Board Retainer</b> Secure the toe board on the Counter Post (code:600814). Marked with red paint for easy identification. Refer to page 182.	<b>603609</b>	<b>0.71</b>

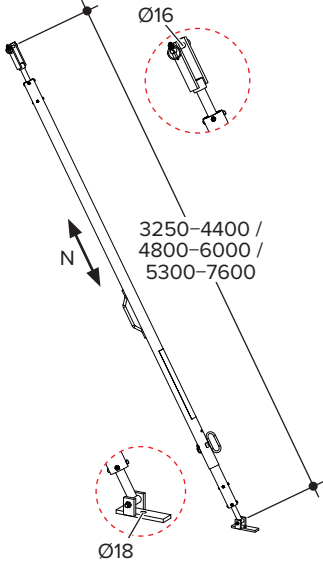
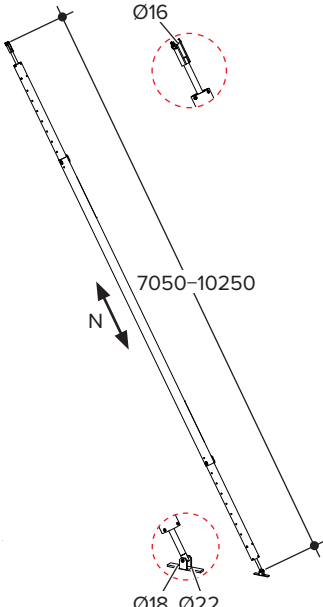
	Component	Code	Weight [kg]
	<b>KG Rail Extension</b> Used in conjunction with Waler Bolt D20 (code:420000) and Spring Cotter Pin Ø4 (code:173778). Refer to page 187.	<b>498218</b>	<b>3.60</b>
	<b>PLATINUM 100 Platform Step</b> The PLATINUM 100 Platform Step may be attached up to a height of 1.00 m off the ground. The platform step can be used to reach components that are higher up the structure. SWL: 150.00 kg. Refer to page 188.	<b>606480</b>	<b>5.95</b>
	<b>Platform Beam 200 - 300 Telescopic</b> Main beam of a shaft platform. Used to support secondary beams of a timber platform made to suit the enclosed space. Includes gravity latches that automatically click into place during lifting operations. Adjustable in 10 mm increments within a range of 1.00 m. Platform beams that cannot be extended are available upon request. Precise dimensions up to 4.00 m. Refer to page 203.	<b>600330</b>	<b>89.50</b>
	<b>Platform Beam 350 - 400</b>	<b>410931</b>	<b>122.20</b>
	<b>Platform Beam 300 - 350</b>	<b>410920</b>	<b>108.80</b>
	<b>Platform Beam 250 - 300</b>	<b>410910</b>	<b>95.40</b>
	<b>Platform Beam 200 - 250</b>	<b>410909</b>	<b>82.00</b>
	<b>Platform Beam 150 - 200</b>	<b>410894</b>	<b>68.60</b>
	<b>Platform Beam 125 - 150</b>	<b>410883</b>	<b>55.20</b>
	Like Platform Beam 200 - 300 Telescopic (code:600330), but length cannot be adjusted. This component is produced only for the respective use in specific projects. The range of each platform beam is indicated here, however it is manufactured to the precise dimensions stated in the order. Platform Beams < 1.25 m are available on request. Not for rental. Refer to page 202.		
	<b>Box-out</b> Provides the recess in the shaft wall for the platform beam. It is secured during formwork assembly with either a tie rod and tie nut, or it is nailed to the formwork. Due to its tapered shape, the Box-out can be recovered and, if in good condition, reused. Refer to page 202.	<b>410942</b>	<b>2.60</b>

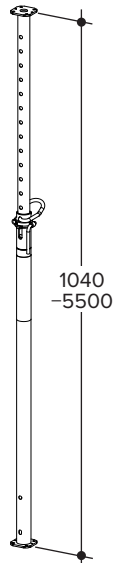

	Component	Code	Weight [kg]
	<b>A-Tie Cone M24/DW 15</b> Steel cone for suspended scaffolds. The front connection is equipped with an M24 thread to accommodate the Fit Bolt M24x70 Z 8.8 (code:185635) and the rear side with a DW 15 thread for tie rods. The cone is reusable. Remove it from the concrete using an Allen key w.a.f. 24 (code:542471). Refer to page 205.	<b>496664</b>	<b>0.65</b>
	The A-Tie Cone M24/DW 15 must be provided with an adequate tying design for the site conditions. Details can be found in the German technical approval T-211.6-1854.		
	<b>Allen key w.a.f. 24</b> Use to remove the A-Tie Cone M24/DW 15.	<b>542471</b>	<b>1.25</b>
	<b>KB Supporting Part</b> The KB Supporting Part is used to support the platform beams. The KB Supporting Part is secured with the Fit Bolt M24x70 Z 8.8 (code:185635) and the A-Tie Cone M24/DW 15 (code:496664). SWL (V): 22.50 kN. Refer to page 205.	<b>600338</b>	<b>5.81</b>

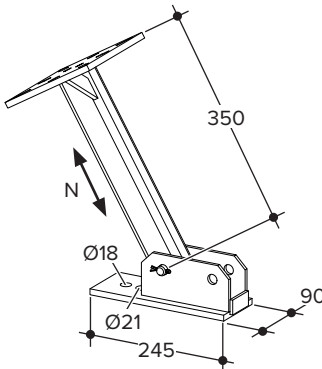
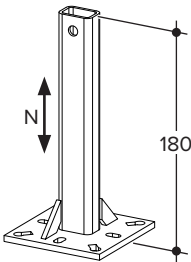
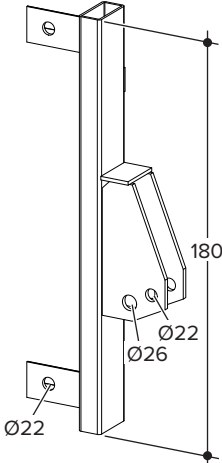
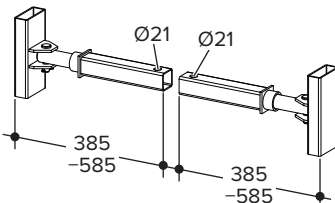
### 3.6 Struts and props

	Component	Code	Weight [kg]
	<b>MANTO Alignment Strut</b> The MANTO Alignment Strut is used to brace and align formwork no higher than 3.90 m. One MANTO Strut Connector (code:565114) or 1no. MANTO Strut Head (code:600035) shall be ordered for each MANTO Alignment Strut.  SWL (N <sub>1</sub> ) Min. extension: 27.00 kN. SWL (N <sub>1</sub> ) Max. extension: 8.00 kN. SWL (N <sub>1</sub> ) for other extensions can be interpolated. SWL (N <sub>2</sub> ): 7.50 kN. Refer to page 170.	<b>565103</b>	<b>23.30</b>

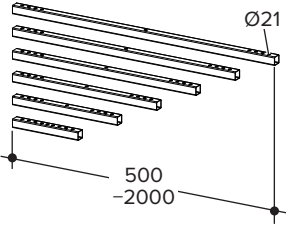
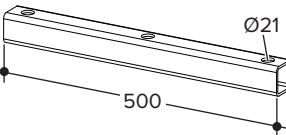
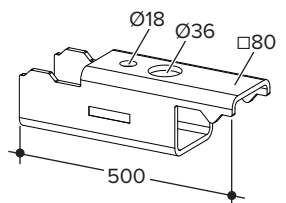
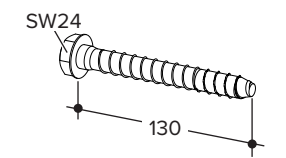
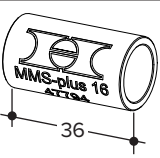
	Component	Code	Weight [kg]
	<b>MANTO Strut Head</b> Allows MANTO panels to be braced with the MANTO Alignment Strut (code:565103). Can be used in conjunction with the Adapter for Alignment Struts (code: 601733) as well as with other struts (K-struts and Alignment Strut Super 10 (code:602095). Combined with the Strut Adapter (code:565331), it can also be used with EUROPLUS <sup>new</sup> struts. SWL: Refer to page 171.	<b>600035</b>	<b>4.33</b>
	<b>Adapter for Alignment Struts</b> Used along with the MANTO Strut Head (code:600035) or the MANTO Strut Connector (code:565114) to brace MANTO formwork with the aid of struts. Refer to page 173.	<b>601733</b>	<b>1.31</b>
	<b>MANTO Strut Connector</b> Allows MANTO panels to be braced with the MANTO Alignment Strut (code:565103) and, in conjunction with the Adapter for Alignment Struts, (code:601733), other struts (K struts and Alignment Struts Super 10 (code:602095). When an additional MANTO Alignment Strut (code:482088) is used, a BKS Alignment Strut (code: 482088) can be connected to brace up to a height of 8.00 m. When the MANTO Strut Connector (code:565114) an additional Bolt D16x87 (code:601908) and well as an additional Spring Cotter Pin 4 (code:173778) are needed. SWL: Refer to page 173.	<b>565114</b>	<b>8.90</b>

	Component	Code	Weight [kg]
	<b>Alignment Strut K440</b> (3250 mm – 4400 mm) SWL (N) at minimum extension (3250 mm): 20.00 kN. SWL (N) when using Adapter for Alignment Struts (code:601733) at minimum extension (3.35 m): 19.20 kN.  SWL (N) at maximum extension (4.40 m): 11.00 kN. SWL (N) when using Adapter for Alignment Struts (code:601733) at maximum extension (4.50 m): 9.90 kN.	<b>601208</b>	<b>22.61</b>
	<b>Alignment Strut K600</b> (4800 mm – 6000 mm) SWL (N) at minimum extension (4.80 m): 20.00 kN. SWL (N) when using Adapter for Alignment Struts (code:601733) at minimum extension (4.90 m): 17.30 kN.  SWL (N) at maximum extension (6.00 m): 14.00 kN. SWL (N) when using Adapter for Alignment Struts (code:601733) at maximum extension (6.10 m): 11.60 kN.	<b>601210</b>	<b>34.97</b>
	<b>Alignment Strut K760</b> (5300 mm – 7600 mm) SWL (N) at minimum extension (5.30 m): 20.00 kN. SWL (N) when using Adapter for Alignment Struts (code:601733) at minimum extension (5.40 m): 20.00 kN.  SWL (N) at maximum extension (7.60 m): 15.00 kN. SWL (N) when using Adapter for Alignment Struts (code:601733) at maximum extension (7.70 m): 12.40 kN. Refer to page 172.	<b>601212</b>	<b>50.47</b>
	<b>Alignment Strut Super 10</b> (7050 mm – 10250 mm) SWL (N) at minimum extension (7.05 m): 27.00 kN. SWL (N) when using Adapter for Alignment Struts (code:601733) at minimum extension (7.15 m): 27.00 kN.  SWL (N) at maximum extension (10.25 m): 22.30 kN. SWL (N) when using Adapter for Alignment Struts (code:601733) at maximum extension (10.35 m): 18.30 kN. Refer to page 172.	<b>602095</b>	<b>83.25</b>

	Component	Code	Weight [kg]
	<b>EUROPLUSnew 20-250</b> (1470 mm – 2500 mm)	<b>601390</b>	<b>13.15</b>
	<b>EUROPLUSnew 20-300</b> (1720 mm – 3000 mm)	<b>601400</b>	<b>16.82</b>
	<b>EUROPLUSnew 20-350</b> (1980 mm – 3500 mm)	<b>601410</b>	<b>20.52</b>
	<b>EUROPLUSnew 20-400</b> (2240 mm – 4000 mm)	<b>601415</b>	<b>23.79</b>
	<b>EUROPLUSnew 20-550</b> (3030 mm – 5500 mm)	<b>601425</b>	<b>36.07</b>
	SWL pursuant to DIN EN 1065: 20 kN.		
	<b>EUROPLUSnew 30-150</b> (1040 mm – 1500 mm)	<b>601460</b>	<b>10.68</b>
	<b>EUROPLUSnew 30-250</b> (1470 mm – 2500 mm)	<b>601430</b>	<b>16.19</b>
	<b>EUROPLUSnew 30-300</b> (1720 mm – 3000 mm)	<b>601440</b>	<b>19.17</b>
	<b>EUROPLUSnew 30-350</b> (1980 mm – 3500 mm)	<b>601445</b>	<b>24.24</b>
	<b>EUROPLUSnew 30-400</b> (2240 mm – 4000 mm)	<b>601450</b>	<b>28.75</b>
	SWL pursuant to DIN EN 1065: 30 kN.		
<p>All EUROPLUSnew steel props feature a quick-lowering mechanism, anti-crush guard and protection against sliding out of the inner tube. The props are hot-dip galvanised for long-term protection from corrosion.</p> <p>The strut is used to brace and align formwork at heights of 3.90 m – 6.00 m.</p> <p>Refer to page 174.</p>			
	<b>Counter Nut A/DB 260/300</b>	<b>107107</b>	<b>0.92</b>
	For EUROPLUS 260, 300 DB/DIN, EUROPLUSnew 20-250, 20-300, EUROPLUSnew 30-150		
	<b>Counter Nut AS/DB 350/410</b>	<b>107118</b>	<b>1.00</b>
	For EUROPLUS 350 DB/DIN, EUROPLUSnew 20-350, 20-400, EUROPLUSnew 30-250, 30-300, 30-350		
	<b>Counter Nut EC 350/DB 450</b>	<b>562051</b>	<b>1.50</b>
	For EUROPLUS 350 EC and 450 DB		
	<b>Counter Nut EC 400/DC 550</b>	<b>587675</b>	<b>1.39</b>
	For EUROPLUS 400 EC, 550 DC, EUROPLUSnew 20 - 550, EUROPLUSnew 30 - 400		
<p>Reinforces EUROPLUSnew props to absorb tensile loads. Must be attached when EUROPLUSnew props are to serve as wind bracing (Refer to page 175).</p> <p>Tensile loads in the EUROPLUSnew prop: <math>N_{perm.} = 15.0 \text{ kN}</math>.</p>			

	Component	Code	Weight [kg]
	<b>Strut Base</b> Used to convert EUROPLUSnew props to struts. The Strut Base is fastened to the base plate of the EUROPLUSnew prop with 4no. M12x30 Bolts and Nuts. SWL (N): 34.00 kN. Note the limited tensile load of the EUROPLUSnew prop! Refer to page 174.	<b>566369</b>	<b>7.70</b>
	<b>Strut Adapter</b> Used to convert EUROPLUSnew props to struts. The Strut Adapter is fastened to the upper plate of the EUROPLUSnew prop with 4no. M12x30 Bolts and Nuts. Then the Strut Adapter is connected to the MANTO Strut Connector (code:565114) or to the MANTO Strut Head (code:600035). SWL (N): 34.00 kN. Note the limited tensile load of the EUROPLUSnew prop! Refer to page 174.	<b>565331</b>	<b>4.88</b>
	<b>BKS Strut Connector</b> Shall be used with BKS props longer than 8.00 m. For each connection, 2no. M20x40 Bolts and Nuts as well as 1no. M20x80 Bolt and Nut are required. SWL (N): 34.00 kN. Refer to page 177.	<b>482008</b>	<b>9.10</b>
	<b>Right Spindle Piece</b> <b>Left Spindle Piece</b> Assembled in conjunction with the centre tubes and the Connection Tube (code:533230) (if required) to form a spindle strut in shaft formwork. The flat ends are connected to the MANTO panels using 2no. Panel Clamps (code:448010) per end. The centre tubes are connected the spindle pieces with 2no. Waler Bolts D20 (code:420000) and 2no. Spring Cotter Pins 4 (code:173776) for each connection. The right piece is marked blue and the left piece is marked red. Refer to page 200.	<b>524700</b> <b>524710</b>	<b>4.70</b> <b>4.70</b>

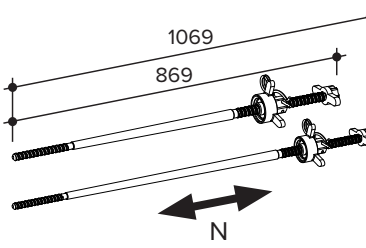


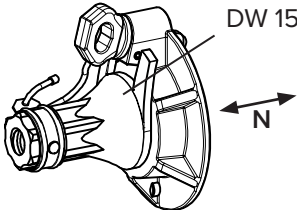
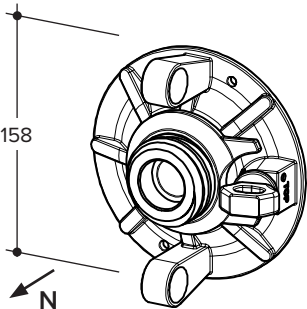
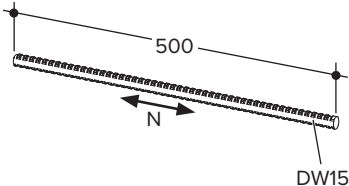
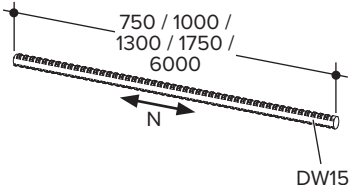
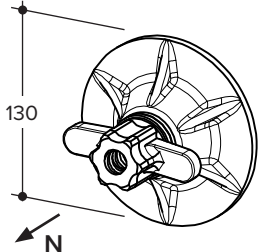
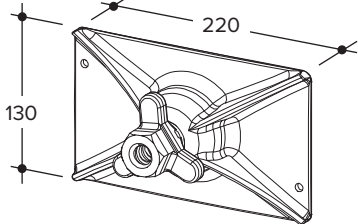
	Component	Code	Weight [kg]
	<b>Centre Tube 50</b>	<b>524721</b>	<b>3.40</b>
	<b>Centre Tube 80</b>	<b>524732</b>	<b>5.40</b>
	<b>Centre Tube 110</b>	<b>524743</b>	<b>7.40</b>
	<b>Centre Tube 140</b>	<b>524754</b>	<b>9.40</b>
	<b>Centre Tube 170</b>	<b>524765</b>	<b>11.40</b>
	<b>Centre Tube 200</b>	<b>524776</b>	<b>13.40</b>
<p>Used with the spindle pieces to form a spindle strut used in shaft formwork. Connect the centre tube to the spindle pieces with 2no. Waler Bolts D20 (code:420000) and 2no. Spring Cotter Pins 4 (code:173778) for each connection.</p>			
	<b>Connection Tube</b>	<b>533230</b>	<b>2.80</b>
<p>Acts as a sleeve to join 2no. centre tubes end-to-end if a spindle strut is required to be longer than the available centre tubes. Secure with 2no. Waler Bolts D20 (code:420000) and 2no. Spring Cotter Pins 4 (code:173778).</p>			
	<b>Panel Anchor Bracket</b>	<b>605999</b>	<b>2.39</b>
<p>Protects MANTO panels from uplift. Secured in the concrete with the Anchor Bolt MM Plus SSK 16 x 130 mm (code:443500). Refer to page 165.</p>			
	<b>Anchor Bolt MM Plus SSK 16 x 130 mm</b>	<b>443500</b>	<b>0.21</b>
<p>Used to temporarily secure the Panel Anchor Bracket (code:605999) to the existing structure. Only 1no. Anchor Bolt MM+SSK 16 x 130 mm is required per bracket. Refer to page 166.</p>			
	<b>MMS+16 Thread Checking Gauge</b>	<b>443501</b>	<b>0.04</b>
<p>Used to check the state if the Anchor Bolt MM Plus SSK 16 x 130 (code:443500). Refer to page 168.</p>			

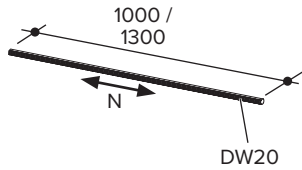
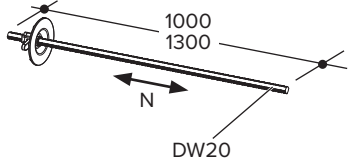
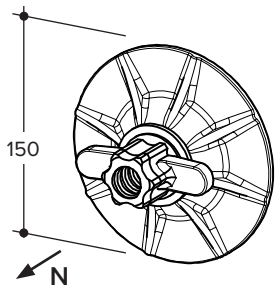
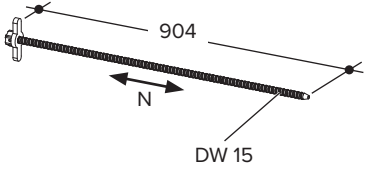
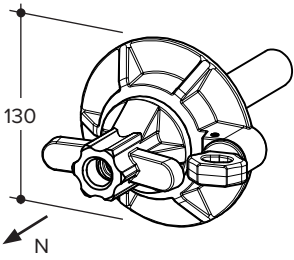
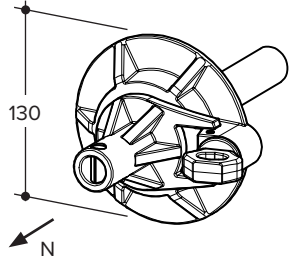
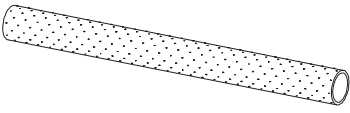
## 3.7 Tying components

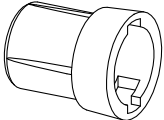
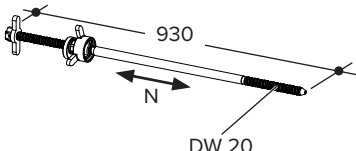
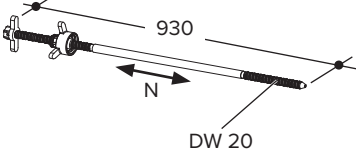
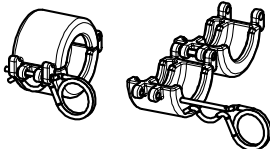
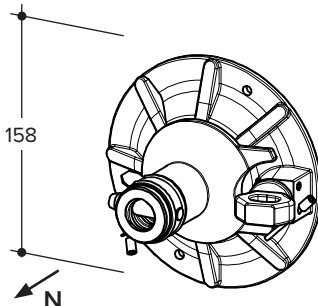
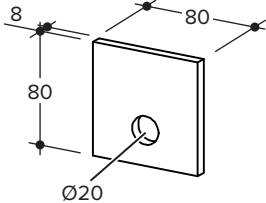
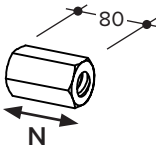




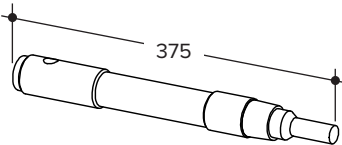
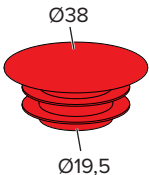

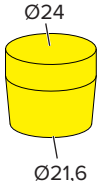
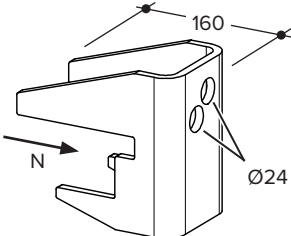
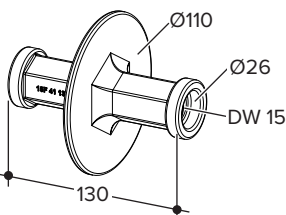
Never weld and/or heat tie rods. Heating can damage them, causing them to break when subjected to load.

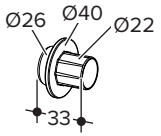
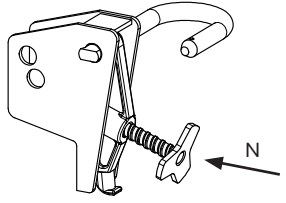
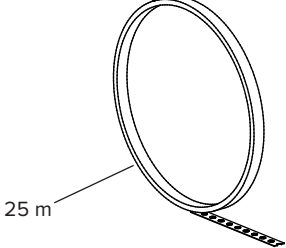
	Component	Code	Weight [kg]
	<b>Taper Tie 15/15-35</b>	<b>610185</b>	<b>3.31</b>
	Tie rod for wall thicknesses of 15 to 35 cm.		
	<b>Taper Tie 15/35-55</b>	<b>610190</b>	<b>3.85</b>
	Tie rod for wall thicknesses of 35 to 55 cm.		
<p>SWL (N): 90 kN. Refer to page 102.</p>			

	Component	Code	Weight [kg]
	<b>Taper Tie 15 Adjusting Nut</b> SWL (N): 90 kN. Refer to page 102.	<b>609650</b>	<b>2.20</b>
	<b>PLATINUM 100 Tie Nut Closing Side</b> Used along with the PLATINUM 100 Tie Nut Advancing Side (code:604196) and the PLATINUM 100 Tie Rod G2 (code:606340) to create a one-sided taper tie system. Refer to page 112. Used in conjunction with a taper tie 15 Taper Tie15 Adjusting Nut (code:609650) to enable one-sided taper tying with the taper tie system DW 15. SWL (N) with a taper tie 15: 90.00 kN. Refer to page 103. SWL (N) with a PLATINUM 100 Tie Rod G2: 150.00 kN. Refer to page 110.	<b>604197</b>	<b>2.65</b>
	<b>Tie Rod DW15/50</b> Connects the MANTO Column Angle Walers (code:540005) in assembled condition. Always used with 2no. MANTO Tie Nuts (DW 15) (code:464600). SWL (N): 90.00 kN. Refer to page 123.	<b>102527</b>	<b>0.72</b>
	<b>Tie Rod DW15/75*</b> <b>Tie Rod DW15/100*</b> <b>Tie Rod DW15/130*</b> <b>Tie Rod DW15/175*</b> <b>Tie Rod DW15/600*</b> SWL (N): 90.00 kN. Refer to page 123.	<b>437660</b> <b>24387</b> <b>20481</b> <b>20470</b> <b>136260</b>	<b>1.08</b> <b>1.44</b> <b>1.87</b> <b>2.52</b> <b>8.64</b>
	<b>MANTO Tie Nut (DW15)</b> Using a MANTO Ratchet (code:408780) or a hammer, the MANTO Tie Nut (DW15) can be easily loosened due to the integrated rotating disk, even under full load. SWL (N): 90.00 kN. Refer to page 123.	<b>464600</b>	<b>1.26</b>
	<b>Tie Nut 230 (DW15)</b> Tie nut with a large plate and a ball-type nut that allows for an inclination of up to 10°. SWL (N): 90.00 kN.	<b>48344</b>	<b>2.40</b>

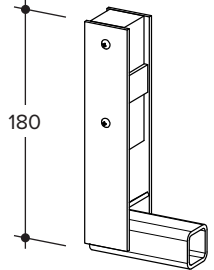
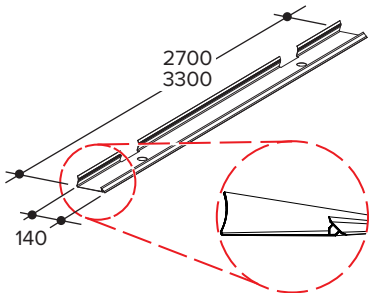
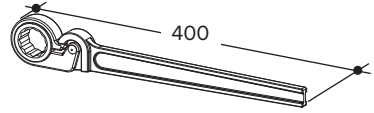

	Component	Code	Weight [kg]
	<b>Tie Rod DW 20/100</b>	<b>531600</b>	<b>2.56</b>
	<b>Tie Rod DW 20/130</b> SWL (N): 150.00 kN. Refer to page 123.	<b>531610</b>	<b>3.33</b>
	<b>Tie Equipment DW 20/100**</b>	<b>534213</b>	<b>4.10</b>
	<b>Tie Equipment DW 20/130**</b> Tie rod with a captive Tie Nut 150 (DW 20) (code:531481). SWL (N): 150.00 kN. Not for rental.	<b>534224</b>	<b>4.80</b>
	<b>Tie Nut DW 20/150</b> Easy to fasten tie nut to be used with tie rods DW 20. SWL (N): 150.00 kN. Refer to page 123.	<b>531481</b>	<b>1.51</b>
	<b>MR Tie Rod DW 15</b> Tie rod for one-sided tying with a tie sleeve. For wall thicknesses up to 37 cm. With a grip to facilitate insertion and extraction. SWL (N): 90 kN. Refer to page 118.	<b>607250</b>	<b>1.71</b>
	<b>MANTO Front Tie Nut</b> Part of the one-sided tie system with tie sleeve. Used only with MANTO G3 and G3 M panels. SWL (N): 90.00 kN. Refer to page 118.	<b>607230</b>	<b>2.18</b>
	<b>MANTO Rear Tie Nut</b> Part of the one-sided tie system with tie sleeve. Used only with MANTO G3 and G3 M panels. SWL (N): 90.00 kN. Refer to page 118.	<b>607240</b>	<b>2.11</b>
	<b>Tie Sleeve DW 15x2000 (Ø26/22)*</b>	<b>605916</b>	<b>0.47</b>
	<b>Tie Sleeve DW 20x2000 (Ø32/26)*</b> Plastic sleeve to protect the tie rod. Values in brackets indicate outer and inner diameters respectively. Length: 2.0 m.	<b>605921</b>	<b>0.84</b>

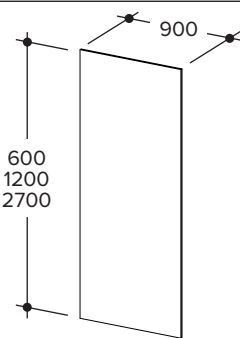
	Component	Code	Weight [kg]
	<b>MR Sealing Cone</b> Plastic cone to be placed on a tie sleeve with an inner diameter of 22 mm. Creates a tie hole that can be sealed with a plug or with mortar after stripping. The sealing cone can be extracted from the concrete and used again.	607122	0.01
	<b>PLATINUM 100 Tie Rod</b> Used along with the PLATINUM 100 Tie Nut Advancing Side (Art.-Nr. 604196) and the PLATINUM 100 Tie Nut Closing Side (Art.-Nr. 604197) to create a sleeveless tying system. SWL (N): 150.00 kN. Refer to page 112.	604300	4.07
	<b>PLATINUM 100 Tie Rod G2</b> A taper tie system that is quick and easy to install can be constructed when used in conjunction with the PLATINUM 100 Tie Nut Advancing Side (code:604196) and the PLATINUM 100 Tie Nut Closing Side (code:604197). It can be operated either from the advancing side or from the closing side. It shall be used along with the PLATINUM 100 Adjustment Clip for Tie Rod G2 (code:604021). SWL (N): 150.00 kN. Refer to page 114.	606340	3.92
	<b>PLATINUM 100 Adjustment Clip for Tie Rod G2</b> Used to adjust the wall thickness on the PLATINUM 100 Tie Rod G2 (code:606340). Refer to page 114.	604021	0.26
	<b>PLATINUM 100 Tie Nut Advancing Side</b> Used along with the PLATINUM 100 Tie Nut Closing Side (code:604197) and the PLATINUM 100 Tie Rod G2 (code:606340) to create a one-sided taper tie system. Refer to page 111.	604196	2.79
	<b>Plate 8/8*</b> Used to allow the lower tie to be installed along with a Hexagonal Nut 15/50 (code:164535) in panels lying on the ground.	400214	0.40
	<b>Hexagonal Nut 15/50</b> Used as a tie nut for the rigid plates without thread. The nut has to be operated with a spanner (w.a.f. 30). SWL (N): 90.00 kN.	164535	0.22

	Component	Code	Weight [kg]
	<b>MANTO G3 DW Insert*</b> Used for conventional tying with a tie rod and tie sleeve as well as for one-sided tying with an MR Tie Rod DW 15 (code:607250) and a tie sleeve. Protects the tie holes from wear and seals the tie system against the panel. Refer to page 99.	<b>607915</b>	<b>0.05</b>
	<b>MANTO G3 Sealing Insert*</b> Used for one-sided taper tying with taper ties. Protects the tie holes from wear and seals the tie system against the panel. Refer to page 99.	<b>607925</b>	<b>0.05</b>
	<b>MANTO G3 Replacement Tool</b> Used to extract the MANTO G3 plastic inserts (code:607915, 607925) and to remove concrete residue from the tie holes in the MANTO panels.	<b>608270</b>	<b>1.83</b>
	<b>A Plugs, 100 pieces</b> Used to close Ø24 mm and Ø27 mm (with collar) tie holes and the MANTO G3 DW Insert (code:607915) (code:607915). Red.	<b>602578</b>	<b>0.00</b>
	<b>TEKKO Plug, 100 pieces</b> Used to close the MANTO G3 DW Sealing Insert (code:607915). Blue.	<b>197457</b>	<b>0.16</b>
	<b>MANTO Plug, 100 pieces</b> Used to close Ø24mm tie holes in the MANTO MP panel. Yellow.	<b>453253</b>	<b>0.00</b>
	<b>Edge Tie Fastener MR</b> Attached to the edge profile of the MANTO panel to allow a tie to be placed above the panel and clear of the concrete. SWL (N): 10.00 kN. Refer to page 128.	<b>566667</b>	<b>2.40</b>
	<b>Water Stop 15*</b> Used with tie rods DW 15 and tie sleeves to create watertight tie holes. SWL (N): 90.00 kN. Water resistance: 7 bar. Refer to page 124.	<b>164400</b>	<b>0.55</b>

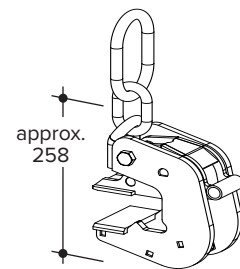
	Component	Code	Weight [kg]
	<b>250 pcs. WS Adapter Ø22*</b> Used with the Water Stop 15 (code:164400) when tie sleeves or fibre cement sleeves with an outer diameter > 26 mm are used. Packaging unit of 250 pieces. Refer to page 126.	<b>605789</b>	<b>1.09</b>
	<b>FU Tightener</b> Used in conjunction with the Punched Steel Tape to tie across foundation formwork. SWL (N): 12.00 kN. Refer to page 128.	<b>568357</b>	<b>3.60</b>
	<b>Punched Steel Tape 25 m*</b> The FU Tightener (code:568357) and the Punched Steel Tape are used together in foundation formwork. Working load: 15.00 kN.	<b>568081</b>	<b>17.20</b>

### 3.8 Accessories

	Component	Code	Weight [kg]
	<b>MANTO Add-on Piece</b> With integrated nailing strip: for on-site extensions of up to 300 mm with 21 mm plywood. MANTO Add-on Pieces are secured with 1no. Panel Clamp (code:448010) per MANTO Add-on Piece.	<b>450157</b>	<b>1.55</b>
	<b>Triangular Column Fillet 270</b> <b>Triangular Column Fillet 330</b> Used to create chamfers of 20 mm in rectangular outer corners and columns. It is pushed onto the edge of the panel.	<b>544952</b> <b>549830</b>	<b>1.40</b> <b>1.70</b>
	<b>MANTO Ratchet</b> Connectors and tie nuts can be operated quickly, quietly and easily without damaging the material.	<b>408780</b>	<b>1.00</b>
	Do not extend the ratchet lever!		

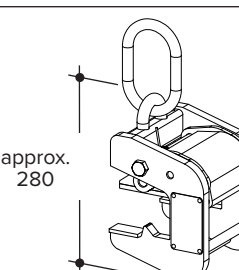
	Component	Code	Weight [kg]
	<b>Plywood Sheet 90/270 Undrilled**</b>	<b>479996</b>	<b>40.00</b>
	<b>Plywood Sheet 90/120 Undrilled**</b>	<b>480009</b>	<b>17.80</b>
	<b>Plywood Sheet 90/60 Undrilled**</b>	<b>490884</b>	<b>8.90</b>
	21 mm thick plywood sheets without tying holes for exposed concrete walls. Tying holes must be drilled on site as needed. Not for rental.		

## 3.9 Lifting accessories

	Component	Code	Weight [kg]
	<b>MANTO Transport Hook G2</b>	<b>608380</b>	<b>10.50</b>
	Used to erect and transport by crane single or connected MANTO formwork panels (all generations). The MANTO Transport Hook G2 is attached to the edge profiles of the MANTO panels. It is equipped with a self-locking safety catch. SWL (N): 15.00 kN. Refer to page 223.		

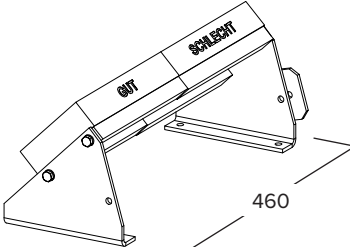


Always comply with the separate operating instructions for the MANTO Transport Hook G2!

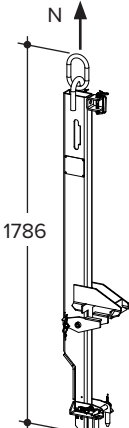

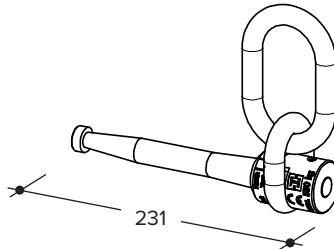

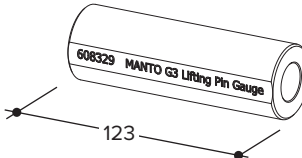
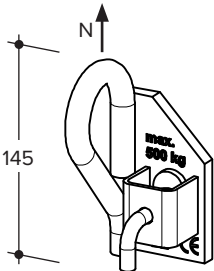

	<b>MANTO Crane Adapter</b>	<b>446710</b>	<b>14.27</b>
	Used to transport single MANTO panels and to move panel assemblies (all generations). The MANTO Crane Adapter is attached to the edge profiles of the MANTO panels. It is equipped with a self-locking safety catch. SWL (N): 10.00 kN. Refer to page 225.		



Always comply with the separate operating instructions for the MANTO Crane Adapter!

	<b>Hook Template</b>	<b>548700</b>	<b>23.64</b>
	Used to check the operating conditions of the MANTO Crane Adapter.		



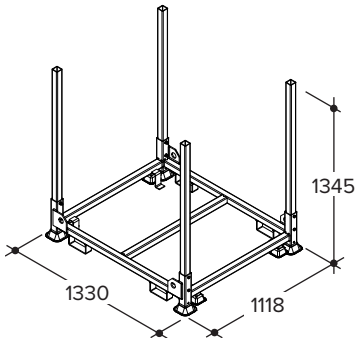
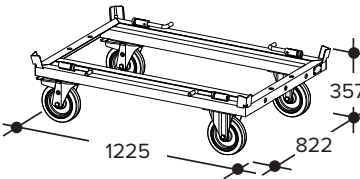
	Component	Code	Weight [kg]
	<b>PLATINUM 100 Lifting Device</b> Used to raise and move panel assemblies. SWL (N): 15.00 kN. Refer to page 208.	<b>606920</b>	<b>27.99</b>
	<div>            Always comply with the separate operating instructions for the PLATINUM 100 Lifting Device (code:606920)!         </div>		
	<b>MANTO G3 Lifting Pin</b> Used to move by crane single or stacked MANTO G3 and G3 M formwork panels as well as single MANTO G3 inner corners 35 lying horizontally. The panels shall have the required hole in the edge profile. Not for use with MANTO panels G1 or G2! SWL (N): 5.50 kN. Working load: 22.00 kN for a set of 4. Refer to page 222.	<b>608295</b>	<b>1.61</b>
	<div>            Always comply with the separate operating instructions for the MANTO G3 Lifting Pin Lifting Device (code:608295)!         </div>		
	<b>MANTO G3 Lifting Pin Gauge</b> Used to check the state of the MANTO G3 Lifting Pin (code:608295).	<b>608329</b>	<b>0.90</b>
	<b>MANTO Loading Adapter</b> Used to move laterally by crane bundles of horizontally stacked MANTO panels G1 and G2. For loading and unloading bundled panels. Not for use with MANTO panels G3 or G3 M. SWL (N): 5.00 kN. Working load: 20.00 kN for a set of 4. Refer to page 221.	<b>461033</b>	<b>1.21</b>
	<div>            Always comply with the separate operating instructions for the MANTO Loading Adapter Lifting Device (code:461033)!         </div>		

## 3.10 Fasteners

	Component	Code	Weight [kg]
	<b>Fit Bolt M24x70 Z 8.8*</b> Zinc bolt required to attach the KB Supporting Part (code:600338) to the A-Tie Cone M24/DW 15 (code:496664).	<b>185635</b>	<b>0.47</b>
	<b>Bolt M16x35 (with Nut) 8.8</b> Used with the extension of a MANTO shaft corner.	<b>603623</b>	<b>0.13</b>
	<b>Bolt M12x30 (with Nut) 4.6</b> Used to connect a EUROPLUS <sup>new</sup> prop to the Strut Base (code:566369) or to the Strut Adapter (code:565331). Use 8no. per prop.	<b>5210</b>	<b>0.06</b>
	<b>Waler Bolt Ø20</b> For connecting the MANTO P-Walkway Bracket (code:606240) to panels lying on the ground.	<b>420000</b>	<b>0.32</b>
	<b>Bolt D16x87</b> For connecting struts to the MANTO Strut Connector (code:565114) when the struts are used horizontally.	<b>601908</b>	<b>0.19</b>
	<b>Spring Cotter Pin 4</b> Secures Walers Bolt D20 (code:420000) and the Bolt 16x87 (code:601908).	<b>173776</b>	<b>0.02</b>

## 3.11 Transport equipment

	Component	Code	Weight [kg]
	<b>Euro Lattice Box</b> Lattice box used to store and transport small items by crane. Can be moved using the Euro Trolley (code:607610) (code:607610) . Working load: 1200 kg. Refer to page 233.	<b>548480</b>	<b>68.79</b>
	<b>Euro Stacking Frame 120/80</b>	<b>553689</b>	<b>54.47</b>
	<b>Euro Stacking Frame 160/120</b>	<b>566494</b>	<b>80.00</b>
	<b>Euro Stacking Frame 240/80</b> Stacking frame used to store and transport materials by crane. The Stacking Frame 120/80 can be moved with the Euro Trolley (code:607610). Working load: 1200 kg. Refer to page 233.	<b>566509</b>	<b>105.00</b>

	Component	Code	Weight [kg]
	<b>PROTECTO Panel Stillage</b>	<b>692740</b>	<b>56.00</b>
	<p>Used to store and transport PROTECTO Panels G2.</p> <p>Safe Working Load: 1200 kg.</p> <p>Refer to page 233.</p>		
	<b>Euro Trolley</b>	<b>607610</b>	<b>39.57</b>
	<p>Used to manually transport the Euro Lattice Box (code:548480), the Euro Stacking Frame 120/80 (code:553689) and other transport equipment approved by Hünnebeck.</p> <p>The Euro Trolley has two lockable swivel castors.</p> <p>Working load: 1300 kg.</p> <p>Refer to page 233.</p>		

## 4 MANTO panels

The dimensions and possible combinations of the panels assure an accurate fit of the MANTO formwork to the structure to be formed.

The geometry and the profiles are similar for all panels. The panels have continuous edge profiles and perforated rib profiles positioned in 300 mm increments.

The corner of the panels, the area most severely stressed, is stiffened by a corner plate. The lower edge profile has a special leverage edge that significantly eases any fine adjustment with a pry bar after the panels have been positioned by crane.

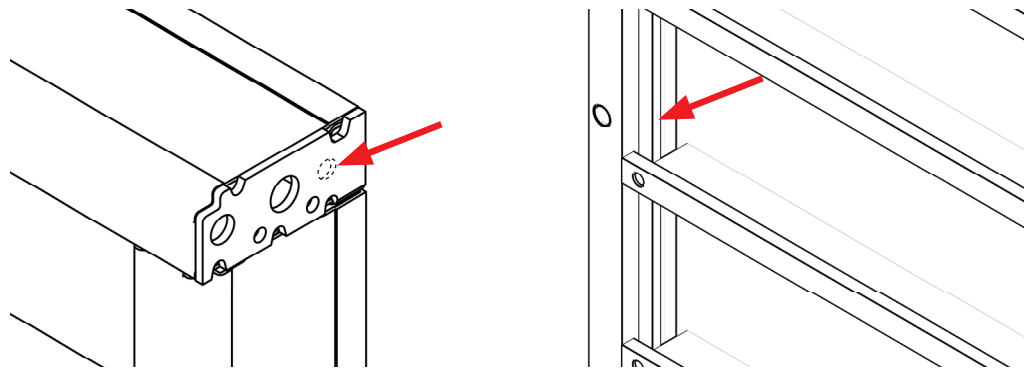
As a result of continuous development, new versions of the MANTO panels have been introduced and can be used in conjunction with older models.

These generations of MANTO panels are referred to as G1, G2, G3 and G3 M.

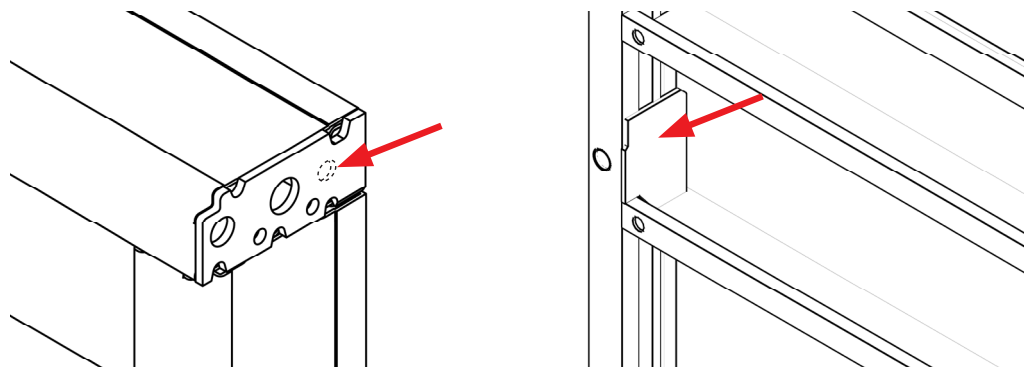
The following sections explain the differences between the various versions as well as the general rules for the use and/or how to combine different panels.

### 4.1 MANTO panels G1

MANTO panels without Ø 14 mm hole in the corner plates and without reinforcement plate on the inside of the long edge profile near the tie positions:



MANTO panels without Ø 14 mm hole in the corner plates and with reinforcement plate on the inside of the long edge profile near the tie positions:



Safe Working Loads for MANTO panels G1: 60.00 kN/m<sup>2</sup> with DW15 only.  
MANTO panels G1 are not suitable for use with DW 20.

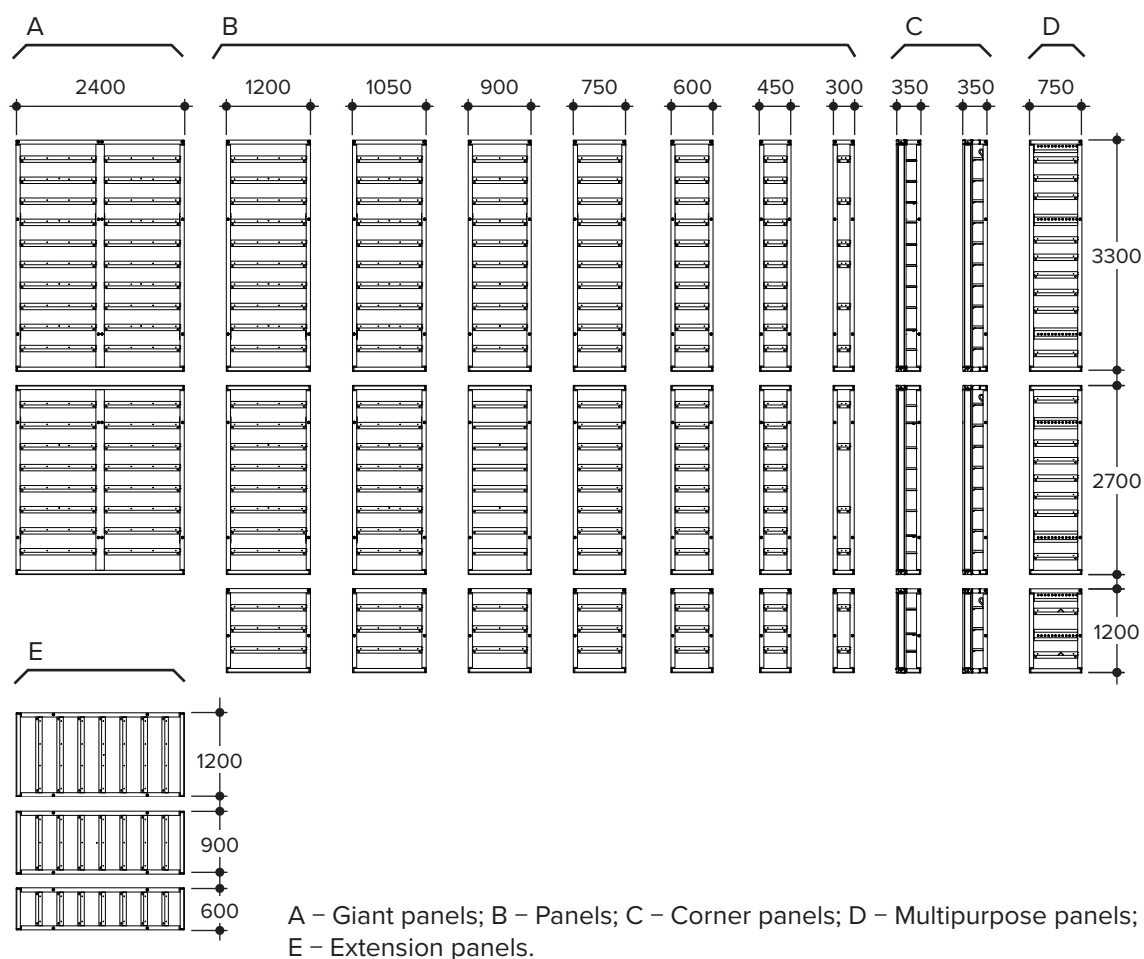


MANTO panels G1 share the same code numbers as MANTO panels G2. However, they are no longer available from Hünnebeck.

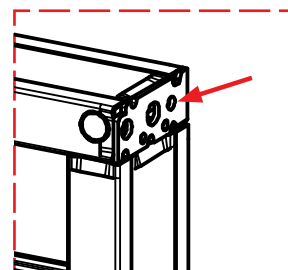
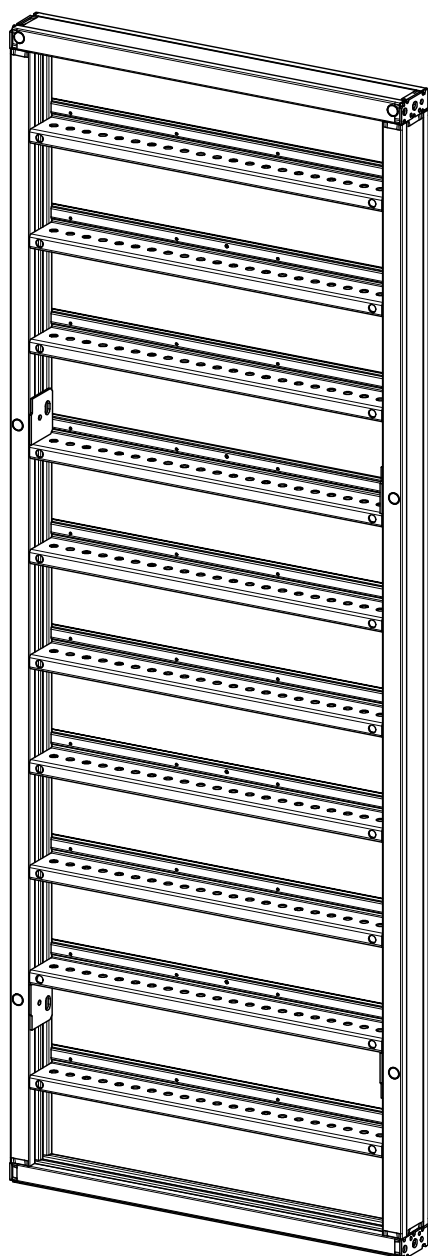
## 4.2 MANTO panels G2

MANTO panels G2 can be identified by the following characteristics:

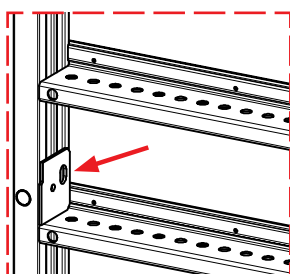
- Reinforcement plates on the inner side of the long edge profiles near the tie hole  
On panels 2.70 m high and  $\geq 1.05$  m wide and  
On panels 3.30 m high and  $\geq 0.60$  m wide
- Tie position on the long edge profile with just one hole (without smaller holes above and below tie hole, which are needed for single-side operated ties).  
MANTO Giant Panels also have pairs of tie positions on the centre profile.
- No stiffeners between ribs and and/or between ribs and smaller edge profiles.
- With  $\varnothing 14$  mm holes in the corner plates.



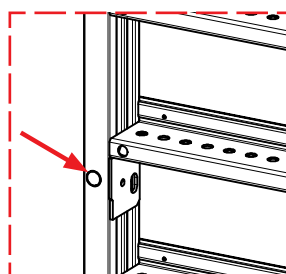
For Safe Working Loads for MANTO panels, refer to page 234.



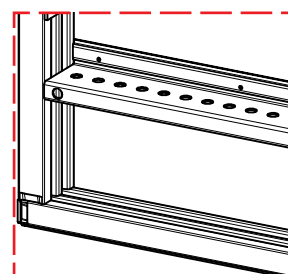
Ø14 mm holes in the corner plates.



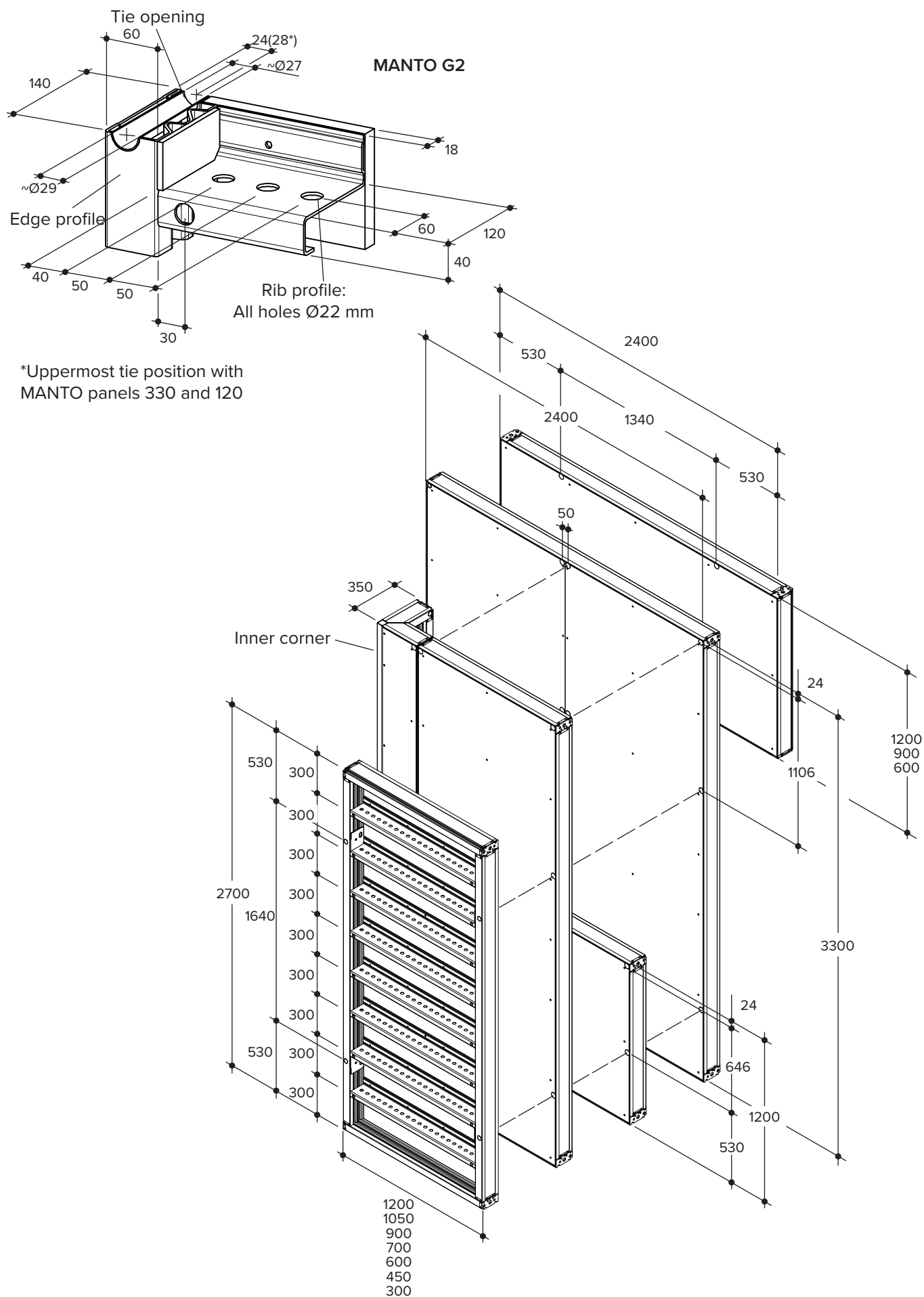
Reinforcement plates on the inside of the long edge profile, near the tie holes.



Tie position on the long edge profile without smaller ancillary holes (single-side operated ties not possible).



No stiffener elements between ribs and/or between ribs and smaller edge profiles.

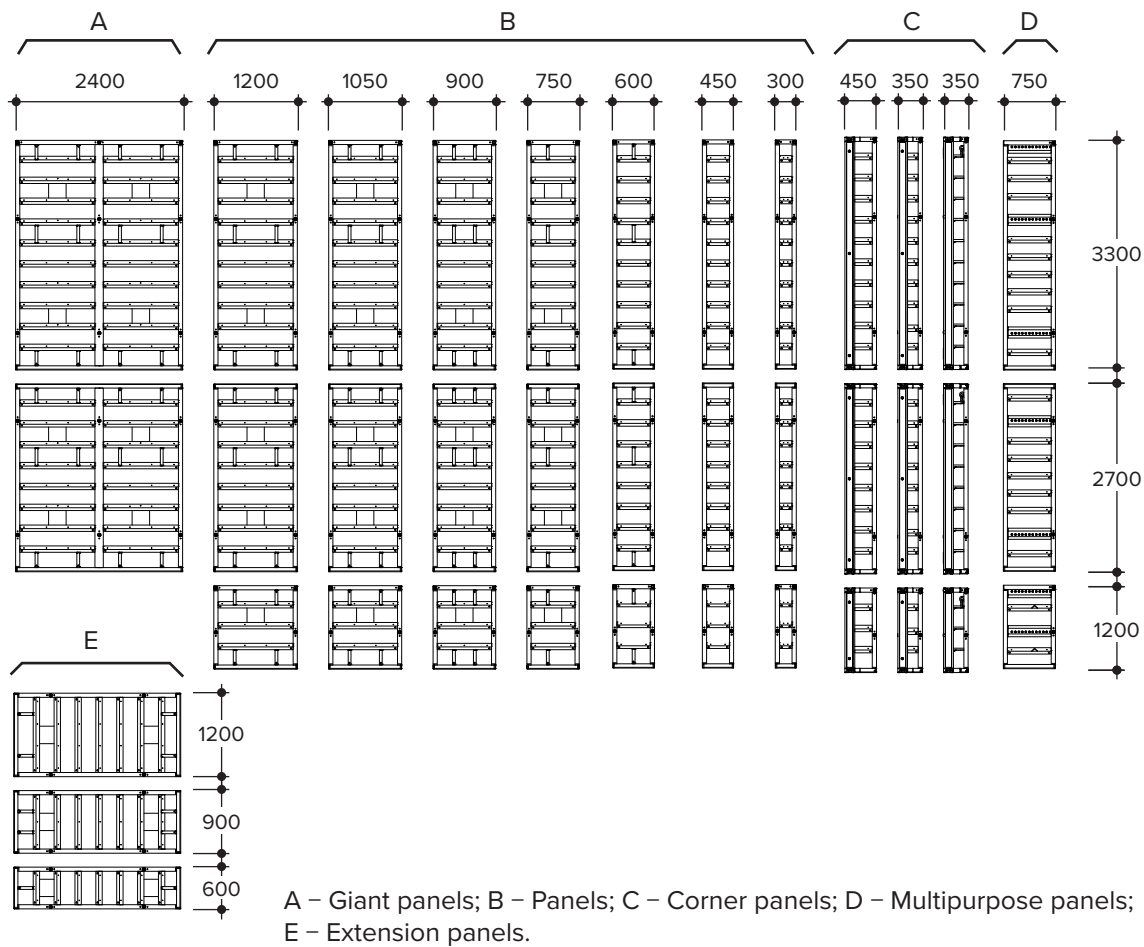




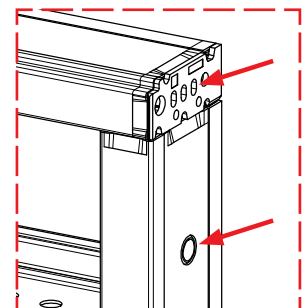
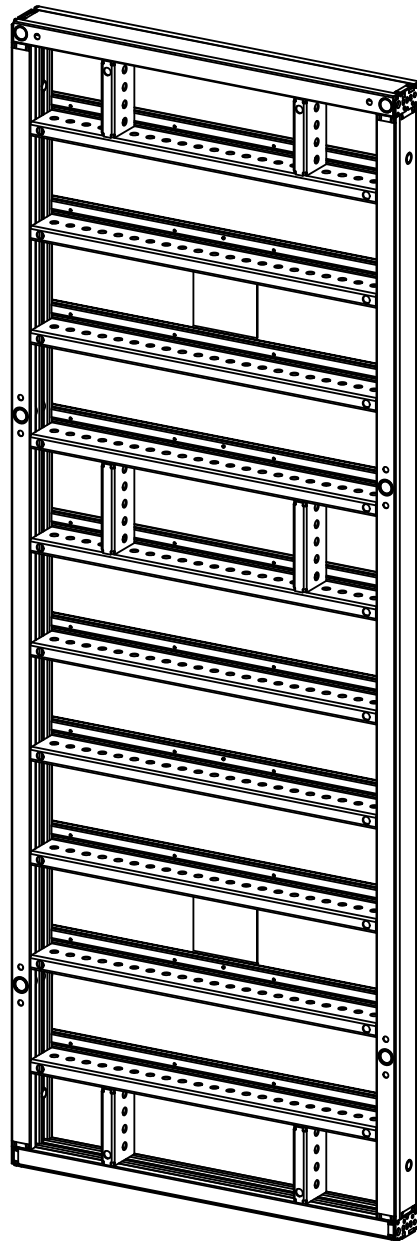
4.3 MANTO panels G3

MANTO panels G3 can be identified by the following characteristics:

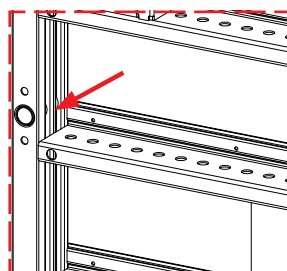
- No reinforcement plates on the inner side of the long edge profiles near the tie hole
- Tie position on the long edge profile with smaller holes above and below the tie hole, for the single-side operated ties
- Bracing between ribs and/or between ribs and smaller edge profiles (in most panels).
- Holes Ø 22 in the edge profiles.



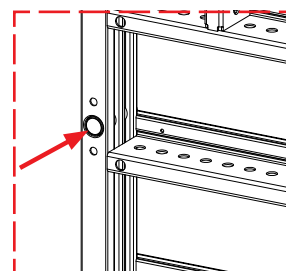
For Safe Working Loads for MANTO panels, refer to page 234.



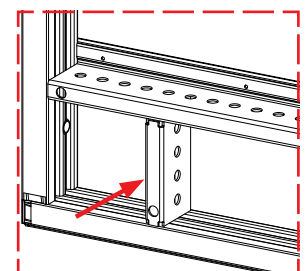
3no. slots in the corner plates and hole Ø21. Thus easy to recognise in a stack.



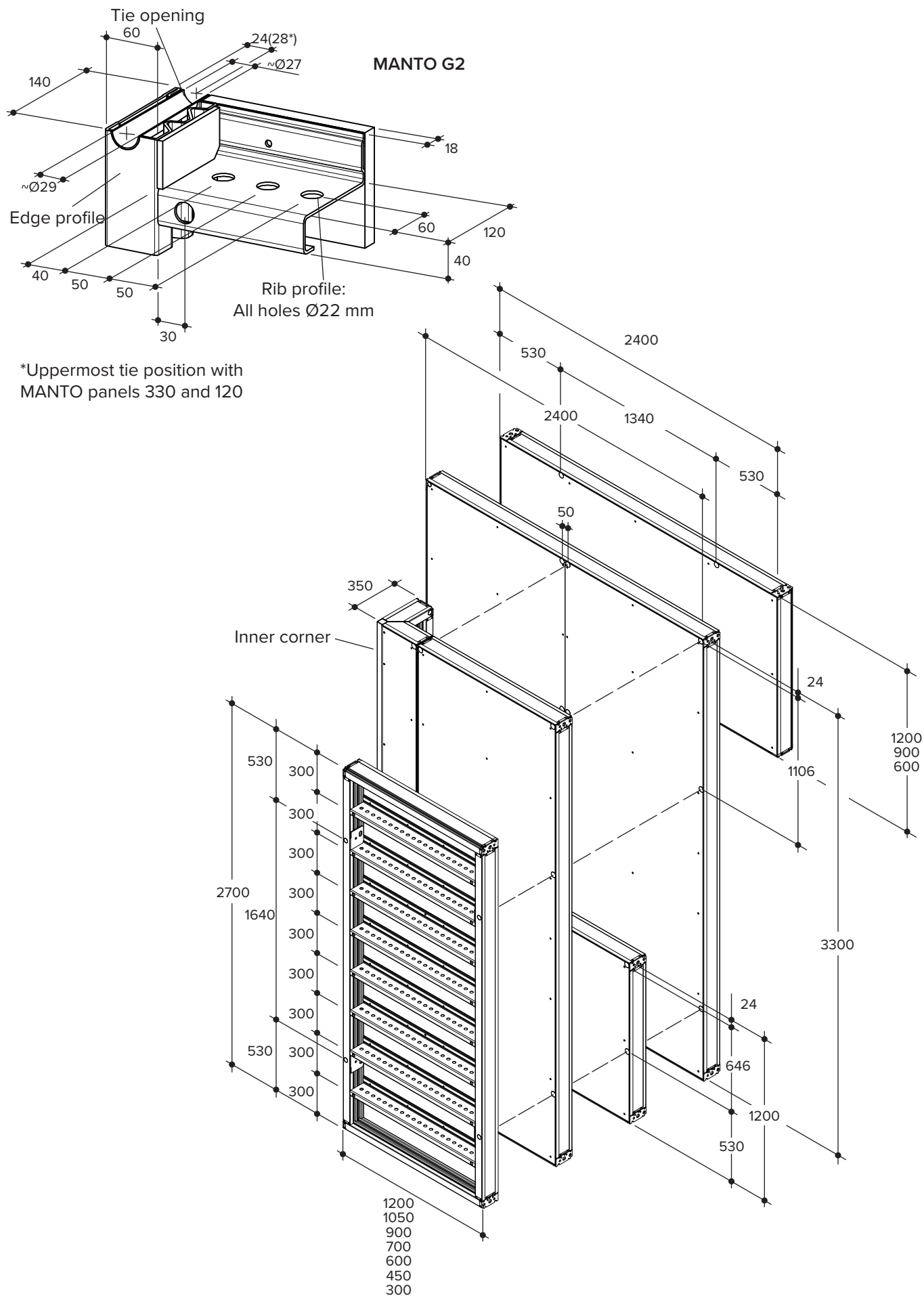
No reinforcement plates on the inner side of the long edge profile near the tie holes.



Tie position on the long edge profile with smaller ancillary holes for single-side operated ties.



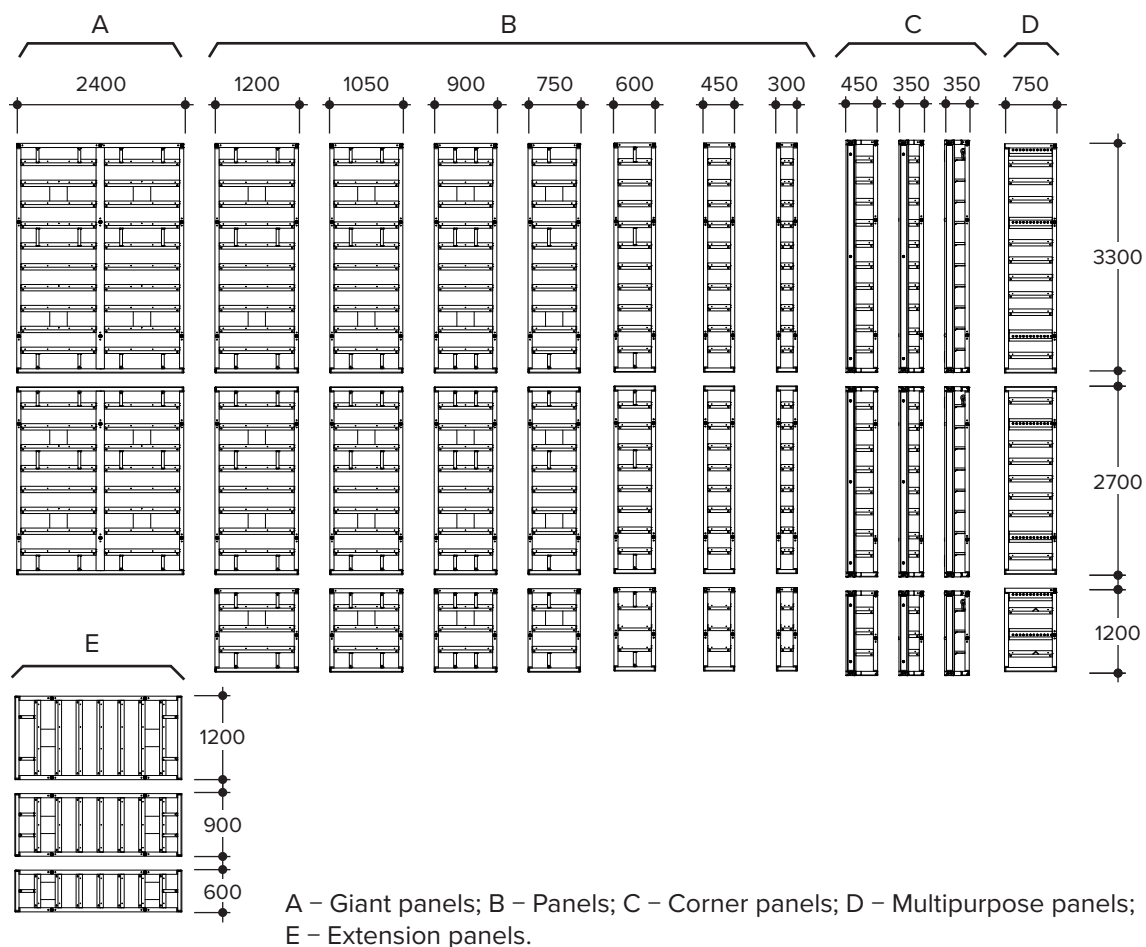
Stiffener elements between ribs and/or between ribs and smaller edge profiles (in most panels).



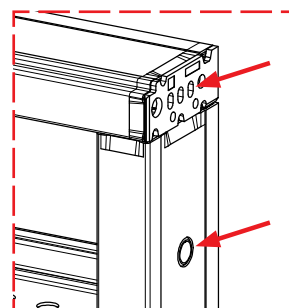
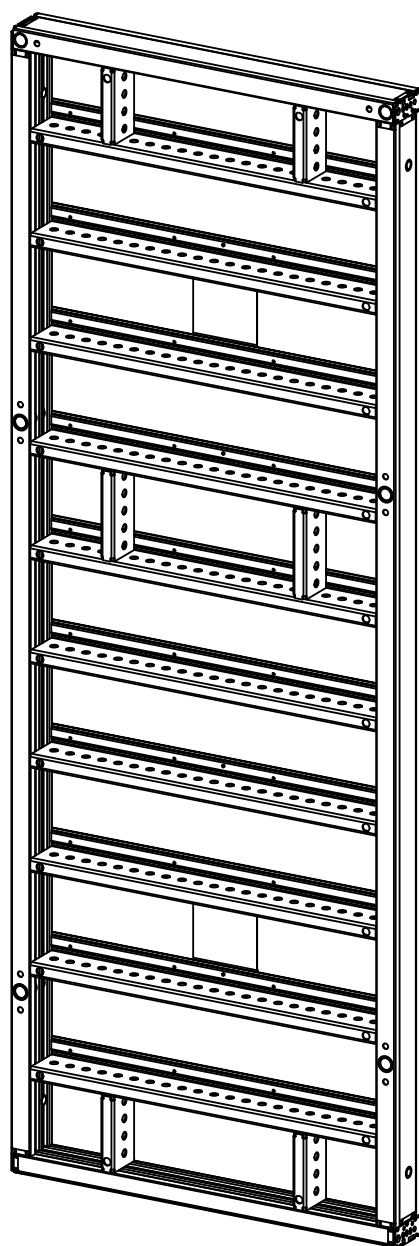
## 4.4 MANTO Panels G3 M

MANTO panels G3 can be identified by the following characteristics:

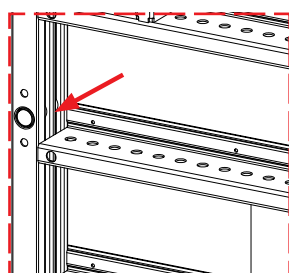
- No reinforcement plates on the inner side of the long edge profiles near the tie hole
- Tie position on the long edge profile with smaller holes above and below the tie hole, for the single-side operated ties
- Bracing between ribs and/or between ribs and smaller edge profiles (in most panels).
- Holes Ø 22 in the edge profiles.



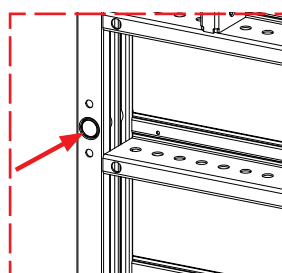
For Safe Working Loads for MANTO panels, refer to page 234.



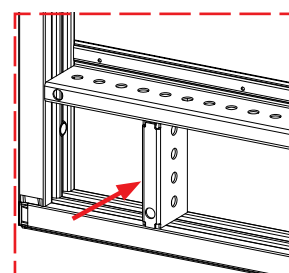
3no. slots in the corner plates and hole Ø21. Thus easy to recognise in a stack.



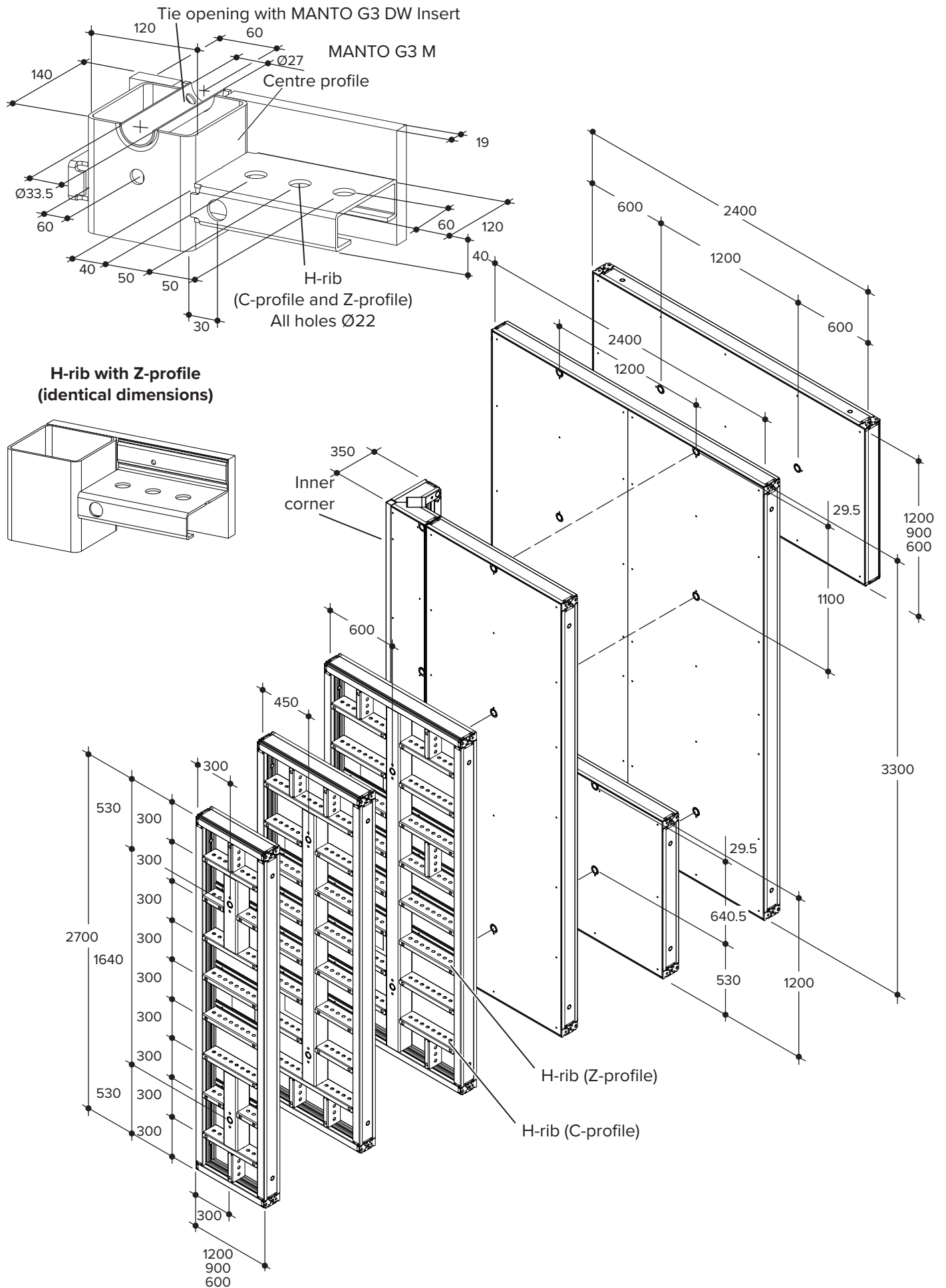
No reinforcement plates on the inner side of the long edge profile near the tie holes.



Tie position on the long edge profile with smaller ancillary holes for single-side operated ties.



Stiffener elements between ribs and/or between ribs and smaller edge profiles (in most panels).



## 4.5 Using MANTO panels of different generations

### 4.5.1 Rules for using MANTO panels of different generations

It is essential to follow these rules when using MANTO panels of different generations in the same formwork:

- All panels must be able to withstand the same fresh concrete pressure. Pay particular attention to the reduced concrete pressure permitted for MANTO Panels G1 (Refer to page 44).
- Panels of different generations can be connected horizontally (side-by-side) (Refer to section 4.5.2 on page 55). The rules for connecting panels horizontally apply to all generations of panels.
- One-sided tying is possible only with MANTO panels G3 or G3 M.
- Panels of different generations can be used opposite one another as shown in the following tables.

MANTO panels Two-sided tying				
Advancing side		Closing side		
		G2	G3	G3 M
	G2	✓	✓	–
	G3	✓	✓	–
	G3 M	–	–	✓

MANTO panels Single-sided tying				
Advancing side		Closing side		
		G2	G3	G3 M
	G2	–	–	–
	G3	–	✓	–
	G3 M	–	–	✓

MANTO Giant Panels* Two-sided tying				
Advancing side		Closing side		
		G2	G3	G3 M
	G2	✓	–	–
	G3	–	✓	–
	G3 M	–	–	✓

MANTO Giant Panels* Single-sided tying				
Advancing side		Closing side		
		G2	G3	G3 M
	G2	–	–	–
	G3	–	✓	–
	G3 M	–	–	✓

\*Also applies to MANTO G3 M Panels 240/330 and MANTO G3 M Panels

All other rules contained in this User Guide apply to MANTO panels G1, G2, G3 and G3 M.



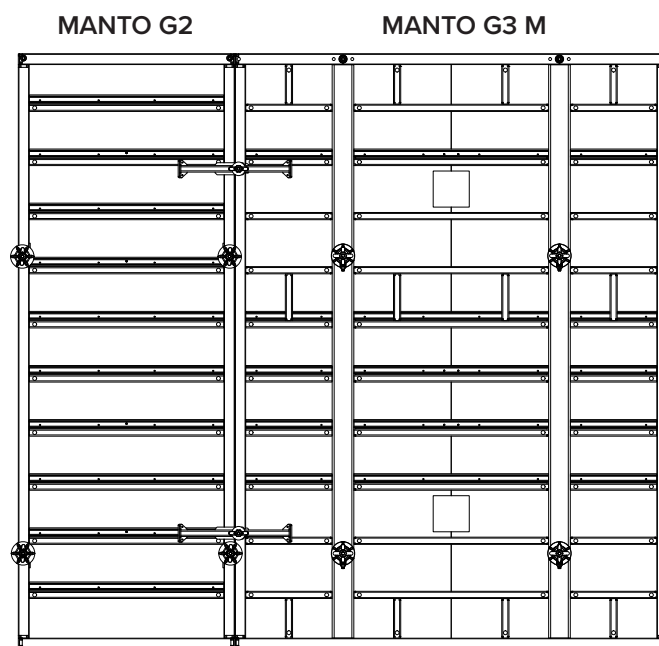
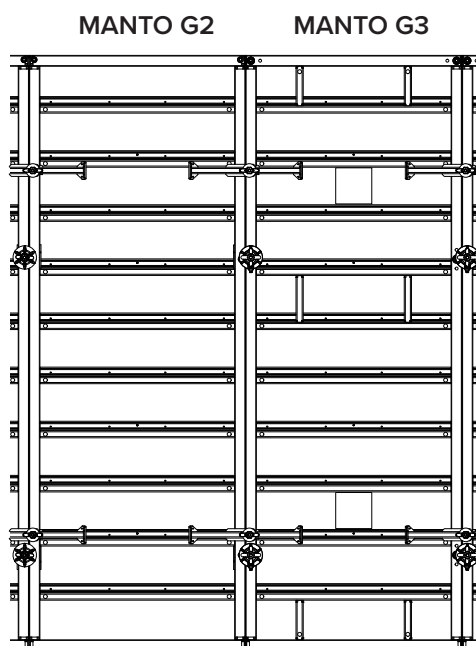
#### 4.5.2 Examples of the connection of MANTO panels of different generations



The following illustrations show examples of panels connected to one another using the MANTO Aligning Panel Clamp (code:448000). The panels shown here can also be connected to the PM Aligning Wedge Clamp (code:606900) (potentially using a different position).



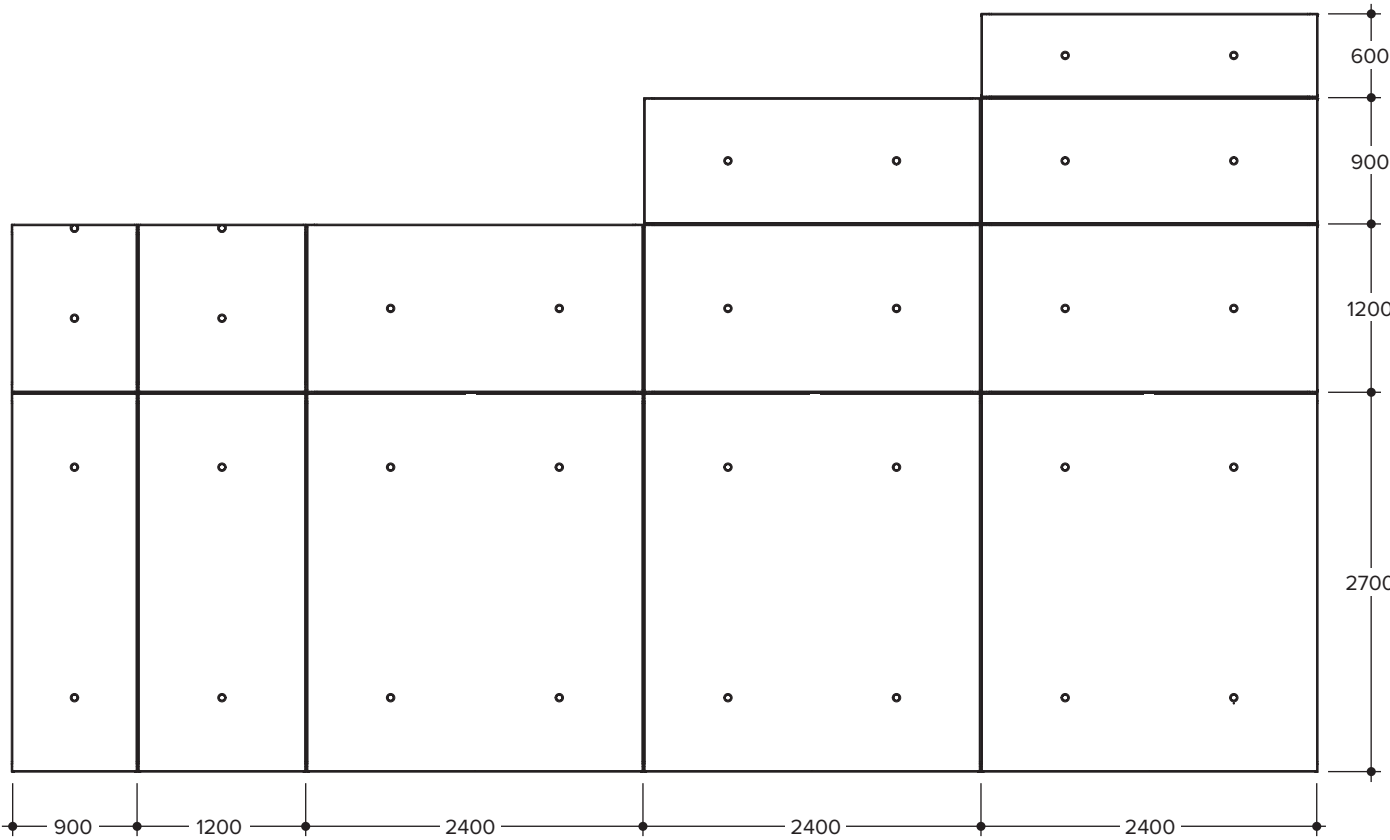
The uppermost tie position on MANTO Panels 330 is needed only when panels are stacked.



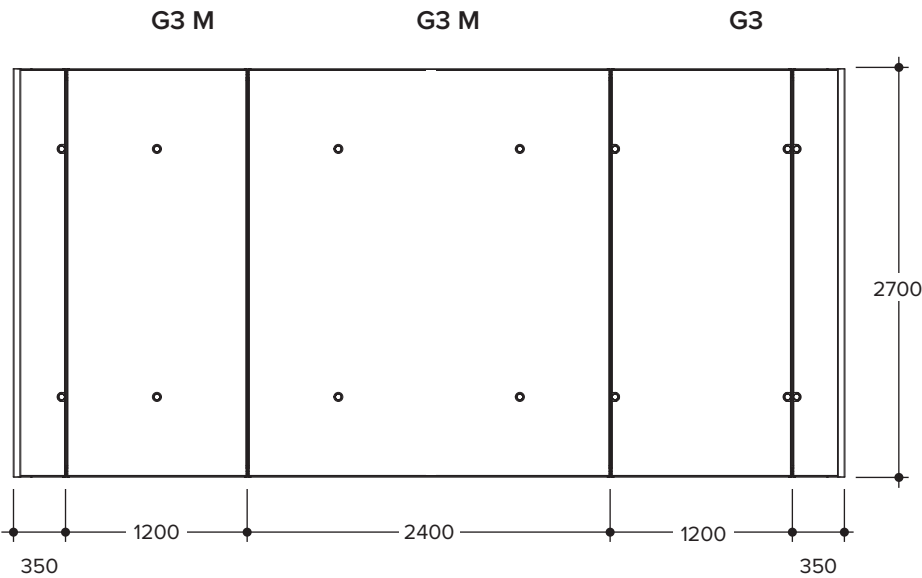


**4.6 Tie pattern**

**Example: MANTO G3 M, stacked**



**Example: MANTO G3 and MANTO G3 M in the inner corner**



## 5 Connecting panels horizontally

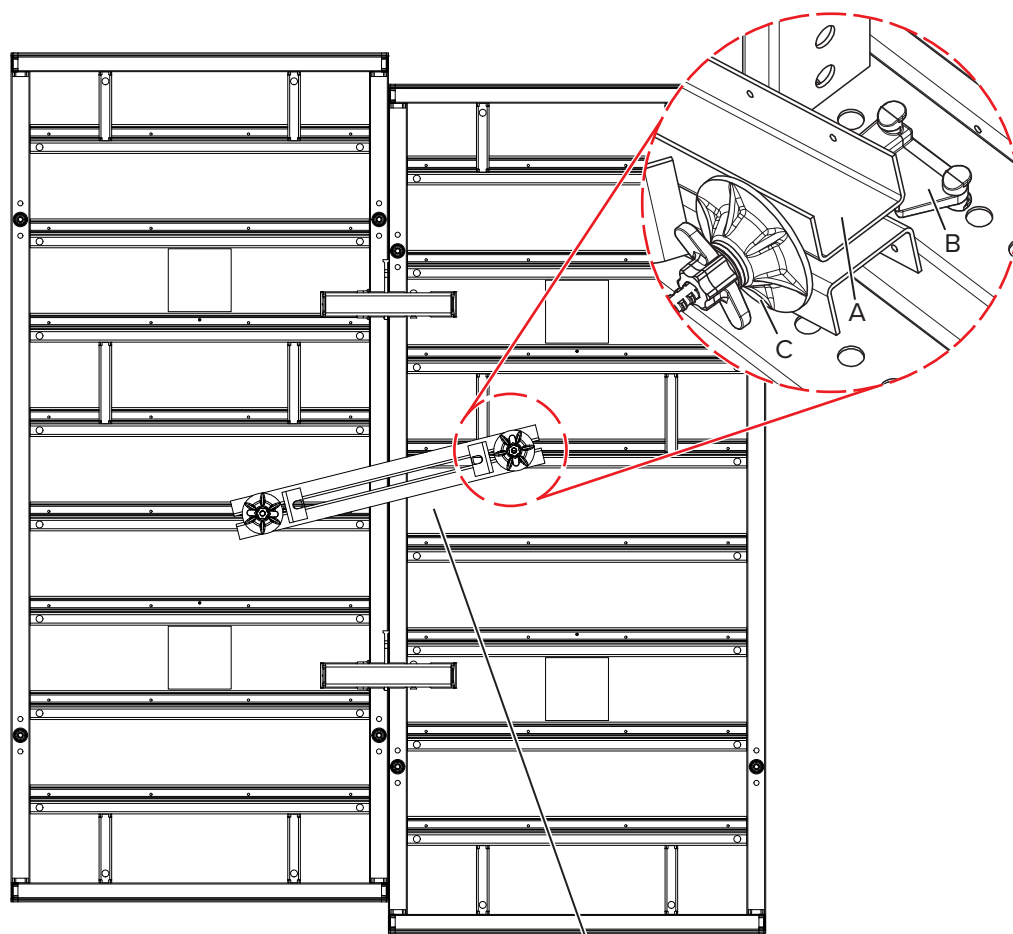
MANTO panels are normally connected to one another using the MANTO Aligning Panel Clamp (code:448000) or the PM Aligning Wedge Clamp (code:606900). The Adjustable Aligning Clamp or the Multipurpose Waler 100 has to be used for infills at the vertical joint.



Check that all connectors are tight and, if necessary, retighten before every use and every time they are moved.

### 5.1 Height offset

MANTO panels can be connected to a height offset of 20 mm using the MANTO connectors. For greater offsets and when the connectors cannot grasp over the H-ribs, the vertical joints have to be braced with MANTO walers as well.



Multipurpose Waler 100 (**A**, code:450764)  
 PLATINUM 100 Multi Bolt (**B**, code:605810)  
 MANTO Tie Nut (**C**, code:464600)

## 5.2 Using the MANTO Aligning Panel Clamp

The MANTO Aligning Panel Clamp (code:448000) can be used for all vertical and horizontal panel joints. The MANTO Aligning Panel Clamp, with its aligning profile of 630 mm, provides an absolutely tight, flush-mounted and perfectly aligned panel joint when it is used correctly.

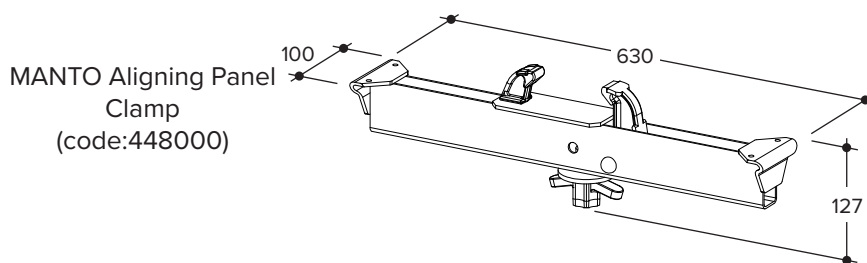
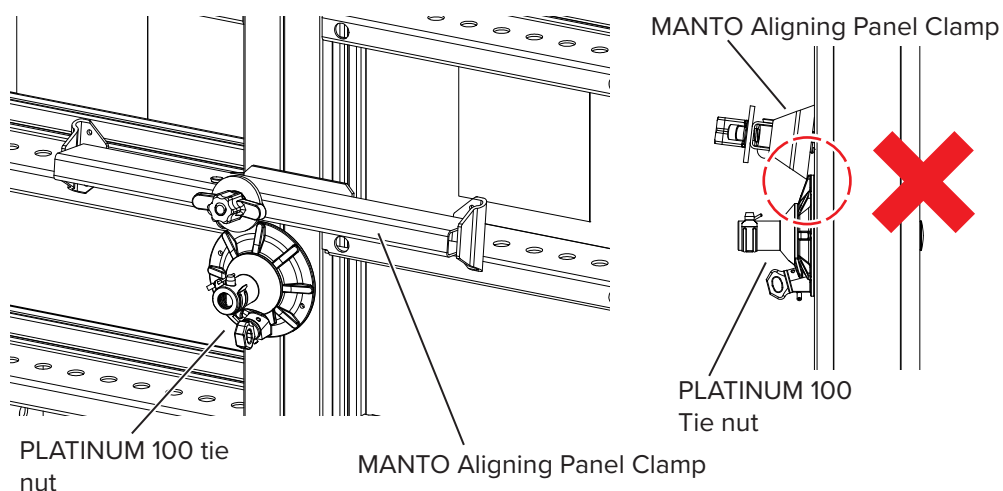


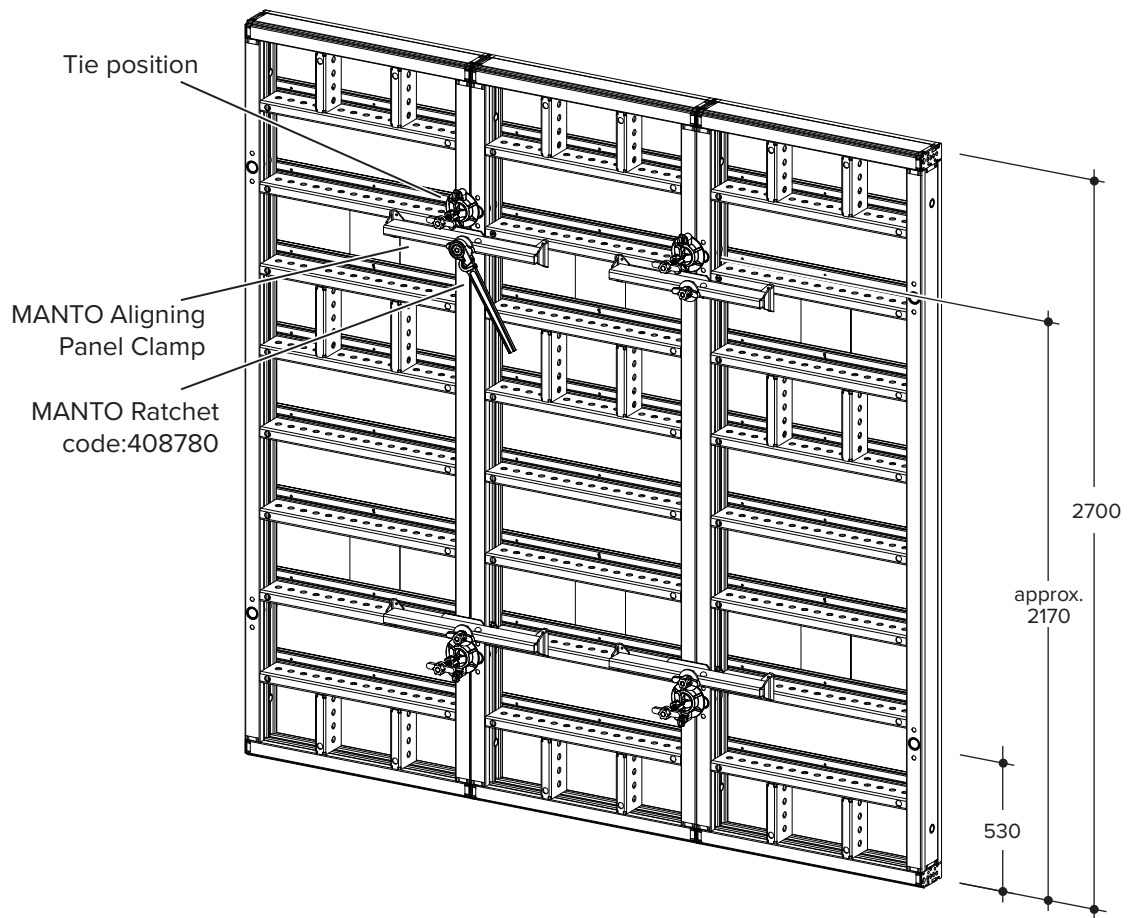
### WARNING

#### Risk of injury from falling MANTO panels!

If the panels are not fastened correctly, the MANTO Aligning Panel Clamp (code:448000) can release and formwork panels can fall off when being transported by crane!

Every time the MANTO Aligning Panel Clamp is attached, check that it is not resting on the PLATINUM 100 tie nut. The MANTO Aligning Panel Clamp has to rest against the MANTO panels. If necessary, attach the MANTO Aligning Panel Clamp to the next-higher or next-lower H-rib.





- Step 1** If possible, mount MANTO Aligning Panel Clamps (code:448000) near the ties at the edge profiles of the panel frame. The supporting surfaces of the MANTO Aligning Panel Clamps should have full contact with the ribs of the panel.



When using the PLATINUM 100 tie nut to tie on only one side, ensure that there is sufficient space between the Tie Nut and the Aligning Panel Clamp.

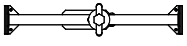

If necessary, attach the MANTO Aligning Panel Clamp to the next-higher or next-lower H-rib.

- Step 2** Use the MANTO Ratchet to tighten the MANTO Aligning Panel Clamps. The MANTO Ratchet can be operated quickly, quietly and easily without damaging the material. If there is no MANTO Ratchet available, tighten the MANTO Aligning Panel Clamp by striking a hammer against the wing of the wing nut.

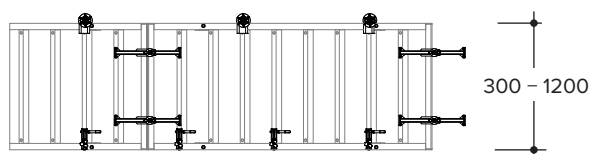
## Typical arrangements

The following illustrations show typical connecting arrangements between MANTO panels when joining panels side-by-side. Panels of the generation G2 are shown as examples. For clarity, a legend of the components used is shown below.

### Legend

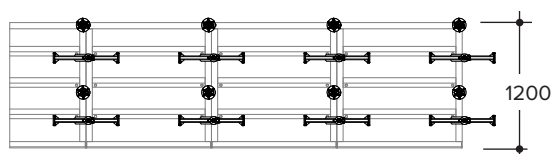
	MANTO Aligning Panel Clamp (code:448000) or PM Aligning Wedge Clamp
	MANTO Tie Nut DW 15 (code: 464600) or Tie Nut 150 (DW 20) (code:531481)

### Formwork height: 0.30 m to 1.20 m

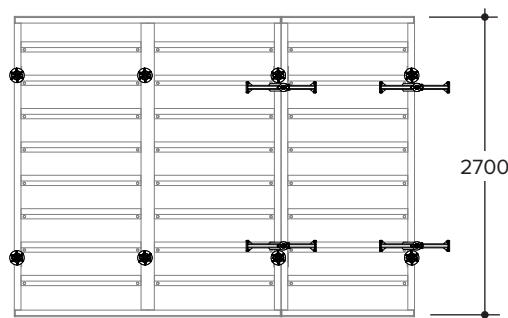


The above arrangement shows tying using the FU Tightener (code:568357). For more information, refer to page 127.

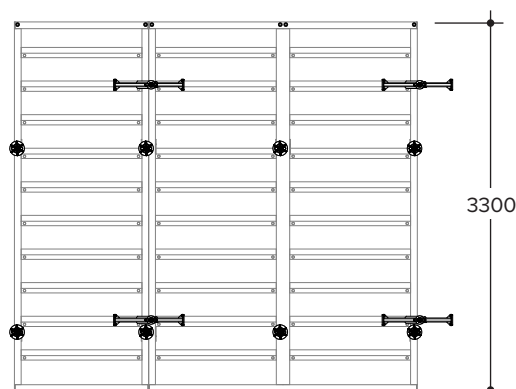
### Formwork height: 1.20 m



### Formwork height: 2.70 m



### Formwork height: 3.30 m



The uppermost tie position on MANTO panels 330 is needed only when the panels are stacked.



## 5.3 With the PM Aligning Wedge Clamp

Use the PM Aligning Wedge Clamp (code:606900) to connect MANTO Panels and align them flush without offset.

If the PM Aligning Wedge Clamp is not attached to the panel joint, e.g. when the formwork is being moved, it can be fastened in the Aligning Wedge Clamp Holder (code:609070) to store it. Then it is readily available for the next use.

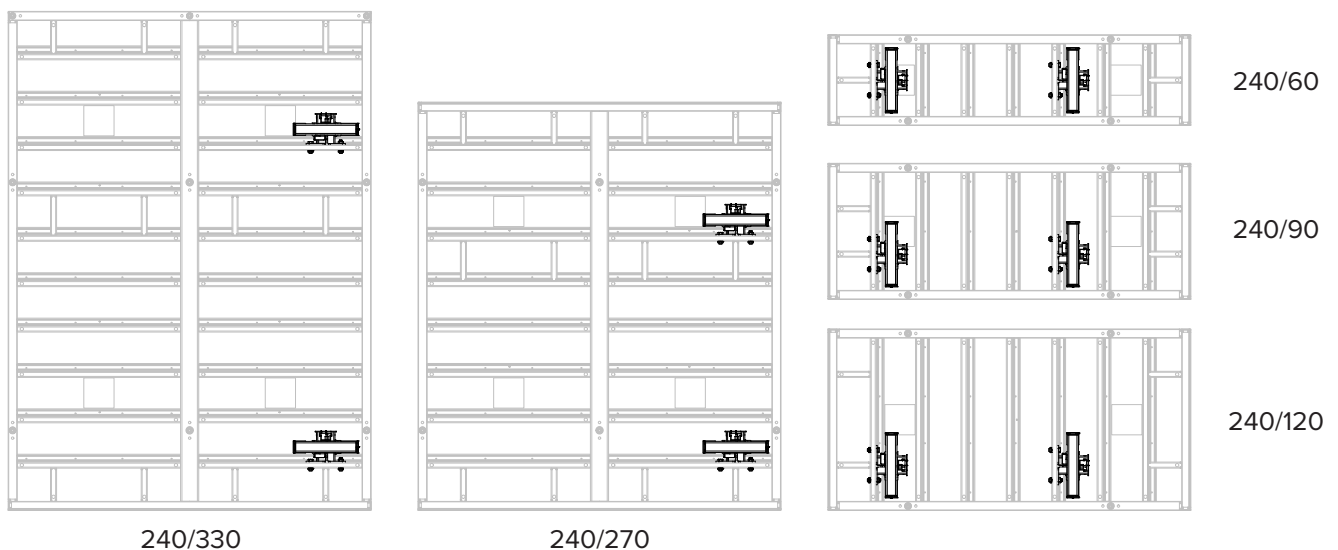
The PM Aligning Wedge Clamp and the Aligning Wedge Clamp Holder together make up the Panel Connection Unit (code:609080). The PM Aligning Wedge Clamp can also be purchased separately.

### 5.3.1 Attaching Panel Connection Unit to MANTO panel

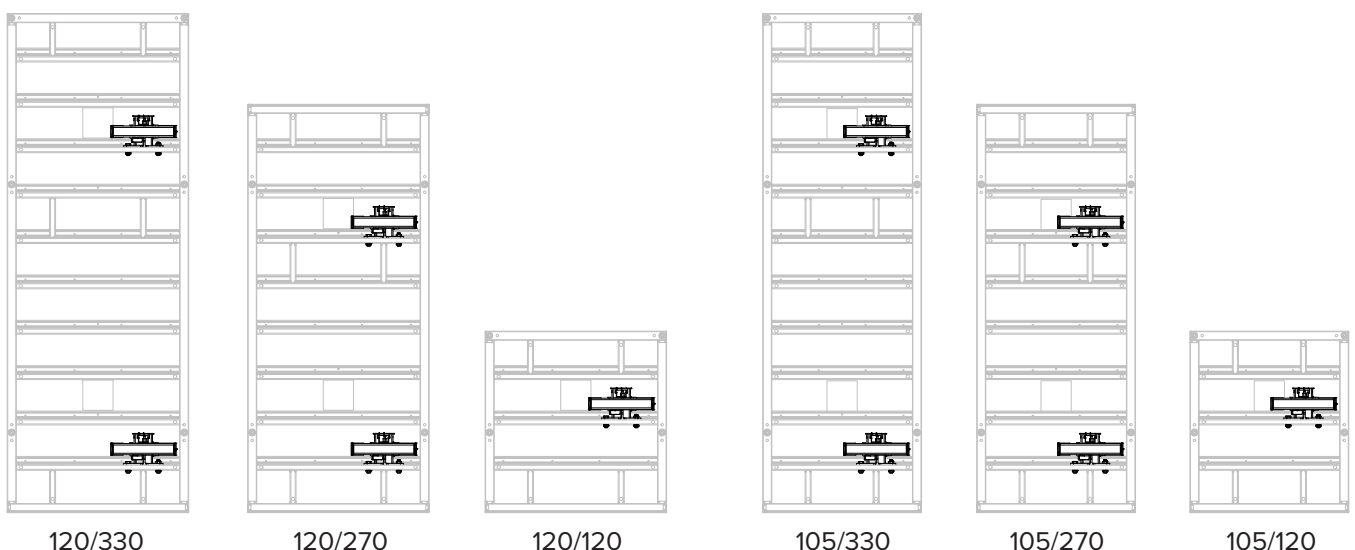
The mounting positions of the Panel Connection Unit (code:609080) are shown in the following illustrations. Attaching the Panel Connection Unit in these positions ensures that the PM Aligning Wedge Clamp (code:606900) can always be mounted in a suitable position. We recommend adhering to these mounting positions.

The Panel Connection Unit cannot be attached to panels that are not shown in the following illustrations. However, the panels can still be connected using the PM Aligning Wedge Clamps available separately.

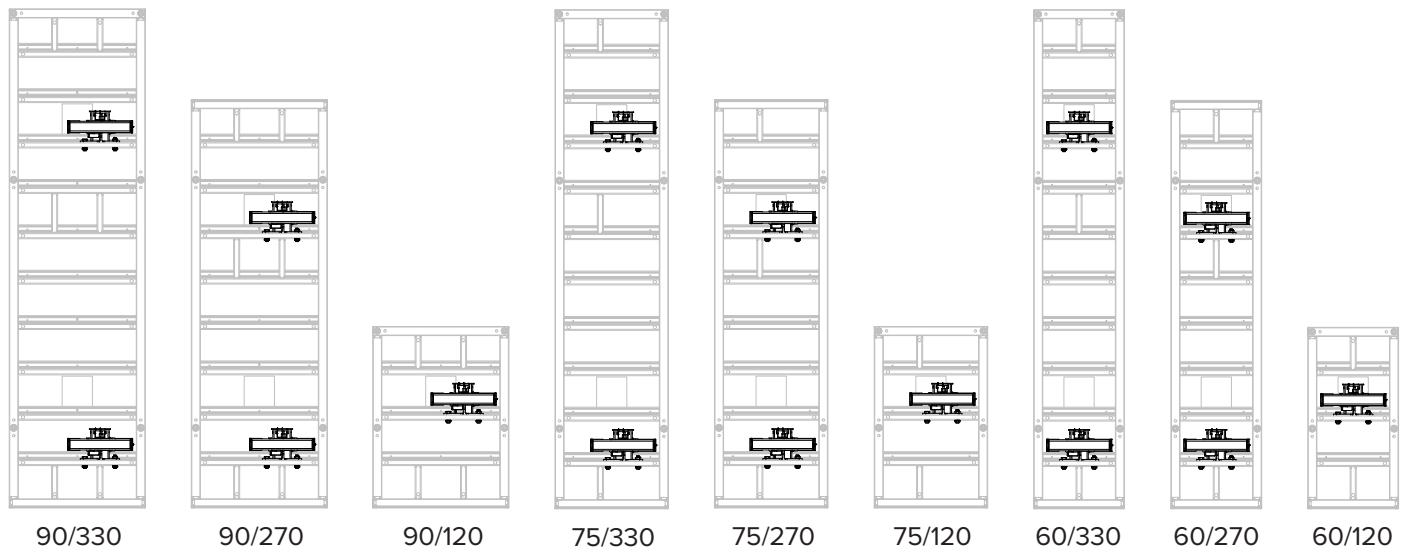
#### MANTO G2/G3 Panels 240



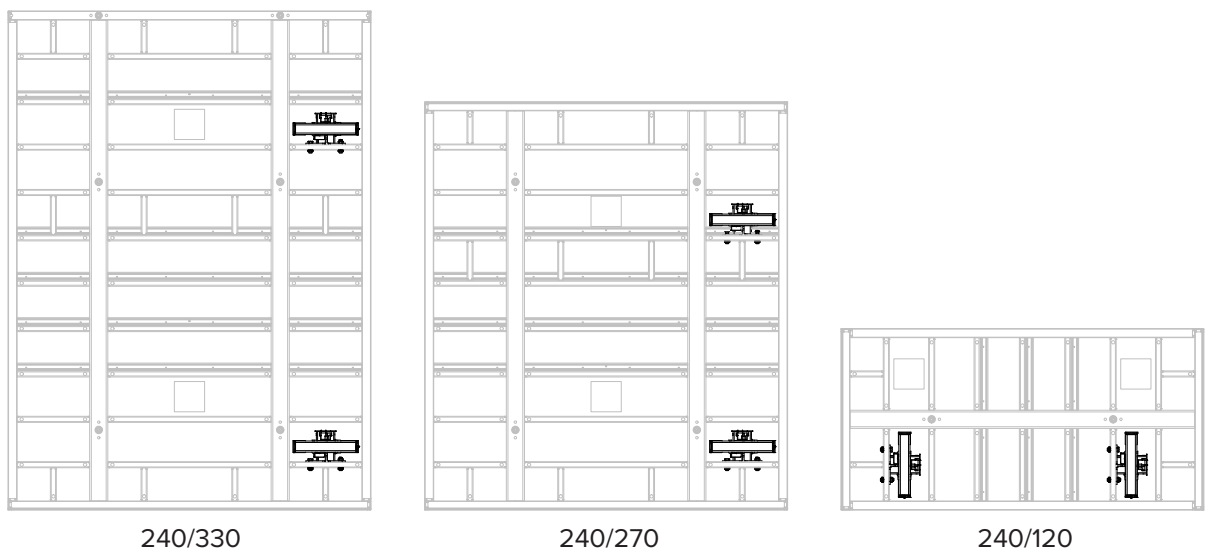
#### MANTO G2/G3 Panels 120 and 105



**MANTO G2/G3 Panels 90, 75 and 60**



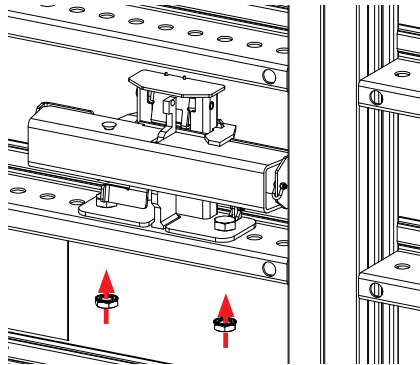
**MANTO G2/G3 M Panels 240**



**MANTO G3 M Panels 120**



- Step 1** Use the included bolts and nuts to attach the Panel Connection Unit (code:609080) to the panel rib.



## 5.3.2 Removing PM Aligning Wedge Clamp from Aligning Wedge Clamp Holder and attaching to panel joint

The PM Aligning Wedge Clamp (code:606900) can be used to connect MANTO panels side by side (vertical joint).

Stacked MANTO G3 and G3/M panels (horizontal joints) can also be connected to one another with the PM Aligning Wedge Clamp. The PM Aligning Wedge Clamp should be attached such that it rests against a V-rib.

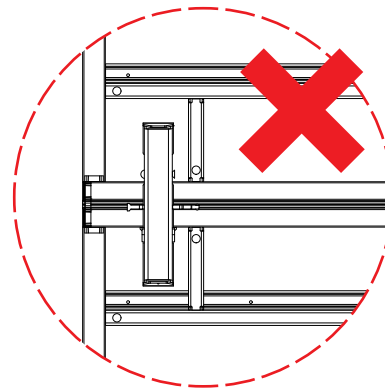
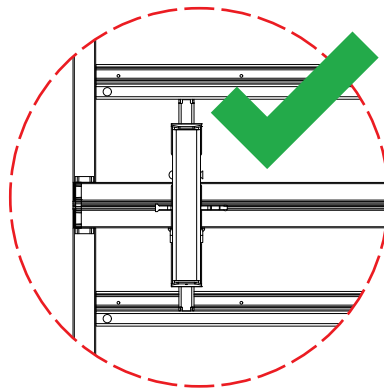


### WARNING

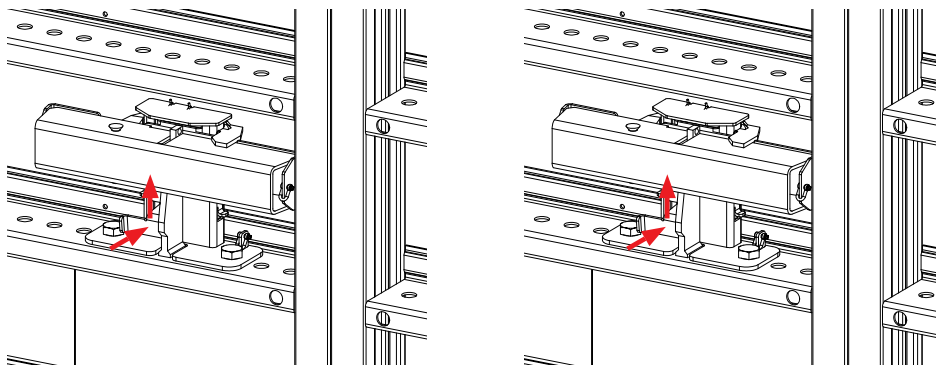
#### Risk of injury from falling formwork panels!

If the PM Aligning Wedge Clamp on the horizontal joint is not attached over a V-rib, the panel connection is not secure.

A PM Aligning Wedge Clamp on a horizontal joint always has to be attached over a V-rib!

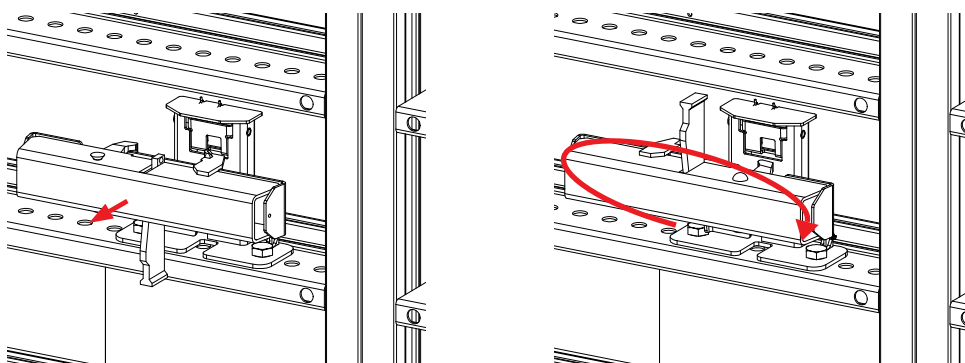


- Step 1** Release the PM Aligning Wedge Clamp by pressing the lever towards the panel and then upwards.

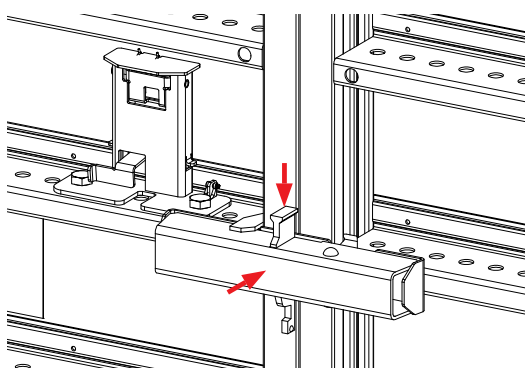


- Step 2** Pull the PM Aligning Wedge Clamp (code:606900) out of the Panel Connection Unit (code:609070).

- Step 3** Rotate the PM Aligning Wedge Clamp 180° (the wedge head must face upwards).

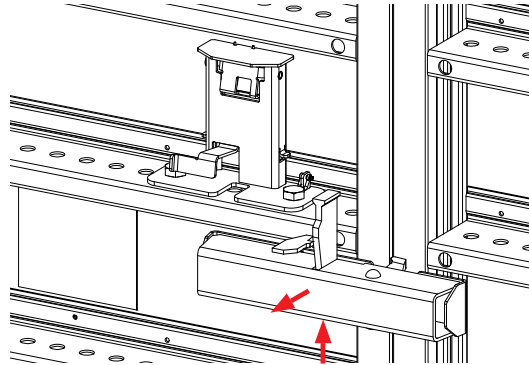


- Step 4** Place the PM Aligning Wedge Clamp in the required position and lock it in place by striking the top of the wedge with a hammer.



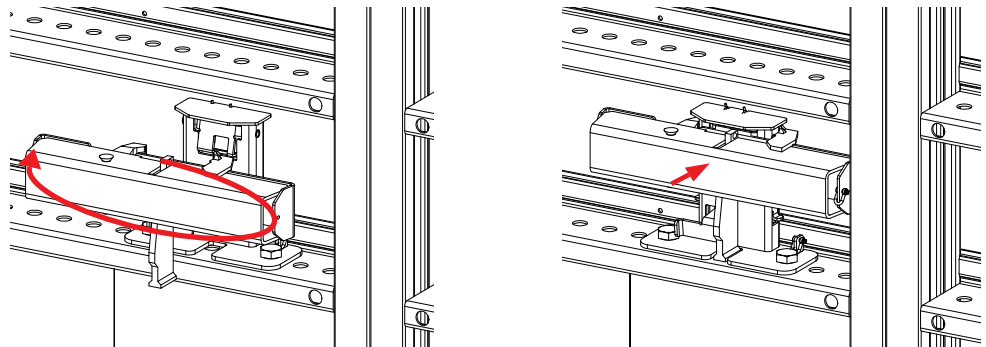
## 5.3.3 Detaching PM Aligning Wedge Clamp from panel joint and attaching it to Aligning Wedge Clamp Holder

- Step 1** Strike the bottom of the wedge with a hammer to release the PM Aligning Wedge Clamp and pull the clamp out.

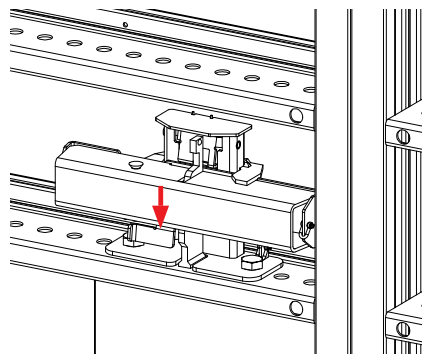


- Step 2** Rotate the PM Aligning Wedge Clamp 180° (the wedge head must face downwards).

- Step 3** Place the PM Aligning Wedge Clamp on top of the mounting profile of the holding device. This will automatically adjust the clamp extension to fit the device.



- Step 4** Push the PM Aligning Wedge Clamp downwards until it clicks in place.



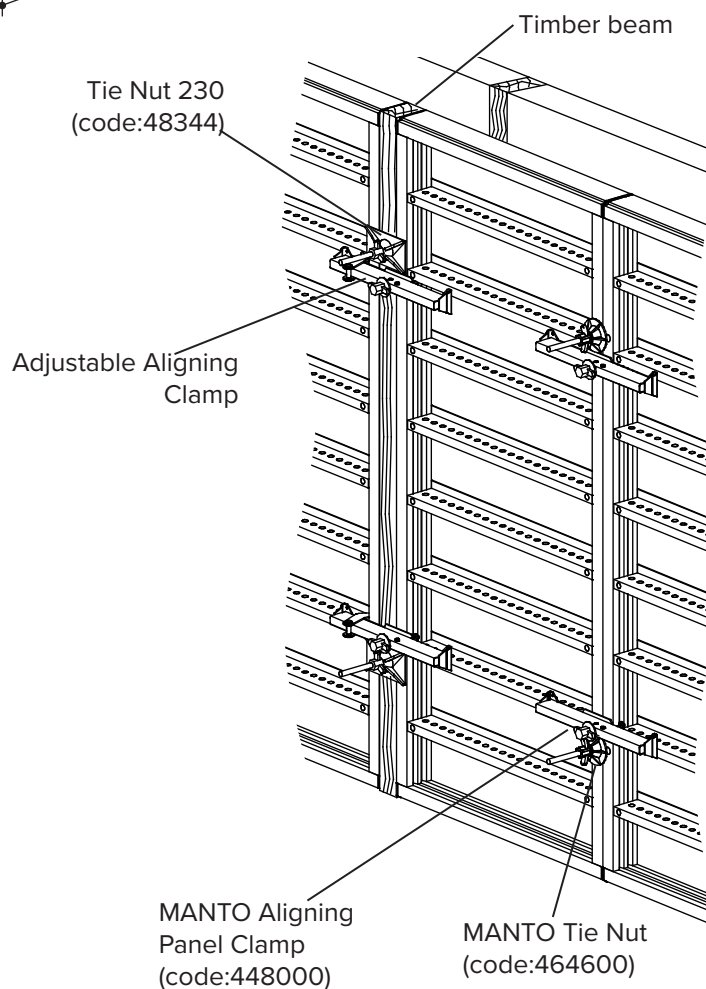
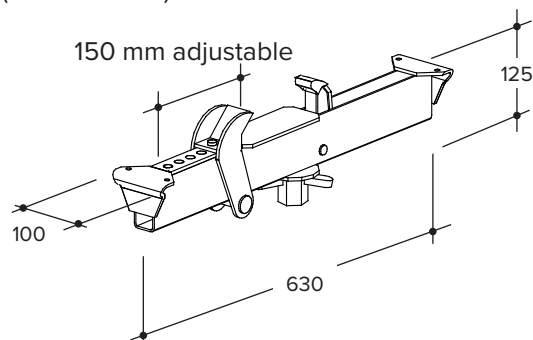
## 5.3.4 Detaching Panel Connection Unit from MANTO panel

Detach the Panel Connection Unit from the panel by reversing the steps described in on Section 5.3.1 on page 62.

## 5.4 Using the Adjustable Aligning Clamp

The Adjustable Aligning Clamp is used to connect the vertical joints between MANTO panels when infills are placed in between panels. It connects the MANTO panels in the same way as the Aligning Panel Clamp does but due to its sliding claw, it allows for adjustments of up to 150 mm.

Adjustable Aligning Clamp  
(code:467898)

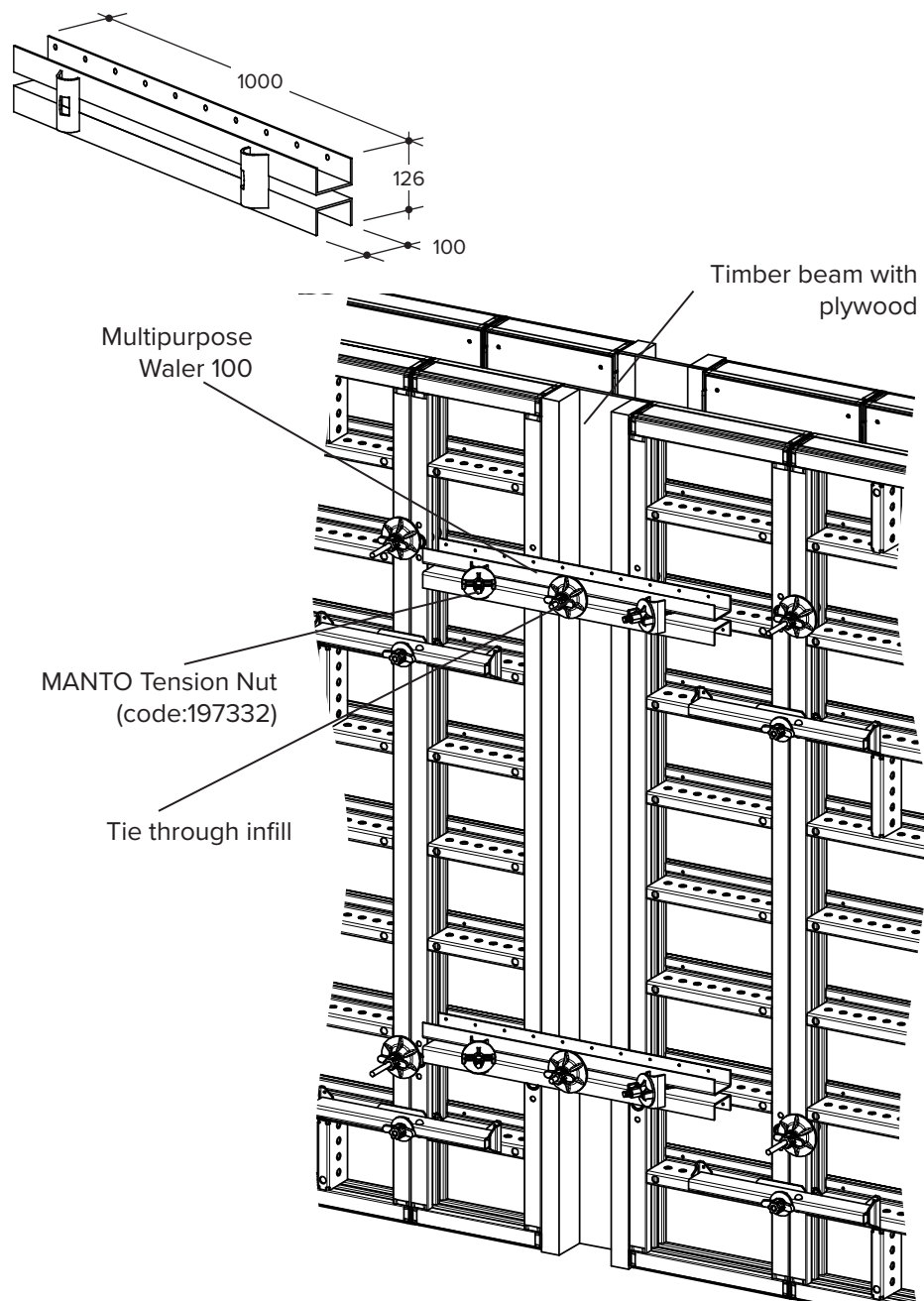


## 5.5 Using the Multipurpose Waler 100

Panels with vertical infills of up to 300 mm can be connected using the Multipurpose Waler 100. In this example 2no. waler spanners and 2no. tension nuts are used on the panel ribs to create an aligned and high-tensile infill. Alternately 2no. PLATINUM 100 Multi Bolts (code:605820) and 2no. MANTO Tie Nuts (code:464600) can be used.

Ties are placed through the infill as centred as possible.

Multipurpose Waler 100  
(code:450764)



For rules regarding infill solutions, refer to page 70.

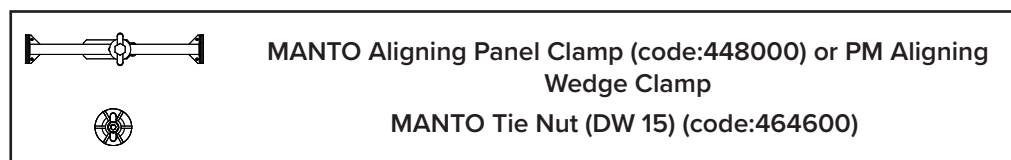


## 5.6 MANTO XXL panels

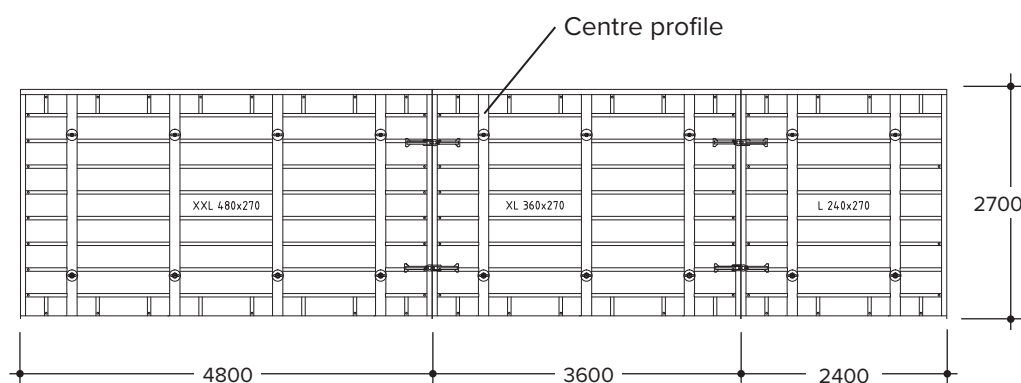
### Typical arrangements

The following illustrations show typical connecting arrangements between MANTO XXL Panels when joining panels side-by-side.

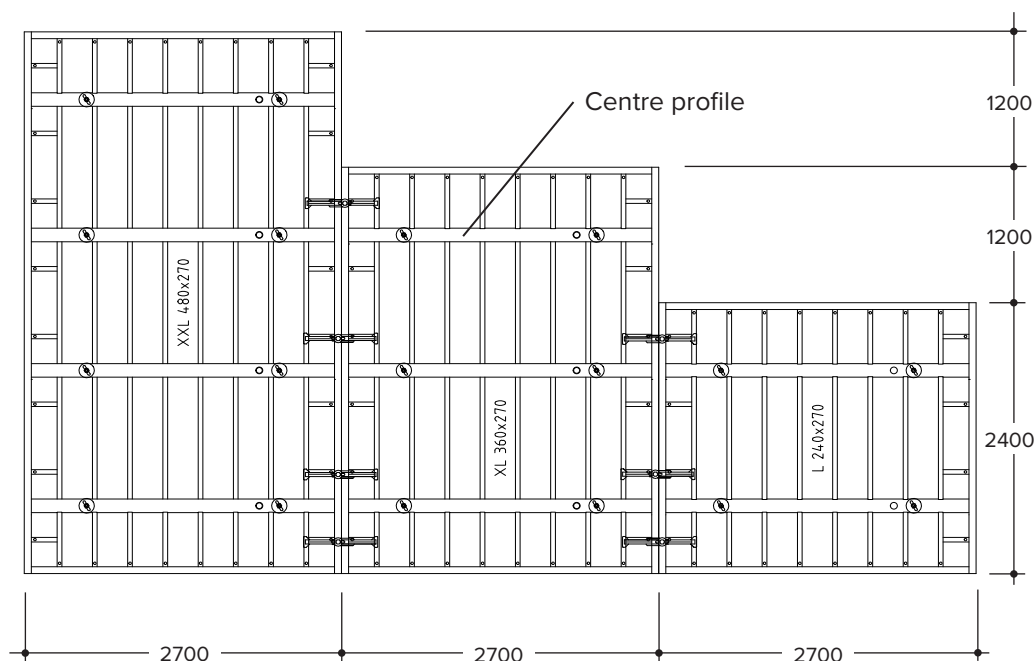
For clarity, a legend of the components used is shown below.



When used in the vertical position (main profile is vertical):



or when used in the horizontal position (main profile is horizontal):



The illustrations above show typical connections between MANTO XXL Panels using the MANTO Aligning Panel Clamp (code: 448000). Other arrangements and/or variations have to be designed according to the respective job requirements.

## 6 Horizontal infills

This section shows the rules and typical solutions for horizontal infills up to 300 mm. Skillful placement of the panels and infills that are part of this system as well of the connectors can mean that on-site infills or additional tying are not necessary. Comply with the respective rules.

The subsequent pages show the following typical infill widths:

- For information on infills up to 60 mm, see page 72.
- For information on infills up to 80 mm, see page 72.
- For information on infills up to 150 mm, see page 73.
- For information on infills up to 300 mm, see page 74.

### 6.1 General rules

When selecting the best infill solution, take into consideration the specific conditions on site. This applies to the actual influence width (IW, refer to page 71) and the maximum influence width (max. IW, refer to page 71).



If the actual influence width is less than the maximum influence width, tying is not required.

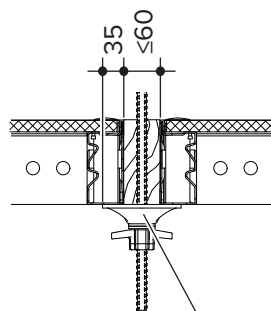
$IW < \text{max. IW} \rightarrow \text{No tying in infill.}$



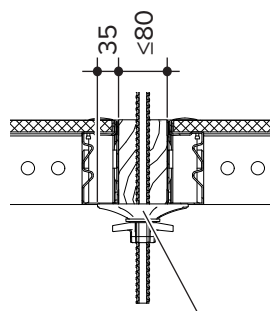
If the actual influence area is greater than the maximum influence area, at least one additional tie is needed. Refer to the typical examples in the following subsections.

$IW \geq \text{max. IW} \rightarrow \text{At least one tie in the infill.}$

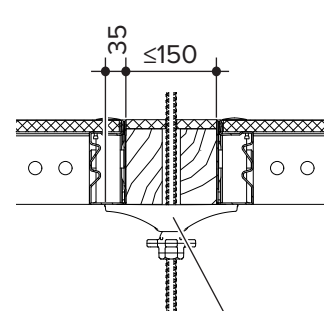
When tying through the infill, the tie shall always be placed through the centre of the infill. The tie washer shall overlap the panel by at least 35 mm on each side. Select the tie nut best suited to this purpose.



MANTO Tie Nut  
(DW 15)



Tie Nut DW 150  
(DW 20)

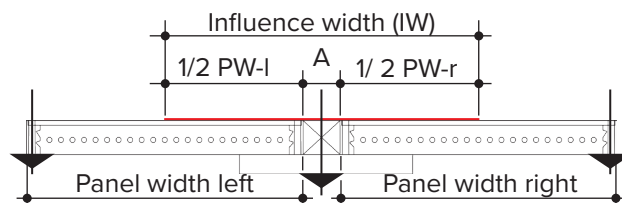


Tie Nut 230  
(DW 15)

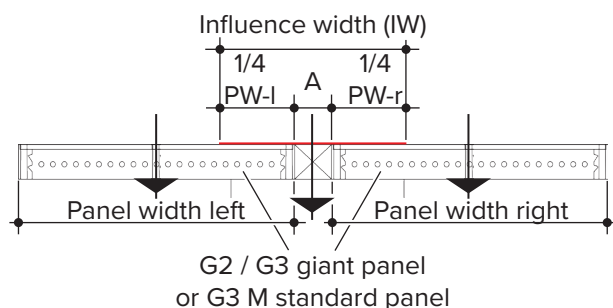
### Actual influence width

The actual influence width (IW) is a factor of the type and width of the panel as well as the width of the infill.

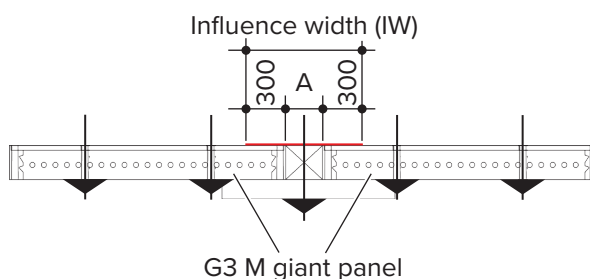
Simply put, the actual influence width is the sum of the width of the infill (A) and half the width of the panels on each side of the infill ( $1/2$  PW-l and  $1/2$  the PW-r).



If there are MANTO G2 or G3 giant panels or MANTO G3 M standard panels adjacent to the infill, the actual simple influence width is the sum of the width of the infill (A) and a quarter of the width of the panels on each side of the infill ( $1/4$  PW-l and  $1/4$  the PW-r). This has to do with the different tie position.







If there are MANTO G3 M giant panels next the infill, the actual simple influence width is the sum of the width of the infill (A) and  $2 \times 300$  mm. This has to do with the different tie pattern.



### Maximum influence width

The maximum influence width (IW) is a factor of the panel height, the profile of the concrete pressure and the respective tie diameter.

Maximum influence width (IW) when tying infill with a single tie (Refer to solutions 6.2.1, 6.2.2 and 6.2.3)				
Panel height	Pressure profile	Max. IW		Connectors per panel ***
		DW 15 *	DW 20 **	
2.70 m	Hydrostatic 	1.30 m	1.50 m	2
	Constant 	1.20 m	1.40 m	2
3.30 m	Hydrostatic 	1.05 m	1.50 m	2
	Constant 	1.00 m	1.20 m	2

\* Constant pressure for DW 15 =  $60.00 \text{ kN/m}^2$

\*\* Constant pressure for DW 20 =  $80.00 \text{ kN/m}^2$

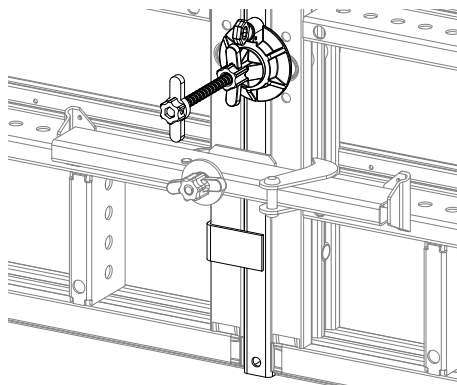
\*\*\* Additional connectors might be required due to timber beam and joint capacity.

## 6.2 Typical solutions

### 6.2.1 Infills up to 60 mm wide

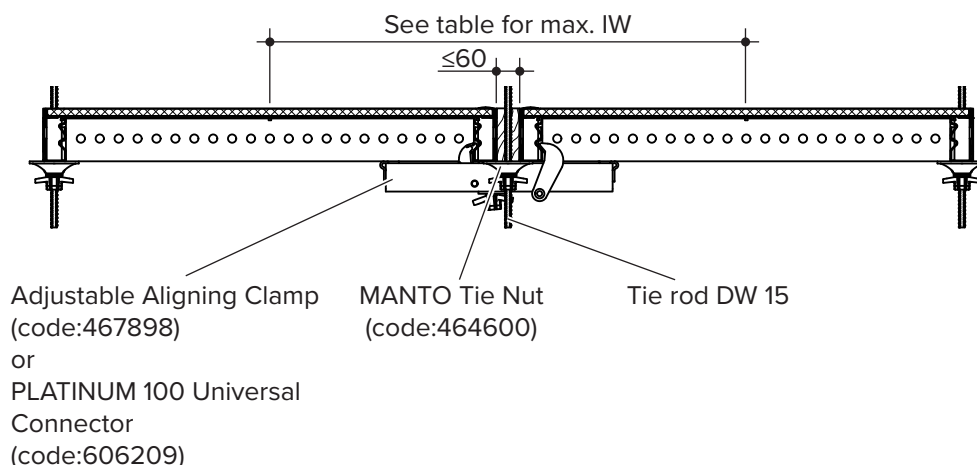
#### System infills

Infills that are 50 mm wide are included in the product line. They have tie holes for simple, standard tying at the system heights of 1200 mm, 2700 mm and 3300 mm. Even one-sided tie systems can be attached to MANTO G3 corner adjustments.

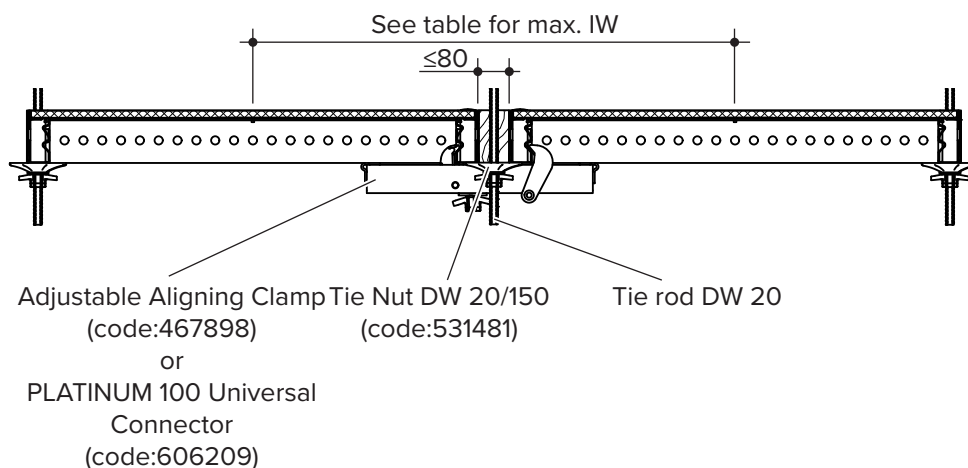


#### On-site infills

Solid timber beams, 140 mm thick and available on site, are used to achieve flat and continuous infill surfaces in cases where the width differs from that of the standard infills.

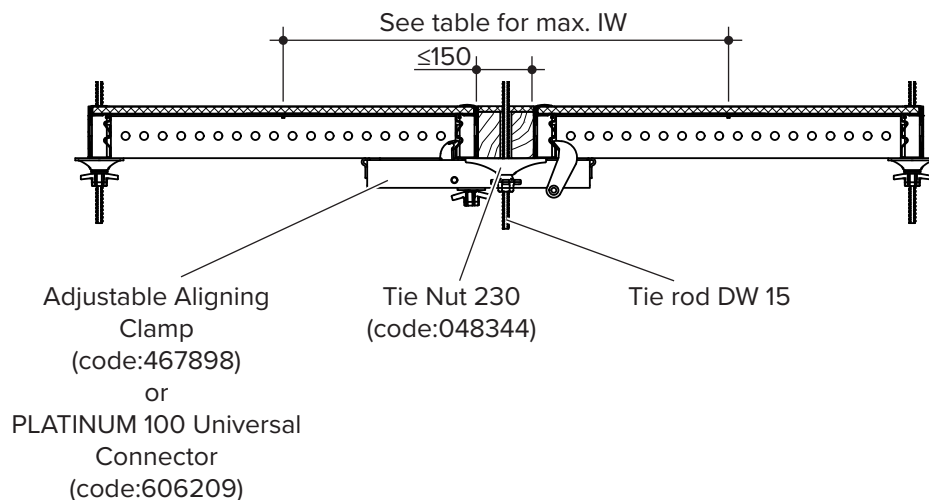


### 6.2.2 Infills up to 80 mm wide

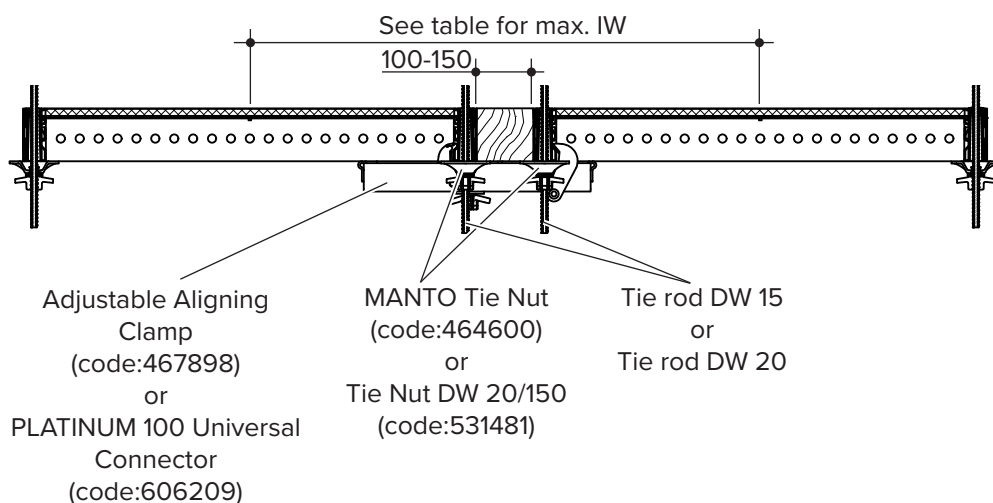


### 6.2.3 Infills up to 150 mm wide

**If actual influence width (IW)  $\leq$  maximum influence width (max. IW)**

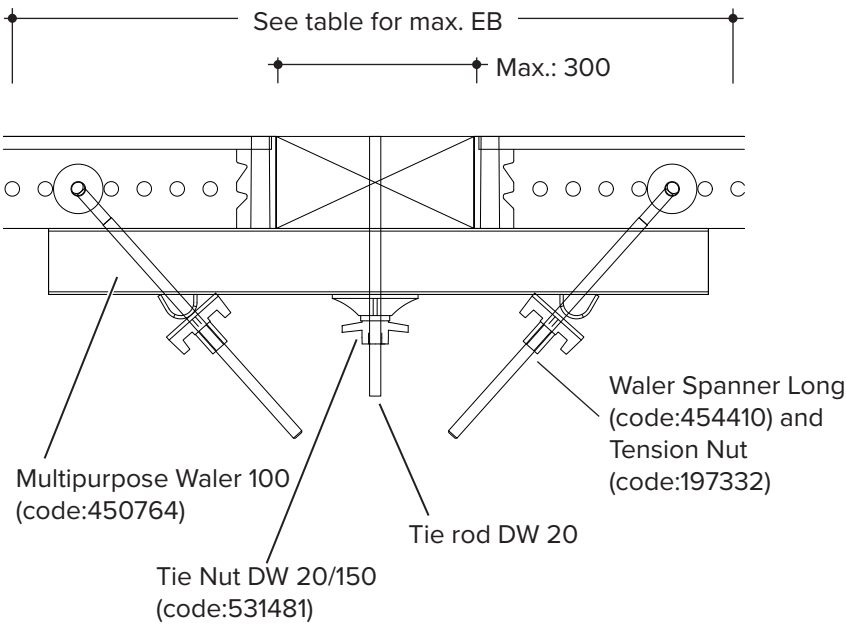


**If actual influence width (IW)  $>$  maximum influence width (max. IW)**

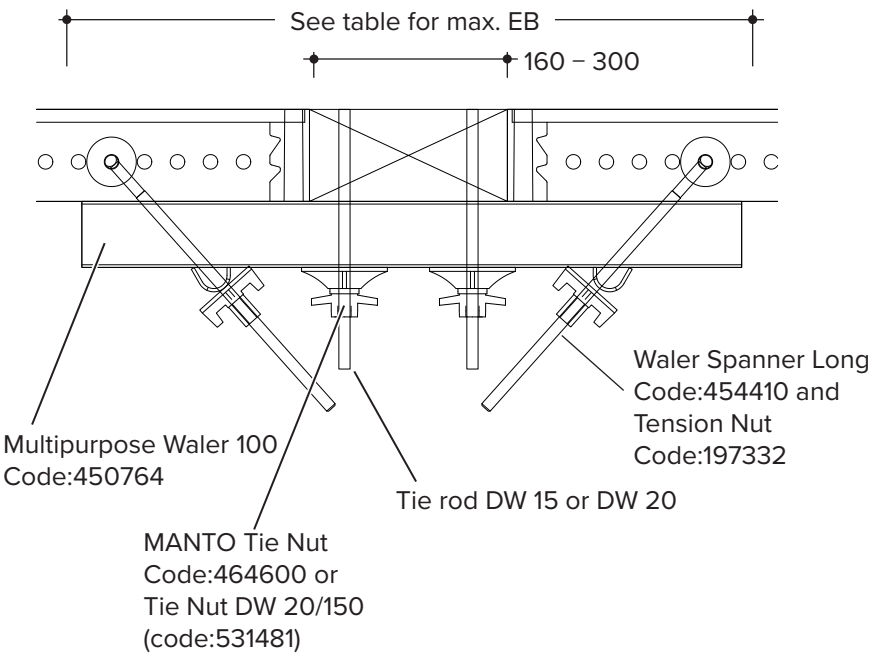


6.2.4    Infills up to 300 mm wide

If actual influence width (IW) ≤ maximum influence width (max. IW)



If actual influence width (IW) > maximum influence width (max. IW)

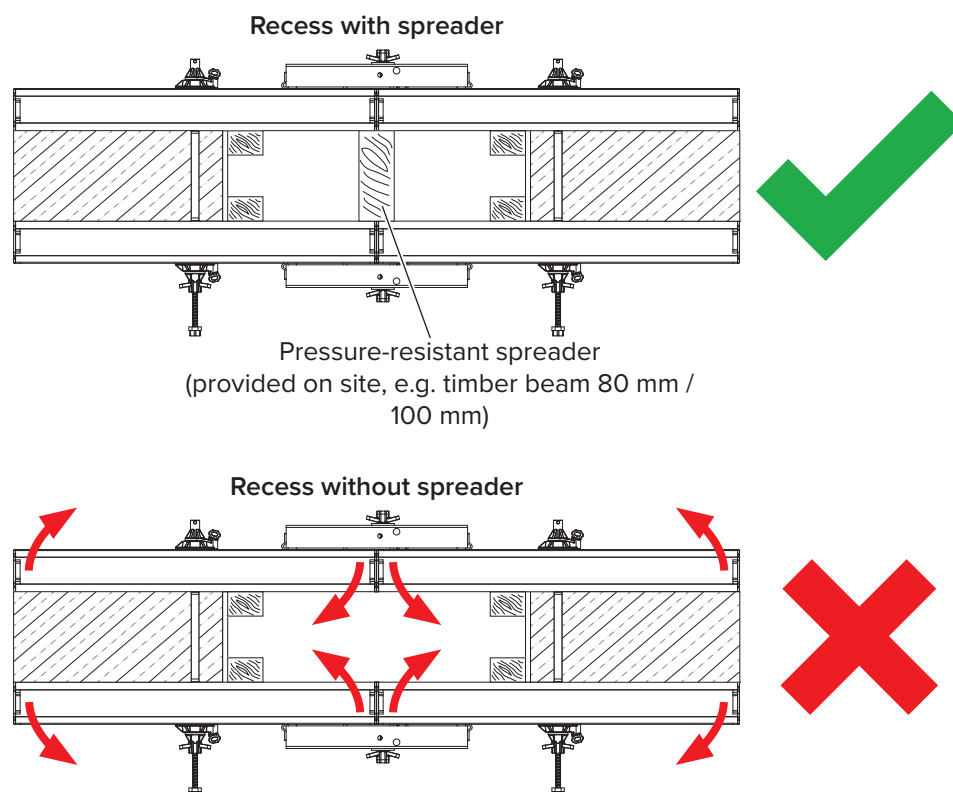


### 6.3 Openings for windows and doors

If the strain is asymmetric on panels (MANTO G3 M) tied in the centre near openings for doors and windows, e.g. because concrete is being poured from one side, pressure-resistant struts have to be added to the panel joints. Otherwise the joint may seesaw:

The strain will force the panels apart, and the panel joint that is not strained will force the panels together. The connectors at the panel joints are not designed to accommodate this force.

The struts provided on site have to be placed in the tie position and at the upper and lower edges of the panel.



Place the pressure-resistant struts (e.g. timber beam 80 mm / 100 mm) at the panel joint, one in each tie position as well as at the upper and lower edge of the element.



This does not apply to MANTO panels that are tied at the edge profile.



## 7 Vertical panel extensions

Should it be required, it is possible to create extensions in height of up to 500 mm on top of the MANTO panels without the need for extra panels.

Should these extensions not provide enough extra height, it is also possible to join MANTO panels on top of one another to further increase the height of the formwork (height extension) (Refer to page 78).

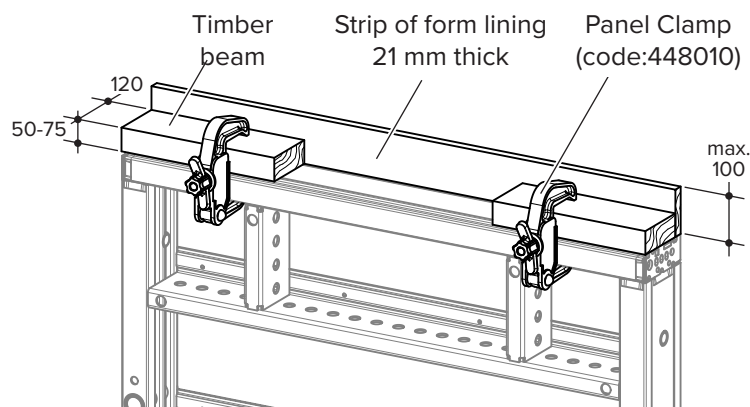


Extending panels vertically will increase the tie loads. Keep this in mind when planning the design.



Check that all connectors are tight and, if necessary, retighten before every use and every time they are moved.

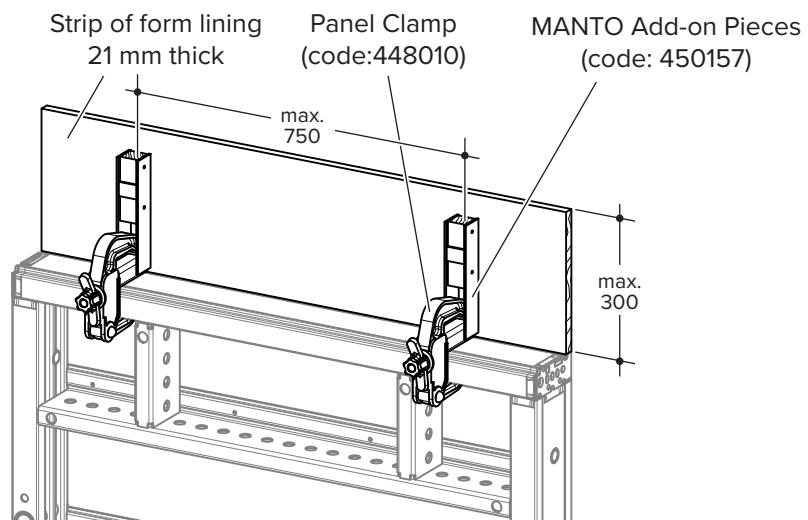
### 7.1 Extensions up to 100 mm (with Panel Clamp)



**Step 1** Use Aligning Panel Clamps (code:448010) to attach timber beams to the top edge profile of the panel to be extended.

**Step 2** Nail plywood, 21 mm thick and up to 100 mm high, to the timber beams.

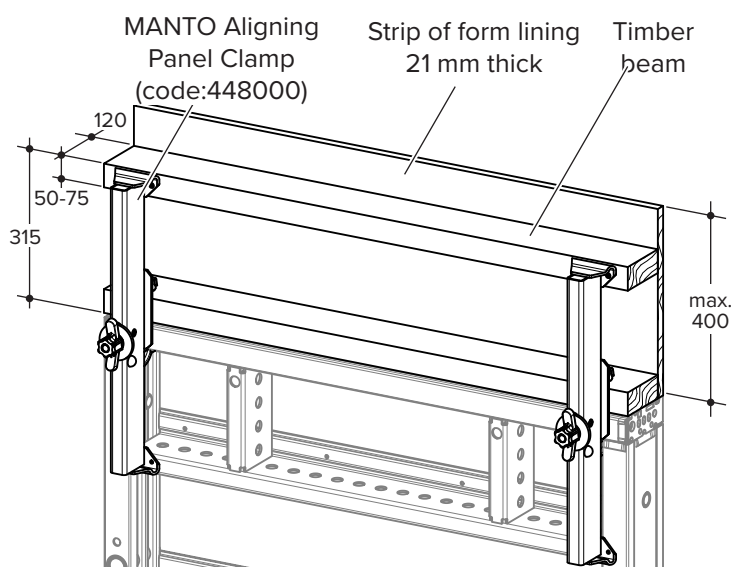
### 7.2 Extensions up to 300 mm (with Panel Clamp and MANTO Add-on Piece)



**Step 1** Use Panel Clamps (code:448010) to attach MANTO Add-on Pieces (code:450157) to the top edge profile of the panel to be extended. Maximum spacing between the MANTO Add-on Pieces (code:450157): 750 mm.

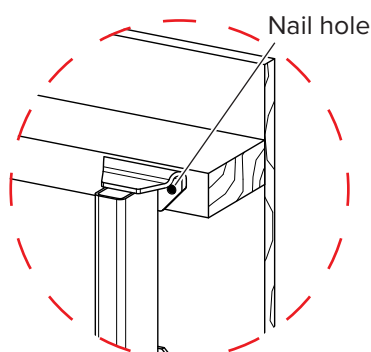
**Step 2** Nail plywood, 21 mm thick and up to 300 mm high, to the MANTO Add-on Pieces. The MANTO Add-on Pieces have a wooden strip for this purpose.

### 7.3 Extensions up to 400 mm (with MANTO Aligning Panel Clamp)



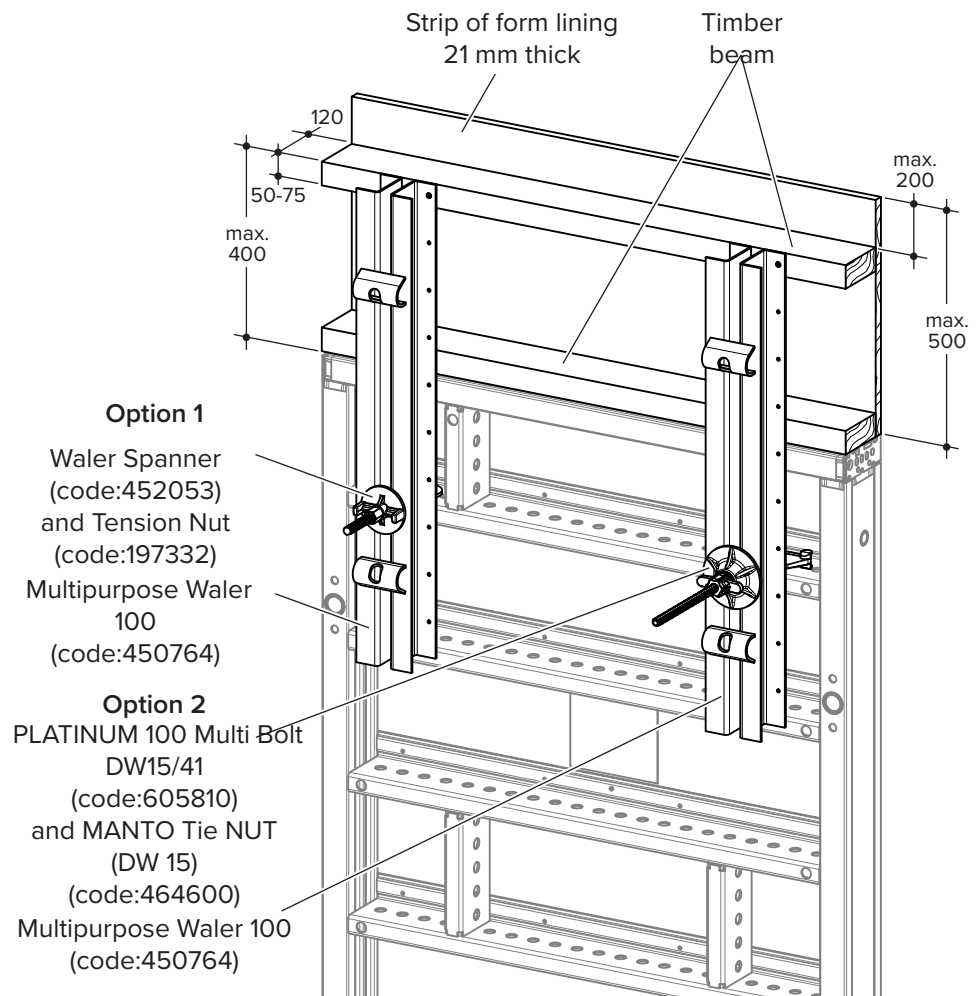
**Step 1** Use 2no. Aligning Panel Clamps (code:448000) to attach timber beams to the top edge profile of the panel to be extended.

**Step 2** Nail a second timber beam to the upper arms of the MANTO Aligning Panel Clamps. There are nail holes at the ends of the arms of the MANTO Aligning Panel Clamps to accommodate the nails.



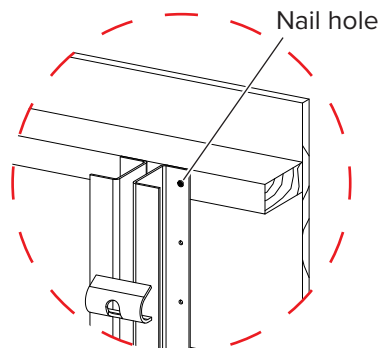
**Step 3** Nail plywood, 21 mm thick and up to 400 mm high, to the timber beams.

## 7.4 Extensions up to 500 mm (with Multipurpose Waler 100)



**Step 1** Fasten the Multipurpose Waler 100 (A, code:450764) to the uppermost H-rib on the MANTO panels with the aid of Waler Spanners (B, code:452053) and Tension Nuts (C, code:197332) or with PLATINUM 100 Multi Bolts DW 15 / 41 (code:605810) and MANTO Tie Nuts (E, code:464600).

**Step 2** Nail 2no. timber beams to the Multipurpose Waler 100. The Multipurpose Waler 100 has nail holes in the flanges.



**Step 3** Nail plywood, 21 mm thick and up to 500 mm high, to the timber beams.

## 7.5 Extensions up to 500 mm

To build extensions greater than 500 mm, attach additional MANTO panels to the top edge (horizontal joint) of the MANTO panels. Refer to page Section 8 on page 79.

## 8 Connecting (extending) panels vertically



The arrangements shown here take into account only the weight of the individual components. If additional components such as platforms are attached, the number of connectors must be adjusted to accommodate the actual weight.

Any arrangements other than those shown here must be carefully checked by the user.

Consult a Hünnebeck technical advisor if you have any questions.

### 8.1 General rules

#### 8.1.1 Rules for panel extensions

- Check that all connectors are tight and, if necessary, retighten before every use and every time they are moved.
- When using a pouring platform with horizontally arranged extended panels, always place the tie rods at the top level or use a PLATINUM 100 Bulkhead Clamp (code:604328).
- If more than two connectors are needed at the joint, the PM Aligning Wedge Clamp (code:606900) cannot be used.



Unlike previous generations, the panel generations 3 (MANTO G3 and G3 M) have V-ribs. The PM Aligning Wedge Clamp (code:606900) can be attached to these ribs. This means that no more than 2no. PM Aligning Wedge Clamps can be attached to each panel joint.

To see how to attach the PM Aligning Wedge Clamp, refer to pageSection 5.3.2 on page 64.

#### 8.1.2 Rules for use and combination of connectors

- At least 2no. connectors have to be used to attach a stacked panel to the panel below it.
- As a general rule, use the PLATINUM 100 MANTO Extension Bar (code:607000) (. 450157) in conjunction with another connector.  
Never use just 1no. PLATINUM 100 MANTO Extension Bar per horizontal joint!
- Using 1no. PLATINUM 100 MANTO Extension Bar saves using 4no. MANTO Panel Aligning Clamps (clamp (code:448000))

## 8.1.3 Rules for arrangement of connectors on formwork panel

- The connectors shall rest only against the tie nut.
- Check the spacing between the edge of the panel and the clamp axis.

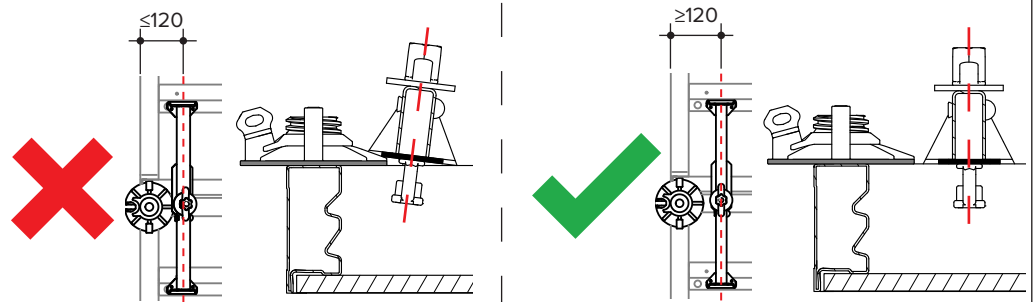


### WARNING

#### Risk of injury from falling MANTO panels!

If the panels are not fastened correctly, the MANTO Aligning Panel Clamp (code:448000) can release and formwork panels can fall off when being transported by crane!

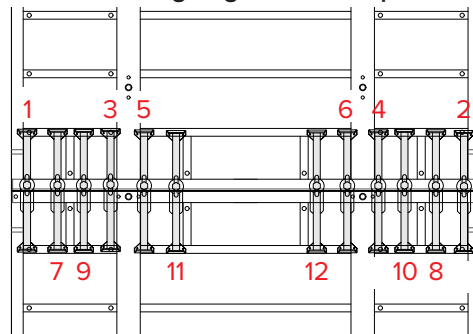
Every time panels are put into place, ensure that the MANTO Aligning Panel Clamp is not overlapping the tie nut used for one-sided tying. The MANTO Aligning Panel Clamp must rest completely on the MANTO panels. Attach the MANTO Aligning Panel Clamp farther away from the edge profile.



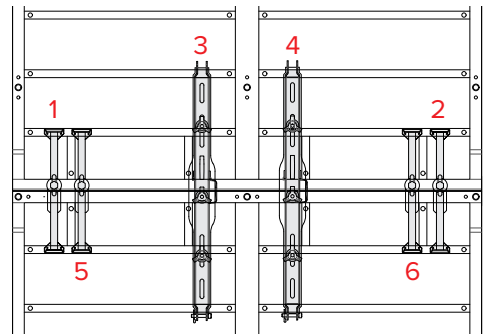
- Attach the connectors to the edge ribs, working from the edge profile to the middle profile or towards the centre of the panel (Refer to the following illustrations).

For panel widths 240 cm

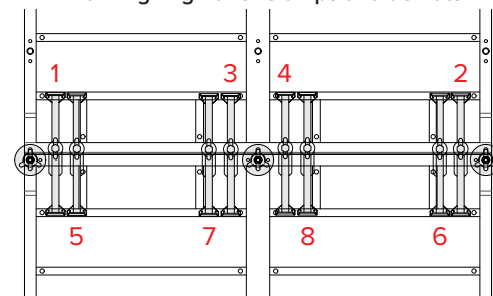
MANTO G3 giant panels  
with Aligning Panel Clamps



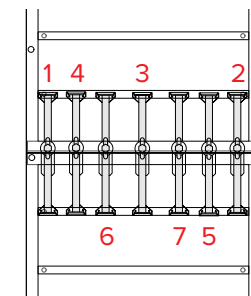
MANTO G3 giant panels  
with PLATINUM MANTO 100 Extension  
Bar and Aligning Panel Clamps



For panel widths 240 cm  
MANTO G3 giant panel  
with Aligning Panel Clamps and tie nuts

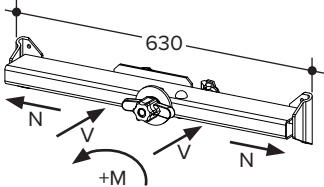

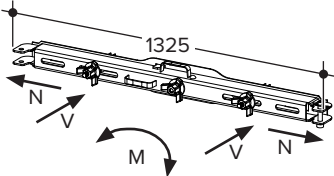


For panel widths  
≤ 120 cm



## 8.1.4 Connectors for panel extensions

The connectors used to extend MANTO panels securely close the panel joints and properly align the panels without offset.

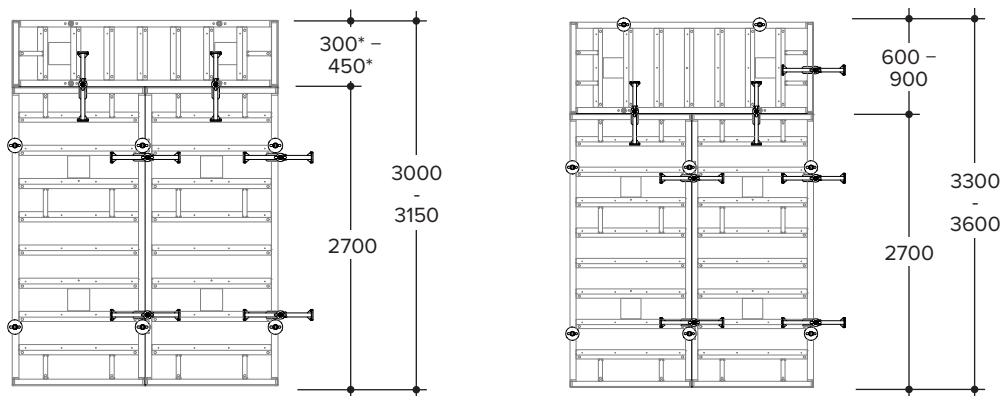
	Part	Item code	Weight [kg]
	<b>MANTO Aligning Panel Clamp</b>	<b>448000</b>	<b>5.50</b>
	Safe Working Moment (-M, facing down): 1.70 kNm. Safe Working Moment (+ M, facing up): 1.20 kNm. SWL (N): 11.20 kN. SWL (V): 6.70 kN.		
<div>  <p>The bending capacity <math>M_{perm}</math> of the MANTO Aligning Panel Clamp (code:448000) can be positive or negative. When the plywood is facing the ground (down) the bending capacity is negative. The least favourable case (plywood facing up), with 1.20 kNm, is used to calculate the required number of connectors for the horizontal joint.</p> </div>			
	<b>PLATINUM 100 MANTO Extension Bar</b>	<b>607000</b>	<b>18.83</b>
	Safe Working Moment (M): 4.50 kNm. SWL (N): 15.00 kN. SWL (V): 11.00 kN.		

## 8.2 Extensions with MANTO Aligning Panel Clamp

For information on how to attach the MANTO Aligning Panel Clamp (code:448000), refer to pageSection 5.2 on page 59.

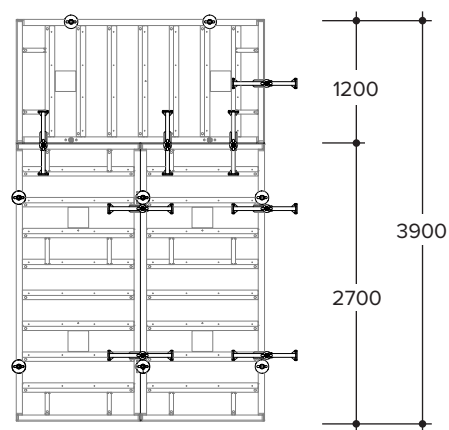
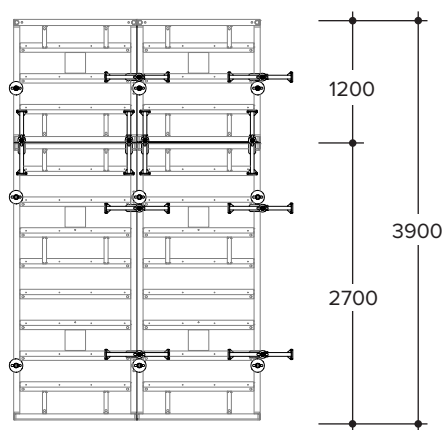
**With MANTO Aligning Panel Clamp, ties and MANTO panels 2.70 m**

• **Formwork height: 3.00 m to 3.60 m**

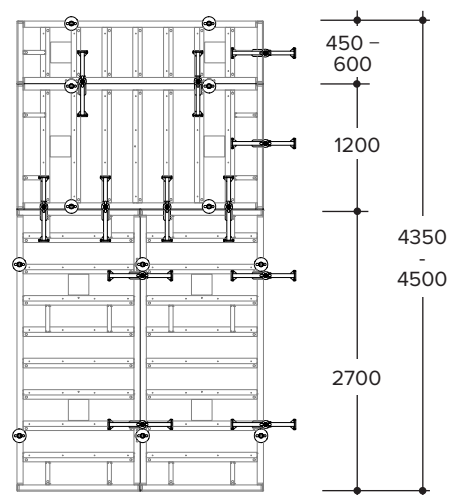
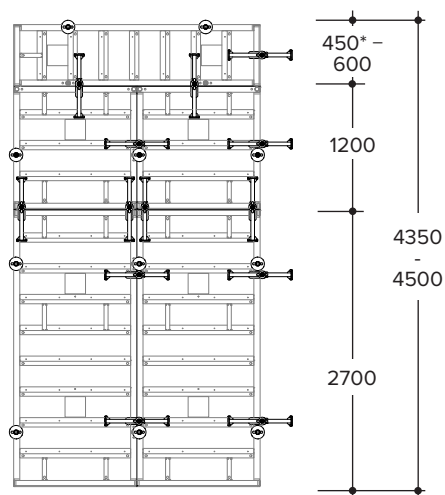


Panels marked with an asterisk (\*) do not represent the real panel width and are for illustration purposes only.

## • Formwork height: 3.90 m



## • Formwork height: 4.35 m to 4.50 m

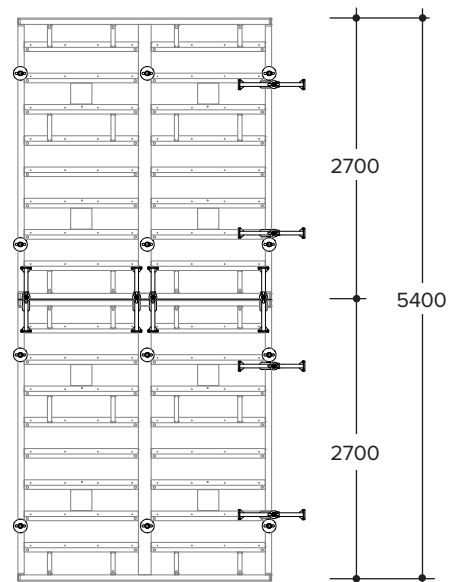
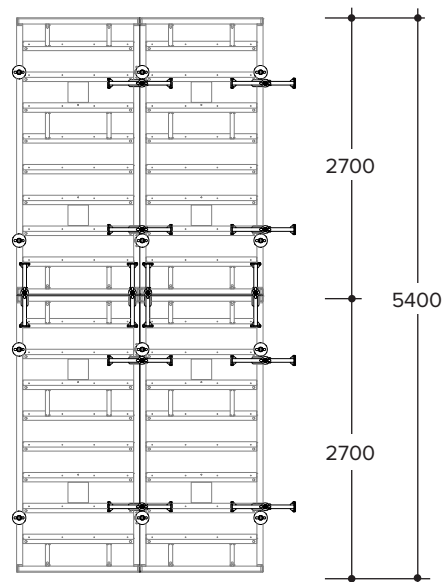


Panels marked with an asterisk (\*) do not represent the real panel width and are for illustration purposes only.

## • Formwork height: 5.40 m

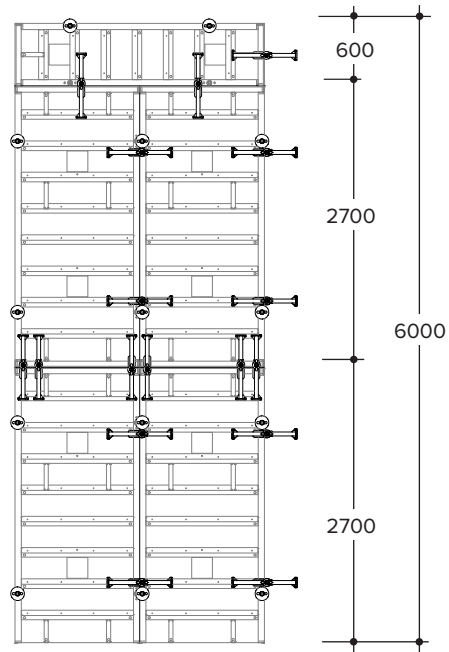
*Left illustration: MANTO G2 panels*

*Right illustration: MANTO G3 Giant Panels 240/270*

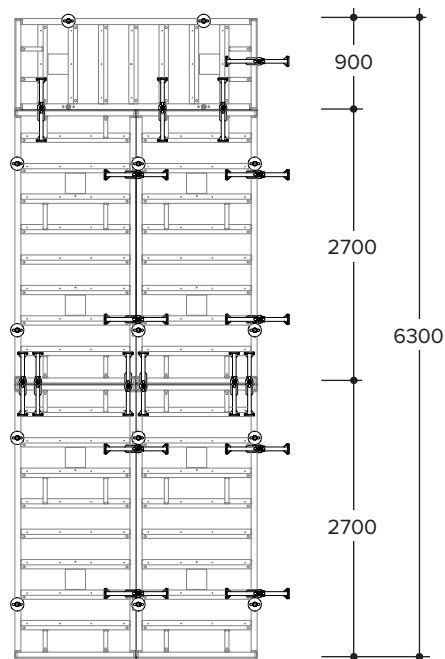




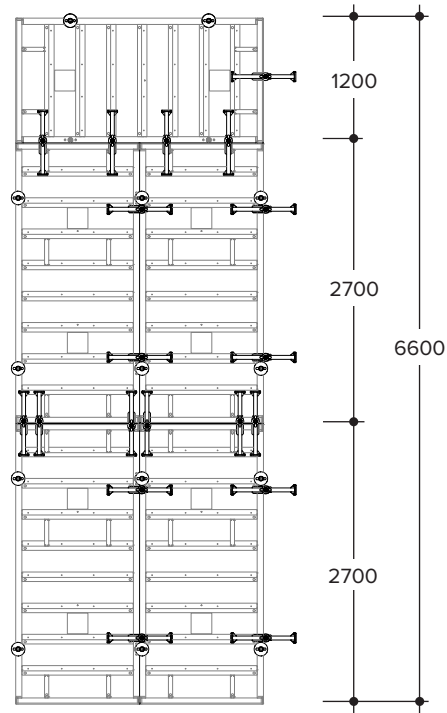
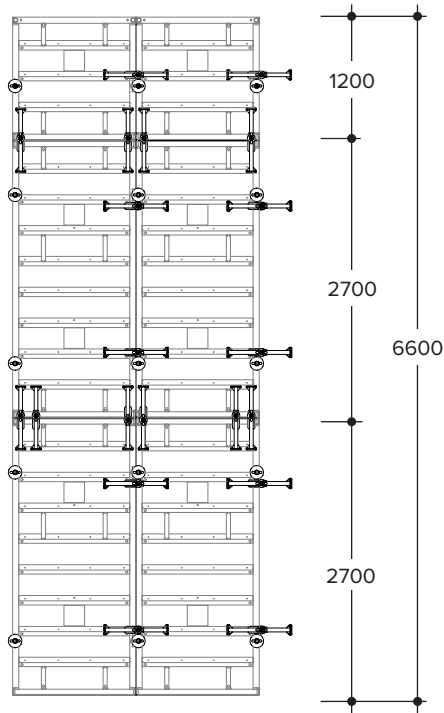
• **Formwork height: 6.00 m**



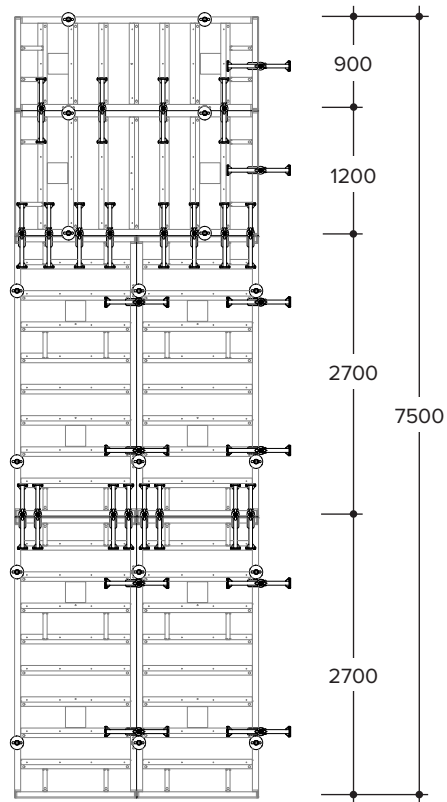
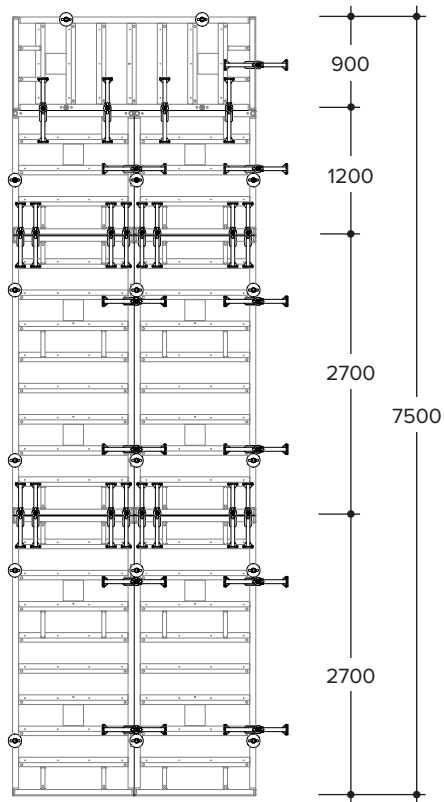
• **Formwork height: 6.30 m**



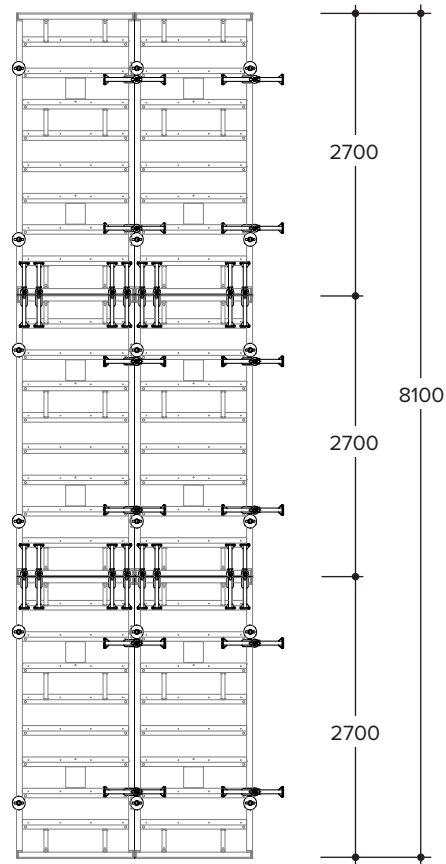
• Formwork height: 6.60 m



• Formwork height: 7.50 m

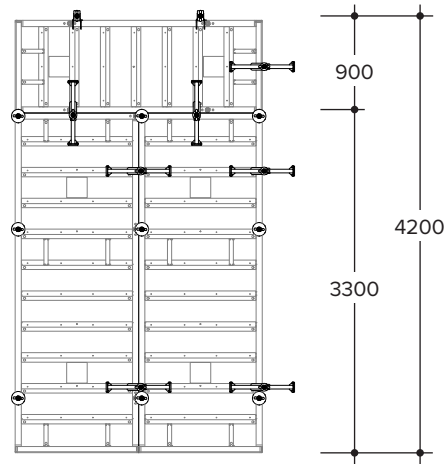


• Formwork height: 8.10 m

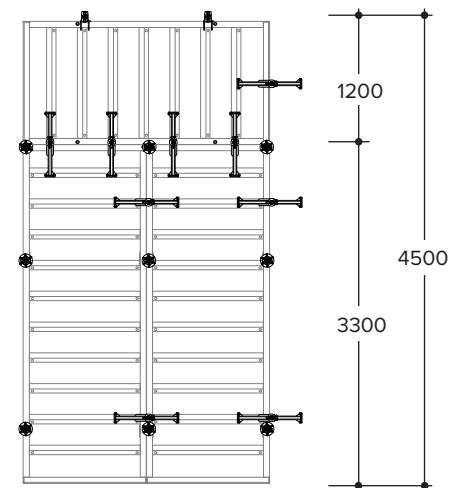
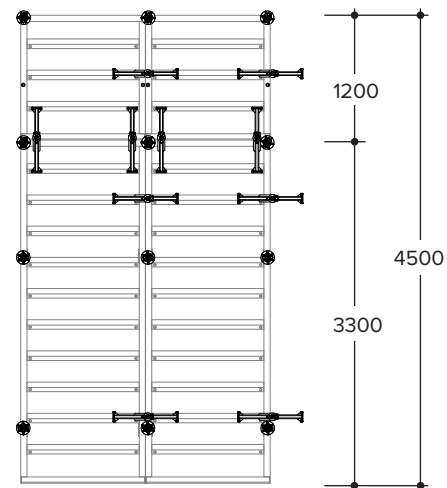


## Using the MANTO Aligning Panel Clamp, ties and MANTO panels 3.30 m

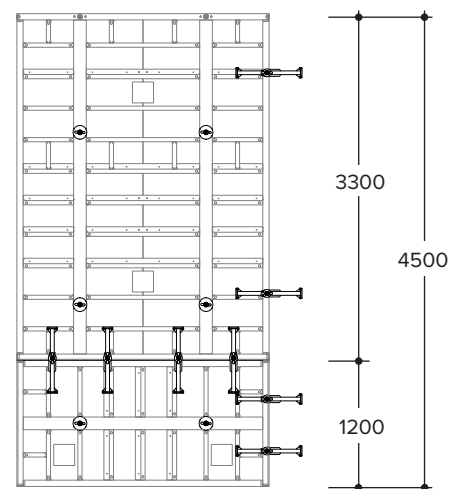
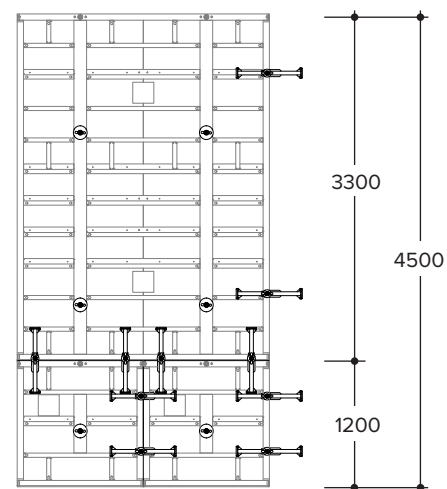
- Formwork height: 4.20 m



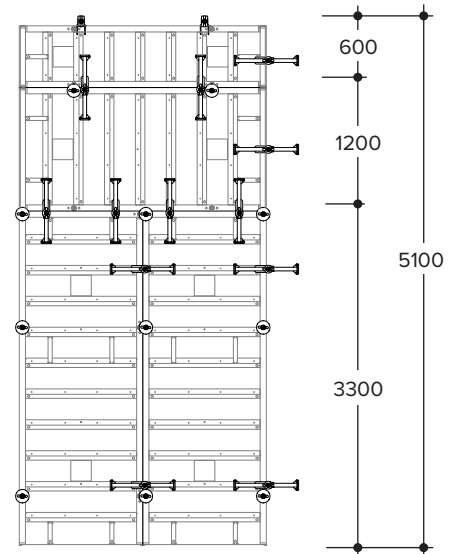
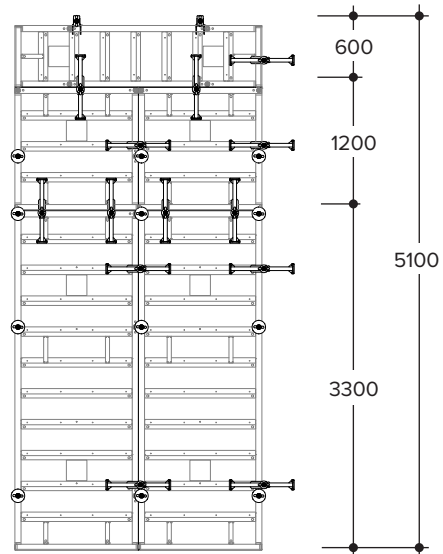
- Formwork height: 4.50 m



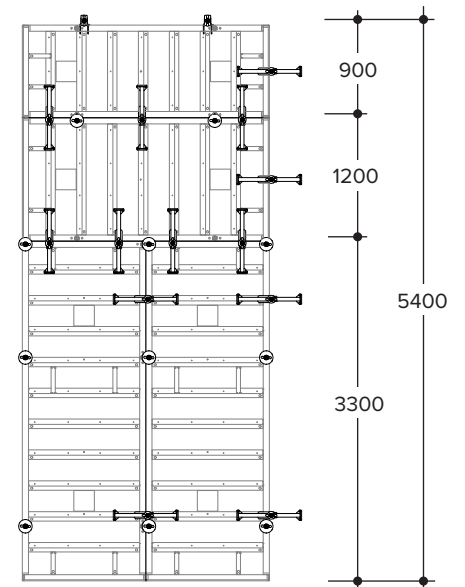
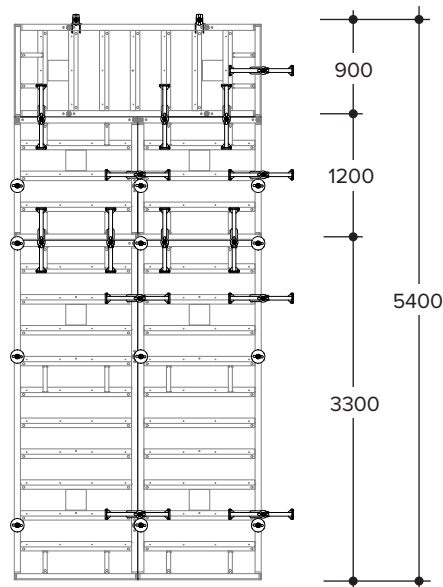
## With MANTO G3 M Giant Panels 240/330:



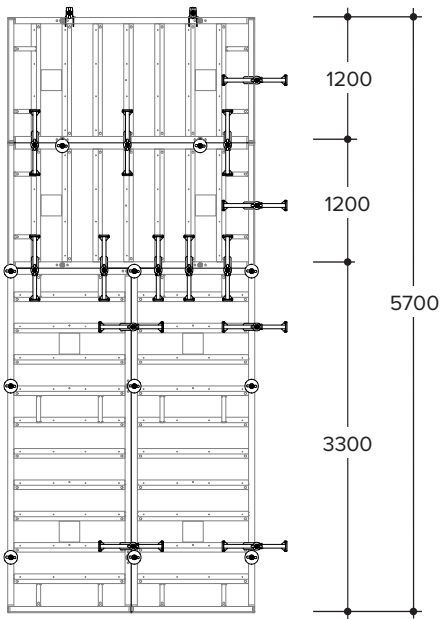
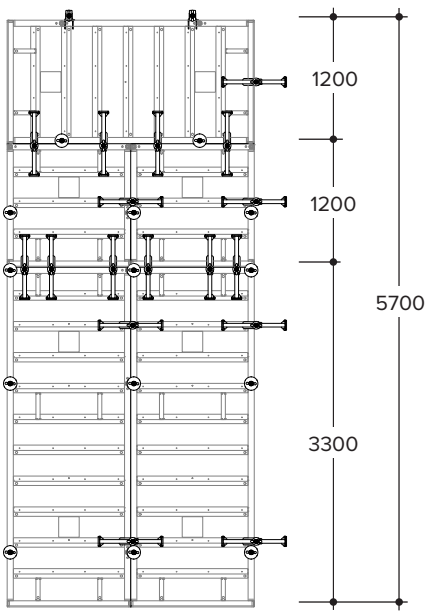
• Formwork height: 5.10 m



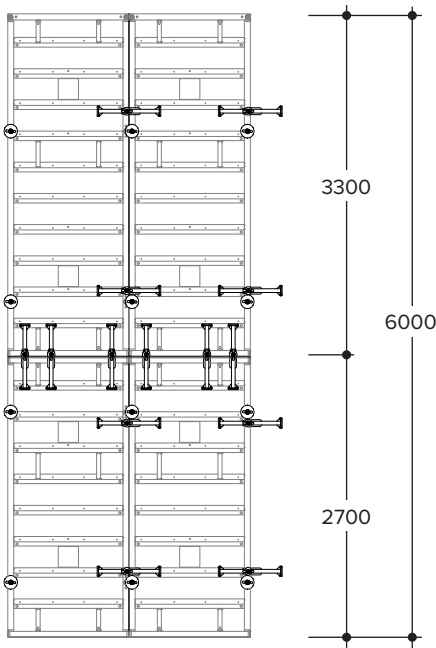
• Formwork height: 5.40 m



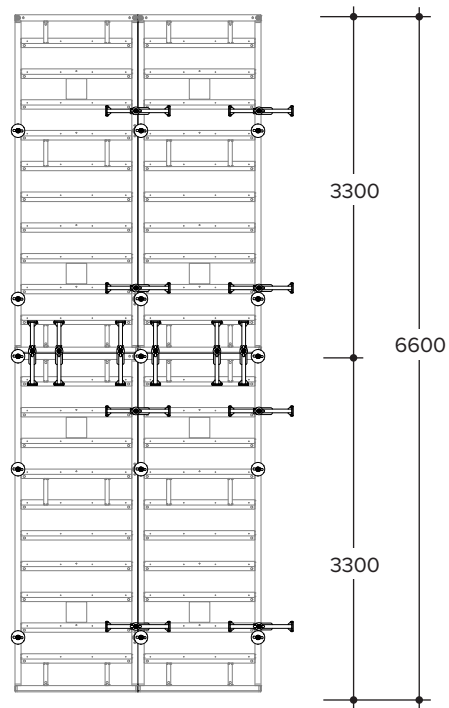
• Formwork height: 5.70 m



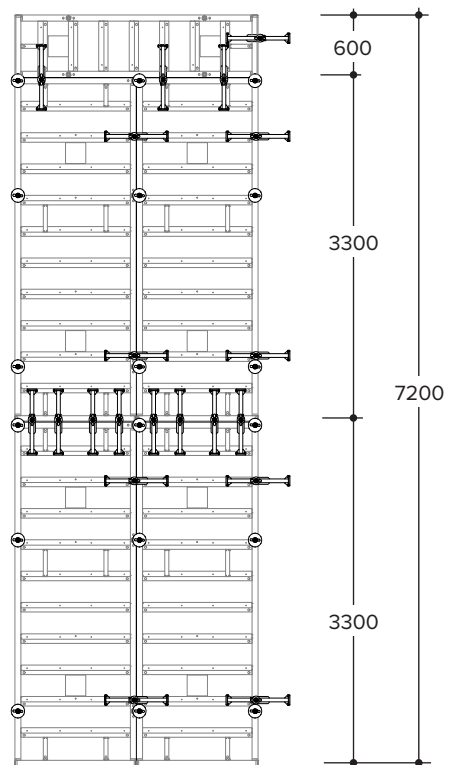
• Formwork height: 6.00 m



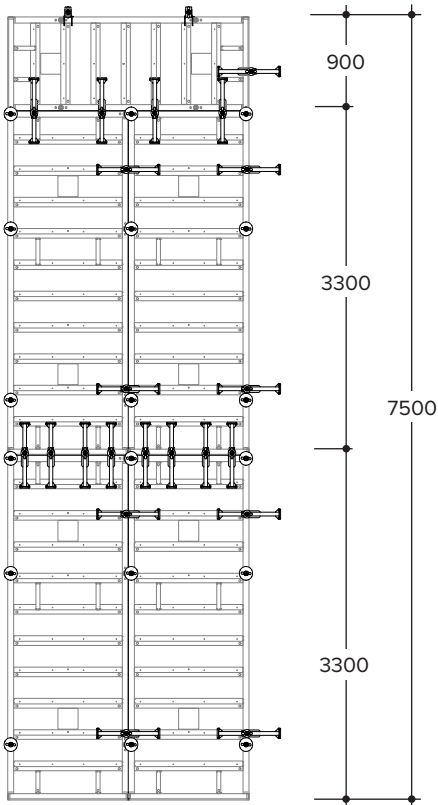
• Formwork height: 6.60 m



• Formwork height: 7.20 m



• Formwork height: 7.50 m

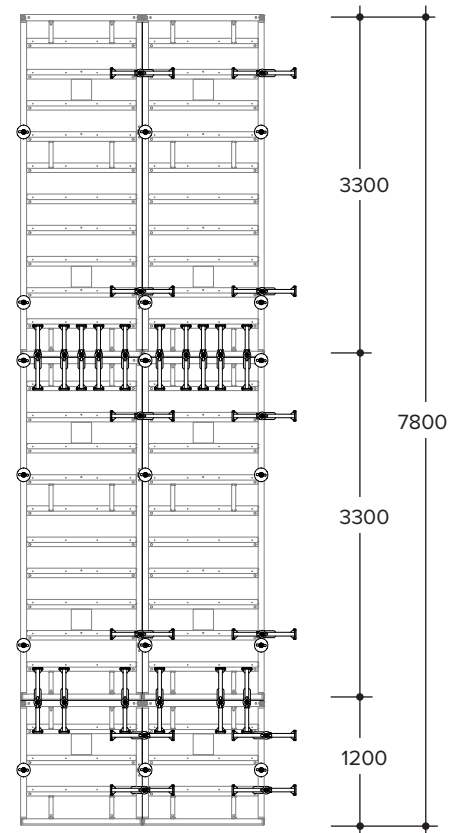
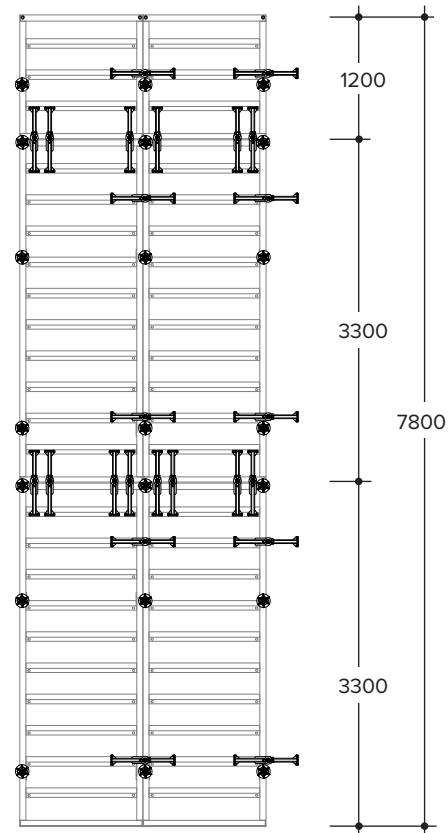




• **Formwork height: 7.80 m**

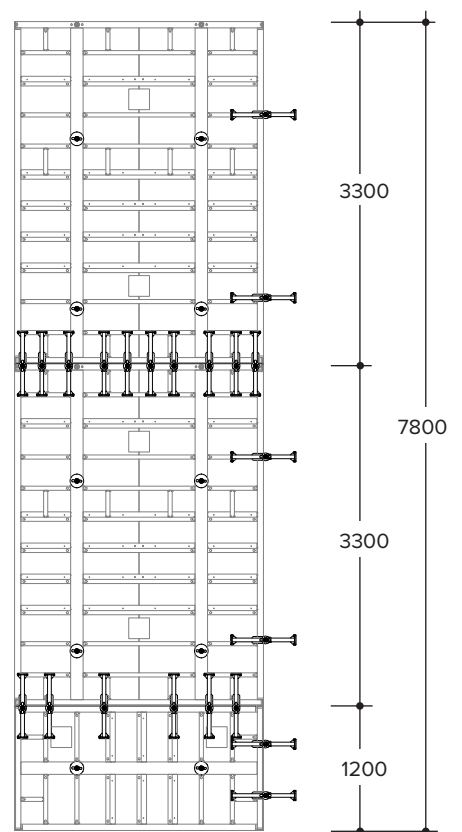
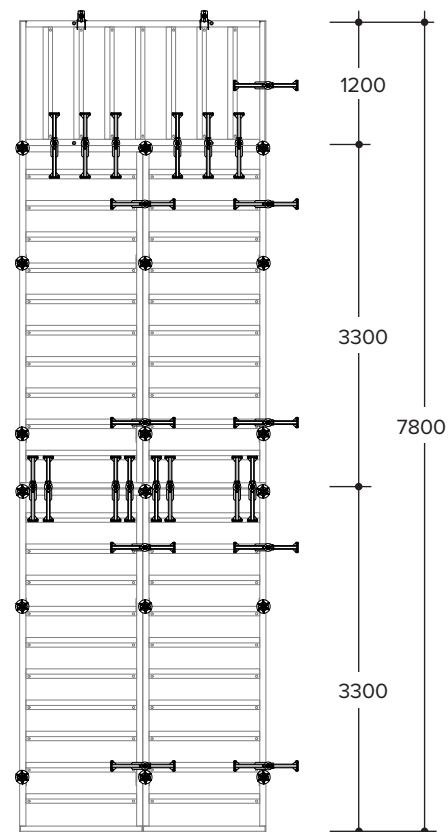
*Left illustration: MANTO G2 panels*

*Right illustration: MANTO G3 panels*



*Left illustration: MANTO G2 panels*

*Right illustration: with MANTO G3 M Giant Panels 240/330*

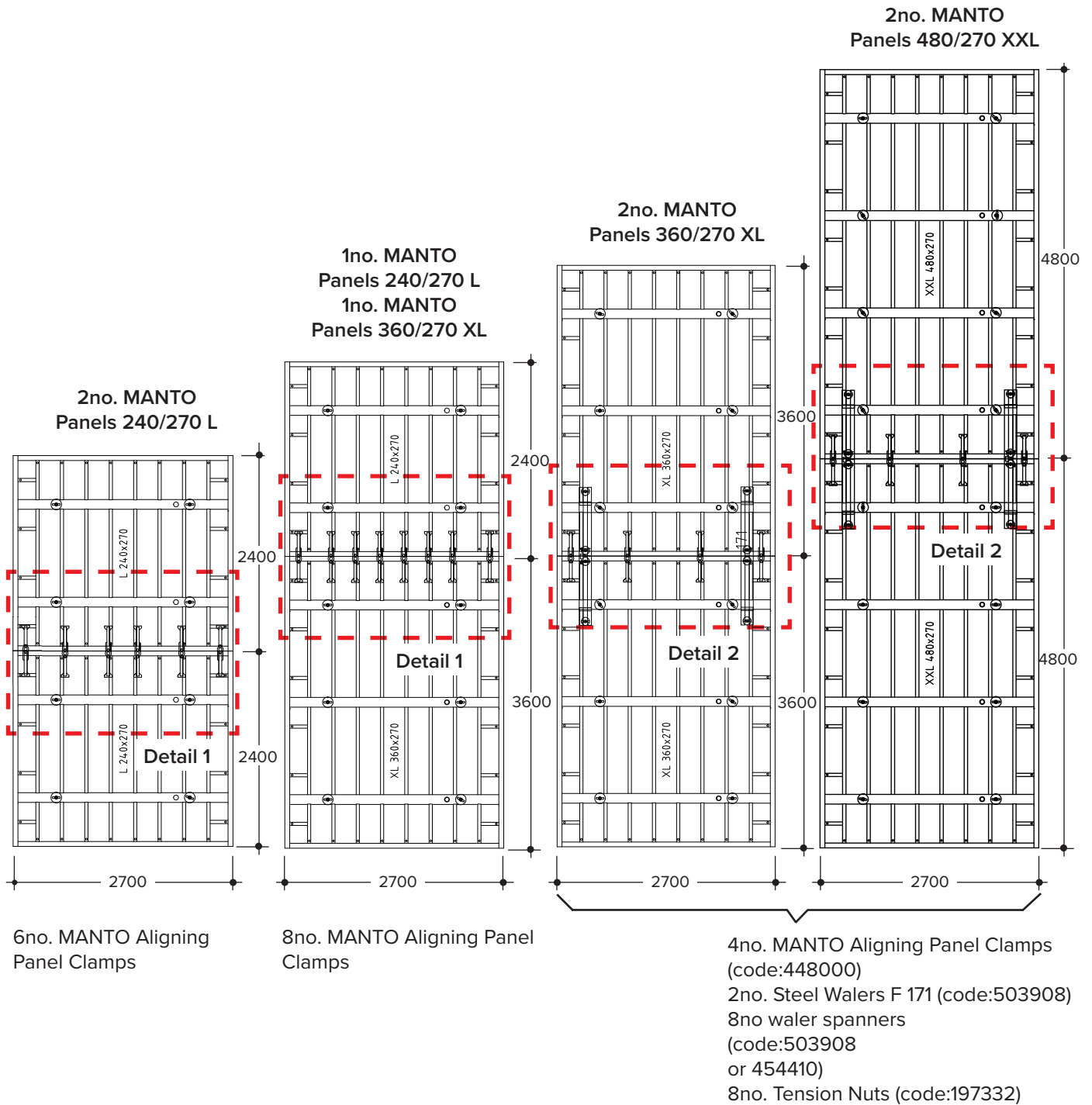


## 8.3 Extensions in height of MANTO XXL panels

### Using MANTO Aligning Panel Clamp, ties and MANTO XXL panels

#### Typical arrangements

The following illustrations show typical tie positions and connecting arrangements between MANTO XXL panels when joining panels in height.



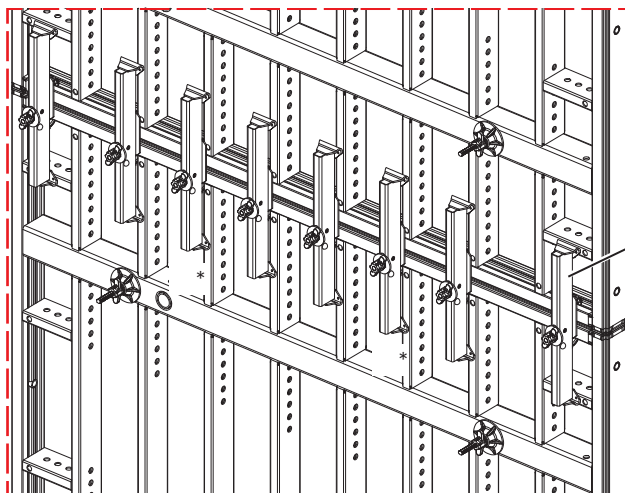
The illustrations above show typical connections between MANTO XXL panels. Other arrangements and/or variations have to be designed according to the respective job requirements.

## Typical arrangement

The following details show a typical vertical connection between MANTO XXL panels and one of the following panels:

### Detail 1

- MANTO Panel L 240/270 (code:600860) + MANTO Panel L 240/270 (code:600860)  
6no. MANTO Aligning Panel Clamp (code:448000)
- MANTO Panel L 240/270 (code:600860) + MANTO Panel XL 360/270 (code:600861)  
8no. MANTO Aligning Panel Clamp (code:448000)

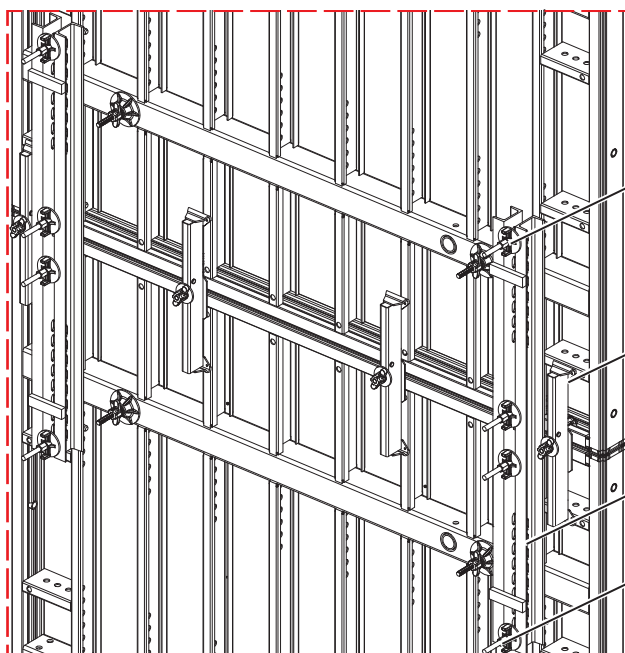


MANTO Aligning Panel Clamp  
(code: 448000)

(\*) These clamps do not need to be included in the option with only 6no. clamps.

### Detail 2

- MANTO Panel XL 360/270 (code:600861) + MANTO Panel XL 360/270 (code:600861)  
4no. MANTO Aligning Panel Clamps (code:448000)  
2no. Steel Walers F 171 (code:503908)  
2no. waler spanners  
8no. Tension Nuts (DW 15) (code:197332)
- MANTO Panel XXL 480/270 (code:600862) + MANTO Panel XXL 480/270 (code:600862)  
(Same connector as with 2no. XL panels)



Tension Nut (DW 15)  
(code:197332)

MANTO Aligning Panel Clamp  
(code: 448000)

Waler 171  
(code:503908)

Waler spanner  
(code:452053 or 454410)

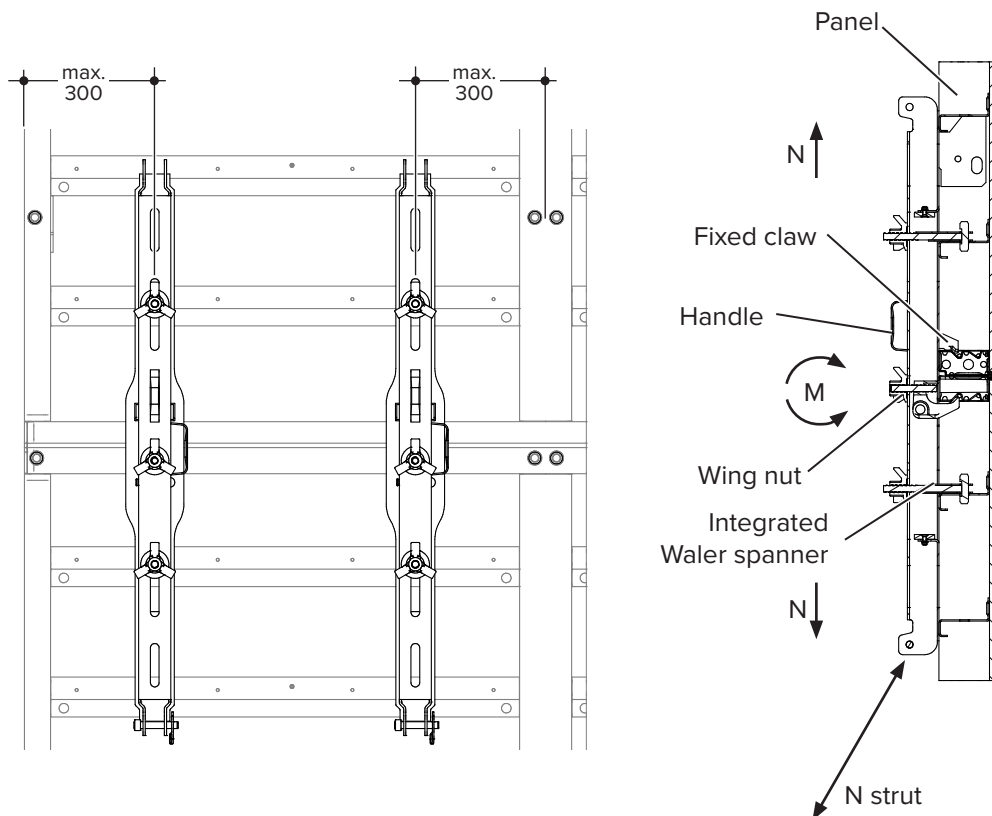
## 8.4 Extensions in height using PLATINUM 100 MANTO Extension Bar

### Attaching PLATINUM 100 MANTO Extension Bar



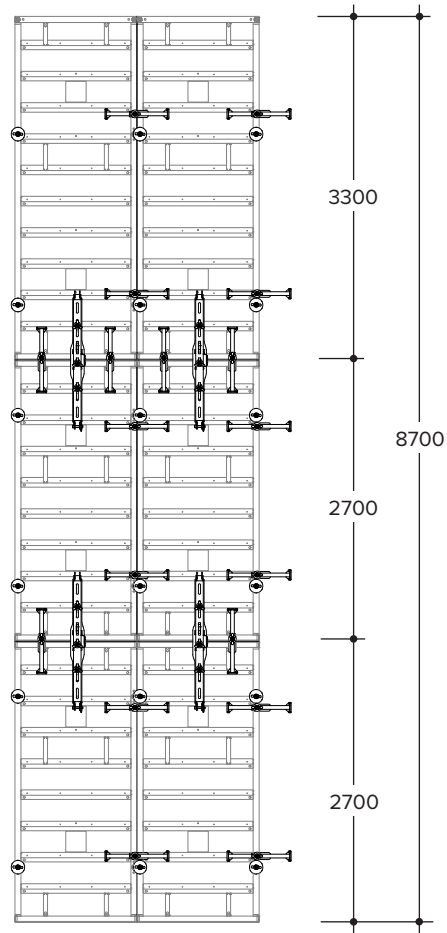
Place the PLATINUM 100 MANTO Extension Bar (code:60700) at a (code:607000) maximum distance of 300 mm from the panel edge or the middle rib.

- Step 1** Hook the PLATINUM 100 MANTO Extension Bar to the frame of the upper panel and secure it with the wing nut. The fixed claw should face upward.
- Step 2** Hook both integrated waler spanners to the walers. Secure the PLATINUM 100 MANTO Extension Bar by tightening the wing nuts.

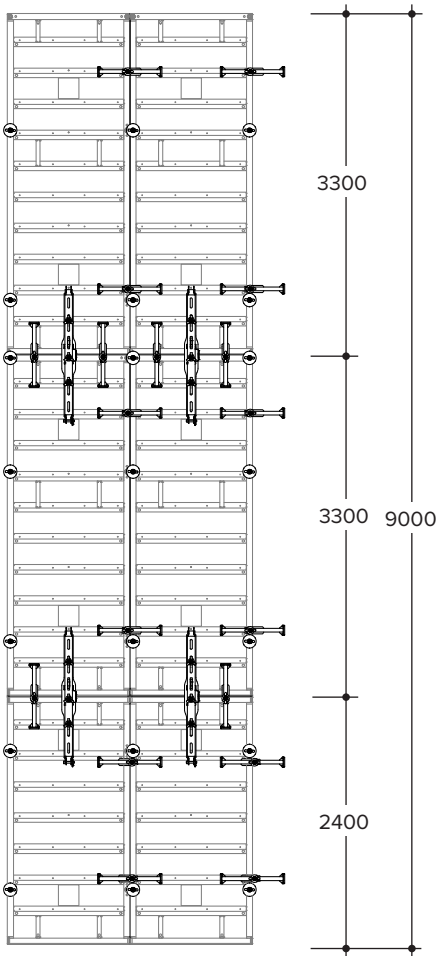
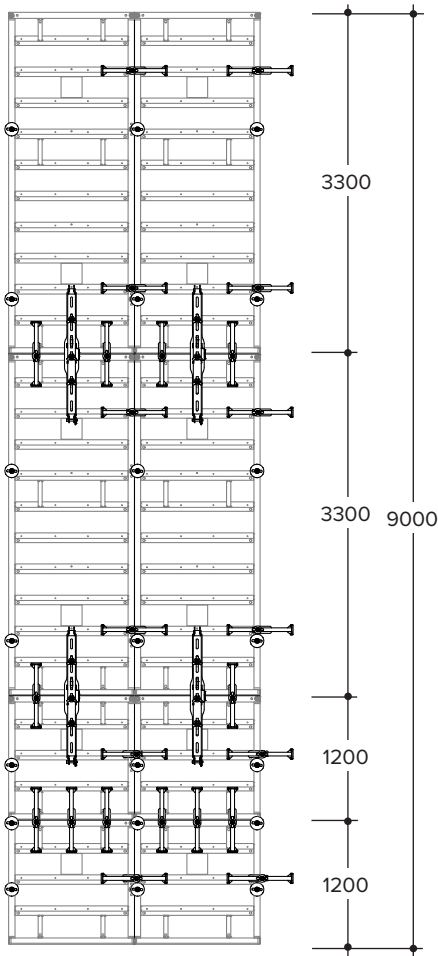


### Examples of applications

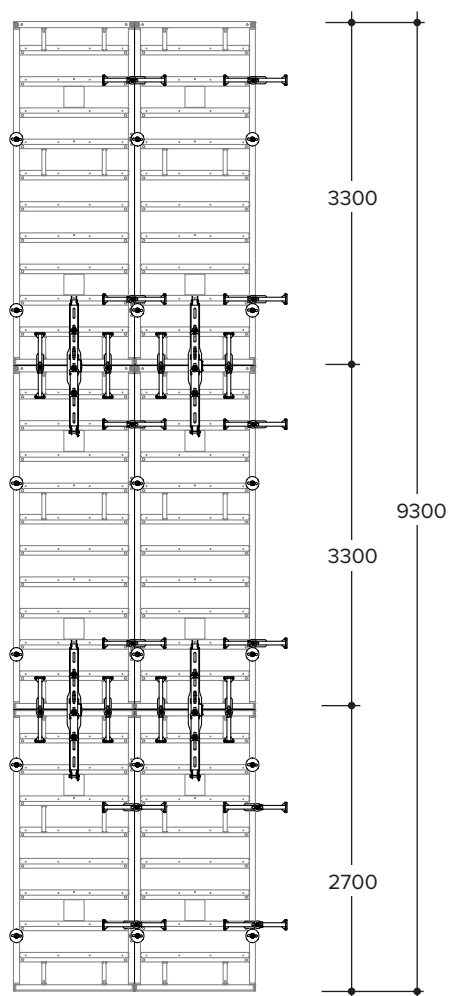
- Formwork height: 8.70 m



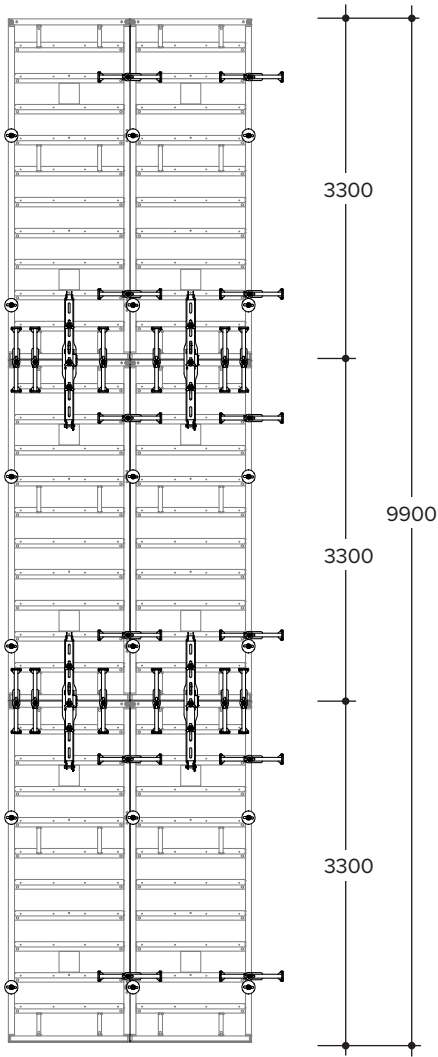
• Formwork height: 9.00 m



• Formwork height 9.30 m



• Formwork height 9.90 m





## 9 Tie systems

### 9.1 Using MANTO G3 plastic inserts

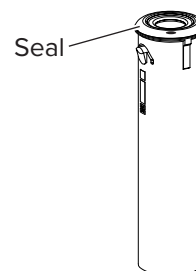
#### 9.1.1 Selecting MANTO G3 plastic inserts

The MANTO G3 plastic inserts protect the tie hole from concrete and dirt, thus reducing the effort required for cleaning and repairs. Always use the MANTO G3 plastic inserts suitable for the respective tie.



**MANTO G3 DW Insert**  
(code:607915)

- One-side operated tie system MR Tie Rod DW15 (code:607250).
- Standard DW 15 and DW 20 ties with tie sleeves and sealing cones.



**MANTO G3 Sealing Insert**  
(code:607925)

- One-side operated taper tie system, taper tie 15 (code:610185 and 610190)
- One-side operated taper tie system PLATINUM 100 Tie Rod G2 (code:606340)

#### 9.1.2 Inserting MANTO G3 plastic inserts into MANTO panels

If there are no MANTO G3 plastic inserts in the tie holes on MANTO panels, MANTO G3 plastic inserts have to be placed in the tie holes before putting the panels into place.

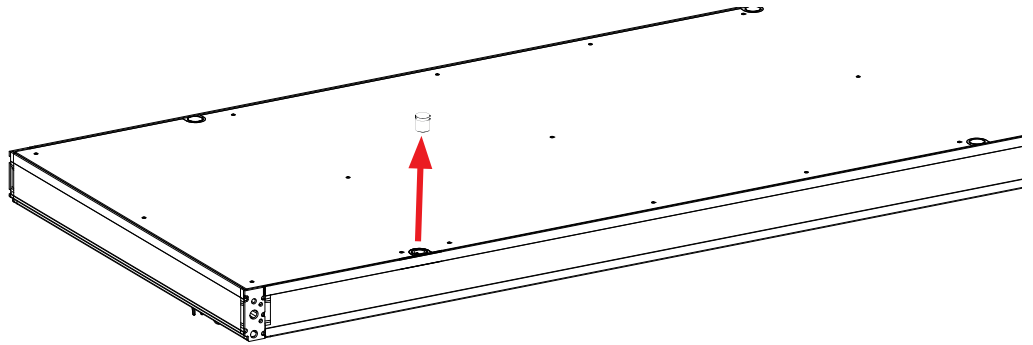


Place MANTO G3 plastic inserts in all of the tie holes.

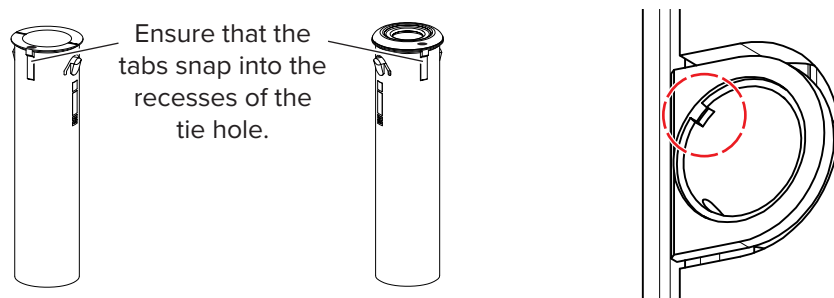
Use A-Plugs (code:602250) to seal MANTO G3 DW Inserts not in use.

Use A-Plugs (code:197457) to seal MANTO G3 Sealing Inserts (607925) not in use.

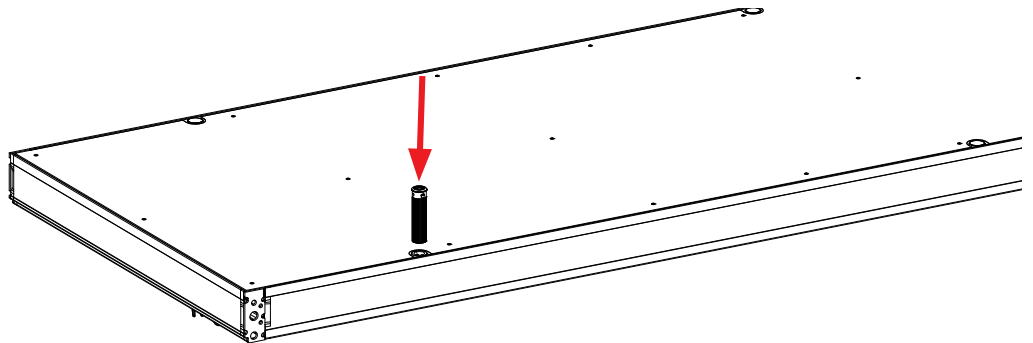
- Step 1** Remove the MANTO Plugs (code:445716) or A Plugs (code:602250) from the MANTO panels and clean the tie holes.



- Step 2** Turn the MANTO G3 plastic insert such that the tabs line up with the recesses of the tie hole.



- Step 3** Fully insert the MANTO G3 plastic insert. The insert will lock into place.



The tabs have to snap in completely and may not protrude. If the tabs do not snap into place properly, check the following:

- Whether the plastic insert is pushed in far enough. Otherwise push the plastic insert in farther.
- Whether the plastic insert is turned such that the tab lines up precisely with the recess in the tie hole. Otherwise turn the plastic insert to the proper position.
- Whether the tie hole is clean and there is no concrete residue or coarse dirt in the tie hole. Otherwise remove the plastic insert and clean the tie hole.

### 9.1.3 Removing MANTO G3 plastic inserts

Use the MANTO G3 Replacement Tool (code:608270) to push out the MANTO G3 plastic inserts. Panels lying on the ground have to be placed e.g. on a timber beam (at least 140 mm high) so that the MANTO G3 plastic inserts can fall out. Removing the MANTO G3 plastic inserts destroys them, so they cannot be used again.



#### CAUTION

##### **Risk of injury from flying metal splinters!**

A ring may form around the striking surface of the MANTO G3 Replacement Tool over time.

This can cause metal splinters to detach, fly around and cause injury.

Wear gloves and safety glasses when using the MANTO G3 Replacement Tool. Grind off the ring or other damage to the striking surface.



#### CAUTION

##### **Risk of crushing!**

Wear suitable protective gloves when using the MANTO G3 Replacement Tool

#### NOTE

##### **The MANTO Replacement Tool can damage the MANTO panels!**

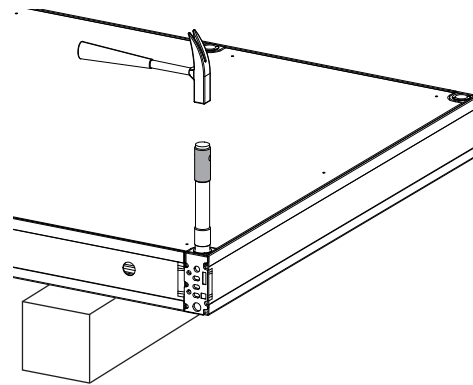
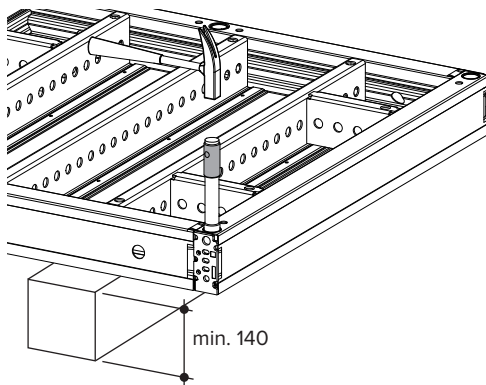
Always pound in with the MANTO G3 Replacement Tool carefully and straight.



The MANTO G3 Replacement Tool can also be used to remove concrete residue from the tie holes in the panels.

#### **Step 1**

Insert the MANTO G3 Replacement Tool in the MANTO G3 plastic insert and pound the insert out with a hammer. Plastic inserts can be struck out from the underside of the panel or from the form sheet side.



## 9.2 One-sided tying with Taper Tie System 15

The Taper Tie System 15 is a taper tie system for use with MANTO G3 and G3 M panels. The system joins formwork panels opposite one another such that they are resistant to tension and pressure.

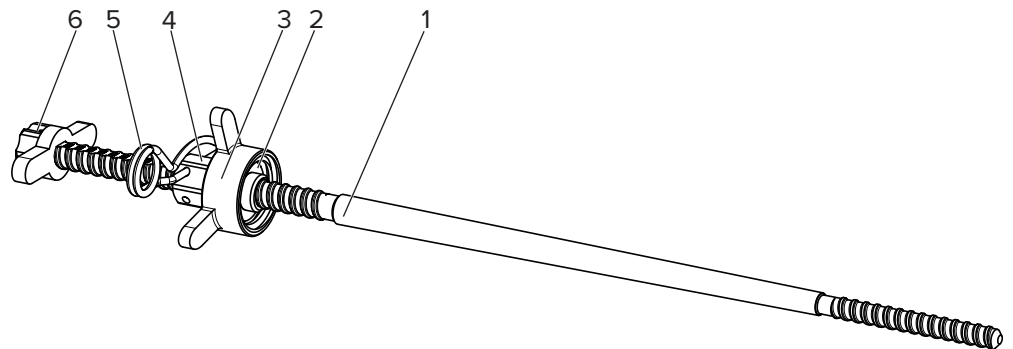
The Taper Tie System 15 enables one person to attach and secure the ties from one side of the formwork.

### 9.2.1 Components of the one-sided Taper Tie System 15

The system consists of a taper tie rod, an adjusting nut and a tie nut.

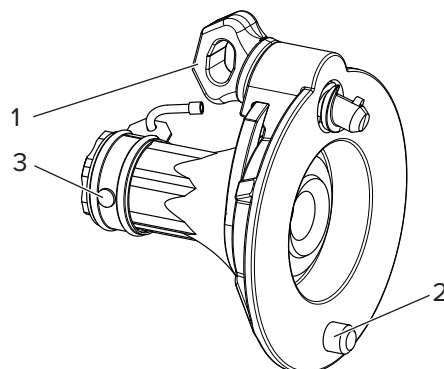
The Taper Tie 15 is available in two different lengths, enabling it to be used to form various walls between 15 and 55 cm thick (Refer to page 34 and to the table on page 106).

#### Taper Tie 15



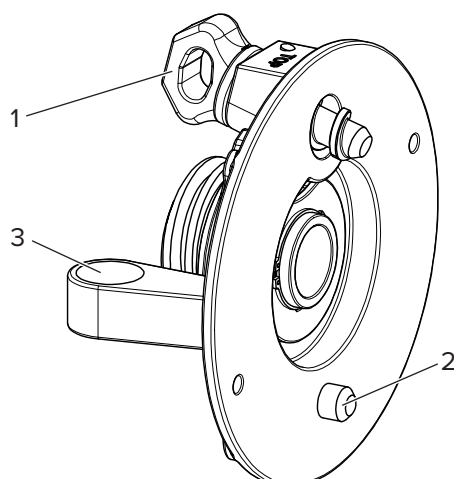
1. Taper tie rod
2. Thrust washer
3. Counter nut
4. Lock nut
5. Spring Cotter Pin 6 (code:610183)
6. Wing handle w.a.f. 36

#### Taper Tie 15 Adjusting Nut



1. Fixing screw
2. Positioning pin
3. Adjusting pin for opposite side

### PLATINUM 100 Tie Nut Closing Side



- 1. Fixing screw
- 2. Positioning pin
- 3. Tie rod holder

### 9.2.2 Attaching Taper Tie 15 Adjusting Nut



#### Preparing formwork panels

Prepare the formwork panels by placing the plastic inserts in the tie holes.

For more information refer to the notes on pageSection 9.1.1 on page 99.

Use Plugs (code:197446) to seal the tie holes not in use.

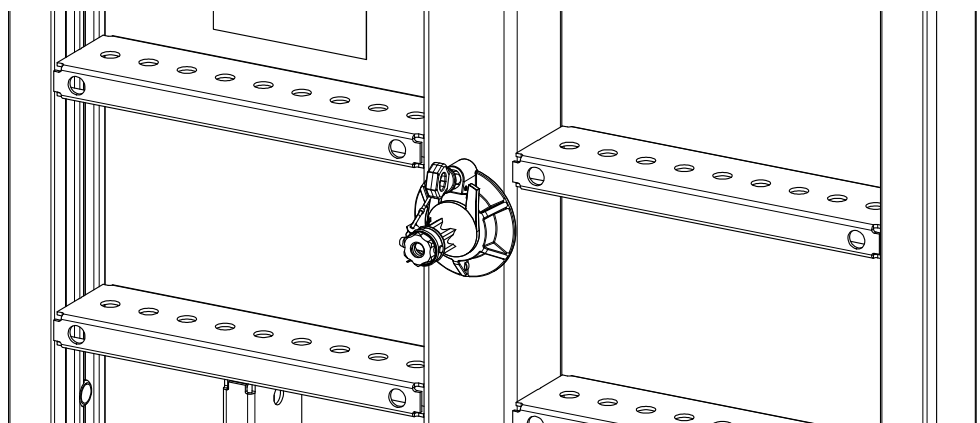


#### **WARNING**

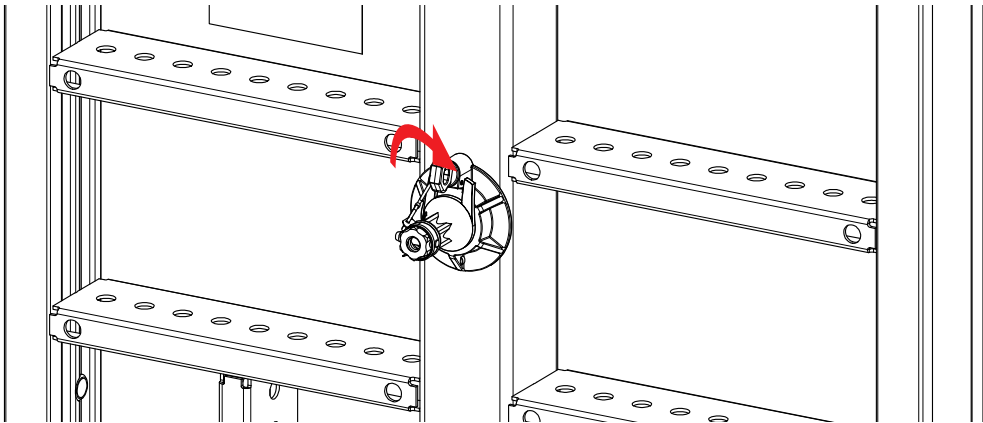
#### Risk of injury from overturning formwork!

Do not allow access to platforms if the formwork is not secured against overturning.

- Step 1** Position the Taper Tie 15 Adjusting Nut (code:609650) over the corresponding tie hole on the opposite side of the formwork panel. Insert the positioning pin into the hole in the formwork panel.



- Step 2** Use the fixing screw to secure the Taper Tie 15 Adjusting Nut to the formwork panel.



Before each subsequent use, check that the Taper Tie 15 Adjusting Nut is properly tightened. Tighten the fixing screw if necessary.

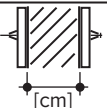
**Selecting wall thickness and Taper Tie**

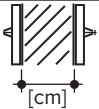
Two different wall thicknesses can be created using the Adjusting Pin (code:604304) and selecting the required taper tie.

Taper Tie 15/15-35 = 15 to 35 cm

Taper Tie 15/35-55 = 35 to 55 cm

**Step 3** Depending on the selected wall thickness, leave the Adjusting Pin in the Adjusting Nut or remove it (Refer to the tables in the following illustrations).

Adjusting Pin for Adjusting Nut removed	 [cm]
Taper Tie 15/15-35 (code:610185)	15–25
Taper Tie 15/35-55 (code:610190)	35–45

Adjusting Pin for Adjusting Nut inserted	 [cm]
Taper Tie 15/15-35 (code:610185)	25–35
Taper Tie 15/35-55 (code:610190)	45–55

### 9.2.3 Attaching PLATINUM 100 Tie Nut Closing Side

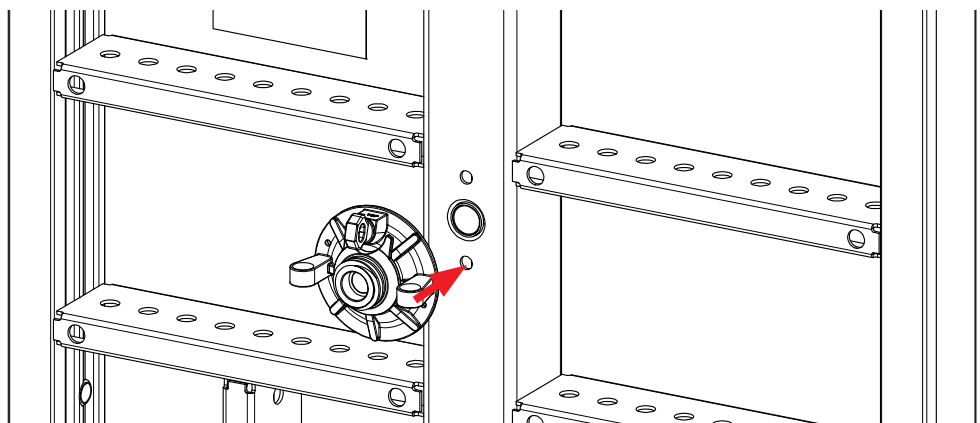


#### WARNING

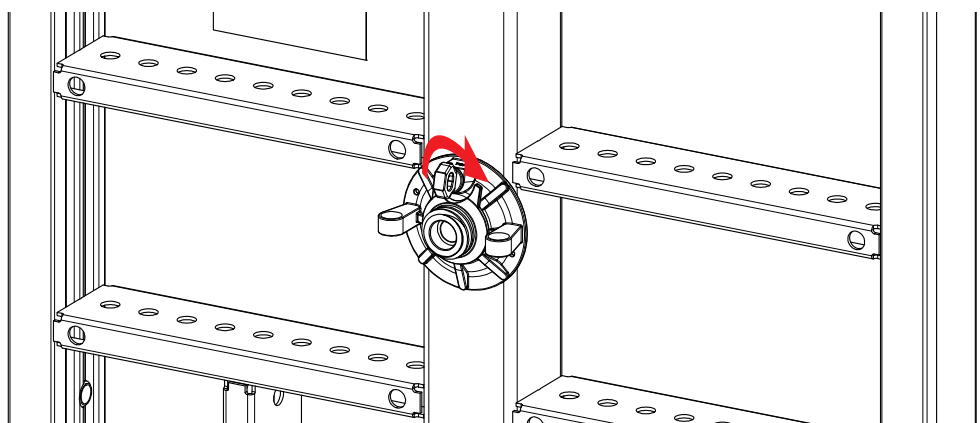
#### Risk of injury from overturning formwork!

Do not allow access to platforms if the formwork is not secured against overturning.

- Step 1** Position the PLATINUM 100 Tie Nut Closing Side (code:604197) over the corresponding tie hole on the closing side. Insert the positioning pin into the hole in the formwork panel.



- Step 2** Use the fixing screw to secure the PLATINUM 100 Tie Nut Closing Side (code:604197) to the formwork panel.



Before each subsequent use, check that the PLATINUM 100 Tie Nut Closing Side is properly tightened. Tighten the fixing screw if necessary.

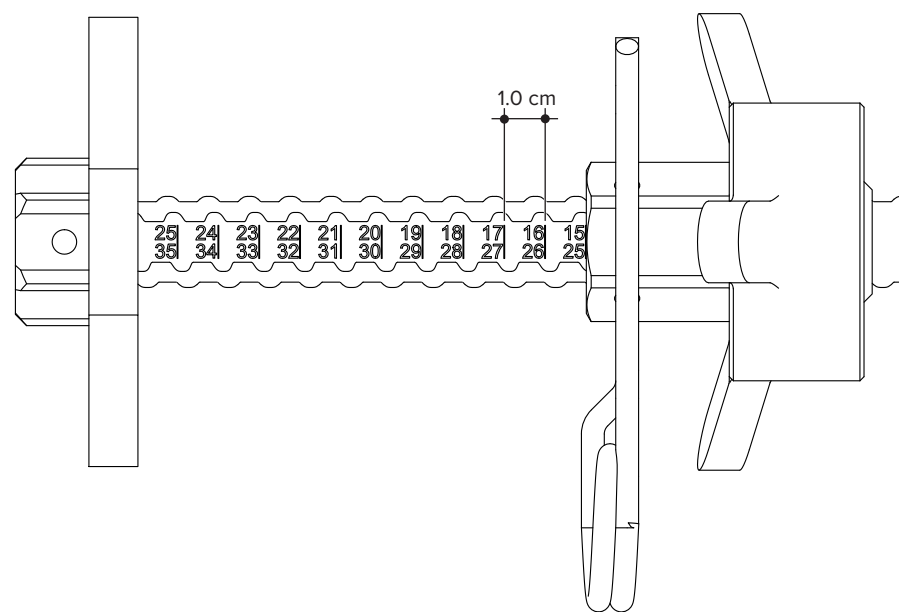
### 9.2.4 Setting Wall Thickness on Taper Tie 15

The exact wall thickness can be preset in increments of 0.5 cm on the taper tie 15 before assembling the formwork.

Wall thicknesses between 15 and 55 cm can be created (Refer to 9.2.2, step 3).



The lock nut on the taper tie 15 has two holes in which the spring cotter pin 6 can be secured. Turning the lock nut half a revolution changes the presetting by 0.5 cm.



Adjusting Pin for opposite side removed –		Adjusting Pin for opposite side inserted ✓	
Wall thickness [cm] with Taper Tie 15/15-35 (code:610185)	Wall thickness [cm] with Taper Tie 15/35-55 (code:610190)	Wall thickness [cm] with Taper Tie 15/15-35 (code:610185)	Wall thickness [cm] with Taper Tie 15/35-55 (code:610190)
15.0	35.0	25.0	45.0
16.0	36.0	26.0	46.0
17.0	37.0	27.0	47.0
18.0	38.0	28.0	48.0
19.0	39.0	29.0	49.0
20.0	40.0	30.0	50.0
21.0	41.0	31.0	51.0
22.0	42.0	32.0	52.0
23.0	43.0	33.0	53.0
24.0	44.0	34.0	54.0
25.0	45.0	35.0	55.0



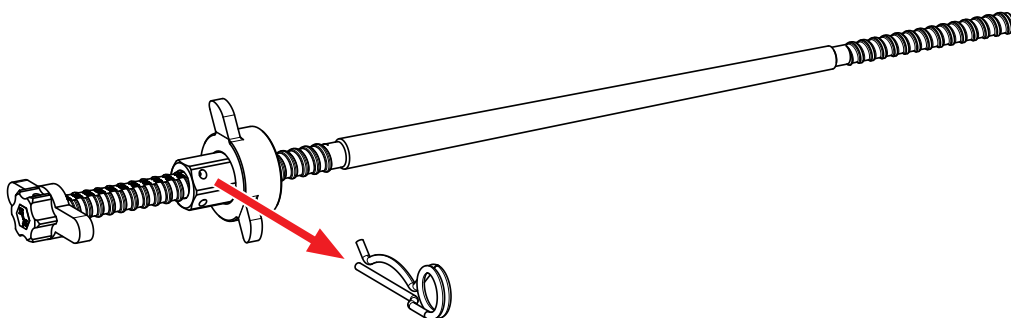
The wall thickness 35 cm can be created with both taper ties 15:  
When using the Taper Tie 15/ 15- 15-35 (code:610185), insert the adjusting pin on the opposite side and turn the lock nut on the Taper Tie 15/15-35 as far as the first mark.

The wall thicknesses 25 cm and 45 cm can be achieved with two different pin positions on the respective taper tie 15:  
To create a wall thickness of 25 cm, use the Taper Tie 15/15-35; for a wall thickness of 45 cm use the Taper Tie 15/35-55.

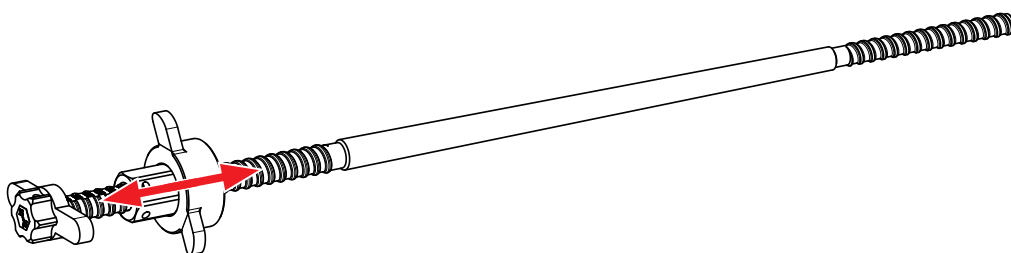
When the adjusting pin is inserted on the opposite side, turn the lock nut on the taper tie 15 to the first mark; if the adjusting pin has been removed from the opposite side, turn the lock nut on the taper tie 15 all the way to the last mark (refer to step 2 on pageStep 2 on page 107).



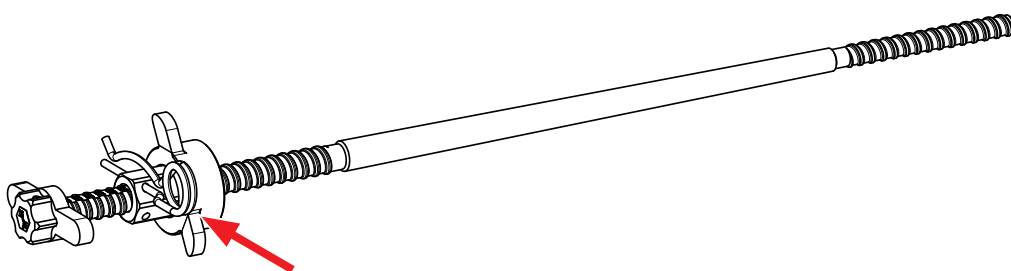
**Step 1** Pull the spring cotter pin out of the lock nut and save it for later use.



**Step 2** Position the lock nut as required for the desired wall thickness.



**Step 3** Insert the spring cotter pin into the respective hole in the lock nut. This secures the pre-setting of the wall thickness.



The wall thickness can also be set without using the holes for presetting.

## 9.2.5 Inserting taper tie 15 into formwork panel

The previously set taper tie 15 can be inserted by one person, working on one side of the formwork element.

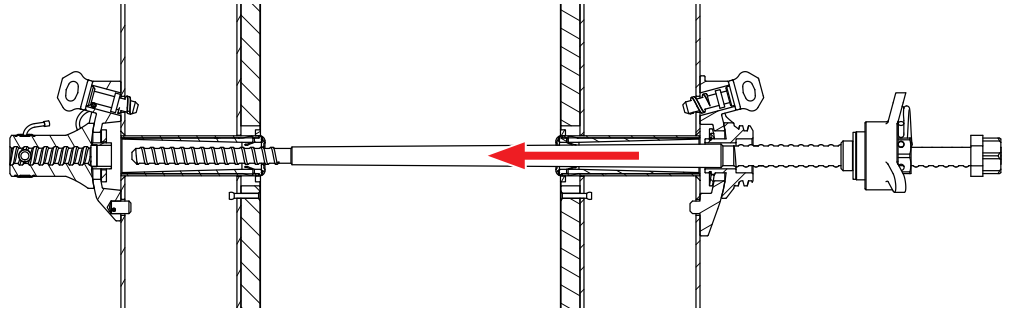


### WARNING

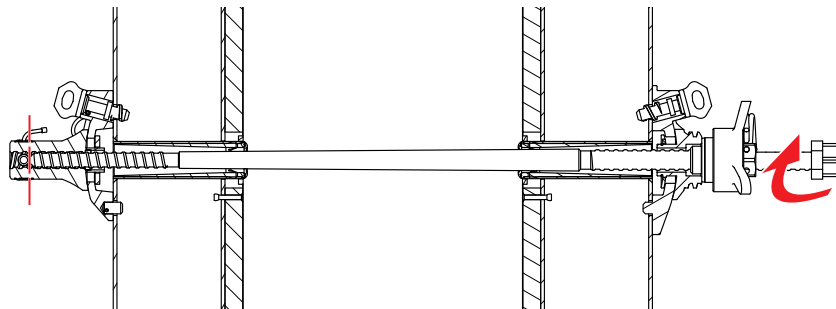
#### Risk of injury from overturning formwork!

Do not allow access to platforms if the formwork is not secured against overturning.

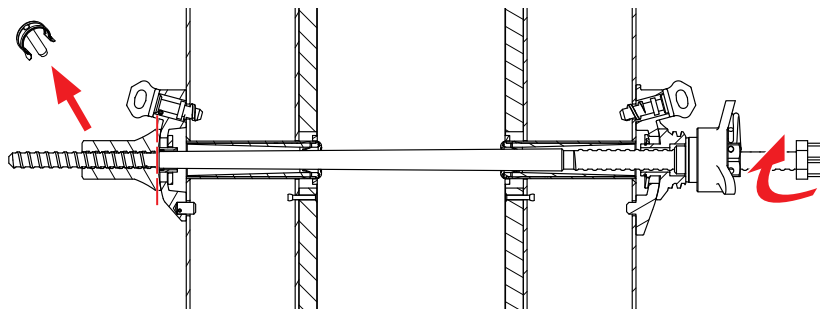
- Step 1** Slide the preset taper tie 15 through the PLATINUM 100 Tie Nut Closing Side (code:604197) mounted on the formwork and into the tie hole on the opposite side, all the way to the Taper Tie 15 Adjusting Nut (code:609650).



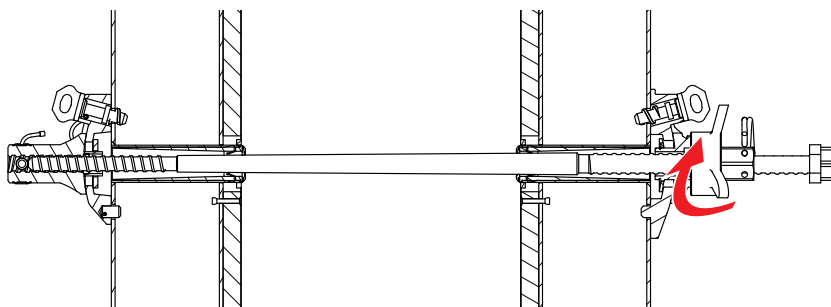
- Step 2** Screw the taper tie 15 all the way into the Taper Tie 15 Adjusting Nut.



Depending on the selected presetting (Refer to the tables on pages 104 and 106), the limit stop for the Tie Rod is either the Adjusting Pin or the beginning of the thread in the Taper Tie 15 Adjusting Nut.



- Step 3** When the lock nut is touching the PLATINUM 100 Tie Nut Closing Side, screw the counter nut onto the PLATINUM 100 Tie Nut Closing Side.



### 9.2.6 Detaching Taper Tie 15



#### **WARNING**

#### **Risk of injury from overturning formwork!**

Do not allow access to platforms if the formwork is not secured against overturning.  
Do not remove the ties unless both sides of the formwork are secured against overturning.

#### **NOTE**

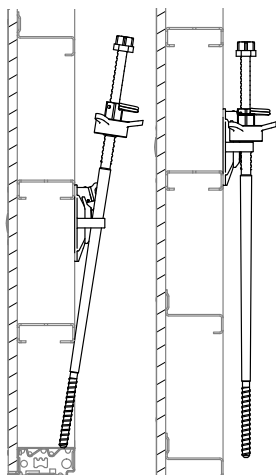
#### **Note!**

Do not move formwork until ties have been removed.

Reverse the steps described on pageSection 9.2.5 on page 108 to remove the Taper Tie 15.



The detached taper tie 15 can be left in the preset position and stored in the bracket on the PLATINUM 100 Tie Nut Closing Side (code:604197), if it will be needed again later to form walls of the same thickness in other sections.



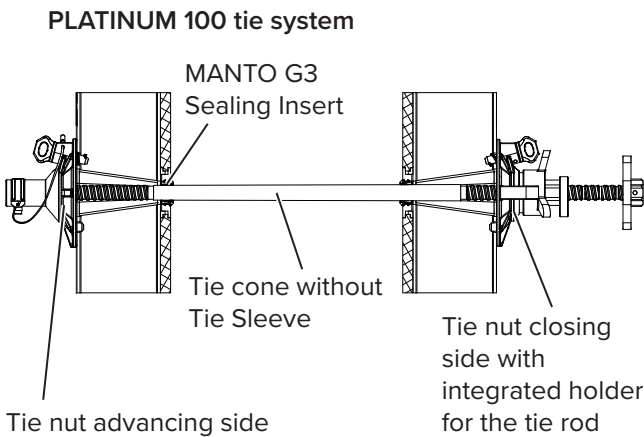
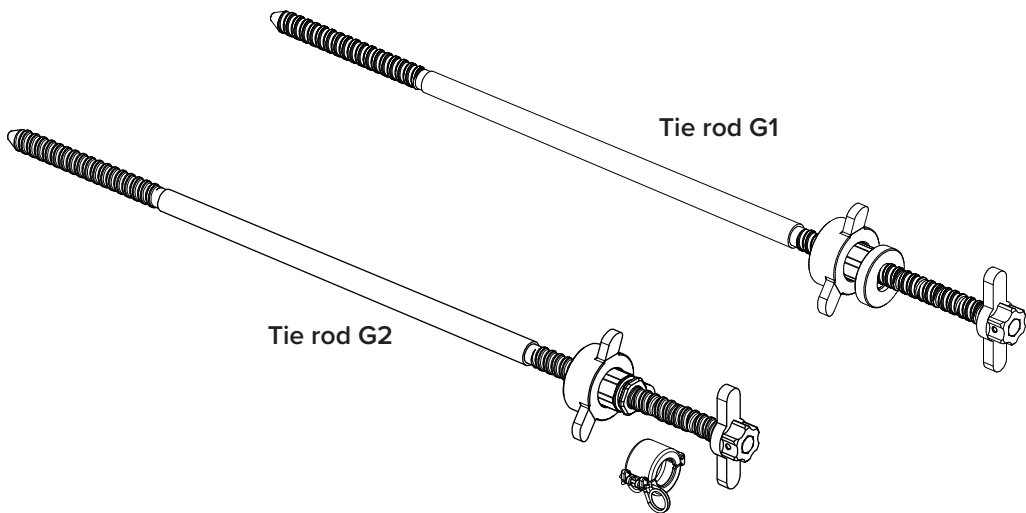
9.3 One-sided tying with the PLATINUM 100 tie system

There are two versions of the PLATINUM 100 tie rod available, Generation 1 (G1) and Generation 2 (G2). The PLATINUM 100 Tie Rod G2 (code:606340) has been modified and the adjusting washer for adjusting the wall thickness has been replaced by the hinged adjustment clip. This facilitates the adjustment of the wall thickness.

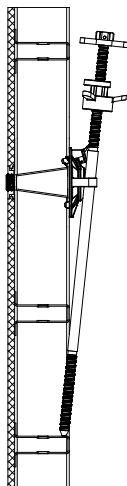


When formwork is not stacked (extended), tying can be done from the closing side in most cases. When using stacked formwork, it is advisable to install the platforms on the advancing side of the formwork and to tie from there.

The operator always has to decide on site which side offers the safest position for operating the ties.



The PLATINUM 100 Tie Nut Closing Side (code:604197) is equipped with a unique tie rod holder for PLATINUM 100 tie rods. This allows the tie rods to be safely stowed during transport. As a result, the number of loose parts on site and during material transport can be reduced, and assembly time can be saved.



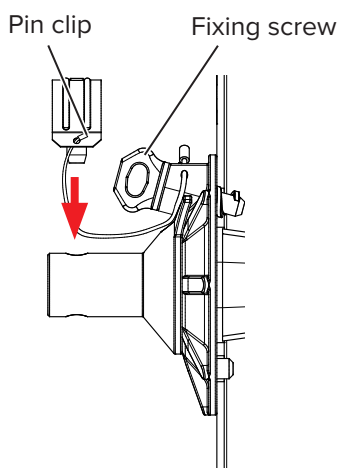
Tie nut closing side with PLATINUM 100 Tie Rod in holder



Before each subsequent use, check that the PLATINUM 100 Tie Nut Advancing Side (code:604196) and the PLATINUM 100 Tie Nut Closing Side (code:604197) are properly tightened. Tighten the fixing screw if necessary.

### 9.3.1 Preparing advancing side

The PLATINUM 100 Tie Nut Advancing Side (code:604196) is hooked into the relevant tie point on the back of the formwork panel and screwed tightly with the fixing screw to the panel frame. Depending on the required wall thickness, it may be necessary to remove the pin clip from the tie nut on the advancing side (Refer to the tables on page 113 and page 116).



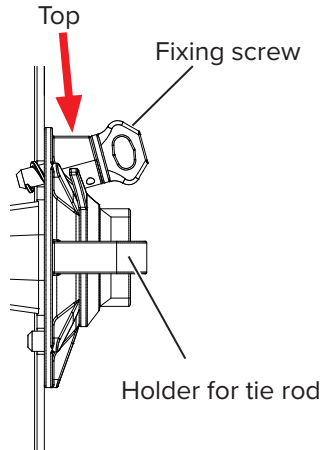
Fixing of the PLATINUM 100 Tie Nut Advancing Side



Before each subsequent use, check that the PLATINUM 100 Tie Nut Advancing Side is properly tightened. Tighten the fixing screw if necessary.

## 9.3.2 Preparing closing side

THE PLATINUM 100 Tie Nut Closing Side (code:604197) is hooked into the relevant tie point on the back of the formwork panel and screwed tightly with the fixing screw to the panel frame.



Fixing of the PLATINUM 100 Tie Nut Closing Side



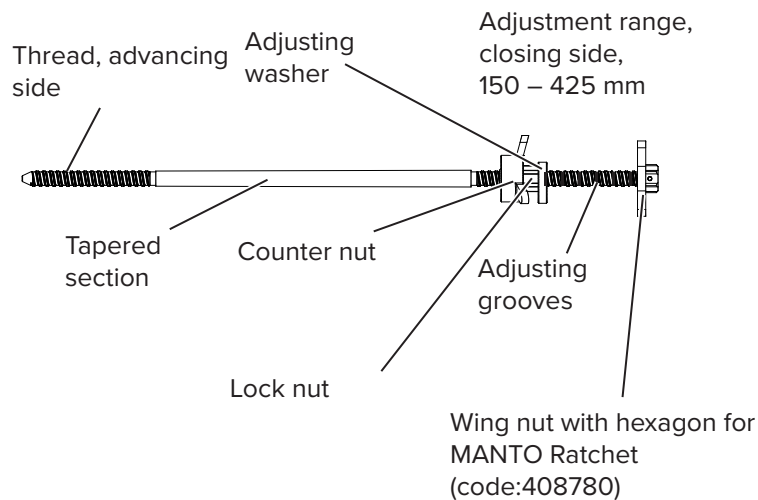
Before each subsequent use, check that the PLATINUM 100 Tie Nut Closing Side is properly tightened. Tighten the fixing screw if necessary.

Before assembling the formwork, the PLATINUM 100 tie rods can be adjusted to the correct length to suit the wall thickness.

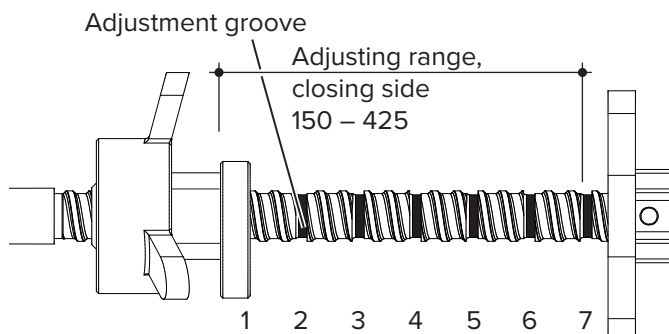
Preparing the tie rod differs depending on the generation of the tie rod. The preparation of the PLATINUM 100 Tie Rod of the 1st generation (code:604300) is described below, after which the preparation of the tie rod G1 is shown.

### Preparing Tie Rod 1st generation

The PLATINUM 100 Tie Rod (code:604300) is delivered to the construction site as a set with integrated lock nut, counter nut and adjusting washer.



The PLATINUM 100 Tie Rod allows for the required wall thickness to be set before installation. Common wall thicknesses can be selected by placing the adjusting washer in the appropriate groove without having to measure. Other wall thicknesses can be freely set, without using the predefined settings.



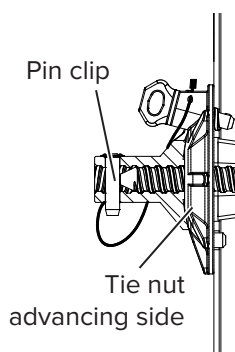
The predefined wall thicknesses can be set from 150 to 425 mm, in increments of 25 mm.

Decisive for the correct set-up of the PLATINUM 100 Tie Rod is to know if the PLATINUM 100 Tie Nut Advancing Side is equipped with a pin clip or not (see pageRefer to section 9.3.1 on page 111).

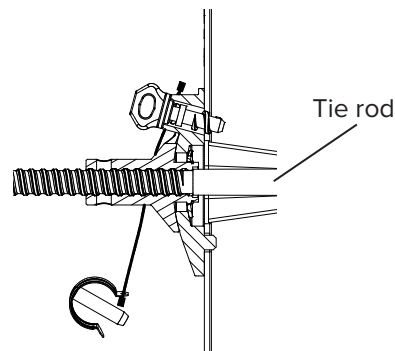
In the following step, the PLATINUM 100 Tie Rod is screwed into the PLATINUM 100 Tie Nut Advancing Side (code:604196) until it reaches the pin clip.

If the pin clip has been removed, the PLATINUM 100 Tie Rod has to be screwed completely into the tie nut on the advancing side.

**With pin clip inserted**



**Without pin clip inserted**

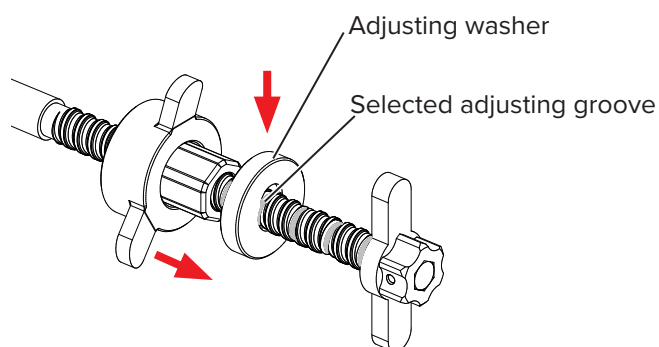


Depending on this, the following wall thicknesses can be preset without measuring:

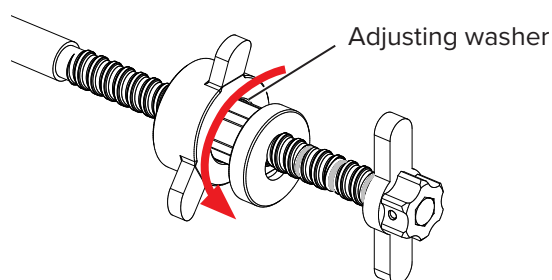
PLATINUM 100 Tie Nut Advancing Side	Adjusting positions PLATINUM 100 tie rod/wall thickness [mm]						
	1	2	3	4	5	6	7
<b>Without pin clip</b>	150	175	200	225	250	275	300
<b>With pin clip</b>	275	300	325	350	375	400	425 (a)

(a) Only possible with the clip.

- Step 1** To set the desired wall thickness, position the adjusting washer in the appropriate adjusting groove.

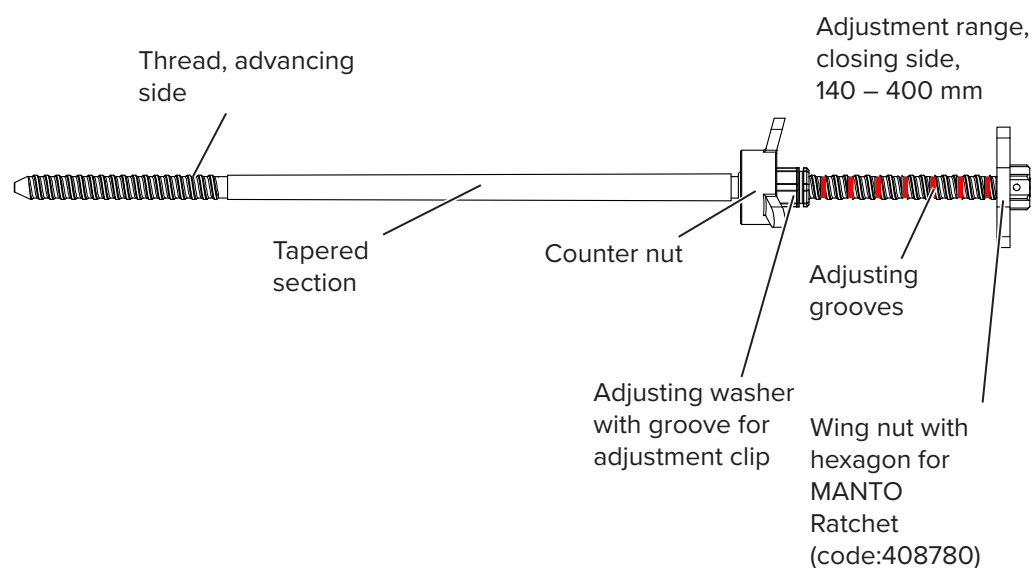


- Step 2** Screw the adjusting washer on the tie into the adjusting washer to secure the pre-selected position.



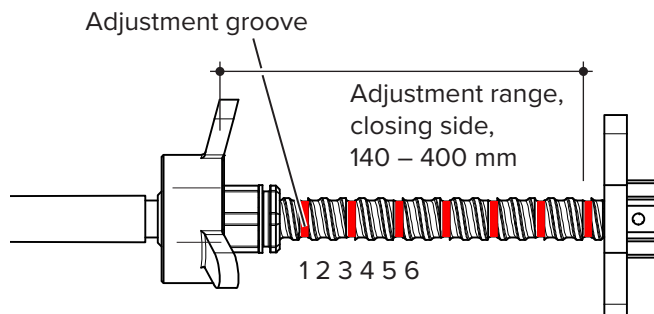
## Preparing PLATINUM 100 Tie Rod G2

THE PLATINUM 100 Tie Rod G2 (code:606340) is delivered to the construction site as a set with integrated lock nut and counter nut.

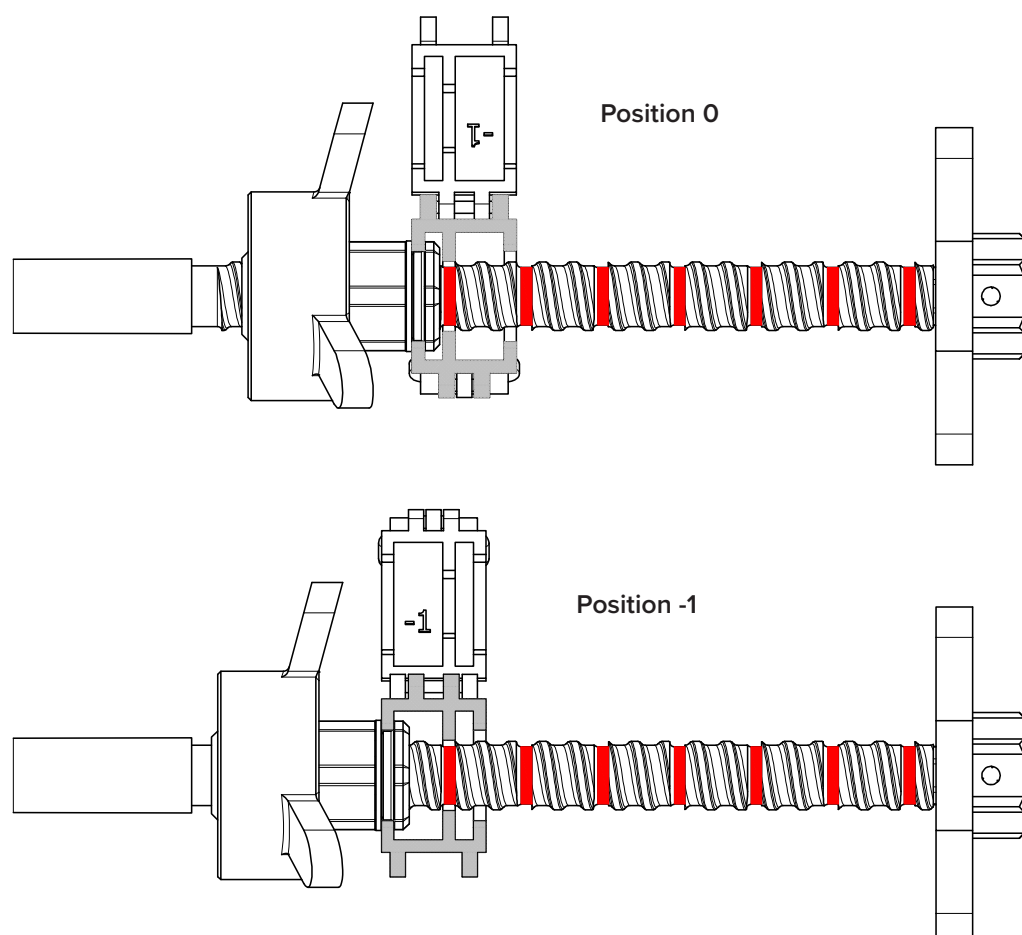




The PLATINUM 100 Tie Rod G2 allows for the required wall thickness to be set before installation. Common wall thicknesses can be selected by placing the adjustment clip in the appropriate groove without having to measure. The adjustment grooves 1–6 can be used (see below). Other wall thicknesses can be freely set, without using the predefined settings.



The predefined wall thicknesses can be set from 140 to 400 mm, in increments of 10 to 15 mm. The adjustment clip can be placed on the adjusting washer in two different directions. Position 0 and position -1. Depending on the position different wall thicknesses can be set.

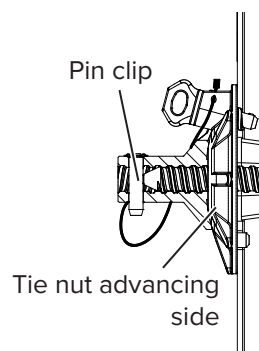


Decisive for the correct set-up of the PLATINUM 100 Tie Rod G2 is to know whether the PLATINUM 100 Tie Nut Advancing Side (code:604197) is equipped with a pin clip or not (Refer to pageSection 9.3.1 on page 111).

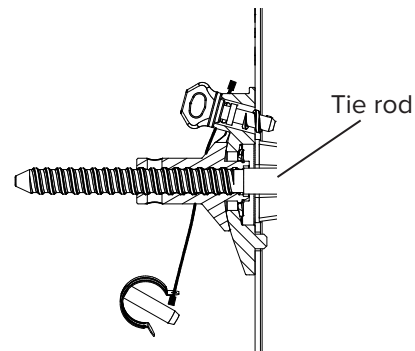
If the pin clip is installed, the tie rod stops at the pin clip when screwed into the tie nut.

If the pin clip has been removed, the PLATINUM 100 Tie Rod has to be screwed completely into the tie nut on the advancing side. This allows different wall thicknesses to be set (with pin clip 140 - 265 mm, without pin clip 275 - 400 mm).

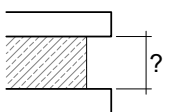
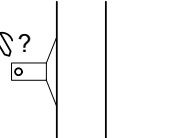
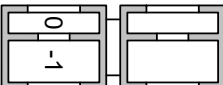
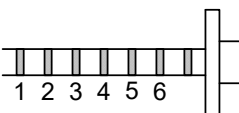
**With pin clip**

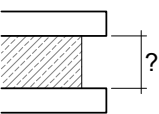
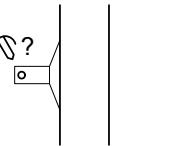
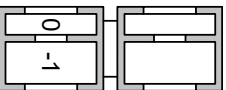
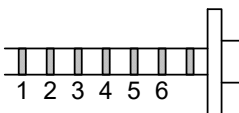


**Without pin clip**

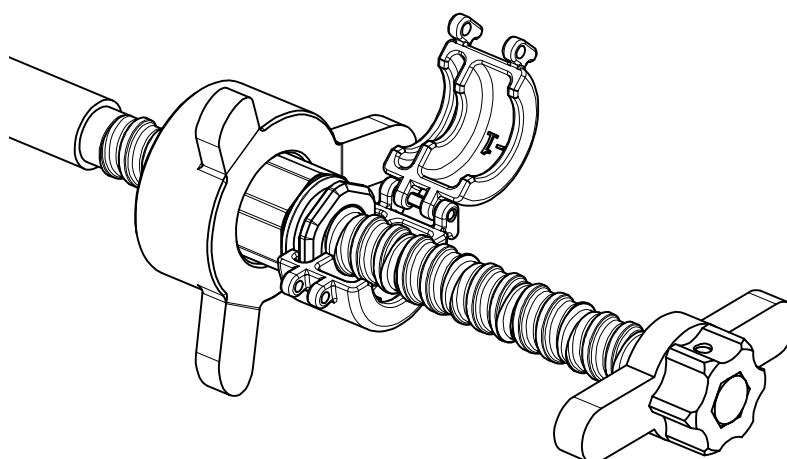


The following tables help to find the correct parameters for the required wall thickness.

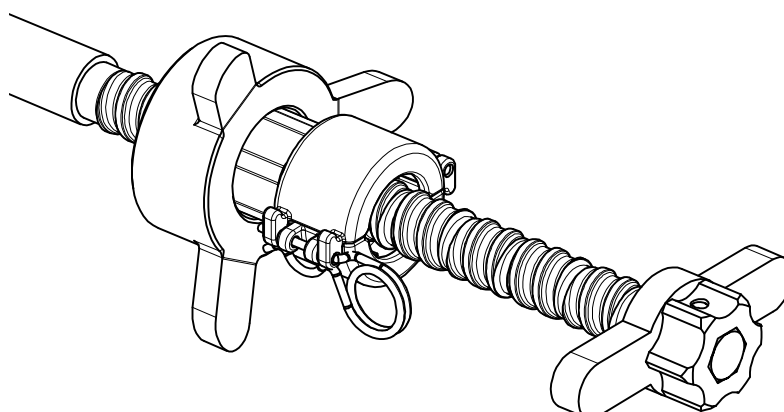
Wall thickness [mm]	140	150	165	175	190	200	215	225	240	250	265		
Adjusting pin inserted	∅	∅	∅	∅	∅	∅	∅	∅	∅	∅	∅	∅	✓ 
Adjustment clip direction	-1	0	-1	0	-1	0	-1	0	-1	0	-1	-1	
Tie rod adjusting groove	1	1	2	2	3	3	4	4	5	5	6	1	

Wall thickness [mm]	275		290	300	315	325	340	350	365	375	390	400	
Adjusting pin inserted	Ø	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Adjustment clip direction	0	0	-1	0	-1	0	-1	0	-1	0	-1	0	
Tie rod adjusting groove	6	1	2	2	3	3	4	4	5	5	6	6	

**Step 1** Place the adjustment clip at the desired position in the grooves of the tie rod and the lock nut.



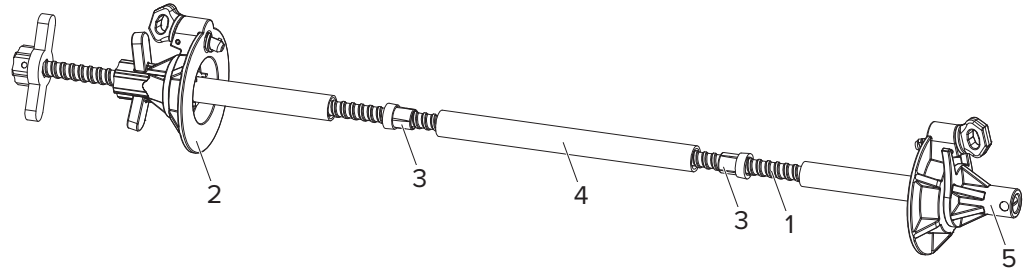
**Step 2** Close the adjustment clip and secure with the corresponding spring cotter pin.



## 9.4 One-sided tying with the MR tie system

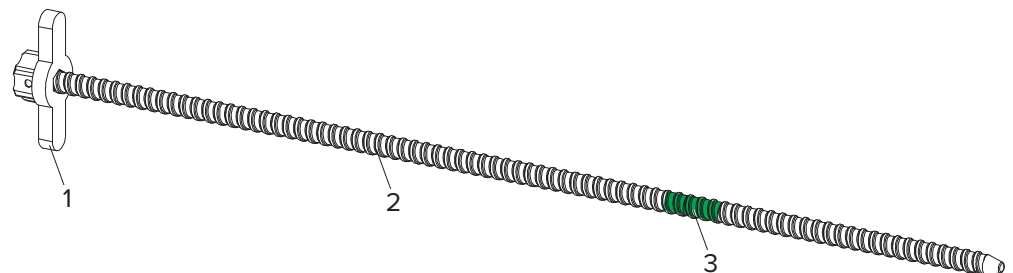
The MR tie system allows for the ties to be fastened and fixed in place by just one person, working only from one side of the formwork. This system can only be used with MANTO panels G3 or G3 M.

### 9.4.1 Components of the one-sided MR tie system



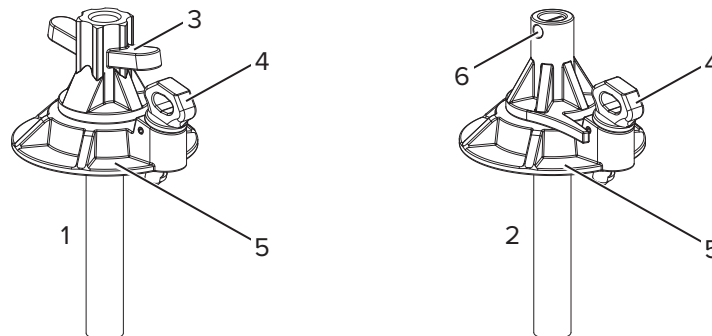
1. MR Tie Rod DW15 (code: 607250)
2. MANTO Front Tie Nut (code:607230)
3. Sealing Cone (code:607122), reusable
4. Tie Sleeve DW 15×2000 (Ø26/22) (code:605916)
5. MANTO Rear Tie Nut (code:607240)

#### MR Tie Rod DW15



1. Tie rod wing nut
2. Threaded rod DW 15
3. Tie rod marking (coloured section)

#### MANTO G3 Front Tie Nut and MANTO G3 Rear Tie Nut



1. MANTO Front Tie Nut (code:607230)
2. MANTO Rear Tie Nut (code:607240)
3. Wing nut
4. Fixing screw
5. Washer
6. Locking pin

## 9.4.2 Attaching ties



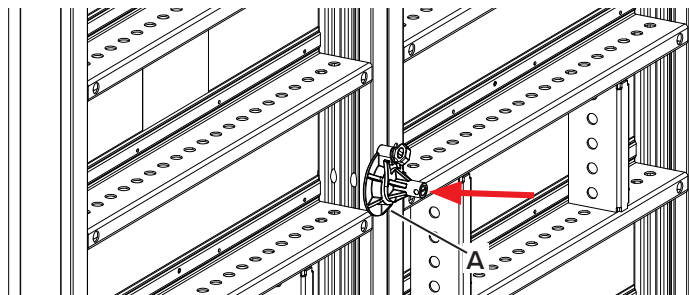
### WARNING

#### Risk of injury from overturning formwork!

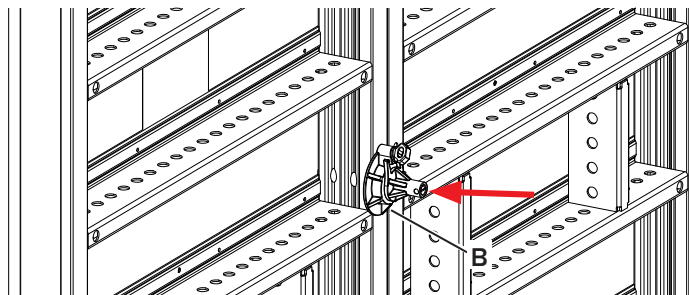
Do not allow access to platforms if the formwork is not secured against overturning.

#### Attaching Rear Tie Nut to MANTO panel

- Step 1** Push the MANTO Rear Tie Nut (A, code:607240) into the tie hole located on the V-rib of the MANTO panel until the washer rests against the profile.



- Step 2** Insert the locking screw (B) into one of the holes at the tie position and tighten it.



Before each subsequent use, check that the MANTO G3 Rear Tie Nut is properly tightened. Tighten the fixing screw if necessary.



Place MANTO G3 plastic inserts in all of the tie holes.

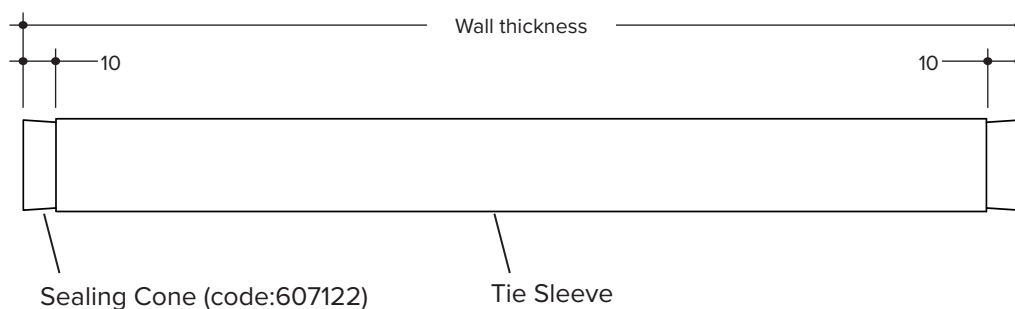
Use A-Plugs (code:602250) to seal MANTO G3 DW Inserts not in use.

Use Plugs (code:197446) to seal MANTO G3 Sealing Inserts not in use.

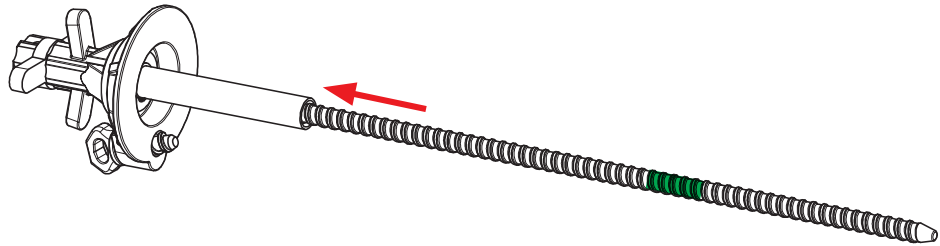
#### Preparing MR Tie Rod and MANTO G3 Front Tie Nut

The MR Tie Rod, MANTO G3 Front Tie Nut, Tie Sleeve and Sealing Cones form a unit that is operated from the closing side formwork.

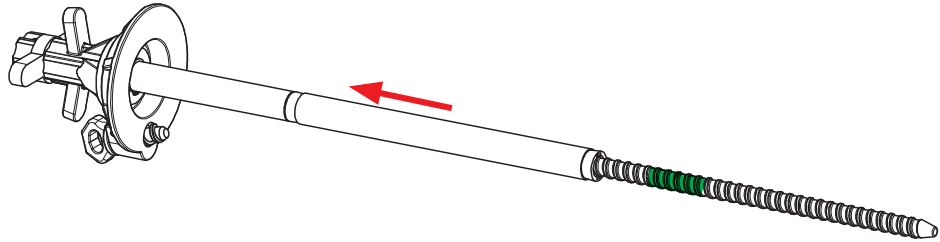
- Step 3** Cut the Tie Sleeve to the required length. The length of the Tie Sleeve is the wall thickness minus 20 mm.



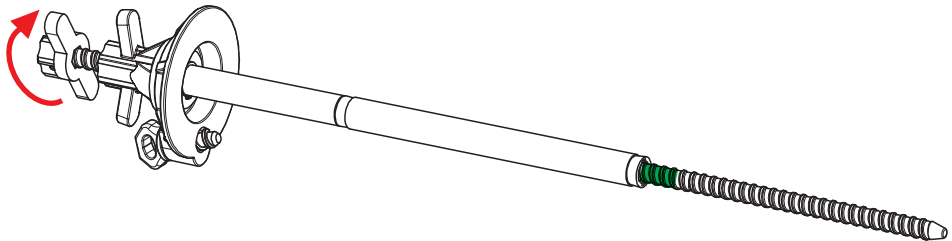
- Step 4** Screw the MR Tie Rod into the MANTO G3 Front Tie Nut.



- Step 5** Place the Tie Sleeve with the Sealing Cones on the Tie Rod.

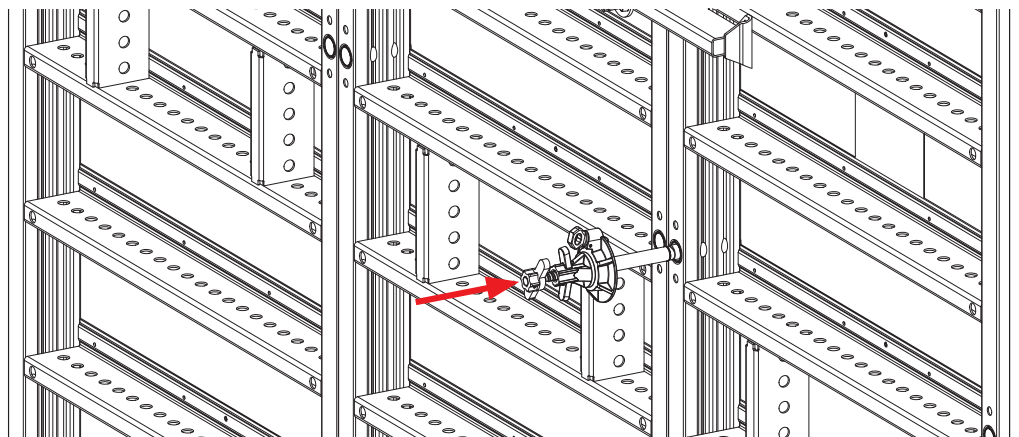


- Step 6** Unscrew the MR Tie Rod until the end of the Tie Sleeve is positioned at the tie rod marking.

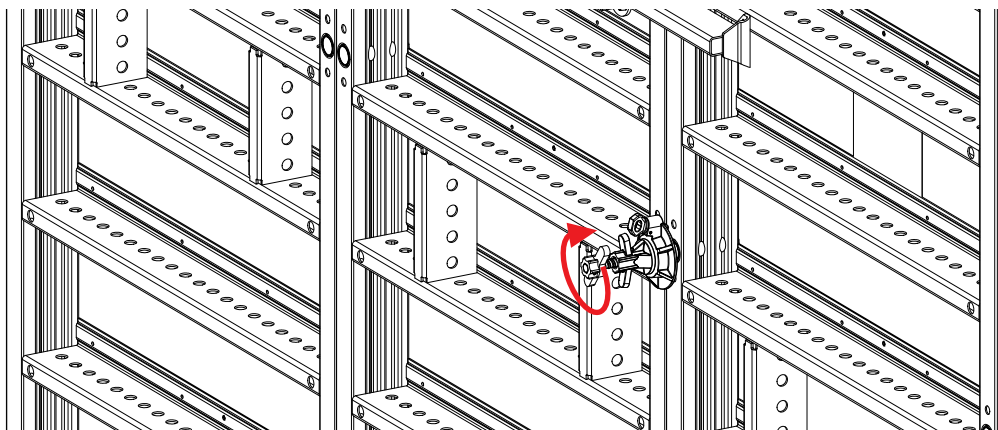


## Attaching MR Tie Rod and MANTO G3 Front Tie Nut to Advancing Side

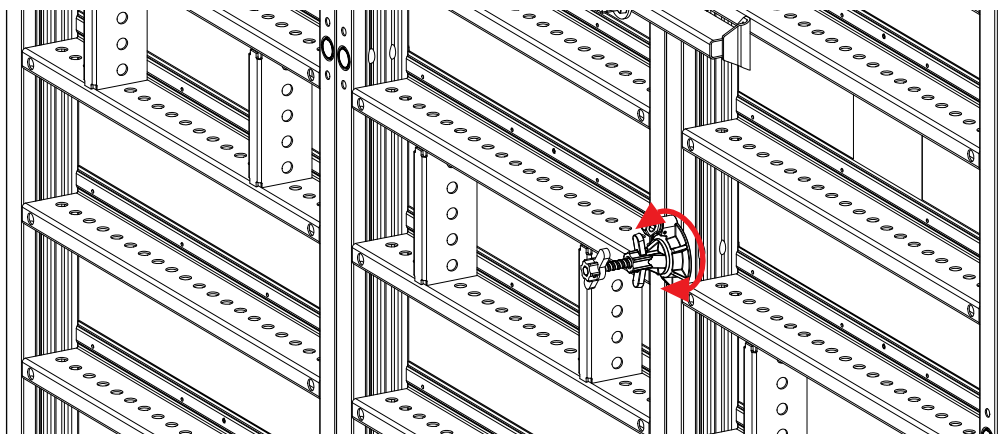
- Step 1** Remove the plugs from the plastic inserts in the tie holes to be used.
- Step 2** Close unused plastic inserts with sealing plugs.
- Step 3** Set up the formwork panels.
- Step 4** Position the MANTO G3 Front Tie Nut with the Tie Rod, the Tie Sleeve and Sealing Cones assembled previously in the tie positions opposite the MANTO G3 Rear Tie Nuts installed in steps 1 and 2. Push the assembly through the tie holes of the opposing MANTO Panel.



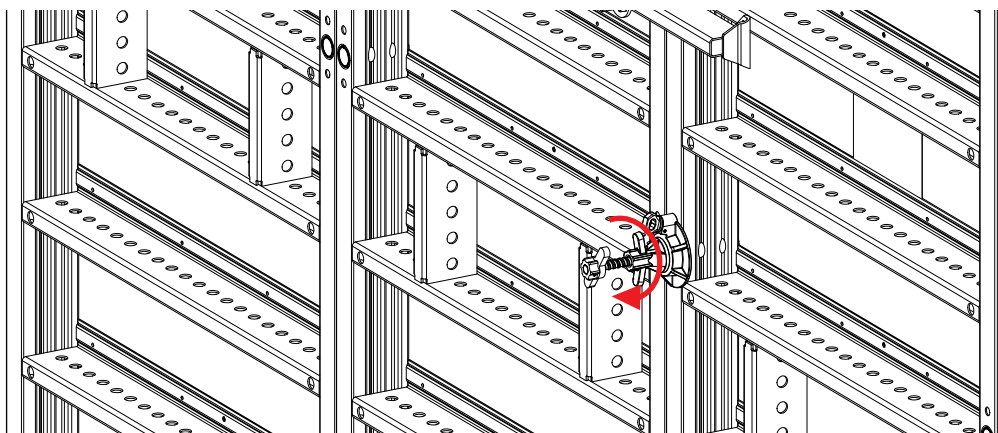
- Step 5** Screw the Tie Rod all the way into MANTO G3 Rear Tie Nut until it touches the stopping pin of the MANTO G3 Rear Tie Nut and cannot be inserted any further.



- Step 6** Rotate the washer of the MANTO G3 Front Tie Nut until the locking screw is aligned with the smaller holes in the tie position.

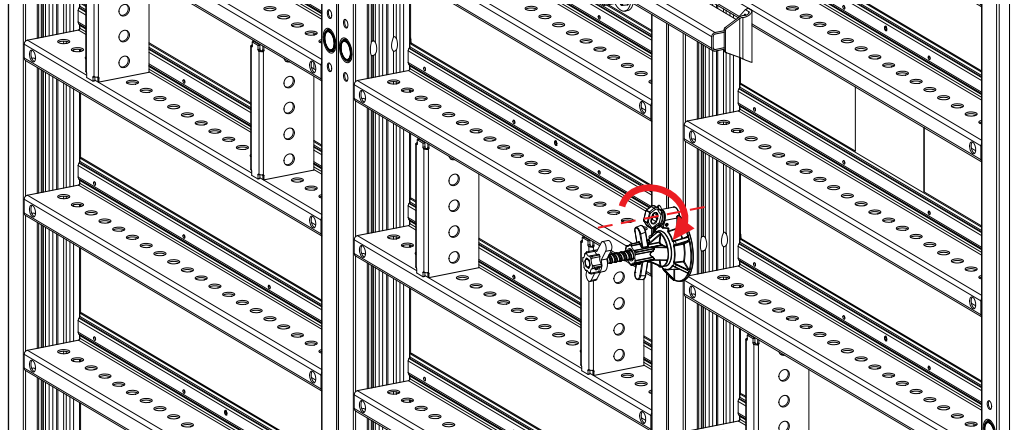


- Step 7** Screw the wing nut on the MANTO G3 Front Tie Nut as far in as possible.





**Step 8** Insert the locking screw of the MANTO G3 Front Tie Nut and tighten.



**Step 9** Install the remaining ties in the same way.

## 9.4.3 Removing MR Tie Rod



### WARNING

#### Risk of injury from overturning formwork!

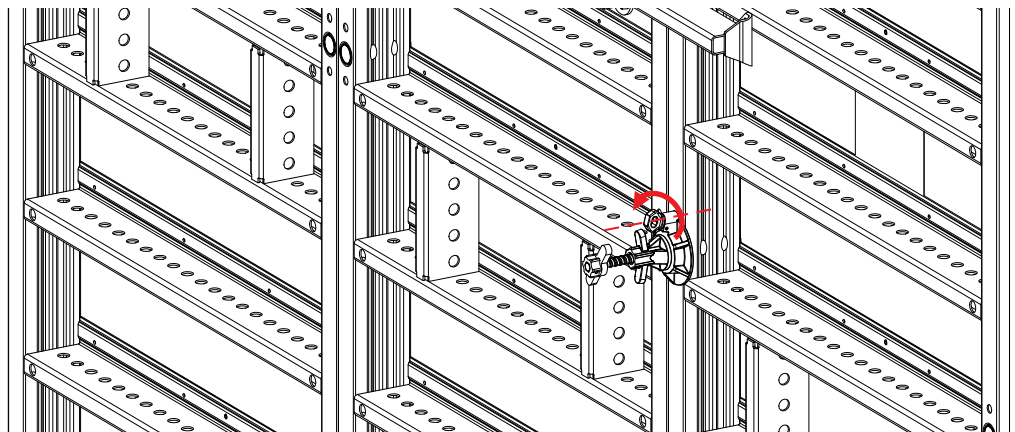
Do not allow access to platforms if the formwork is not secured against overturning.  
Do not remove the ties unless both sides of the formwork are secured against overturning.

### NOTE

#### Note!

Do not move formwork until ties have been removed.

**Step 1** Loosen the locking screw of the MANTO G3 Front Tie Nut and release it completely from the panel profile.



**Step 2** Release the wing nut on the MANTO G3 Front Tie Nut.

**Step 3** Unscrew the Tie Rod from the MANTO G3 Counter Nut (approx. 60 mm).

**Step 4** Pull the MR Tie Rod and the MANTO G Front Tie Nut out of the formwork. The Tie Sleeve remains in the concrete. The Sealing Cones can be carefully removed after stripping and used again later.



## 9.5 Conventional (two-sided) tying

You can also use the MANTO Panels with conventional Tie Rods and MANTO Tie Nuts. In this case, both sides of the formwork have to be accessible.



### **WARNING**

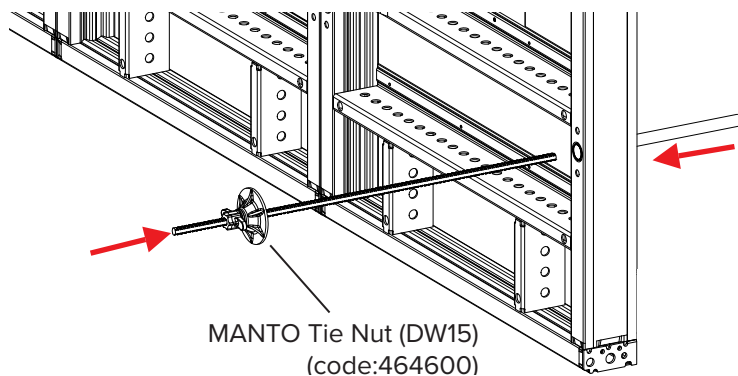
#### **Risk of injury from overturning formwork!**

Do not allow access to platforms if the formwork is not secured against overturning.

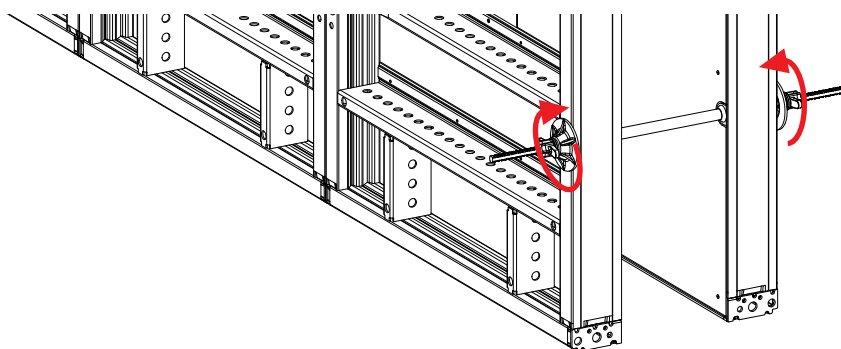
### 9.5.1 Attaching ties

**Step 1** Remove the plugs from the tie holes to be used. Close unused tie holes with plugs.

**Step 2** Push the Tie Rod through the tie hole sufficiently such that it protrudes into the Tie Sleeve.



**Step 3** Set up the opposite panel and push the Tie Rod all the way through. Screw the MANTO Tie Nut onto the opposite side of the Tie Rod and tighten by rotating the opposite Tie Nut.



**Step 4** Install the remaining ties in the same way.

## 9.5.2 Removing ties

The tie can be removed from the formwork by reversing the steps of the assembly sequence.



### WARNING

#### Risk of injury from overturning formwork!

Do not allow access to platforms if the formwork is not secured against overturning.

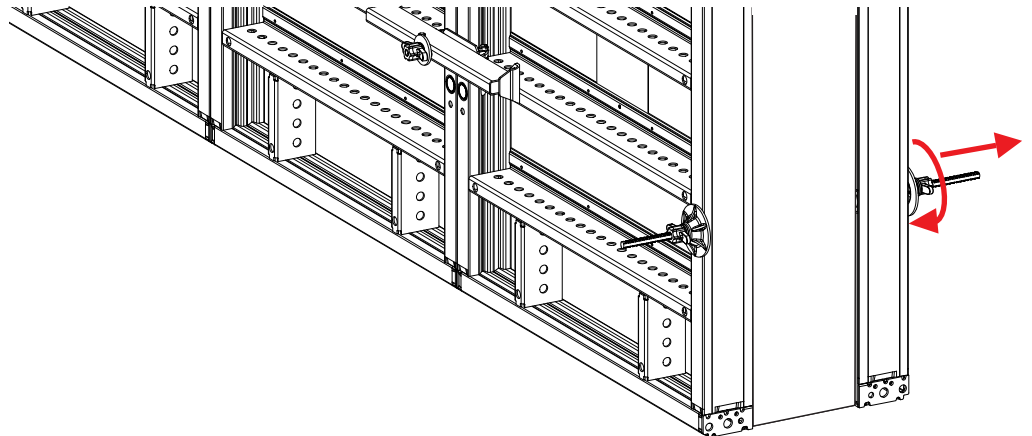
Do not remove the ties unless both sides of the formwork are secured against overturning.

### NOTE

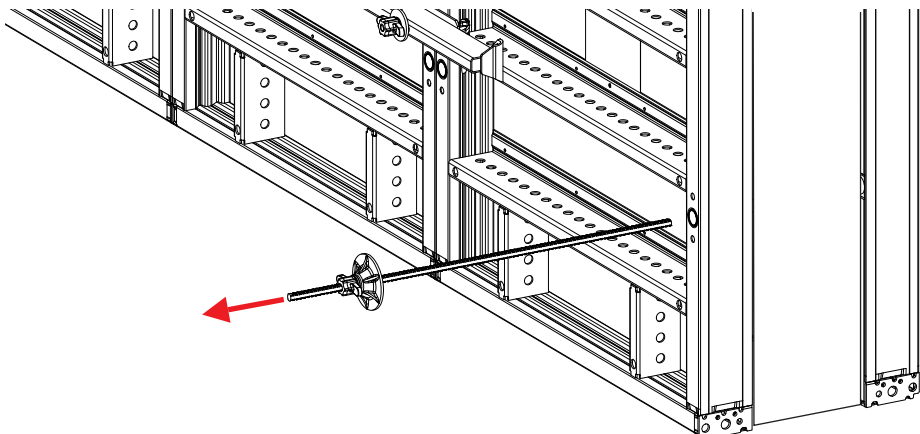
#### Note!

Do not move formwork until ties have been removed.

**Step 1** Release the tie nut on one side of the formwork and remove it from the panel.



**Step 2** Unscrew the tie rod with the tie nut from the opposite panel.



## 9.6 Creating watertight tie holes

A Water Stop 15 (code:164400), 2no. tie sleeves (outer diameter 26 mm, e.g. code:605916) 2no. cones for ties sleeves, 2no. tie rods (DW15 and 2no. tie nuts DW 15 (code:464600 or 48344) are needed to create a watertight tie hole. This combination of parts ensures water resistance up to 7 bar.

If tie sleeves with an outer diameter >26 mm are used, 2no. WS Adapters Ø22 (packaging unit of 250 pieces, code:605789) are required. It is important that the tie sleeve used has an inner diameter of 22 mm.

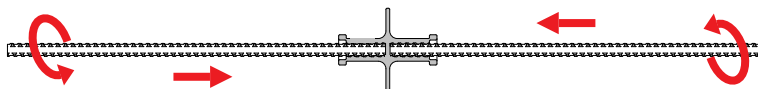
### 9.6.1 Using tie sleeve with outer diameter 26 mm



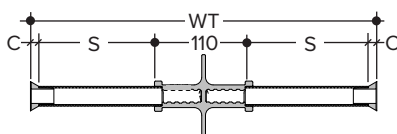
Before using the Water Stop 15 (code:164400), check that the thread is clean.

Do this e.g. by marking the tie rod 5.0 cm from the end and then screw in the tie rod. If the mark is still visible, the Water Stop 15 has to be cleaned.

**Step 1** Screw the tie rod onto both sides of the Water Stop 15.

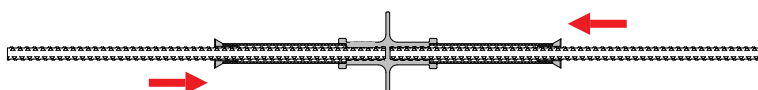


**Step 2** Cut the tie sleeve to the length needed for the wall thickness.  
Required length of tie sleeve  $S = (\text{wall thickness WT} - 110 \text{ mm} - 2 \times \text{cone overlap C}) / 2$ .

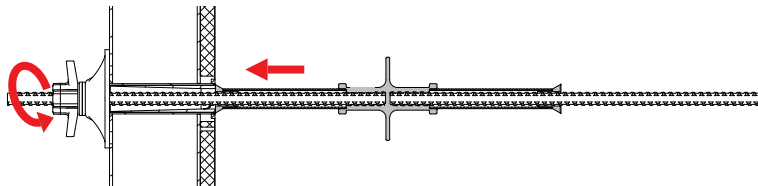


**Step 3** Push the tie sleeve cones onto the ends of the two tie sleeves.

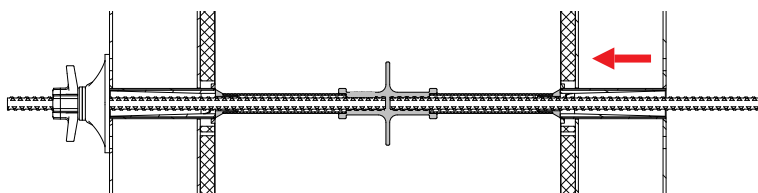
**Step 4** Insert the tie sleeves into both ends of the Water Stop 15.



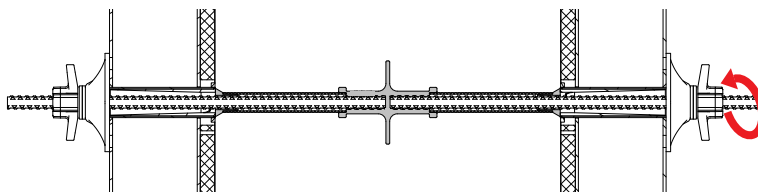
**Step 5** Slide the assembly with the tie rod through the tie hole on the advancing side and secure from the outside with a tie nuts DW 15.  
Brace the Water Stop 15 by hand or with a spanner w.a.f. 30.



**Step 6** Put the closing side into place and slide the tie rod through the tie hole.

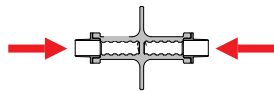


**Step 7** Secure the tie hole by tightening the tie nut on the closing side.

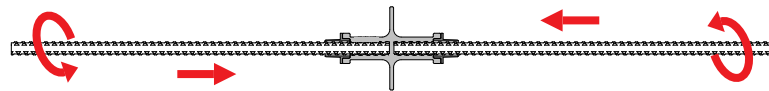


## 9.6.2 Using tie sleeve with outer diameter > 26 mm

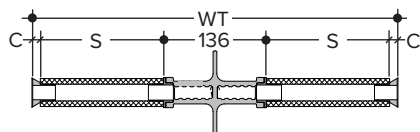
- Step 1** Insert the WS Adapter Ø22 (packaging unit of 250 pieces, code:605789) with the greater diameter into the two openings of the Water Stop 15 (code:164400).



- Step 2** Screw the tie rod onto both sides of the Water Stop 15.

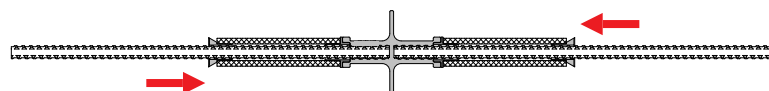


- Step 3** Cut the tie sleeve to the length needed for the wall thickness.  
Required length of tie sleeve  $S = (\text{wall thickness WT} - 136 \text{ mm} - 2 \times \text{cone overlap } C) / 2$

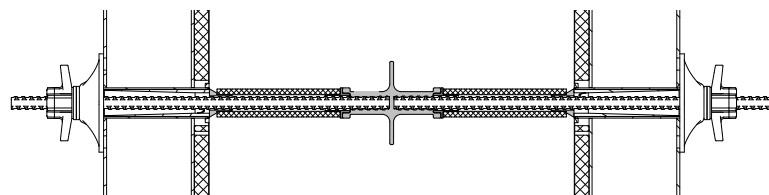


- Step 4** Push the tie sleeve cones onto the ends of the two tie sleeves.

- Step 5** Place a tie sleeve on the WS Adapter Ø22 at each end of the Water Stop 15



- Step 6** The following steps correspond to those in section 9.6.1, Step 5 – Step 7.

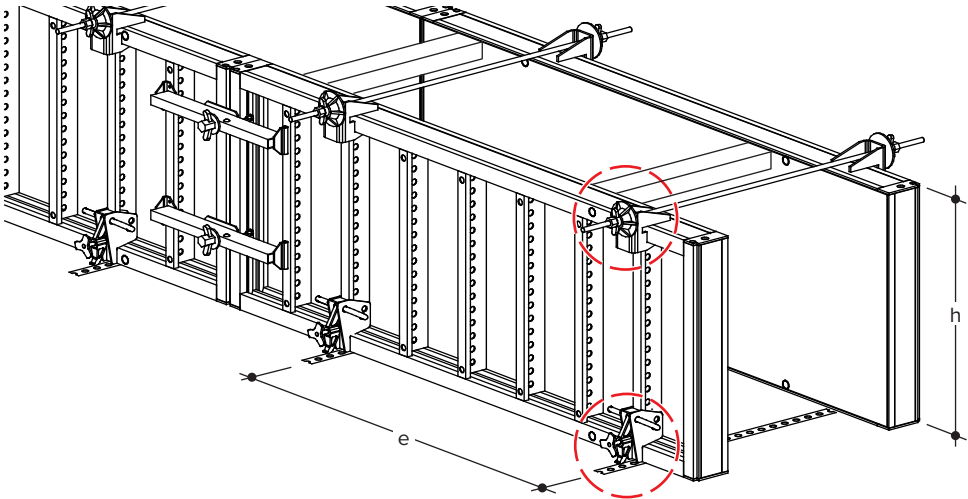


9.7 FU Tightener and Edge Tie Fastener MR

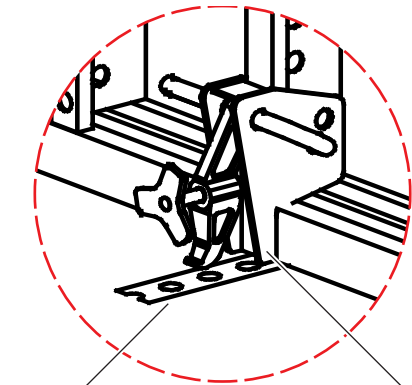
The FU Tightener and the Punched Steel Tape are an alternative solution for tying through, e.g. when panels are used for foundations.

The Safe Working Load (N) of the Edge Tie Fastener MR is 10.00 kN and of the FU Tightener is 12.00 kN. This leads to a maximum distance between ties of 1.75 m when used in a 0.90 m high formwork structure.

The Edge Tie Fastener MR can be placed anywhere along the edge profile of the panel. The tie fastener connects the Tie Rod to the edge profile of the MANTO panel.

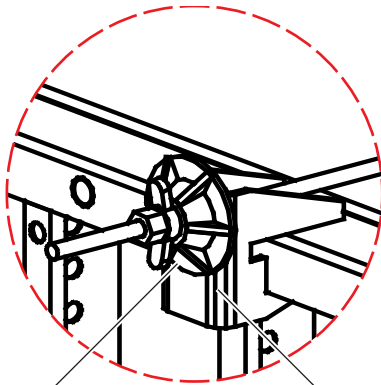


Permitted distance (e) of FU Tightener			
Height (h)	0.90 m	1.05 m	1.20 m
Distance (e)	1.75 m	1.30 m	1.00 m



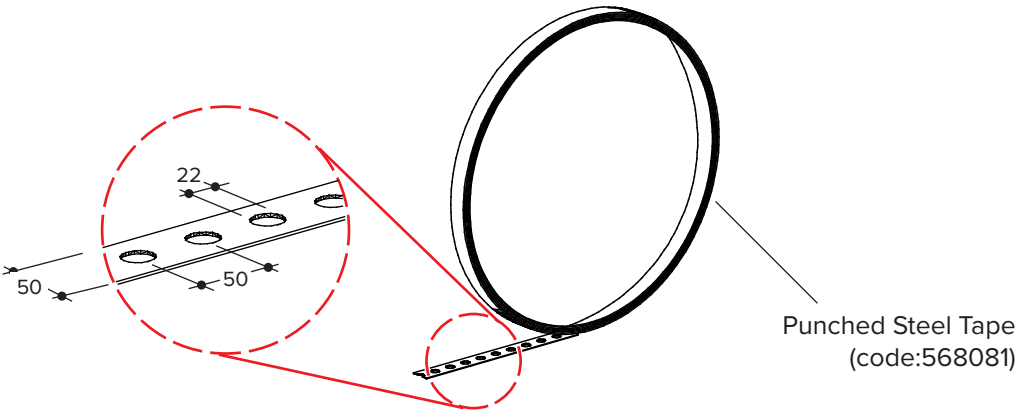
Punched Steel Tape  
(code:568081)

FU Tightener  
(code:568357)



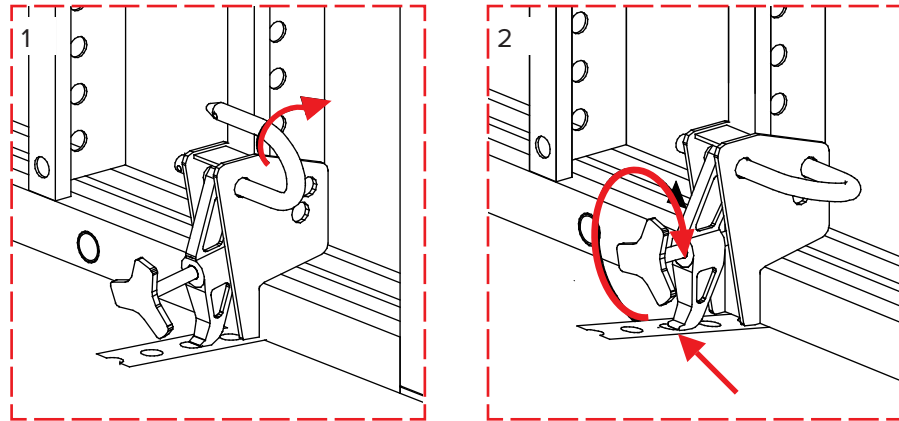
MANTO Tie Nut  
(DW 15) (code:464600)

Edge Tie Fastener  
MR (code:566667)



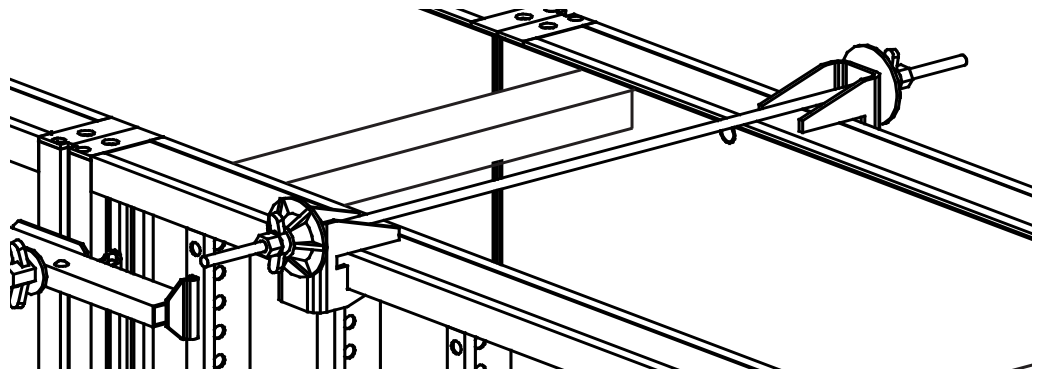
## 9.7.1 FU Tightener

- Step 1** The FU Tightener is positioned on the lower edge profile of the MANTO Panel and secured to the rib by using the stirrup bolt.
- Step 2** Cut a piece of the Punched Steel Tape to size and hook it to the FU Tightener. Tighten the tape by turning the threaded bolt of the FU Tightener.



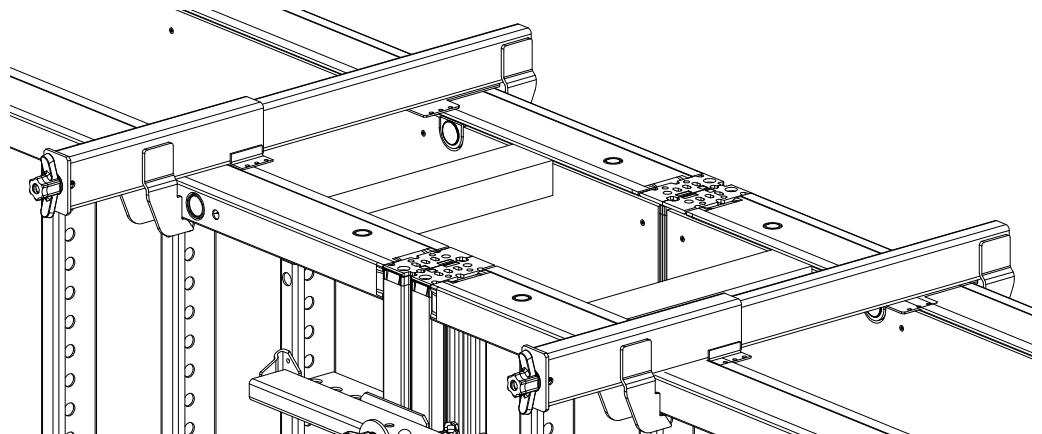
## 9.7.2 Edge Tie Fastener MR

- Step 1** Slide the Edge Tie Fastener MR onto the edge profile of the MANTO panel.
- Step 2** Place spreaders, e.g. timber beams, between the panels.
- Step 3** Slide the tie rod through the Edge Tie Fastener MR and secure with MANTO Tie Nuts.



## 9.7.3 Alternative: PLATINUM 100 MANTO Bulkhead Clamp dry tie (wall thickness 100 - 425 mm)

- Step 1** Place spreaders, e.g. timber beams, between the panels.
- Step 2** Attach the PLATINUM 100 MANTO Bulkhead Clamp to the edge profile on MANTO panels.



## 10 Corners

Many different constellations of corners can be built with the MANTO system components. In general, there is more strain on the formwork near the outer corners than along straight sections. This is why more connectors are needed near corners (Refer to page 137). This applies to the corners themselves as well as to the nearby panels:

- Up to 1.25 m from the corner when the wall is no more than 30 cm thick.
- Up to 1.55 m from the corner when the wall is more than 30 cm thick.



### CAUTION

#### Risk of formwork collapsing!

If the permitted pressure is exceeded (Refer to the table on page 234), the formwork can collapse! Never exceed the permitted concrete pressure! If necessary, decrease the pouring rate!

### 10.1 90° corners

Create the interiors of 90° corners with the aid of the MANTO G3 Inner Corners, MANTO Inner Corners or MANTO Shaft Corners. Create the outer corners using MANTO panels, generation 2 or 3 and, when needed, the Corner Adjustment.



When using MANTO G3 M panels, MANTO G3 panels usually have to be used to construct the outer corners.

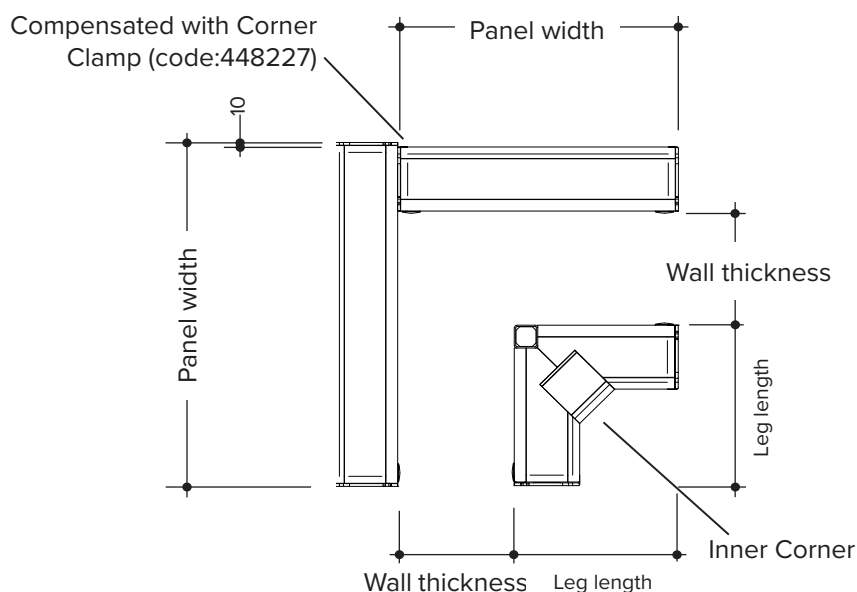
MANTO G3 M panels can be used in outer corners only when the panel can be tied together with an adjacent MANTO G3 panel or with an infill (Refer to the example on page 134).

#### 10.1.1 Planning corner

The following aspects are particularly important when planning the corners:

- The thickness of the wall to be concreted
- The panel widths available
- The position of the tie holes

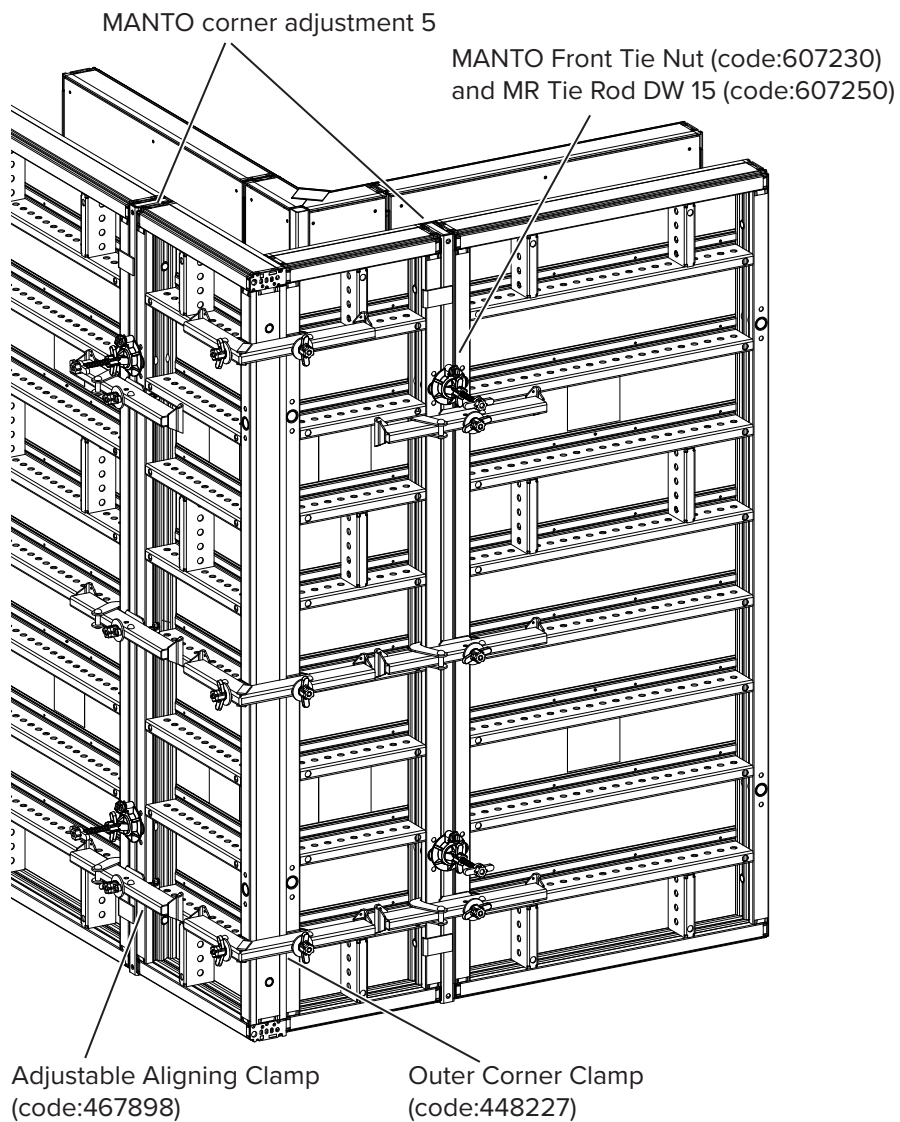
#### Typical 90° corner



The following illustrations are intended to help plan the corners and select the proper components.

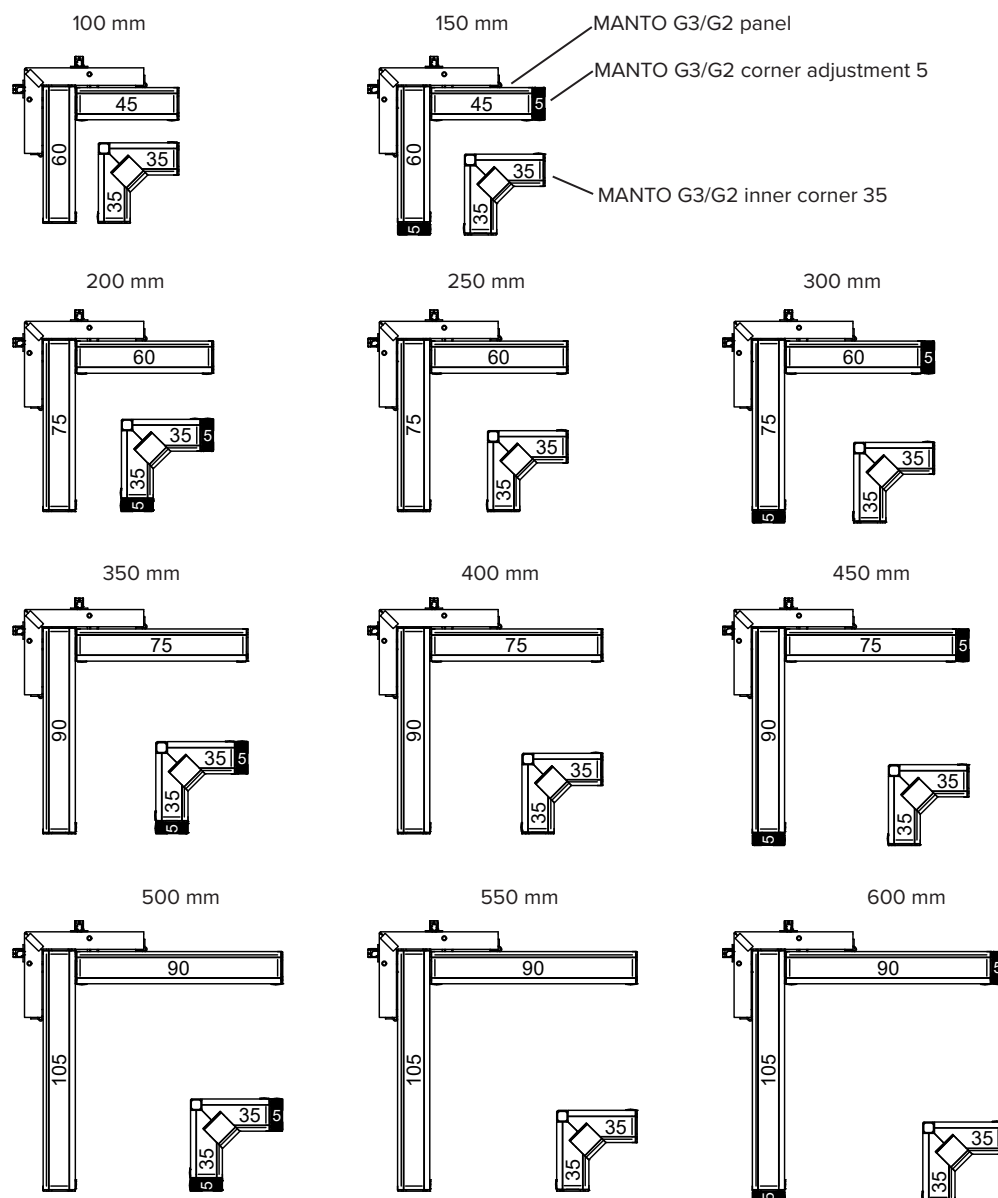
## MANTO G3 Corner Adjustment 5

The combinations of panels used in corners vary as a factor of the different wall thicknesses. Some corner geometries with common wall thicknesses require the MANTO G3 Corner Adjustment 5, 50 mm wide.

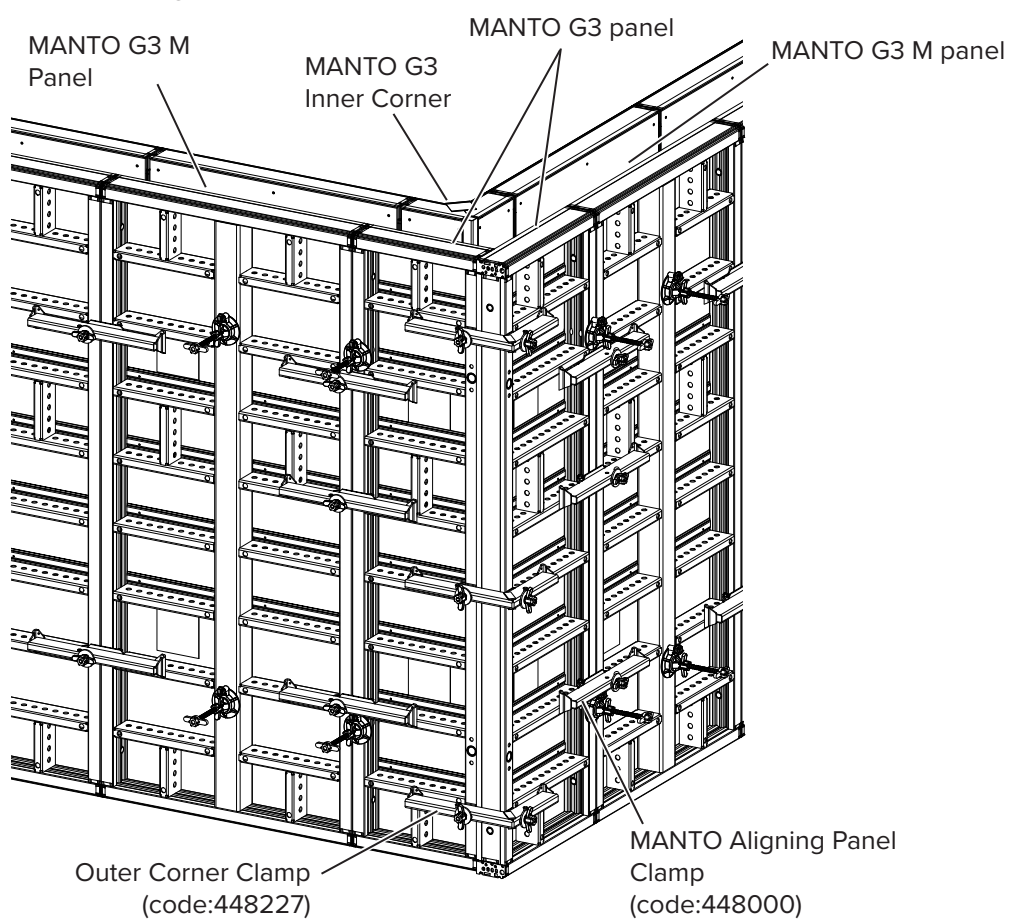




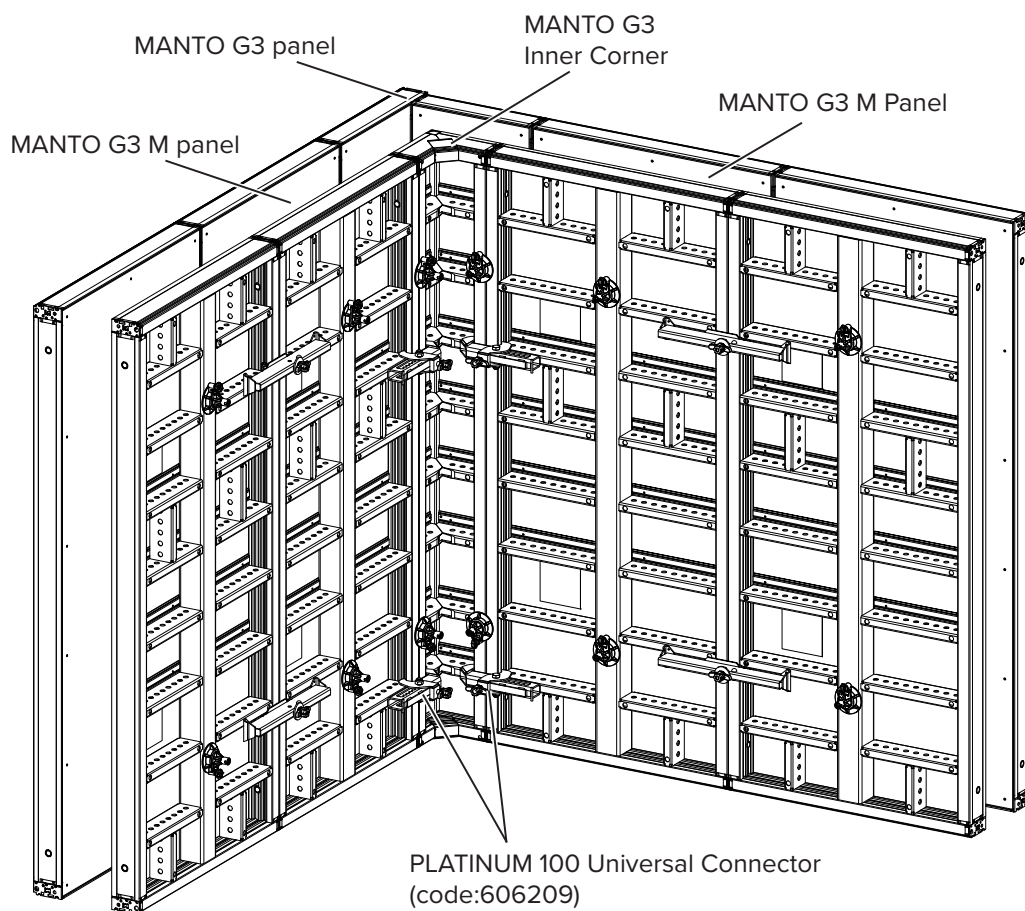
### Examples using MANTO G3 Inner Corner 35



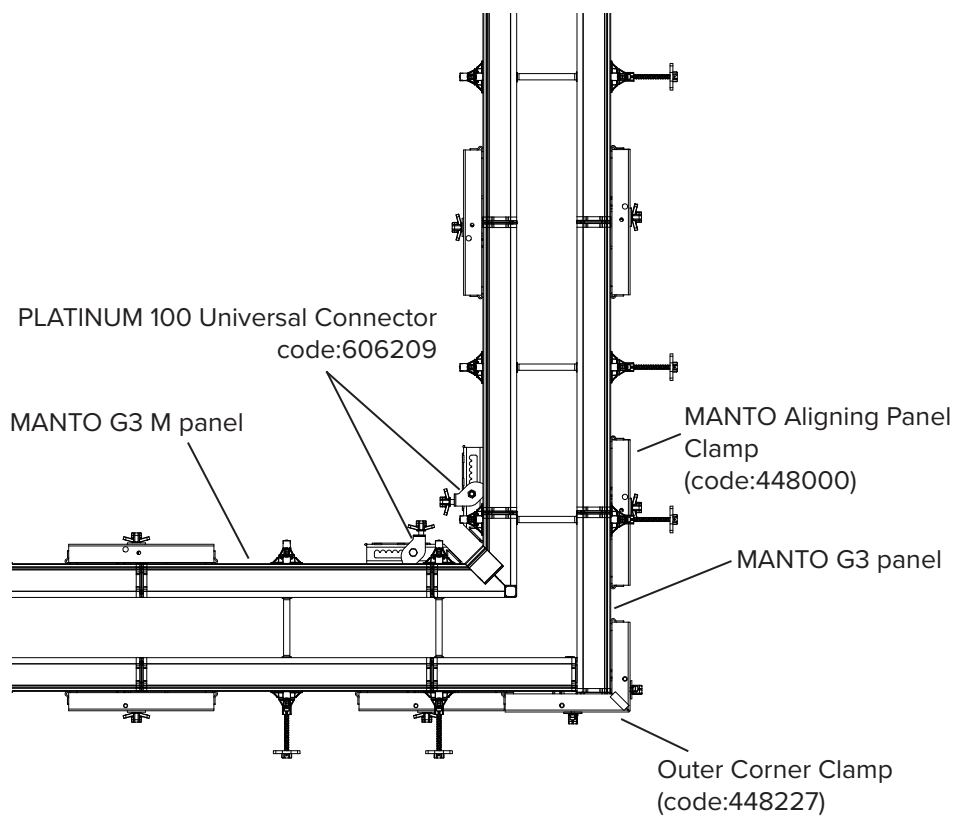
## Example using MANTO G3 M / G3 – view of outer corner



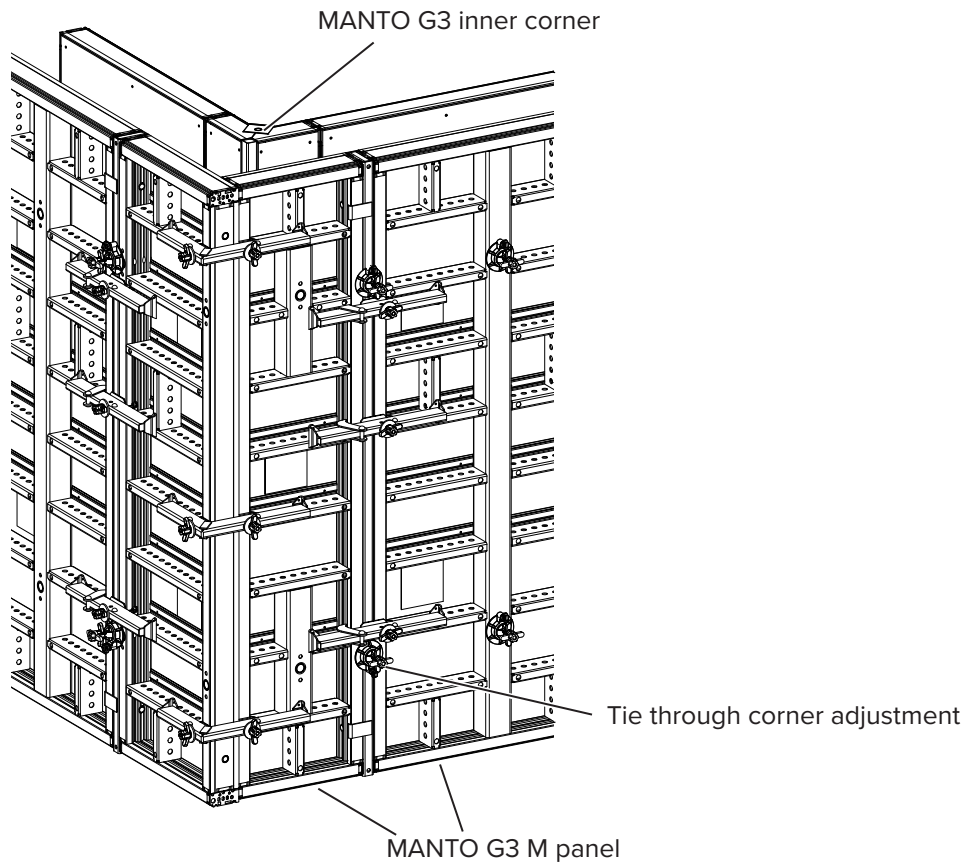
**Example using MANTO G3 M / G3 – view of inner corner**



**Example using MANTO G3 M / G3 – view from above**



## Example using MANTO G3 M with Corner Adjustment – view of outer corner



MANTO G3 M panels cannot be tied to the edge profile.

When MANTO G3 M panels are used in the outer corner, tying has to be done using an adjacent MANTO G3 corner adjustment!

The MANTO G3 corner adjustment has to be used for one-sided tying.



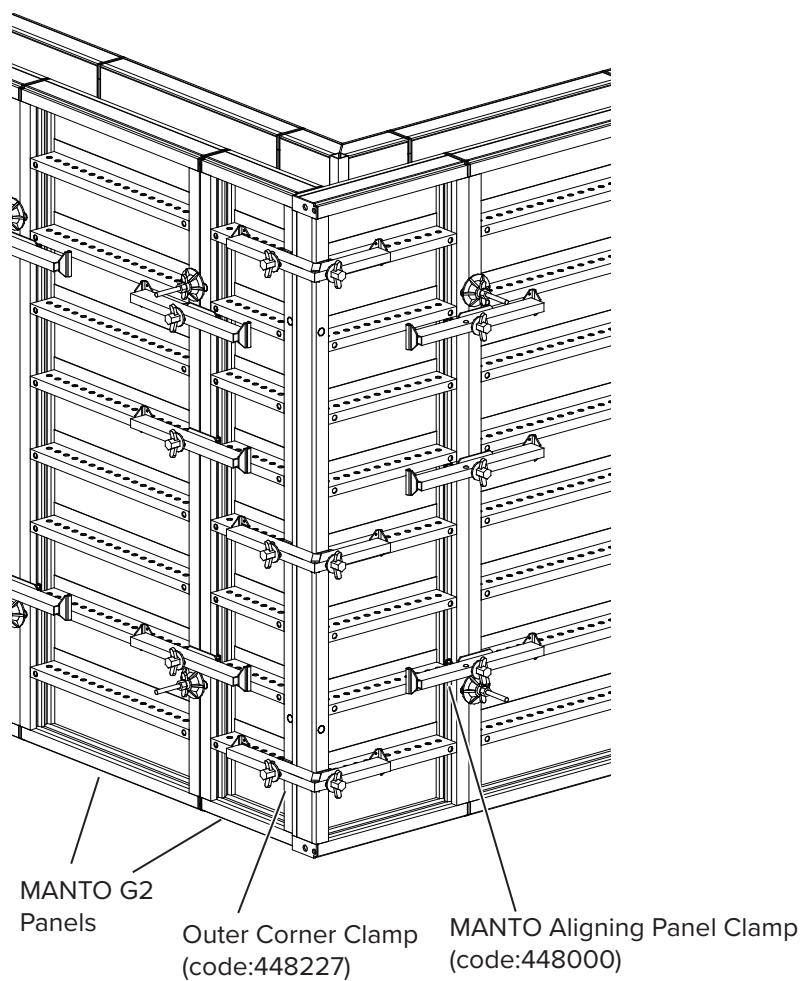
### WARNING

#### Risk of injury from falling MANTO panels!

If the panels are not fastened correctly, the MANTO Aligning Panel Clamp (code:448000) can release and formwork panels can fall off when being transported by crane!

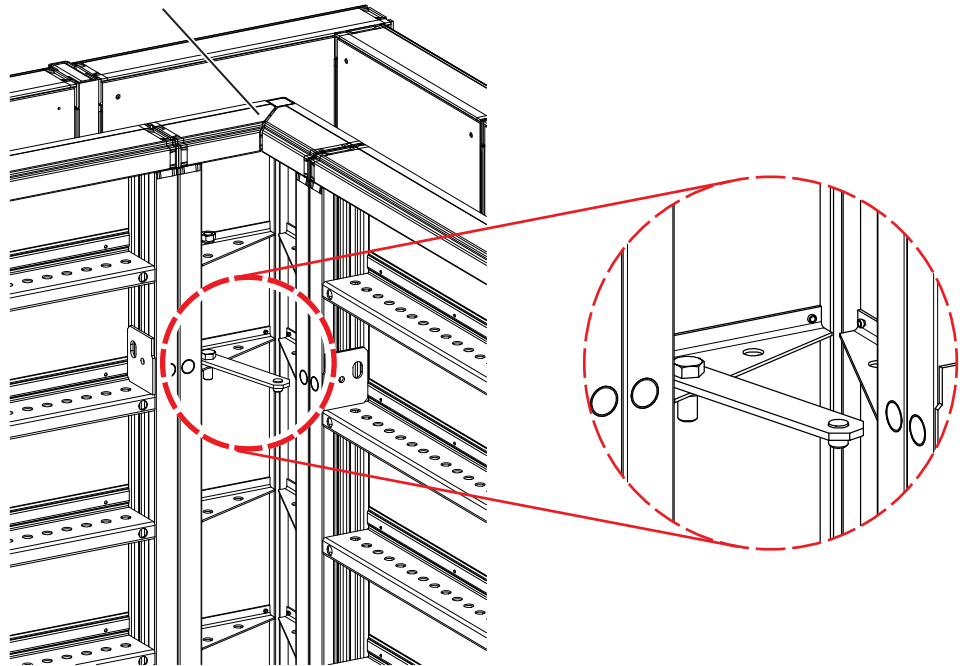
When using the PLATINUM 100 Tie Nut Closing Side (code:604197) in a one-sided tie system, ensure that the MANTO Aligning Panel Clamp is not resting on the PLATINUM 100 tie nut. The MANTO Aligning Panel Clamp has to rest against the MANTO panels. If necessary, attach the MANTO Aligning Panel Clamp to the next-higher or next-lower H-rib.

### Example of application with MANTO G2



When using a MANTO inner corner G2, unlatching the corner stiffener will allow for the component to flex 2° when striking. This makes it easier to separate the inner corner G2 from the concrete.

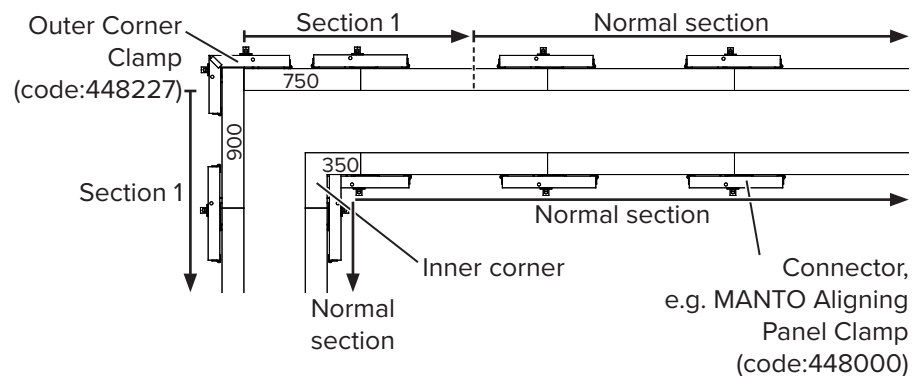
MANTO G2 inner corner



## Quantity and distribution of Outer Corner Clamps at 90° outer corners

The load to which the corner and the adjacent panels (section 1 in the illustration below) are subjected is greater than in the normal sections along straight walls. This is why more Aligning Corner Clamps are needed at the corners and in section 1.

The number and arrangement of the Outer Corner Clamp (code:448227) and of the Aligning Panel Clamps (code: 448000) on the first joint of the outer corner are a factor of the thickness and height of the wall to be formed.



The following tables and the illustrations are intended to help you connect the panels properly. The quantity of connectors indicated applies to all panel generations (G1, G2, G3 and G3 M).

MANTO panel (Height)		Any wall thickness		Wall thickness ≤ 300 mm				Wall thickness ≤ 400 mm			
		Straight section		Corner		Area 1 < 1250 mm		Corner		Area 1 < 1550 mm	
		Req. no. of connectors		Req. no. of Corner Clamps		Req. no. of connectors		Req. no. of Corner Clamps		Req. no. of connectors	
2.70 m		2		3		3		3		3	
3.30 m		2		4		3		4		4	
2.70 m	1.20 m <sup>*)</sup>	2	1 <sup>*)</sup>	3	2 <sup>*)</sup>	4	1 <sup>*)</sup>	4	2 <sup>*)</sup>	4	2 <sup>*)</sup>
3.30 m	1.20 m <sup>*)</sup>	2	1 <sup>*)</sup>	4	2 <sup>*)</sup>	4	1 <sup>*)</sup>	5	2 <sup>*)</sup>	5	2 <sup>*)</sup>
2.70 m	2.70 m <sup>*)</sup>	2	2 <sup>*)</sup>	4	3 <sup>*)</sup>	4	3 <sup>*)</sup>	5	3 <sup>*)</sup>	5	4 <sup>*)</sup>
2.70 m	3.30 m <sup>*)</sup>	2	2 <sup>*)</sup>	4	4 <sup>*)</sup>	5	3 <sup>*)</sup>	5	5 <sup>*)</sup>	5	5 <sup>*)</sup>
3.30 m	3.30 m <sup>*)</sup>	2	2 <sup>*)</sup>	5	4 <sup>*)</sup>	5	3 <sup>*)</sup>	6	4 <sup>*)</sup>	6	5 <sup>*)</sup>

<sup>\*)</sup> Stacked panels

All values stated here apply to concrete of a normal consistency and assuming a coefficient of friction of  $\mu = 0.20$  between the concrete and the formwork. Special records must be kept for liquid concrete and concrete of a thinner consistency!

MANTO panel (Height)		Any wall thickness		Wall thickness ≤ 450 mm				Wall thickness ≤ 600 mm			
		Straight section		Corner		Area 1 < 1250 mm		Corner		Area 1 < 1550 mm	
		Req. no. of connectors		Req. no. of Corner Clamps		Req. no. of connectors		Req. no. of Corner Clamps		Req. no. of connectors	
2.70 m		2		4		3		4		3	
3.30 m		2		5		4		5		4	
2.70 m	1.20 m <sup>*)</sup>	2	1 <sup>*)</sup>	5	2 <sup>*)</sup>	4	2 <sup>*)</sup>	6	2 <sup>*)</sup>	4	2 <sup>*)</sup>
3.30 m	1.20 m <sup>*)</sup>	2	1 <sup>*)</sup>	6	2 <sup>*)</sup>	5	2 <sup>*)</sup>	7	2 <sup>*)</sup>	5	2 <sup>*)</sup>
2.70 m	2.70 m <sup>*)</sup>	2	2 <sup>*)</sup>	5	4 <sup>*)</sup>	5	4 <sup>*)</sup>	6	4 <sup>*)</sup>	5	4 <sup>*)</sup>
2.70 m	3.30 m <sup>*)</sup>	2	2 <sup>*)</sup>	5	5 <sup>*)</sup>	5	5 <sup>*)</sup>	6	5 <sup>*)</sup>	5	5 <sup>*)</sup>
3.30 m	3.30 m <sup>*)</sup>	2	2 <sup>*)</sup>	6	5 <sup>*)</sup>	6	5 <sup>*)</sup>	7	5 <sup>*)</sup>	6	5 <sup>*)</sup>

<sup>\*)</sup> Stacked panels

All values stated here apply to concrete of a normal consistency and assuming a coefficient of friction of  $\mu = 0.20$  between the concrete and the formwork. Special records must be kept for liquid concrete and concrete of a thinner consistency!



The following illustrations show the quantity and position of the connectors and Outer Corner Clamps for the combinations and wall thicknesses contained in the tables above, when using MANTO G3 Inner Corners (leg length 35 cm).

For a clearer view, other components such as ties, access solutions or edge protection are not shown here.



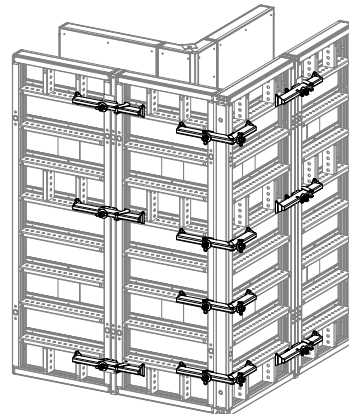
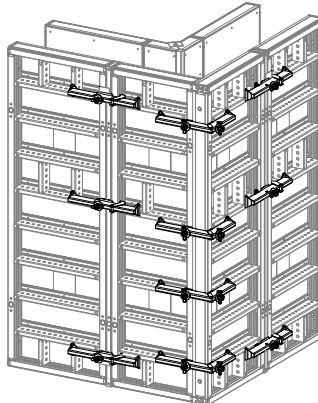
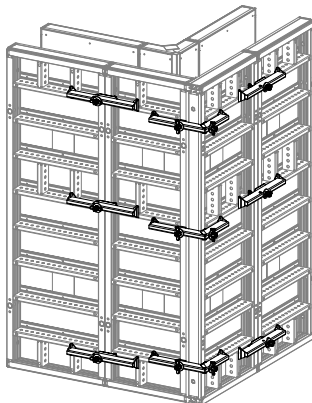
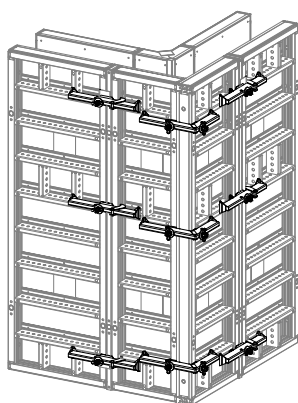
## Example: Panels 270

Wall thickness  $\leq 300$  mm

Wall thickness  $\leq 400$  mm

Wall thickness  $\leq 450$  mm

Wall thickness  $\leq 600$  mm



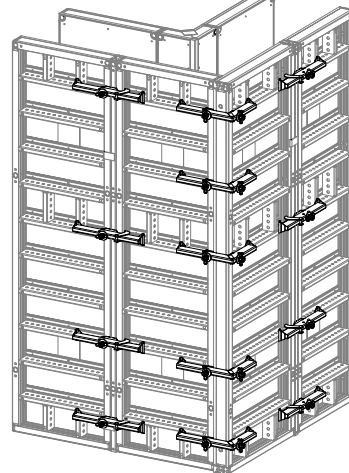
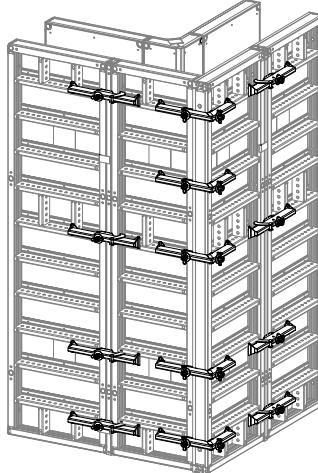
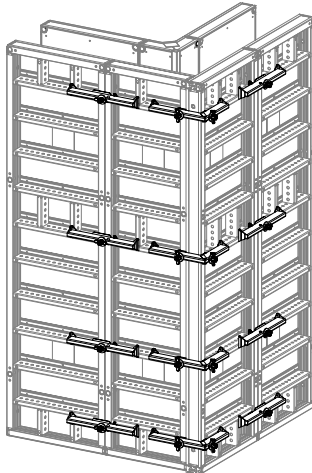
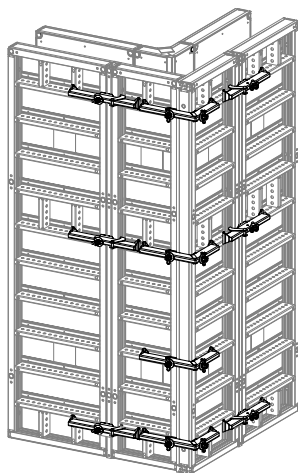
## Example: Panels 330

Wall thickness  $\leq 300$  mm

Wall thickness  $\leq 400$  mm

Wall thickness  $\leq 450$  mm

Wall thickness  $\leq 600$  mm



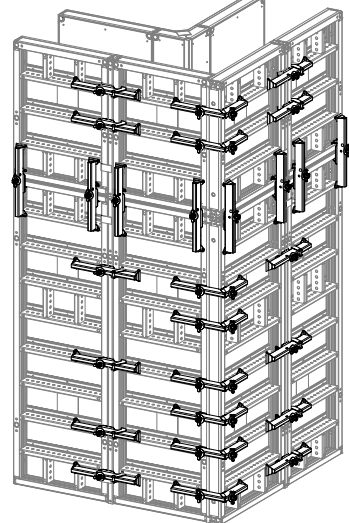
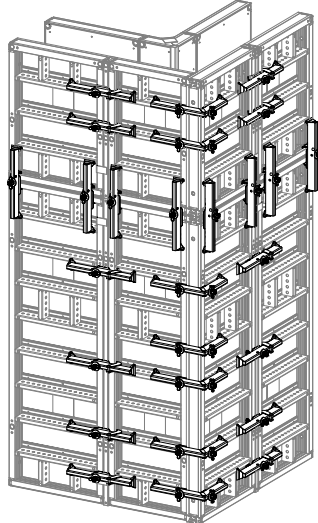
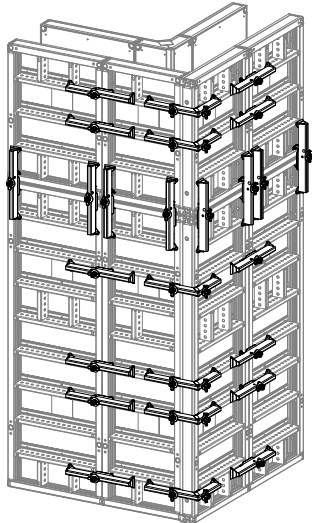
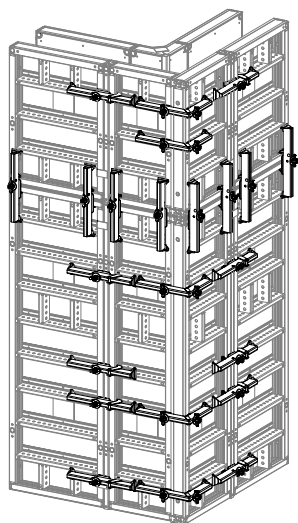
## Example: Panels 270/120

Wall thickness  $\leq 300$  mm

Wall thickness  $\leq 400$  mm

Wall thickness  $\leq 450$  mm

Wall thickness  $\leq 600$  mm





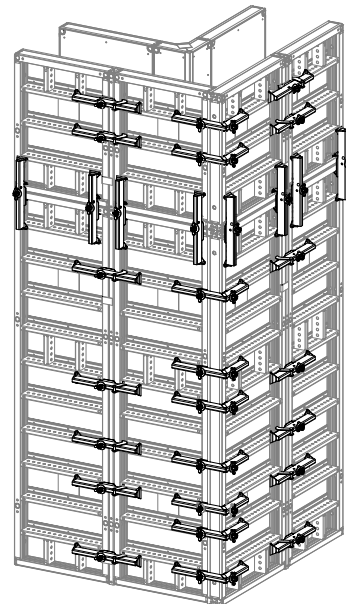
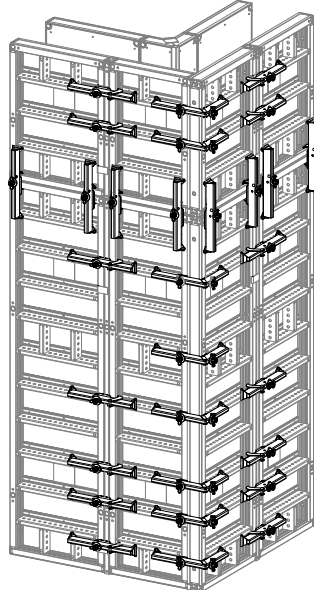
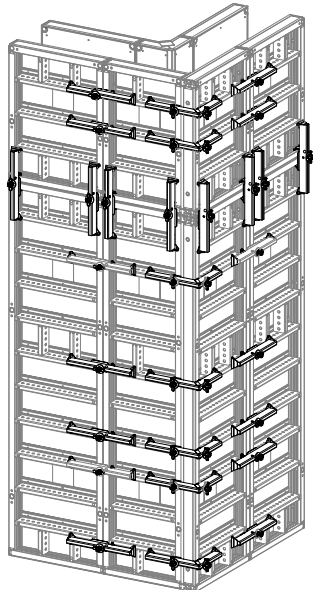
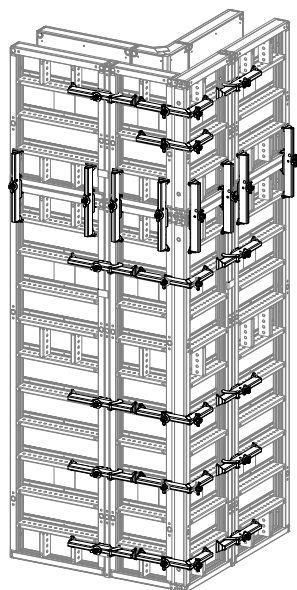
**Example: Panels 330/120**

Wall thickness ≤ 300 mm

Wall thickness ≤ 400 mm

Wall thickness ≤ 450 mm

Wall thickness ≤ 600 mm



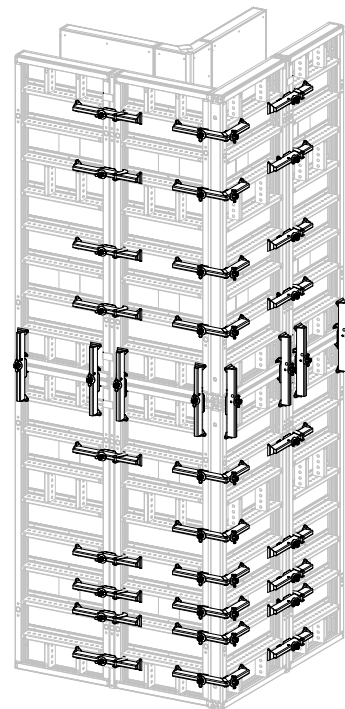
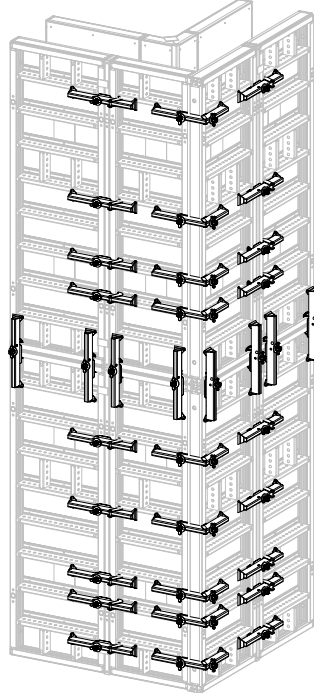
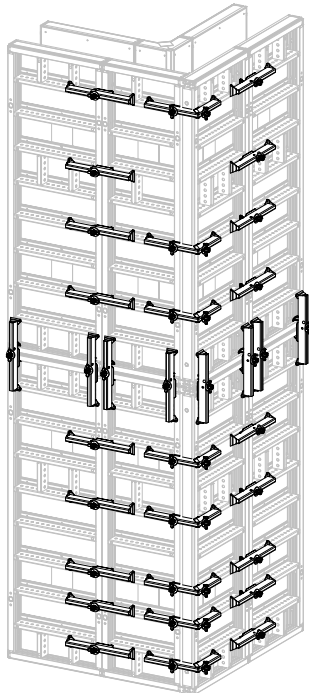
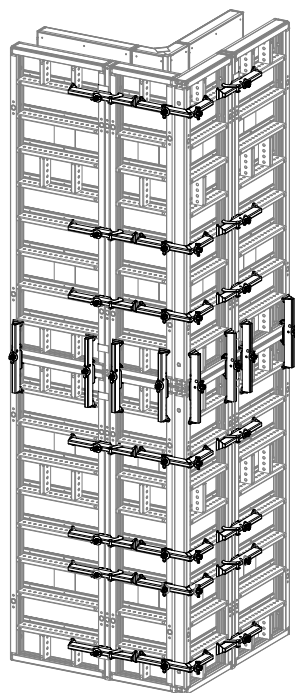
**Example: Panels 270/270**

Wall thickness ≤ 300 mm

Wall thickness ≤ 400 mm

Wall thickness ≤ 450 mm

Wall thickness ≤ 600 mm



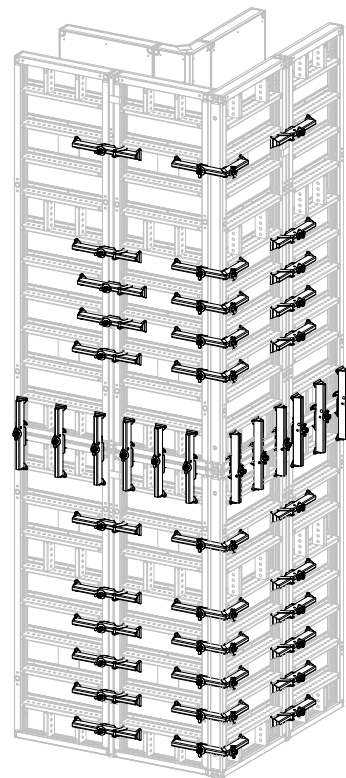
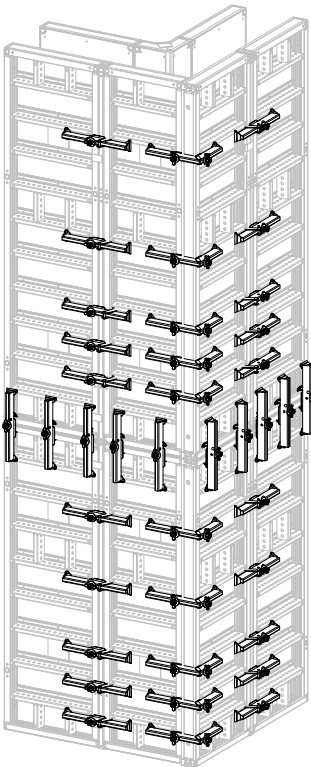
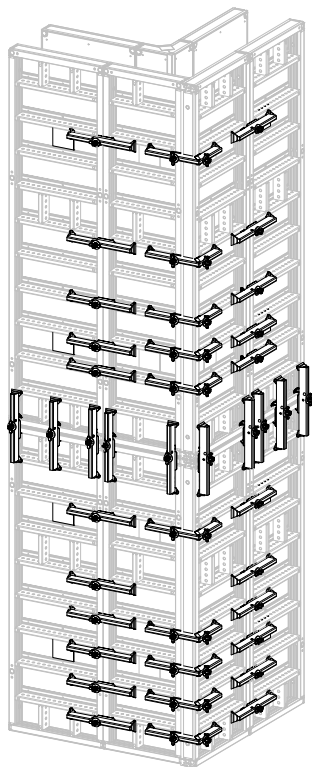
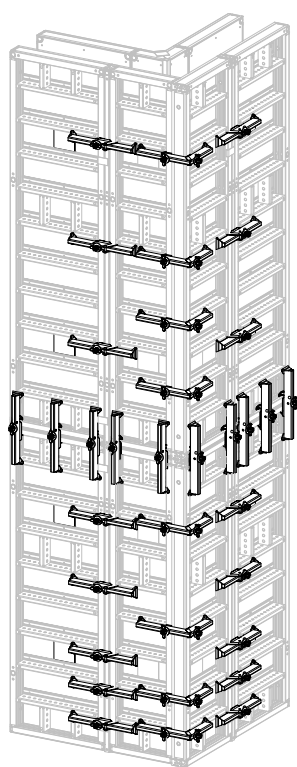
## Example: Panels 270/330

Wall thickness  $\leq 300$  mm

Wall thickness  $\leq 400$  mm

Wall thickness  $\leq 450$  mm

Wall thickness  $\leq 600$  mm



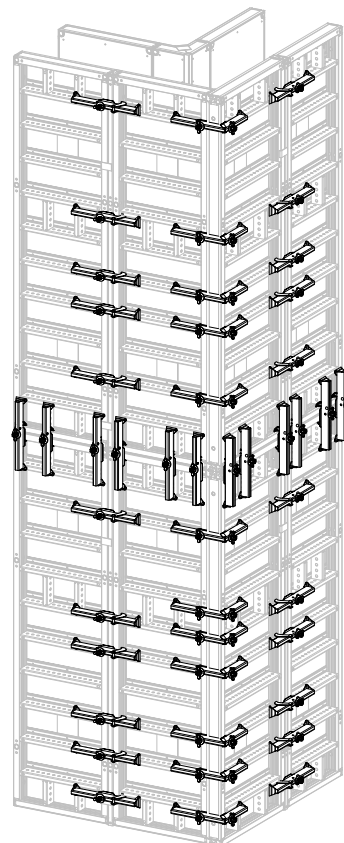
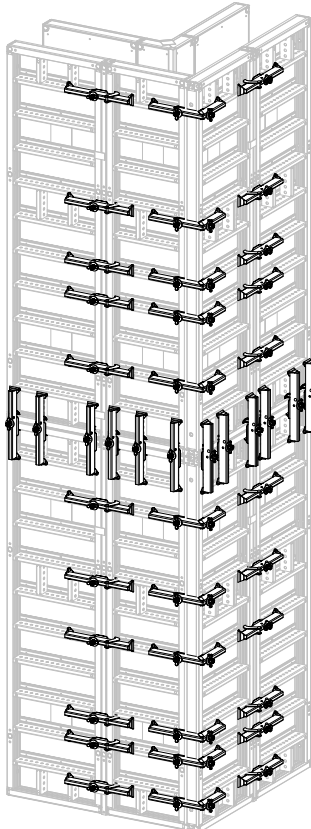
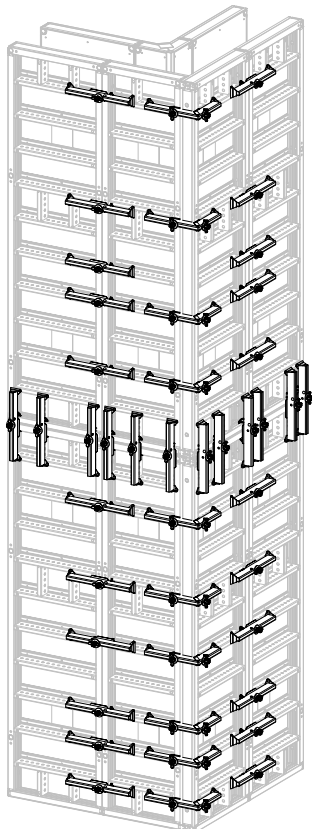
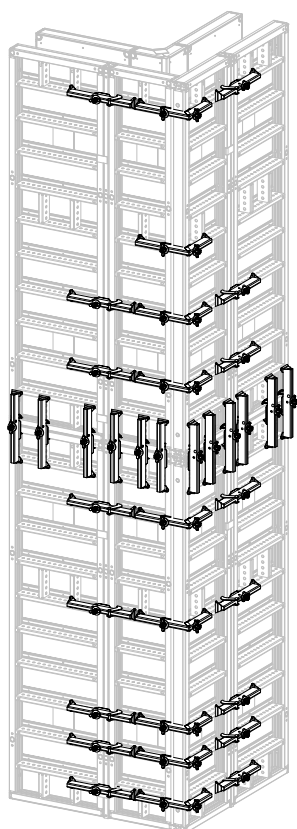
## Example: Panels 330/330

Wall thickness  $\leq 300$  mm

Wall thickness  $\leq 400$  mm

Wall thickness  $\leq 450$  mm

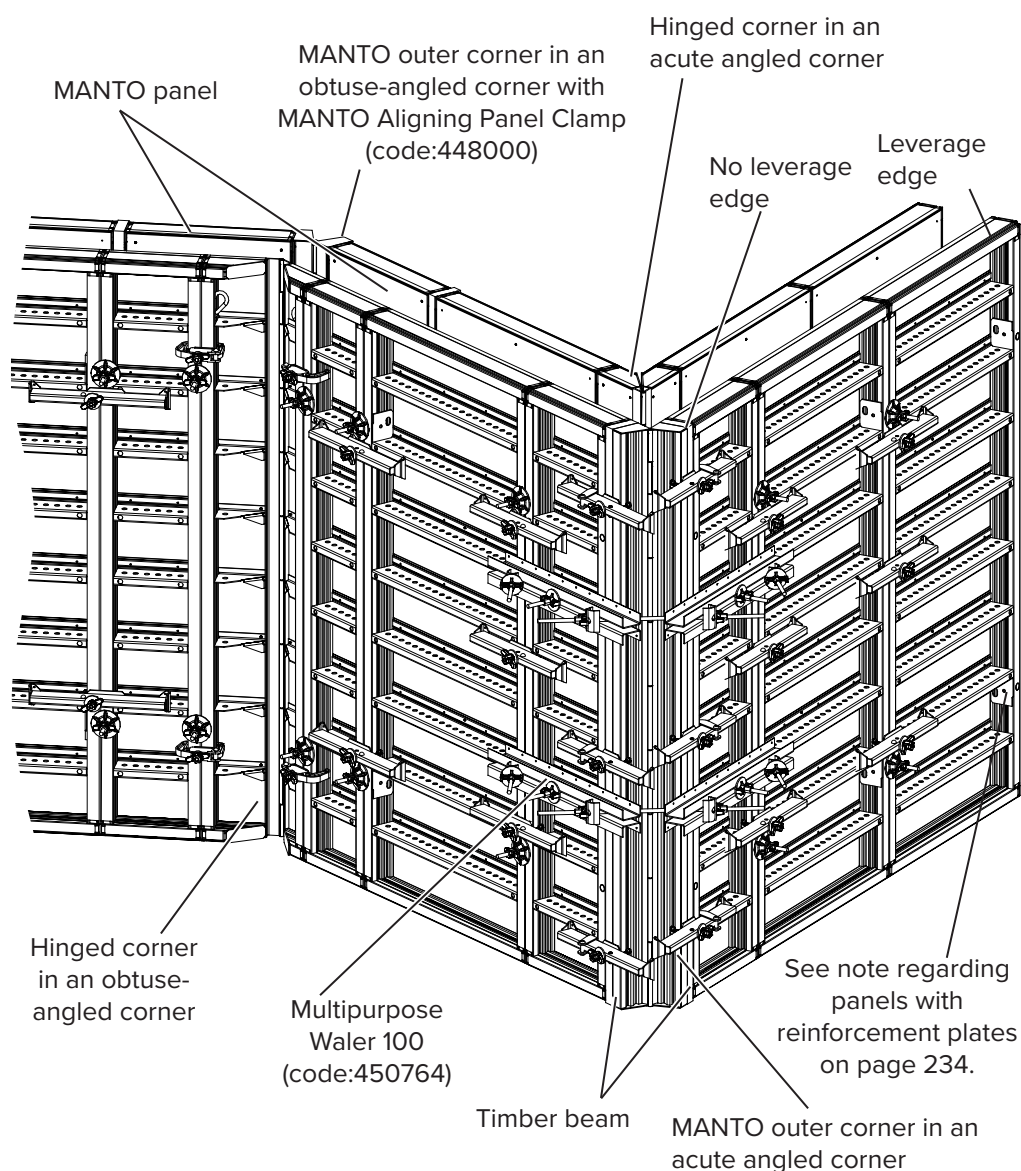
Wall thickness  $\leq 600$  mm





## 10.2 Oblique-angled corners

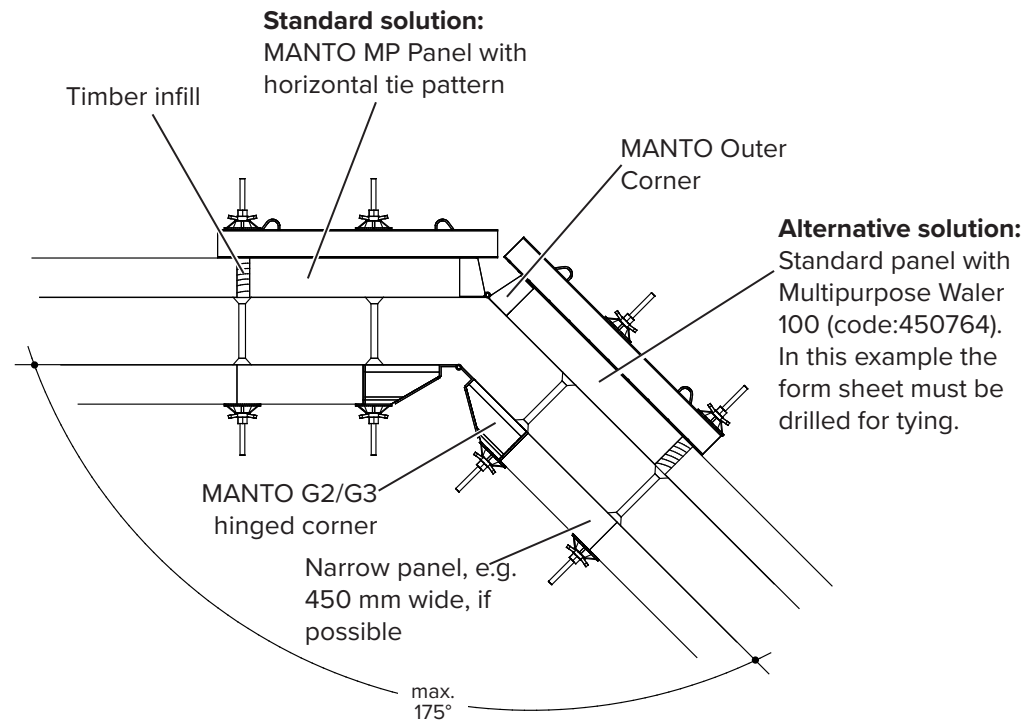
With MANTO G2/G3 panels in combination with the MANTO Outer Corner and the MANTO Hinged Corner, it is possible to form oblique-angled corners (as well as right-angled ones), starting with a minimum angle of 60° and up to a maximum of 175°. Timber infills can be used to achieve the required wall thickness.



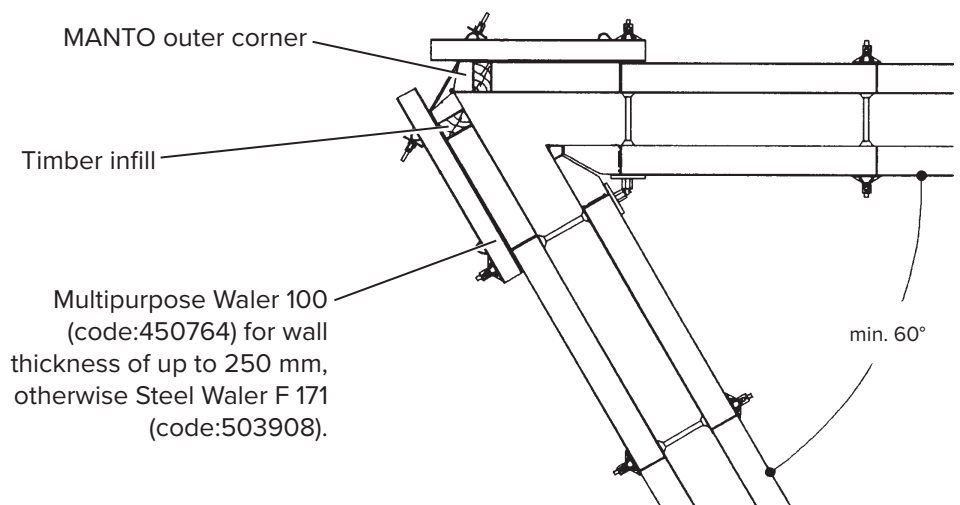
Be aware that some sections are subjected to higher tensile loads (Refer to table on page 137)!



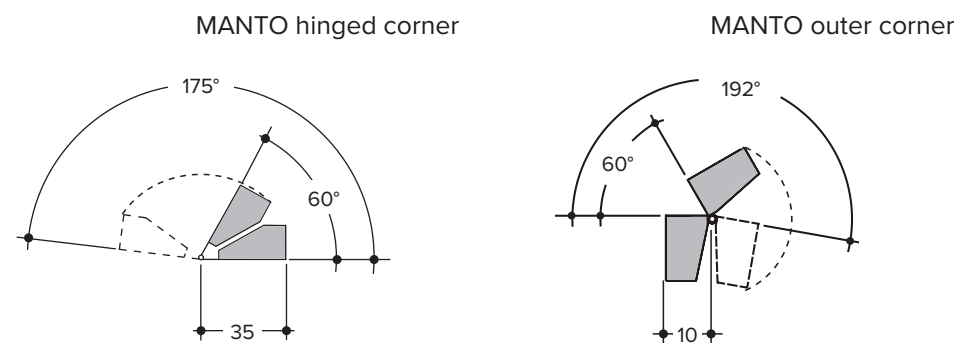
The tie should normally be secured through the corner adjustment 5. At least 25 mm of the MANTO Tie Nut must rest against the adjacent panels.  
Refer to page 70 ff. for information on using infills.



When MANTO G2/G3 MP or standard panels are used in the outer wall of an oblique-angled corner, tying has to be two-sided!



Adjustment ranges for the MANTO Hinged Corner and the MANTO Outer Corner.

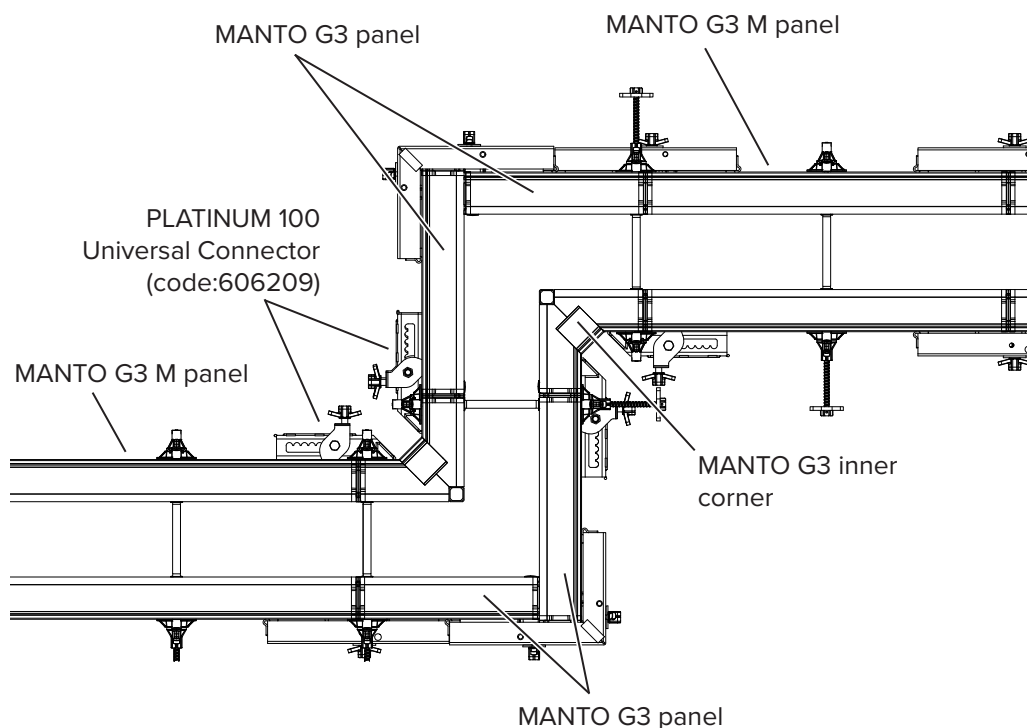


## 11 Wall offsets

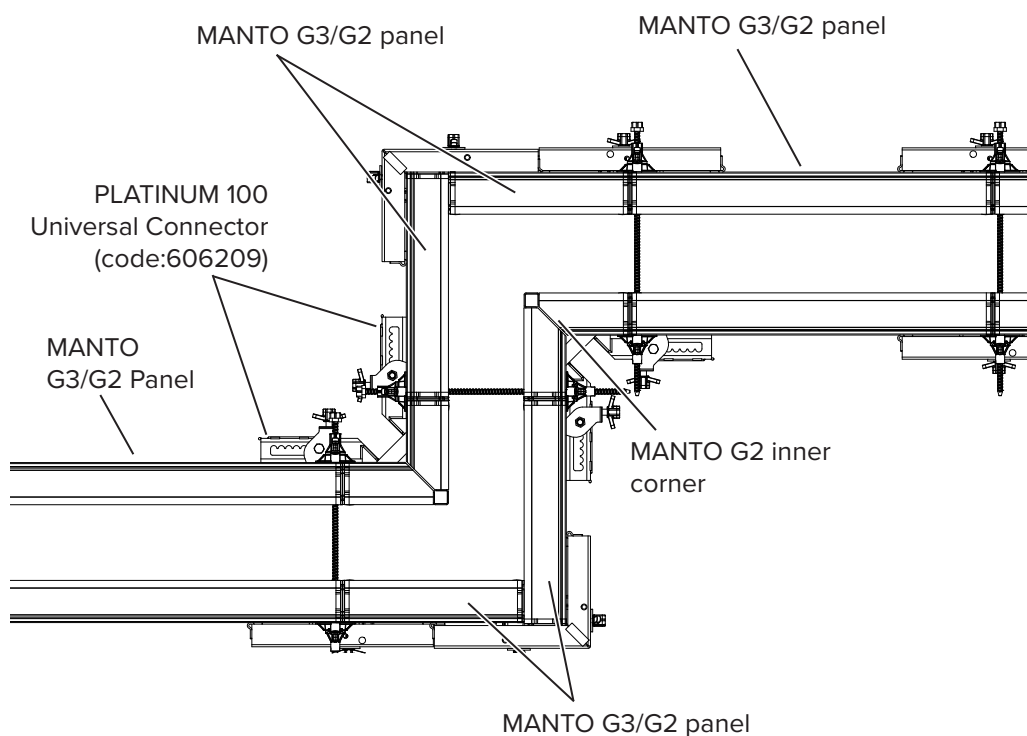
Below are some typical solutions to the most common types of wall offsets. Other solutions available upon request.

### 11.1 Wall offset

#### 11.1.1 Wall offsets with MANTO G3 and G3 M



#### 11.1.2 Wall offsets with MANTO G3/G2





One-sided tying is possible only when using MANTO G3 panels!  
When MANTO G2 panels or a combination of MANTO G2 and MANTO G3 panels are used, tying has to be two-sided.



Be aware that some sections are subjected to higher tensile loads (Refer to table on page 137)!

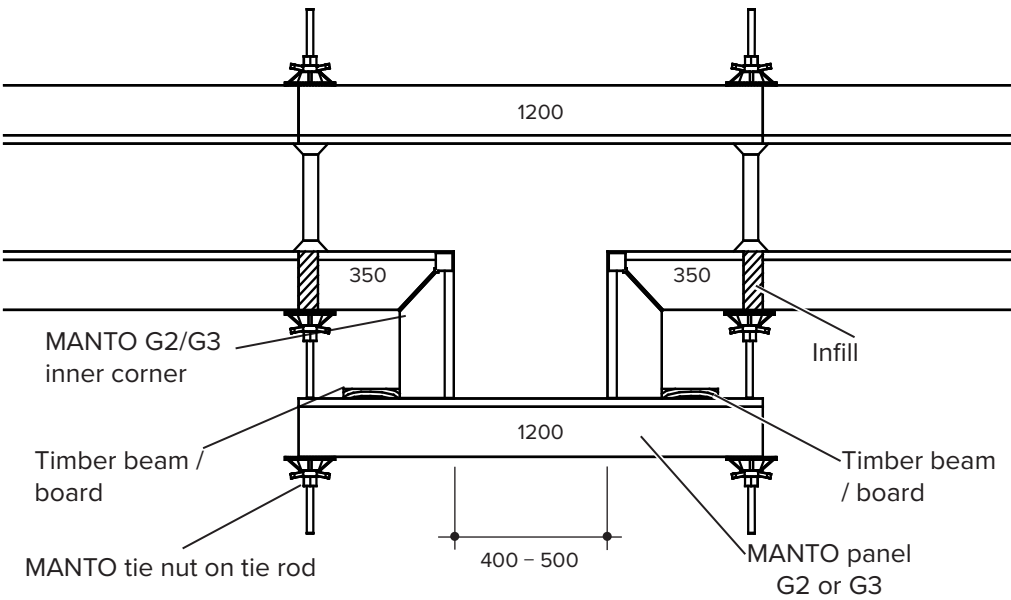
11.2 Pilasters



Comply with the stated widths when tying through the structure (Refer to the following structures)!

400 mm to 500 mm wide pilasters

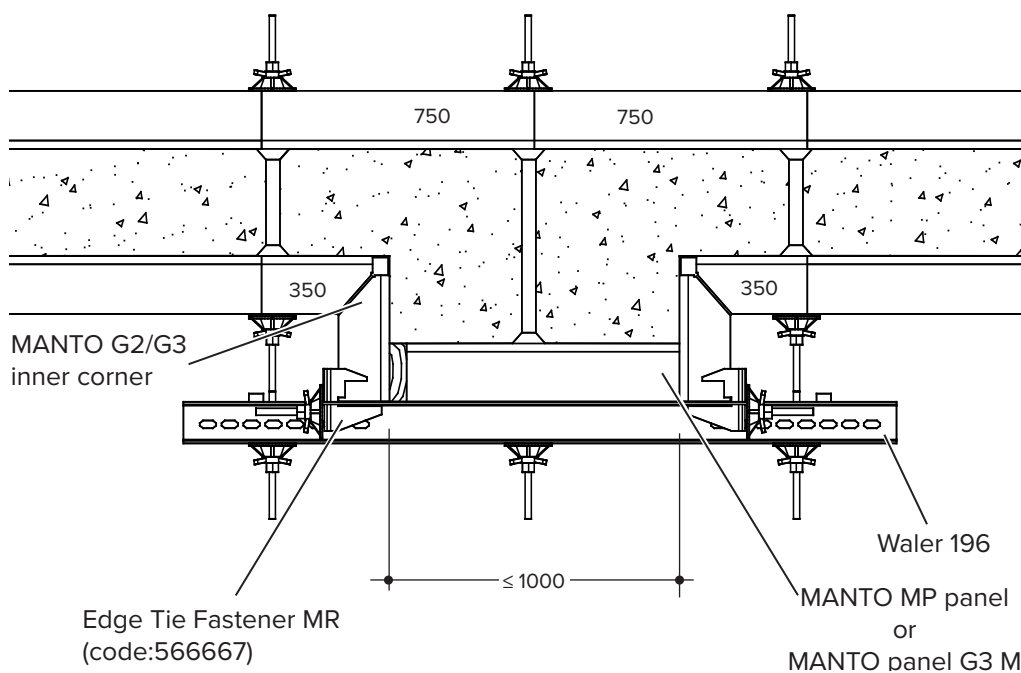
Forming of pilasters with a width between 400 mm to 500 mm is possible as shown below. An additional tie is not required.



Secure the timber beams and boards provided on site to withstand the anticipated concrete load.

### 500 mm to 1000 mm wide pilasters

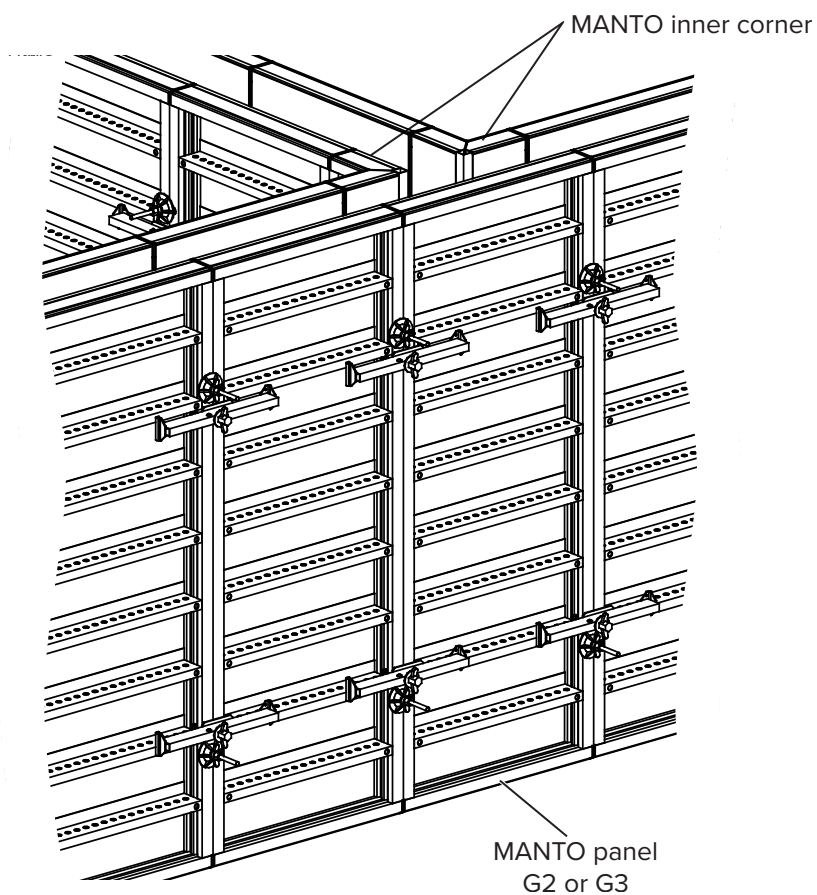
Additional ties are needed for wider pilasters. In this case, attach a steel waler of adequate dimensions to the MANTO Inner Corner using the Edge Tie Fastener MR and Waler Spanners.



One MANTO One Aligning Panel Clamp (code:448000) every meter is required in this position.

## 11.3 T-walls

T-walls up to 600 mm thickness of 400mm can be formed with the MANTO can be formed with the MANTO system. Adjustments can be made using the various panel widths and the MANTO Corner Adjustment 5.

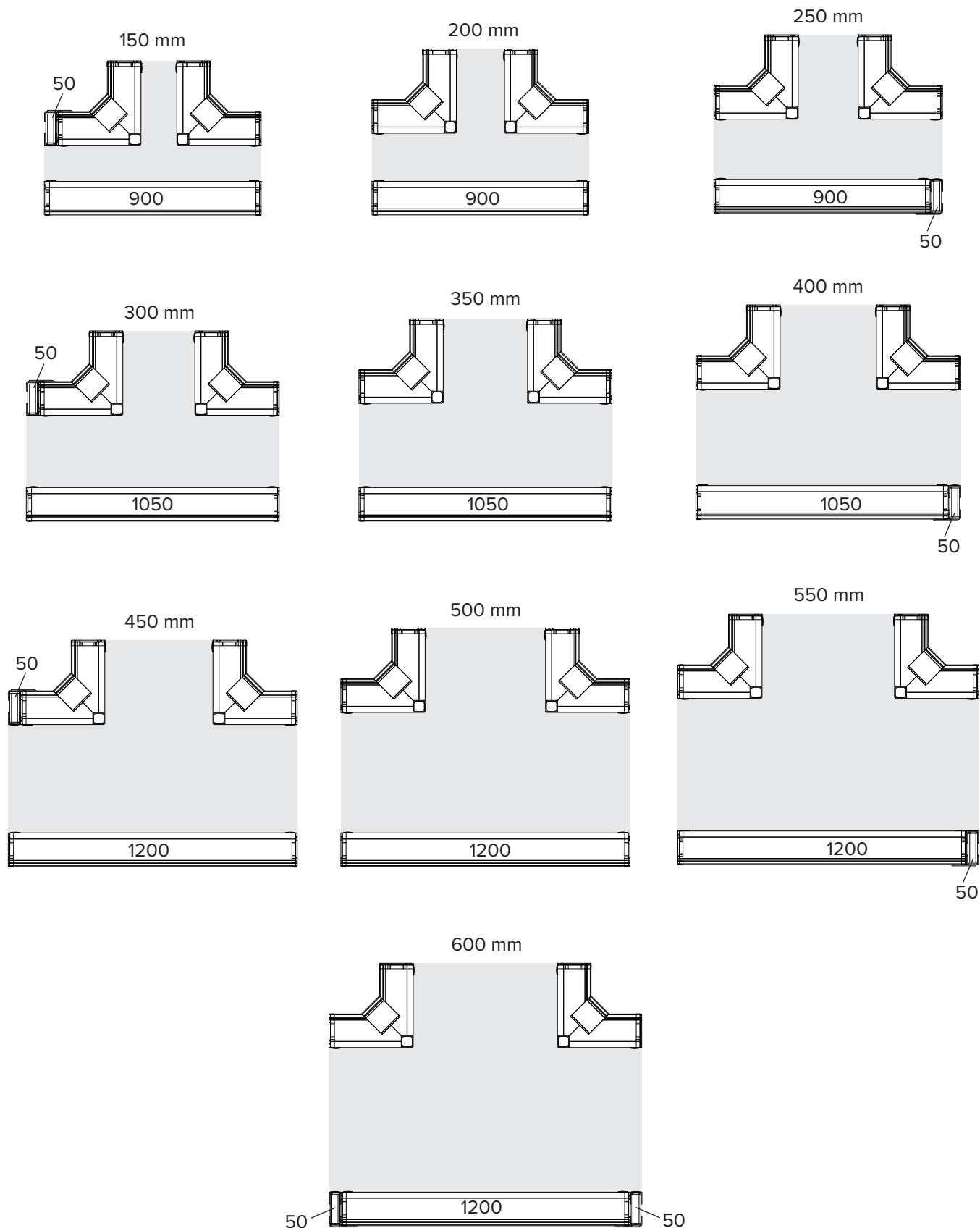




### Typical arrangements

The following illustrations show typical T-wall configurations using MANTO G2/G3 panels, MANTO G2/G3 inner corners and MANTO G2/G3 corner adjustments 5.

MANTO G2/G3 inner corners with 35 cm legs can be used to form walls that are 150 mm to 600 mm thick, in increments of 50 mm.



## 11.4 T-wall connection

When pouring concrete against an existing wall, it is advisable to use a MANTO corner adjustment 5. This allows standard equipment to be used and the regular materials to be used for tying.



### WARNING

#### Warning!

1. The existing wall must be capable of withstanding the additional load and, if required, it has to be braced adequately.
2. The formwork may have to be secured to prevent movement, e.g. by tying it to an existing structure.

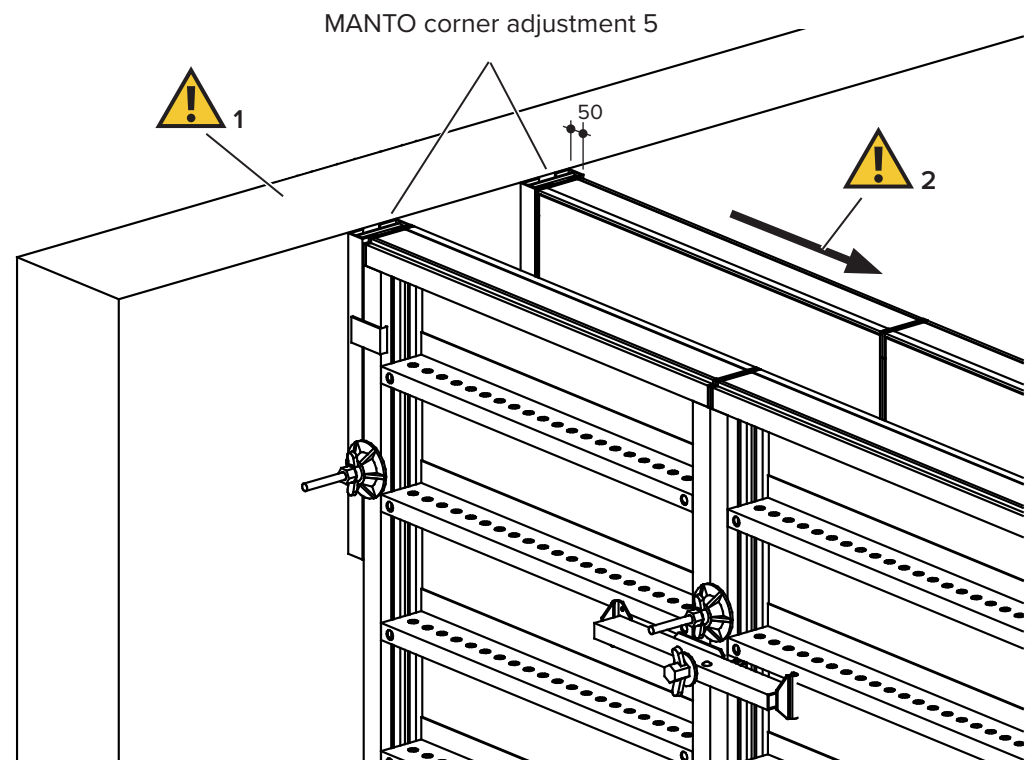
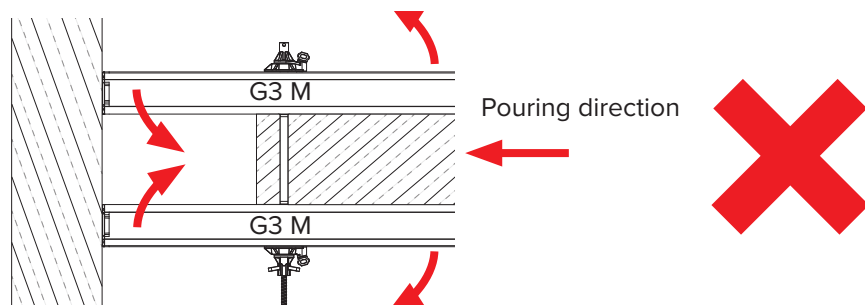
### NOTE

#### MANTO G3 M panels can seesaw!

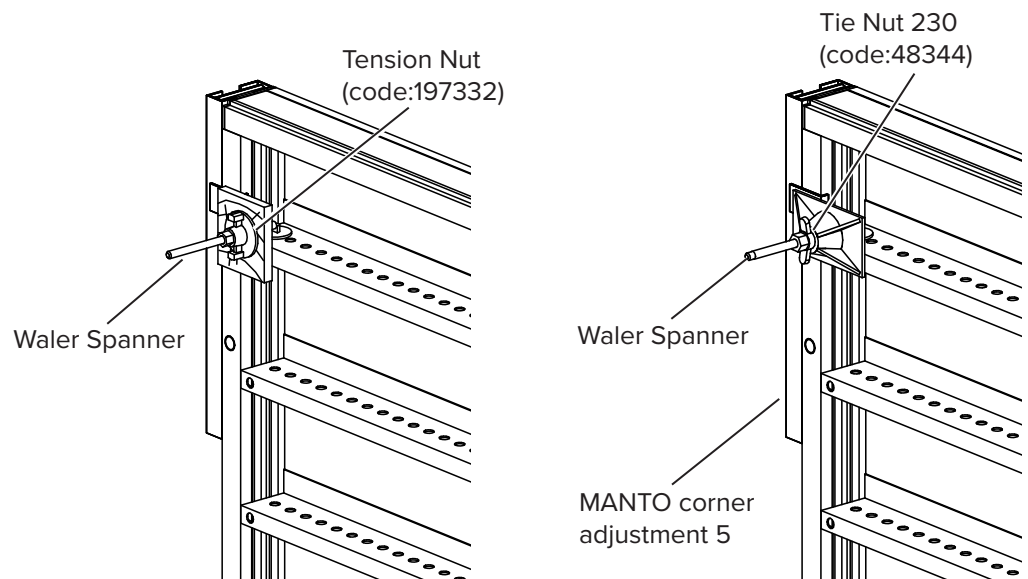
Because the panels are tied in the middle, an asymmetric load can cause the panels to seesaw.

Use only MANTO G3 M panels  $\leq 1.20$  m for wall connections. Use MANTO G3 panels or MANTO G3 M panels 240 as an alternative for wall connections.

Pressure-resistant struts have to be provided on site and placed by recesses. Refer to page 75.



To connect the MANTO Corner Adjustment 5 to a MANTO Panel, the Tension Nut or the Tie Nut 230 with the Waler Spanner can be used as shown below. Connecting in either of these ways allows the MANTO Corner Adjustment 5 to remain attached to the MANTO Panels when lifting them by crane.



## 12 Stopends

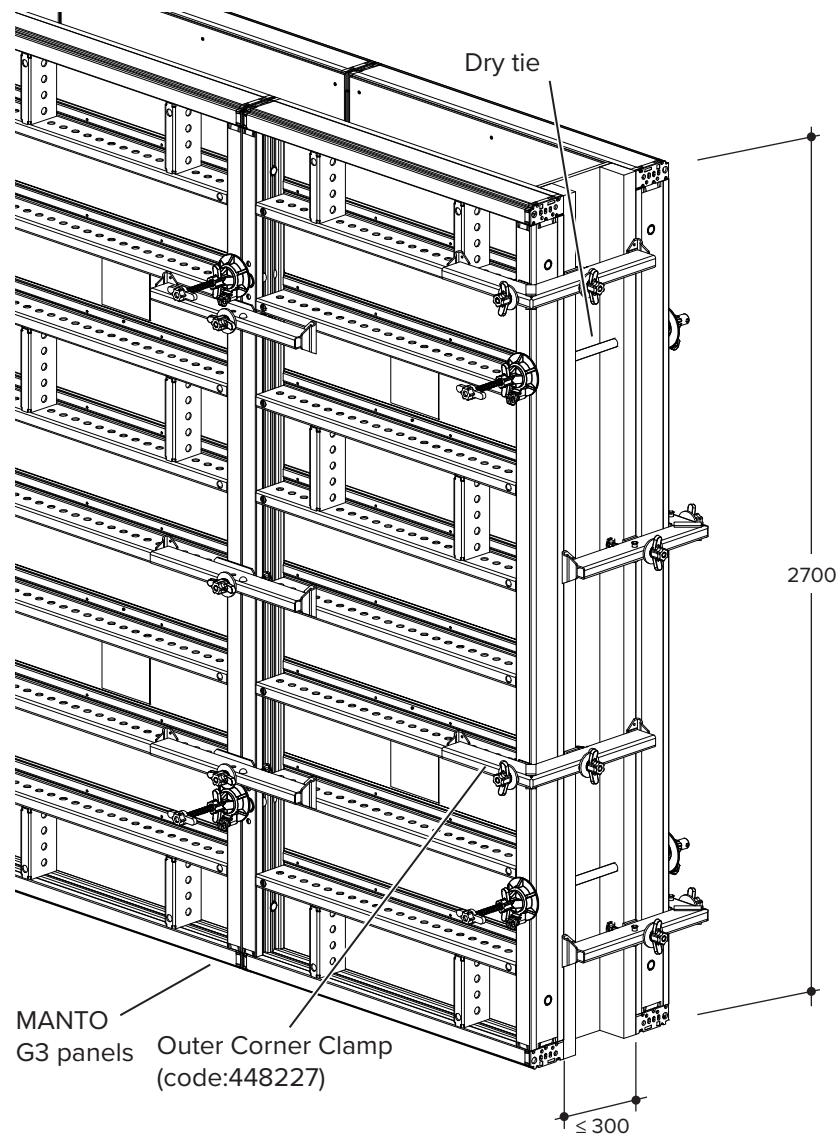
There are three ways to create stopends using the MANTO formwork system:

- For wall thicknesses up to 300 mm, use Outer Corner Clamps (code:448227, refer to section 12.1) to create the stopend.
- For wall thicknesses 100 – 425 mm, use the PLATINUM 100 Bulkhead Clamp (code:604328, refer to section 12.2) to create the stopend.
- For wall thicknesses > 425 mm, use the Multipurpose Waler 100 (code:450764: refer to section 12.3) to create the stopend.

### 12.1 With Outer Corner Clamps

#### Up to 300 mm wall thickness

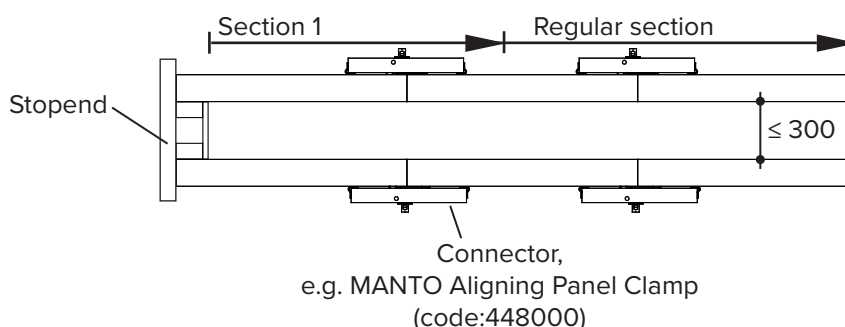
For wall thicknesses up to 300 mm, stopends can be created using the Outer Corner Clamp (code:448227). The Outer Corner Clamps have to be secured on the end panels and attached as shown below.



Be aware that some sections are subjected to higher tensile loads (Refer to the table below)!

The following table shows the quantity of Outer Corner Clamps needed at the stopends and the connectors needed in the section 1, which is subjected to a higher tensile load.

MANTO panel (Height)	Stopend	
	Wall thickness $\leq 300$ mm	
	Stopend	Section 1 < 500 mm
	No. of Outer Corner Clamps	No. of Aligning Panel Clamps
2.70 m	4	2
3.30 m	5	2
2.70 m / 1.20 m	4/2	2/1
3.30 m / 1.20 m	5/2	2/2
2.70 m / 2.70 m	4/4	3/2
2.70 m / 3.30 m	4/4	3/2
3.30 m / 3.30 m	5/4	3/2

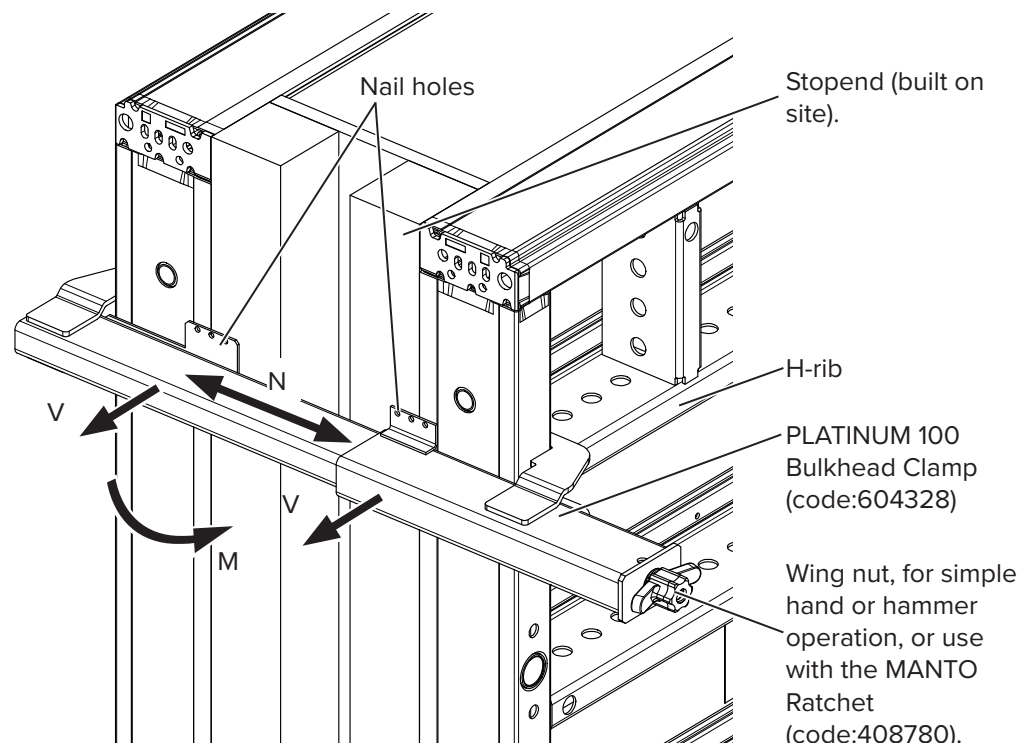


All information shown above is valid for concrete of normal consistency with an assumed coefficient of friction of  $\mu = 0.20$  between the concrete and formwork. Liquid concrete and concrete with low consistency must be checked separately.

12.2 Using the PLATINUM 100 Bulkhead Clamp

From 100 mm to 425 mm wall thickness

Stop-ends for wall thicknesses ranging from 100 mm to 425 mm can be formed with the PLATINUM 100 Bulkhead Clamps. The Bulkhead Clamps support the stop-end formwork and also act as tension-resistant dry ties. They can be attached at any height to MANTO panels assemblies either upright or lying on the ground. The nail holes in the PLATINUM 100 Bulkhead Clamps make it easy to secure the timber stopend formwork.



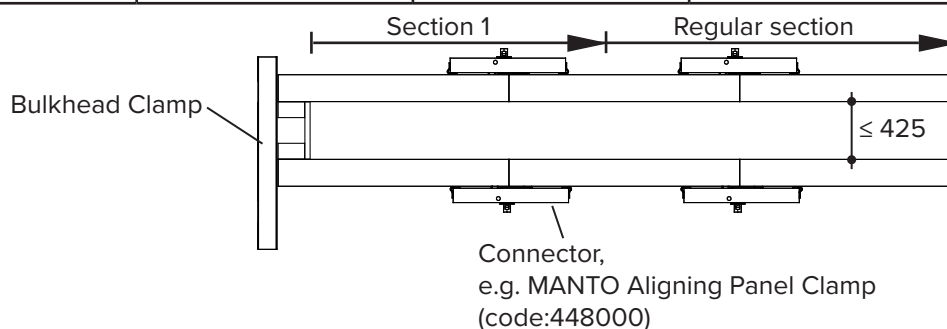
Safe Working Load of the PLATINUM 100 Bulkhead Clamp (code:604328)		
Tensile (N):	36.00	kN.
Shear (V):	36.00	kN.
Bending (M):	5.00	kNm.



Be aware that some sections are subjected to higher tensile loads (Refer to the table below)!

The following table shows the quantity of Bulkhead Clamps needed at the stopends and the connectors needed in the section 1, which is subjected to a higher tensile load.

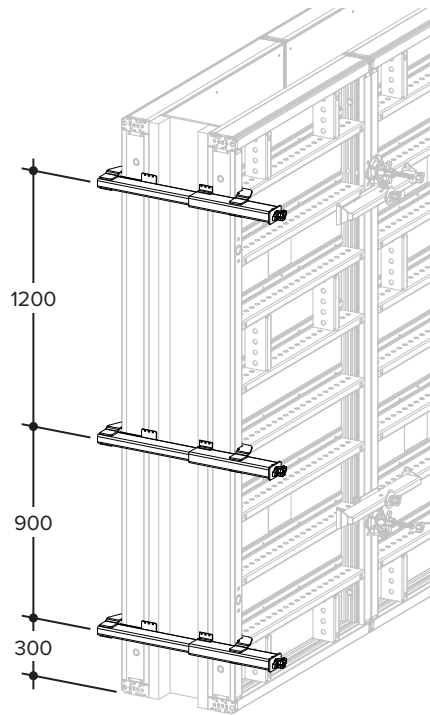
Stopend				
MANTO panel (Height)	Wall thickness $\leq 300$ mm		Wall thickness 300 mm – 425 mm	
	Stopend	Area 1 < 500 mm	Stopend	Section 1 < 850 mm
	No. of stop-end holders*	No. of Aligning Panel Clamps	No. of stop-end holders*	No. of Aligning Panel Clamps
2.70 m	3	2	3	2
3.30 m	3	2	3	2
2.70 m / 1.20 m	3/1	2/1	3/1	2/2
3.30 m / 1.20 m	4/1	2/2	4/1	3/2
2.70 m / 2.70 m	3/3	3/2	3/3	3/3
2.70 m / 3.30 m	3/4	3/2	3/4	3/3
3.30 m / 3.30 m	4/4	3/2	w.a.f 18/4	3/3



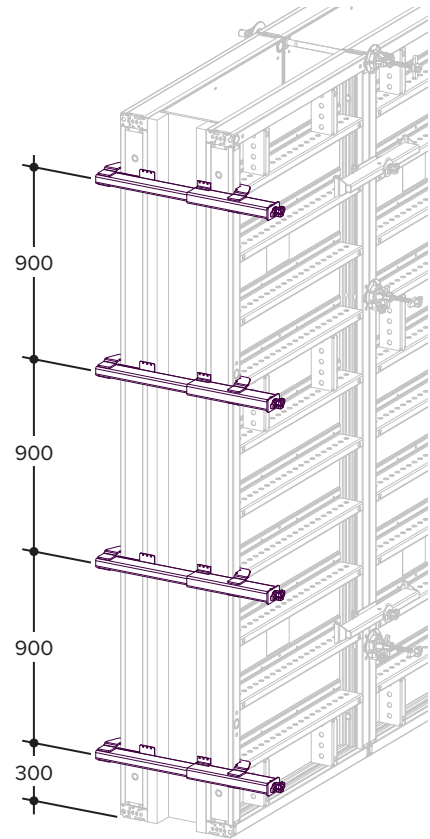
All information shown above is valid for concrete of normal consistency with an assumed coefficient of friction of  $\mu = 0.20$  between the concrete and formwork. Liquid concrete and concrete with low consistency must be checked separately.

12.2.1 Maximum spacing of PLATINUM 100 Bulkhead Clamps when formwork is not stacked

Panels 270,  
hydrostatic concrete pressure



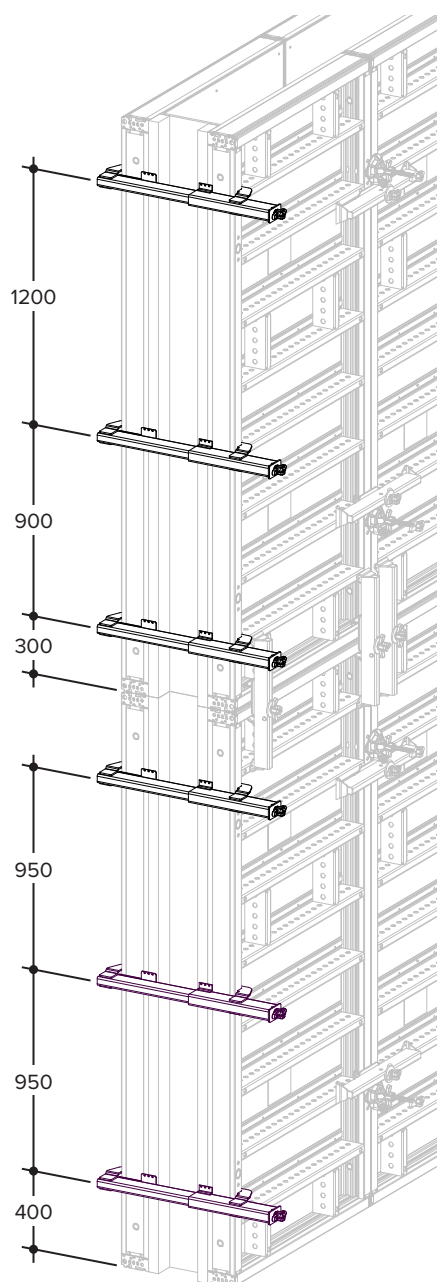
Panels 330,  
hydrostatic concrete pressure



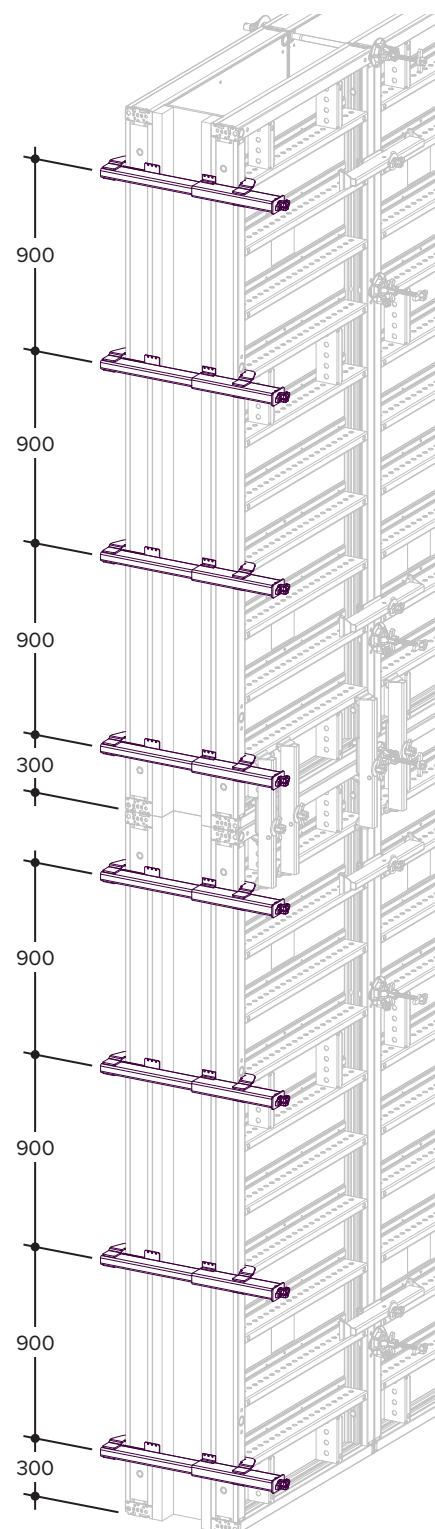


## 12.2.2 Maximum spacing of PLATINUM 100 Bulkhead Clamps with extended formwork (concrete pressure max. 80 kN, steady)

Panels 270,  
Hydrostatic and  
steady concrete pressure

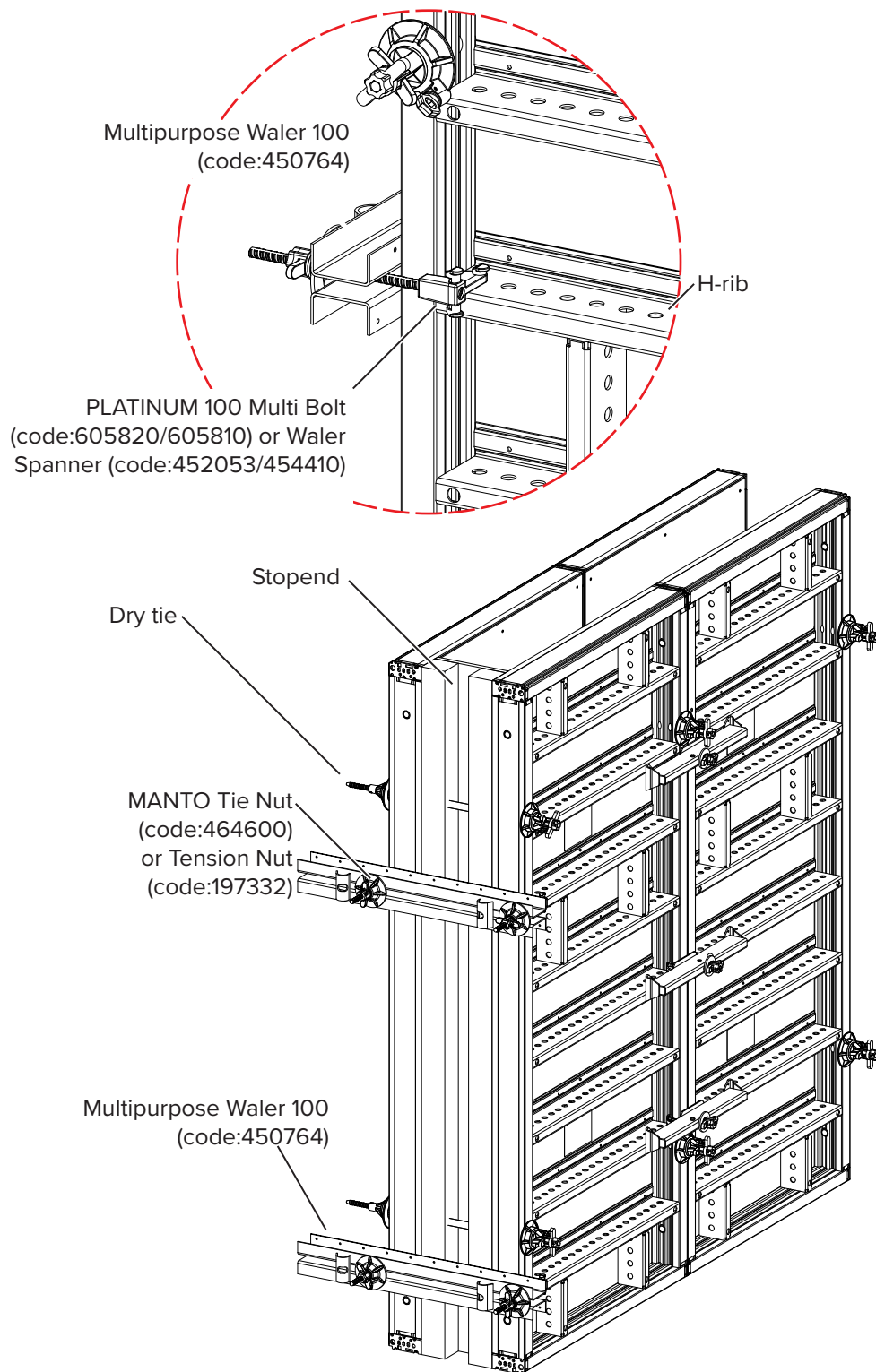


Panels 330,  
Hydrostatic and  
steady concrete pressure



## 12.3 Using the Multipurpose Waler 100

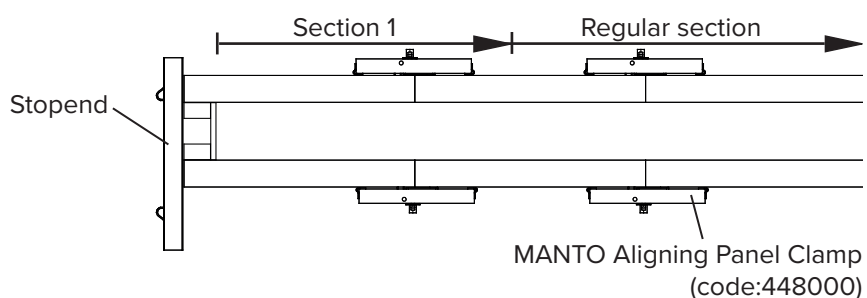
The Multipurpose Waler 100 (code:450764) is used to form a stopend for a wall thicker than 425 mm. It is fastened to the last MANTO Panels, tied in the usual manner, with 2no. PLATINUM 100 Multi Bolts or 2no. Waler Spanners.



Be aware that some sections are subjected to higher tensile loads (Refer to the table below)!

The following table shows the quantity of Multipurpose Walers 100 needed at the stopends and the connectors needed in the section 1, which is subjected to a higher tensile load.

Stopend				
MANTO panel (Height)	Wall thickness $\leq 300$ mm		Wall thickness 300 mm – 425 mm	
	Stopend	Section 1 < 500 mm	Stopend	Section 1 < 850 mm
	No. of Multipurpose Walers 100	No. of Aligning Panel Clamps	No. of Multipurpose Walers 100	No. of Aligning Panel Clamps
2.70 m	2	2	2	2
3.30 m	2	2	2	2
2.70 m / 1.20 m	2/1	2/1	2/1	2/2
3.30 m / 1.20 m	2/1	2/2	2/1	3/2
2.70 m / 2.70 m	2/2	3/2	2/2	3/3
2.70 m / 3.30 m	2/2	3/2	2/2	3/3
3.30 m / 3.30 m	2/2	3/2	2/2	3/3



All information shown above is valid for concrete of normal consistency with an assumed coefficient of friction of  $\mu = 0.20$  between the concrete and formwork. Liquid concrete and concrete with low consistency must be checked separately.

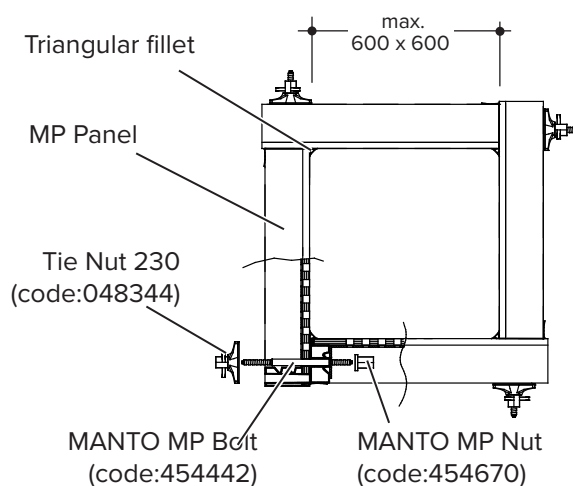
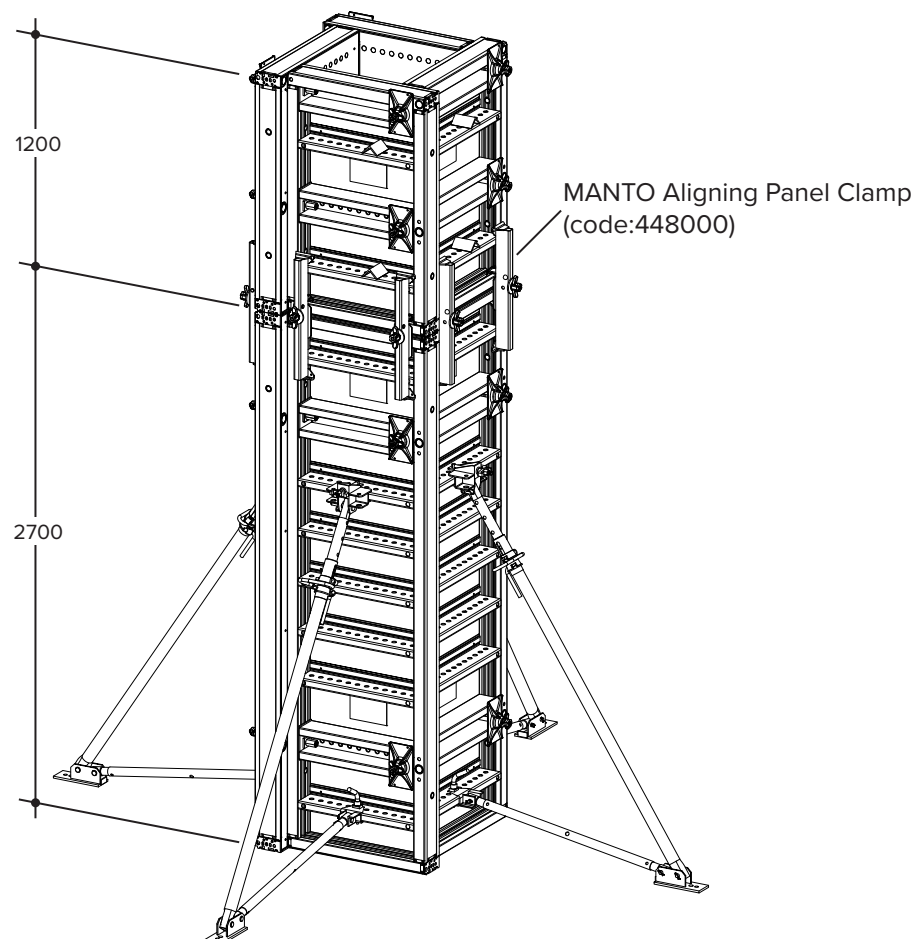
## 13 Column formwork

### 13.1 Using MANTO MP panels

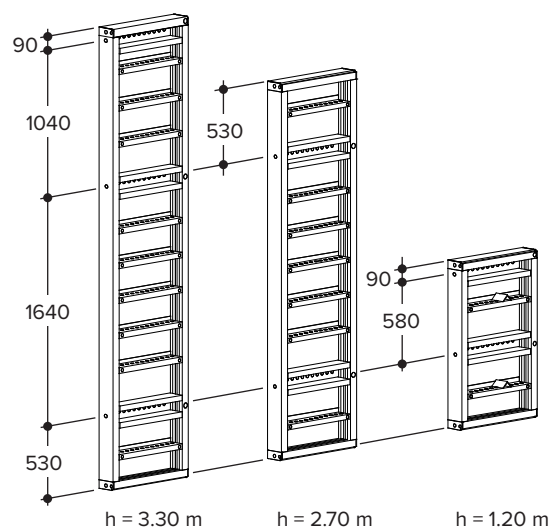
With their tying holes in 50 mm increments and the transverse hole in the edge profile, MANTO MP panels are ideal for forming square and rectangular columns. The extension panels are connected using the MANTO Aligning Panel Clamp.

Maximum column size: 600 mm x 600 mm.

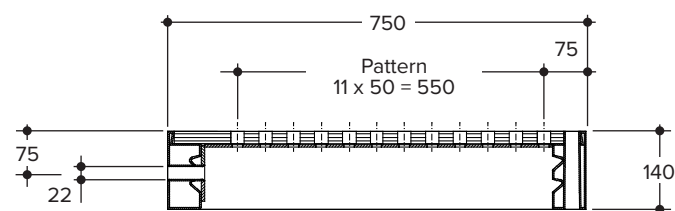
Permitted fresh concrete pressure: 80.00 kN/m<sup>2</sup>.



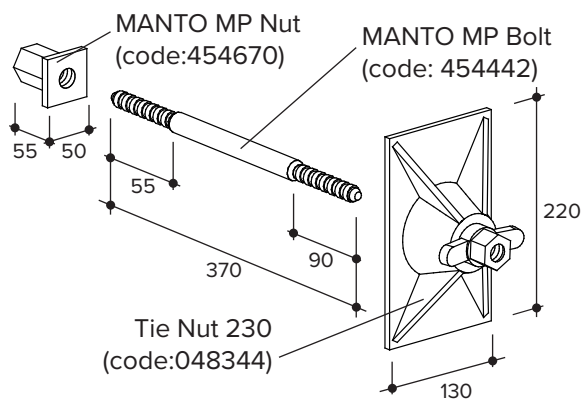
Three different panel heights are available.



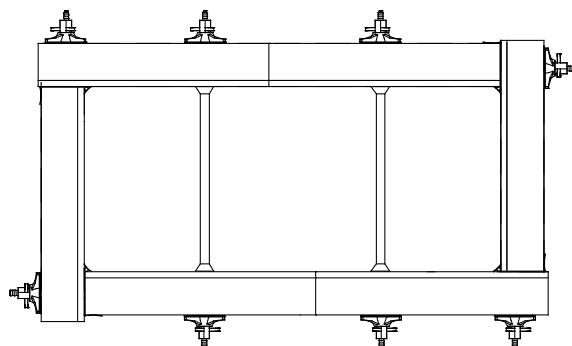
The available tie holes of the MP panels can be seen in the typical cross-section shown below.



The panels are connected to the MP Bolt, the MP Nut and the Tie Nut 230. For forming heights of up to 2.70 m, only 2no. connections per panel are required.



With additional ties and MP panels, larger column cross-sections can be formed.



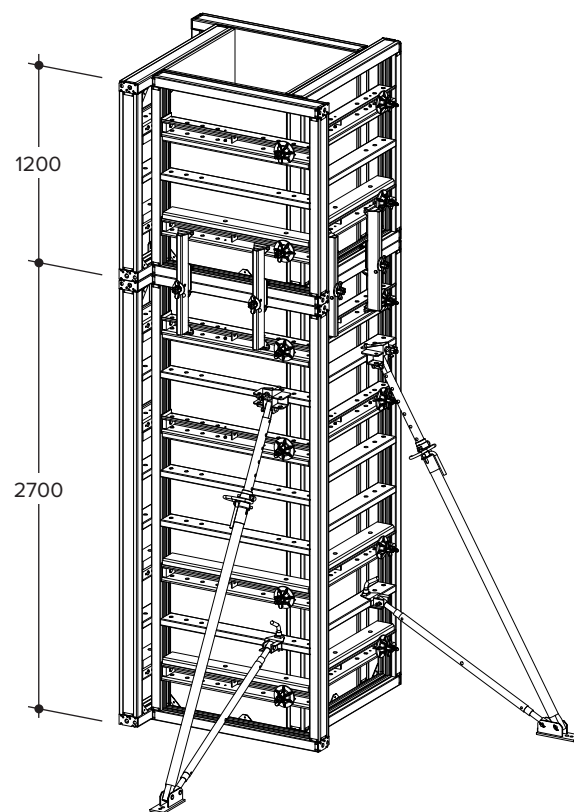
## 13.2 Using MANTO Column Frames

The MANTO Column Frames are supplied without the form sheet. They can be covered on site with a sturdy form sheet, using the built-in wooden strip.

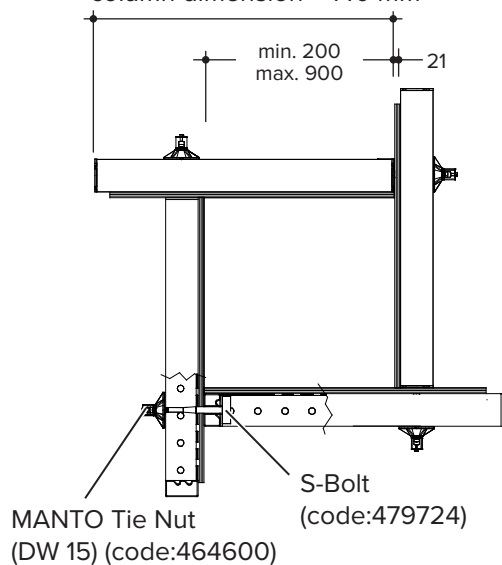
Form sheets in cut-to-size shapes, with or without hole patterns, can be purchased from Hünnebeck.

Maximum column size: 900 mm x 900 mm.

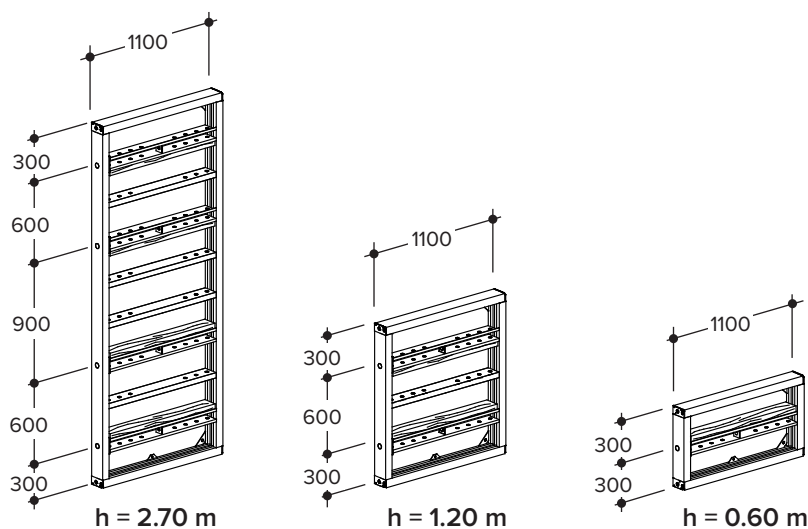
Permitted fresh concrete pressure: 100.00 kN/m<sup>2</sup>.



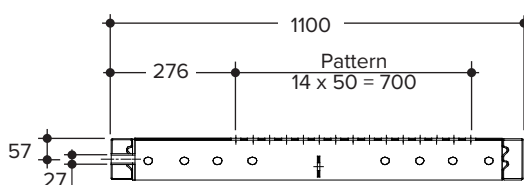
Width of plywood sheet =  
column dimension + 140 mm



Three different MANTO Column Frame panels are available.

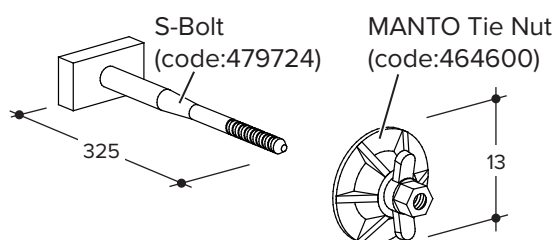


The available tie positions of the panels can be seen in the typical horizontal section shown below.



The panels are connected to a MANTO Tie Nut and an S-Bolt.

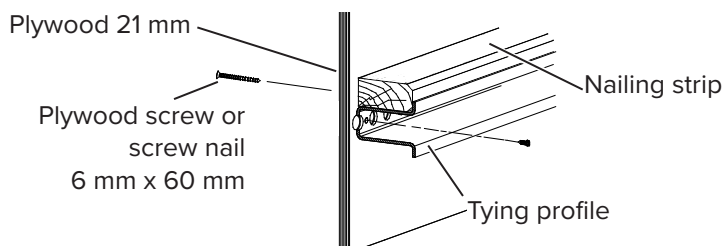
Column formwork of 2.70 m requires 16no. S-Bolts and 16no. MANTO Tie Nuts. An extension of 1.20 m requires 8no. S-Bolts and 8no. MANTO Tie Nuts. An extension of 0.60 m requires 4no. S-Bolts and 4no. MANTO Tie Nuts.



The form sheets must be fixed to the panels before the panels are tied.

### Attaching plywood sheet

The plywood sheet can be screwed or nailed onto the nailing strip or screwed from the rear through the tying profile. There are also fasteners at the upper and lower edge profile of the MANTO Column Frames.



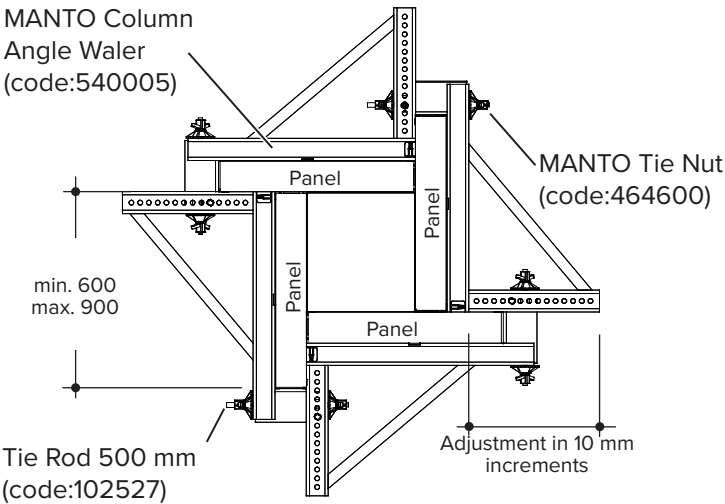
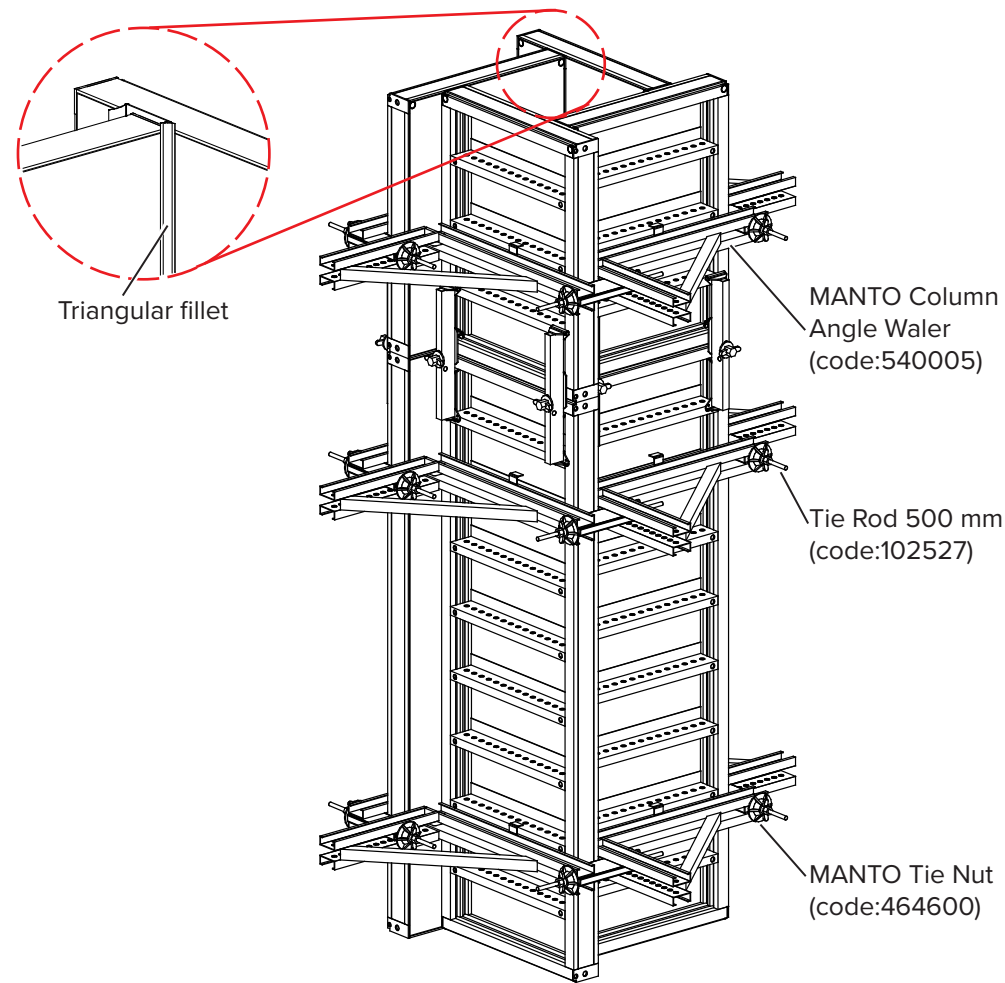
13.3 Using the MANTO Column Angle Waler

The MANTO Column Angle Waler allows columns to be formed without having to use special panels. Standard MANTO panels 600 mm to 900 mm wide are used for this solution.

The Triangular Column Fillet (simply attached to the edge of the MANTO Panel) assures a clean concrete edge.

Column edge length: 200 mm to mm (in mm increments)

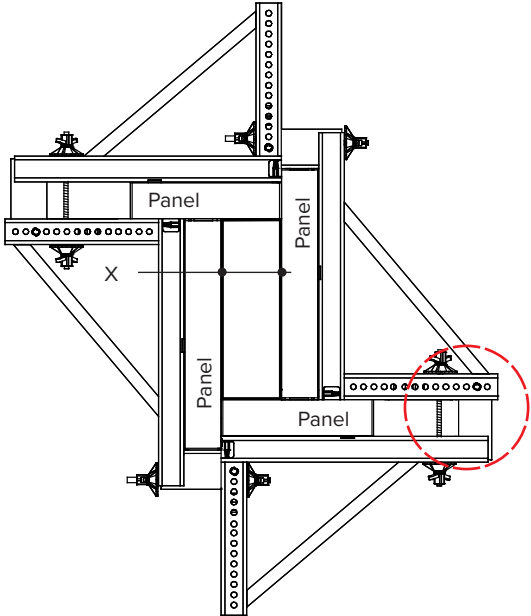
Permitted fresh concrete pressure: 80.00 kN/m<sup>2</sup>.



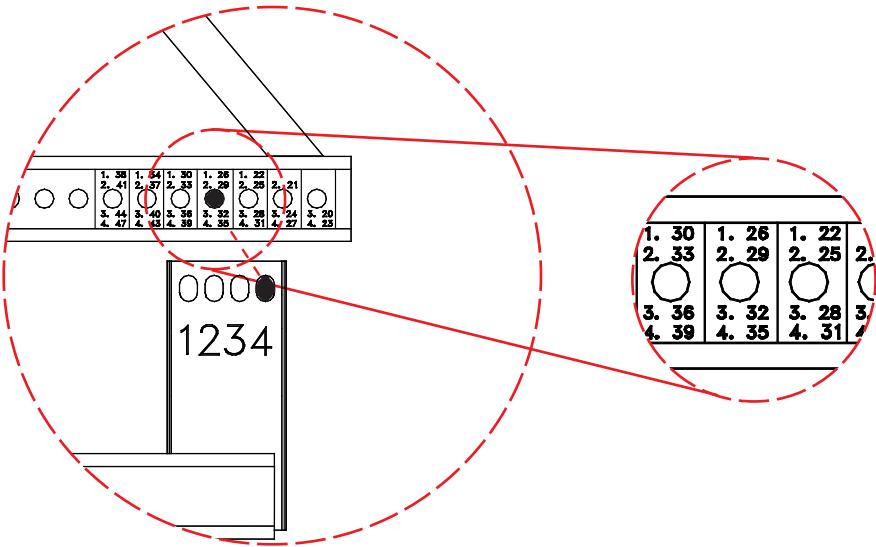


Panels ranging in width from 600 mm to 900 mm can be used to create non-square columns. The marking of the hole pattern allows easy adjustment to the desired column dimensions. Find the hole on the grid with the appropriate dimension and connect it to the hole with the number preceding the dimension (1 to 4).

The “X” distance is set with the markings on the Column Waler.

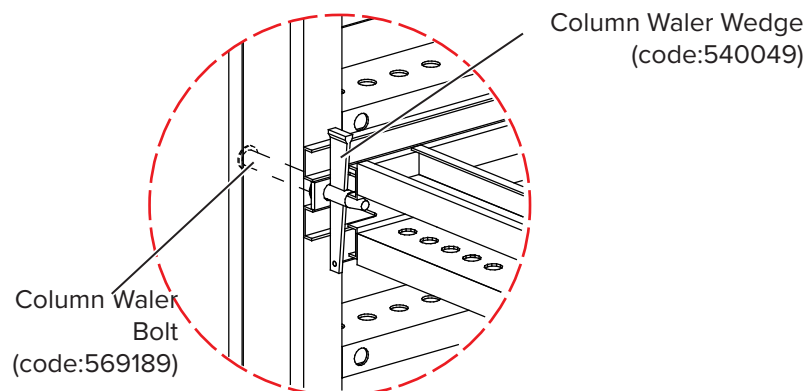
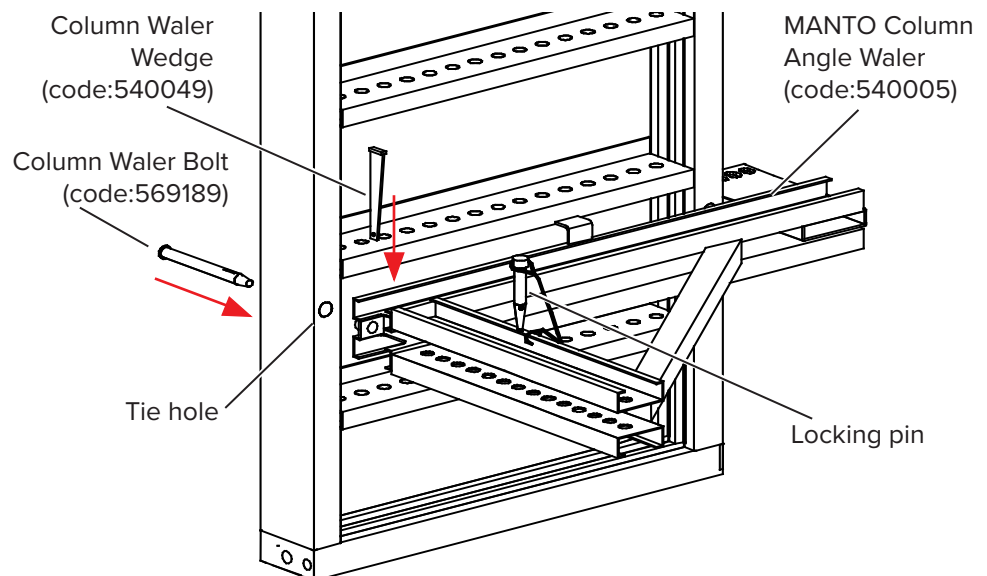


For a column with a cross-section of 350 mm for example, assemble as shown in the details below.



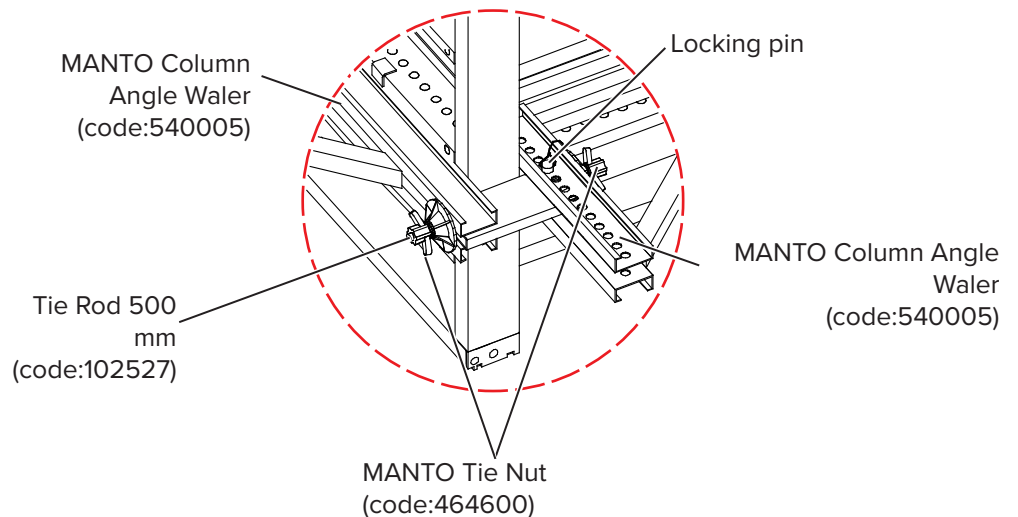
The values on the hole pattern of the MANTO Column Angle Waler are indicated in centimetres.

The MANTO Column Angle Walers must be fastened through the tie hole with a Column Waler Bolt and a Waler Wedge on each of the four panels. This determines the position and quantity of the walers.



After assembling the panels, the MANTO Column Angle Walers must be mounted. The spacing of the MANTO Column Angle Walers should be adjusted to the desired column dimension by using the captive safety pin.

Finally, by installing the tie (2no. MANTO Tie Nuts and a Tie Rod DW15 500mm) the column formwork is closed and ready to use.



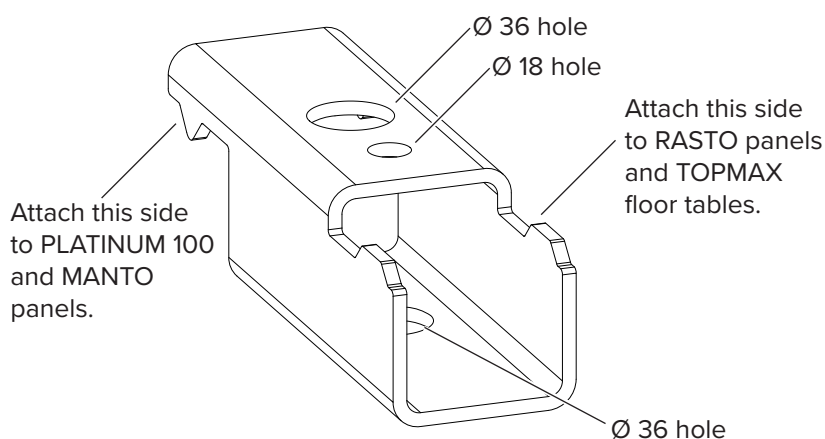
## 14 Formwork restraint

### 14.1 Tying panels to the ground

MANTO panels can be tied to the ground (concrete) with the Panel Anchor Bracket and the Anchor Bolt MM+SSK 16 × 130 mm. This secures the formwork against uplift, e.g. when it is windy.

#### 14.1.1 Panel Anchor Bracket

The Panel Anchor Bracket (code:605999) is a multi-system component used to restrain panels. The Panel Anchor Bracket is designed to accommodate panels from different systems. The position/orientation depends on the respective panel.



The Panel Anchor Bracket (code:605999) is secured using the Anchor Bolt MM+SSK 16 x 130 mm (code:443500). The Panel Anchor Bracket has 2no. staggered Ø18 holes on opposite faces for installing the Anchor Bolt. Two Ø36 holes are aligned with the smaller holes on the opposite face, allowing the Anchor Bolt to be passed through the holes.

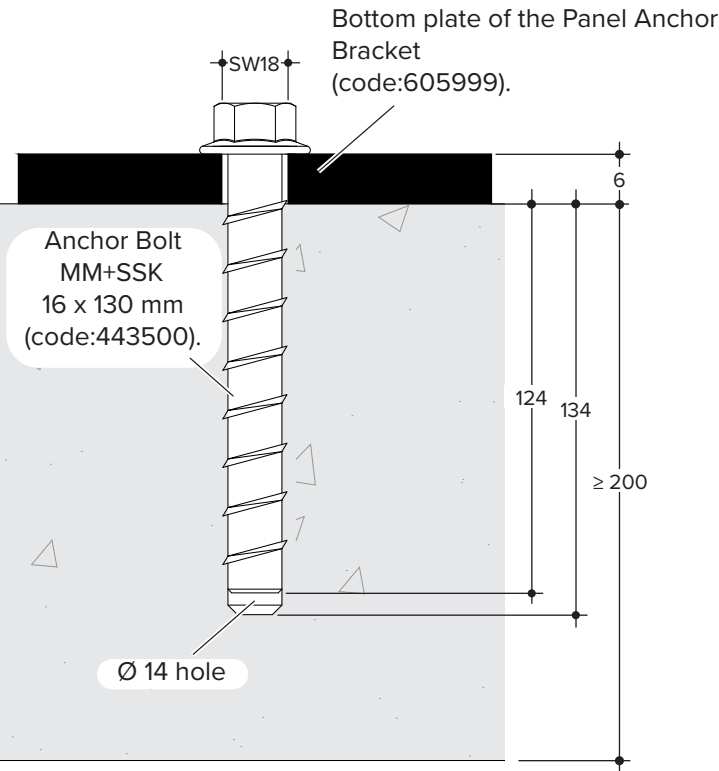
Only one Anchor Bolt is required per Panel Anchor Bracket. To fasten the Anchor Bolt, tighten it with a 24 mm spanner with a spanner extension.



The Panel Anchor Bracket is intended to protect formwork panels from uplift. The Panel Anchor Bracket does **not** eliminate the need to secure formwork elements against overturning, e.g. using MANTO Alignment Struts!

14.1.2    Anchor Bolt MM+SSK 16 x 130 mm

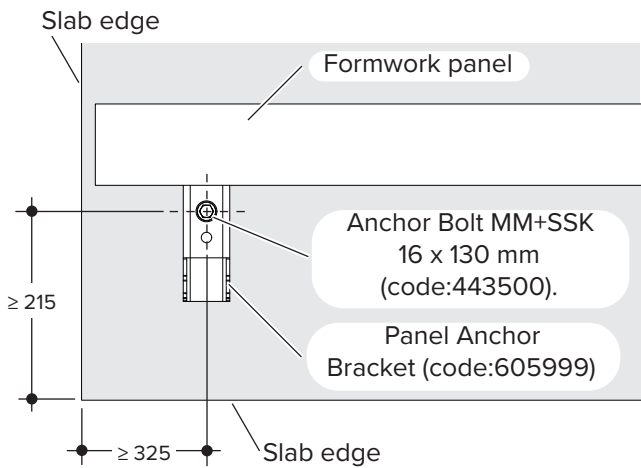
The Anchor Bolt MM+SSK 16 x 130 mm (code:443500) is used to temporarily secure components to the existing structure. The bolt can be tightened using a 24 mm spanner.



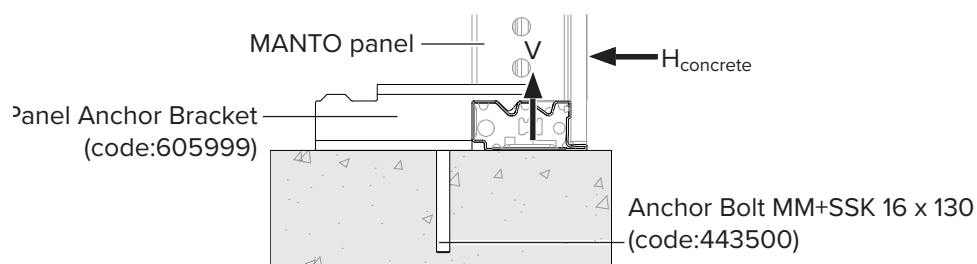
**WARNING**

**Risk of injury from overturning formwork panels!**

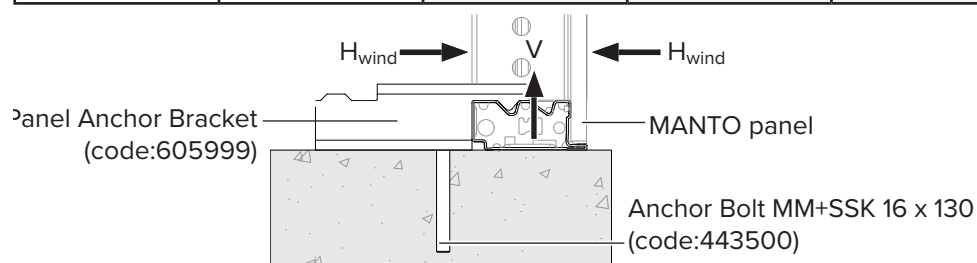
Ensure that the structure can withstand the additional load.



Anchor Bolt MM+SSK 16 x 130 mm (code:443500)		
Data		
Length	L	130 mm
Drill [Ø]	d0	14 mm
Spanner size	w.a.f.	24 mm
Minimum hole spacing	s	645 mm
Minimum edge distance	c	215 / 325 mm
Minimum concrete thickness	d	200 mm



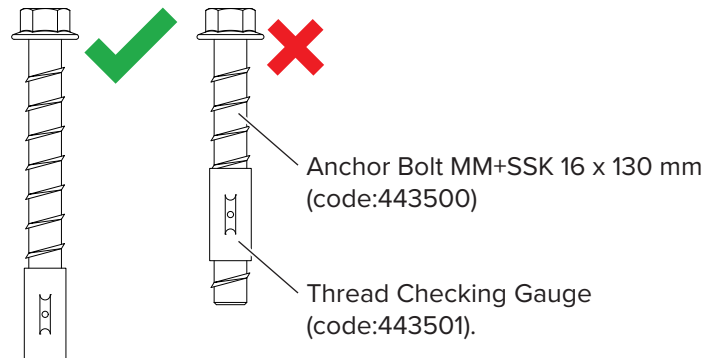
Panel Anchor Bracket (code:605999) + Anchor Bolt MM+SSK 16 x 130 (code:443500)				
Using MANTO panels				
Concrete pressure – SWL				
$H_{concrete}$ [kN]	Concrete strength			
	25 N/mm <sup>2</sup>	20 N/mm <sup>2</sup>	15 N/mm <sup>2</sup>	10 N/mm <sup>2</sup>
	$V$ [kN] panel uplift			
0.00	10.58	9.46	8.18	6.68
2.50	10.20	9.07	7.77	6.25
5.00	9.65	8.48	7.14	5.53
7.50	8.91	7.68	6.24	4.46
10.00	7.95	6.62	5.01	2.83
12.50	6.73	5.22	3.24	0.00
15.00	5.14	3.25	0.00	
17.50	2.88	0.00		
19.50	0.00			



Panel Anchor Bracket (code:605999) + Anchor Bolt MM+SSK 16 x 130 (code:443500)				
with MANTO panels				
Wind load – Safe Working Loads				
$H_{wind}$ [kN]	Concrete strength			
	25 N/mm <sup>2</sup>	20 N/mm <sup>2</sup>	15 N/mm <sup>2</sup>	10 N/mm <sup>2</sup>
	$V$ [kN] panel uplift			
0.00	10.58	9.46	8.18	6.68
2.50	8.00	6.87	5.57	4.05
5.00	5.25	4.09	2.74	1.14
7.50	2.31	1.09		
9.50	0.00			

## Re-using Anchor Bolts

When re-using Anchor Bolts MM+SSK 16 x 130 mm (code:443500) check the bolt beforehand with the Thread Checking Gauge (code:443501).

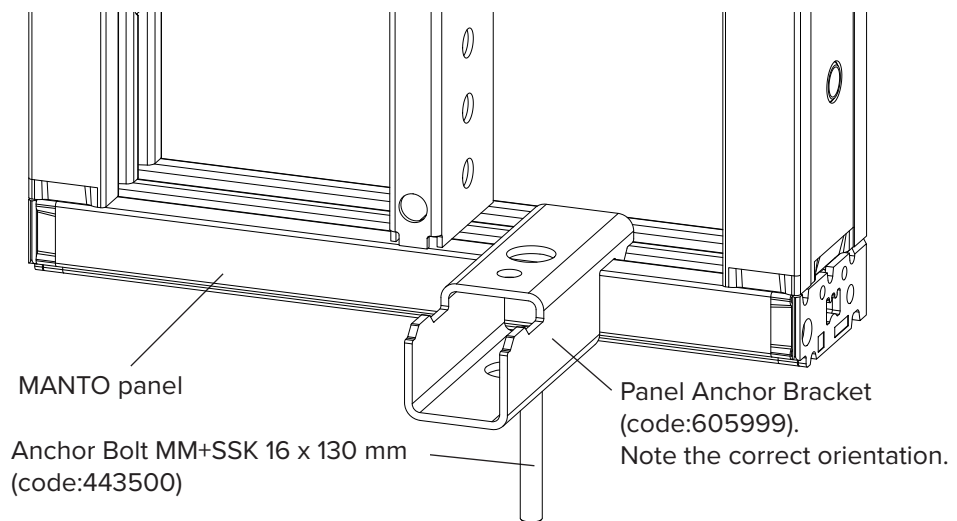


If a hole is drilled incorrectly, a new hole must be drilled at a distance equal to at least twice the actual depth of the incorrectly drilled hole.

Anchor Bolts can be re-used, but the same hole cannot be used a second time.

### 14.1.3 Tying panels to the ground with the Panel Anchor Bracket

The Panel Anchor Bracket (code:605999) can be attached to MANTO panels as shown below to secure MANTO panels against uplift.



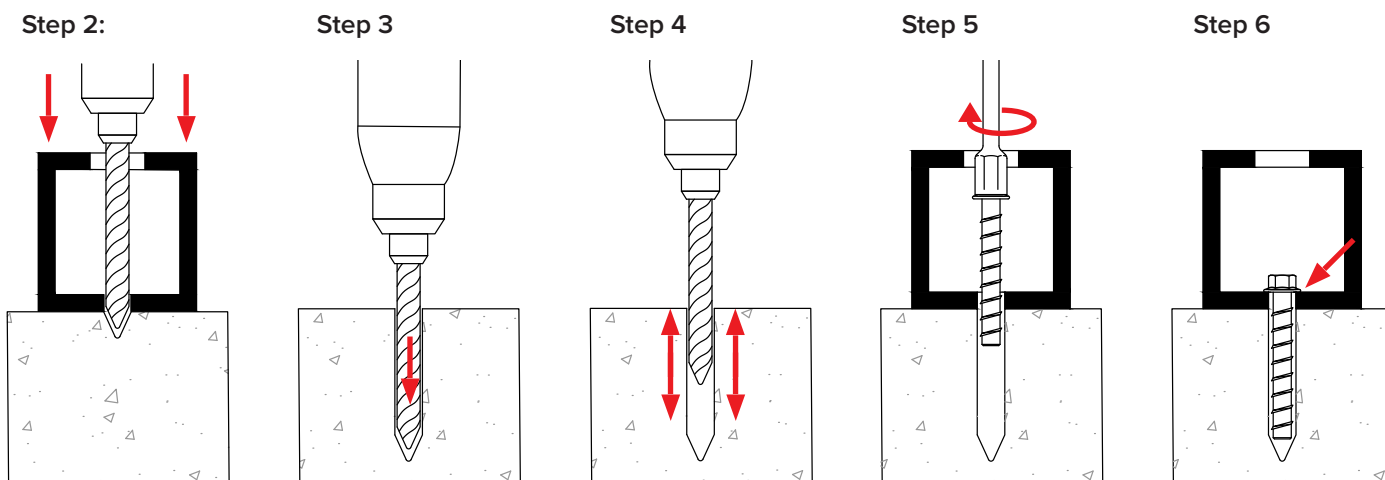
## WARNING

### Risk of injury from overturning formwork panels!

The Customer is responsible for verifying that the concrete strength of the existing structure is in accordance with the specifications shown in section 4.

## Installation

- Step 1** Place the Panel Anchor Bracket (code:605999) at the edge profile of the MANTO panel at the location specified by the supplied scheme.
- Step 2** Pass a  $\varnothing 14$  drill bit through the  $\varnothing 18$  hole in the Panel Anchor Bracket (code:605999) and mark where the hole should be drilled. Remove the Panel Anchor Bracket.
- Step 3** Use a  $\varnothing 14$  drill bit to drill a 134 mm hole in the existing structure.
- Step 4** Remove dust from the drilled hole.
- Step 5** Place the Panel Anchor Bracket at the edge profile again, insert the Anchor Bolt through the  $\varnothing 36$  hole and screw tight using a 24 mm spanner with an extension.
- Step 6** Ensure that the Panel Anchor Bracket (code:605999) is securely bolted.



## Spacing

Spacing of the Panel Anchor Brackets (code:605999) is a factor of the conditions on site, such as formwork height and weight, wind load, etc. It has to be calculated individually for each application!

14.2 Bracing panels

14.2.1 Struts for formwork heights up to 3.90 m

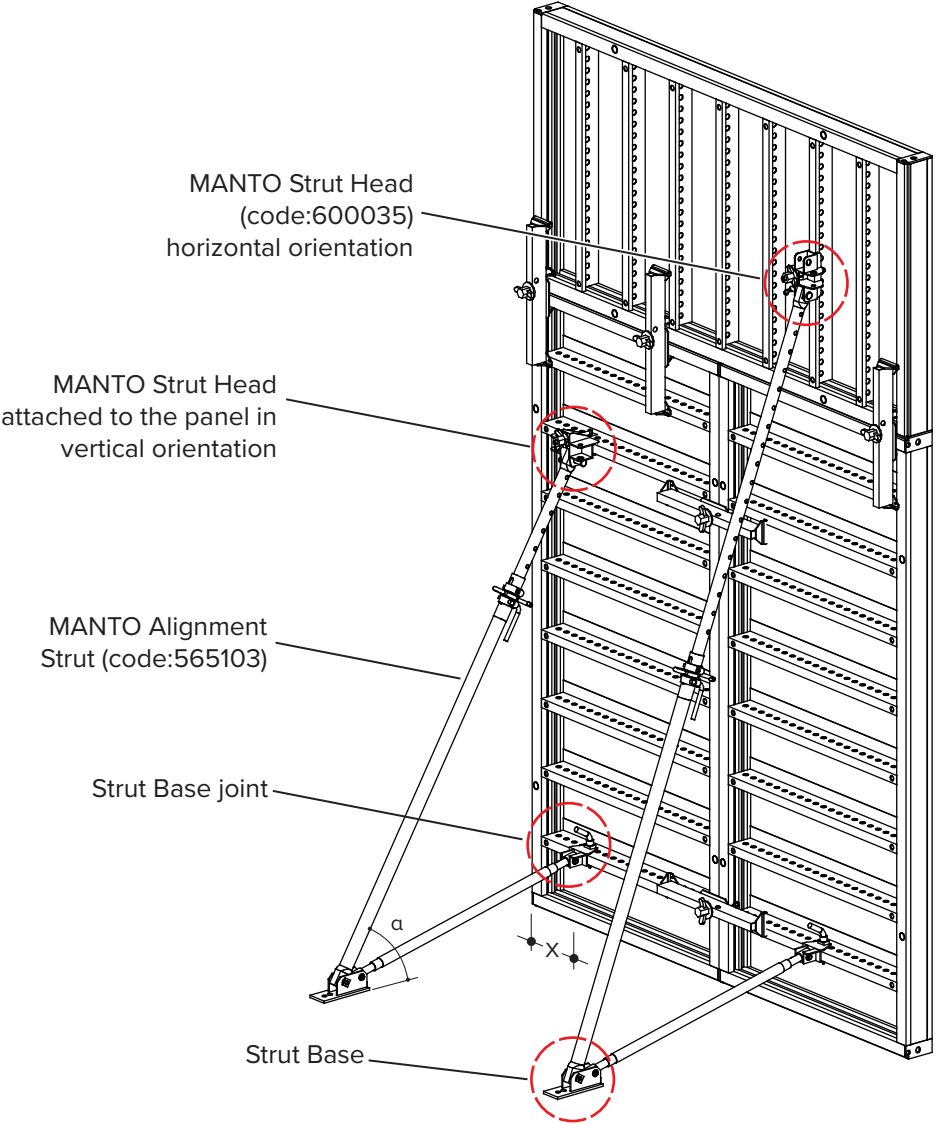
The MANTO Alignment Struts (code:565114) are used with formwork heights of up to 3.90 m. The MANTO strut is attached to a rib of the MANTO panel which can be either in a horizontal or vertical orientation.



Props must be placed as near as possible to the vertical panel joint or the centre profile.



For information on the Safe Working Loads SWL), refer to pages 29 ff. and 166.



Always follow the instructions in the User Guide for the struts.



**MANTO Strut Head**

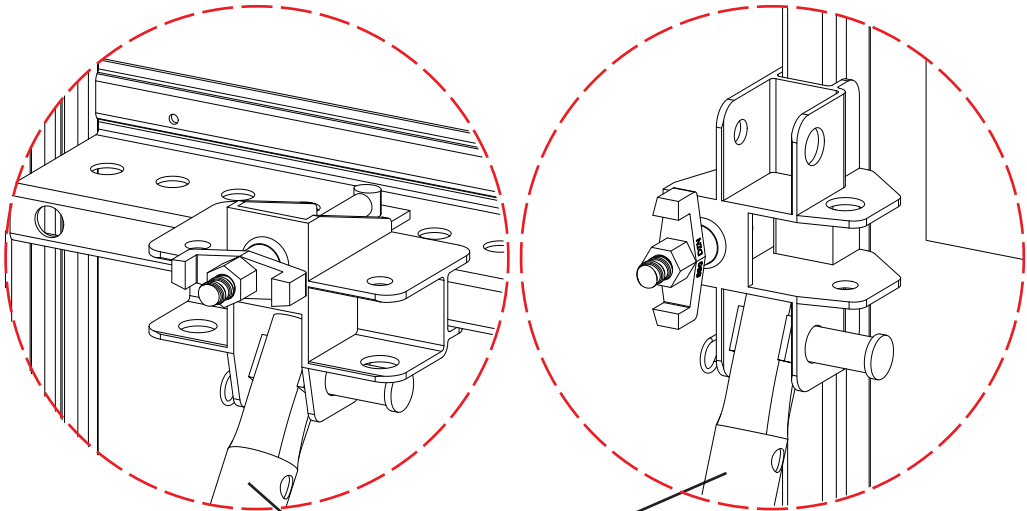
The MANTO Strut Head (code:600035) can be connected to vertically or horizontally orientated MANTO panels.

The following table shows the permitted strut loads.

	Safe working load [kN] (strut load $N_{perm}$ )					
	MANTO Strut Head with vertical panels (horizontal ribs)					
	Strut angle $\alpha$ to the horizontal	Distance to panel edge or centre profile				
		200 mm	300 mm	400 mm	500 mm	600 mm
	50°	8.25	6.16	5.19	4.73	4.63
	55°	7.50	5.56	4.69	4.31	4.19
	60°	6.87	5.13	4.31	3.98	3.85
MANTO Strut Head with horizontal panels (vertical ribs)						
10.00						

MANTO Strut Head  
(code:600035)  
vertical panel orientation

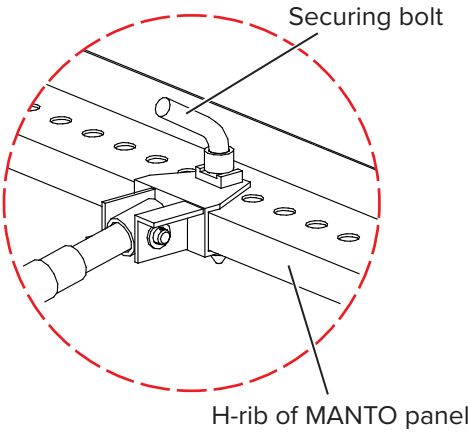
MANTO Strut Head  
(code:600035)  
horizontal panel orientation



MANTO  
Alignment Strut  
(code:565103)

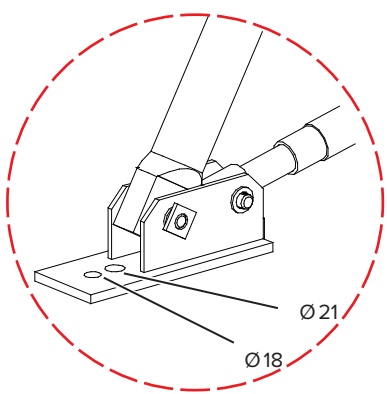
Base connector of the strut

Strut Base



Securing bolt

H-rib of MANTO panel

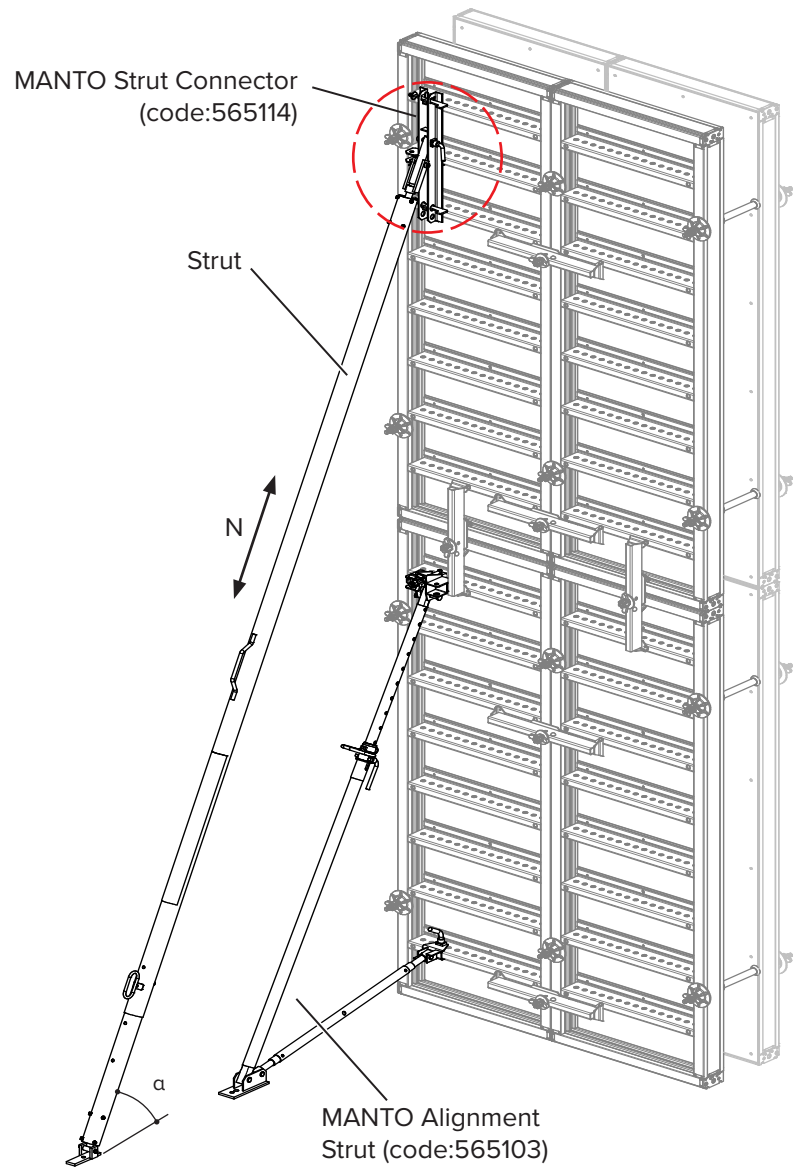


Ø21

Ø18

14.2.2 Struts for formwork heights of more than 3.90 m

When additional struts are required to extend MANTO formwork in height (higher than 3.90 m), use struts (K struts and Alignment Strut Super 10 (code:602095). All struts can be telescoped and are lightweight. The encapsulated thread facilitates fine-tuning.



The maximum strut loads for the connection to upright panels are a factor of the distance of the strut head to the panel edge (dimension X above) and the inclination of the struts (angle  $\alpha$  in the illustration above).



Props must be placed as near as possible to the vertical panel joint or the centre profile.



For information on the Safe Working Loads SWL), refer to pages 29 ff. and 166.



Always follow the instructions in the User Guide for the struts.

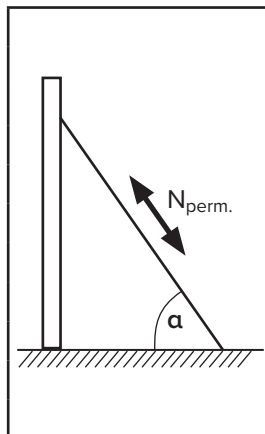
### MANTO Strut Connector

The MANTO Strut Connector (code:565114) can be connected to vertically or horizontally arranged MANTO panels.

When using struts, the Adapter for Alignment Struts (code:601733) is also needed. When using steel props, the Strut Adapter (code:565331), the Strut Base (code:566369) and 4no. Bolts M12×30 with Nut (code:5210) are also needed.

The following table shows the permitted strut loads.

Safe working load [kN] (strut load $N_{perm}$ )						
MANTO Strut Connector with vertical panels (horizontal ribs)						
Strut angle $\alpha$ to the horizontal	Distance to panel edge or centre profile					
	200 mm	300 mm	400 mm	500 mm	600 mm	
50°	16.92	12.76	10.88	10.02	9.78	
55°	16.65	12.61	10.75	9.89	9.65	
60°	16.40	12.35	10.52	9.65	9.46	
MANTO Strut Connector with horizontal panels (vertical ribs)						
50°	4.60					
55°	4.40					
60°	4.30					



### Connection for struts

The strut is used initially to connect vertically and horizontally aligned panels. Insert the Adapter for Alignment Struts (code:601733) into the head of the strut and secure it with the Bolt D16x87 (code:601908) and the Spring Cotter Pin 4 (code:173776).

Then the MANTO Strut Connector (code:565144) is attached with the aid of the integrated wedges.

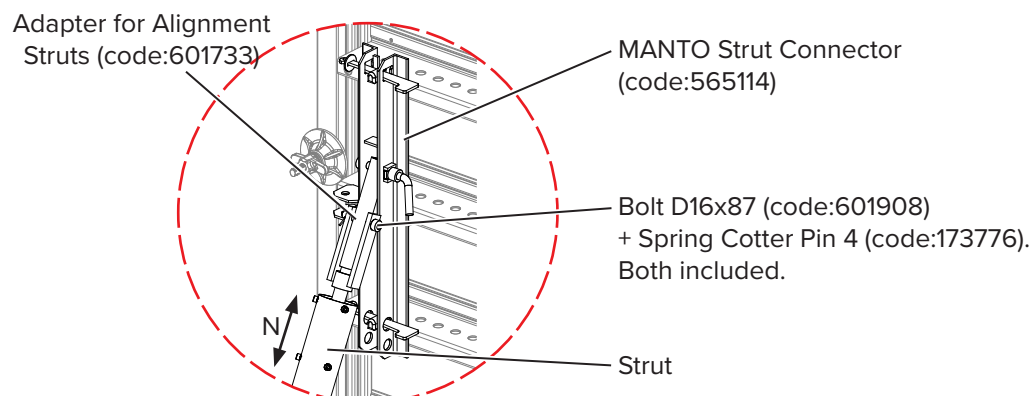


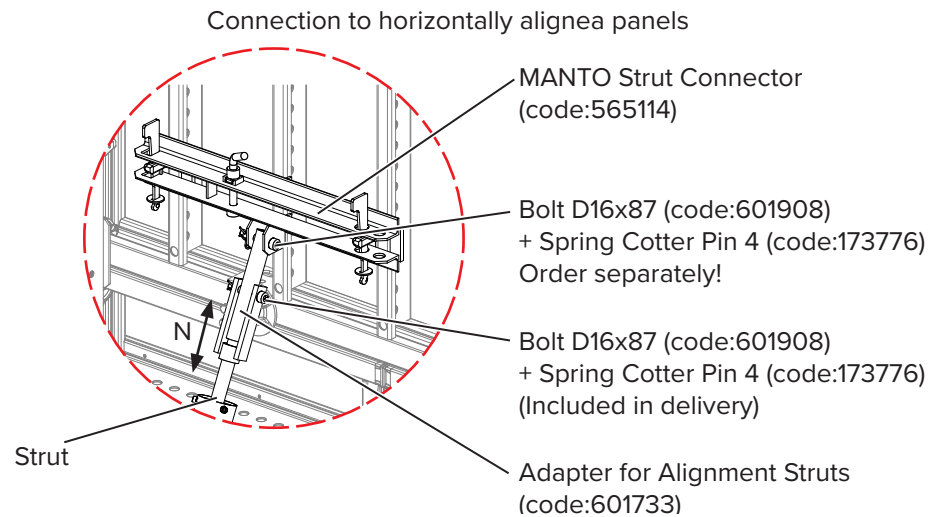
Observe the orientation of the panels when using horizontally aligned panels or extension panels.

Panels must be assembled in such a way that the ribs are open from the right side. Otherwise the Strut Connector will be mounted in the wrong direction and the props cannot be attached.

Finally, connect the assembled struts to the MANTO Strut Connector with the Adapter for Alignment Struts.

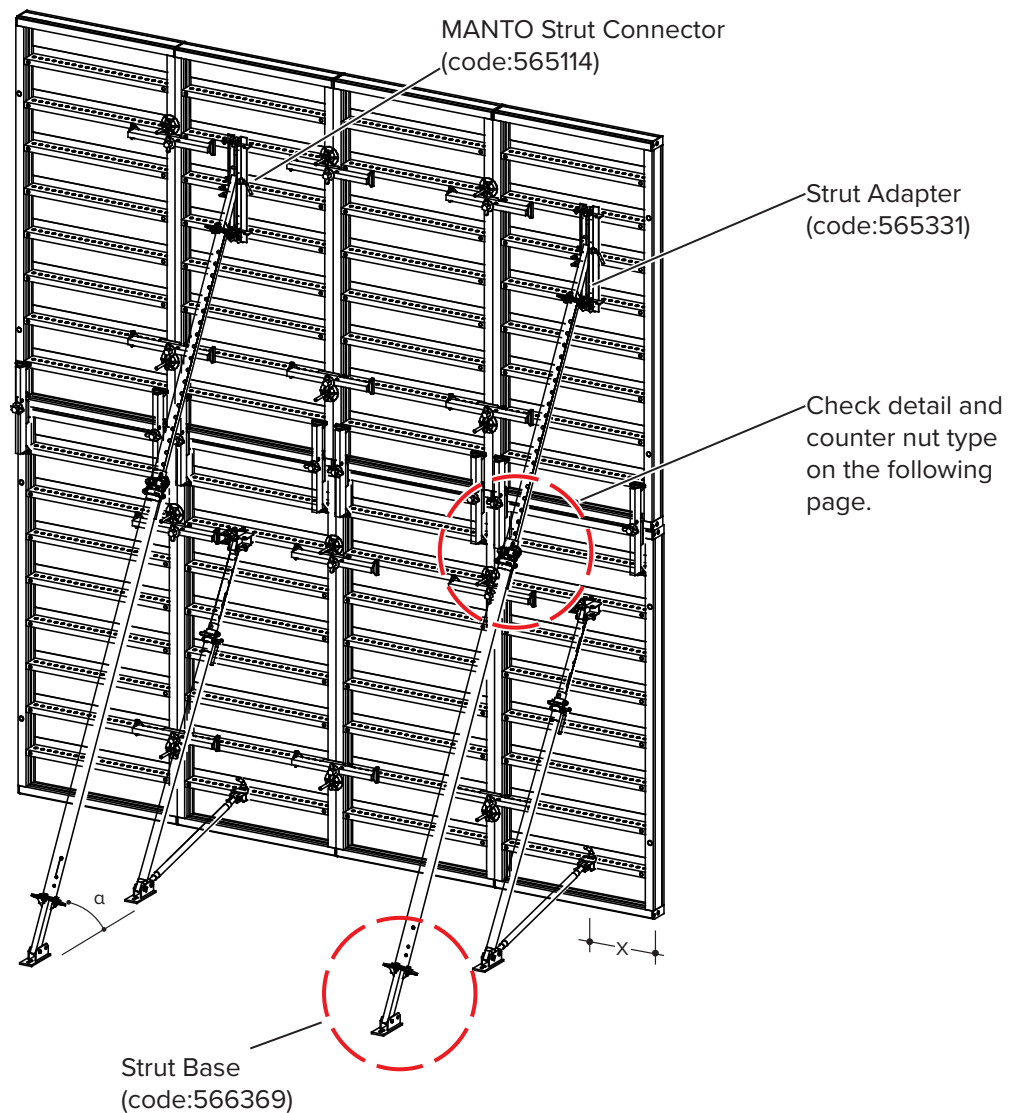
### Connection to vertically aligned panels





## 14.2.3 Struts for formwork heights from 3.90 m to 6.00 m

For supporting of extended MANTO panels and with formwork heights between 3.90 m and 6.00 m, EUROPLUS new props in combination with Strut Base (code:566369), Strut Adapter (code:565331) and an appropriate counter nut, can also be used.





The maximum strut loads for the connection to upright panels are dependant of the distance of the strut head to the panel edge (distance X) and the inclination of the struts (angle  $\alpha$  above).



Props must be placed as near as possible to the vertical panel joint or the centre profile. The correct type and size of the steel prop has to be selected according to the load, the formwork height and the extension length of the prop.



Image for reference only. Strut distance must be in accordance with the design scheme supplied. Always follow the instructions in the User Guide for the alignment struts.

### Connection for EUROPLUSnew struts

- Strut Adapter

On the top, the tubular steel prop is connected to the Strut Adapter with 4no. M12x30 Bolts & Nuts 4.6.

- Counter Nut

The permitted tension load of the steel prop is limited by the counter nut.

Permitted Tension: 15.00 kN.



### WARNING

#### Formwork can overturn!

Without additional Counter Nuts, EUROPLUS Steel Props are not resistant to tension! If EUROPLUS Steel Props are used without additional counter nuts, the formwork can topple over towards the opposite side. Always attach an additional counter nut to each EUROPLUS prop.

Counter Nut A/260/300 (code:107107) for EUROPLUS 260, 300 DB/DIN

EUROPLUSnew 20-250, 20-300

EUROPLUSnew 30-150

Counter Nut AS/350/410 (code:107118) for EUROPLUS 350 DB/DIN

EUROPLUSnew 20-350, 20-400

EUROPLUSnew 30-250, 30-300, 30-350

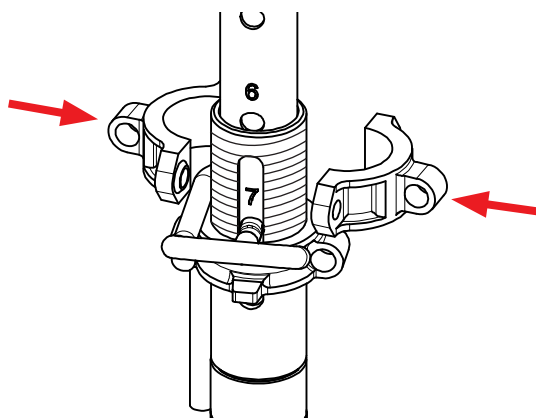
Counter Nut EC 400/DC 550 (code:587675) EUROPLUS 400 EC, 550DC

EUROPLUSnew 20-550, 30-400

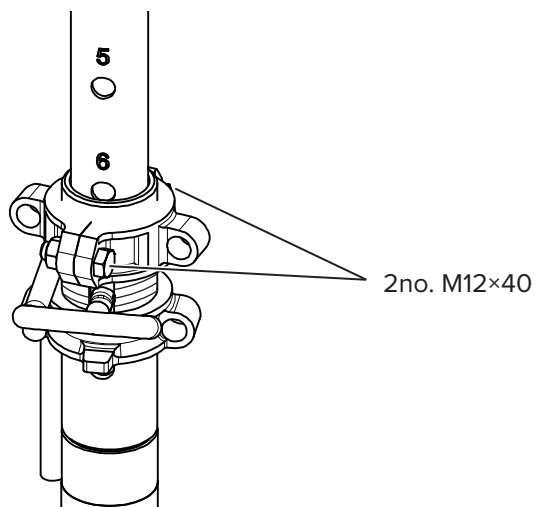
### Attaching counter nuts to EUROPLUSnew props

Depending on which prop is used, choose the matching counter nut from the list above and order separately.

- Step 1** Place both halves of the counter nut on the thread of the *EUROPLUSnew* prop.



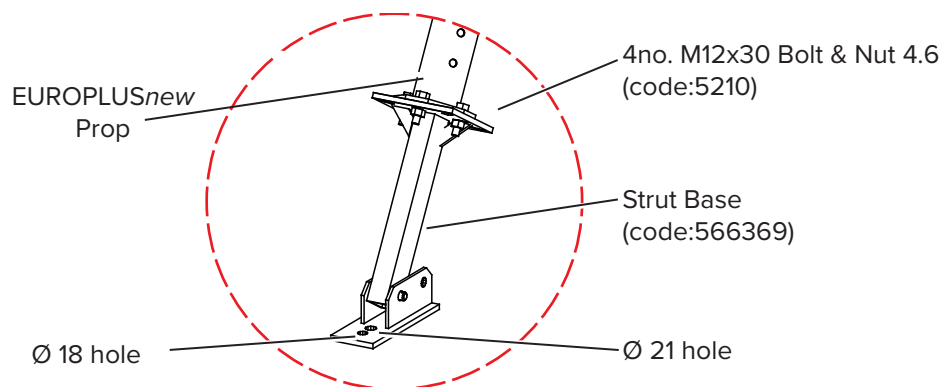
**Step 2** Join the two halves of the counter nut using 2no. screws M12x40 and nuts.



- Strut Base joint

### Attach Strut Base (code:566369)

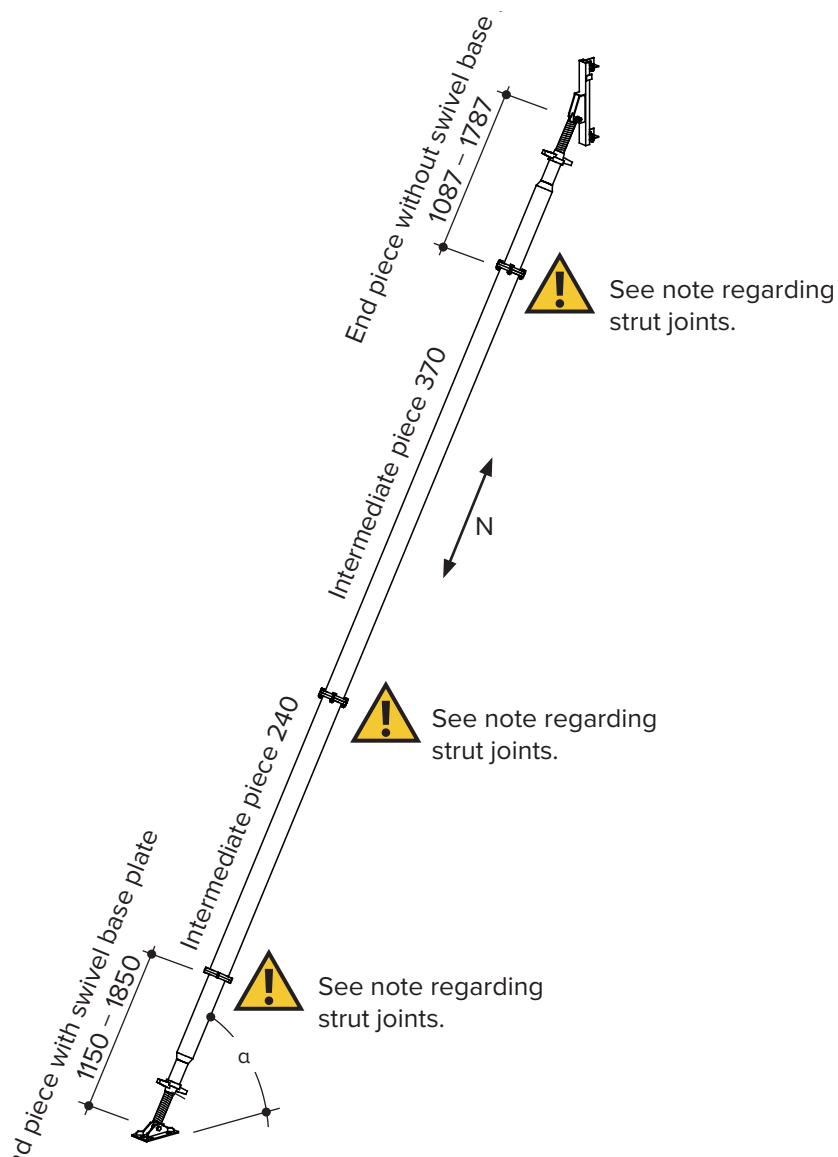
At the bottom, the Strut Base is connected to EUROPLUSnew props with 4no. M12x30 Bolt & Nut 4.6.



Props must be placed as near as possible to the vertical panel joint or the centre profile. The correct type and size of the prop has to be selected according to the load, the formwork height and the extension length of the prop.

#### 14.2.4 Struts for formwork heights of more than 6.00 m

The BKS alignment strut in combination with the BKS Strut Connector (code:482008) can provide support for formwork higher than 6.00 m.



Each strut joint requires 4no. M16x60 bolts and nuts 10.9.



The maximum strut loads for the connection to vertical panels are dependant of the distance of the strut connector to the panel edge and the inclination of the struts (angle  $\alpha$  above).

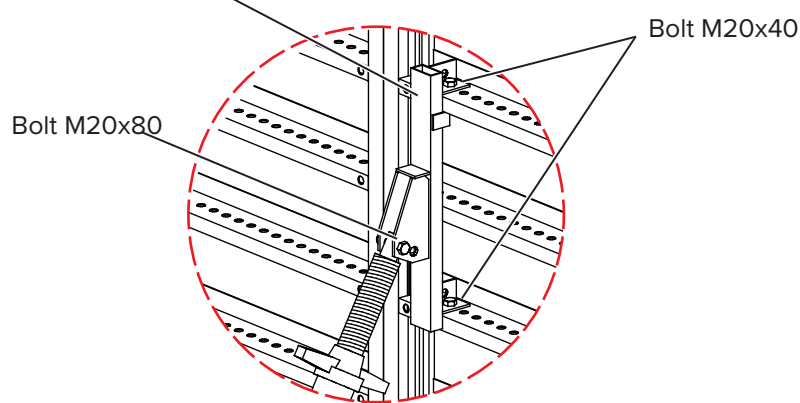


Props must be placed as near as possible to the vertical panel joint or the centre profile. The correct type and size of the strut has to be selected according to the load, the formwork height and the extension length of the strut.

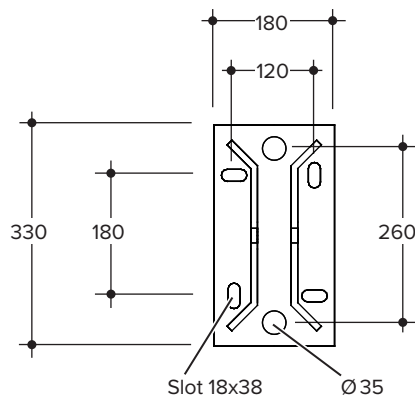
## Connection for BKS Struts

To connect the struts at the top, use the BKS Strut Connector (code:482008) attached to the MANTO panel rib using 2no. M20×40 bolts and nuts and 1no. M20×80 bolt with nut.

BKS Strut Connector  
(code:482008)



Swivel base plate of the end piece



BKS Strut Connector – Safe Working Load [kN]					
Depending on the distance to the edge of panel					
Strut angle $\alpha$ (to the horizontal plane)	Distance to panel edge or centre profile (G3 M)				
	200 mm	300 mm	400 mm	500 mm	600 mm
50°	29.30	19.10	15.30	13.70	13.20
55°	28.00	18.30	14.70	13.10	12.70
60°	27.10	17.70	14.20	12.70	12.20

BKS Struts – Safe Working Load						
Type	Length [m] min – max	Safe Working Load [kN] fully extended	Number of end pieces		Number of intermediate pieces	
			with part 489102	with part 489775	short (2.40 m) 489113	long (3.70 m) 489124
BKS 3	5.95 – 7.30	37.40	1 each	1 each	-	1
BKS 4	7.05 – 8.40	32.60			2	-
BKS 5	8.35 – 9.70	28.20			1	1
BKS 6	9.65 – 11.00	23.80			-	2
BKS 7	10.75 – 12.10	20.10			2	1



## 15 Constructing working platforms

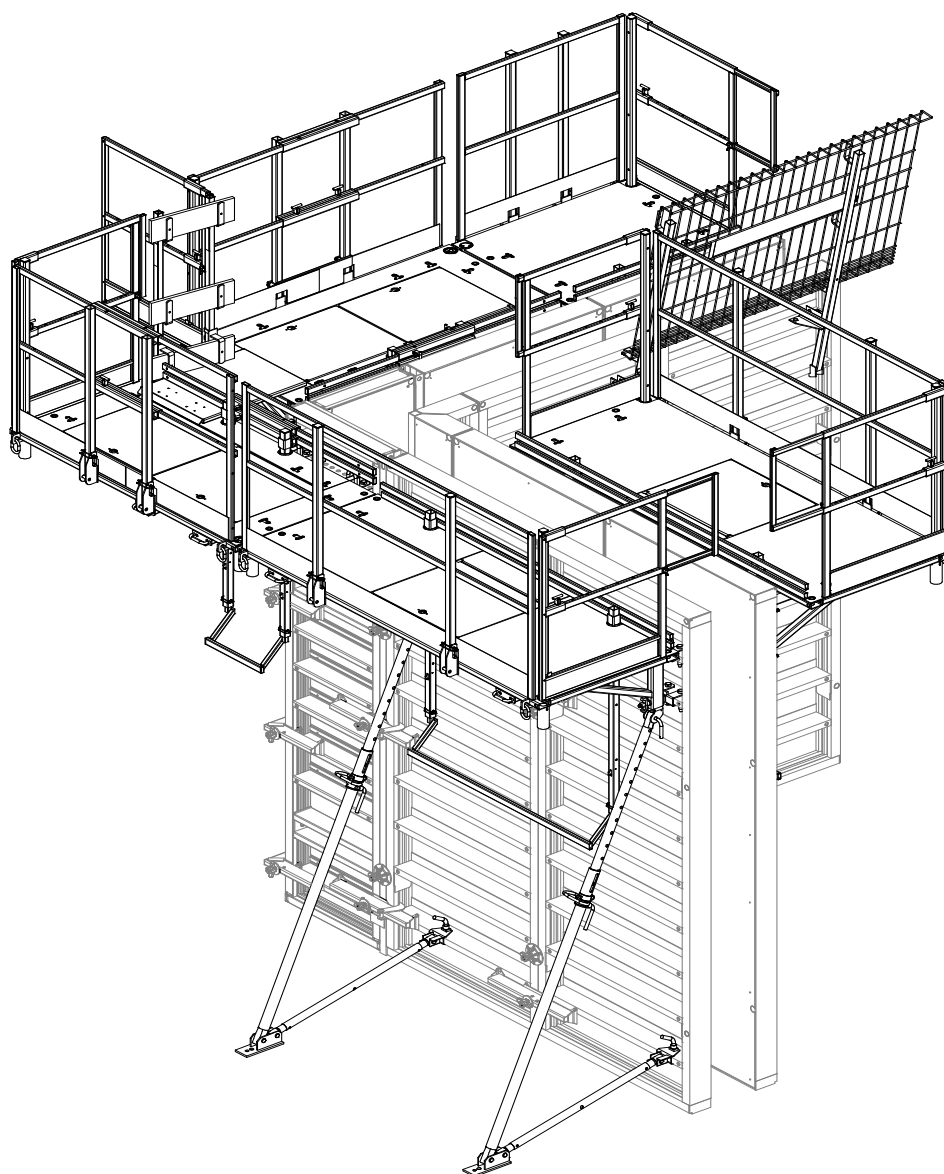
### 15.1 PLATINUM 100 platform and access system

The PLATINUM 100 platform and access system is fully compatible with MANTO wall formwork systems.

The PLATINUM 100 platform and access system permits safe access and allows safe execution of all work on the wall formwork, e.g. tying and connecting, and it is used as a pouring platform at the highest level of the formwork.

The PLATINUM 100 platforms are designed to meet the requirements of load class 2, DIN EN 12811, 150 kg/m<sup>2</sup>).

They are equipped with integrated mesh front and side panels, temporary railings and self-locking hatches, infill decks, counter posts, ladders and useful accessories. Compatibility with the PROTECTO edge protection extends the platform capabilities and allows it to be adapted to each formwork situation. This allows for all work at the platform to be executed from a safe position.



For more information regarding the PLATINUM 100 platform and access system, refer to the respective User Guide.

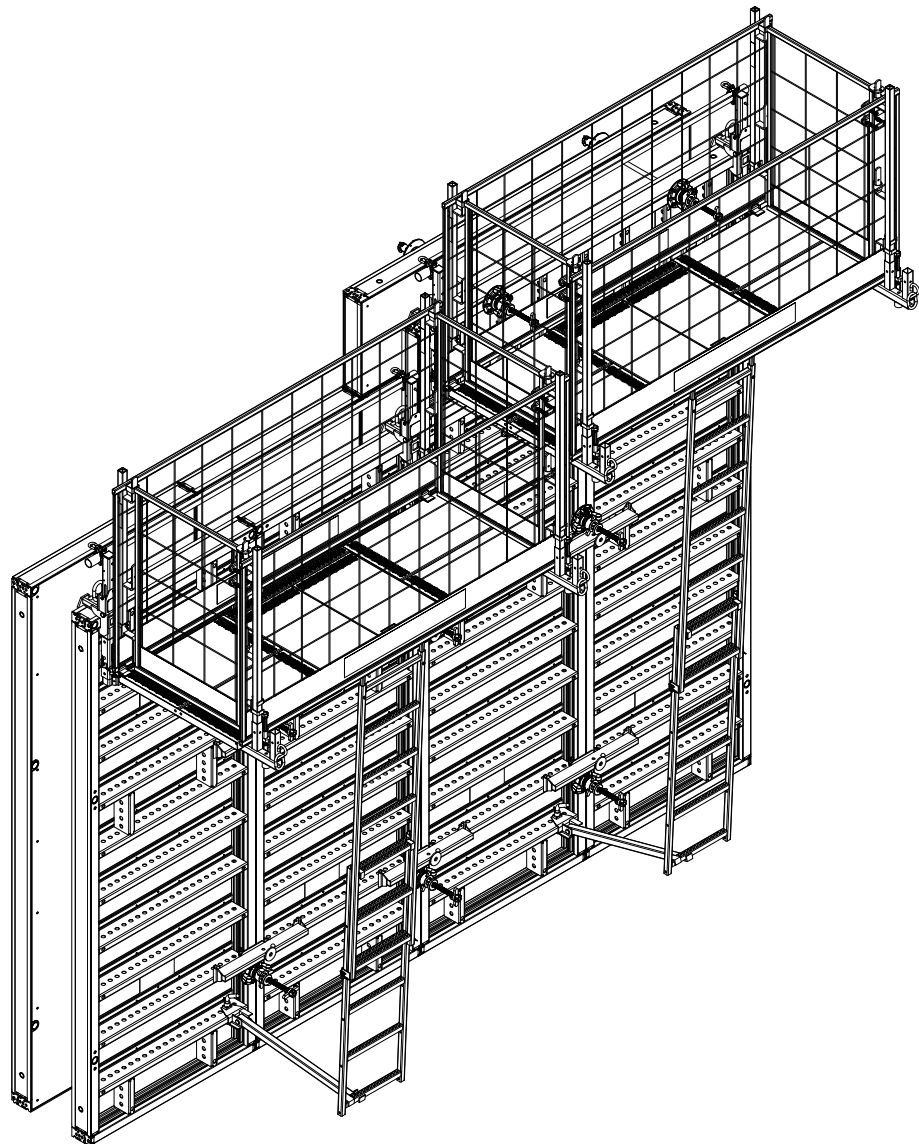
## 15.2 Universal Formwork Platform

With the Universal Formwork Platform, you can completely assemble a formwork platform with 360° side protection on panels lying flat and then raise the panels upright. The system ladders can then be used to safely ascend to the completely protected area.

Another option is to use a crane to hang the completely assembled Universal Formwork Platform on the formwork.

The Universal Formwork Platform can be secured to either the upper edge of the panels or to the profiles within the panels.

The SWL on the Universal Formwork Platform complies with load class 2 (150 kg/m<sup>2</sup>) pursuant to DIN EN 12 811-1 and DIN 4420-1.



More information on the Universal Formwork Platform can be found in the respective User Guide.

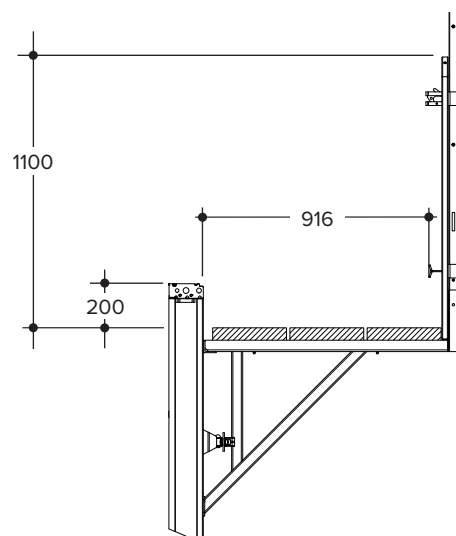
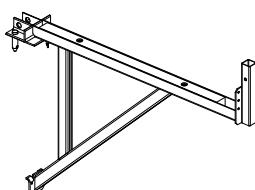
## 15.3 Walkway brackets

### MANTO P-Walkway Bracket and PROTECTO Railing Post 130 Adjustable

PROTECTO Post  
130 Adjustable  
(code:692750)  
Height of post 1.31 m



MANTO P-Walkway Bracket  
(code:606240)



More information on how to assemble and use the PROTECTO Post 130 Adjustable (code:692750), the PROTECTO Post (code:601225) and the PROTECTO G2 panels can be found in the respective User Guide.

### Attaching MANTO P-Walkway Brackets to a vertical panel

Hang the MANTO P-Walkway Brackets (code:606240), with the PROTECTO Railing Post (code:601225) or the PROTECTO Post 130 Adjustable (code:692750) inserted, with the pegs into the holes in the horizontal ribs of the panels. Always use a captive spring pin to secure the MANTO P-Walkway Bracket.



### WARNING

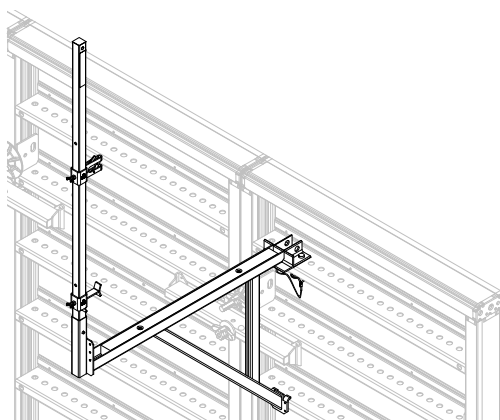
#### Risk of falling from height!

Check maximum span of planks and railings as well as the edge protection components being used.

Always secure the planks against uplift.

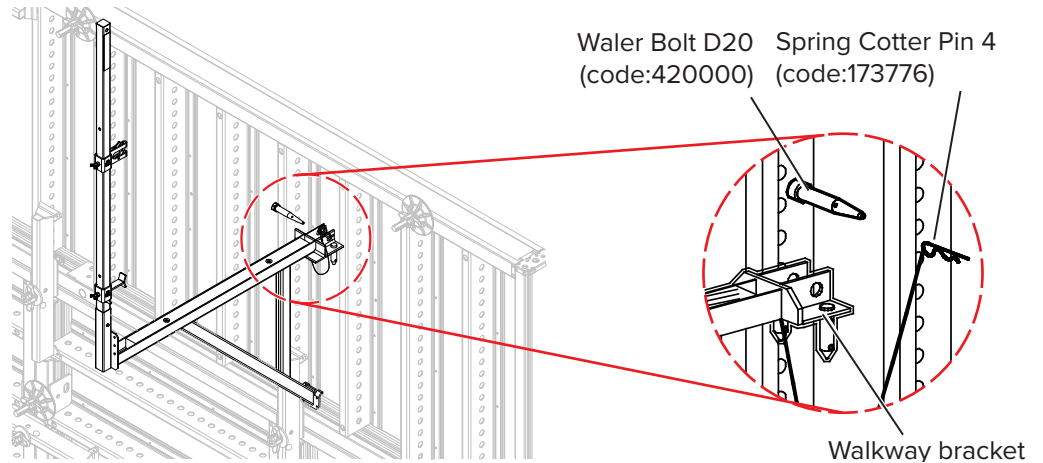
Always choose bracket spacing to comply with the design scheme supplied.

The MANTO P-Walkway Brackets are designed for load class 2 (150 kg/m<sup>2</sup>), pursuant to DIN EN 12811-1:2004 and DIN 4420-1:2004-03.



## Attaching MANTO P-Walkway Bracket to a vertical panel

Secure the MANTO P-Walkway Brackets (code:606240), with the PROTECTO Railing Post (code:601225) or the PROTECTO Post 130 Adjustable (code:692750) inserted, to the vertical H-ribs with a Waler Bolt D20 (code:420000). Always use a Spring Cotter Pin 4 (code:173776) to secure the Waler Bolt D20.



## 15.4 Counter Post

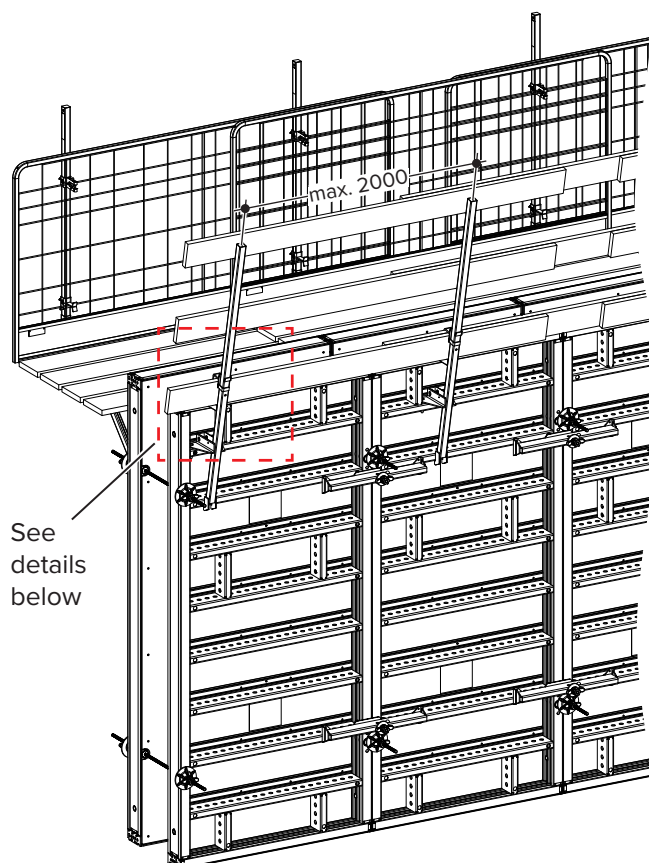
Use the Counter Post (code:600814) to erect edge protection on the opposite side of the platform. As with the MANTO P-Walkway Bracket (code:606240), the Counter Post is secured to the top rib of the panel. Use the integrated Spring Cotter Pin 4 (code:173776) to secure the Counter Post.



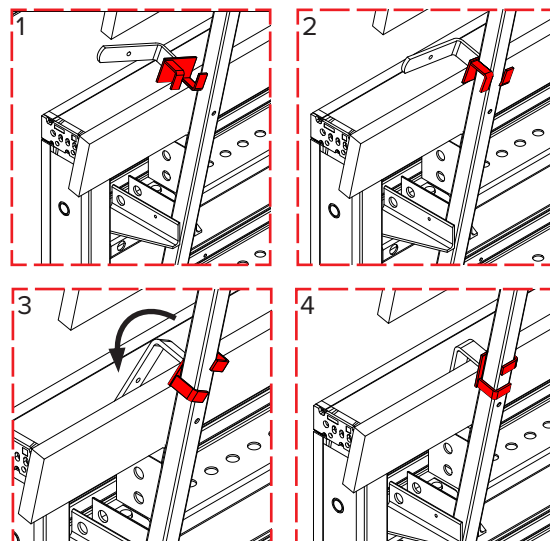
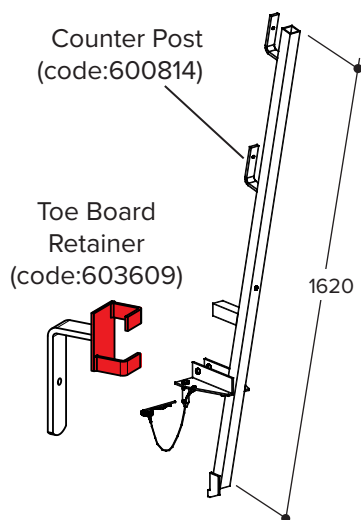
### Act according to the current position of the panels!

The Counter Post (code:600814) can be attached to the uppermost H-rib on vertical or horizontal MANTO G2 panels. The same applies to vertical MANTO G3 / G3 M panels. Attach the Counter Post to the second H-rib on horizontal MANTO G 3 / G3 M panels.

The inclined position of the Counter Post means that the required clearance for pouring operations is achieved. With an additional Waler Bolt D (code:420000) the Counter Post (code:600814) can also be mounted to horizontal panels.



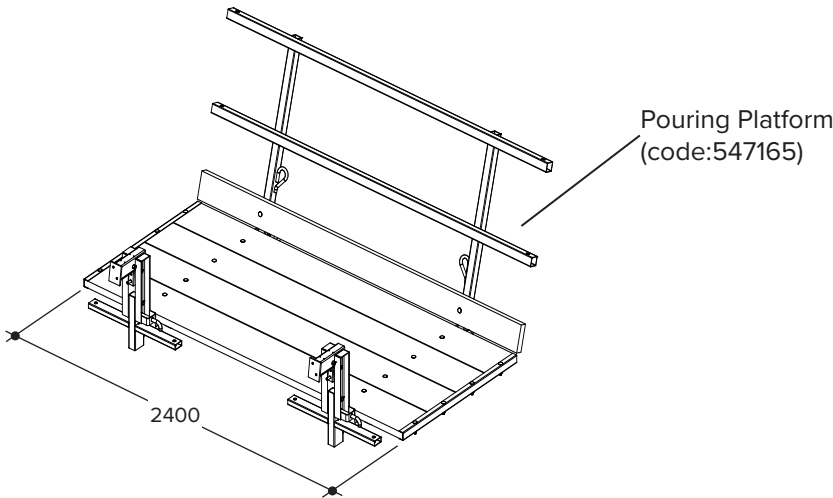
Attach the Toe Board Retainer (code:603609) (Refer to the red dashed frame) to the Counter Post as shown here:



The edge protection can be made of plank railings or of PROTECTO panels.  
When plank railings are used, the planks have to be at least 150 x 30 mm in size.

15.5 Pouring platform

The pouring platform is the top working platform on the MANTO formwork.



WARNING

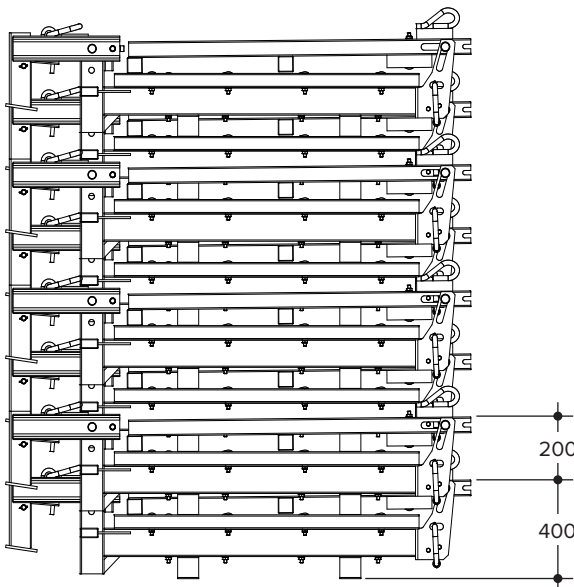
**Risk of falling from height!**

The pouring platforms are designed for load class 2 (150 kN/m<sup>2</sup>), pursuant to DIN EN 12811-1:2004-03 and DIN 4420-1:2004-03.

Always choose platform spacing to comply with the design scheme supplied.

**Stacking pouring platforms**

The pouring platforms are collapsed upon delivery to the construction site. The stacking height is 400 mm for the lower platform and 200 mm for the other platforms.



WARNING

**Risk of injury from stacks toppling over!**

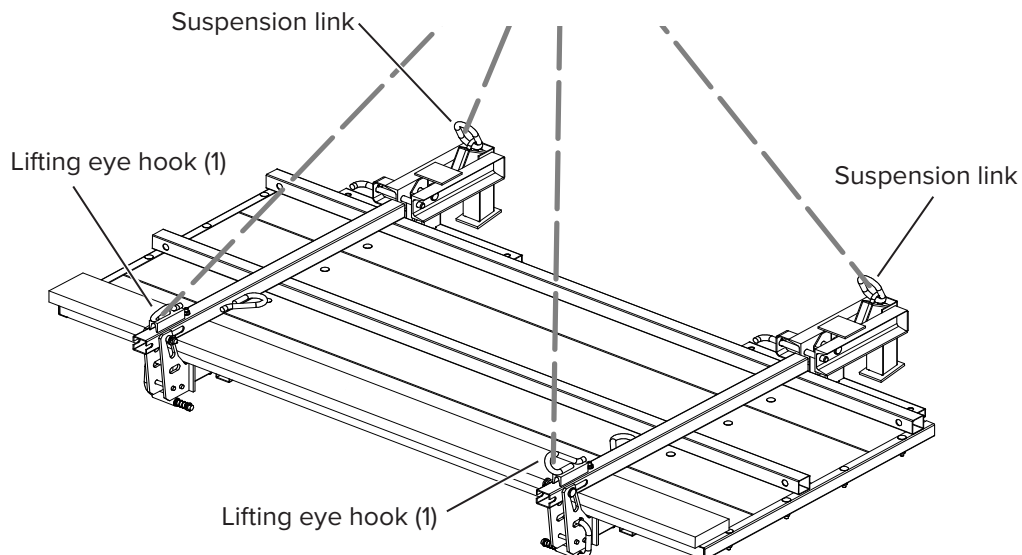
Maximum stacking height: 8no. units.



## 15.5.1 Installing pouring platform

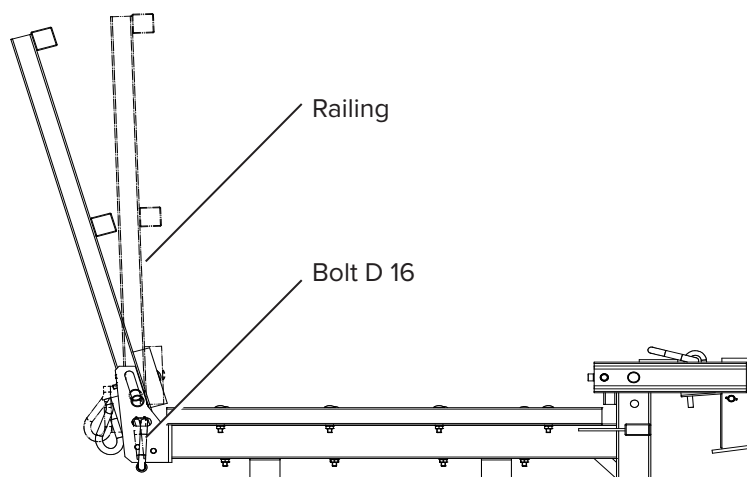
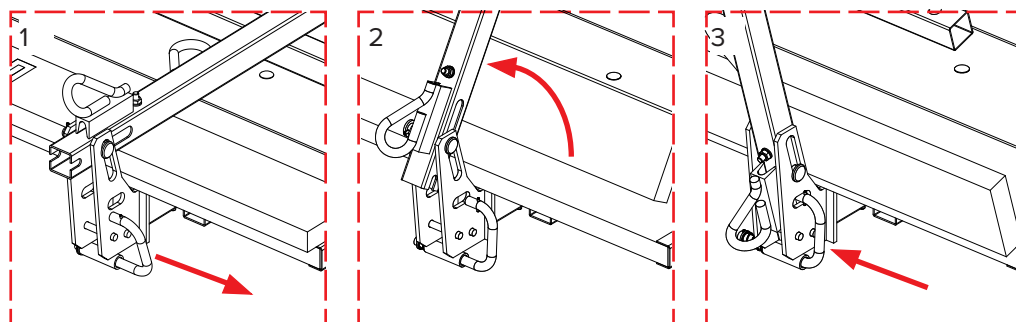
### Lifting from the storage position (guardrails collapsed)

In the collapsed position, the crane slings have to be attached to the lifting eye hooks (1) and to the lifting eyes. Refer to the following illustration.

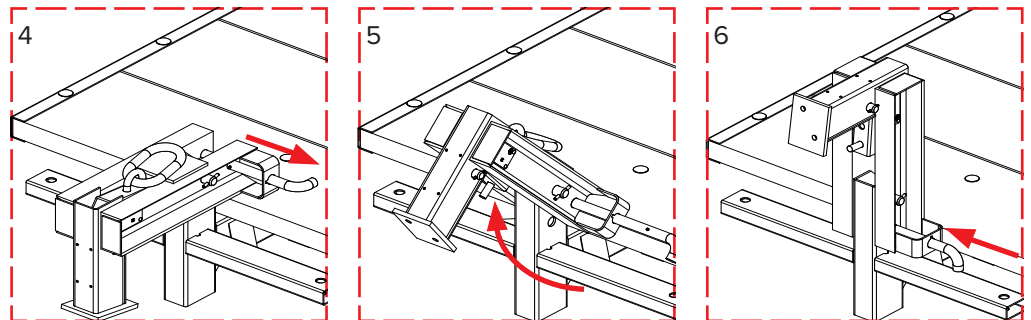
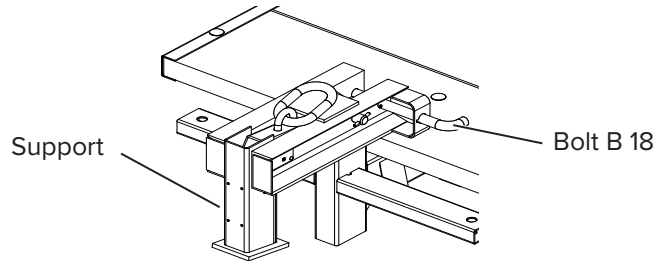


### Unfolding the guardrails

- Step 1** Unlock the railings by pulling out the Bolt D 16.
- Step 2** Unfold the railing section to the upright position. The railing can be in a vertical or inclined position.
- Step 3** Lock the railing by pushing the Bolt D 16 back in.



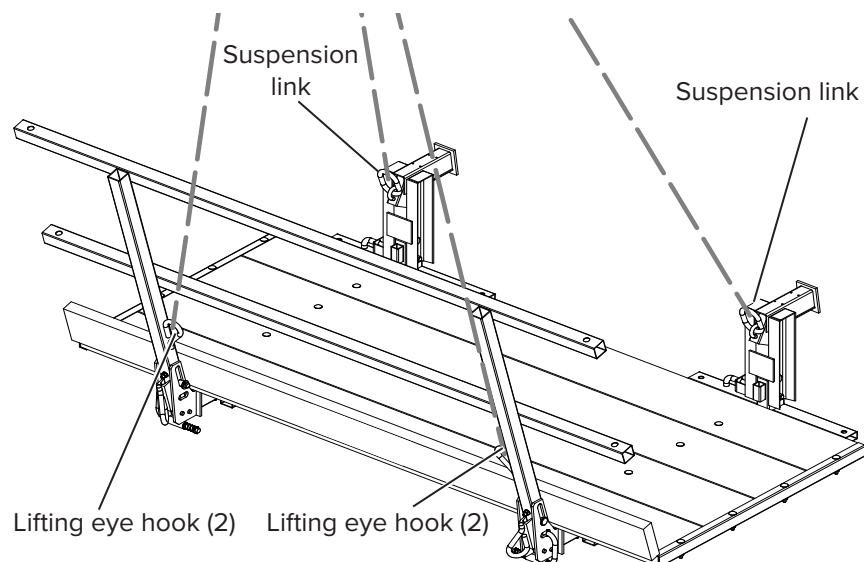
- Step 4** Pull out Bolt B 18 to release the support.
- Step 5** Rotate the support from the transport/storage position (horizontal) to the operational position (vertical).
- Step 6** Once the support is in the vertical position, push the Bolt B 18 back in to lock the part.



To prepare the platform for storage, simply reverse the order of the steps until the platform is completely collapsed and secured.

## Lifting to working position (guardrails unfolded)

Attach the crane slings to the eye hooks (2), which are located higher up the railing posts in relation to the eye hooks (1) and to the lifting eyes.



## WARNING

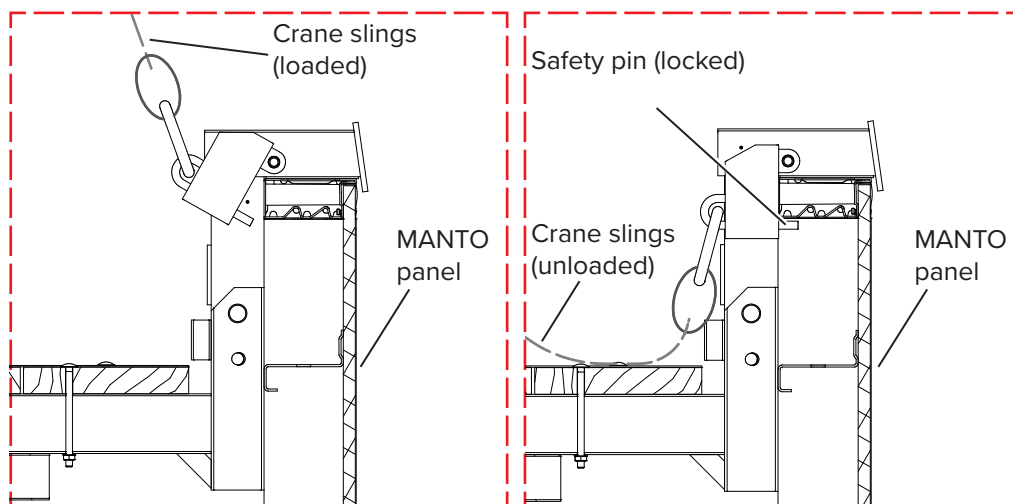
### Risk of injury from falling panels!

The lifting points on the platform may not be used to move the platform with formwork attached. Completely detach the platform from the panels before lifting it.



### Securing to MANTO formwork

The pouring platform is equipped with a self-securing suspension that automatically locks after the tension on the crane slings is released.



### WARNING

#### Risk of falling from height!

The safety pin must be latched correctly.

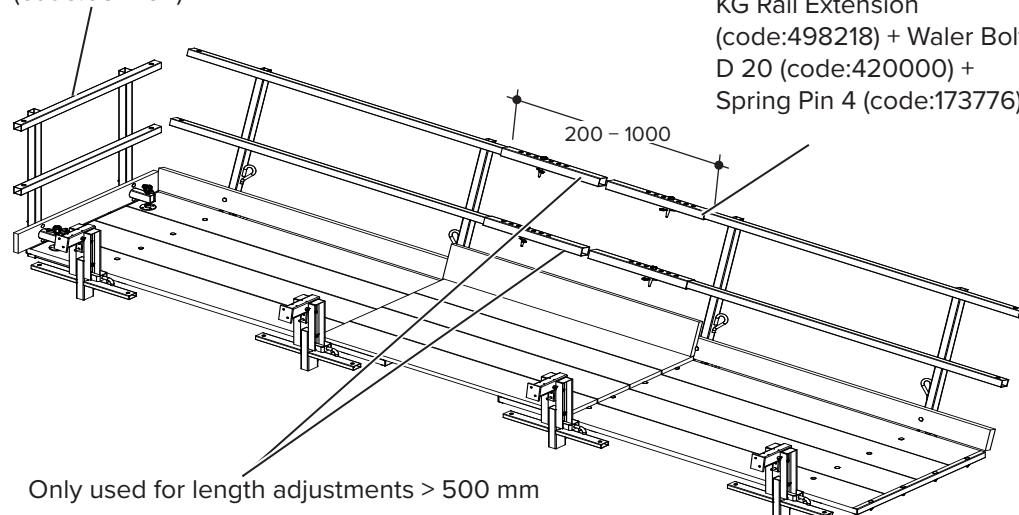
### Infills and stopend

Extensions from 0.20 m to 1.00 m are created using on-site boards, toe boards and 2no. or 4no. KG Rail Extensions. The boards must overlap by 450 mm at both ends and they have to be properly restrained (e.g. nailed).

The Platform Railing secures the end of the platform. It is fastened with the integrated screws.

Platform Railing  
(code:587252)

KG Rail Extension  
(code:498218) + Waler Bolt  
D 20 (code:420000) +  
Spring Pin 4 (code:173776)



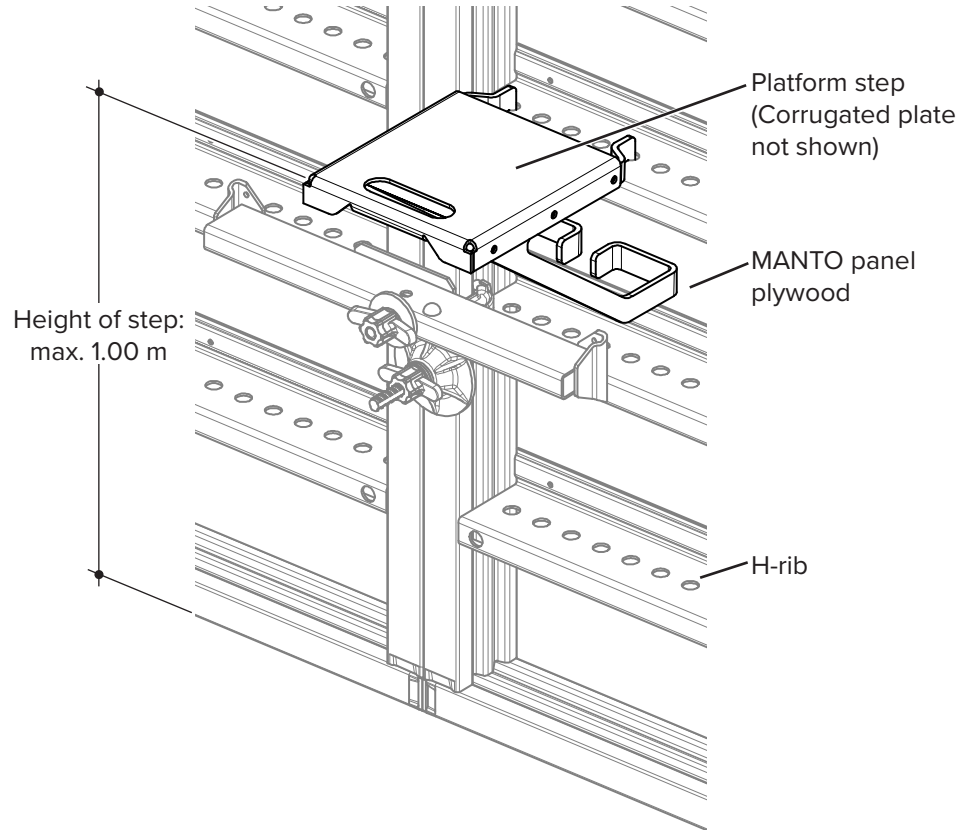
### WARNING

#### Risk of falling from height!

Use suitable safety equipment to install the platform until all edge protection around the platform is complete. Extension boards overlapping the pouring platform pose a tripping hazard. All tripping hazards should be eliminated by using suitable fillets.

## 15.6 PLATINUM 100 Platform Step

The PLATINUM 100 Platform Step code:606480) is used as a climbing aid with the MANTO formwork to reach tie holes, struts and other connectors. The Platform Step can be hooked to the three lowest ribs of the MANTO Formwork. The Platform Step can only be used with upright formwork panels.

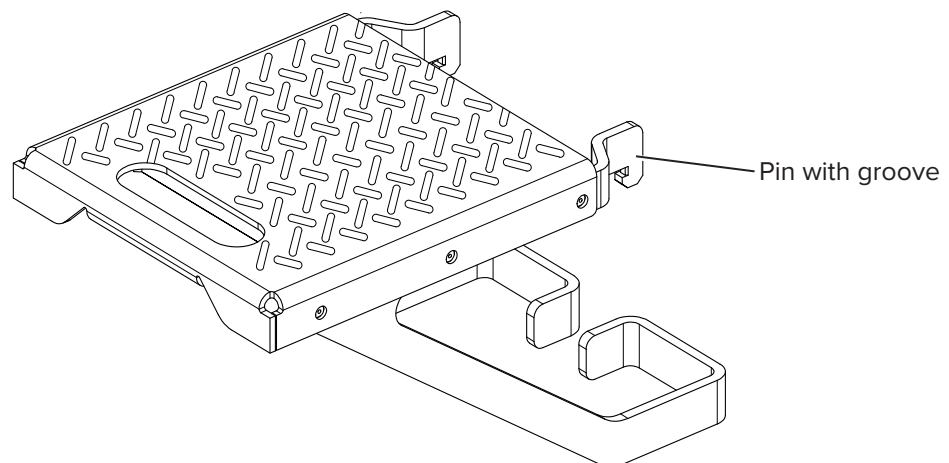


### WARNING

#### Risk of falling from height!

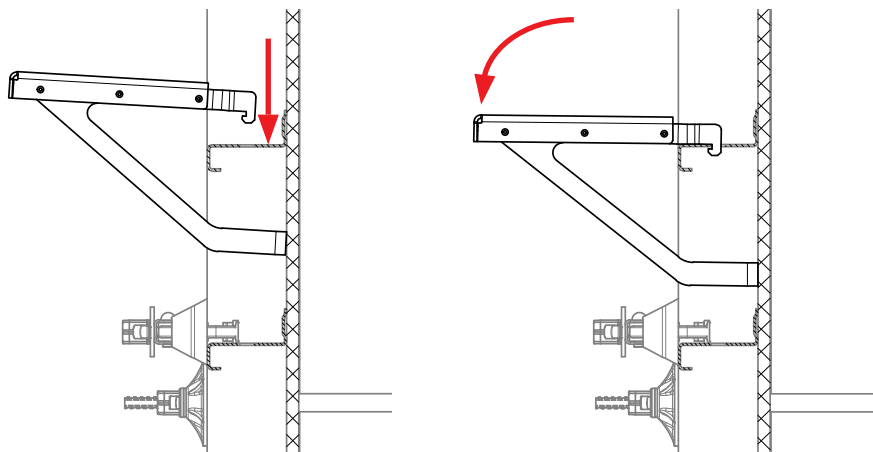
The maximum permitted height of the PLATINUM 100 Platform Step is 1.00 m in accordance with AGR A2.1. Other local regulations and variations must also be followed when working at height.

The SWL of the PLATINUM 100 Platform Step is 150.00 kg.



### Attaching to MANTO panels

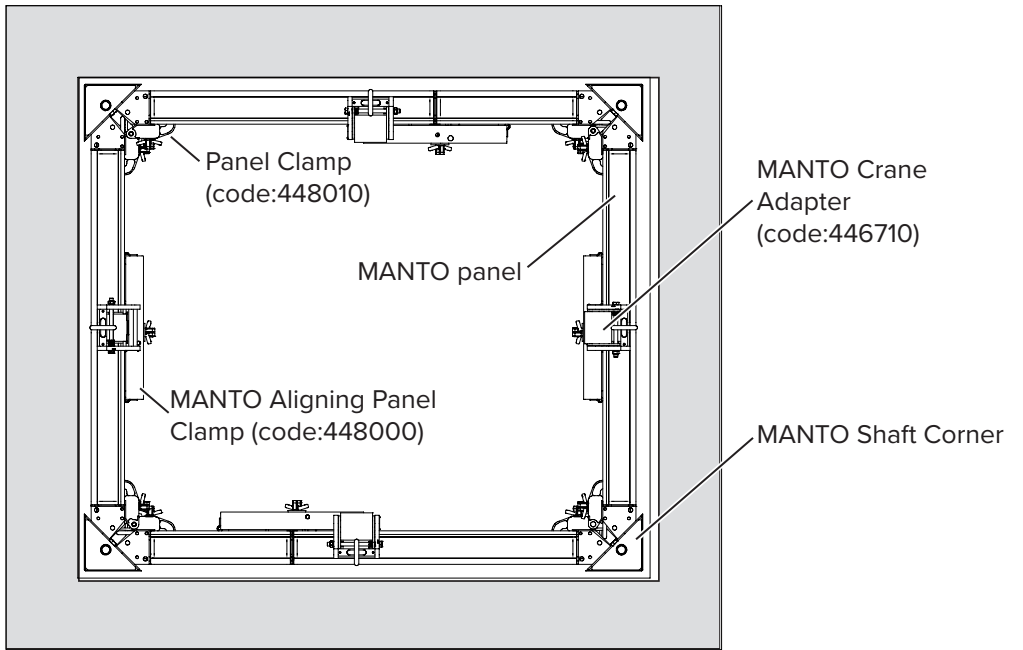
- Step 1** To attach the step, insert the pins of the Platform Step into the holes of a rib on the MANTO panel.
- Step 2** Swivel the step down. The grooves in the pin grip the rib profile and prevent the step from detaching.



16 Shaft formwork

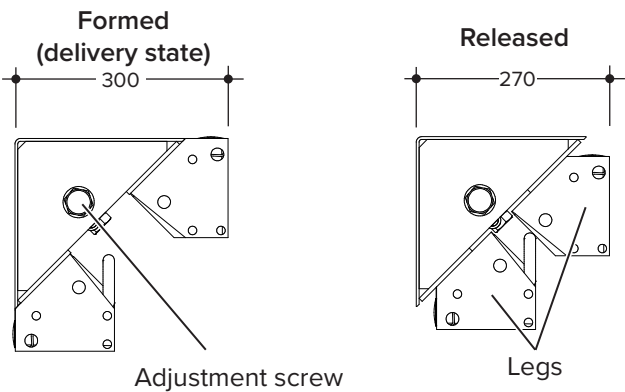
16.1 Using the MANTO shaft corner

Shaft formwork can be easily assembled or dismantled using MANTO shaft corners. The MANTO shaft corners allows the complete inner wall formwork of the shaft to be released from the concrete simply by using a MANTO Ratchet. After this, the shaft formwork can be lifted by crane using a 4-strand suspension.



Place any infills that may be required in the middle of the formwork and not near the corners.

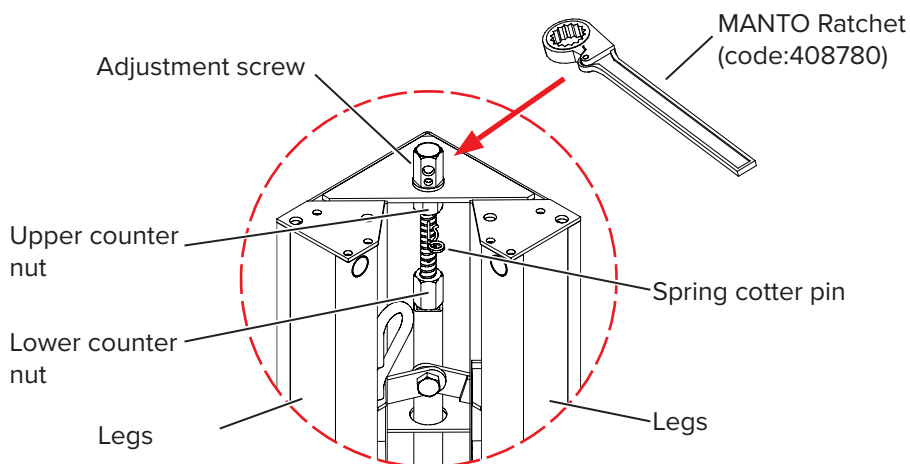
MANTO shaft corners have a side dimension of 300 mm when the legs are in the forming position and 270 mm in the stripped position.



If the MANTO shaft corner is extended in height, make sure that the legs on both corners are in the same position before connecting the next MANTO shaft corner.

### Operating the mechanism

The mechanism is operated from above and is always accessible, even in narrow shafts. Turning the adjustment screw using a MANTO Ratchet (36 mm) causes the legs of the MANTO Shaft Corner to move diagonally, creating a stripping clearance of up to 30 mm.



### Extending the formwork in height

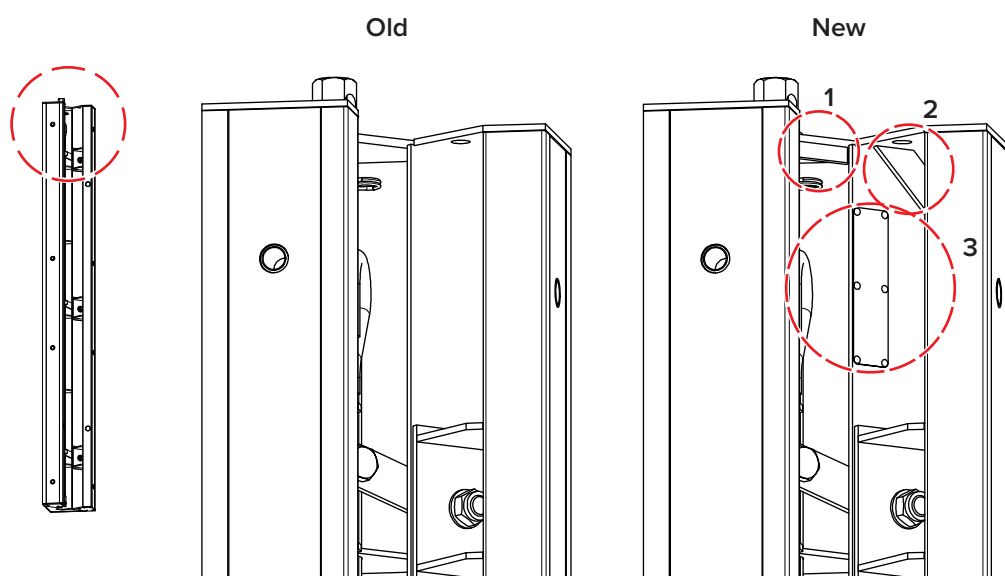
If you join MANTO shaft corners in height, you must connect the mechanics of the corners. This way you can operate both MANTO shaft corners simultaneously from above with the MANTO Ratchet (36 mm).



Before stacking, ensure that the legs of the MANTO shaft corners are in the outermost position (original position). Do this by turning the hexagon nut (w.a.f. 36) on the MANTO shaft corner counter-clockwise as far as it will go.

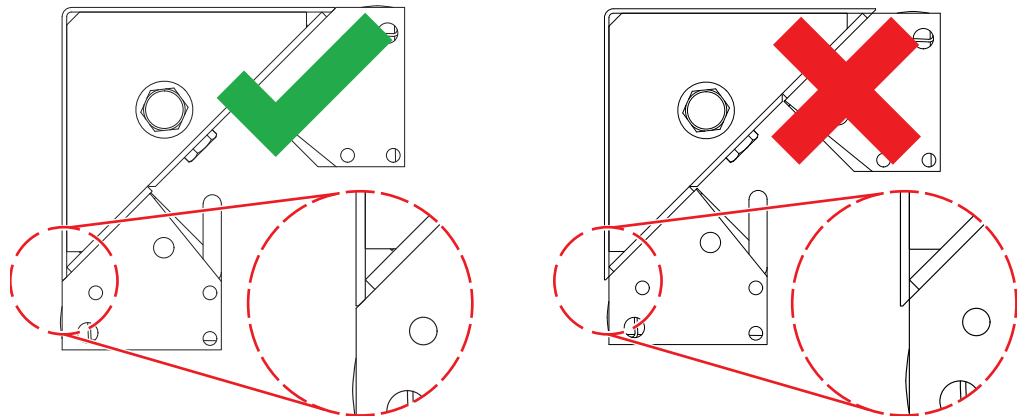
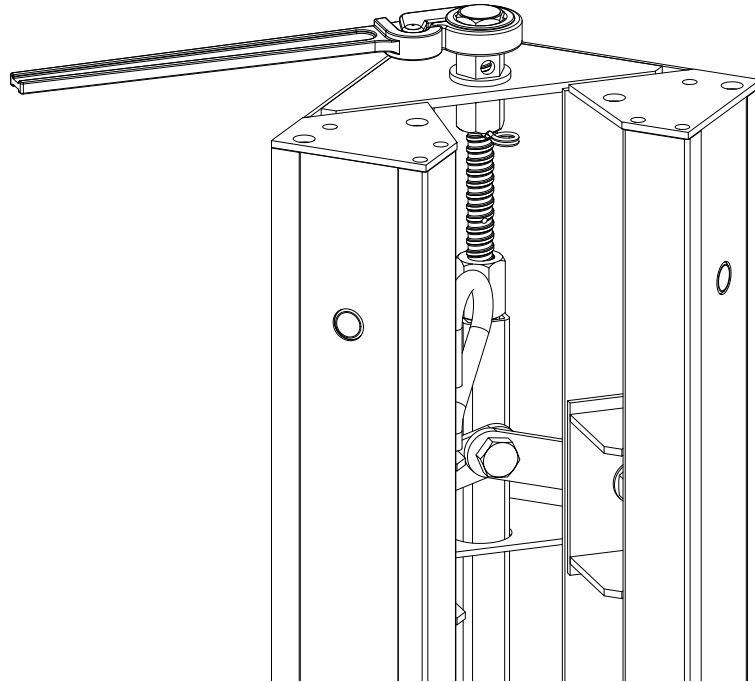


There are currently two versions of the MANTO shaft corner, an old and a new one. The MANTO shaft corners can be easily distinguished. The new MANTO shaft corner has reinforcements (1 and 2) at the top as well as a label (3) that describes the stacking process. Stacking is done differently with the old and new MANTO shaft corner!

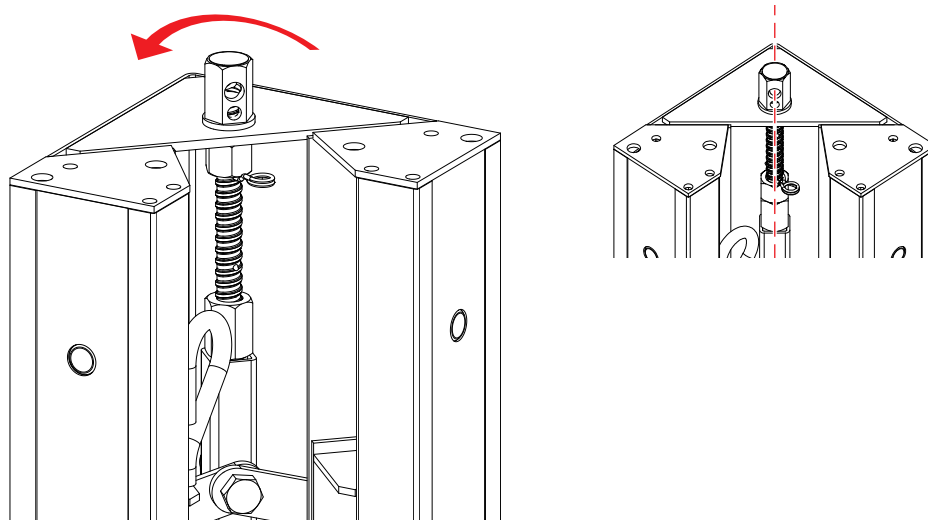


## Stacking MANTO shaft corners (old version)

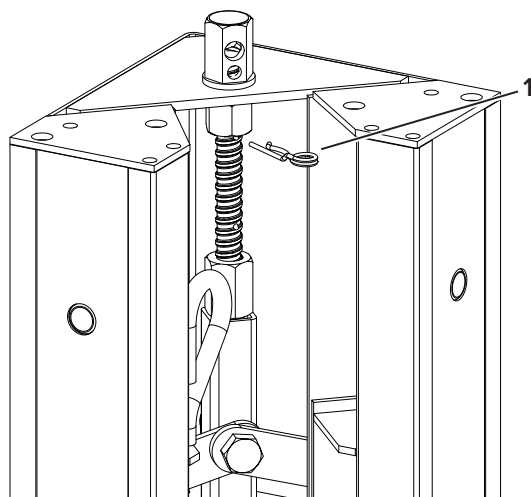
- Step 1** Return both MANTO shaft corners to their original (formed) position. To do this, use the MANTO Ratchet (code:408780) to turn the hexagon nut (w.a.f. 36) on the MANTO shaft corner counter-clockwise until it stops. The legs of the MANTO shaft corner should be flush on the outside.



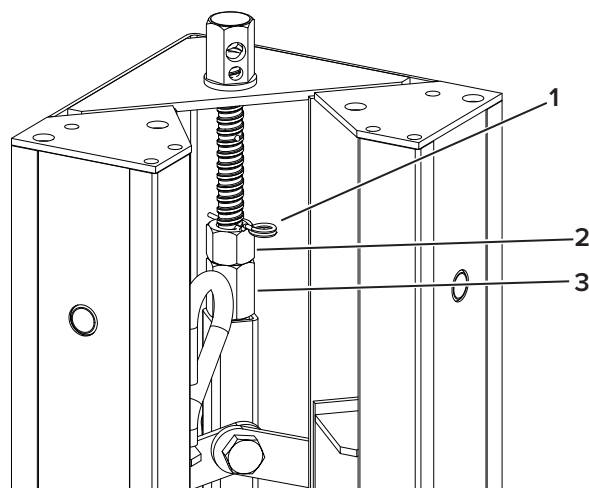
- Step 2** Use the MANTO Ratchet to turn the adjustment screw, until the holes in the hexagon nut point to the top of the MANTO shaft corner.



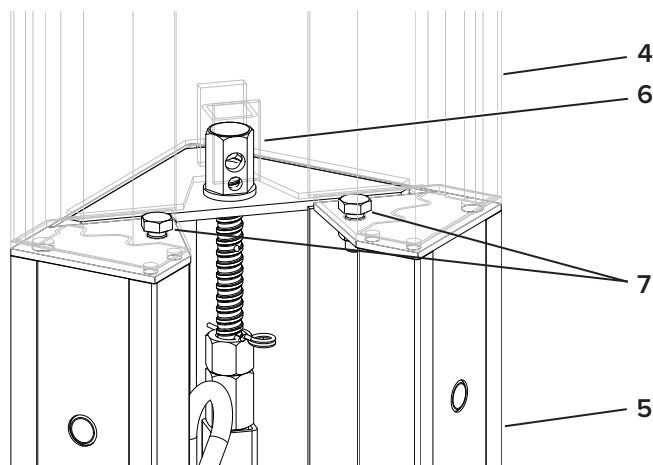
- Step 3** Pull out the spring pin (1) from the lower MANTO shaft corner. The uppermost MANTO shaft corner remains in the original position.



- Step 4** Screw down the upper counter nut (2) until it is locked with the lower counter nut (3). Insert the spring cotter pin (1) in the hole directly above the upper counter nut.

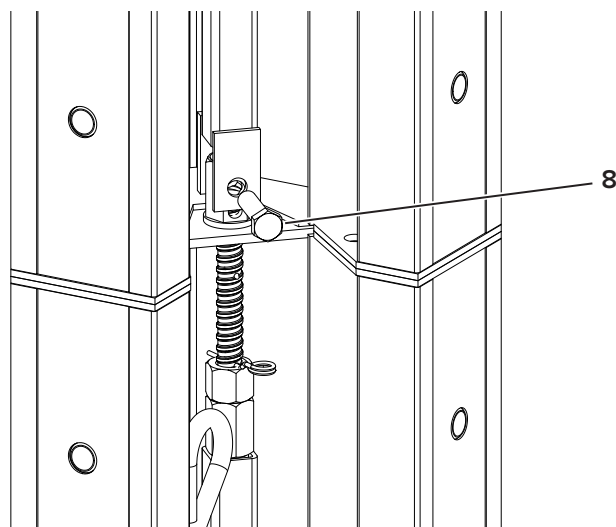


- Step 5** Place the upper MANTO shaft corner (4) on the lower MANTO shaft corner (5). Make sure that the forkhead (6) fits over the adjustment nut of the lower MANTO shaft corner. Connect the legs of the MANTO shaft corners with 2no. Bolts M16x35 (with Nut) 8.8 (7, code:603623). Tighten the bolts and nuts hand-tight.



Ensure that the MANTO shaft corners lie on top of each other without any gaps and flush to each other.

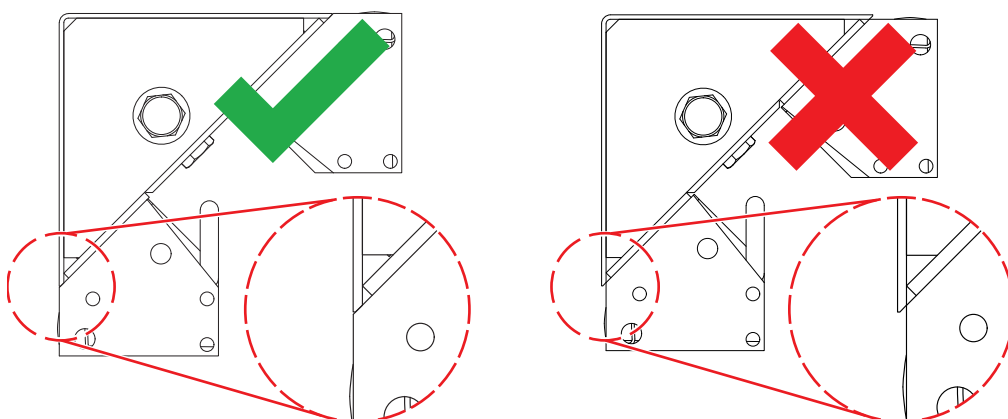
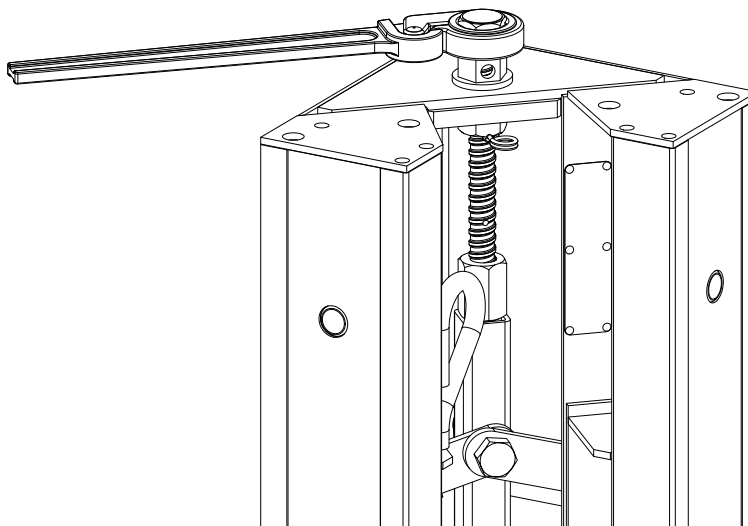
- Step 6** Insert an M16x60 Bolt (8) through the hole in the head of the hexagon nut and tighten. Tighten the 2no. M16x35 bolts in the legs as well. The shaft corners are stacked.



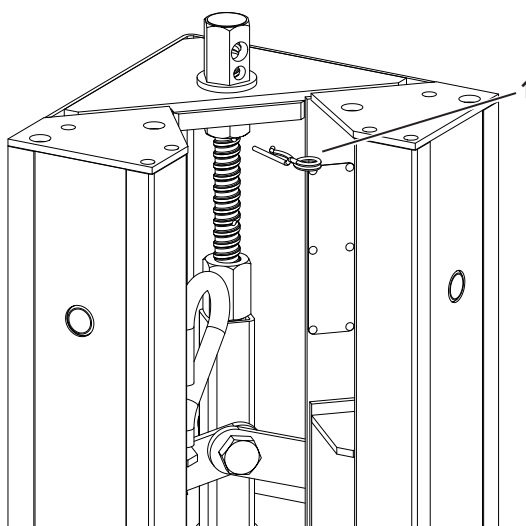


### Stacking MANTO shaft corners (new version)

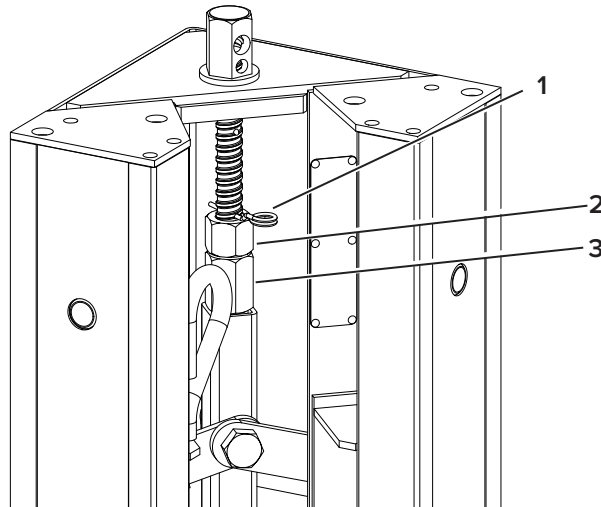
- Step 1** Return both MANTO shaft corners to their original (formed) position. To do this, use the MANTO Ratchet (code:408780) to turn the hexagon nut (w.a.f. 36) on the MANTO shaft corner counter-clockwise until it stops. The legs of the MANTO shaft corner should be flush on the outside.



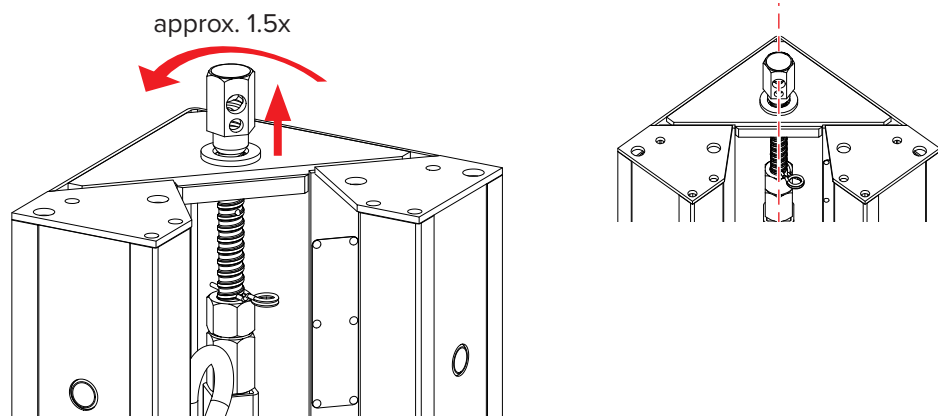
- Step 2** Pull out the spring pin (1) from the lower MANTO shaft corner.



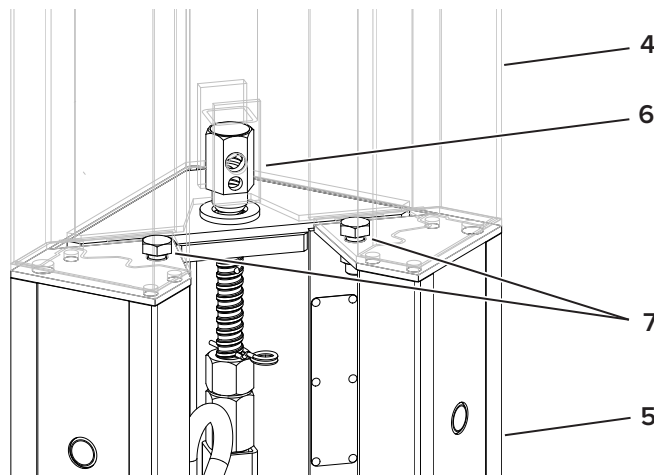
- Step 3** Screw down the upper counter nut (2) until it is locked with the lower counter nut (3). Insert the spring cotter pin (1) in the hole directly above the upper counter nut.



- Step 4** Use the MANTO Ratchet to turn the adjustment screw approx. 1.5 revolutions counter-clockwise. The holes in the hexagon nut should face the tip of the MANTO shaft corner. Then finish tightening the counter nut.

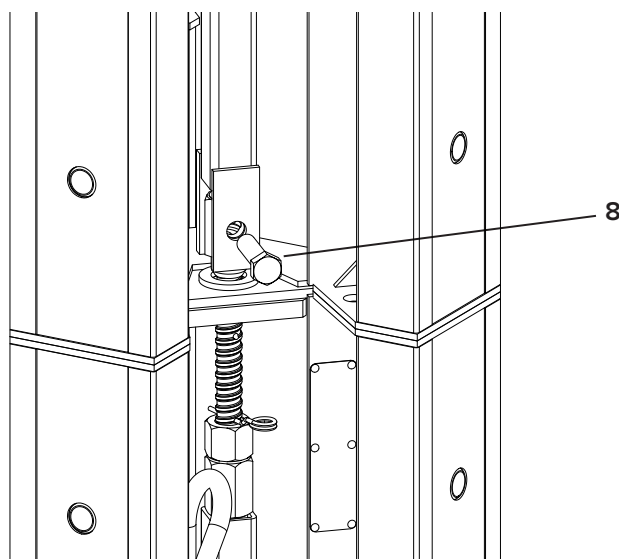


- Step 5** Place the upper MANTO shaft corner (4) on the lower MANTO shaft corner (5). Make sure that the forkhead (6) fits over the adjustment nut of the lower MANTO shaft corner. Connect the MANTO shaft corners with 2no. M16×35 Bolt and Nut (code:603623). Tighten the bolts and nuts hand-tight.



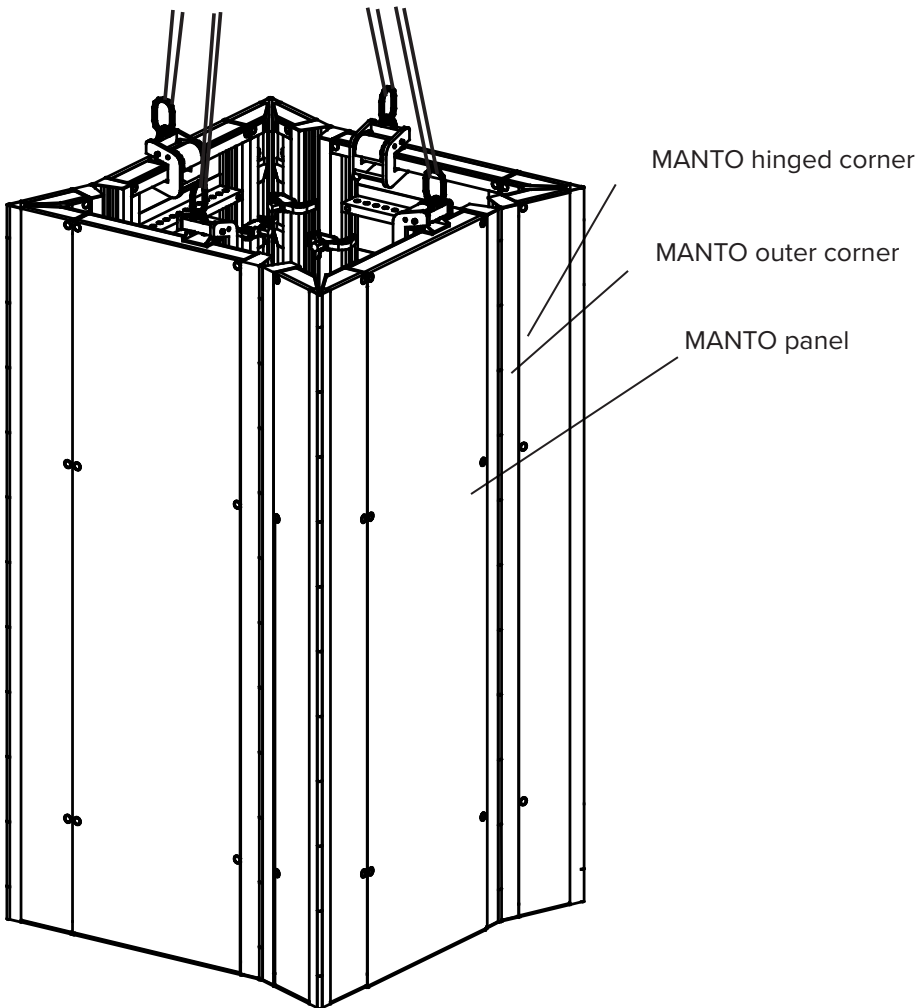
Ensure that the MANTO shaft corners lie on top of each other without any gaps and flush to each other.

- Step 6** Insert an M16×60 Bolt (8) through the hole in the head of the hexagon nut and tighten. Tighten the 2no. M16×35 bolts in the legs as well.



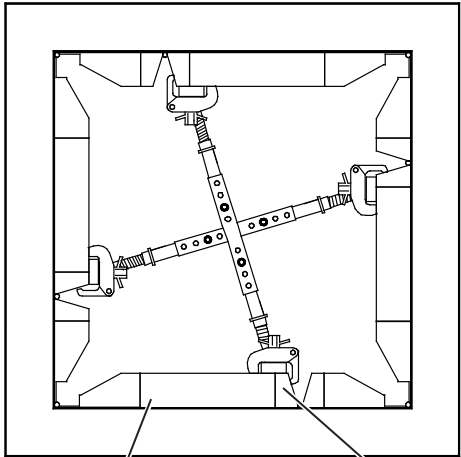
16.2 Using MANTO Hinged Corner

With the MANTO shaft formwork, the inner formwork of a shaft (or a room) can be shifted by crane with a single lift without having to release the panel connections. The formwork is released from the wall by retracting the shaft spindles. The retracted spindles and the hinged connections reduce the formwork to such an extent that it can be easily shifted.

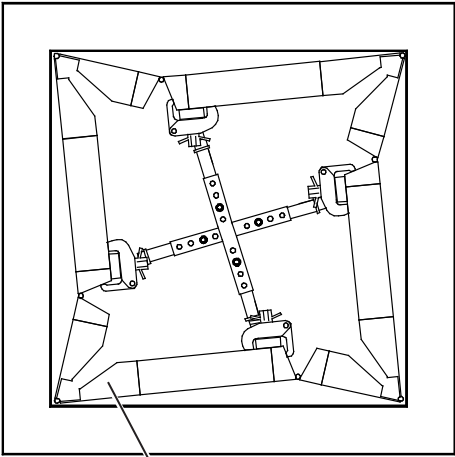


Formed

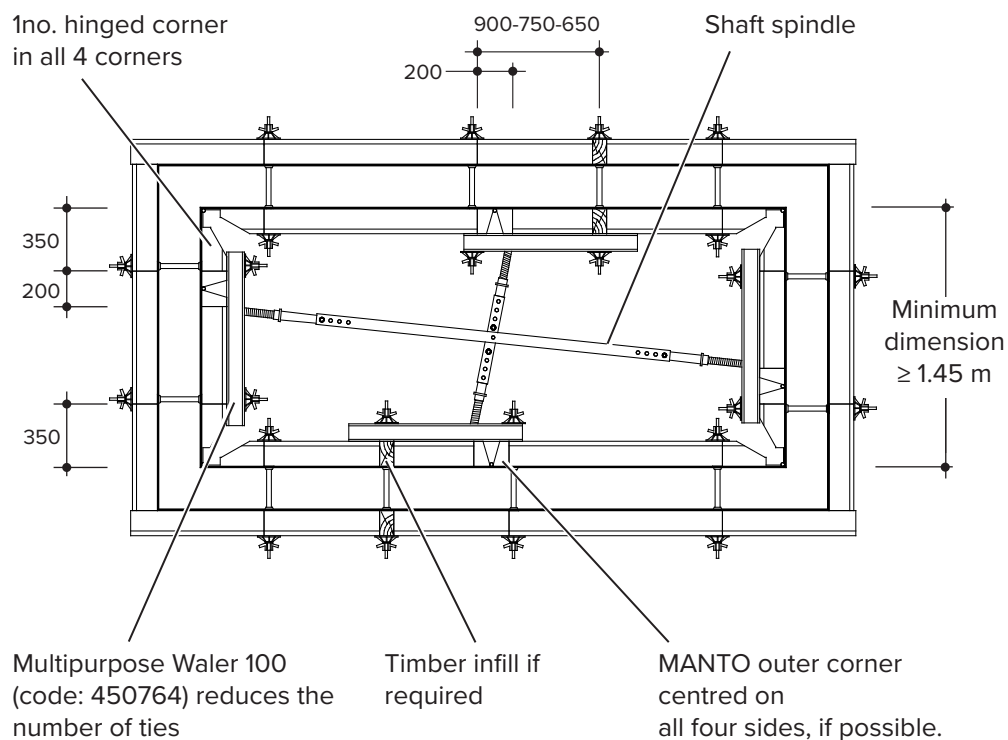
Stripped



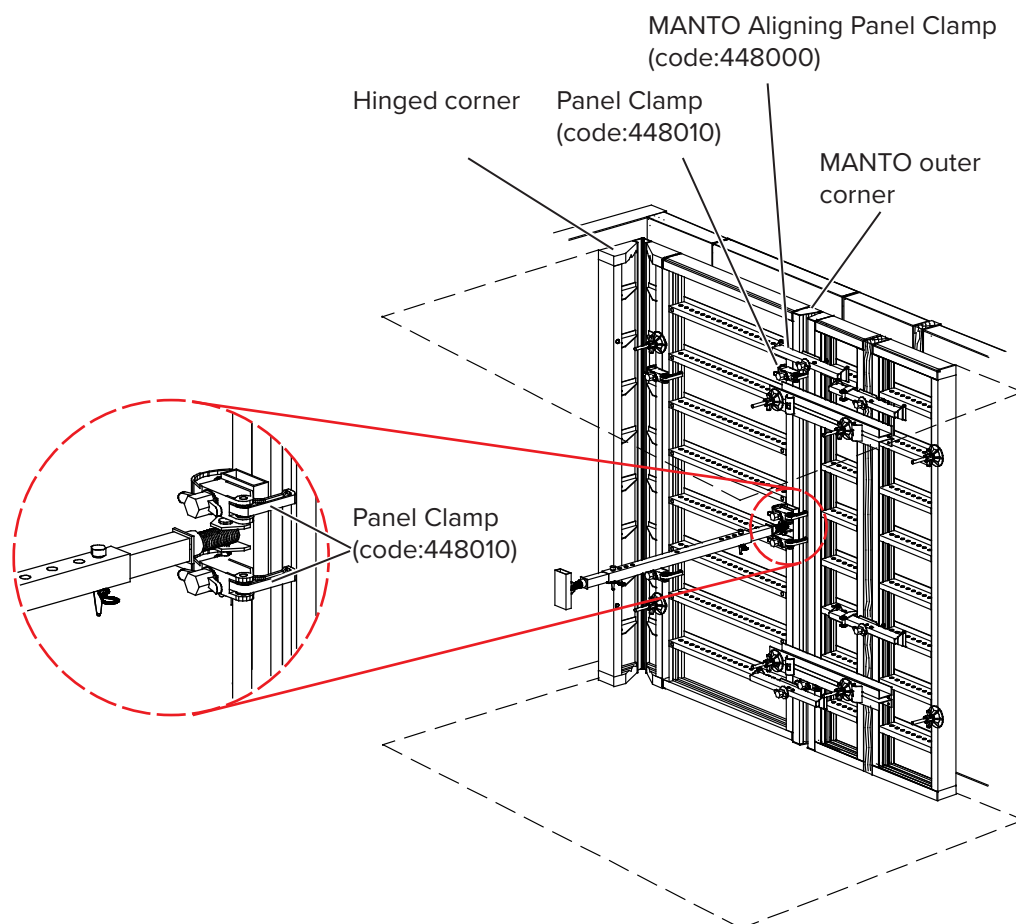
MANTO panel      MANTO outer corner



MANTO hinged corner



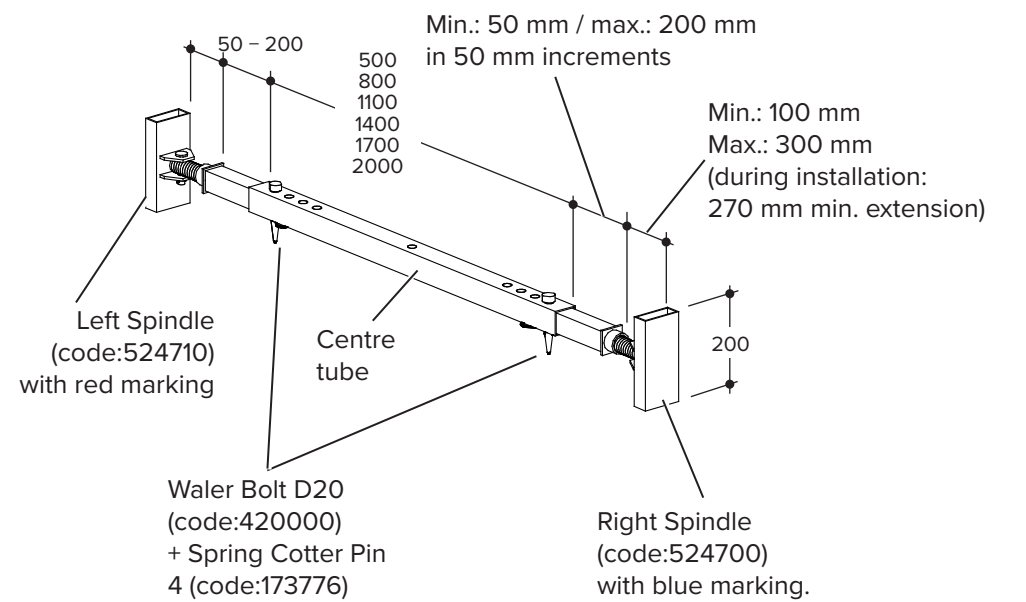
Up to a formwork height of 3.30 m, one shaft spindle is positioned in every direction. Connect the MANTO Outer Corner with a Panel Clamp and a MANTO Aligning Panel Clamp to the adjacent panel. The MANTO Aligning Panel Clamp serves as a stopper when closing the formwork.



Shaft spindle

The shaft spindle consists of a Centre Tube, the Left and Right Spindle and 2no. Waler Bolts D20 with a Spring Cotter Pin 4.

The shaft spindle has to be fastened with two Panel Clamps each at the element joint of the Outer Corner.

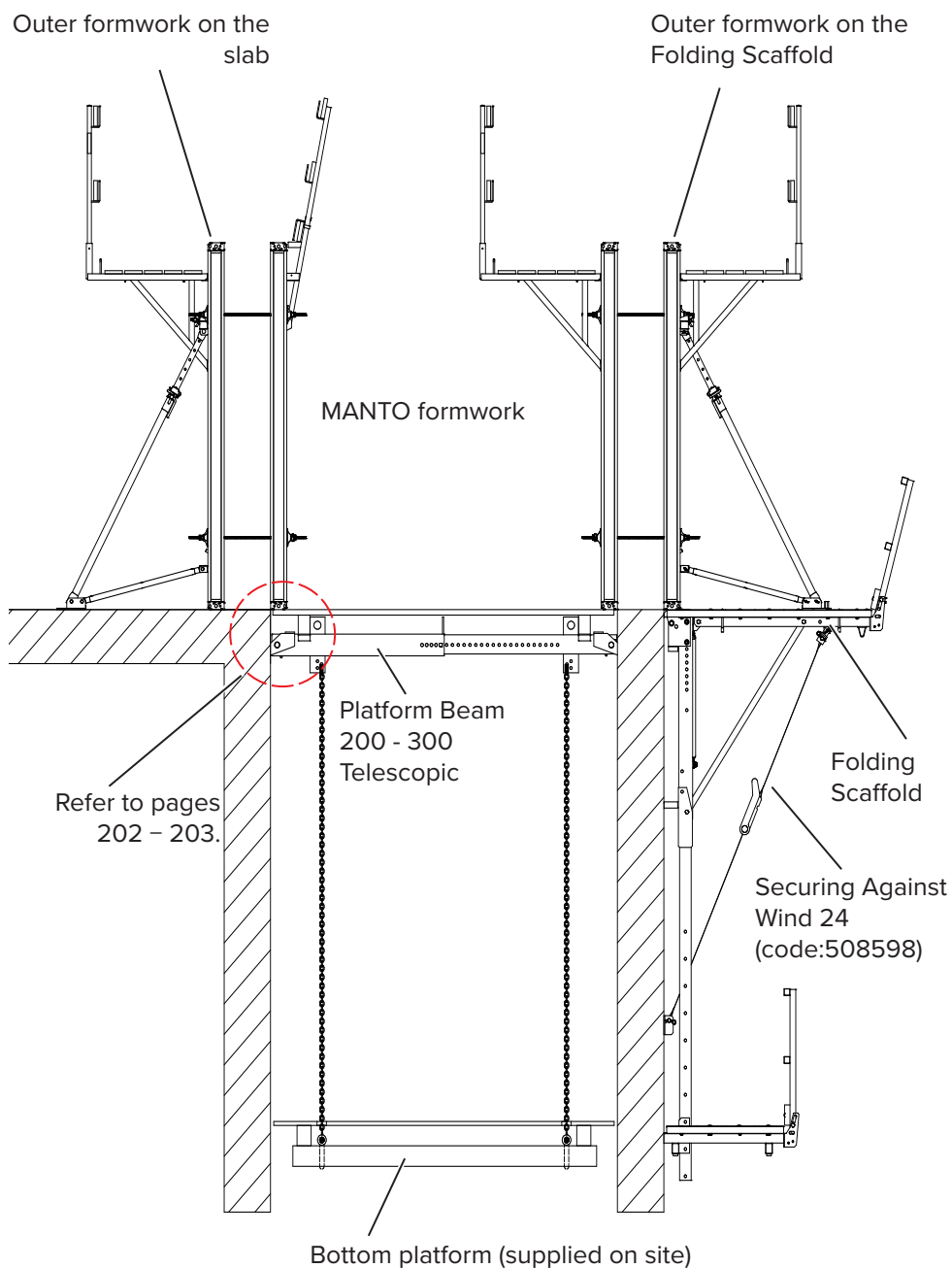


Always install the spindles in the extended condition (270 mm minimum) in order to obtain adequate spindle retraction for stripping.

Inside shaft dimension	Centre Tube	Product code
1.45 – 1.75 m	0.50 m	524721
1.75 – 2.05 m	0.80 m	524732
2.05 – 2.35 m	1.10 m	524743
2.35 – 2.65 m	1.40 m	524754
2.65 – 2.95 m	1.70 m	524765
2.95 – 3.25 m	2.00 m	524776

### 16.3 MANTO shaft formwork with an external and internal platform

The schematic cross-section below shows the MANTO shaft formwork combined with additional Hünnebeck components like the folding scaffold for the outer formwork and Platform Beam 200 - 300 Telescopic (code:600330) for the inner formwork.



#### **WARNING**

#### **Risk of falling from height!**

Secure timber boards adequately against uplift and horizontal displacement.

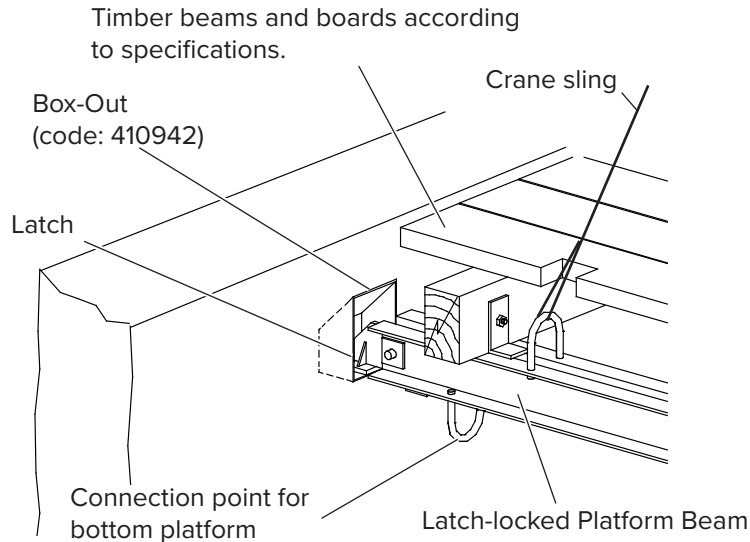


More information on the folding scaffold can be found in respective User Guide.

## 16.4 Platform Beams

The latch-locked platform consists of platform beams with timber beams and boards on top.

Gravity latches are attached to both ends of the double U-channel. They engage automatically into the pockets created by the Box-outs or the KB Supporting Parts. The Box-outs can be released from the bottom platform after the latch-locked platform is moved and can be re-used.



The Platform Beam is produced specifically for each project.  
For Safe Working Load, refer to the table on page 203.

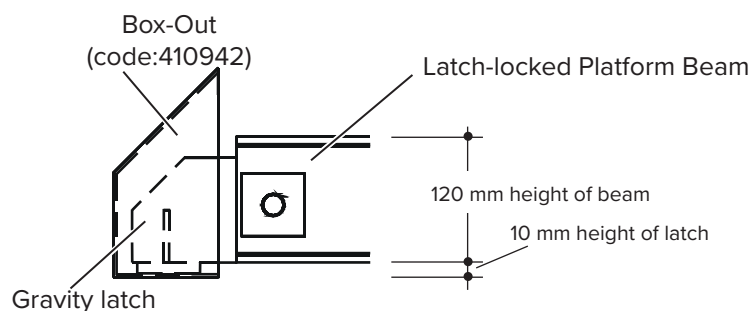
### Configuration limits

The following specifications apply to the Platform Beam 400:

- Maximum spacing of Platform Beams: 2.50 m centres
- Maximum height of the MANTO formwork: 5.40 m
- WLL of the bottom platform chains: 10.00 kN (alternatively DW15 tie rods can be used)
- Permitted live load: Either for latch-locked or bottom platform  $P = 1.50 \text{ kN/m}^2$  (alternatively:  $N = 1,0 \text{ kN}$  point load)
- Minimum concrete strength:  $15.00 \text{ N/mm}^2$  (for the supporting latches of the Platform Beam).

### Self-weights

- Formwork:  $60.00 \text{ kg/m}^2$  (approx.)
- Latch-locked platform:  $70.00 \text{ kg/m}^2$  (approx.)
- Bottom platform:  $50.00 \text{ kg/m}^2$  (approx.)



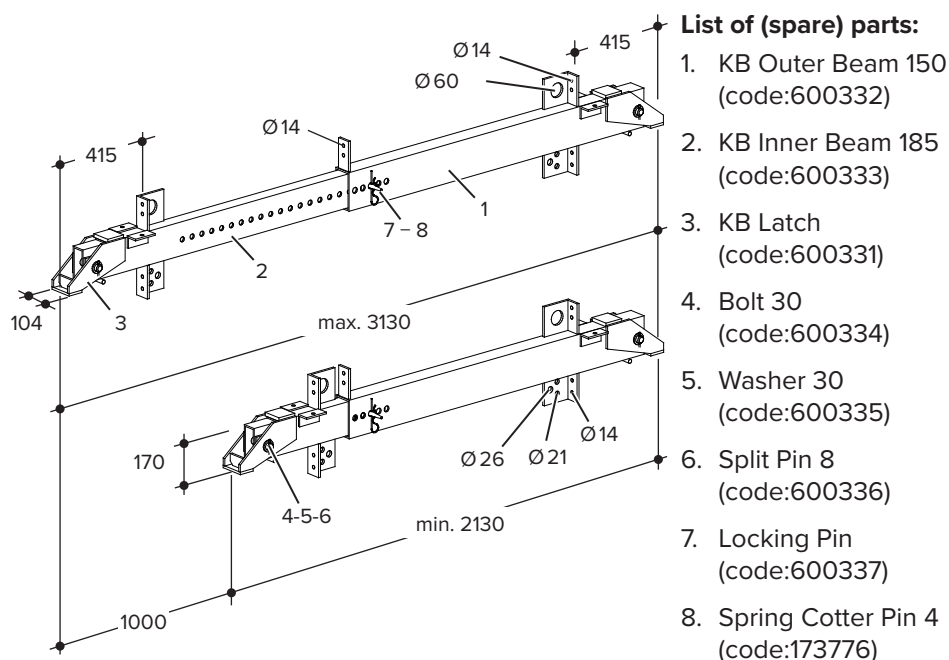


## 16.5 Using Platform Beam 200 – 300 Telescopic

The Platform Beam Telescopic 200 – 300 Telescopic (code:600330) is adjustable in steps of 10 mm within a range of 1.0 m and can cover openings in shafts. Depending on the support type of the Platform Beam 200 - 300 Telescopic, the possible clear width is between 2.00 m and 3.00 m when using the Box-out (code:410942) or between 2.24 m and 3.24 m, when the KB Supporting Part (code:600338) is used.

The latch of the Platform Beam 200 – 300 Telescopic locks into the pocket created by the Box-out or sits on the KB Supporting Part. The Box-out and the KB Supporting Part can be removed after use.

The Platform Beam 200 - 300 Telescopic is provided with connections for timber boards (supplied on site) and for a bottom platform if required.



The Platform Beam 200 - 300 Telescopic is supplied as a full assembly, complete with components 1 to 8.

The SWLs of the Platform Beam 200 - 300 Telescopic vary according to the component used to support the beam on the wall. Two choices are available:

- KB Supporting Part
- Box-out

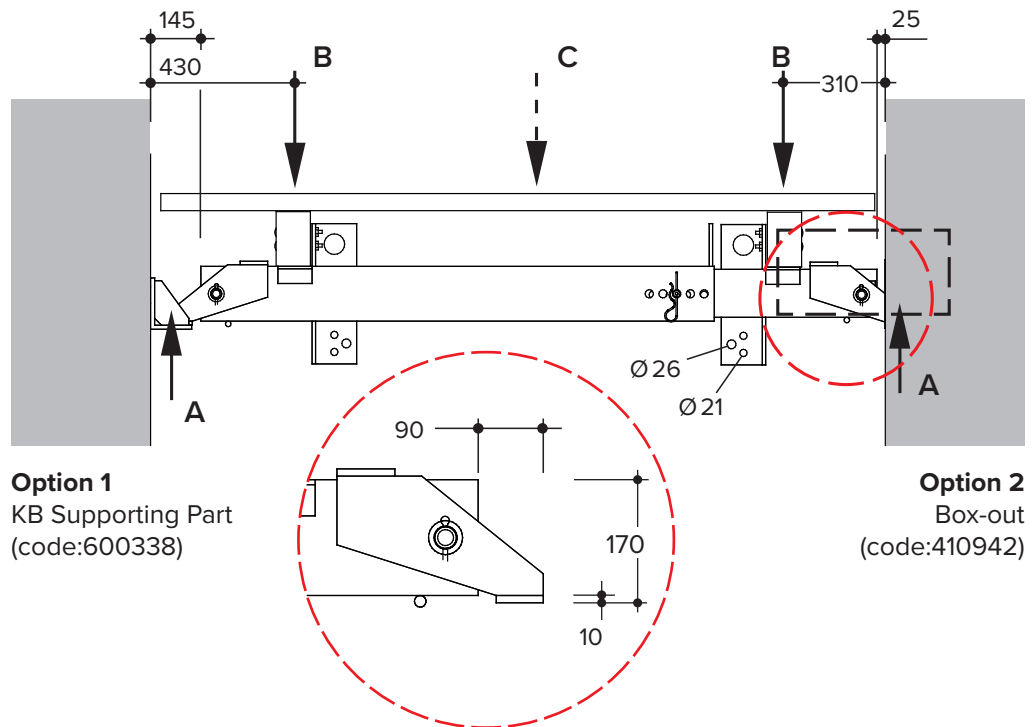
SWL		
Platform Beam 200 - 300 Telescopic (code:600330) and Latch-locked Platform Beam		
Permitted structural values	End Support	
	KB Supporting Part (code:600338)	Box-out (code:410942)
Permitted Bending Moment (M)	12.50 kNm	
Permitted Support Reaction	22.50 kN	40.00 kN
SWL (edge of the shaft)	29.00 kN	
SWL (middle of the shaft)	20.40 kN	



### WARNING

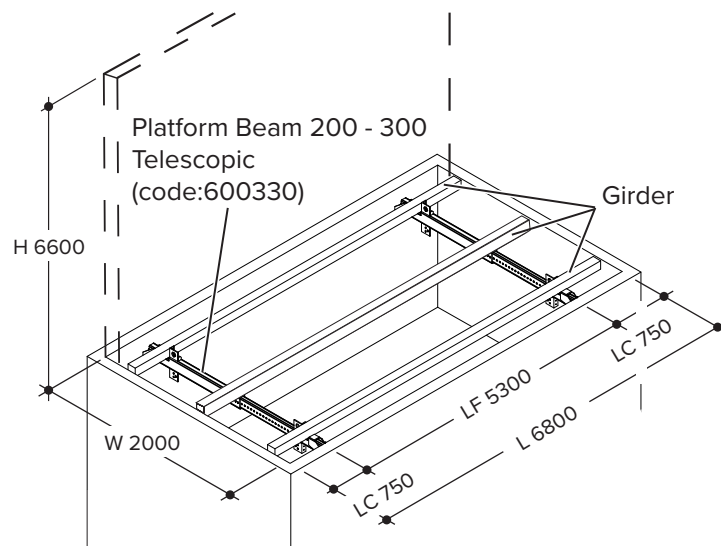
#### Warning!

Always use the same support at both ends of the beam and for all of the beams that make a platform.



The required minimum concrete strength for the Platform Beam 200 - 300 Telescopic (code:600330) is 15.00 N/mm<sup>2</sup>.

Below is an example of a typical assembly for a shaft 2.00 m wide and 6.80 m long with 6.60 m high formwork.



Also refer to maximum shaft dimensions table on page 206.



## WARNING

### Risk of overturning!

Do not begin assembly of the formwork over the cantilevered end.

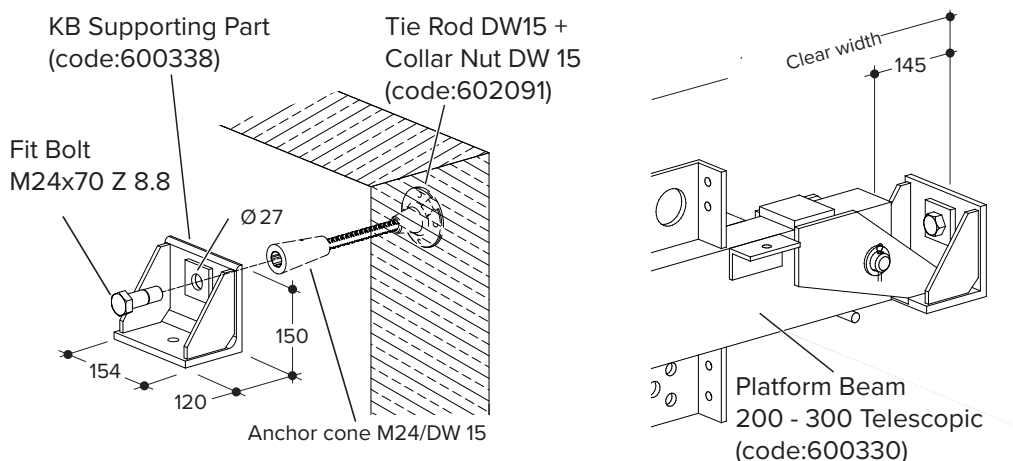


With option 1 keep in mind the load on the platform boards imposed by the weight of the formwork. The cantilevered planks may be overloaded by high formwork and must be reinforced accordingly.

### 16.5.1 Support option 1: Platform Beam 200 - 300 Telescopic

With support option 1 for the Platform Beam 200 - 300 Telescopic (code:600330), both ends of the beam rest on a KB Supporting Part.

The required length of the beam is the clear width of the shaft minus 290 mm (2 x 145 mm).



#### **WARNING**

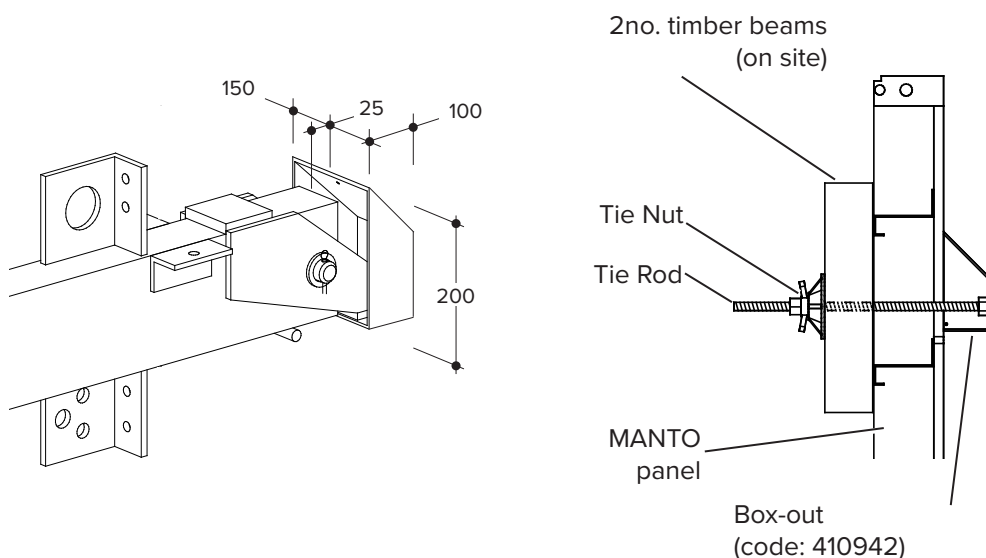
##### **Risk of falling from height!**

The Tie Cone M24/DW 15 (code:496664) has to be tied in a way that is suitable to the site conditions. Tie the Tie Cone M24/DW 15 according to approval no. Z-21.6-1854-2017-03-17 and/or other local regulations. Please check your local requirements and regulations.

### 16.5.2 Support option 2: Platform Beam 200 - 300 Telescopic

The latch of the platform beam 200 - 300 Telescopic engages in the Box-out (code:410942). The Box-out can be removed and re-used after lifting the platform.

The required length of the beam is the clear width of the shaft minus 50 mm (2 x 25 mm).



The Box-out can be connected to the MANTO panel with a Tie Rod and a Tie Nut. The Box-out can also be nailed to the formwork using the nailing holes.

Maximum shaft dimensions: width and length												
Design	KB Supporting Part						Box-out					
Height of formwork H [m]	6.60	5.40	4.50	3.90	3.30	2.70	6.60	5.40	4.50	3.90	3.30	2.70
Timber beam* main platform [mm]	160/120	160/120	160/120	160/120	160/120	160/120	160/120	160/120	160/120	160/120	160/120	160/120
Timber beam* bottom platform [mm]	160/120	160/120	160/120	160/120	160/120	160/120	160/120	160/120	160/120	160/120	160/120	160/120
Bearing force max. A [kN]	22.5						40.0					
Width of shaft	W = 3.00 m											
Length of shaft L [m]	3.30	4.00	4.70	5.30	5.70	5.70	4.20	4.90	5.50	5.70	5.70	5.70
Bay length LF [m]	2.30	2.80	3.30	3.70	3.90	3.90	3.00	3.50	3.90	3.90	3.90	3.90
Length of cantilever Lk [m]	0.50	0.60	0.70	0.80	0.90	0.90	0.60	0.70	0.80	0.90	0.90	0.90
Width of shaft	W = 2.50 m											
Length of shaft L [m]	3.80	4.60	5.40	6.00	6.20	6.20	4.60	5.40	6.20	6.30	6.30	6.30
Bay length LF [m]	2.60	3.20	3.80	4.20	4.40	4.40	3.20	3.80	4.40	4.50	4.50	4.50
Length of cantilever Lk [m]	0.60	0.70	0.80	0.90	0.90	0.90	0.70	0.80	0.90	0.90	0.90	0.90
Width of shaft	W = 2.24 m						W = 2.00 m					
Length of shaft L [m]	4.50	5.40	6.30	6.90	7.00	7.00	5.20	6.10	7.00	7.00	7.00	7.00
Bay length LF [m]	3.10	3.80	4.50	4.90	4.80	4.80	3.60	4.30	4.80	4.80	4.80	4.80
Length of cantilever Lk [m]	0.70	0.80	0.90	1.00	1.10	1.10	0.80	0.90	1.10	1.10	1.10	1.10

\*Timber beams of strength class C24 according to EN 338

Do not exceed a formwork weight of 0.75 kN/m<sup>2</sup>.

Live load (on one level only): Pouring or main platform 1.50 kN/m<sup>2</sup> or bottom platform 1.50 kN/m<sup>2</sup>.

Board thickness main platform: 50 mm, regardless of board width.

Board thickness bottom platform: 45/200 or 40/240 according to table 3 of DIN 4420-1.

## 17 Assembling formwork

The following section shows the typical assembly of the MANTO wall formwork.



### **WARNING**

#### **Risk of injury from falling panels!**

Do not stand or walk under suspended loads!



Apply release agent to the form sheets prior to lifting/pouring concrete. This makes it easier to separate the formwork panels from the concrete.

### 17.1 Assembling formwork with one-sided tie system

How to assemble wall formwork with a one-sided tie system is described here.

The ties are operated from the advancing side.

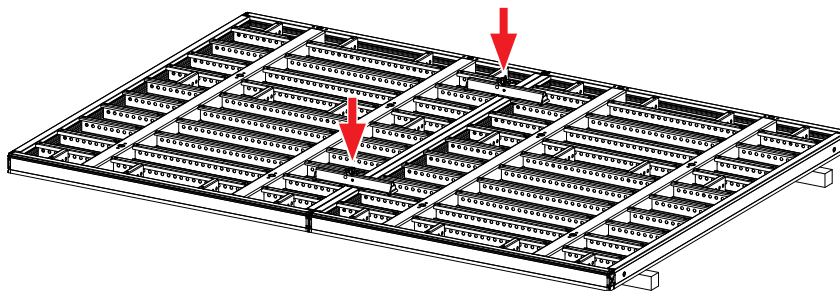


When formwork is not stacked, tying can be done from the closing side in most cases. When using stacked formwork, it is advisable to install the platforms on the advancing side of the formwork and to tie from there.

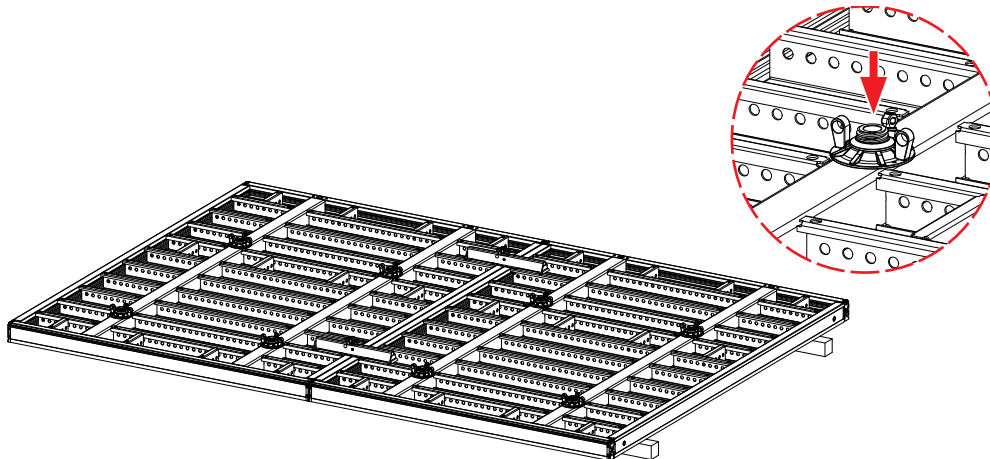
The operator always has to decide on site which side offers the safest position for operating the ties.

#### **Assembling the formwork**

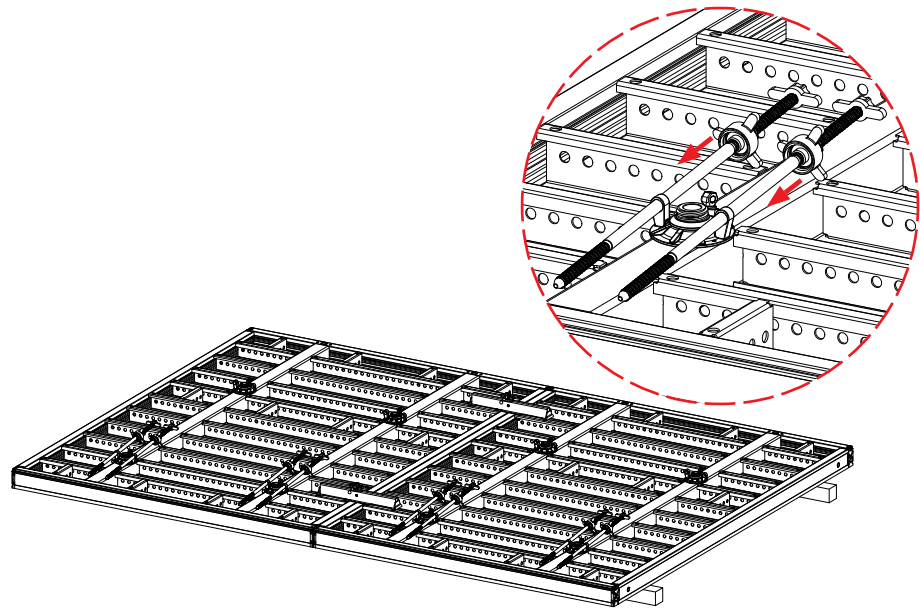
- Step 1** Assemble the advancing formwork on the ground, using timber beams or trestles, to prevent damage to the components. Ensure enough clearance from the ground.



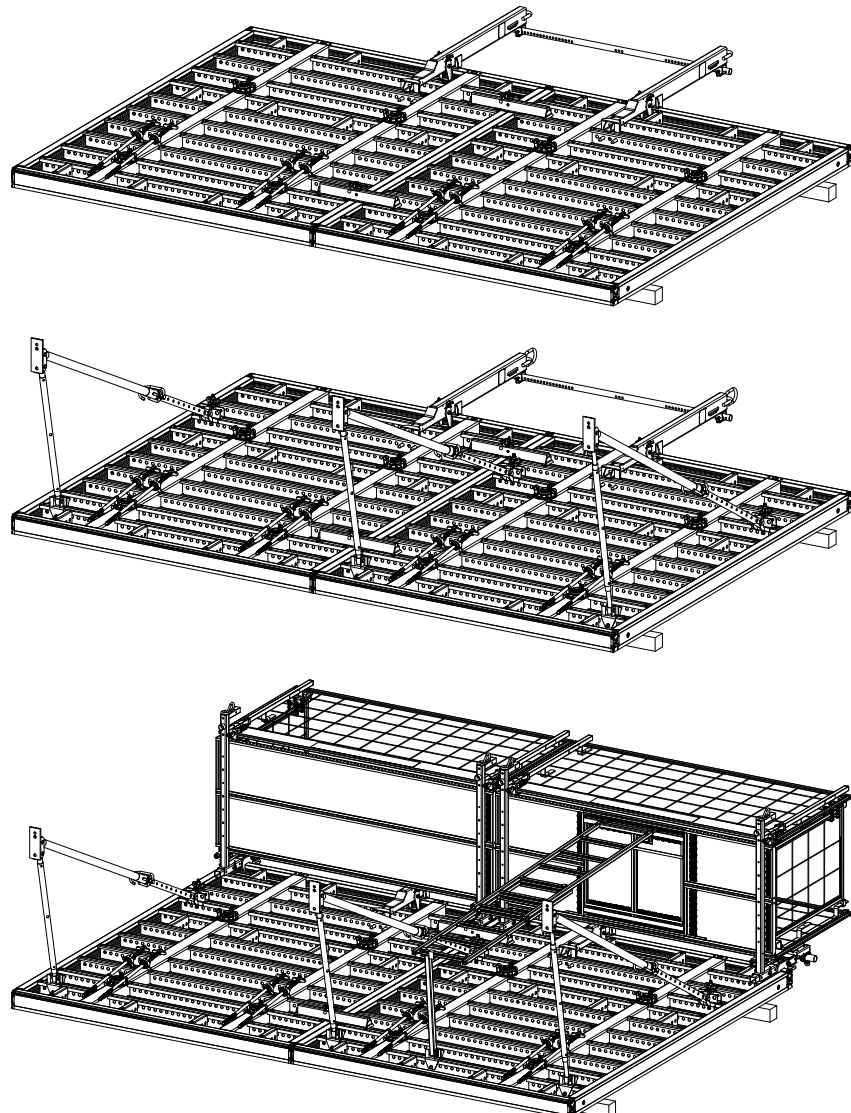
- Step 2** Attach e.g. PLATINUM 100 Tie Nuts Closing Side (code:604197). Refer to section 8 or to the design scheme for the correct number and position.



- Step 3** Insert the tie rods, which have been pre-adjusted as shown on page 105, into the tie rod holder.

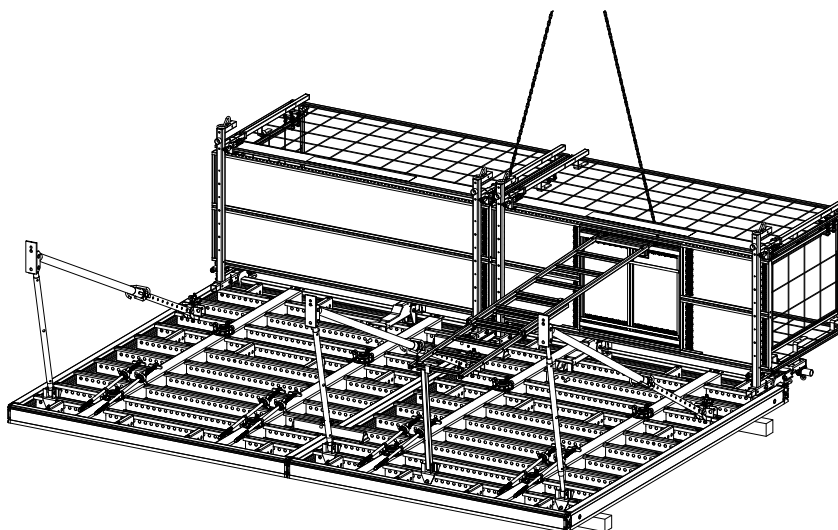


- Step 4** Install PLATINUM 100 Lifting Devices (code:606920), struts and platforms, including inner guardrails, as per the design scheme.

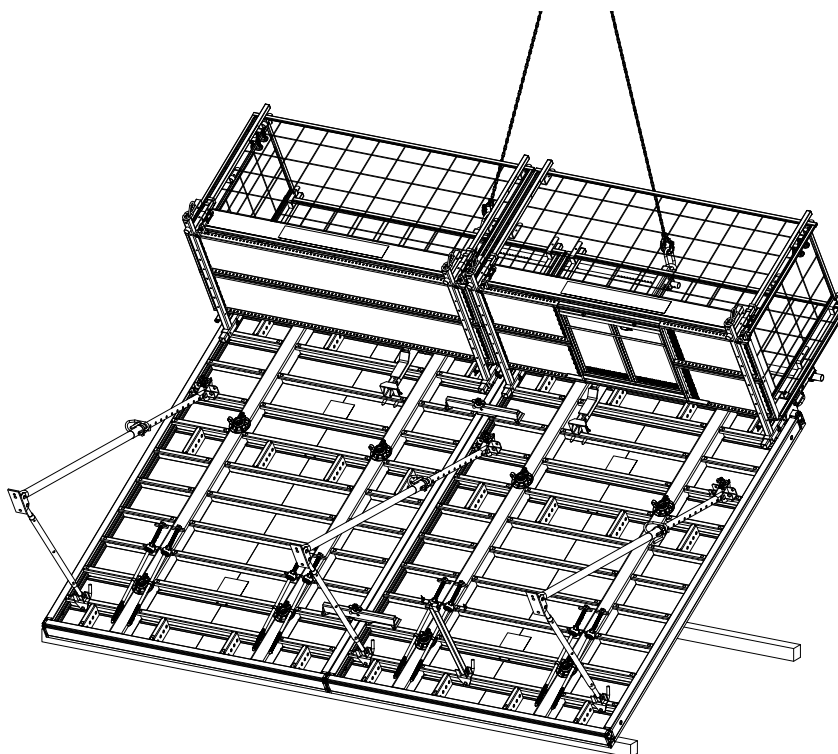




- Step 5** Install the slings. Check that the slings do not damage other components or get tangled.



- Step 6** Raise the formwork upright in a safe and controlled way.

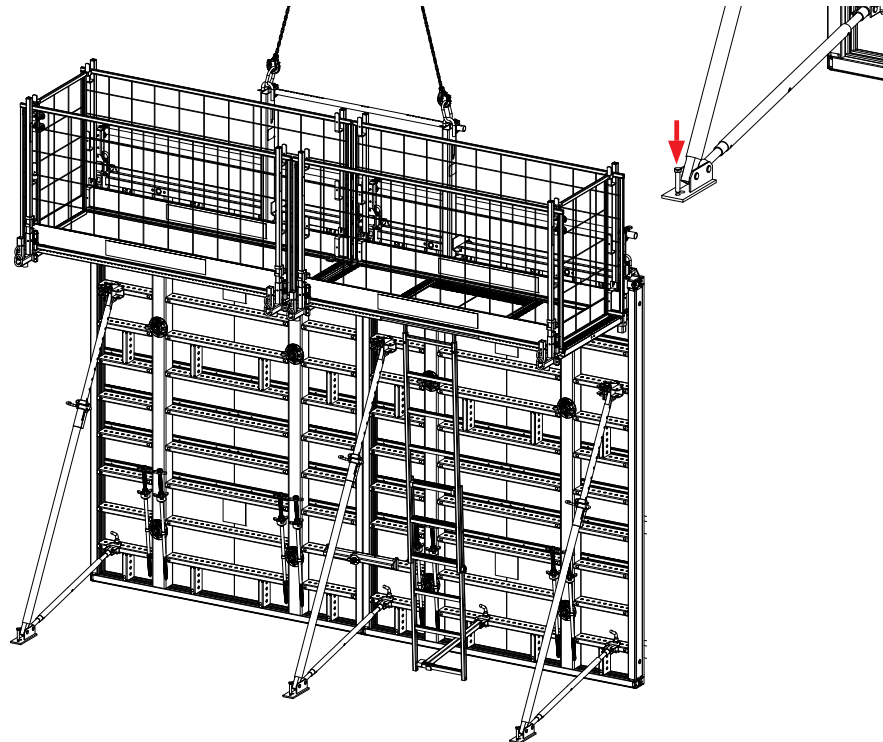


**WARNING**

**Risk of injury from falling panels!**

Do not stand or walk under suspended loads!

**Step 7** Place the formwork in position and secure the struts using suitable ties.



## WARNING

### Risk of injury from collapsing formwork!

The formwork can topple over if the struts are not tied properly!

Appropriate ties to suit the specific application must be selected by a competent person.

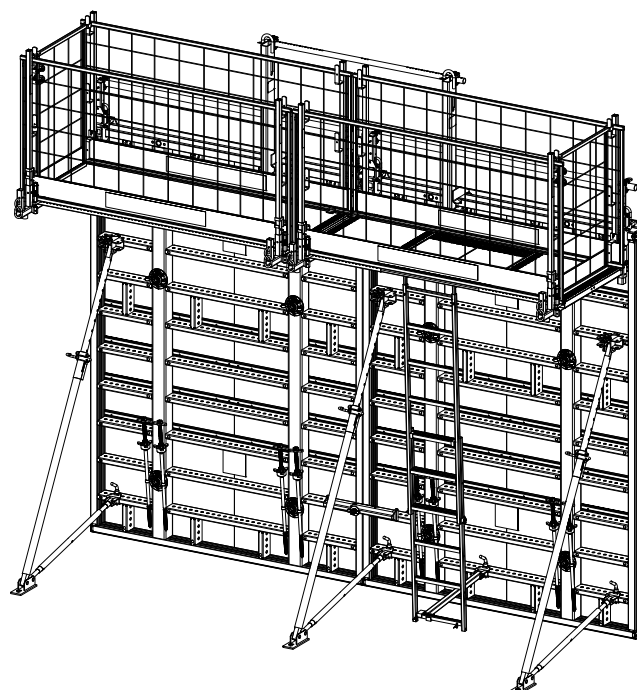


## WARNING

### Risk of injury from overturning formwork!

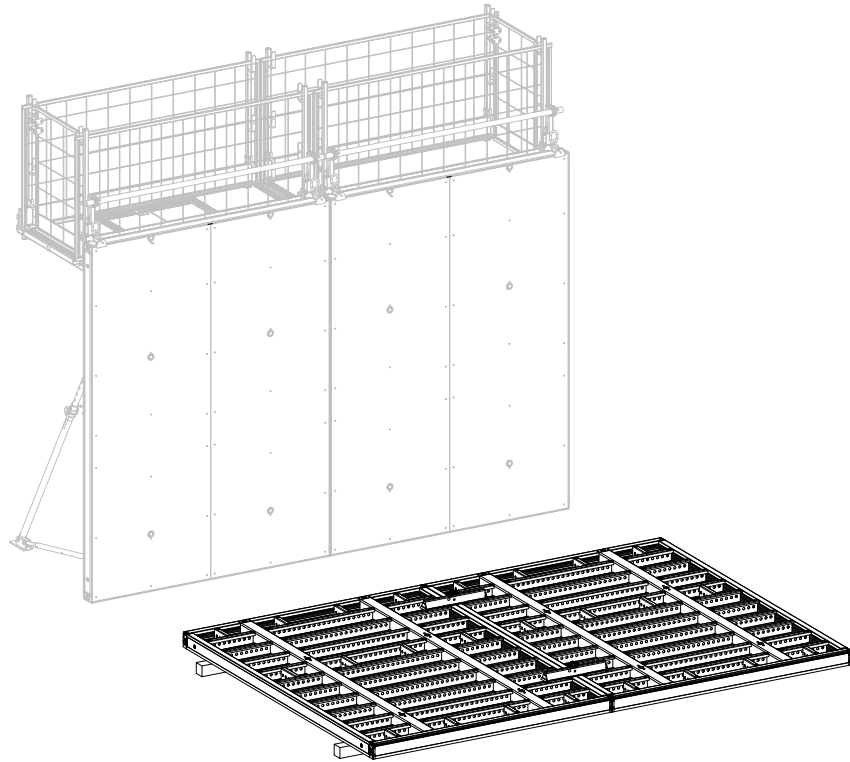
Do not detach the lifting gear from the PLATINUM 100 Lifting Device (code:606920) on the advancing side of the formwork until all ties are secure and the struts are firmly tied to the ground.

**Step 8** Remove the PLATINUM 100 Lifting Device.

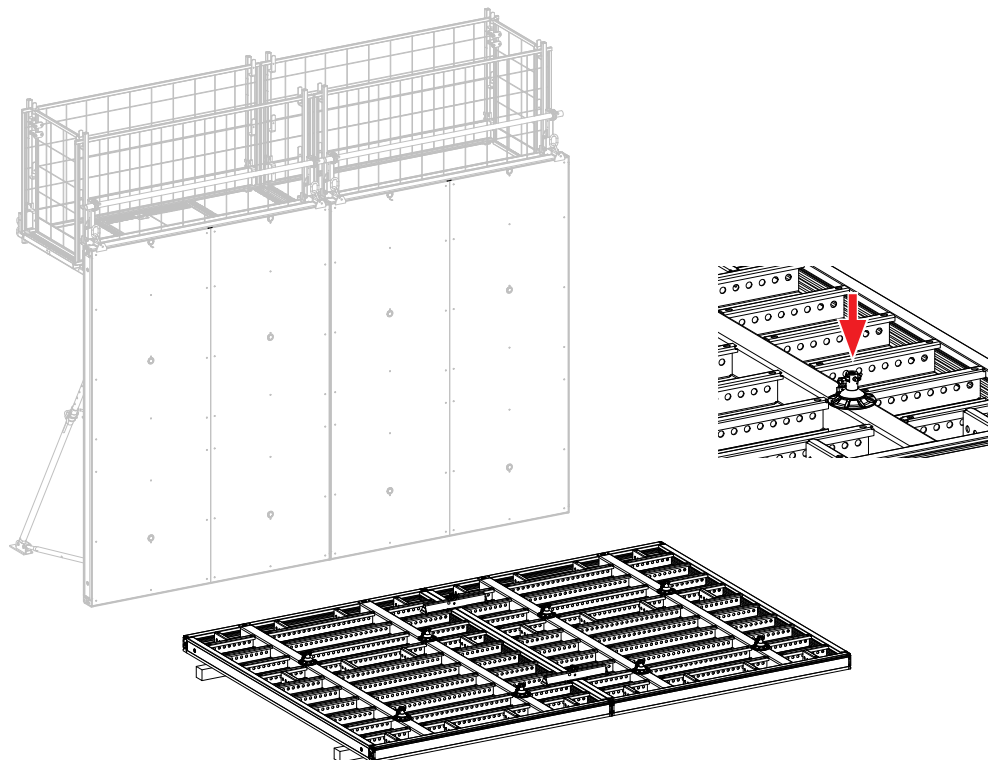




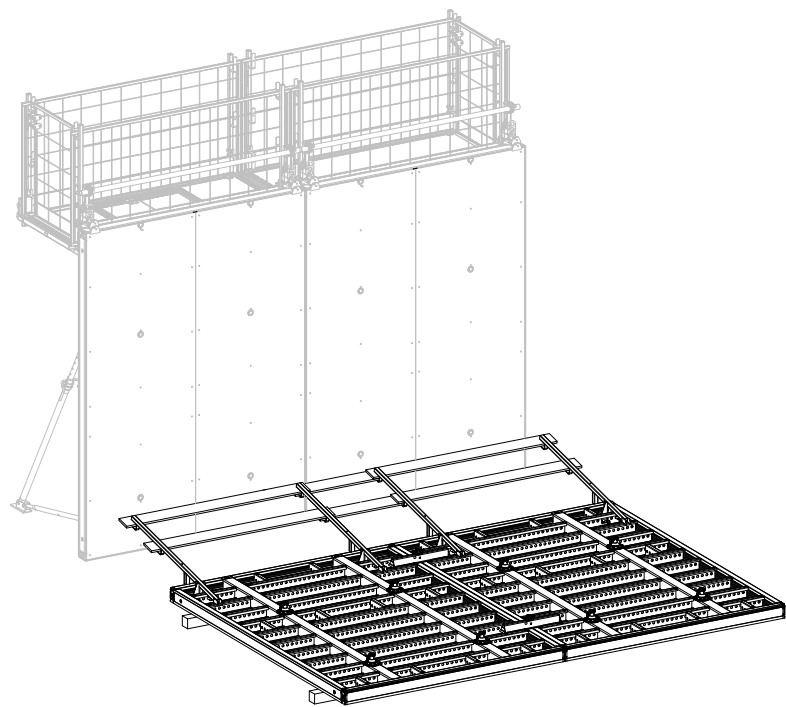
**Step 9** Assemble the closing side on timber beams on the ground.



**Step 10** Attach e.g. PLATINUM 100 Tie Nuts Advancing Side (code:604196). Refer to the design scheme for the correct number and position.

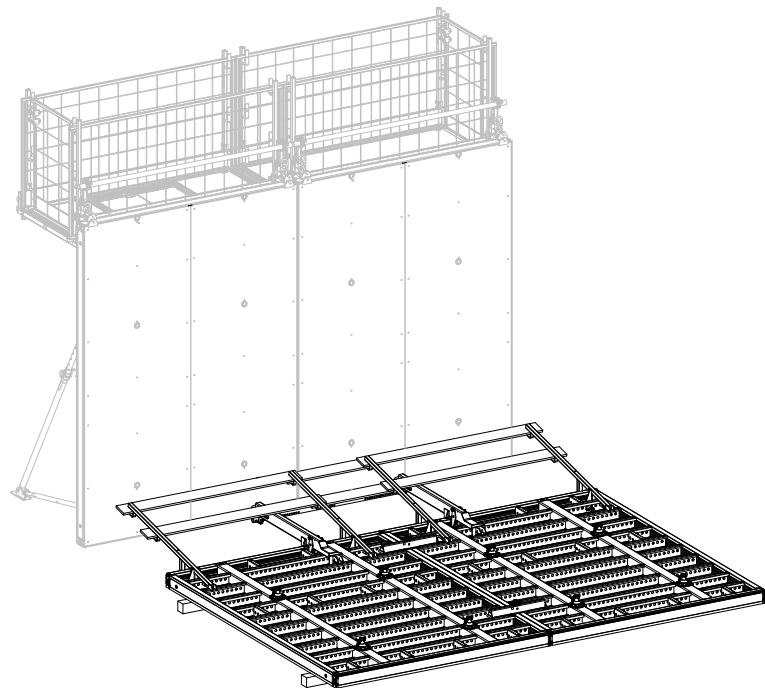


Step 11    Attach Counter Posts and guardrails.

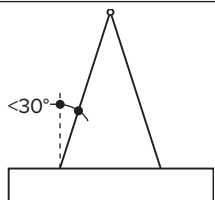


The assembly sequence shown uses timber boards as guardrails for illustration only. Other edge protection systems can be used to comply with local regulations.

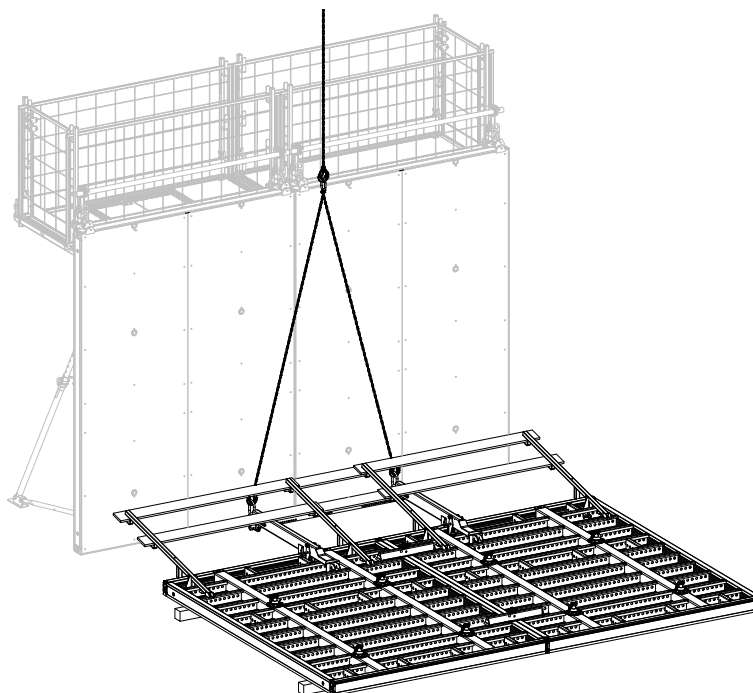
Step 12    Install lifting devices.



When transporting loads with two lifting points, the angle pitch of the chains on the crane hook may not be greater than 30°. Otherwise the slings will be overloaded.



- Step 13** Attach a suitable sling, e.g. a two-strand chain sling, to the lifting devices. Raise the formwork upright in a safe and controlled way.

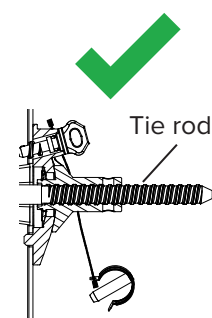
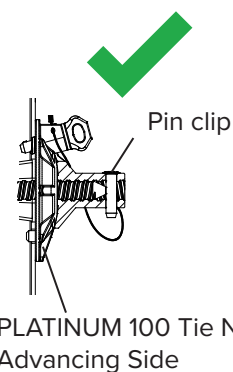
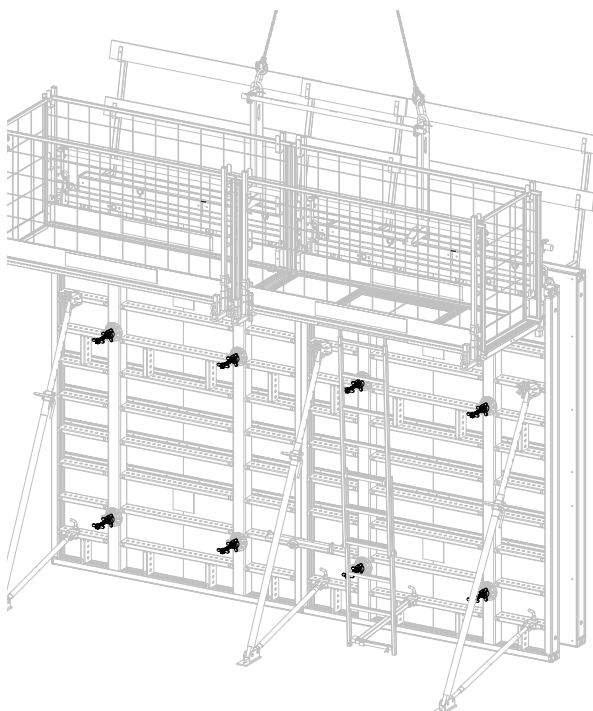


## **WARNING**

### **Risk of injury from falling panels!**

Do not stand or walk under suspended loads!

- Step 14** Working from the advancing side, release the taper tie from the tie rod holder and slide them through the PLATINUM 100 Tie Nuts Closing Side (code:604197). Screw the tie rods all the way into the PLATINUM 100 Tie Nuts Advancing Side (code:604196) on the opposite of the formwork. Screw the counter nut from the PLATINUM 100 Tie Rods G2 onto the thread of the PLATINUM 100 Tie Nut Closing Side.





When the tie rods hit the pin clip of the opposing tie nuts, the tie is ready to take tension loads but not compression loads. The counter nut cannot resist both tension and compression loads until the counter nut is tightened.

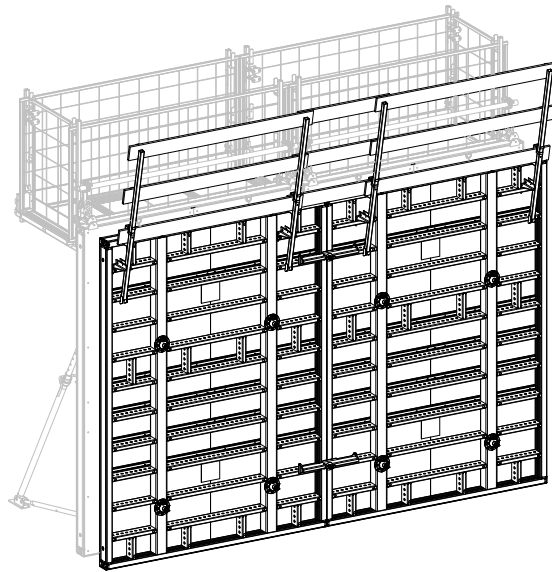


## WARNING

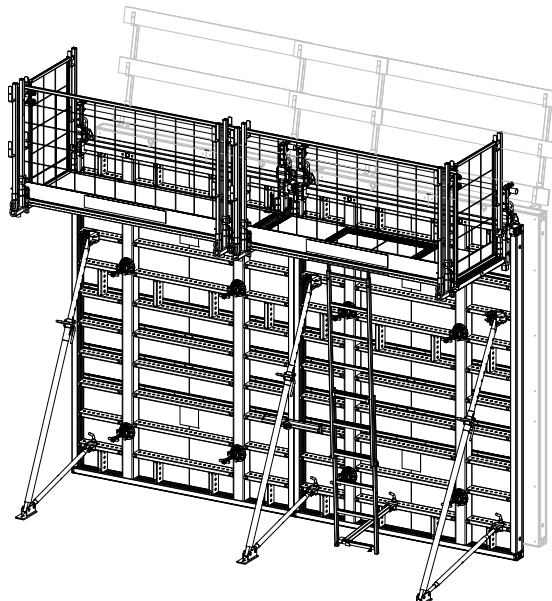
### Risk of injury from overturning formwork!

Do not detach the lifting gear from the PLATINUM 100 Lifting Device (code:606920) on the closing side of the formwork until all ties are secure, the tie rods are in place and the counter nuts are properly tightened.

- Step 15** Release the PLATINUM 100 Lifting Device and install any toe boards on the internal edge protection if required.

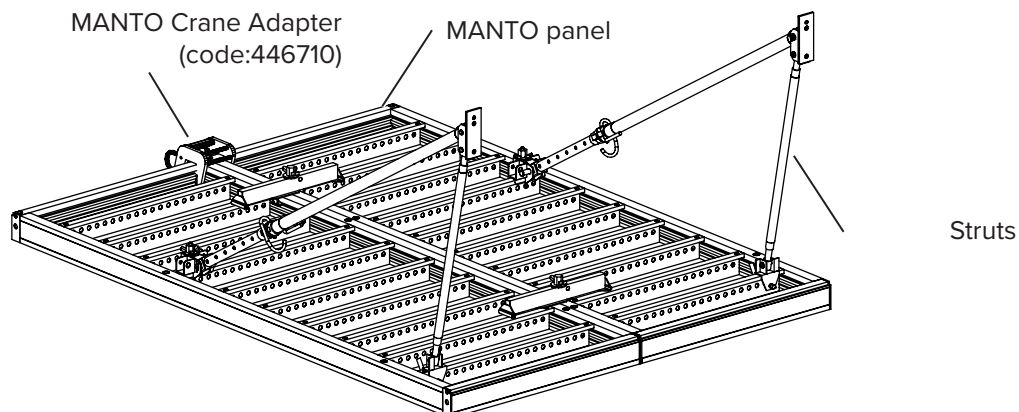


- Step 16** Move the interior guardrail on the Universal Formwork Platform to the park position on the outside.

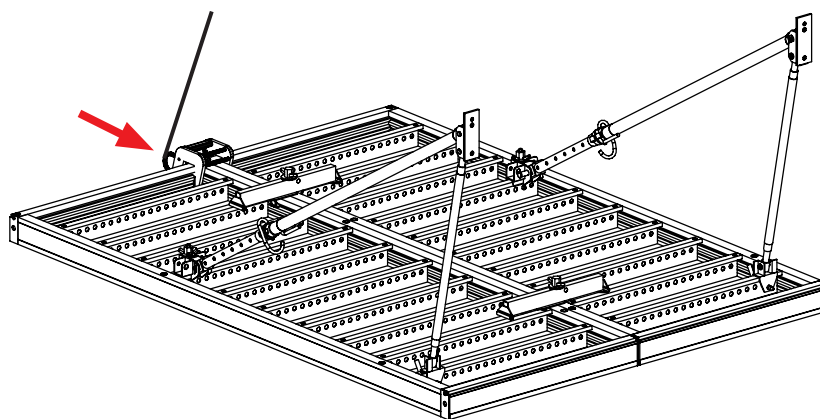


## 17.2 Assembling formwork with conventional tie method

- Step 1** Pre-assemble the MANTO panels on timber beams on even ground.
- Step 2** Attach 2no MANTO Alignment Struts to the first MANTO panels. This allows the formwork to be secured to the ground after it is raised upright, preventing it from collapsing.



- Step 3** If no pouring platforms are to be attached, the MANTO formwork can now be transported with a crane to the point of use by using the MANTO Crane Adapter.



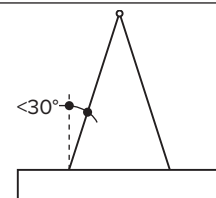
### WARNING

#### Risk of injury from falling panels!

Do not stand or walk under suspended loads!



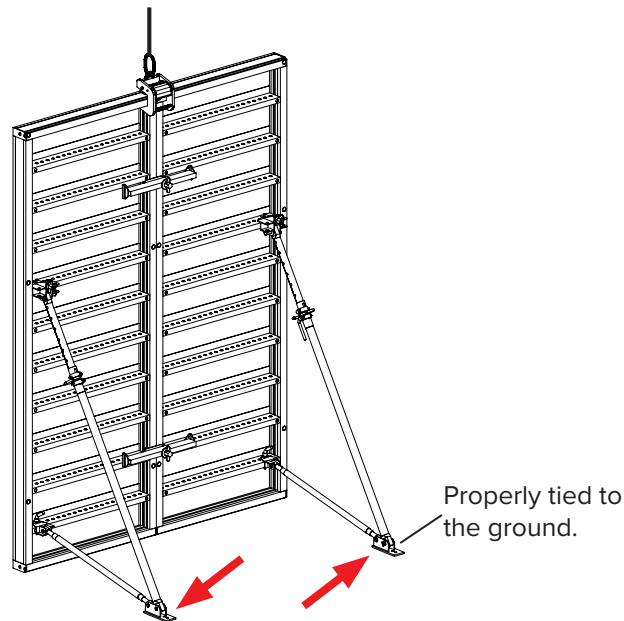
When transporting loads with two lifting points, the angle pitch of the chains on the crane hook may not be greater than 30°. Otherwise the slings will be overloaded.



The WLL of the MANTO Crane Adapter (code:446710) is 1000 kg.

The WLL is 1500 kg when the MANTO Transport Hook G2 (code:608380) is used.

- Step 4** Once the formwork is at the point of use, use suitable ties to tie the MANTO Alignment Struts (code:565144) firmly to the ground.

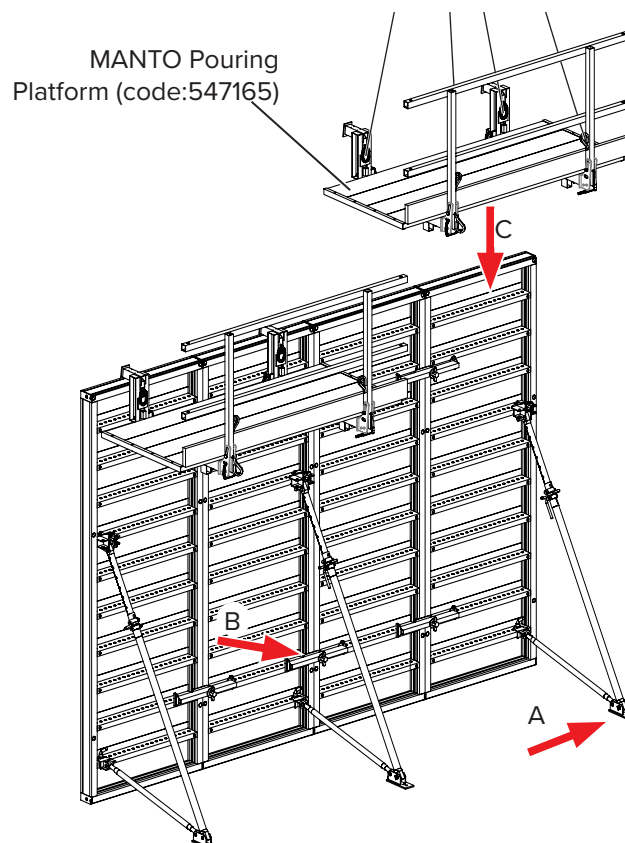


## WARNING

### Risk of injury from overturning formwork!

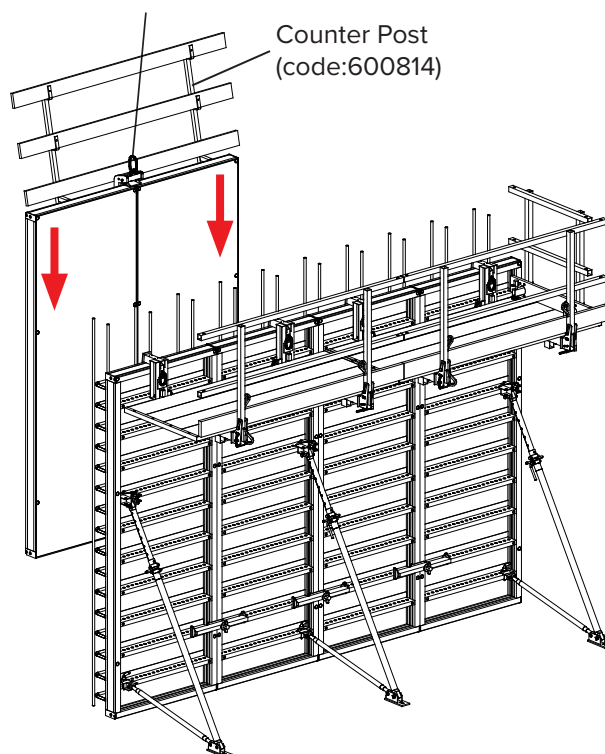
Do not detach the slings and the MANTO Crane Adapter or MANTO Transport Hook G2 from the closing side of the formwork until the MANTO Alignment Struts are firmly tied to the ground.

- Step 5** If required, attach further MANTO panels, tie to the ground (A) and connect to the first panels with MANTO Aligning Panel Clamps (B, code:448000).
- Step 6** Connect the proper platform, in this case the MANTO Pouring Platform, with the integrated railing to the formwork (C).



End guardrails not shown for clarity.

- Step 7** Pre-assemble the closing side with the Counter Posts. Then transport the formwork panels to the place of use.



## **WARNING**

### **Risk of injury from overturning formwork!**

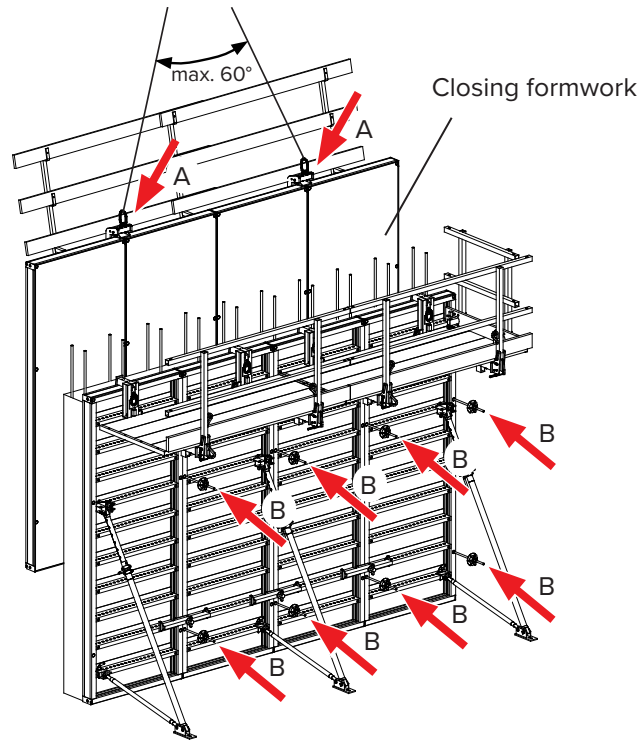
Do not release the MANTO Transport Hook G2 or MANTO Crane Adapter from panels which do not have struts (closing side) until all ties are securely fixed.

- Step 8** Tie the advancing side and closing side of the formwork together using the specified ties.
- Step 9** Release the MANTO Crane Adapter from the formwork.
- Step 10** Repeat previous steps for further panels if required.



## 18 Stripping

- Step 1** Remove loose items from the formwork.
- Step 2** Attach the MANTO Crane Adapter (A) to the closing side of the formwork (opposite the MANTO Pouring Platform).
- Step 3** Remove all ties (B) connecting the part of the formwork to be removed.
- Step 4** Release the closing formwork from the wall. Lifting can now start.



### WARNING

#### Risk of injury from overturning formwork!

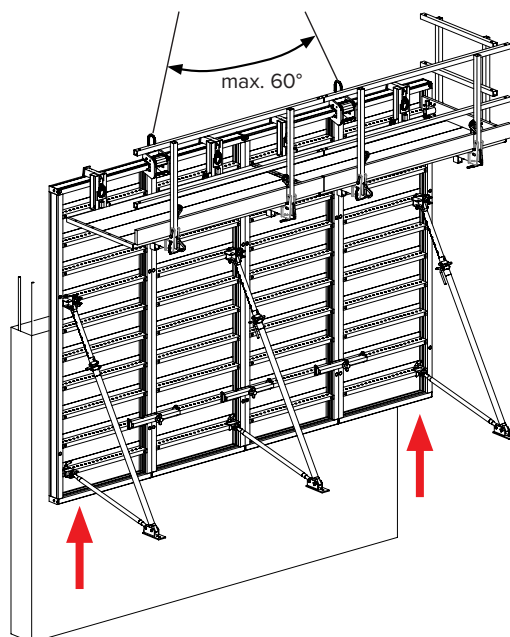
Attach the closing formwork to a crane before removing the ties.

When transporting MANTO panels with two lifting points, the angle pitch of the chains on the crane hook may not be greater than 30°.

- Step 5** Clean the formwork to remove the remaining concrete.



**Step 6** Release the advancing formwork from the wall and move it to the next place of use.



## **WARNING**

### **Risk of injury from falling panels!**

The lifting points on the platform may not be used to move the platform with formwork attached. Use only MANTO Crane Adapters to move formwork with a platform attached to it. Follow the operating instructions for the MANTO Crane Adapter.

19    Cleaning on-site

A flat scraper is the best tool for removing concrete residue from the form sheet. Use caution to ensure that the tool does not damage the form sheet.

A scraper or a hard brush is the best tool for cleaning the steel frame.

NOTE	<p><b>Form lining can be damaged!</b></p> <p>When using a pressure washer to clean the equipment, do not direct the spray towards the edges of the form sheet. This could cause the surface layer of the form sheet to peel off.</p>
------	--

When using a pressure washer to clean the equipment, comply with the applicable regulations regarding waste water. The waste water may need to be collected and disposed of properly. Comply with the safety regulation pertaining to the formwork oil and other substances used.

## 20 Storage and transport

### 20.1 MANTO Panels

#### 20.1.1 Using MANTO Loading Adapter

##### Bundled panels (MANTO G1 and MANTO G2 panels)



Always comply with the separate operating instructions for the MANTO Loading Adapter (code:461033)!



#### WARNING

##### Risk of injury from falling formwork panels!

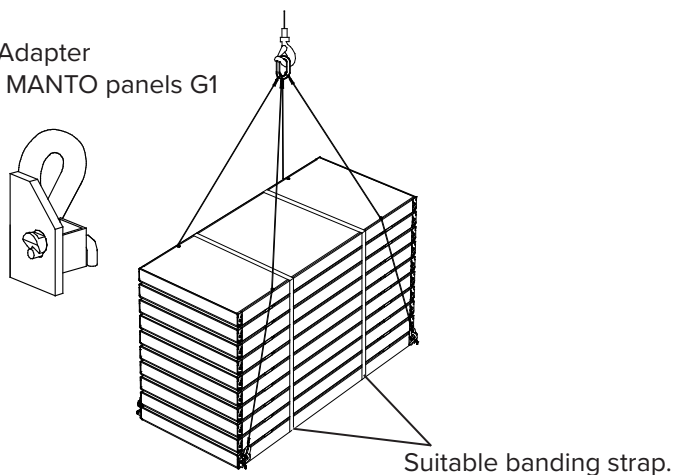
Adequately secure MANTO panels that are transported as a bundle with at least 2no. retaining bands to prevent panels from sliding out of the bundle.

When lifting MANTO panels the internal angle of the slings on the crane hook should not exceed 60°.

MANTO Loading Adapters are used to horizontally transport horizontally stacked bundles of MANTO G1 and G2 panels by crane. Refer to Section 20.1.2 on page 222 for information on MANTO G3 and MANTO G3 M.

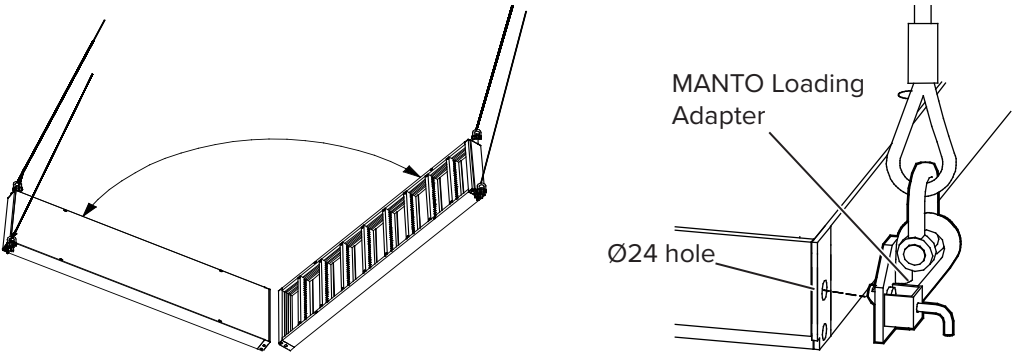
The MANTO Loading Adapter combined with 4-string suspensions allows bundles of 10no. panels or 5no. giant panels 240/270 or 240/330 to be moved. The WLL per MANTO Loading Adapter is 500 kg.

MANTO Loading Adapter  
(code:461033) for MANTO panels G1  
and G2.



Using single panels

Single MANTO panels can be turned over the long way with 2no. MANTO Loading Adapters (code:460133) (does not apply to MANTO panels G3 G3 M- Refer to Section 20.1.2 on page 222). The Loading Adapters are connected at the corners of the panel by engaging the connecting pin in the hole (Ø 24 mm) in the panel.



Turning of the panels is only permitted as shown here. Lifting multiple connected MANTO panels with the MANTO Loading Adapter is not permitted.

The separate operating instructions of the MANTO Loading Adapter have to be followed.

20.1.2 With the MANTO G3 Lifting Pin

Bundled panels (MANTO G3 and MANTO G3 M panels)



Always comply with the separate operating instructions for the MANTO G3 Lifting Pin (code:608295)!



WARNING

**Risk of injury from falling formwork panels!**

Adequately secure MANTO panels that are transported as a bundle with at least 2no. retaining bands to prevent panels from sliding out of the bundle.

When lifting MANTO panels the internal angle of the slings on the crane hook should not exceed 60°.

MANTO G3 Lifting Pins are used to horizontally transport by crane single horizontal or bundles of horizontal MANTO G3 and G3 M panels.

Bundles of MANTO MANTO G3 / G3 M panels or giant panels can be transported when the 4-string suspension is used as well. The stacked formwork panels have to all be the same size. The WLL per MANTO G3 Lifting Pin is 550 kg.



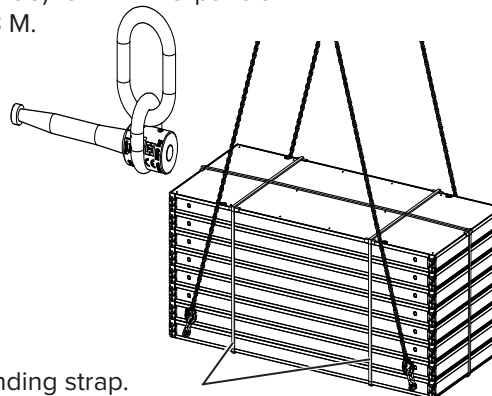
WARNING

**Risk of injury from falling/slipping loads!**

Always use 4no. MANTO G3 Lifting Pins to transport MANTO G3 and G3 M panels.

When transporting stacked panels, always attach the MANTO G3 Lifting Pins to the bottom panel.

MANTO G3 Lifting Pin  
(code:608295) for MANTO panels  
G3 and G3 M.



Suitable banding strap.

### 20.1.3 With the MANTO Transport Hook G2



Always comply with the separate operating instructions for the MANTO Transport Hook G2 (code:608380)!



#### **WARNING**

#### **Risk of injury from falling formwork panels!**

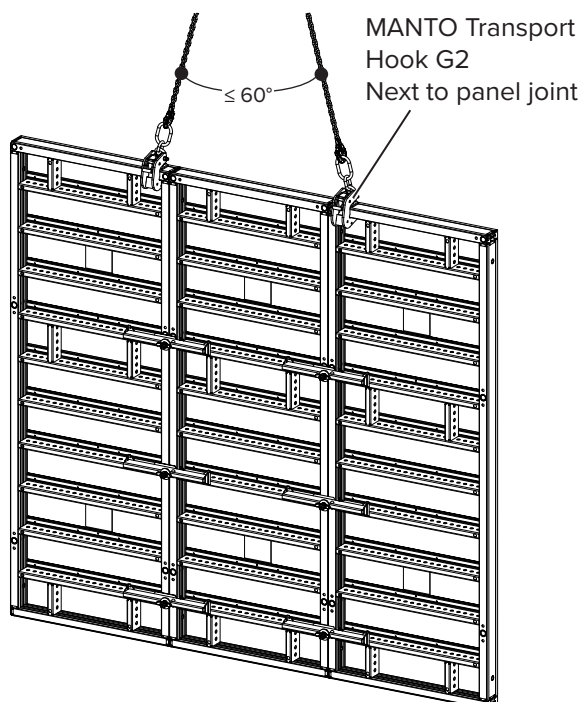
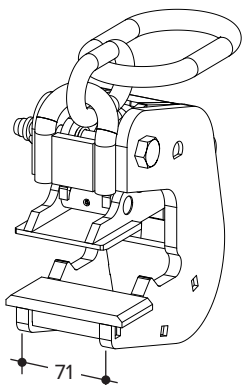
When lifting MANTO panel assemblies the internal angle of the slings on the crane hook should not exceed 60°.

Otherwise the slings and crane hook will be overloaded.

The MANTO Transport Hook G2 is intended to be used only to erect and transport by crane single or connected MANTO formwork panels. It enables vertical or horizontal MANTO formwork panels to be moved.

Only 1no. MANTO Transport Hook G2 is required to move single MANTO formwork panels. The MANTO Transport Hooks G2 have to be used in pairs when moving panel assemblies and horizontal panels.

MANTO Transport  
Hook G2 (code:608380)





When moving panel assemblies, attach the MANTO Transport Hook G2 next to the panel joint or next to a vertical/horizontal profile.

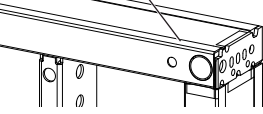
The WLL of the MANTO Transport Hook G2 (code:608380) is 15.00 kN.

- Step 1**
- With the safety catch open, slide the jaw of the MANTO Transport Hook G2 over the edge profile of the formwork panel.
- Step 2**
- Press the MANTO Transport Hook G2 all the way onto the edge profile and then push down the operating lever.

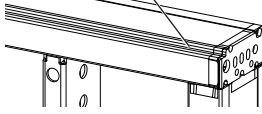


MANTO panels have edge profiles with and without a leverage edge.

Edge profile without leverage edge



Edge profile with leverage edge



**Note the closing states of the operating lever when attaching to the edge profile without and with leverage edge!**



**WARNING**

**Risk of injury from falling formwork panels!**

Once the operating lever of the MANTO Transport Hook G2 is attached to the edge profile of the formwork, check that the lever is engaged as it should be for the respective edge profile.

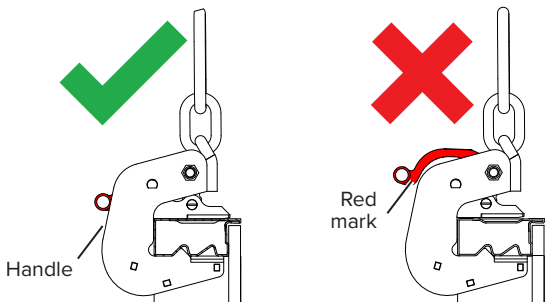
Otherwise the MANTO panel may sustain damage when it is lifted.

Follow the instructions in the separate User Guide for the MANTO Transport Hook G2.

**• Attaching without leverage edge:**



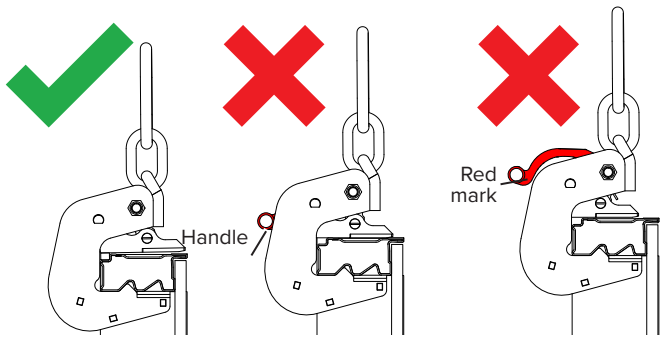
Check that the operating lever is pressed all the way down and locked into place. Only the handle should be visible, not the red sides of the lever.



**• Attaching with leverage edge:**



Check that the operating lever is pressed all the way down and locked into place. The red sides and the handle on the lever may not be visible from the side.



#### 20.1.4 With the MANTO Crane Adapter



Always comply with the separate operating instructions for the MANTO Crane Adapter!



#### **WARNING**

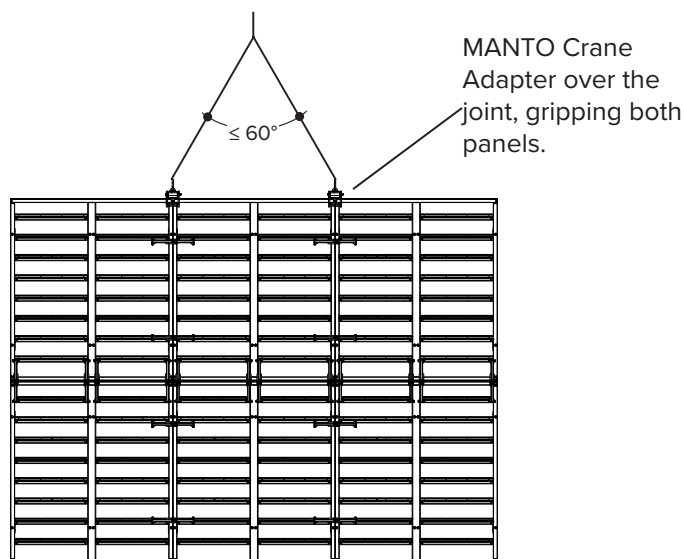
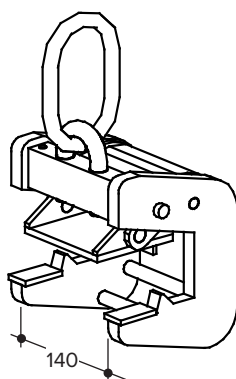
##### **Risk of injury from falling formwork panels!**

When lifting MANTO panel assemblies the internal angle of the slings on the crane hook should not exceed 60°.

Otherwise the slings and crane hook will be overloaded.

The MANTO Crane Adapter is used to transport single MANTO panels and to move panel assemblies. With a pair of MANTO Crane Adapters, panel assemblies up to a weight of 2000 kg as well as horizontal panels can be transported.

MANTO Crane Adapter  
(code:446710)



The MANTO Crane Adapters should be positioned at the panel joint or over a vertical or horizontal profile (with horizontal panels) in such a way that the Crane Adapter cannot slide inwards.

The WLL of the MANTO Crane Adapter (code:446710) is 10.00 kN.



## WARNING

### Risk of injury from falling formwork panels!

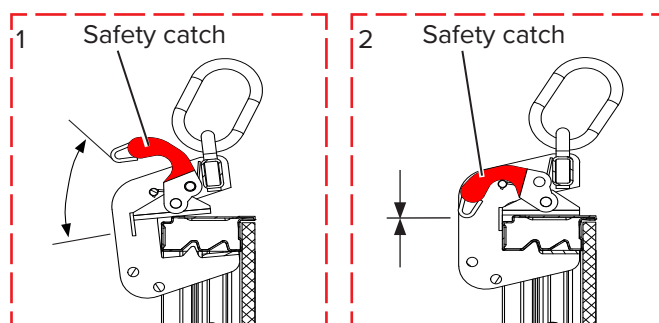
When connecting to the edge profile of the formwork, make sure that the safety catch on the MANTO Crane Adapter is completely engaged.

The red mark on the safety catch of the MANTO Crane Adapter must disappear from view before lifting with the crane. Lifting with a crane may not begin until then.

Follow the instructions in the separate User Guide for the MANTO Crane Adapter.

**Step 1** Open the safety catch of the MANTO Crane Adapter and push it onto the edge profile.

**Step 2** Close the safety catch.





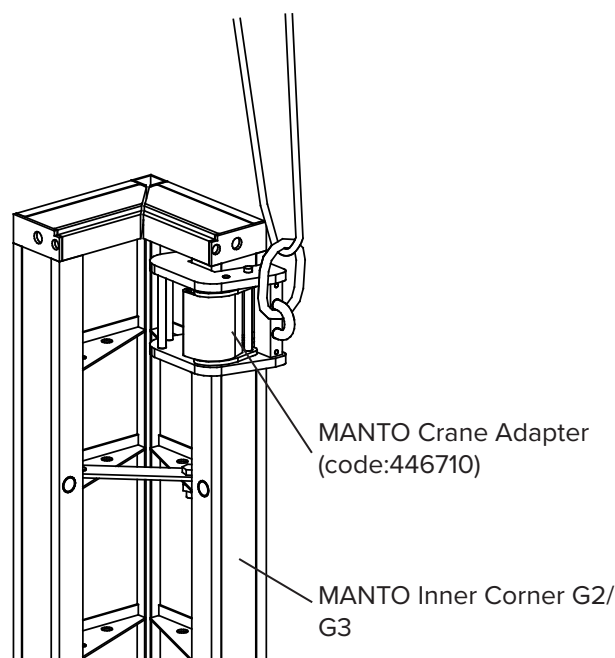
## 20.2 Corners

### 20.2.1 MANTO Inner Corners

#### With MANTO Crane Adapter or MANTO Transport Hook G2

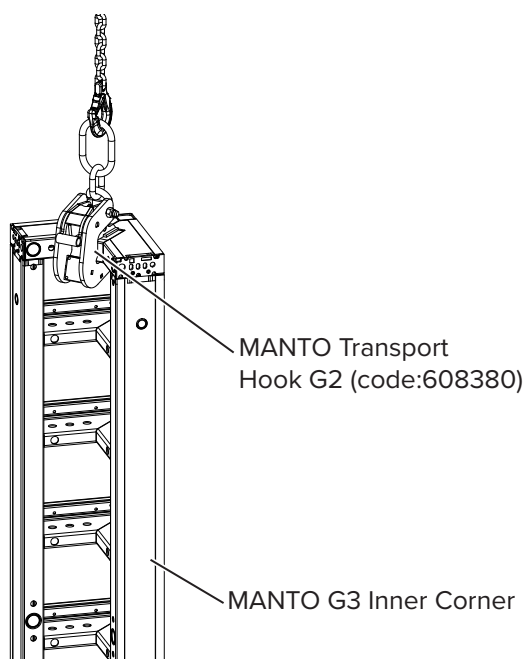
MANTO G2/G3 inner corners can be transported singly in a vertical position using the MANTO Crane Adapter (code:446710) or the MANTO Transport Hook G2 (code:608380).

Attach the MANTO Transport Hook to the side of the edge profile on the leg of the corner panel.



The WLL of the MANTO Crane Adapter (code:446710) is 10.00 kN.

To transport single MANTO G3 Inner Corners, attach the MANTO Transport Hook G2 to the centre of the frame.





The WLL of the MANTO Transport Hook G2 (code:608380) is 15.00 kN.

**With the MANTO G3 Lifting Pin**



Always comply with the separate operating instructions for the MANTO G3 Lifting Pin!

MANTO G3 Lifting Pins (code:608295) are used to horizontally transport by crane single horizontal MANTO G3 Inner Corners with the proper hole in the edge profiles. A 90° Inner Corner can be transported in conjunction with a 2-string suspension. The WLL per MANTO G3 Lifting Pin is 550 kg.



**WARNING**

**Risk of injury from falling/slipping loads!**

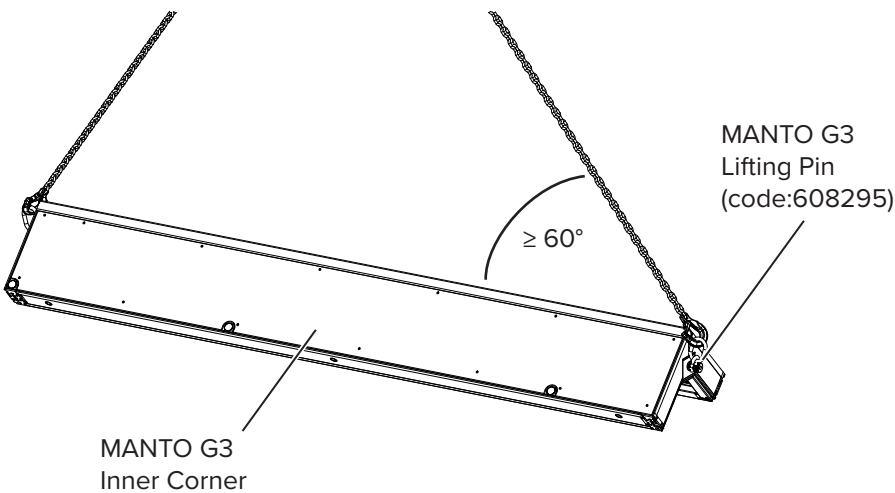
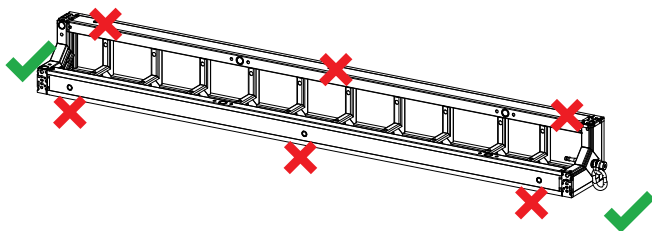
Always use 2no. MANTO G3 Lifting Pins to transport MANTO G3 inner corners 35 with the proper hole in the edge profile.  
Never move stacked MANTO G3 inner corners with the MANTO G3 Lifting Pin.



**CAUTION**

**Hazard posed by inserting into wrong position!**

If the MANTO G3 Lifting Pin is inserted in the wrong position, it can slip out of the profile.  
Use only the holes in the edge profiles of the MANTO G3 inner corner described here!



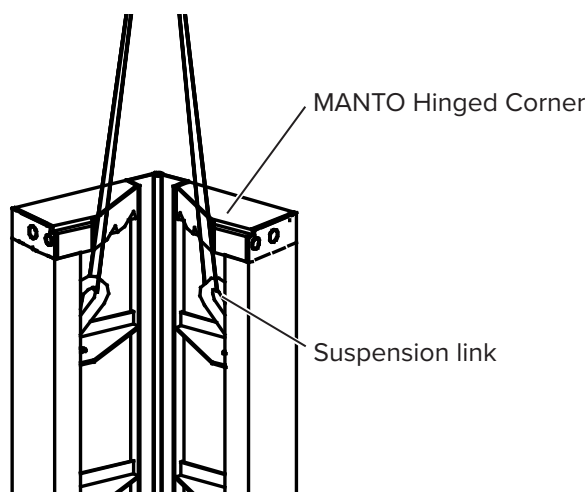
**CAUTION**

**Risk of collision!**

There is a risk of collision with body parts when lifting the MANTO G3 Inner Corners. The MANTO G3 inner corner turns around the MANTO G3 Lifting Pin until it is suspended from the crane in its final position.  
Step back before lifting the MANTO G3 inner corner off the formwork panel.

### 20.2.2 MANTO Hinged Corners

The MANTO Hinged Corners can be lifted individually by attaching a textile sling to the lifting eyes on the MANTO hinged corners.



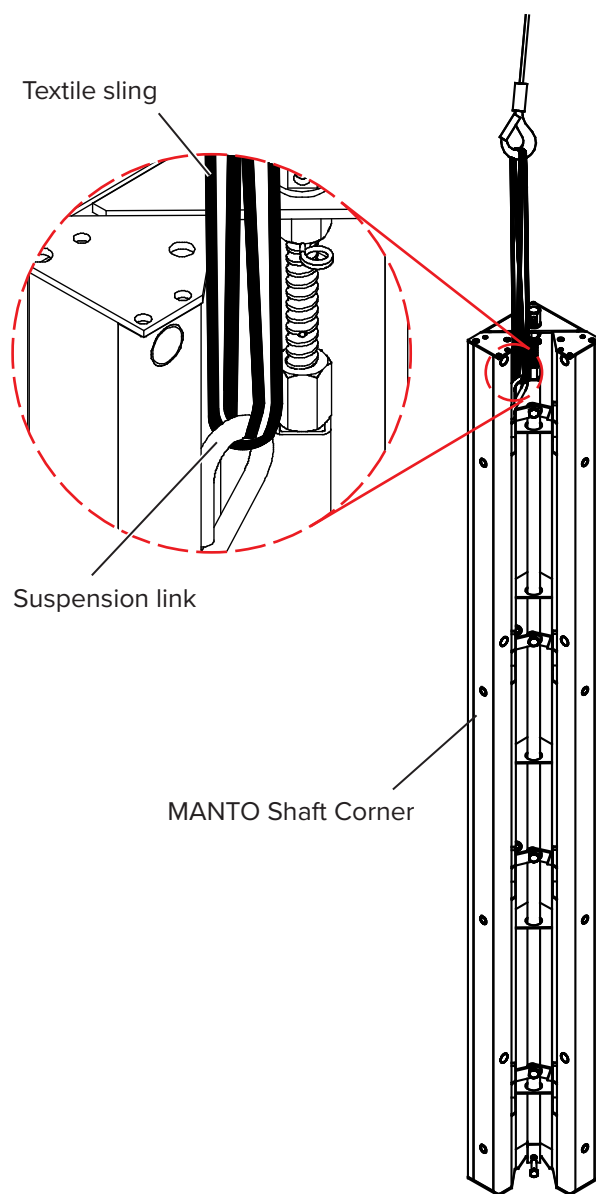
#### **WARNING**

##### **Risk of injury from falling formwork panels!**

When transporting/lifting single MANTO hinged corners without the MANTO Crane Adapter, a textile sling must be attached to both lifting eyes. For example, attaching a four-strand chain sling to a lifting eye is prohibited.

## 20.2.3 MANTO shaft corner

Each MANTO shaft corner is equipped with a fixed lifting eye. Attach a textile sling to the lifting eye to transport a single element.



### WARNING

#### Risk of injury from falling formwork panels!

When transporting/lifting thread the textile sling through the lifting eye.

Attaching a MANTO Crane Adapter (code:446710) or the hook of a chain sling directly to the lifting eye is not permitted.

The lifting eye is intended to be used only to transport a single MANTO Shaft Corner, not to transport the entire shaft formwork.

## 20.3 Shaft formwork

The MANTO shaft formwork can be lifted once the formwork is released from the concrete. The complete formwork can be lifted by crane by attaching the MANTO Crane Adapters to all four sides of the formwork.



### WARNING

#### Warning!

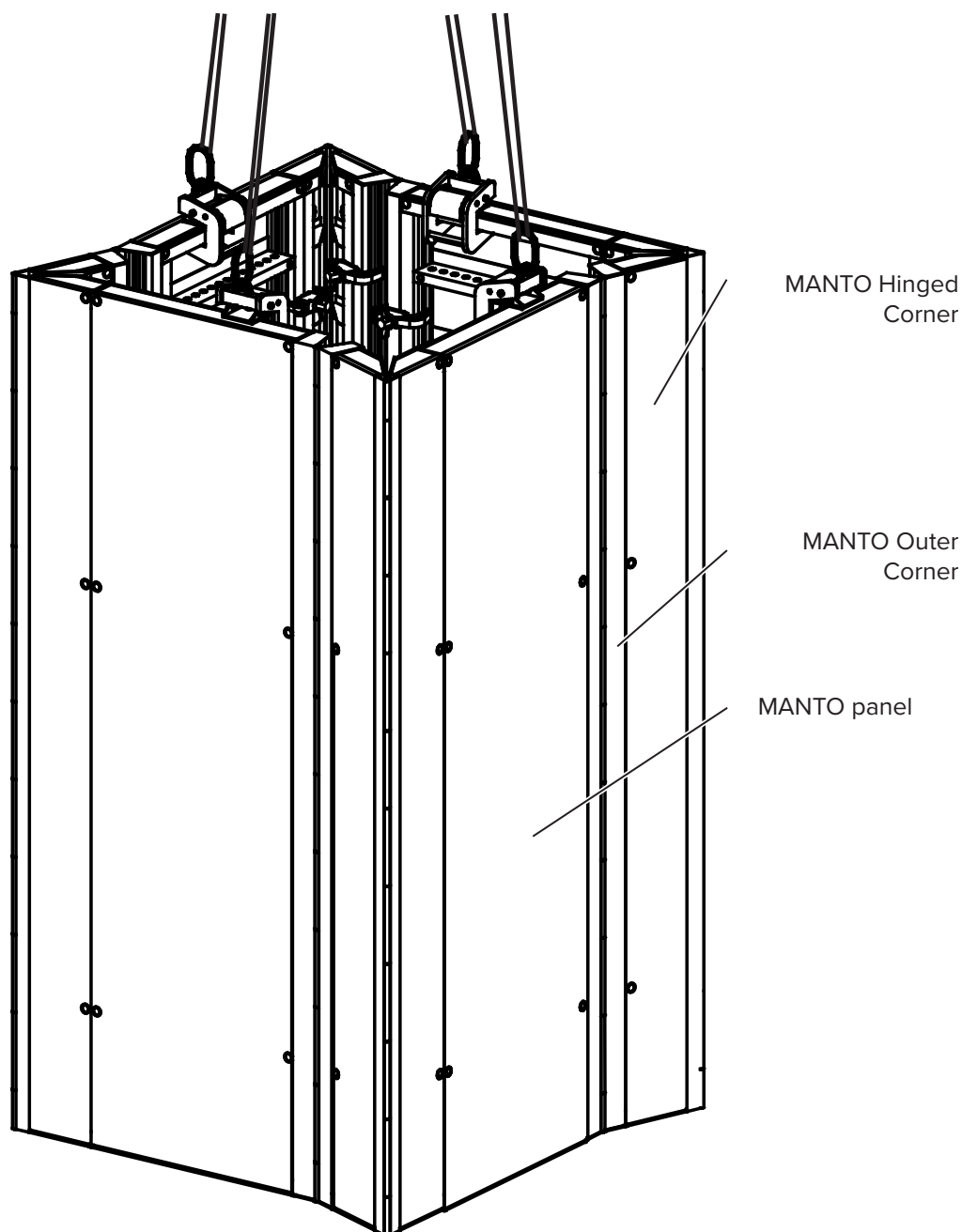
When lifting MANTO shaft formwork the internal angle of the crane slings should not exceed 60°.

Do not exceed the WLL of the MANTO Crane Adapter.

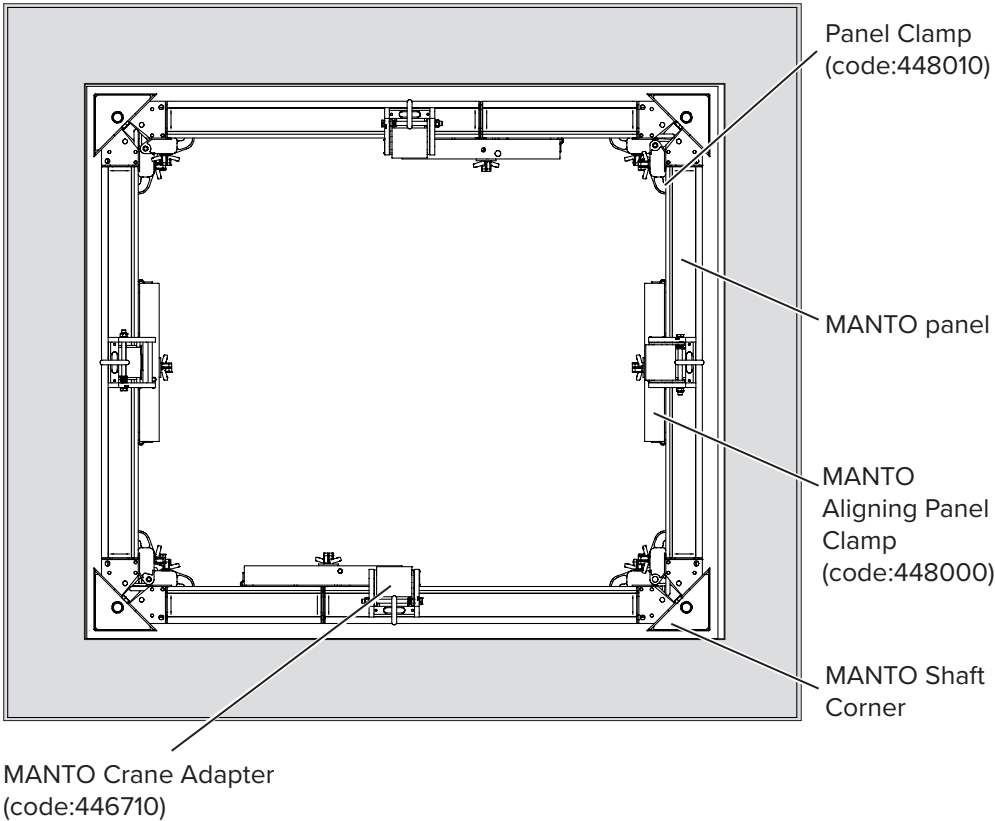
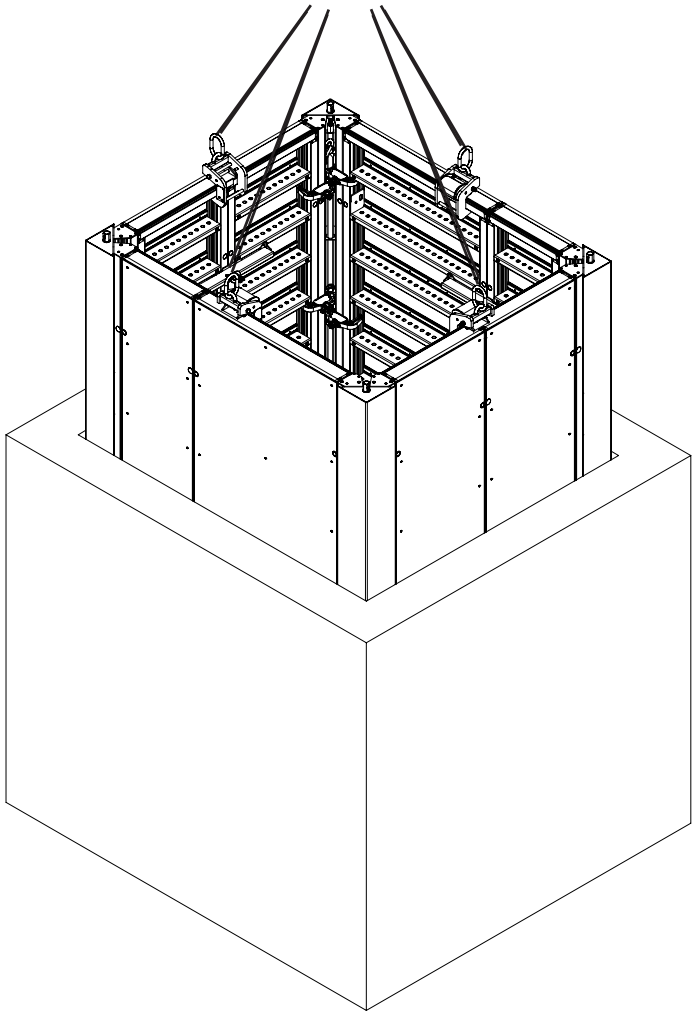


Centre the MANTO Crane Adapters on all four sides. Ensure the whole formwork assembly is adequately connected before lifting.

### Example: Shaft formwork with MANTO Outer Corners and MANTO Hinged Corners



Example: Shaft formwork with MANTO Shaft Corners



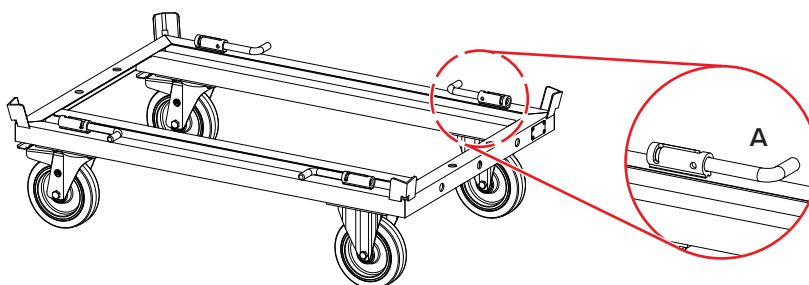
## 20.4 Other components

All of the components should be stored in the proper transport equipment. Most of the transport equipment can be moved with the Euro Trolley (code:607610) and transported with the crane on site.



Always follow the directions in the Euro Trolley operating instructions.

Always use the latch (**A**, shown opened here) on the Euro Trolley to secure the transport equipment.



### 20.4.1 Components < 1.00 m long and loose parts

Components < 1.00 m long and loose parts should be stored in the Euro Lattice Box (code:548480). Boards (720 or 1120 mm long, max. 25 mm thick and 600 mm high) provided by the customer on site can be used to separate the parts in the box. Keep in mind that the mesh size is 22 mm; if necessary, use different packaging.

The Euro Lattice Box can be moved with the Euro Trolley (code:607610).

### 20.4.2 Components > 1.00 m long

Parts that are longer than 1.00 m, e.g. EUROPLUS<sup>new</sup> props, platform beams, PROTECTO posts and similar items should be transported and stored using the Euro Stacking Frame 120/80 (code:553689), Euro Stacking Frame 160/120 (code:566494) or Euro Stacking Frame 240/80 (code:566509). Always secure the components with straps or similar protection to prevent them from slipping when being transported.

The Stacking Frame 120/80 can be moved with the Euro Trolley (code:607610).

### 20.4.3 PROTECTO Panel G2

PROTECTO panels G2 should be stored and transported in the PROTECTO Panel Stillage (code:692740). The panels are stored vertically in the stillage. Always secure the panels with straps or similar protection to prevent them from slipping when being transported.

No more than 35 PROTECTO panels of any size can be stored and transported in the stillage. Never place panels of different lengths in the stillage.

The PROTECTO Panel Stillage can be moved with the Euro Trolley (code:607610). Refer to the respective operating instructions.





## 21 Disposal

Components that are destroyed or are beyond repair must be disposed of properly. The components should be handed over to a disposal specialist certified according to local regulations. Information on the materials used are available upon request.

Always ensure that destroyed or damaged components are not used again!

## 22 Technical data

### 22.1 Permitted fresh concrete pressure for MANTO

Tie Rod	Concrete pressure profile		Panel height [m]	Permissible fresh concrete pressure [kN/m <sup>2</sup> ]	
				Maximum deflection according to DIN 18202 Table 3 and tie load capacity	
				Line	
				5, 6	7
DW20	Hydrostatic (non-stacked panels)		All	Full hydrostatic pressure	
	Constant (stacked panels)		3.30	80.00	65.00
			2.70		63.00
			2.40	80.00	
			1.20		
DW 15	Hydrostatic (non-stacked panels)		All	Full hydrostatic pressure 3.30 m panels limited to 60.00	
	Constant (stacked panels)		3.30	46.00	
			2.70	60.00	
			2.40		
			1.20		



Tie rods DW 15 up to a maximum of 90.00 kN and tie rods DW 20 up to a maximum of 150.00 kN.

The lowest of the above values apply top panels built before 1995 (Panels built before 1991 are equipped with a leverage edge at the vertical edge profile and panels built before 1995 do not have reinforcement plates by the tie holes). see pageRefer to section 4.1 on page 44.

A mixture of DW 15 and DW 20 tie rods on one site is not permitted!

Warranty can only be granted for original tying equipment delivered by Hünnebeck.

Compliance of the deformation limits refers to the deflection resulting from the concrete pressure. Unevenness of the panels is not considered.



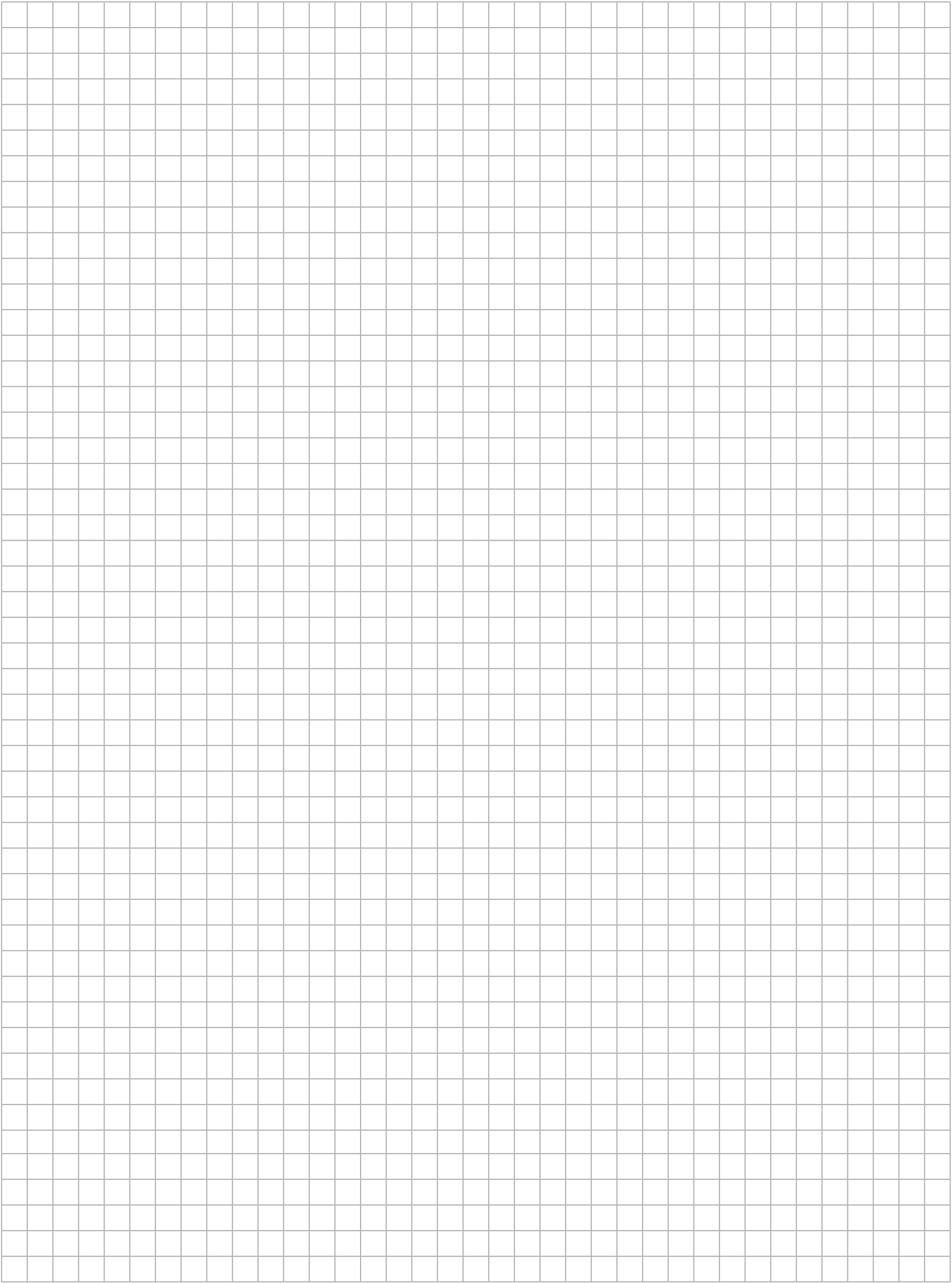
## 23 Chronology

Changes since edition 2022-09	Page	Date
PROTECTO G2 panels added.	26, 27, 181, 233	2023-10
Water Stop 15 and WS Adaptor Ø22 added.	38, 39, 124 ff.	2023-10
Section 6 "Horizontal infills" revised.	70 ff.	2023-10
Section 7 "Vertical panel extensions" revised.	76 ff.	2023-10
Section 8 "Connecting (extending) panels vertically" revised.	79 ff.	2023-10
Taper Tie 15 replaced by new item. Wall thickness adjustment of Taper Tie 15 revised.	34, 102, 105 ff.	2023-10

## Notes

This image shows a full page of blank graph paper. The grid consists of thin, light gray horizontal and vertical lines that intersect to form small squares across the entire surface. There are no margins, text, or other markings on the paper.







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