# **MANTO**

Large-frame panel formwork Instructions for assembly and use

ebruary 2004





#### **Table of contents**



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The following instructions for erection and use include detailed information on the handling and proper application of the products that are described and depicted.

All instructions regarding technical operation and function have to be observed carefully. Exceptional use requires a separate design calculation.

With regard to safe and technically correct use of our products abroad, all relevant safety rules, regulations and safety instructions of national institutes and/or local authorities have to be followed.

Generally, only flawless material must be used. Damaged components have to be sorted out. In case of repairs, only original spare parts of the Hünnebeck Company may be used. Combined use of our formwork systems with equipment from other suppliers may involve certain dangers and, therefore, requires an additional checkup.

For reasons of further technical development we emphatically reserve the right to revise, change or modify any of the product's components at any time without prior notice.

The quality features of the Manto Formwork were proved by an independent testing institution and Hünnebeck was awarded the "Sign of Quality" as member of the "Association for Quality Assurance of Concrete Forms".

Product features	3
Overview	4
Basic and additional	
components	5–21
Panel dimensions	22
Element connections	23–26
Connection and tying	27–29
Corners	30–32
T-Walls	33
Stopends	33
Length adjustment	34
T-Wall intersections	34
Oblique angular corners	35
Column formwork	36–39
Walkway bracket	39
Universal platform	40
Pouring platform	40–42
Strutting the formwork	43–45
Large-area application	
by crane	46
Shaft formwork	47–50
Shaft formwork	51

#### **Product features**



Manto formwork from Hünnebeck is a steel framed panel formwork which is ready for use and very rugged. The 2.70 m, 3.30 m and 1.20 m high panels each have various widths from 45 cm to 1.20 m and can be delivered in steps of 15 cm or 5 cm.

Profitable giant panels 2.40 m wide with 6.48 m² shuttering area and 7.92 m² respectively, are also available.

All Manto panels are based on sturdy 14 cm deep steel profiles for the edges. These edge profiles are prepared with a special shaping on the inside that allows application of the patented Manto connecting clamps. Tie holes are provided in the vertical edge profiles. Exact alignment of the erected panel is made possible through the recess of the base edge profile by using a crow-bar (or nail-remover). The 18 mm thick plywood sheet is supported by eight or ten intermediate bars of equal design. They also offer numerous possibilities for the attachment of Manto accessories.

The steel frame of the Manto panel is completely hot-dip galvanized.

All the panels can be combined in various ways, lying on their sides or standing upright. They can also be installed in a staggered arrangement as their interconnection is independent of any dimension modules. A panel depth of 14 cm guarantees good load-bearing capacity (80 kN/m²)\* so that for a single-storey formwork of 2.70 and 3.30 metres height, concrete pressure and rate of concrete placing need not be taken into consideration.

The 18 mm thick plywood is glued 7-fold and coated with  $350 \text{ g/m}^2$  phenol resin (on the concrete-sided surface). Because of this, a high number of applications and a long life span is guaranteed. The 10-fold steel frame support of the plywood (for a panel height of 2.70 m) reduces deflection and results in a smooth concrete finish.

The use of aligning panel clamps to connect two panels, accelerates shuttering work.

The joints are made absolutely tight and the panels are aligned perfectly without any mismatching.

The aligning panel clamp also permits the repositioning of large-area formwork elements without having to install any additional stiffening walers. It can be used with the Manto ratchet or with a hammer. Use of the ratchet allows less fatiguing work from ground level (for single-storey formwork) and, moreover, spares the material.

Using the components included in the basic system, you will be able to solve formwork problems in industrial and housing construction.

The parts included in the additional components widen the application possibilities of formwork and simplify concreting.

All Manto formwork steel parts are hot-dip galvanized.

\* Giant panel 240
Inner corners 120 und 270
Hinged corners 120 und 270

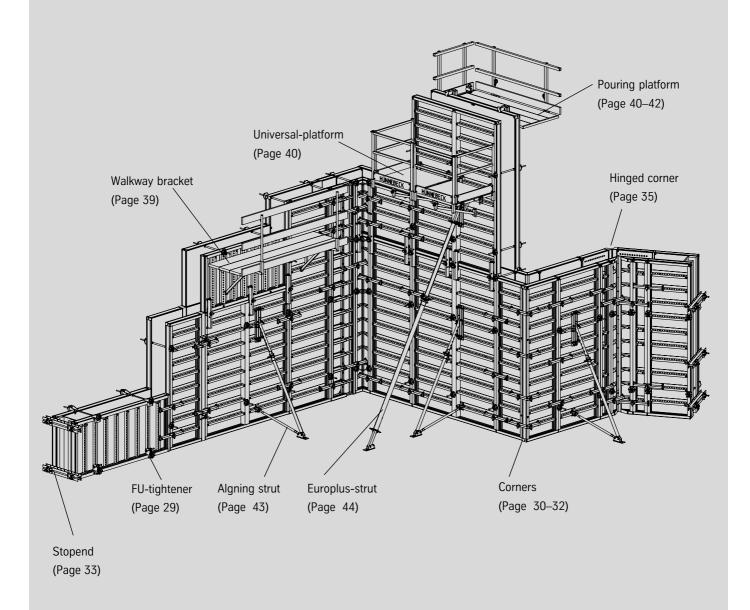
(up to the year 1991) Permissible concrete pressure see page 51





#### MANTO frame panel formwork

The overview gives an impression of the various combinations of the MANTO system.





Description **Basic components** panel height 330 cm Giant panel 240 x 330 (7.92 m<sup>2</sup>) 525 759 364.0 The largest formwork element with a panel height of 3.30 m. The intermediate post is equipped with 4 tie openings. A giant panel can also be used with two opposing panels with a width of 1.20 m each. 330 Panel 120 x 330 176.0 (3.96 m<sup>2</sup>) 525 760 Panel 105 x 330 (3.47 m<sup>2</sup>) 525 770 160.5 Panel 90 x 330 (2.97 m<sup>2</sup>) 525 781 143.5 Panel 75 x 330 525 792 (2.48 m<sup>2</sup>) 128.1 Panel 70 x 330 525 807 (2.31 m<sup>2</sup>) 123.0 Panel 65 x 330 (2.15 m<sup>2</sup>) 525 818 117.8 Panel 60 x 330 525 829 112.7 (1.98 m<sup>2</sup>) Panel 55 x 330 525 830 106.3 (1.82 m<sup>2</sup>) Panel 45 x 330 525 840 (1.49 m<sup>2</sup>) 95.8 330 Panel 30 x 330 (0.99 m<sup>2</sup>) 600 009 80.7



	Description	Article No.	Weight kg/item
Basic components panel height 270 cm			
270	Giant panel 240 x 270 (6.48 m²)  The largest formwork element with a panel height of 2.70 m.  The intermediate post is equipped with 4 tie openings. A giant panel can also be used with two opposing panels with a width of 1.20 m each.	534 990	313,6
	Panel 120 x 270 (3.24 m <sup>2</sup> ) Panel 105 x 270 (2.84 m <sup>2</sup> )	446 000	159.8
	Panel 105 x 270 (2.84 m²) Panel 90 x 270 (2.43 m²)	446 022 446 033	146.8 117.9
	Panel 75 x 270 (2.03 m <sup>2</sup> )	446 044	105.0
	Panel 70 x 270 (1.89 m²)	453 378	100.7
	Panel 65 x 270 (1.76 m <sup>2</sup> )	489 640	96.4
	Panel 60 x 270 (1.62 m²)	446 055	92.1
	Panel 55 x 270 (1.49 m²) Panel 45 x 270 (1.22 m²)	453 389 450 786	87.9 79.2
270	Panel 30 x 270 (1.22 III <sup>-</sup> )  (1.22 III <sup>-</sup> )  (1.22 III <sup>-</sup> )	600 007	65.4
	(see page 23)		



	Description	Article No.	Weight kg/item
Basic components panel height 120 cm			
120	Panel 120 x 120 (1.44 m²)  Panel 105 x 120 (1.26 m²)  Panel 90 x 120 (1.08 m²)  Panel 75 x 120 (0.90 m²)  Panel 70 x 120 (0.84 m²)  Panel 65 x 120 (0.78 m²)  Panel 60 x 120 (0.72 m²)  Panel 55 x 120 (0.66 m²)  Panel 45 x 120 (0.54 m²)  Panel 30 x 120 (0.36 m²)	458 175 458 186 458 197 458 201 458 212 489 650 458 223 458 234 458 245 600 002	71.8 65.1 58.4 51.7 49.5 47.2 44.9 42.8 38.2 32.0
Extension panels  240	Panel 240 x 120 (2.88m²)  Panel 240 x 90 (2.16 m²)  Panel 240 x 60 (1.44 m²)  Manto extension panels match with the required shuttering height or serve as an independent formwork for small heights (see page 24).	446 066 479 194 453 437	129.4 106.0 82.8
Multi-purpose panels  60–330	MP-panel 75 x 330 (2.48m²) MP-panel 75 x 270 (2.03 m²) MP-panel 75 x 120 (0.90 m²) MP-panel 75 x 60 (0.45 m²) These panels are equipped with horizontal tying slots. Due to the many tying possibilities in increments of 5 cm, even difficult shuttering tasks can be managed. Hence, they can also be used for shuttering rectangular columns. The four panel heights ensure the height adjustment essential in this kind of application (see also page 36).	533 561 454 340 454 946 455 105	151.5 123.3 66.8 37.0



	Description	Article No.	Weight kg/item
Corner panels Inner corner  35 35 35 330 - 120	Inner corner 35/330 (2.31 m²) Inner corner 35/270 (1.89 m²) Inner corner 35/120 (0.84 m²) This panel for shuttering work on rectangular inner corners is equipped with a formwork aid. Simply by corner stiffeners unlatching, the 90° angle of the inner corner can be decreased by 2° (see page 30).	525 851 535 001 535 012	120.0 99.5 48.1
Hinged corner			
330 - 120	Hinged corner 330 Hinged corner 270 Hinged corner 120 Flexible corner panel for inner corners with angles of 60° to 175°. The lateral side length is 35 cm. Corners with less than 90° are connected with panel clamps (see also pages 17 and 35).	532 188 534 588 534 577	135.1 113.4 55.2
Outer corner 192° 330 - 120	Outer corner 20/270 Outer corner 20/120 To be applied as outer corner for non-rectangular corners. The lateral side length is 10 cm. Also applied in shaft formwork. Adjustable from 60° to 192° (see page 35).	534 040 462 358 462 222	84.1 69.3 31.4



	Description	Article No.	Weight kg/item
330 - 120 50 - 75	Manto telescopic panel 330 (1.65 - 2.31 m²)  Manto telescopic panel 270 (1.35 - 1.89 m²)  Manto telescopic panel 120 (0.60 - 0.90 m²)  The widths of these panels are steplessly adjustable from 50 to 75 cm.  A cut-to-size plywood strip (21 mm thick) can be fixed by nails to the integrated wooden lath in the rigid frame part.	574 366 564 131 564 142	129.4 119.0 56.2
	Corner adjustment 5-330 Corner adjustment 5-270 Corner adjustment 5-120 Used for adapting to differing wall dimensions for corners and T-wall intersections (see pages 31, 33).	530 156 450 606 450 617	32.5 20.4 12.0
	Connection timber 5/270 Connection timber 5/120 The connection timbers carry the 21 mm thick shuttering skin for on-site length adjustment.	453 275 453 286	9.4 4.2



	Description	Article No.	Weight kg/item
100	Manto multi-purpose waler Spans the length compensation and discharges the loads into the Manto panels. Is fastened with 2 waler spanners. By these means an aligning connection with tensile strength is obtained. Further application possibilities are e.g. as a stopend and for the on-site heightening the formwork.  The nail holes ease shuttering work (see page 34).	450 764	13.1
30 50	Waler spanner (30 cm) Waler spanner L (50 cm) To fasten the Manto walers or any other walers and profiles. Simply hang into the module holes of the transverse ribs of the panel. A tension nut is required additionally.  Permissible load F = 19 kN.	452 053 454 410	0.8 1.1
Connectiing parts	Tension nut (DW 15) A tension nut for each waler spanner (permissible load 40 kN). (see page 34)	197 332	0.6
63	Aligning panel clamp  For horizontally and vertically connecting the Manto panels.  With the aligning panel clamp the panel joints are closed absolutely tight in one work cycle and the panels are aligned and interconnected perfectly without any mismatch (see page 23).	448 000	5.5
44	Outer corner clamp The corner clamp connects two standard panels to one outer corner and aligns them rectangularly (see page 30)	448 227	8.8



	L	NI I'IA	Weight
	Description	Article No.	kg/item
63	Adjustable aligning clamp Same function as aligning panel clamp, but with additional adjustment area for adjustment widths of up to15 cm (siehe Seite 28).	467 898	6.0
37 W.a.f. 36	MP-bolt MP-nut For connecting MP-panels when used as column formwork. Always use together with tie nut 230 Art. No. 048 344 (see page 36).	454 442 454 670	0.8 0.3
Brackets and aligning struts			
107 125	M-walkway bracket TK-railing post Used for the installation of the 90 cm wide concrete placing platform. Simply hang the M-walkway bracket at the required height with its pin into a crossmember of the Manto panel. Then secure with spring pin. The M-walkway bracket can either be tied to an upright or a lying formwork panel (with additional bolt). Planks can be nailed to the incorporated lath. The TK-railing post for side protection is simply inserted (see page 39).	448 205 193 220	12.7 4.5
Ø 2.0	Waler bolt D 20 A bolt for connecting the M-walkway bracket to "lying formwork".	420 000	0.3
	Spring pin Secures the bolt D20 (see page 39).	173 776	0.01



	Description	Article No.	Weight kg/item
240	Manto pouring platform A complete 1.2 m wide deck with plank and side protection and 2.40 m system length. After the railing has been unfolded, the platform is ready for use and can be hung and secured onto the Manto formwork with the aid of crane (see page 40).	547 165	141.0
114	Transverse railing This transverse railing is used at both ends of the pouring platform. It is fixed to the platform by means of the integrated clamping screws (see also page 42).	587 252	24.2
Railing 110 railing unit	Universal platform Railing 110 Transverse railing unit These three components form the platform system. No further connecting means are needed. Scaffold group 2 (1.5 kN/m²) according to DIN 4420, Part 1 (see also page 40).	562 095 582 867 582 856	49.1 20.0 18.3
73	M-Strut connector  To be attached to the horinzontal ribs of the Manto panels and used for connecting aligning struts.  (see page 43).	565 114	8.9



	Description	Article No.	Weight kg/item
192-330	M-Aligning strut  The modified design of the joining parts enables the strut to be attached to the Manto panels in horizontal steps of 5 cm. Also applicable to column formwork (MP-panels, column frames).  It has to be ordered together with one Manto strut connector (art. no. 565 114) see page 43.	565 103	23.3
37.5	Strut adaptor Used for Europlus props and other attachments of raking props (see also below).	565 331	4.9
24,5	Strut base joint Standard tubular steel props can simply be completed for supporting and aligning Manto formwork by using the above mentioned parts. The strut adaptor and strut base joint each require 4 bolts for the connection to the prop plate.  It is also possible to connect Alu 500 DC props, Alu-Top single props and BKS aligning struts using the adaptor and base joint (see page 44).	566 369	7.7
	Bolt and nut M12 x 30 (8 pcs. required) (see page 44).	005 210	0.06



	Description	Article No.	Weight kg/item
70	Manto strut connector (BKS)  To connect BKS-props at all shuttering heights from prop lenghts 8.0 m and longer (max. load34 kN).  For each connection 2 bolts and nuts M20 x 40  1 bolt and nut M 20 x 80 are required (see page 45).	482 008	9.1
15	Strut connection piece (for bottom spindle) Used for converting former Manto aligning props (art. no. 453 070) into new M-aligning struts (see page 43).	565 136	2.0
Tying material	Manto tie nut (DW 15)  It can easily be loosened with the ratchet by means of integrated sliding discs even under full tie load (see page 28).	464 600	1.3
22	<b>Tie nut 230</b> (DW 15) With large plate and ball-type nut for an inclination of up to 10° (see page 28).	048 344	2.4



	Description	Article No.	Weight
8 8 8 8	TK plate 8/8 Used for horizontally arranged panels to enable the lower tie to be installed together with the hexagon nut (see also page 24).	400 214	kg/item 0.4
5	Hexagon nut 15/50 It is used as tie nut for the rigid plates without thread. The nut has to be operated with a wrench (w.a.f.30). Permissible load: 90 kN (see page 24).	164 535	0.2
16	Edge tie fastener MR  For stepless tying outside the edge of shuttering panel. For tie DW 15.  Permissible load = 10 kN. (see page 29).	566 667	2.3
######################################	Tie rod 75 (DW 15) Tie rod 100 Tie rod 130 Tie rod 175 Permissible load according to DIN 18216: 90 kN. Not weldable.	437 660 024 387 020 481 020 470	1.1 1.4 1.9 2.5



	Description	Article No.	Weight kg/item
50	FU-Tightener Punched steel tape (25.0 m long) Both the components may be used for foundation formwork with lying Manto panels (see also page 29).	568 357 568 081	3.6 17.2
15	Tie nut 150 (DW 20) Tie nut for tie rods with a dia. of 20 mm. Easy to unscrew.	531 481	1.5
100	Tie rod set 20 mm dia./100 Tie rod set 20 mm dia./130 Tie rod with unlosable tie nut 150.	534 213 534 224	4.1 4.8
Ø1,5	Tie rod 20 mm dia./100 Tie rod 20 mm dia./130 Permissible load-bearing capacity according to DIN 18216: 150 kN. Not weldable.	531 600 531 610	2.6 3.3
$\begin{array}{c} & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & \\ & & & \\ & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ &$	1 Packet of plugs M/27 K (100 pcs.) For covering the tie openings 24 mm dia. (K = with collar)  1 Packet of plugs M/24 K (100 pcs.) For covering the tie openings 27 mm dia. (K = with collar)	566 440 454 394	0.4



	Description	Article No.	Weight kg/item
170 W M	Hinged waler 170 Two hinged walers 170 form a complete waler. If tied with waler spanners to the Manto panels at tying height, these walers can replace the outer corner at non-rectangular corners (see page35).	417 278	19.5
12 TI	Tie rod bracket, complete This is used for supporting the waler spanner at oblique-angle corners in the hinged waler 170. The stirrup bolt for fastening is included (see page35).	434 244	4.0
Ti cu	Add-on piece The add-on piece is used with 21 mm thick plywood cuts for on-site extension of approximately 30 cm. It has a built-in nailable lath. Attachment by means of a panel clamp.	450 157	1.6
22 al	Panel clamp Connector for the add-on piece. Can also be used for connecting the Manto panels and shaft spindles (see page 48).	448 010	3.0
40 ti	Manto ratchet With the Manto ratchet (w.a.f. 36) all clamps and tie nuts can effortlesslybe operated without damaging the material. Do not use an extension tube with this tool.	408 780	1.0



	Description	Article No.	Weight kg/item
ca. 40	Crane adaptor All-round attachable on edge profiles with built-in safety catch. Maximum loading capacity 1 t (10 kN). The crane slings must have an angle of at least 60°. Observe operating instructions (see page 46).	446 710	14.2
14,5	Manto loading adaptor For loading and unloading panel packages. Max. permissible load-bearing capacity: 500 kg (5 kN). See page 46.	461 033	1.2
SCHECKT 460	Gauge system (Hook template)  The gauge system for the crane adapter serves as inspection template for the safety catch and the suspension link of the Crane adapter (Art. No. 446 710)	548 700	23.7
12 110 270 120 60 100 100 100 100 100 100 100 100 100	Column frame 90 x 270 Column frame 90 x 120 Column frame 90 x 60 Special frames for column formwork. Columns with edge lengths of 20 cm to 90 cm (in 5 cm increments) can be shuttered. Supplied without shuttering skin. Any shuttering skin with a sufficient load-bearing capacity can be nailed or bolted on site. Three panel heights for an optimum height adjustment. The permissible concrete pressure is 100 kN/m² with 4 spanning members (S-bolts, Manto tie nuts) at a height of 2.70 m (see page 36).	470 470 470 480 490 900	160,6 68,4 46,1
32,5	S-bolt For connecting column frames. Always use together with Manto tie nut (Art. No. 464 600) see page 37.	479 724	1.9



	Description	Article No.	Weight kg/item
110	Plywood sheet 90 x 270 (n. perf.) Plywood sheet 90 x 120 (n. perf.) Plywood sheet 90 x 60 (n. perf.) Shuttering skins without tying holes for totally exposed concrete. Hole for the spanning member to be drilled on-site at the corresponding position (see page 37).  Important Note: A 21 mm thick plywood sheet with a Modulus of Elasticity of at least 6,700 N/mm² is needed for the maximum concrete pressure of 100 kN/m². The above listed plywood sheets are in compliance with the required figures.	479 996 480 009 490 884	40.0 17.8 8.9
Ø 2.8	Plug 28 dia. (200 pcs. per packet) For covering the unused tie holes in the above shuttering skins.	082 798	0.8
69,5	Column angle waler  The column angle waler converts standard Manto panels into a column formwork of 20 cm to 65 cm adjustable in increments of 1 cm. 4 column walers form a ring, which must be fastened to the panels at the height of the tie holes (see page 38).	540 005	23.8
22	Column waler bolt Column waler wedge For fastening the column walers to the Manto panels (through the tie hole) see page 38.	569 189 540 049	0.5 0.2
50	Tie rod 50  Connects the column angle walers in shuttered condition. Always use with two Manto tie nuts, Art. No. 464 600. (see page 39).	102 527	0.7



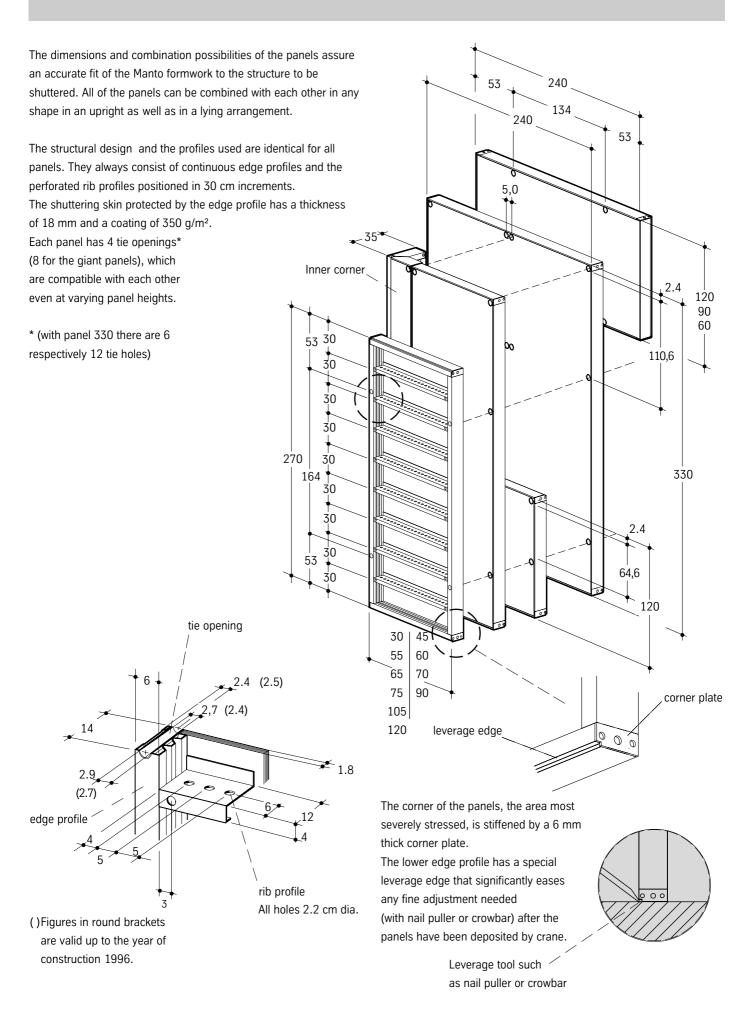
	11110
Article No.	Weight kg/item
544 952 549 830 corners and ofile of the	1.4 1.7
524 721 524 732 524 743 524 754 524 765 524 776	3.4 5.4 7.4 9.4 11.4 13.4
524 700 524 710  / means of ght and a left matching the	4.7 4.7
173 776	0.01
533 230 e tubes and	2.8
	544 952 549 830 corners and offile of the  524 721 524 732 524 743 524 754 524 765 524 776  524 700 524 710  7 means of ght and a left matching the  sans of two  420 000  173 776



Description		Article No.	Weight kg/item
		200 770	00.5
200 - 300	Platform beam 200 - 300 (telescopic)  It spans openings in shafts and can be adjusted in steps of 1 cm within a total telescopic range of 100 cm (see also page 50).	600 330	89.5
	Pawl-locked platform beams Load-carrying component within a shaft platform. With articulated bearing claws which automatically latch when shifted by crane. The wooden construction of the platform must be made and mounted by site. Pawl-locked platform beam for clear shaft widths of:		
project-related production clear width of shaft + 13 cm	Pawl-locked platform beam 350 to < 400 cm Pawl-locked platform beam 250 to < 350 cm Pawl-locked platform beam 250 to < 300 cm Pawl-locked platform beam 200 to < 250 cm Pawl-locked platform beam 150 to < 200 cm Pawl-locked platform beam 125 to < 150 cm Pawl-locked platform beam under 125 cm upon request (see page 49).	410 931 410 920 410 910 410 909 410 894 410 883	122.2 108.8 95.4 82.0 68.6 55.2
20	<b>Box-out</b> Provides the recess in the shaft wall for the pawllocked platform beam. Conical shape allows re-use. (See page 50).	410 942	2.7
Components for polygon-type circular formwork			
15, 20, 25	Form strip 15/270 Form strip 20/270 Form strip 25/270	478 281 478 292 478 307	54.2 57.3 61.0
270	Form strip 15/120 Form strip 20/120 Form strip 25/120 With the aid of the form strips located between the Manto panels, walls with a radius of more than 2.50 m can be shuttered polygonally. They can be adjusted to the required radius by adjusting bolts and are easily connected to the Manto panels using the built-in connectors.	478 318 478 329 478 330	29.5 30.8 32.5
35	<b>Tie cross-bar</b> Tying of the circular formwork has always to be done through the form strips. The cross-bar absorbs and distributes the load from the panels to the ties.	478 579	2.6

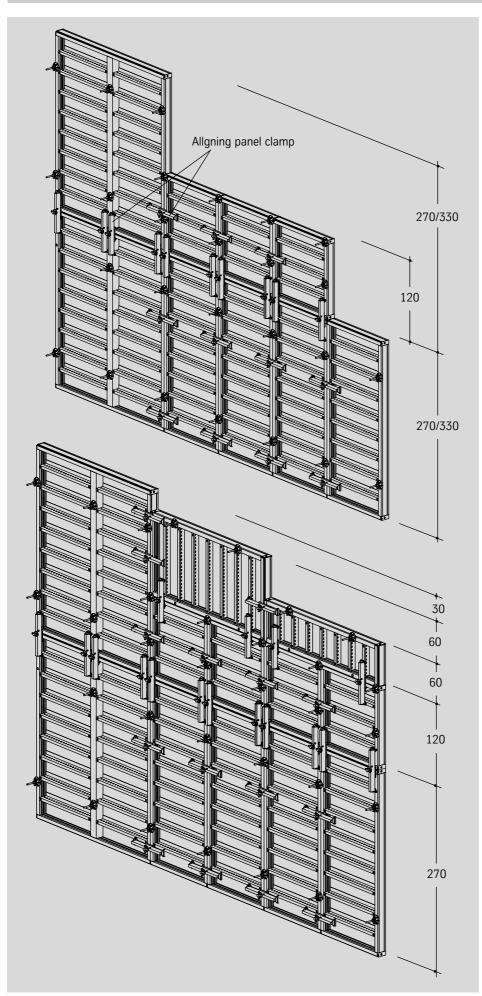
### **Dimensions of panels**





### Arrangment of connectors and ties





The Manto formwork panels are connected with the M-aligning panel clamp.

This connector creates tension-resistant, tight and aligned joints between formwork

It can be used both on vertical panel joints and on horizontal joints on height-extended formwork.

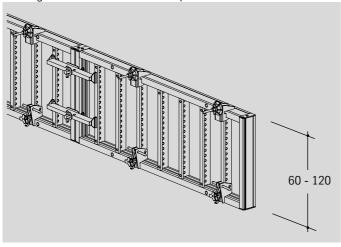
All Manto connectors require only the Manto ratchet for tightening and loosening.

### Arrangement of connectors and ties



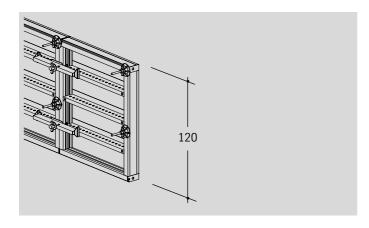
#### Formwork height 0.60 m to 1,20 m

Horizontal Manto panels connected with aligning clamps. Tying example: At the bottom with the FU tightener and at the top with the edge tie fastener MR above the panel.



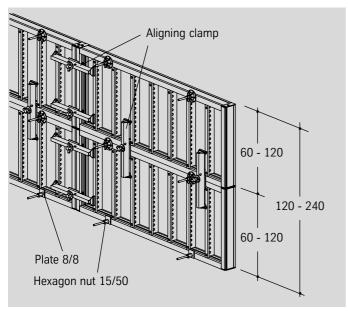
#### Formwork height 1.20 m

Vertical 1.2 m high Manto panels connected with the aligning clamp.



#### Formwork height 1.20 to 2.40 m

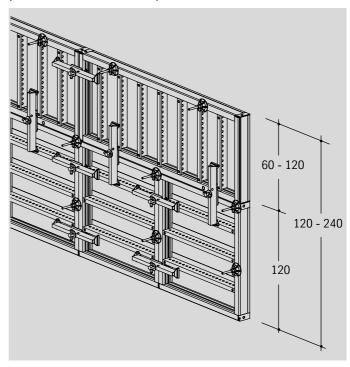
Horizontal, height-extended panels.



#### Formwork height 1.20 m to 2.40 m

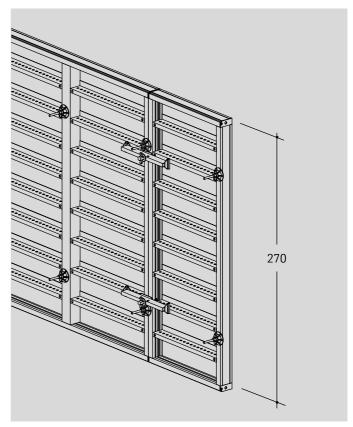
Horizontal height-extension panels placed on vertical 1.2 m Manto panels.

For shuttering 2.40 high walls, it is recommended to use the large panel  $240 \times 270$  in horizontal position.



#### Formwork height 2.70 m

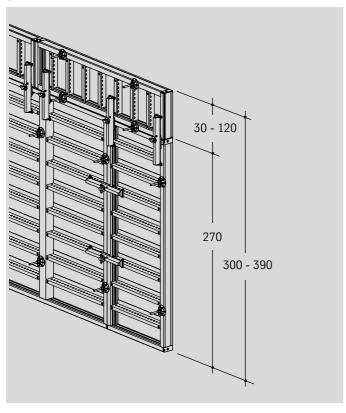
With Manto panels 270.





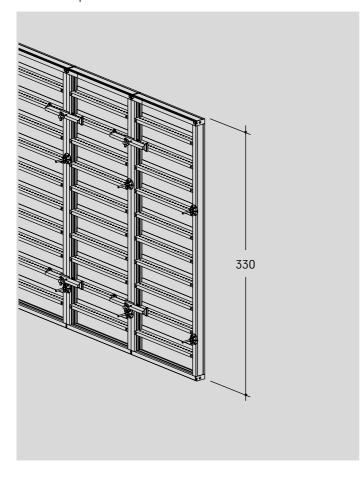
#### Formwork height 3.00 m to 3.90 m

Vertical 2.7 m tall Manto panels height-extended with horizontal panels 30 - 120.



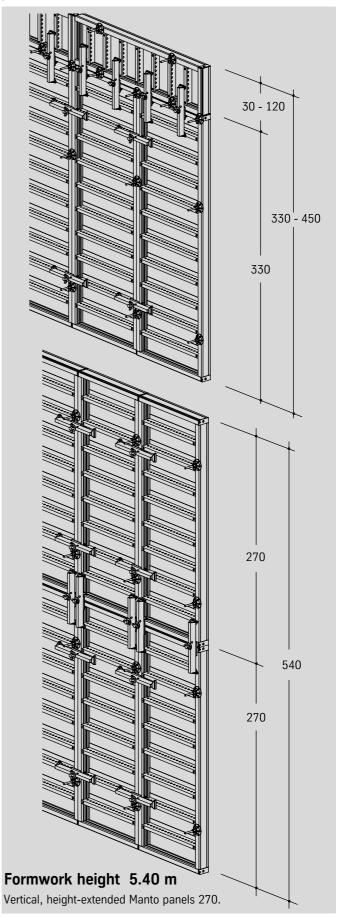
#### Formwork height 3.30 m

With Manto panels 330.



#### Formwork height 3.60 m to 4.50 m

Vertical 3.3 m tall Manto panels height-extended with horizontal panels 30 - 120.



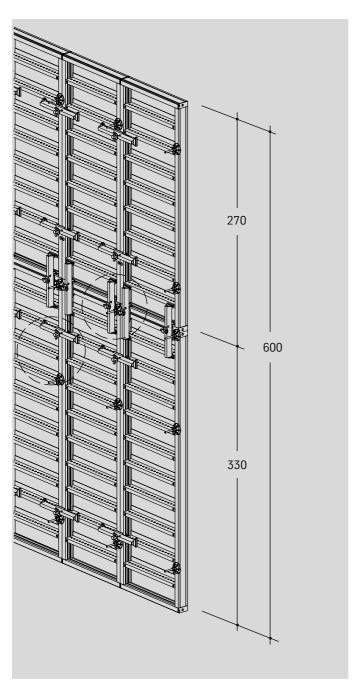


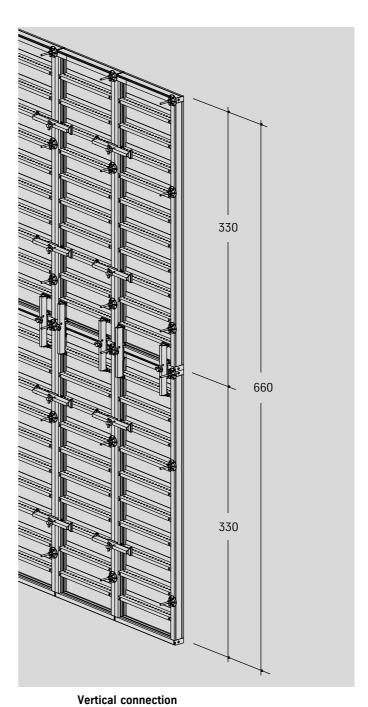
#### Formwork height 6.00 m

Combination of vertical Manto panels 330 and Manto panels 270.

### Formwork height 6.60 m

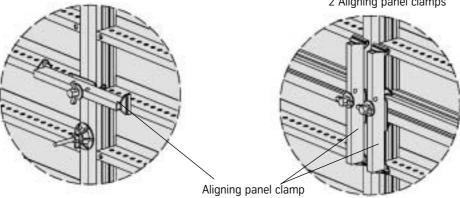
Vertical, height-extended Manto panels 330





Horizontal connection

For one panel you need 2 Aligning panel clamps



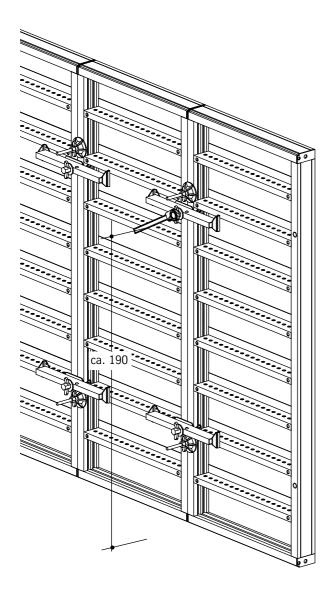
### **Connecting and tying**



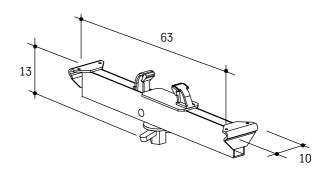
#### The aligning panel clamp

Manto panels are always joined with the aligning panel clamp. This is used for all vertical and horizontal panel joints, regardless whether the panels are positioned standing, lying or staggered at height.

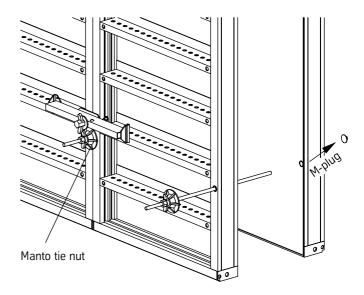
The aligning panel clamp with its more than 63 cm long aligning profile provides an absolutely tight, flush-mounted and aligned panel joint.



At a vertical panel joint with single-storey formwork both aligning panel clamps can be conveniently operated from ground level. The use of the Manto ratchet makes the job fast, noiseless and easy on the components. No need to overtighten the toggle nut.

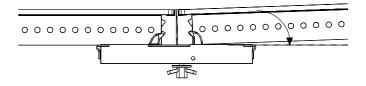


Manto formwork is tied via the tie holes provided in the panels. Before inserting of the tie rod, the plug must be removed. Unused tie holes should be sealed with plugs.

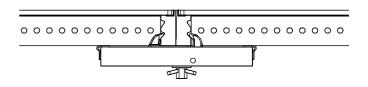


When tying the panel joint, the tie plate (13 cm dia) of the Manto tie nut extends across sufficiently to the neighbouring panel.

Slide aligning panel clamp onto the roughly aligned panels.



Tightening the toggle nut closes the joint and aligns the panels.

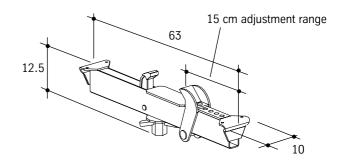


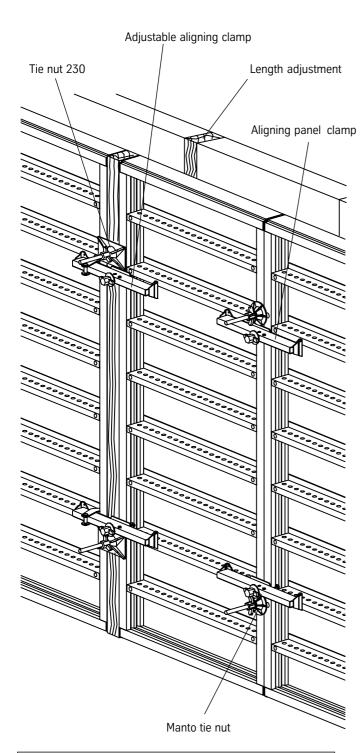
### **Connecting and tying**



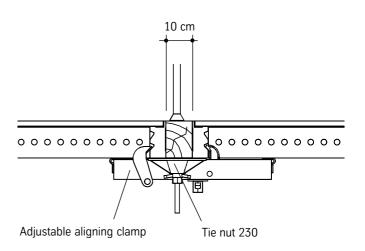
#### With the adjustable aligning clamp

The adjustable aligning clamp connects Manto panels in the same way and perfection as the aligning panel clamp does. Moreover, its sliding claw permits a stepless length adjustment at the panel joint of 0 to 15 cm.

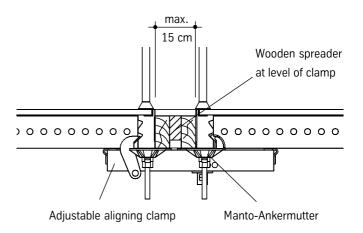




For an adjustment width of up to 10 cm the adjustment is used for tying purposes. Use large tie nut (e.g. tie nut 230) for this.



For larger adjustments both adjacent panels must be tied.



#### Note:

Adjustable aligning clamp (install **three** adjustable aligning clamps on 3.30 m high panels).

### **Connecting and tying**

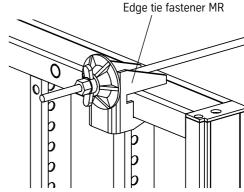


#### Making use of the FU tightener and the Edge tie fastener MR

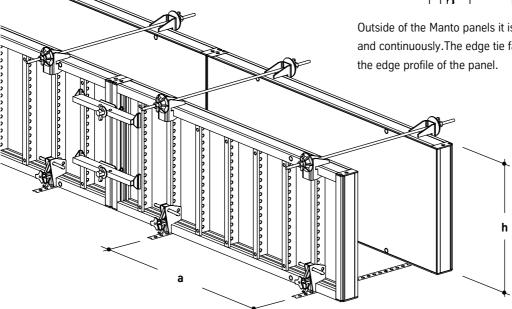
The FU tightener and the punched steel tape are an alternative solution for tying panels when it comes to foundations.

The permissible load for both the Edge tie fastener and the FU tightener is **10 kN**.

From that permissible load results a maximum distance between the ties of 1.75 m when using panels 90 cm high.

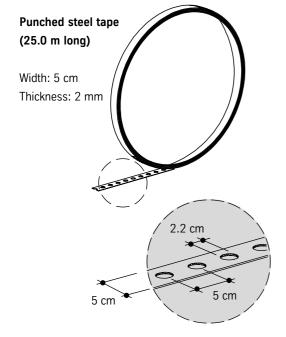


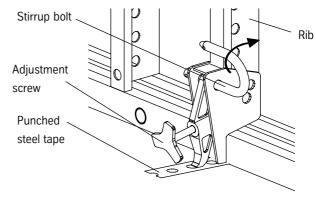
Outside of the Manto panels it is also possible to tie stepplessly and continuously. The edge tie fastener MR secures the tie rod to the edge profile of the panel.



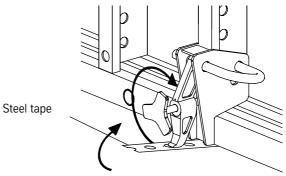
#### Allowable distances of FU-Tighteners (m)

h	0.90	1.05	1.20
а	1.75	1.30	1.00





The FU-Tightener is positioned on the formwork panel and secured to the vertical rib by using the stirrup bolt. Then the cut-to-size piece of steel tape is to be hooked on the finger of the FU-Tightener.

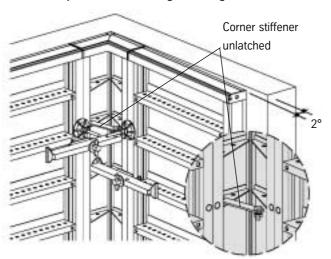


The punched steel tape is tightened by turning the threaded bolt.



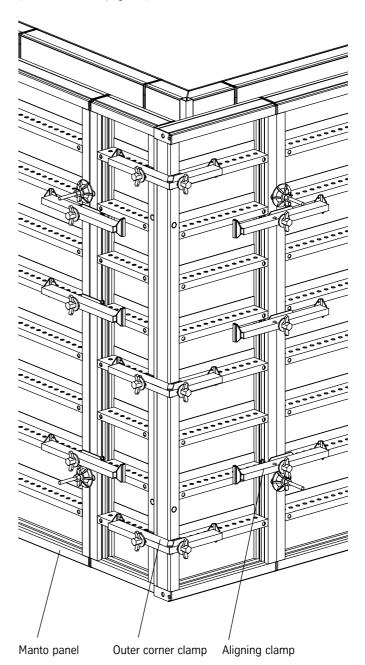
90° wall corners and T-walls are shuttered by means of the Manto inner corners. Adjustment to the desired wall thickness is carried out at the outer corners, which consist of standard panels and outer corner clamps.

The possibility of reducing the 90° corner angle by about 2° assures easy and material-saving shuttering work.



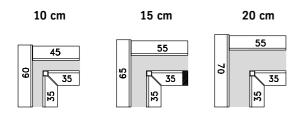
The right-angled outer corner is always composed of two Manto panels aligned and held together with outer corner clamps. The formwork can be adapted to wall thickness with the available elements of 30 to 90 cm and the 5 cm adjustment piece.

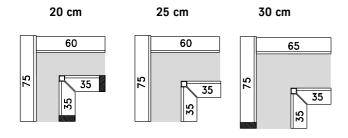
The number and arrangement of outer corner clamps and of the Manto clamps on the first joint of the outer corner depends on the thickness and height of the wall being shuttered. (See the table on page 32).

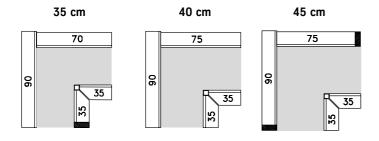




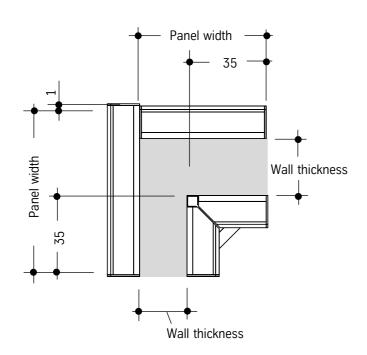
#### Panel arrangement with corners, T walls and wall thicknesses of:



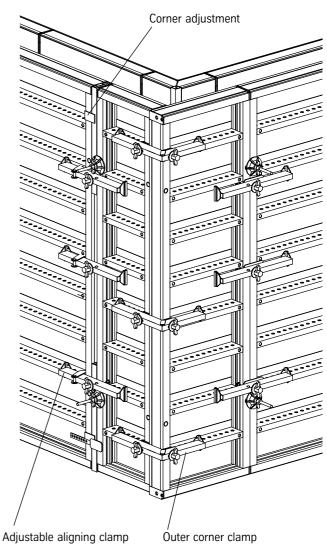




#### System dimensions of the Manto corner



With the 5 cm wide corner adjustments, the formwork can be adapted in 5 cm increments to any wall thickness. A 4 cm wide corner adjustment is used with 24 and 36 cm thick walls. For intermediate corner adjustments, the panels are connected with the adjustable aligning clamp.



#### Note:

With 4 or 6 cm timber adjustment pieces, the formwork can be adjusted to corners with wall thicknesses of 24 or 36 cm.



Number and distribution of connectors on Manto corners (outer formwork).

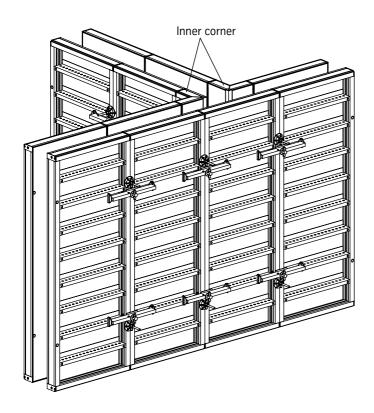
 Wall thickness [cm]	Wall thickness < 30 cm	Wall thickness < 40 cm
270	3 clamps	4 clamps
330	4 clamps	5 clamps
270 + 120	3 + 2 clamps	4 + 2 clamps
330 + 120	4 + 2 clamps	5 + 2 clamps
540	4 + 3 clamps	4 + 4 clamps
660	5 + 4 clamps	5 + 5 clamps

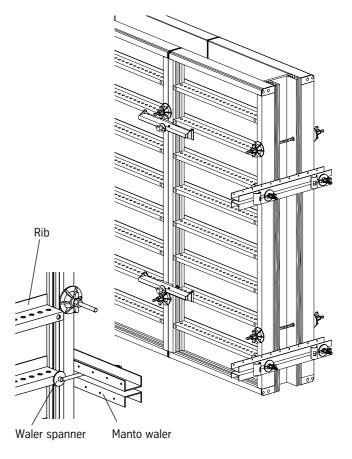
### Stopend



At wall T-junctions, system shuttering can be simply used up to a wall thickness of 40 cm. Adaptation is possible with the various panel widths and the 5 cm wide corner adjustment piece.

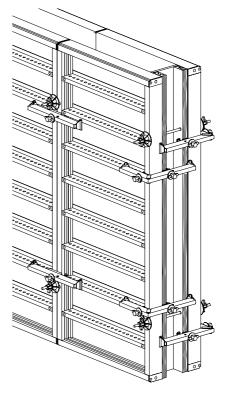
The Manto waler is also used for shuttering a bulkhead. It is fastened with two waler spanners to the last Manto panels, which are tied in the usual manner.





## Panel arrangment with T-Walls of 15 to 30 cm adjustable in increments of 5 cm $\,$

Stopends can also be formed with the Manto formwork by using the outer corner clamps. The maximum wall thickness is then **limited to 30 cm**. The corner clamps are to be assembled in the illustrated manner and quantity on the final panels.



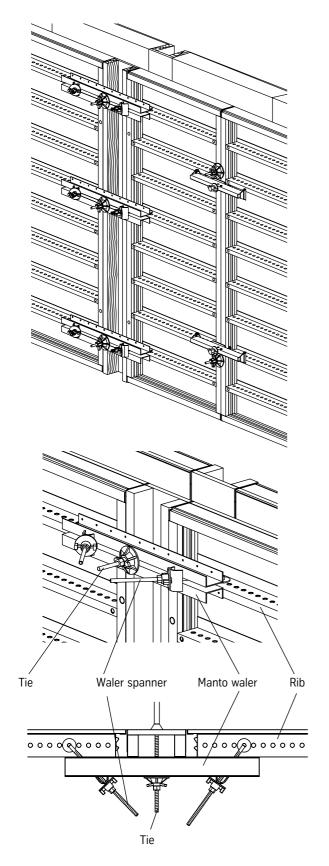
### Length adjustment and T-Wall

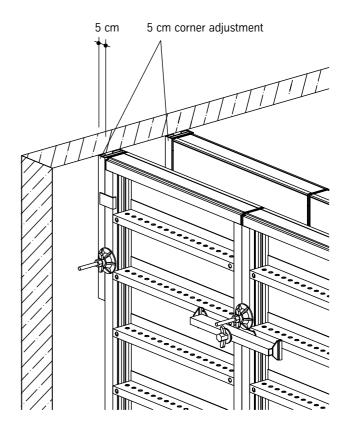


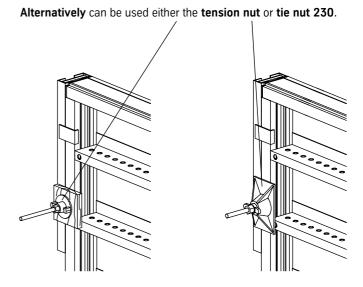
Length adjustments **to 15 cm** werden mit der Ausgleichszwinge erstellt (see page 28).

Length adjustments of **up to 30 cm** are shuttered by means of the Manto waler which is fastened at the panel profiles with 2 waler spanners each for an aligned, high-tensile adjustment.

Should concrete work against an already existing wall be necessary, the use of the 5 cm corner adjustment is advisable. In this case it is possible to tie in the usual manner and with standard material.







#### Note:

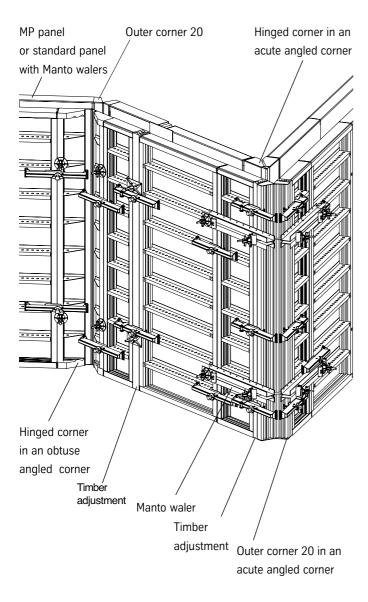
The 5 cm corner adjustment **can remain** in place during transport by crane.

### Oblique angular corners

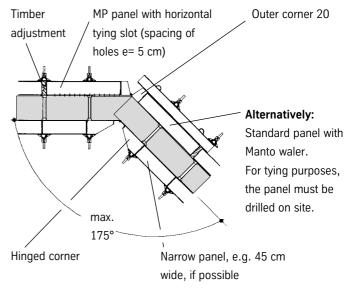


Non-rectangular corners can simply be shuttered with hinged corners and the outer corners 20.

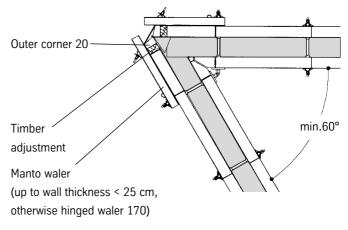
The adjustment range of these components permits oblique angular corners from 60° to 175°. Adjusting members compensate for differing wall thicknesses.



#### Obtuse angled corner

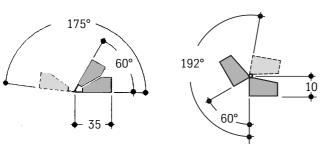


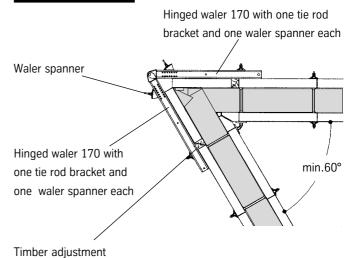
#### Acute angled corner



# **Alternatively** without outer corner 20

# Adjustment ranges for the hinged corner and the outer corner 20:





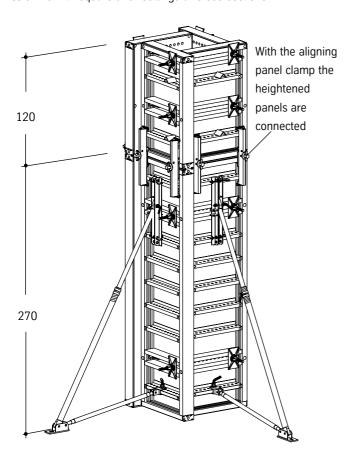
#### **Column formwork**



#### With MP panels

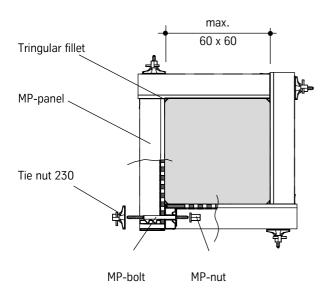
(permissible concrete pressure = 80 kN/m²)

With their holes in 5 cm increments and the transverse hole in the edge profile, these panels are highly suitable for shuttering columns with square and rectangular cross-sections.

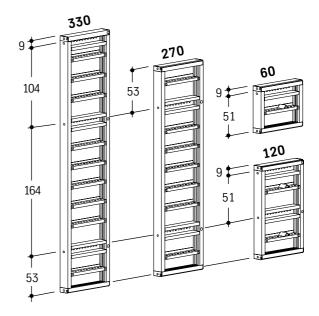


The panels are connected by means of the MP-bolt, the MP-nut and the tie nut 230. For shuttering heights of up to 2.70 m, only two spanning elements are required.

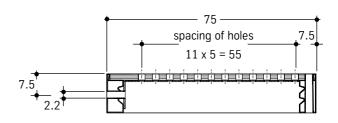
Max. column cross section: 60 x 60 cm.

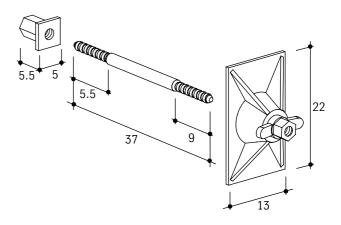


Four different MP panel lengths provide a height adjustment in 30 cm increments.

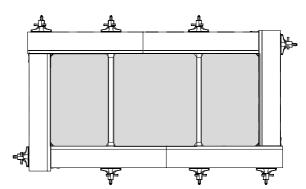


The spacing of the holes of the MP-panels





With additional ties and with further MP-panels, larger column cross-sections can be shuttered, too.



### Column formwork

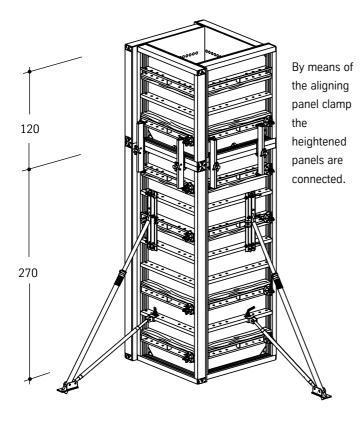


#### With column frames

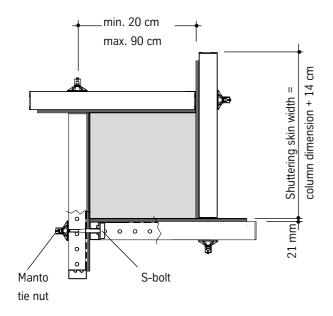
(permissible concrete pressure = 100 kN/m²)

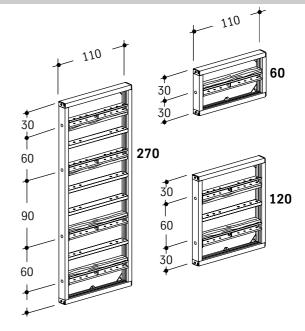
A special column formwork for cross sections of up to 90 x 90 cm and an extremely high permissible concrete pressure. The column frames are supplied without shuttering skin. They can simply be covered (by means of the built-in wooden lath) on-site with an appropriate shuttering skin in the desired manner.

Hünnebeck also supplies shuttering skins in cut-to-size shape, with or without pre-drilled segment holes.

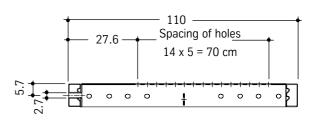


The frames must be connected as illustrated with the S-bolts and one Manto tie nut each after the shuttering skin has been attached.



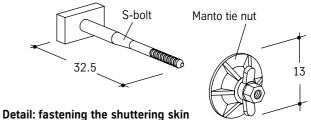


The hole increments of the column frames:

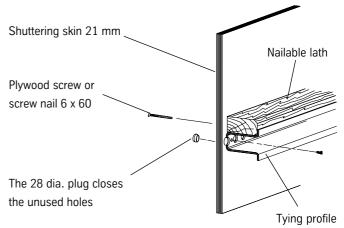


For each S-bolt a Manto tie nut is required.

A 2.70 m high column formwork requires 16, a 1.20 heightening 8 and a 0.60 m heightening 4 S-bolts with Manto tie nuts.



The shuttering skin can be screwed or nailed onto the nailable lath or screwed from the rear through the tying profile. Moreover, at the top and lower edge profile of the column frames fasteners are provided.



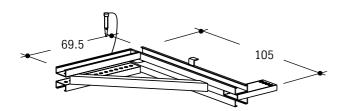
### **Column formwork**

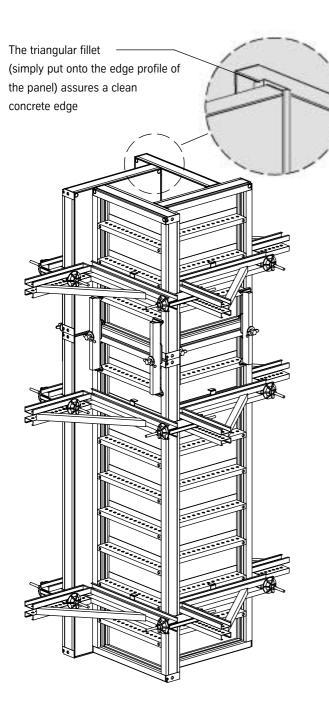


### With column angle walers

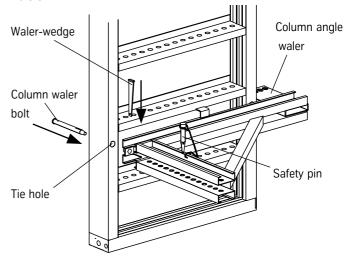
(permissible concrete pressure = 80 kN/m²)

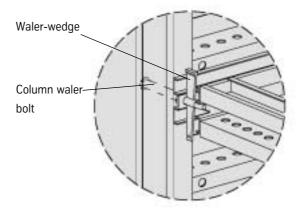
The column waler offers the possibility of shuttering columns of 20 to 65 cm edge length in **1 cm increments** without the use of special panels. Work is possible with standard Manto panels in the widths 60 to 90 cm.



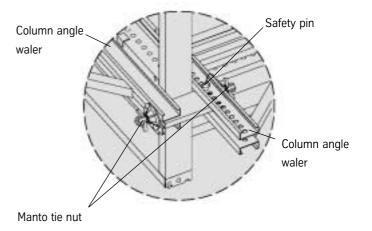


The column walers with one column waler bolt and one column waler each must be fastened through the tie hole on each of the four panels. This determines the position and quantity of the walers.





After assembly of the column walers and after erecting the panels the column walers engaging each other are fastened with the attached bolts in the holed profile according to the desired column dimension.



By installing the tie (2 x Manto tie nut and 1 x tie rod 50) the column formwork is closed and ready for use.

### **Column formwork**

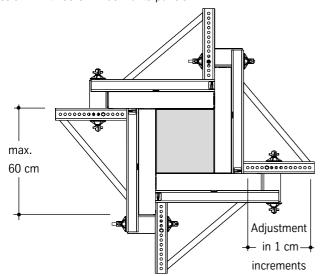
# Walkway bracket **MANTO**

TK railing post

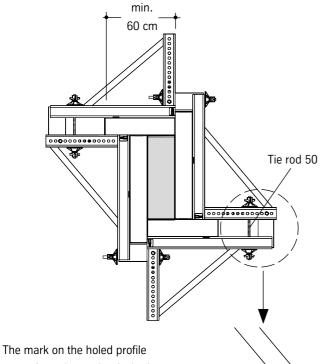
Walkway bracket

#### Column angle waler

Example of column waler application with formwork for a square column with 90 cm wide Manto panels.



The use of panels with differing widths (60 to 90 cm) is possible without any problem.



000

1234

eases fastening to the desired column dimension. Search for hole with the appropriate dimension and fasten with the hole referred to as first number (1 to 4).

#### Example:

For 35 cm column, fasten in hole 4 (with attached bolt)

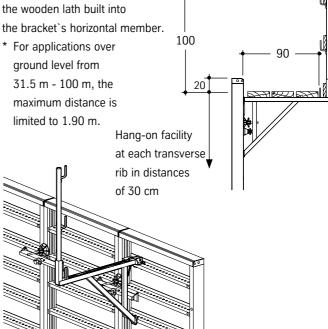
#### Walkway bracket

The stage for concreting is formed with the M-walkway bracket and the inserted TK railing post. Simply hang the brackets with their receiving pins into the hole segment of the transverse ribs of the panels. Fastening with the unlosably attached spring pin secures the walkway bracket.

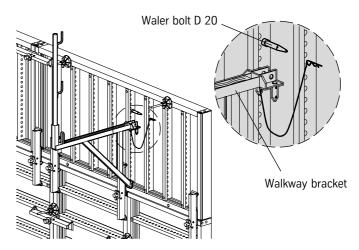
The distances between the M-walkway brackets (freely selectable in 5 cm increments) must not exceed 2.50 m\* at a permissible load of 1.5 kN/m<sup>2</sup>. The planks can be nailed to

the wooden lath built into

\* For applications over ground level from 31.5 m - 100 m, the maximum distance is limited to 1.90 m.



Connecting the M-walkway bracket to an upright panel.

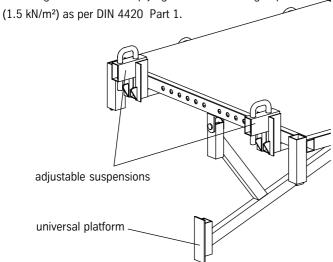


The M-walkway bracket is connected to a lying panel with the aid of a waler bolt D 20 to the vertically arranged ribs.

### **Universal platform**

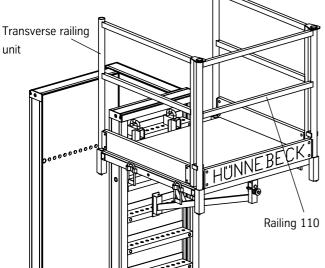


The universal platform serves as pouring and protection platform. It is designed for loads complying with the scaffold group 2

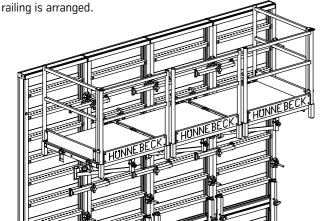


The platform can be attached to Manto panels which are at least 75 cm wide (and wider) by using the adjustable suspensions.

The suspension points can horizontally be varied in steps of 5 cm. It is even possible to place the platform over vertical panel joint.

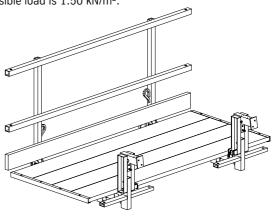


The application example above shows the universal platform as pouring platform attached to a column formwork made of MPpanels. Using 2 times the transverse railing unit a three-sided safety



By simply attaching the universal platforms to the horizontal ribs of the Manto panels, short or long working and protective platforms can be provided almost at all required levels.

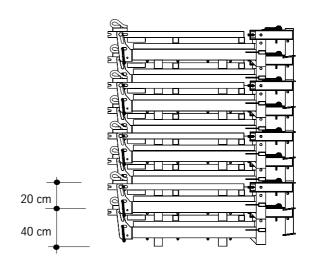
The pouring platform 240 can be used as top working platform on the Manto formwork. Used as single platform, the permissible load is limited to 2.0 kN/m<sup>2</sup>, and with extension up to 2.40 m the permissible load is 1.50 kN/m².



#### Stacking heights of pouring platforms

The pouring platforms are delivered for use as folded-up units. The maximum stacking height is as follows: 40 cm with the lower platform and 20 cm for all further units.

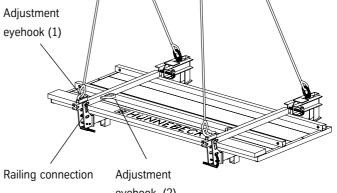
8 folding units can be stacked at maximum.



### Picking up the platform by crane (1)

The crane suspension has to be attached to the adjustment eyehook (1) of the folded-up unit.

It is part of the railing post base construction.



eyehook (2)

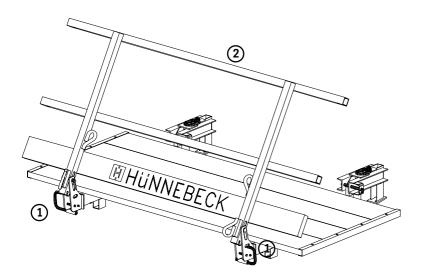
## **Pouring platform**

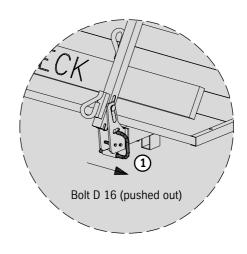


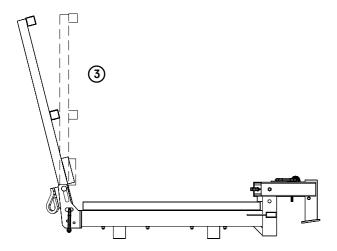
### Assembling the pouring platform

At first, the railing must be erected. For this, the stirrup bolt D16 is to be pulled out, the railing 2 be unfolded and arrested in the desired position 3.

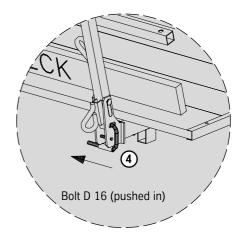
Then the stirrup bolt D16 is to be inserted to secure the railing **4**. This can be used in vertical as well as in inclined position.



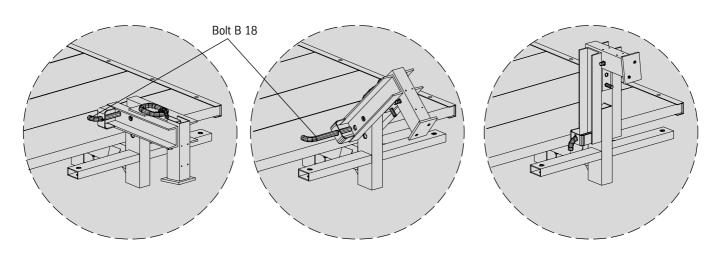




Only the bolt B18 must be pulled out for erecting the  $\,$  suspension bearing of the platform.



Standing upright, the vertical member of the suspension bearing has to be secured again by inserting the bolt B18.



### Pouring platform

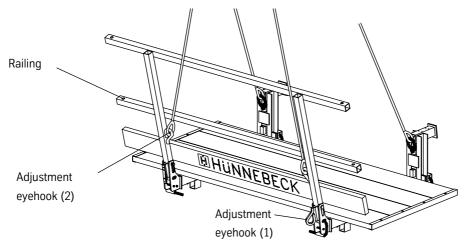


### Picking up the platform (2)

When being unfolded, the suspension by crane is to be carried out using the adjustment eyehook (2) which is welded to the railing post.

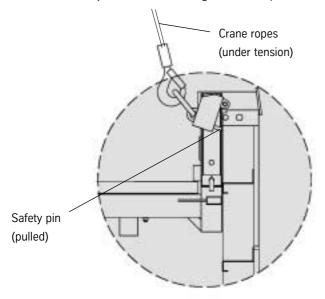


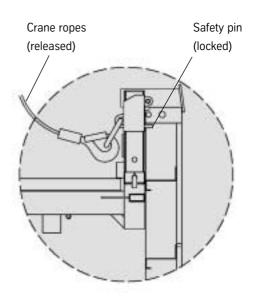
It is not allowed to shift the pouring platform together with the Manto panel.



### Attaching the pouring platform to the Manto formwork

The pouring platform is equipped with a self-securing suspension device that automatically works after releasing the crane ropes.

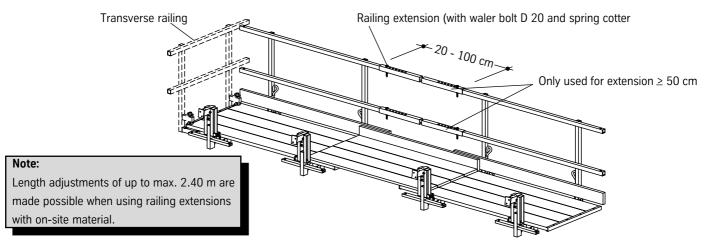




### Length adjustment and transverse railing

Length adjustments from 20 to 100 cm are made possible by means of on-site planks, toe board and 2 or 4 guardrail extensions (art.no. 498 218).

The intermediate planking (provided by site) must have an overlapping of 45 cm at both ends when placed onto the platforms. The planking has to be secured against sliding by nails, screws or similar fasteners.



### Strutting the formwork

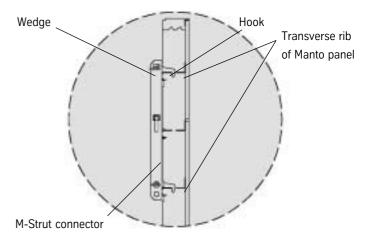


### M-Aligning strut

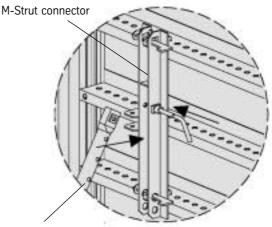
The M-aligning strut is used for bracing and aligning the formwork. Furthermore, it is designed to take additional wind loads acting on the Manto panels.

Fully drawn out the permissible tensile and pressure load is 8 kN.

The hooks of the M-strut connector are fixed to the holes in the Manto transverse ribs by means of the built-in wedges.

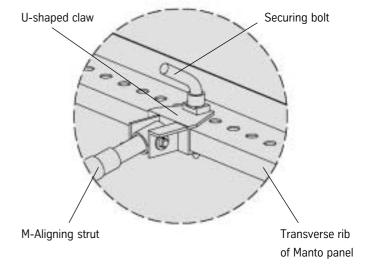


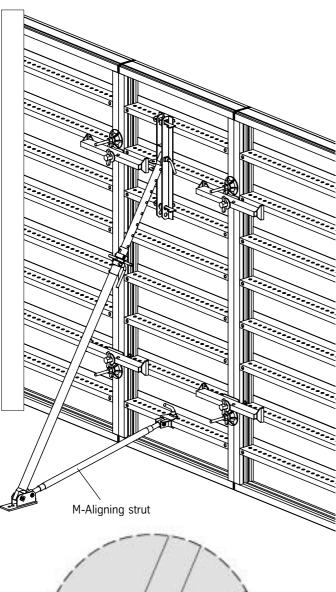
After attaching the M-Strut connector to the Manto panel the M-Aligning strut can immediately be fastened.

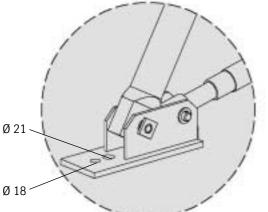


M-Aligning strut

The U-shaped bottom claw of the Manto aligning strut is pushed onto the lowest Manto transverse rib and then arrested with the the integrated securing bolt.







### Strutting the formwork

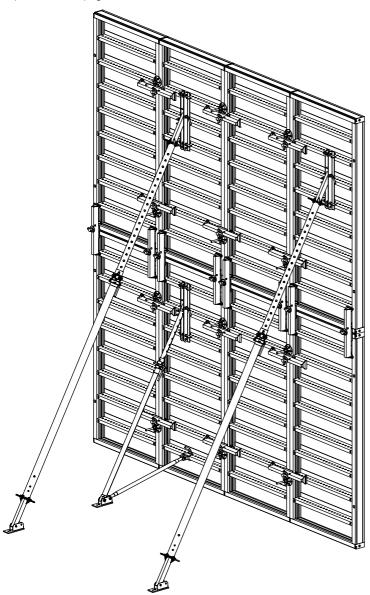


#### Europlus steel props as aligning props

The M-Strut connector, the Strut adapter and the Strut base joint together with standard Europlus steel props can be used for additional bracing height-extended Manto formwork at shuttering heights of H  $\geq 4.20$  m. The drill-holes provided in the connecting plates of the Strut adapter and Strut base joint allow all Hünnebeck steel props to be connected to them (always use 4 bolts M 12 x 30 with nuts for each joint).

For special applications Alu-Top single props or BKS aligning struts can be attached, too.

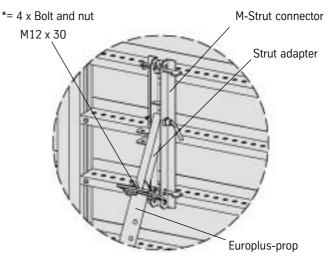
The complete bracing unit is connected to the Manto formwork as depicted on this page.



The proper type and size of steel prop has to be selected accordingly to the loading, formwork height and the extension length of the prop. There are steel props in the product line of Hünnebeck for all ranges between  $1.50\ m$  and  $5.50\ m$  (see also relevant Load Tables).

### Important!

The permissible tension load of the steel prop is at least 15 kN.



A counter nut A/DB, AS/DB or EC/DB (depending on the chosen type of tubular steel prop) makes the steel prop tensile and pressure-resistant.

Counter nut A/DB 260/300 Art. no.: 107 107

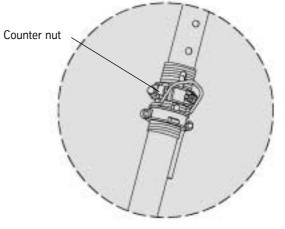
for Europlus 260, 300 DB/DIN.

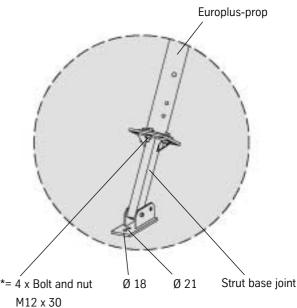
Counter nut AS/DB 350/410 Art. no.: 107 118

for Europlus 350 DB/DIN.

**Counter nut EC 400/DC 550** Art. no.: 587 675

for Europlus 400 EC, 550 DC.



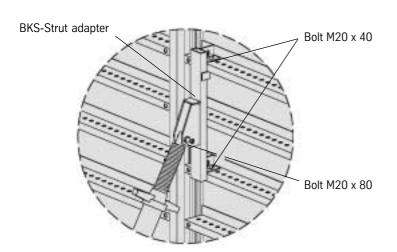


## Strutting the formwork

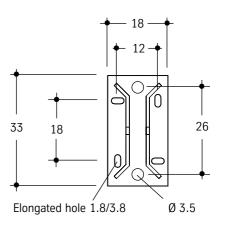


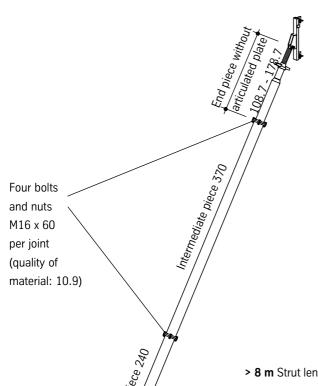
### **BKS-Aligning strut**

The BKS-Strut adapter together with the BKS strut allow supporting stacked Manto formwork at heights of 6.0 m or higher (H  $\geq$  6.0 m).



# End piece with articulated plate





Limitation of the permissible strut load (kN) depending on the distance from the panel edge.

perm. strut load [kN]							
Angle	Distance from panel edge [cm]						
α	20	30	40	50	60		
50°	29.3	19.1	15.3	13.7	13.2		
55°	28.0	18.3	14.7	13.1	12.7		
60°	27.1	17.7	14.2	12.7	12.2		

> 8 m Strut length, with M-Strebenanschluß and Strut adapter (max. 34 kN)

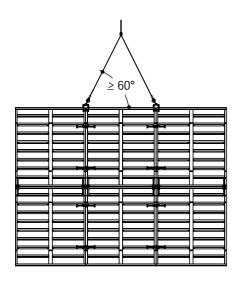
Тур	Adjustment range	perm. load [kN]	number of end pieces		number of Interm. piece	
Typ	[cm] min. max.	fully extended	with art. 489 102	without art. 489 775	short (240 cm) 489 113	long (370 cm) 489 124
BKS 4	703.7 - 843.7	32.6			2	-
BKS 5	833.7 - 973.7	28.2	je 1	je 1	1	1
BKS 6	963.7 - 1103.7	23.8	JC 1	JC I	-	2
BKS 7	1073.7 - 1213.7	20.1			2	1

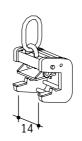
### Large-area application and panel handling by crane



#### Shifting with crane adaptor

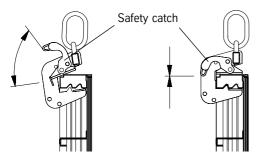
The crane adaptor has a maximum load-bearing capacity of 1,000 kg. With large-area applications, the crane adaptor must always be applied at the joint of 2 neighbouring panels in such a way that both panels are gripped in the stable corners by the crane adaptors.





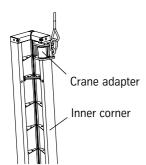
### Warning!

When connecting with the edge profile of the formwork, the safety catch of the crane adaptor must always be tightly closed. The operating instructions of the crane adaptor must be observed.

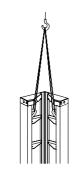


With open safety catch push onto the edge profile.

Only with the safety catch closed, the hook is ready for use.



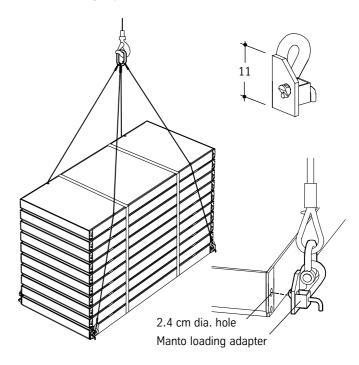
The handling of the inner corners is as illustrated.



When transporting individual corners the crane slings must be fastened at both lifting eyes.

#### Handling a bundle of panels using the loading adaptor

When handling bundles of panels by crane, the Manto loading adaptor can be used. Together with the 4-way cable suspension a bundle of 10 panels can be moved (2.40 m wide giant panels only in bundles of 5 pcs.).



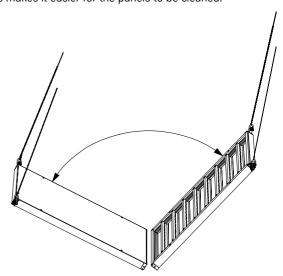
The Manto loading adaptors are connected at the four corners of the bottom panel by engaging the connecting pin with the hole (2.4 cm dia.).

The single loading adaptor has a load-bearing capacity of 500 kg maximum. This load can only be applied in the manner shown here.

Large areas of assembled Manto panels must not be handled in this way!

Individual Manto panels can be turned over their high side with the aid of two loading adaptors.

This makes it easier for the panels to be cleaned!

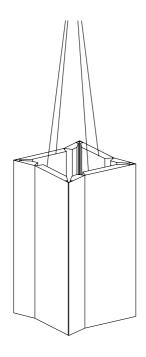


### **Shaft formwork**



With Manto shaft formwork the inner formwork of a shaft (or a room) can be completely shifted by crane, without the need to loosen the connections of the individual shuttering elements.

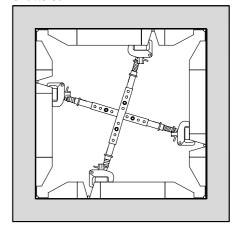
The formwork is loosened from the wall by means of the shaft spindles when stripping. Due to the retraction in the articulating elements, the cross section is reduced to such an extent that a subsequent unproblematical shifting is possible.



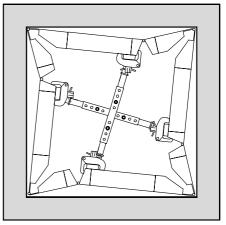
### Important!

For large shaft formwork the available crane capacity must be taken into considertion.

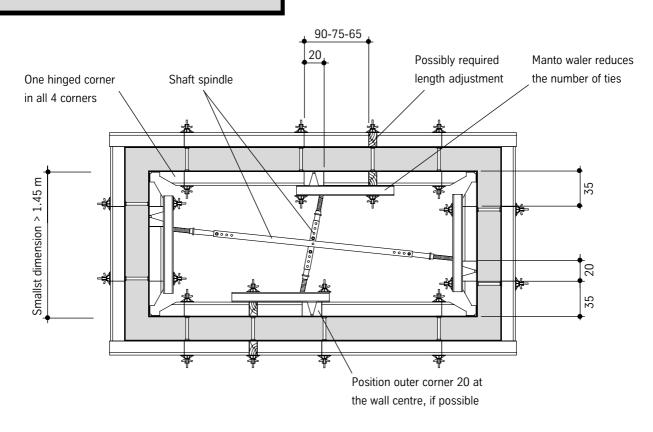
#### Shuttered



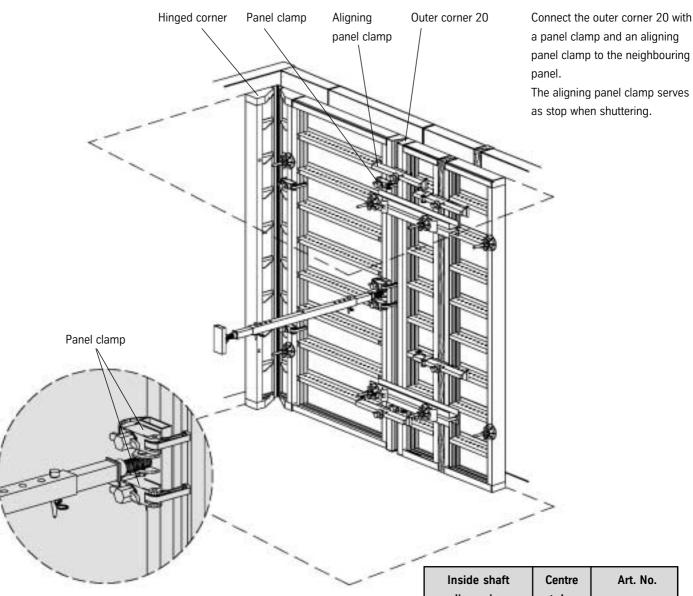
### Stripped



Up to a shuttering height of **3.90 m** one shaft spindle is positioned in every direction.







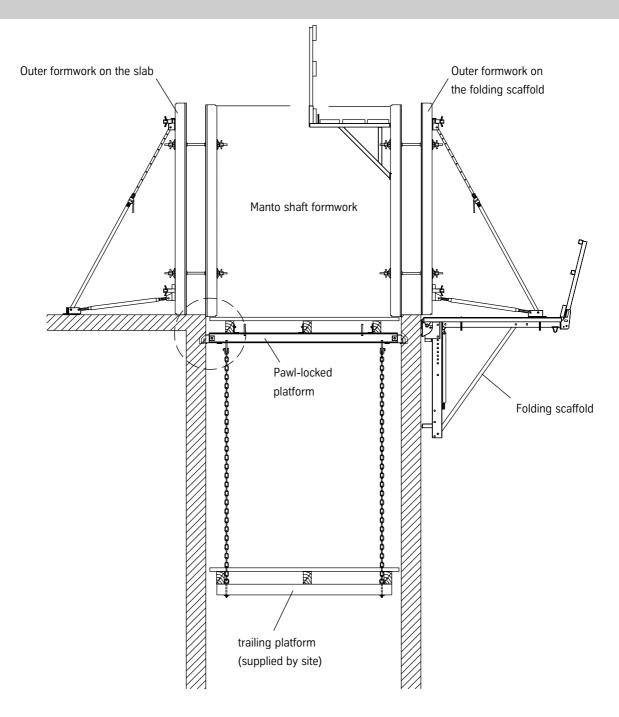
The shaft spindle must be fastened with two panel clamps each at the element joint of the outer corner 20. Always install with screwed-out spindles (27 cm min.) in order to obtain adequate spindle travel for the shuttering work.

dimension	tube	
145 - 175 cm	50	524 721
175 - 205 cm	80	524 732
205 - 235 cm	110	524 743
235 - 265 cm	140	524 754
265 - 295 cm	170	524 765
295 - 325 cm	200	524 776

Art. No.

min. 10 / max. 30 cm	265	5 - 295 cm	170	524 765
5 - 20 cm	295	5 - 325 cm	200	524 776
5 - 20 cm 50 80 110 140 170 200  Left-hand spindle piece with red mark  Centre tube  Waler bolt D 20 + spring pin	min. 5 / n in 5 cm in	nax. 20 cm ncrements	min. 10cm	n / max. 30 cm Right-hand spindle piece with blue mark





This system cross-section shows Manto shaft formwork combined with additional Hünnebeck components such as the folding scaffold for the outer formwork as well as a pawl-locked platform for the inner formwork.

### Note:

For the folding scaffold from Thyssen Hünnebeck, individual instructions for erection and use are available.

Perm. area load of the pawl-locked platform [kN/m²]

Beam distances [m]	Beam length [m]							
į <u>,</u>	1.5	2.0	2.5	3.0	3.5	4.0		
1.0	10	10	10	10	10	8.5		
1.5	10	10	10	10	7.3	5.6		
2.0	10	10	10	7	5.5	4.2		
2.5	10	10	8	6	4.4	3.4		
3.0	10	10	7	5	3.6	2.8		

**Important:** A statical prove for the timber and plank components has to be made separately.

### **Shaft formwork**

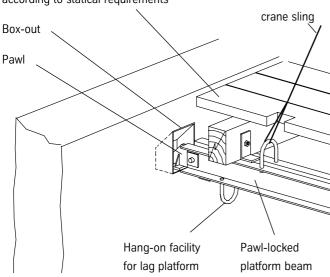


The pawl-locked platform consists of pawl-locked platform beams onto which an on-site squared-timber and plank cover is laid.

The pawl-locked platform beam is always project dimensioned.

Articulated bearing claws are mounted at the ends of the double U-beam and automatically engage into the previously concreted box-outs. These can be re-used with the aid of a hang-on lag platform after shifting the pawl-locked platform.

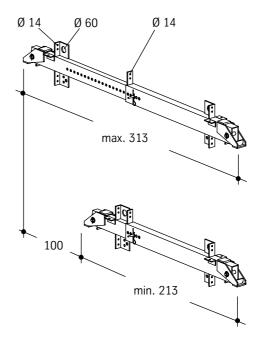
Squared timbers and planks according to statical requirements

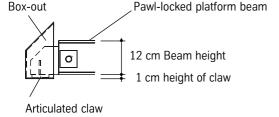




This telescopic platform beam is adjustable in steps of 1 cm and spans lift shafts in floor slabs within a total adjustment range of 100 cm.

Depending on the kind of supporting the articulated claws, the possible clear width (Wc) of the opening is Wc  $\geq$  200 cm /  $\leq$  300 cm when using box-outs.





Statical assumptions:

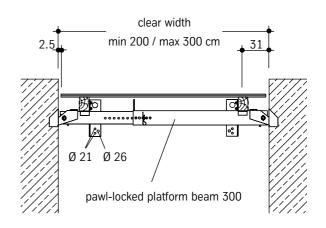
- Max. spacing of pawl-locked beams: 2.50 m.
   Max. height of the Manto formwork: 5.40 m.
- 2. Load-bearing capacity of the lag platform chain must be at least 10 kN, e.g. tension chain Art. No. 022 789.
- 3. Max. live load: either pawl-locked or lag platform  $P = 1.50 \text{ kN/m}^2$ .

Alternative single load: **F** = 1.0 kN at an unfavourable position.

 The articulated claws of the pawl-locked platform beams require a minimum strength of concrete of 1.50 kN/cm² (= B15).

 $\label{eq:decomposition} \mbox{Dead weights:} \quad \mbox{Manto formwork} \qquad \quad \mbox{approx. 60 kg/m}^2,$ 

Pawl-locked platform approx. 70 kg/m², Lag platform approx. 50 kg/m². The pawl-locked platform beam 300 is provided with connection parts for wooden planks (by site) and for a trailing platform (if needed).





### Permissible concrete pressure of Manto

Panel height [cm]	Assumed pressure envelope	Perm. concrete pressure pb [kN/m²] considering max. deflections acc. to DIN 18202		Corresponding tie forces [kN]			
			Line		Line		
		5	6	7	5	6	7
330	$\rightarrow$		<b></b>	82.5		<b></b>	107
	<b>→</b>	80	80	65	153	153	124
270	<b>→</b>		-	67.5		-	85
	<b>→</b>	*) 80	**) 80	***) 63	130	130	102
240	$\rightarrow$		<b></b>	80		<b></b>	115
120	<b>→</b>		<b></b>	80		-	103

- \*) 60 kN/m² for large panel 240/270, inner corners 120 and 270, hinged corners 120 and 270 (up to year of production 1991)
- \*\*) 62 kN/m² for large panel 240/270, panel 120/270 and panel 105/270 (each panel up to the year 1995).
- \*\*\*) 47 kN/m² for large panel 240/270, panel 120/270 and panel 105/270 (each panel up to the year 1995).

### Notes:

- At tie forces ≥ 90 kN always use tie rods with a diameter of 20 mm.
- A warranty can only be granted for original tying equipment delivered by the Hünnebeck company.
- Absolutely plane panels are supposed to be used in order to meet the required deflections of DIN 18202.



### Hünnebeck GmbH