TOWER CRANE MANUAL

SK180

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Betreibsanweisung
Peiner Kran

Operating instructions for Peiner crane
Instructions de service pour grue Peiner

Form
Model/Modèle: **SK 180**

Werk-Nr.
Work no/No. de fabrication

Morrow Equipment Co., L.L.C., P.O. Box 3306, Salem OR 97302-0306 USA, Tel. (503) 585 5721, Fax. (503) 363 1172
www.morrowequipment.com

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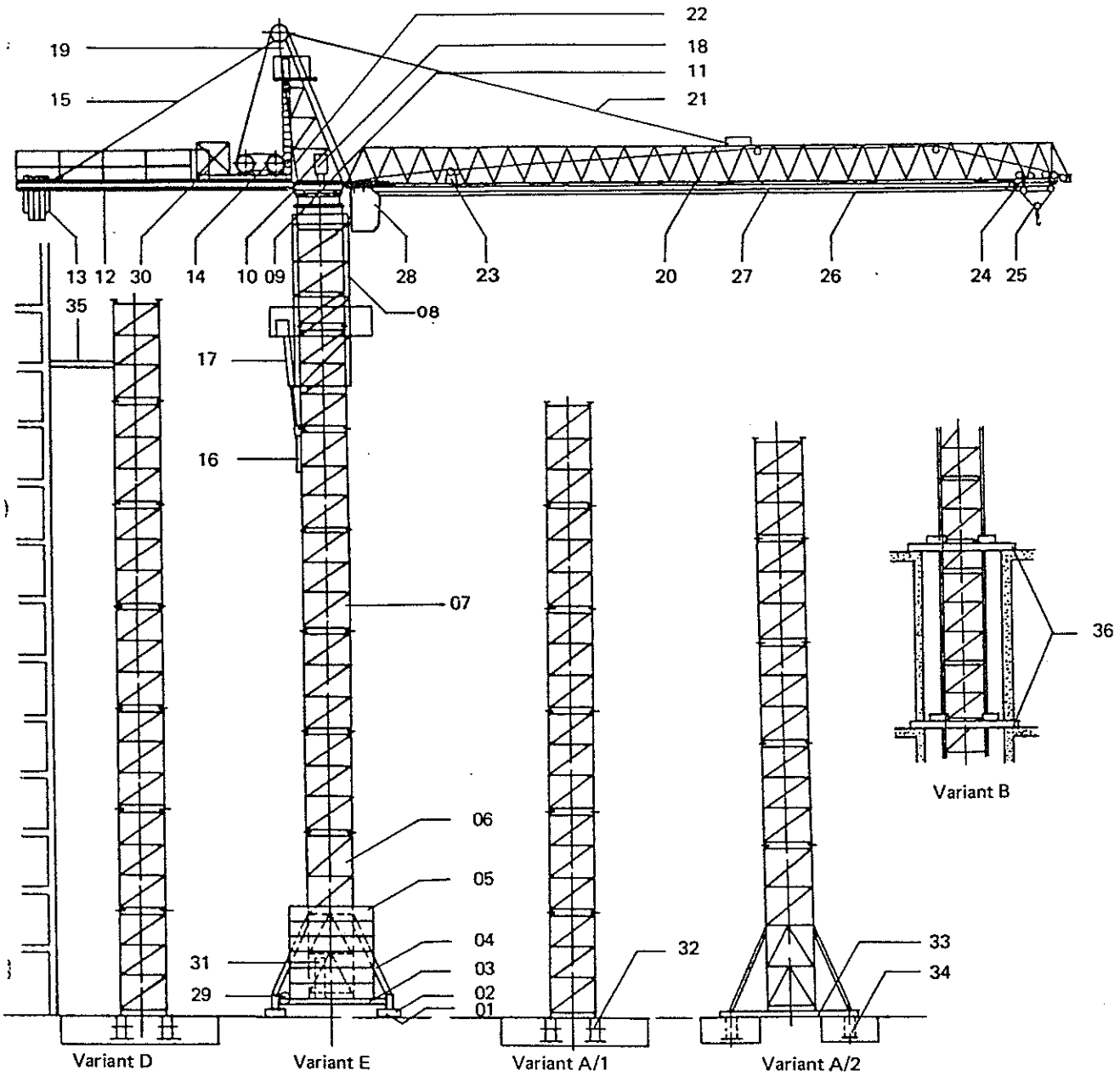
Description of parts



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Technical data

Crane capacities

2-Part Line

Hook Radius	2-Part Line Max Capacity – Radius	ft *m*	80 *24.4*	90 *27.4*	95 *29.0*	101 *30.8*	105 *32.0*	110 *33.5*	120 *36.6*	130 *39.6*	135 *41.1*	140 *42.7*	150 *45.7*	160 *48.8*	168 *51.2*	180 *54.9*	185 *56.4*	190 *57.9*	196 *59.7*
196 ft	13,800 lbs – 81 ft	lbs	13,800	12,300	11,700	10,800	10,320	9,700	8,700	8,000	7,700	7,300	6,700	6,200	5,800	5,400	5,200	5,100	4,900
59.7m	*6 250 kg – 24.7m*	*kg*	*6 250*	*5 580*	*5 310*	*4 900*	*4 680*	*4 400*	*3 950*	*3 630*	*3 490*	*3 310*	*3 040*	*2 810*	*2 630*	*2 450*	*2 360*	*2 310*	*2 200*
185 ft	13,800 lbs – 95 ft	lbs	13,800	13,800	13,800	12,900	12,420	11,800	10,700	9,700	9,300	8,800	8,200	7,600	7,200	6,600	6,400		
56.4m	*6 250 kg – 29.0m*	*kg*	*6 250*	*6 250*	*6 250*	*5 810*	*5 630*	*5 350*	*4 850*	*4 400*	*4 220*	*3 990*	*3 720*	*3 450*	*3 270*	*2 990*	*2 900*		
168 ft	13,800 lbs – 106 ft	lbs	13,800	13,800	13,800	13,800	13,800	13,300	12,100	11,000	10,600	10,100	9,300	8,600	8,200				
51.2m	*6 250 kg – 32.3m*	*kg*	*6 250*	*6 250*	*6 250*	*6 250*	*6 250*	*6 030*	*5 490*	*4 990*	*4 810*	*4 580*	*4 220*	*3 900*	*3 700*				
135 ft	13,800 lbs – 110 ft	lbs	13,800	13,800	13,800	13,800	13,800	13,800	12,600	11,500	11,000								
41.1m	*6 250 kg – 33.5m*	*kg*	*6 250*	*6 250*	*6 250*	*6 250*	*6 250*	*6 250*	*5720*	*5 220*	*5 000*								
101 ft	13,800 lbs – 101 ft	lbs	13,800	13,800	13,800	13,800													
30.8m	*6 250 kg – 30.8m*	*kg*	*6 250*	*6 250*	*6 250*	*6 250*													

4-Part Line

Hook Radius	4-Part Line Max Capacity – Radius	ft *m*	60 *18.3*	70 *21.3*	80 *24.4*	90 *27.4*	101 *30.8*	110 *33.5*	120 *36.6*	130 *39.6*	135 *41.1*	140 *42.7*	150 *45.7*	160 *48.8*	168 *51.2*	180 *54.9*	185 *56.4*	190 *57.9*	196 *59.7*
196 ft	27,600 lbs – 43 ft	lbs	19,060	15,700	13,400	11,700	10,200	9,000	8,100	7,300	7,000	6,700	6,100	5,600	5,200	4,700	4,500	4,300	4,200
59.7m	*12 500 kg – 13.2m*	*kg*	*8 650*	*7 120*	*6 080*	*5 310*	*4 630*	*4 080*	*3 670*	*3 310*	*3 180*	*3 040*	*2 770*	*2 540*	*2 360*	*2 130*	*2 040*	*1 950*	*1900*
185 ft	27,600 lbs – 51 ft	lbs	22,720	18,900	16,200	14,200	12,300	11,000	9,800	9,000	8,600	8,200	7,500	7,000	6,600	5,900	5,700		
56.4m	*12 500 kg – 15.5m*	*kg*	*10 310*	*8 570*	*7 350*	*6 440*	*5 580*	*4 990*	*4 450*	*4 080*	*3 900*	*3 720*	*3 400*	*3 180*	*2 990*	*2 680*	*2 600*		
168 ft	27,600 lbs – 57 ft	lbs	25,750	21,300	18,300	16,100	14,100	12,700	11,400	10,400	9,900	9,400	8,600	7,900	7,500				
51.2m	*12 500 kg – 17.2m*	*kg*	*11 680*	*9 660*	*8 300*	*7 300*	*6 400*	*5 760*	*5 170*	*4 720*	*4 490*	*4 260*	*3 900*	*3 580*	*3 400*				
135 ft	27,600 lbs – 58.5 ft	lbs	26,750	22,300	19,300	16,800	14,600	13,200	11,900	10,800	10,400								
41.1m	*12 500 kg – 17.8m*	*kg*	*12 130*	*10,120*	*8 750*	*7 620*	*6 620*	*5 990*	*5 400*	*4 900*	*4 700*								
101 ft	27,600 lbs – 59 ft	lbs	27,150	22,600	19,600	17,000	14,800												
30.8m	*12 500 kg – 18.0m*	*kg*	*12 320*	*10 250*	*8 890*	*7 710*	*6 700*												

Technical data

Maximum speeds and capacities of the drive units

Hoist Unit	2-Part Line					
105 hp *(78 kW)* AC hoist unit 4-speed gearbox Remote-controlled gear shifting Eddy current brake	Gear	Capacity		Line Speed	*Capacity*	*Line Speed*
	1	13,800 lbs	@	110 fpm	*6 250 kg* @	*34 m/min*
	2	13,800 lbs	@	178 fpm	*6 250 kg* @	*54 m/min*
	3	9,260 lbs	@	282 fpm	*4 200 kg* @	*86 m/min*
	4	5,500 lbs	@	440 fpm	*2 500 kg* @	*134 m/min*
	4-Part Line					
	1	27,600 lbs	@	55 fpm	*12 500 kg* @	*17 m/min*
	2	27,600 lbs	@	89 fpm	*12 500 kg* @	*27 m/min*
	3	18,520 lbs	@	141 fpm	*8 400 kg* @	*43 m/min*
2P130 *4P65*	4	11,000 lbs	@	220 fpm	*5 000 kg* @	*67 m/min*

Drive Unit	Horsepower	Kilowatts	Speed	
Trolley (2-part line)	6.5 hp	*4.8 kW*	13 – 250 fpm	*4 – 76 m/min*
Trolley (4-part line)	6.5 hp	*4.8 kW*	6.5 – 125 fpm	*2 – 38 m/min*
Swing	2 x 6.5 hp	*2 x 4.8 kW*	1.0 rpm	

Connected load depending of hoist unit type

	Three phase current drive 78 Kw hoist unit	
Total connection performance		105 kVA
Maximum supply cable length		190 m
Supply cable length		4 x 70 mm^2
Fuse required at building site isolator		250 A
Current		3 x 380 V; 50 Hz

Ballasting

Counter weight ballast depending on construction of hoist unit

Jib length	78 Kw hoist unit	
	Ballast*	Construction
L 5	21.0 t Δ	6 X 3.5 t Δ
L 4	17.5 t	5 x 3.5 t
L 3	17.0 t	4 x 3.5 t 2 x 1.5 t
L 2	15.5 t	4 x 3.5 t 1 x 1.5 t
L 1	12.0 t	3 x 3.5 t 1 x 1.5 t

1.5 METRIC TONS = 3,300 LBS.

3.5 METRIC TONS = 7,720 LBS.

Central ballast depending on jib coupling height

Jib coupling height	Number of tower section	Ballast*	Construction	Jib coupling height	Number of tower section	Ballast*	Construction
58.70 m	1 + 11	95.0 t	18 x 5.0 t 2 x 2.5 t	31,70 m	1 + 5	40.0 t	8 x 5.0 t
54.20 m	1 + 10	95.0 t	18 x 5.0 t 2 x 2.5 t	27.20 m	1 + 4	40.0 t	8 x 5.0 t
49.20 m	1 + 9	70.0 t	14 x 5.0 t	22.70 m	1 + 3	30.0 t	6 x 5.0 t
45.20 m	1 + 8	70.0 t	14 x 5.0 t	18.20 m	1 + 2	30.0 t	6 x 5.0 t
40.70 m	1 + 7	50.0 t	10 x 5.0 t	13.70 m	1 + 1	30.0 t	6 x 5.0 t
36.20 m	1 + 6	50.0 t	10 x 5.0 t	9.20 m	1	30.0 t	6 x 5.0 t

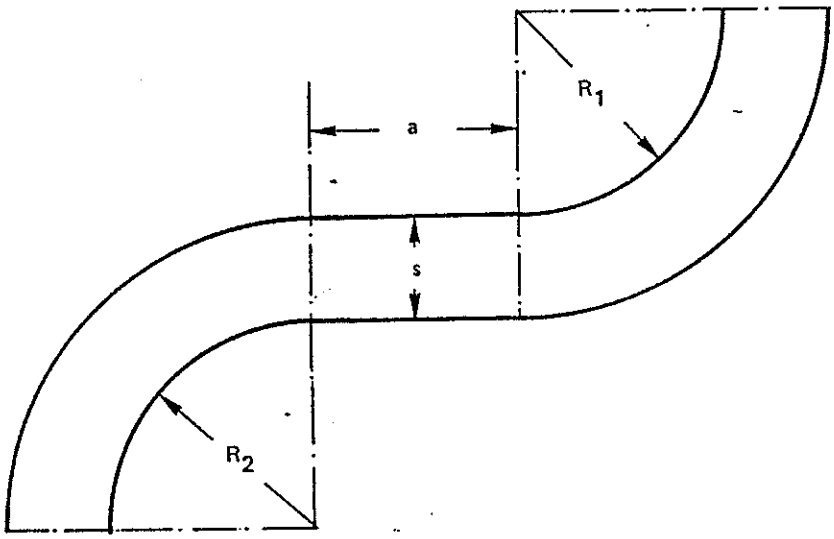
For the erecting of crane var. E the undercarriage must be ballasted with a least 30 t central ballast.

*The specific weight Of 2.3 t/m^3 for concrete Bn 250, shaken must be adhered to the admissible weight tolerances are ± 3% for the counter-weight ballast and 10% for the central ballast.

Please note:

By use of the jib L 5 (60.15m) is the maximum jib coupling height 54.20 m by var. E; 47.10 m by var. A1; 53.30m by var. A2 ahd 54.00m by var. A 3.

Crane track



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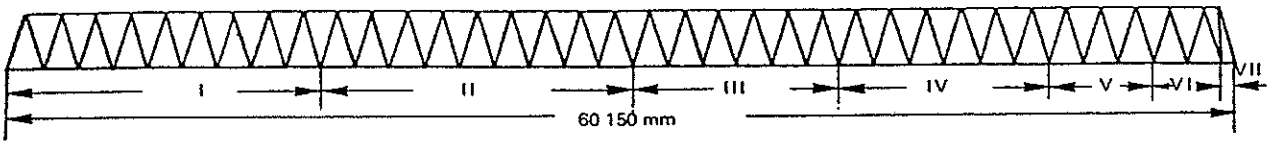
Track gauge (S)	6.0 m
Curve radius "R_1" (travel drive outer)	9.0 m
Curve radius "R_2" (travel drive inner)	12.0 m
Distance "a"	7.5 m
Recommended crane rails	S 64, UIC 60, A 75
Rail head width required	75 mm

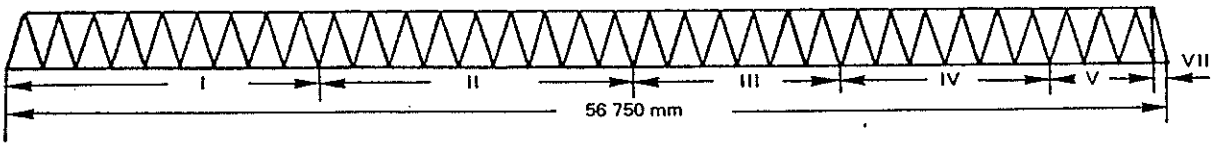
With a reduced rail head width you will only have a shorter service life of the travel wheels and the rails.

Jib division

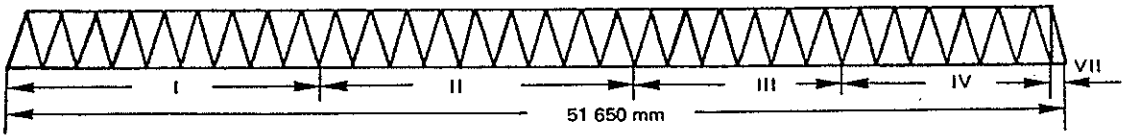
Jib L 5



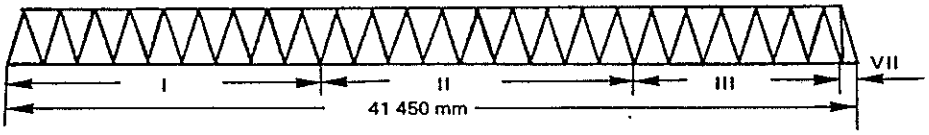
Jib L 4



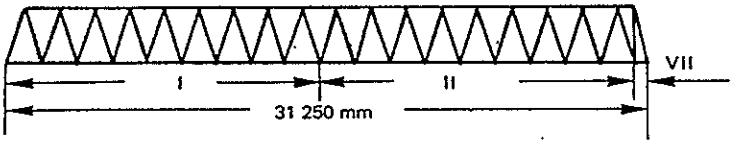
Jib L 3



Jib L 2



Jib L 1



I	=	15 300 mm
II	=	15 300 mm
III	=	10 200 mm
IV	=	10 200 mm
V		5 100 mm
VI	=	3 400 mm
VII	=	650 mm

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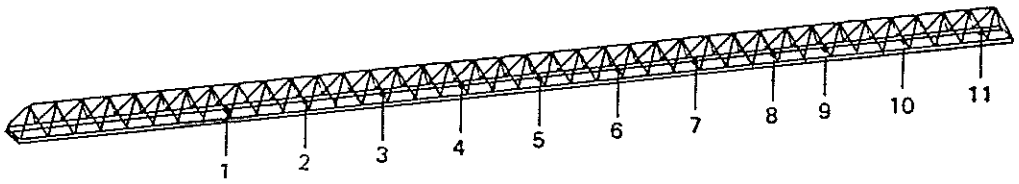
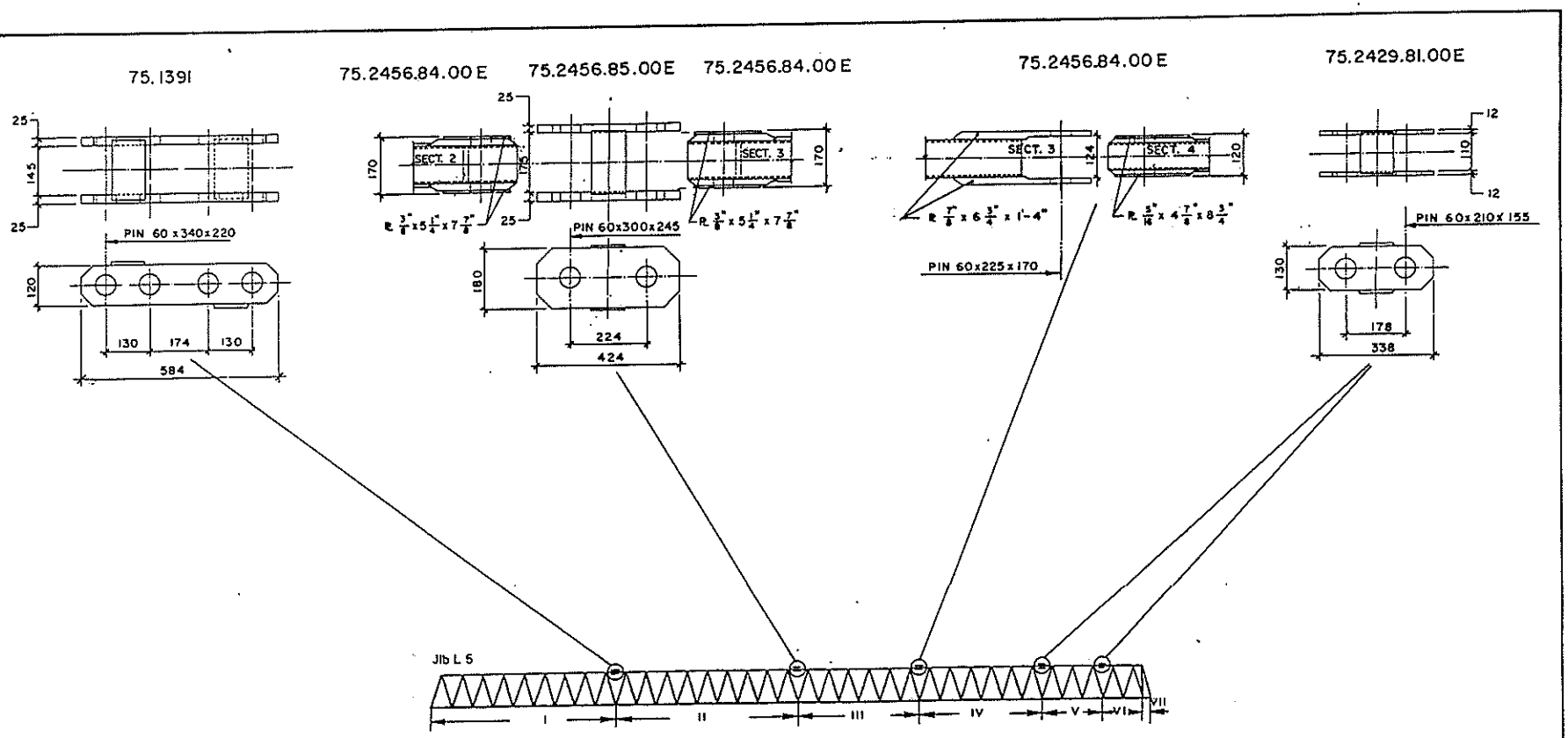
Fixing of capacity plates



Position of capacity plates	Fixing strut for capacity plate (counted from coupling point)	Radius in m (the radius can be read off from the capacity plate)
1	16	15
2	22	20
3	28	25
4	34	30
5	40	35
6	46	40
7	52	45
8	58	50
9	62	55
10	68	60
11	74	65



GENERAL NOTES

1. This drawing is provided by AMERICAN PECCO CORPORATION as a service without liability on its part and is to be approved by your engineers. American Pecco Corporation should be notified of any deviation from this drawing.
2. Contractor to check and verify all dimensions at job before proceeding with work.
3. Written dimensions on these drawings shall have precedence over scaled dimensions.
4. Contractor is accountable for reshoring.

REVISIONS

PECCO

AMERICAN PECCO CORPORATION

SCHUMAN ROAD • MILLWOOD, NEW YORK 10546 • TELEPHONE (914) 762-8550

SK 180

LOCATION & TYPE FISH PLATES ON JIB

PROJECT:	DRAWN BY: R.A.	DATE:	10 - 27 - 87
LOCATION:	CHECKED BY: G.L.	DWG. NO.	102787 - 3
CONTRACTOR:	SCALE:		

7/00

10.01

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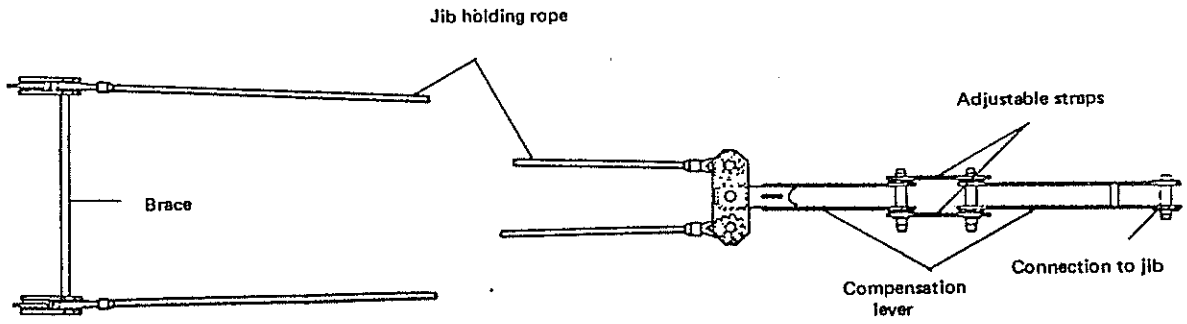
Anchoring the jib



Rope list

Hoist rope

Rope 18 mm Ø Panzer-Multiplex bk 1770 s (left-handed) or Rope 18 mm Ø Gelis bk 1770 s (left handed)					
Jib length	L 1	L 2	L 3	L 4	L 5
Rope length in m: 2-fall rope	61.0	71.0	81.0	86.0	90.0
4-fall rope	66.0	76.0	86.0	91.0	95.0

In the case of 2-fall hoist rope reeving twice the hook path and in the case of 4-fall hoist rope reeving four times the hook path must be added to the hoist rope lengths given.

Trolley rope

Rope 10 mm Ø Panzer-Multiplex S bk 1770 z (right-handed) or Rope 10 mm Ø DIN 3066 SE bk 1770 sZ (right-handed)					
Jib length	L 1	L 2	L 3	L 4	L 5
Rope length in m: upper rope	61.0	81.0	101.0	112.0	120.0
lower rope	39.0	49.0	59.0	65.0	70.0

The longer rope runs over the rope pulley in the jib head.

Jib bracing rope

Rope 38 mm Ø Seal–Multiplex Szn 1770 z (right-handed)					
Jib length	L 1	L 2	L 3	L 4	L 5
Jib length in m*	2 x 22.70	2 x 22.70	2 x 22.70	2 x 22.70	2 x 22.70

Counter jib bracing rope

Rope 32 mm Ø Seal – Multiplex S zn 1770 z (right-handed)					
Jib length	L 1	L 2	L 3	L 4	L 5
Rope length in m *	2 x 12.30	2 x 12.30	2 x 12.30	2 x 12.30	2 x 12.30

*The lengths are measured from centre of rope eye to centre of rope eye. The ropes are pre-stressed by 10,0t (± 20 mm) and are provided with 2 rope eyes B 32 DIN 6899 and press clamps. Optionally galvanized (zn) or blank (bk) and bitumen covered ropes may be used.

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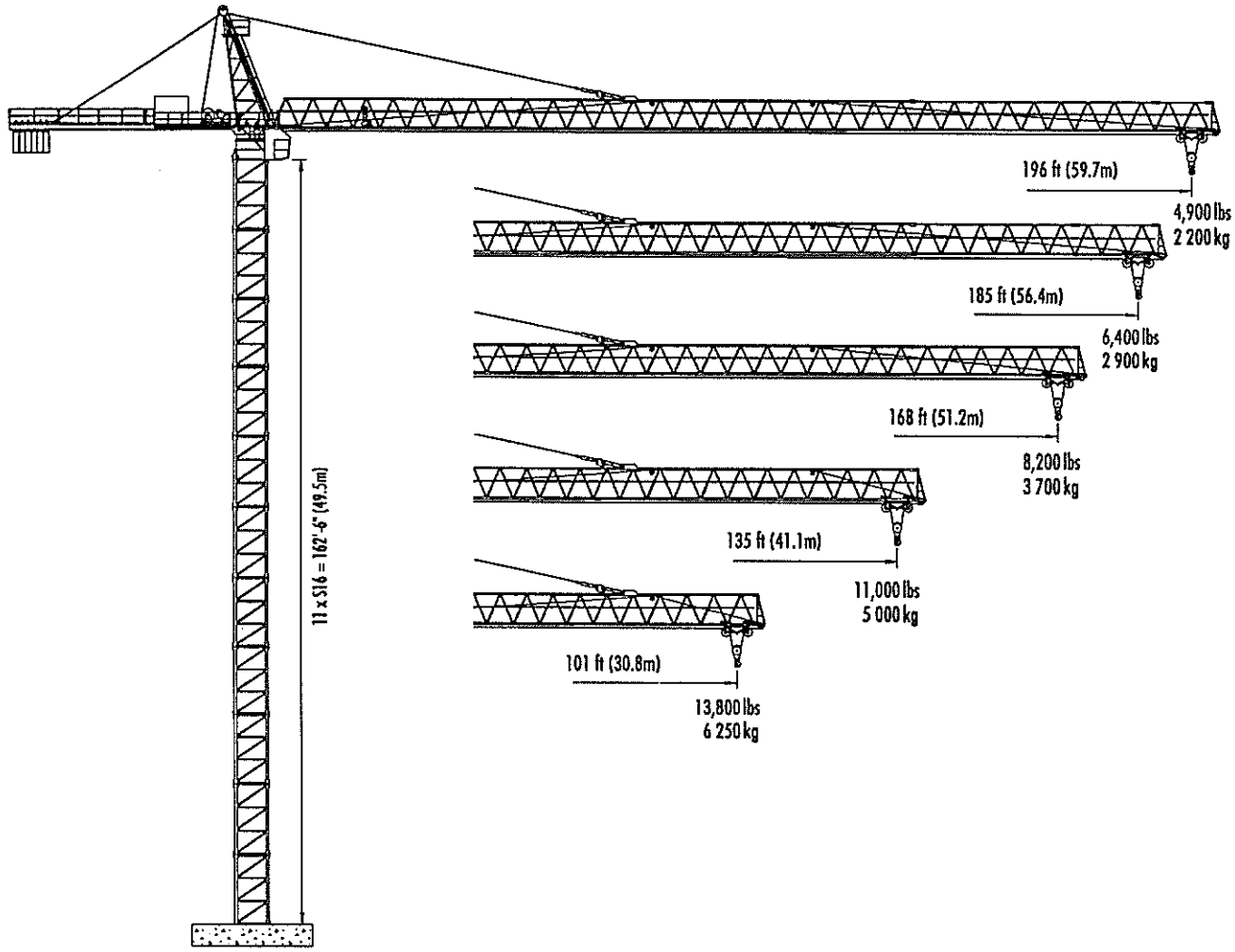
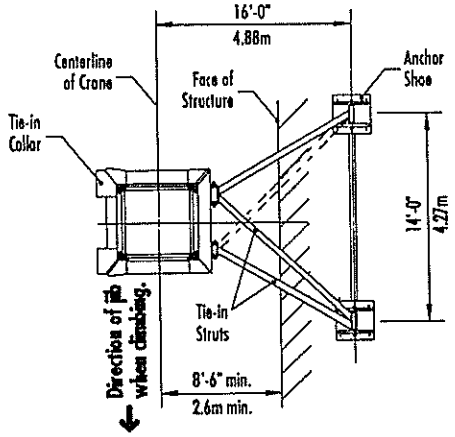


STATIONARY
FREESTANDING

NOTE! If hook height exceeds 330 ft (100m), the number of tower sections above the uppermost tie-in location MUST be reduced by 1 tower section.

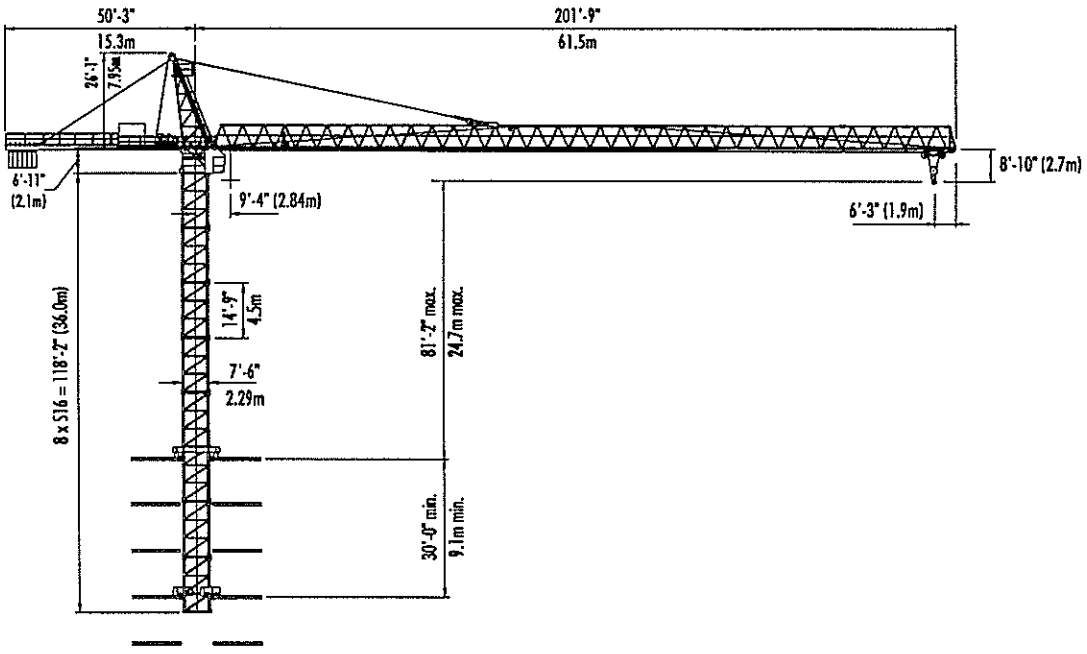
* Lower the top climbing unit to the uppermost tie-in prior to operating crane at maximum hook height.

Consult Morrow Equipment for specific information regarding dimensions, tie-in locations, reaction forces and slab openings.

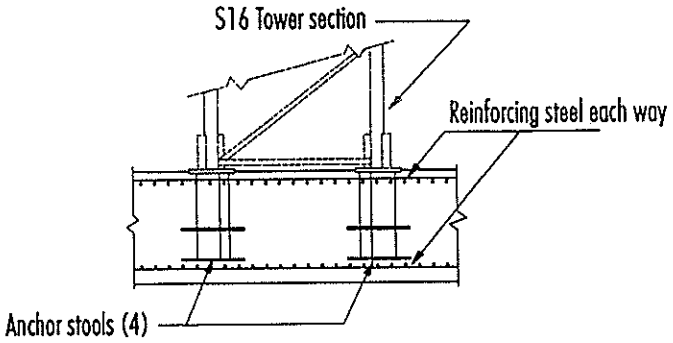


TIE-IN ASSEMBLY
(Plan View)

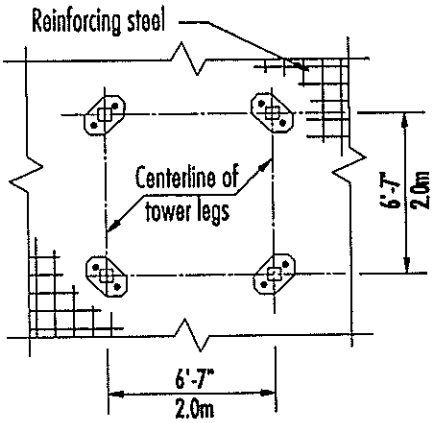
TOP CLIMBING
with S16 Tower Sections
(Tied to Structure)



BOTTOM CLIMBING
with S16 Tower Sections
(Inside Structure)



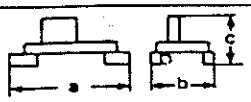
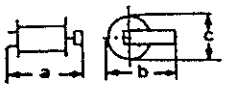
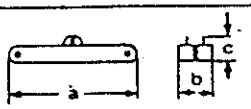
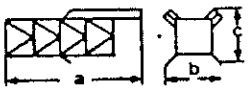
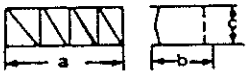
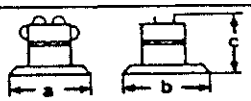
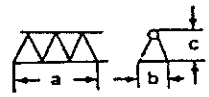
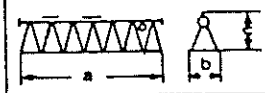
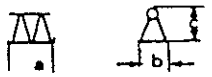
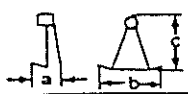
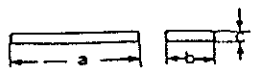
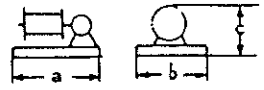
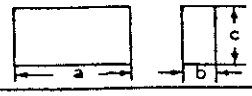
Elevation



Plan View

FOUNDATION DETAILS
with S16 Tower Sections
(Concrete Slab)

Shipping list

Nr.	Description	Supplied in variant	Sketch	Dimension mm a	b	c	Weight pro piece (kg)	Remarks
01	Undercarriage without cable drum	E		9350	2600	2170	9570	with switch cabinet and crane travel units
02	Cable drum	E		1350	1430	800	280	Without cable
03	Struts	E, A2		3760	170	300	590	2 pieces bound together
04	Tower section with 2 struts	E, A2		6940	2600	2600	4330	Including ascent and cable store
05	Normal tower section including ascent	A1, A2, B, E, D		4540	2300	2300	2120	
06	Sleeve frame with telescoping device complete	A1, A2 E, D		7150	2950	5150		Hydraulic plant, incl. platforms, traverse
07	Live ring support, live ring, turntable frame	A1, A2, B E, D		3000	2590	2860	6975	Including slewing units, platforms, ascent, complete
08	Cab platform	A1, A2, B E, D		–	–	–	615	May be inserted in other parts
09	Jib section I	A1, A2, B E, D		15530	1890	2340	2190	Including trolley unit L1, L2,L3,L4,L5
10	Jib section II	A1, A2, B E, D		15600	1690	2240	2190	present in L1,L2,L3,L4,L5
11	Jib section V	A1, A2, B E, D		5380	1680	2135	360	present in L4, L5
12	Jib section III Jib section IV	A1, A2, B E, D		10500 10500	1690 1680	2025 2015	1150 770	present in L2,L3,L4,L5
13	Jib section VI	A1, A2, B E, D		3700	1680	2015	250	present in L5
14	Jib head	A1, A2, B E, D		850	1850	2260	166	present in L1,L2,L3,L4,L5
15	Counter jib	A1, A2, B E, D		14110	1780	1100	3112	including walk-way
16	Frame with hoist winch and drum	A1, A2, B E, D		2530	1540	1070	2323	78 Kw hoist unit
17	switch cabinet	A1, A2, B E, D		2250	625	1800	760 700	for WB for WL

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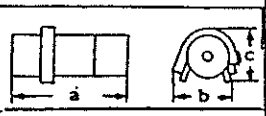
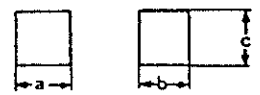
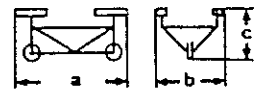
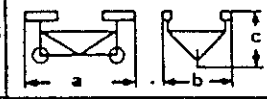
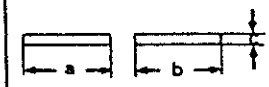
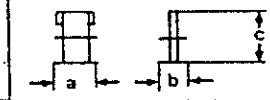
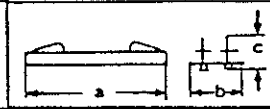
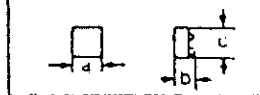
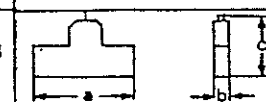
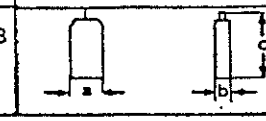
No	Description	Supplied in variant	Sketch	Dimension mm a	b	c	Weight pro piece kg	Remarks
18	transformer	A1, A2, B		2019	862	756	1580	with WL 86 kW
		E, D		1545	700	575	1100	with WL 59 kW
				875	655	663	580	with WL 37 kW
				1608	450	520	597	with WB 64 kW
				1340	450	510	425	with WB 36 kW
19	Erection trestle for ballast	A1, A2, B E, D		2560	810	1300	190	
20	Tower head	A1, A2, B E, D		8330	2000	2650	1568	Including ascent and platform insert bracing
21	Tie rods for jib	A1, A2, B E, D		–	–	–	832	May be inserted in other parts
22	Driver's cab	A1, A2, B E, D		1860	1200	2100	350	Packed in wooden box
23	Trolley 12,5 t	A1, A2, B E, D		2240	1960	990	500	
24	Hook block	A1, A2, B E, D		270	530	1370	350	
25	Rope accessories	A1, A2, B E, D		1720	1020	820	1000	Packed in wooden box
26	Trolley 6,3 t	A1, A2, B E, D		2000	1910	950	310	
27	Hook block 6,3 t	A1, A2,B E, D		320	650	1110	240	
28	Foundation plate	A1, B, D		2490	2490	140	340	
29	Foundation anchoring	A1, B, D		510	310	740	120	4 pieces provided
30	Foundation cross	A2		4340	440	620	900 2 Stück	4 pieces present, tied in pairs
31	Central ballast	E		1900	500	1650	2500	max. 2 pieces
32	Central ballast	E		4000	500	2050	5000	max. 18 pieces
33	Ballast block, counter weight jib	A1, A2,B		2450	350	2120	3500	max. 4 pieces
34	Ballast block counter weight jib	A1, A2,B D, E		1380	350	1420	1500	max. 2 pieces

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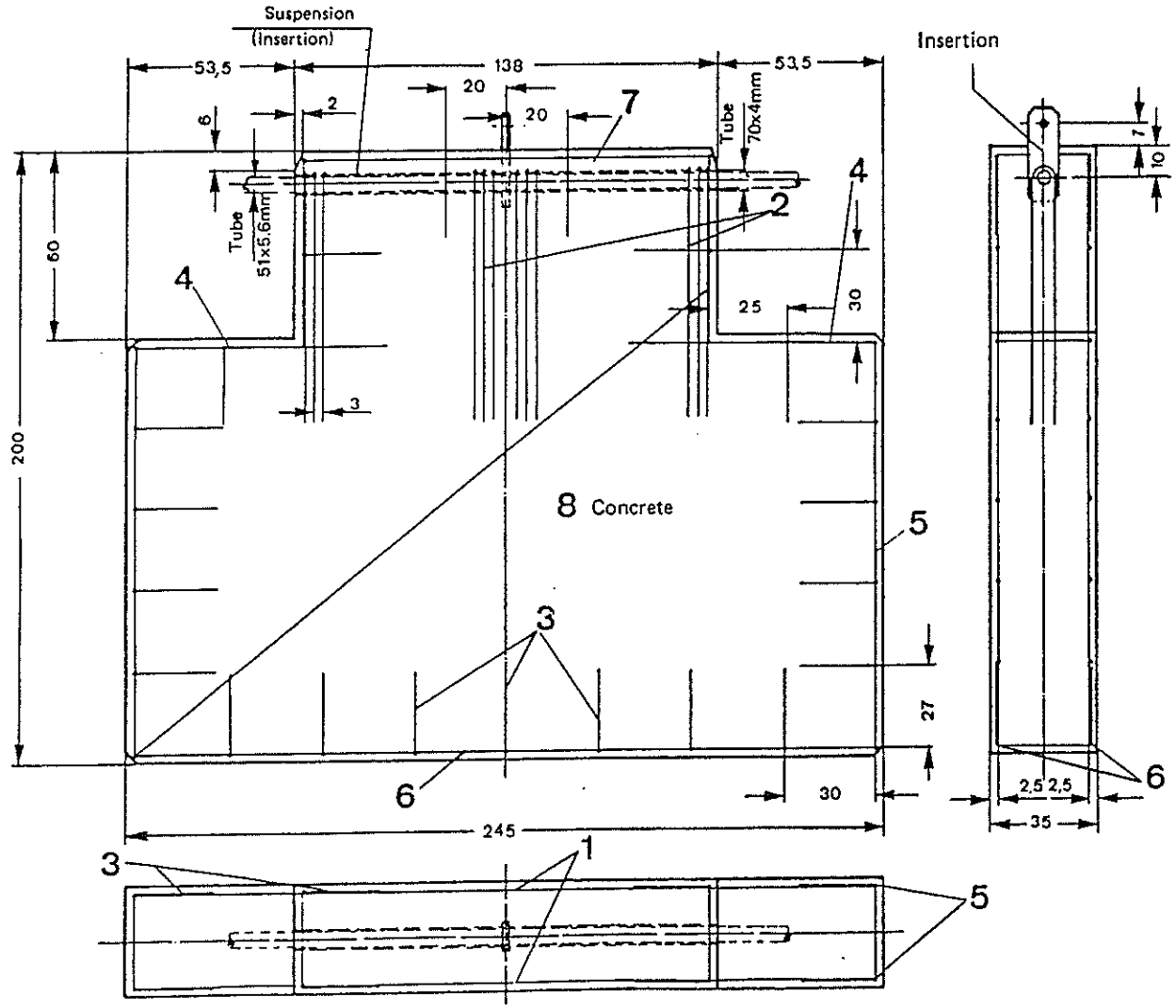
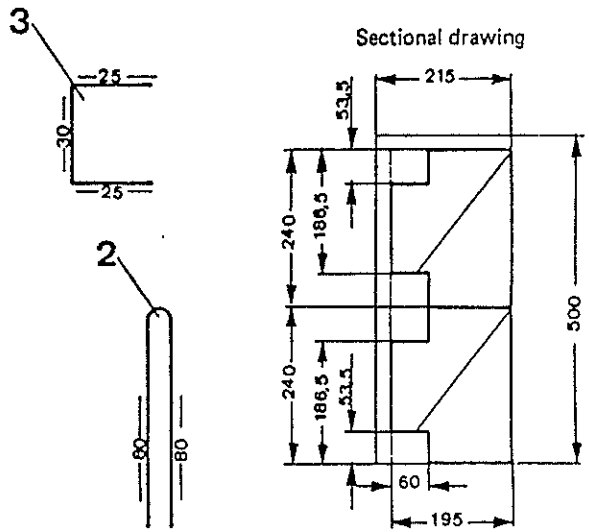
1.5 METRIC TONS = 3,300 LBS.

3.5 METRIC TONS = 7,720 LBS.

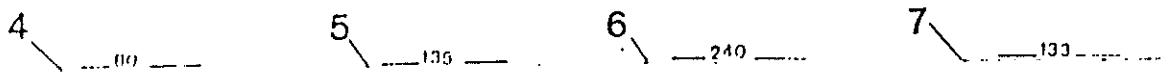
Ballast block (3,5 t) for counter weight ballast



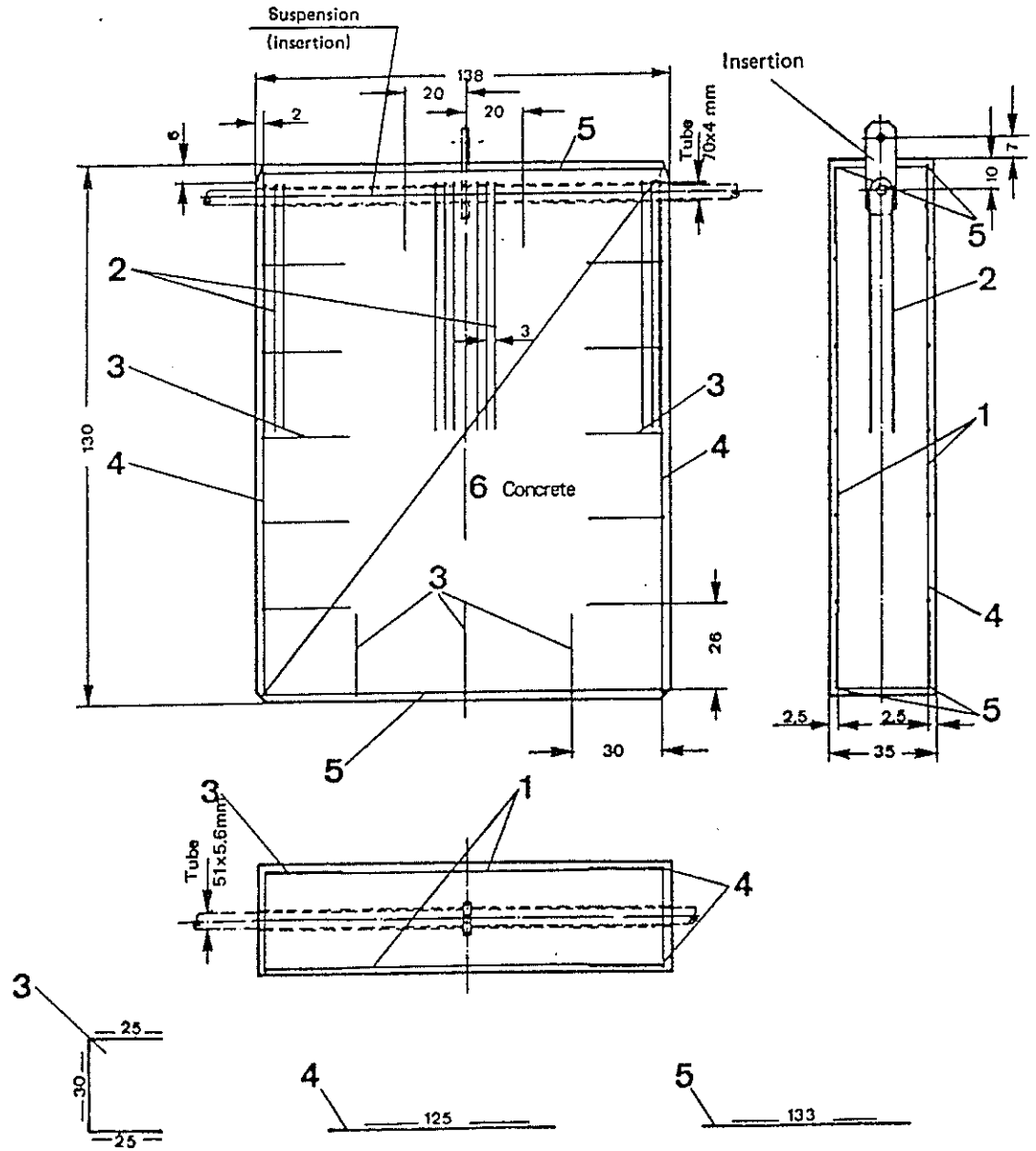


Part	Pieces	Description
1	2	Woven steel fabric Q 377
2	12	Corrugated steel Ø10 Steel III L = 180
3	27	Corrugated steel Ø 6 Steel III L = 80
4	4	ME Ø6 Steel III L = 80
5	4	ME Ø6 Steel III L = 135
6	2	ME Ø6 Steel III L = 240
7	2	ME Ø6 Steel III L = 133
8	1	Concrete Bn 250 DIN 1045, shaken

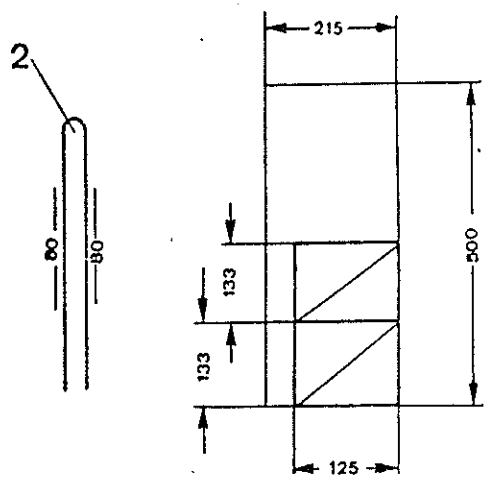
All dimensions in cm



Ballast block (1.5 t) for counter weight ballast



Sectional drawing



Part	Pieces	Description
1	2	Woven steel fabric Q 377
2	12	Corrugated steel Ø 10 Steel III L = 180
3	15	Corrugated steel Ø 6 Steel III L = 80
4	4	ME Ø6 Steel III L = 135
5	4	ME Ø6 Steel III L = 133
6	1	Concrete Bn 250 DIN 1045, shaken

All dimensions in cm

1.5 METRIC TONS = 3,300 LBS.

3.5 METRIC TONS = 7,720 LBS.

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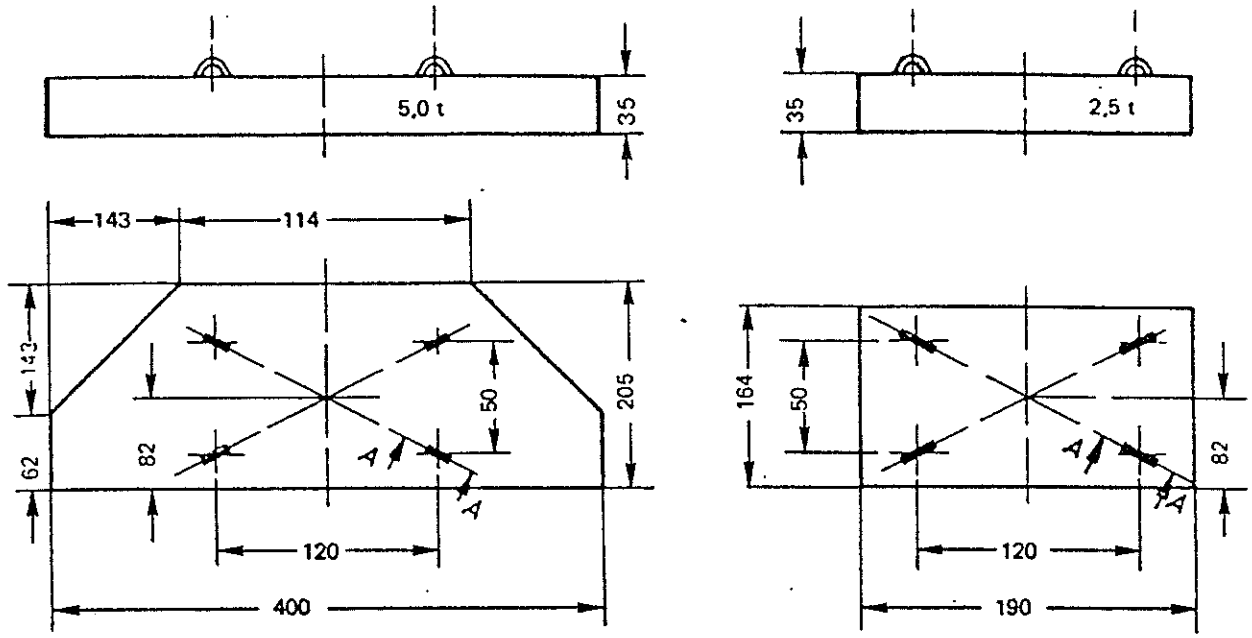
Ballast block for central ballast (variant E)



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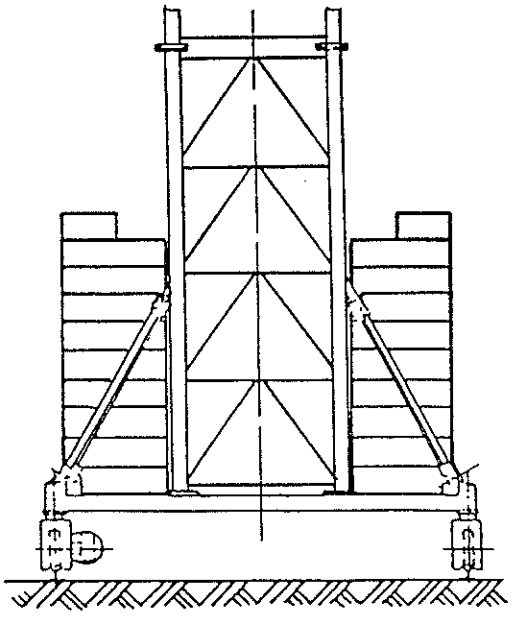
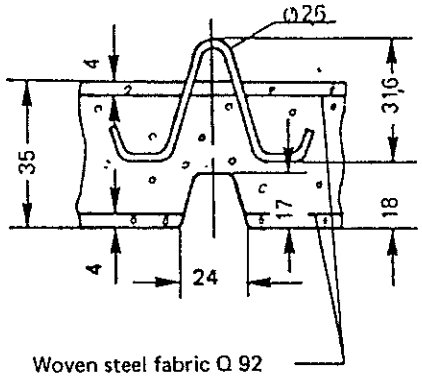
Arrangement of central ballast



Section A – A



Woven steel fabric Q 92

Concrete quality Bn 250/DIN 1045

Specific weight = 2,3 t/m^3

Weight tolerance + 10 %

The elements must be weighed after production

For number of ballast blocks see chapter "Ballasting".

All dimensions in cm

Steel construction

Undercarriage (variant E)

The undercarriage comprises the travel bogies, the undercarriage frame, the slewing arms and the lowest tower section with struts.
The 4 slewing arms have been bolted to the undercarriage frame and are laterally supported by the slewing arm supports. The two slewing arms provided with drives are bolted up even when travelling round curves. The non-driven slewing arms, however, can completely freely adjust themselves when travelling round curves. The centralballast may be placed on the part of the undercarriage frame that on both sides.
For transport purposes, the slewing arm supports are removed and the slewing arms are folded adjacent to the projecting frame bearers. The lower tower section contains two rigid and two articulated struts. The latter are positioned on the non-driven side.

Central ballast

The central ballast comprises steel-reinforced concrete blocks positioned on both sides of the undercarriage and secured against sliding by eyes engaging in recesses.

Foundation fastening (variant A1, B and D)

The lowest normal tower sections are linked to the foundation anchoring and the pressure plate in the foundation by means of two tie rods.

Foundation fastening (variant A2)

The tower section 1 with struts is linked to the foundation blocks via a foundation cross by 4 anchoring bolts per corner.

Tower

The tower sections are designed in welded lattice construction.
The K-lattice side serves for carrying out the telescoping process. At full height the tower comprises for variant A1 11 normal tower sections, but for variant A2 the height is increased by tower section 1 having struts.
The corner struts and the bracing of the K-lattice side consist of two angle profiles welded to form box profiles, while the remaining bracing consists of tubes. The tower sections are linked by two tie rods per corner.

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Telescoping frame without support bearer (variant B)

The tower is supported in two places by telescoping frames which lie on the ceiling of the respective storey of the building, and transfers via these frames moments, horizontal and vertical forces.
The telescoping frames consist of two U-shaped parts which are linked by two distance pieces. The corners of the ceiling recesses contain guides provided with bracing wedges in order to arrest the tower while in operation. The telescoping frames also serve for suspending the crane and telescoping rod supports.

Telescoping frame with support bearer (variant B)

The tower is supported in two positions by telescoping frames which are connected to the building via support bearers.
The telescoping frames consist of two U-shaped parts which are bolted up with support bearers.
By means of the frames, the moments, horizontal and vertical forces are transferred to the support bearers.

Turntable

The turntable is designed in welded bearer construction and takes up the entire upper crane consisting of tower head, jib and counter weight jib. The slewing units are arranged laterally on the turntable frame. The turntable has a welded-on flanged ring for connection with the ball bearing slewing ring. The turntable is linked to the tower by way of the ball bearing slewing ring "Rothe Erde" and the ball bearing slewing ring support.

Jib

The jib is designed in welded lattice construction and has a triangular cross-section.
The two tower straps and the upper strap are made of hollow profiles, the lower straps serving at the same time as running rails for the trolley; the struts consist of C-profiles and tubes. The individual jib sections are linked by bolt and screw connections at the dividing positions. All jib sections are provided with a walkway and a handrail.

The jib consists of a maximum of 6 sections and the jib head

a) Jib section I: coupling section (length 15.3 m) containing the coupling bearing, one deflexion pulley each for the trolley rope and the hoist rope between the coupling points, and a terminal limit for the trolley. The coupling section also accomodates the trolley unit, i.e. drive, motor, brake and rope drum.
b) Jib section II: length 15.3 m, the upper strap contains the fixed point for the bracing.
c) Jib section III: length 10.2 m
d) Jib section IV: length 10.2 m; the upper strap contains a rope pulley for the trolley rope.
e) Jib section V: length 5.1 m
f) Jib section VI: length 3.4 m
g) Jib head: length approx. 0.65 m; contains one fixed point for the hoist rope and a deflexion pulley for the trolley rope, also the terminal limit for the trolley.

Trolley

Construction up to 6.3 t capacity (for 2-fall hoist rope reeving)
The trolley is made in welded frame construction. It is suspended from 8 rollers on ball bearings born on side levers and running on the upper side of the two lower straps of the jib.
Since these rollers have no flanges, the trolley is equipped with tracker rolls.
The two hoist rope pulleys and the tensioning drum with the fixed points for the trolleys ropes are built into the main bearer of the trolley frame. The ropes can then be tensioned by means of the drum. Moreover, the drum is so constructed that it can serve as trolley blocking device. Should a trolley rope break, this blocking device prevents an independent movement of the trolley (see chapter "Safety devices").

Construction up to 12.5 t capacity (2- and 4-fall rope reeving)
In principle, this construction is the same as the former, but the carrying unit is accordingly reinforced. The main bearer of the trolley frame, however, contains 4 hoist rope pulleys. A locking device os provided for supporting the upper hook block during 2-rope operation.

Lower hook block

Construction up to 6.3 t capacity (2-fall rope reeving)
The lower hook block comprises two metal plates joined by bolts. Between the metal plates is the rope pulley required for the deflexion of the hoist rope and an articulated traverse containing the load hook provided with a safety flap (see chapter "Safety devices"). To reduce the sag of the rope, the hook block is equipped with additional weight which are welded onto the lateral metal plates.

Construction up to 12.5 t capacity (2-fall or 4-fall rope reeving)
The hook block consists of an upper and a lower block, each having a rope pulley for the deflexion of the hoist rope. Each rope pulley is supported between two metal plates. During 4-fall rope reeving, a hinged traverse with the load hook provided with a safety flap (see chapter "Safety devices") is linked via fishplates and bolts with the upper and lower pulleys. In the case of 2-fall reeving, the upper block is hold by a locking device fixed to the trolley frame and the fishplate connection to the load hook is bolted up with the lower block (for rope reeving, see chapter "Erection").

Bracing jib

The jib is held in its horizontal position by two bracings which are linked to the tower head on the one hand and to the fixed point on the jib on the other hand.
The connection to the tower head is effected by two rope connection held at a parallel by a stay.
The ropes are connected to the fixed point of the jib via a balancing lever and an adjusting fishplates.

Tower head

The tower head is designed in welded lattice construction. The straps consists of hollow profiles and the side bracing of tubes. The hoist rope pulley, designed as travelling pulley, is fixed to the tower head.
Moreover, the tower head contains fishplates for the bracing of jib and counter weight jib.
The moment overload limit is positioned at the lower part of the tower head.
In the upper region of the tower head, a working platform for the maintenance of overload limit and rope pulleys is housed. The connection to the turntable is effected by bolt connections.

Counter weight jib

The counter weight jib consists of two profile bearers connected by lattice work, the bearers being linked fastened to the turntable by bolts. The entire hoist unit and the control panel are arranged in the vicinity of the tower. The ballast blocks and fishplates for the bracing are at the rear end.
A walkway is provided for maintenance purposes.
For fastening the ballast, an erection trestle is erected on the counterjib.

Bracing — Counter jib

The counter jib is retained in its horizontal position by two bracings. The bracings consists of ropes (see "Rope list") and connection straps.

Counter weight ballast

The counter weight ballast consists of steel-reinforced concrete blocks (see drawing "Ballast block" in the part "General".) The blocks are hooked into the counter jib by means of a hanging device and are locked by the ballast securing device.

Machine equipment

Hoist unit

The hoist unit is positioned on the counter jib. The rope drum is supported on both sides in spherical roller bearings.
A controllable spur gear running in an oil bath is fixed to the extended drum axle. It may be a 4-gear or a 2-gear drive. All drives can be remote-controlled, i.e. from the control desk or from the control stand. The drive is supported on the hoist winch frame by a moment support which at the same time serves as constant load limit and as load limit for the individual gear speeds. See chapter "Safety devices". The motor is flanged to the drive. The spring-loaded double shoe brake is fastened directly to the drive.

Trolley unit

The trolley drive is positioned in jib section 1. The rope drum is supported on both sides in spherical roller bearings. A 2-gear worm drive running in an oil bath is fixed to the extended drum axle; it is supported by a prop. The gear speed is changed manually. An attached lamellar brake, which is released when the drive unit is switched on, serves as brake. The trolley rope is wound onto the drum in such a manner that one side is wound off and the other side wound on. Fine travel speed differences are achieved by different excitation of a built-on eddy current brake.

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Slewing unit

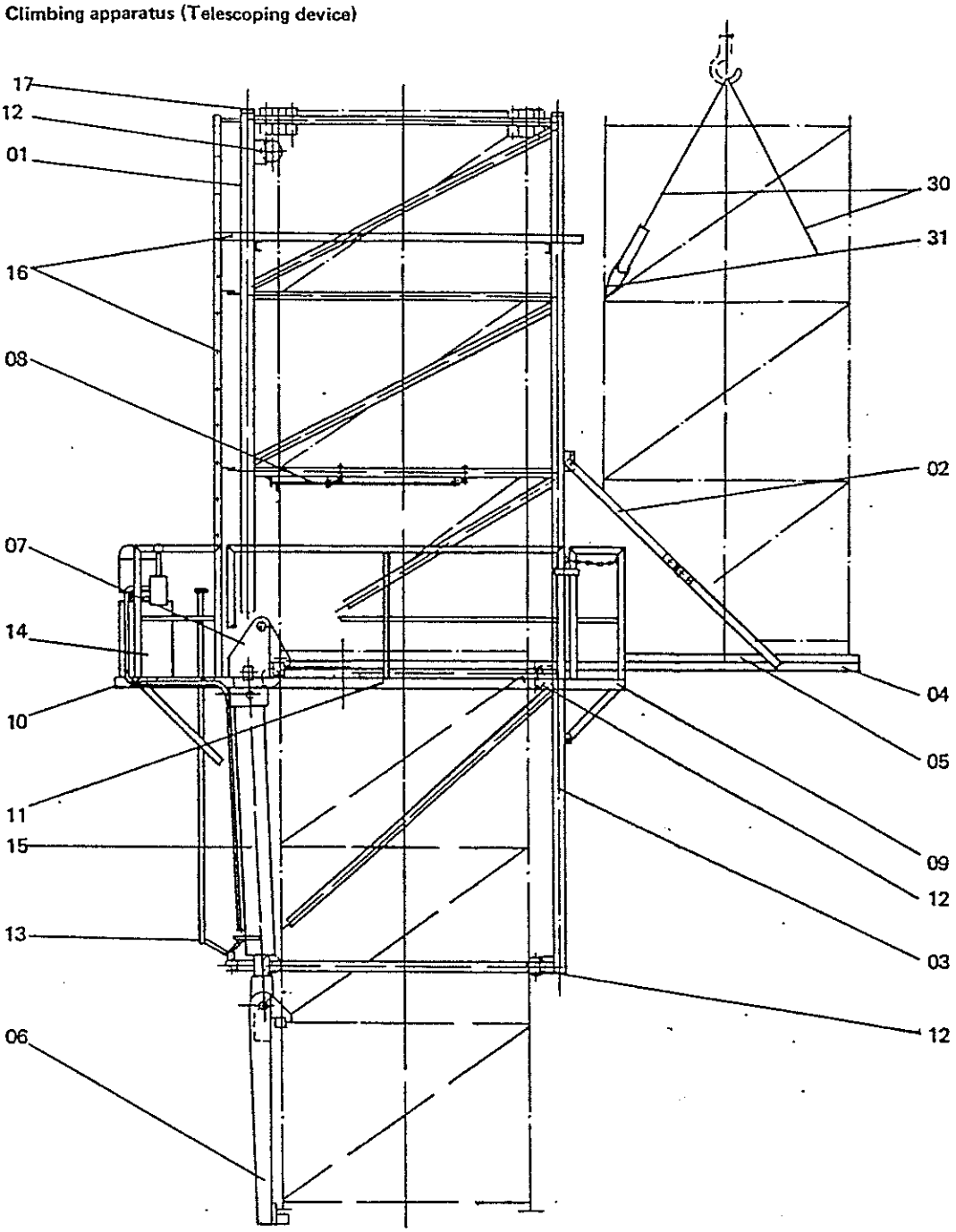
The slewing unit is constructed as toothed planetary gear and supported on the turntable frame. The pinion gear at the lower end of the lantern wheel axis engages in the ball bearing slewing ring having teeth on the outside.
The slewing motor is flanged to the slewing drive. A disc brake which is released when the drive unit is switched on serves as brake.

Crane travel unit

In the PEINER crane, half of all running wheels are, on principle, driven wheels. The two running wheels in two travel bogies are driven by two motors. The driven pinion wheels of the worm gears engage in the wheel rims of both running wheels. The travel motors are slipring motors with built-on brake.

Telescoping device (sleeve)

The telescoping device consists of a U-shaped sleeve frame (01) and a guide wall (03) which is bolted into the lower part of the frame. Two guide rollers (12) are located at the lower part of the frame and two guide rollers at the height of the platform. Above the guide wall, the guide path (04) and the erection carriage (05) are fixed.
Moreover, the working platforms (09, 10, 11) are fixed there. The rear side of the sleeve drame contains the hydraulics plant (14) including setting-down bolt (07), hoist cylinder (14) and telescoping traverse (06), Two ladders lead to an erection platform (15) on the left or, respectively, right side of the frame. A double folding support (08) is fixed to each of two cross bolts on the left and on the right side, approximately in the centre of the sleeve frame. The upper end of the frame contains bores for the bolting up of sleeve and ball bearing slewing ring support by means of tie rods (16).
The erection carriage moves in the guide path which consists of two parts. One part is fastened within the sleeve. The second part is hinged to the first and is located outside the sleeve. Here, the section are transferred or, respectively, set down. This hinged part is held in the centre by two two-part flat irons (02) and bolts. By means of the connection fish-plates of these flat irons, the guide path for the erection of the tower section may be lowered or raised, so that the sections can be easily moved. The end of the guide path contains a stop which presents derailing during dismantling. During telescoping, the erection must be interlocked with the guide path by means of a pin. When the telescoping has been completed, the outer guide path including the erection carriage is folded upwards against the sleeve frame and locked.



01 Sleeve frame
02 Two-part flat iron
03 Guide wall
04 Guide path for erection carriage
05 Erection carriage
06 Telescoping traverse
07 Setting - down bolt
08 Folding support
09 Platform, front
10 Platform, rear
11 Platform, right
12 Guide rollers
13 Telescoping traverse control
14 Hydraulics plant
15 Erection platform with ladder
16 Tie rod
30 Shoulder rope
31 Rope sling

Climbing hydraulics

The hydraulic aggregate is a compact aggregate consisting of oil tank and a power unit.
The power unit consists of an electromotor having an inside gear with elastic coupling and intermediate cage flanged on.
The maximum operating pressure of the equipment has been set to 250 bar at the pressure limiting valve.

The switch for the motor is installed at the hydraulic aggregate. The plug-type connection is at the rear side of the cutoff switch located under the slip ring transmitter. Lock key "bridging" enables the trolley to be driven against the buffers and the hoist unit beyond the top hook position. The lock key is accommodated in the control stand.

Putting the hydraulic installation into operation

Prior to the installation being put into operation the direction of rotation of the pump and the motor must be checked. The direction of rotation is indicated by an arrow on the electric motor. During putting into operation of the installation consideration must also be given to a good ventilation of the system. Possible leaking points at screw fittings should be eliminated by tightening up action.
This must not take place when the installation is under pressure.
It is recommended that during the putting into operation phase, the installation should be run through a few times as a jogging operation.

Hydraulic system

The inside gear pump (7) driven by the electromotor (5) aspires the oil out of the tank (1) delivering it to the connection "P" at the hand control valve (8).
In 0—position all working connections at the hand control valve are locked, while the oil is flowing pressureless through the deloaded pressure limiting valve which in 0—position serves as a by-pass valve, returning via filter (4) into the oil tank (1).
The control valve consists of a hand-operated 4/3-way control valve with volume regulation and pressure limiting valve including by-pass valve. Shifting the valve (8) to position I or II, respectively, the internal control connection "X" is closed, thus building up in the P-line the pressure of 250 bar set at the pressure valve. The pressure is indicated at the piston gauge (11).

7209 0310

Extending piston (climbing)

When actuating the hand control valve in position I, that is hand lever in direction "a", the pressure oil flows from "P" valve to "A" valve and further via the locking brake valve (11) into the piston chamber of the cylinder.
The piston extends, pressing the oil out of the cylinder ring chamber via connections "B" of the control valve through the filter (5) into the tank.

Retracting piston (declimbing)

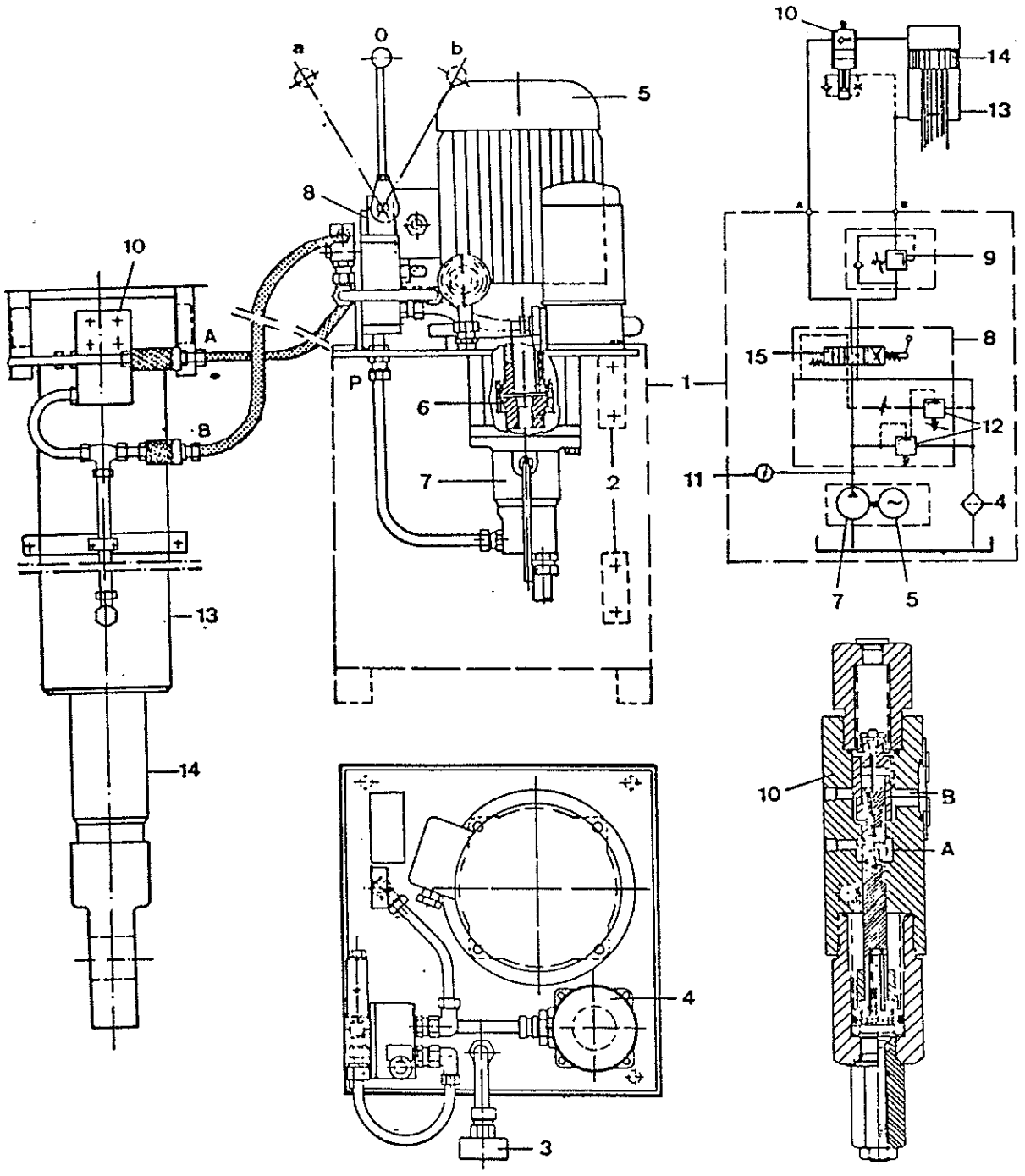
If the control valve is shifted in position II, that is, the hand lever toward "b", the pressure oil of the pump flows from connection "B" of control valve to the ring chamber of the cylinder.
A control line from the B-line to the connection "X" is installed at the locking brake valve (10).
If the pressure in the cylinder ring chamber raises to approx. 30 bar, the locking brake valve starts opening giving way to the oil via control valve and filter into the tank.

Emergency lowering of the crane

The locking brake valve (10) has an emergency hand operating device enabling the crane to be let down during the climbing process to the next support during a power breakdown or a fault in a component of the hydraulics.

For this, the bolt at the locking brake valve is loosened with a hexagon pin spanner, 6 mm across flats.
Turn threaded pin (2) inwards with hex. pin spanner SW 6. As the threaded pin is turned in further, the rate of lowering increases.
Now the oil can flow through a small passage from the piston compartment of the cylinder to the connection "A" of the brake valve bypassing the nonreturn valve of the brake valve and reaching the hand control valve.
At the control valve all connections are locked, when it is in zero position.
If the handlever is shifted now in direction "b" (switch position II), the oil can flow out of the piston chamber via return filter into the tank.
The crane starts lowering.
At the same time the ring chamber of the cylinder is supplied with oil out of the oil tank via the post-suction valve integreted in the hand control valve.

Important!
After lowering, turn the threaded pin (2) again completely "out" and lock with hex. nut (1).



7209 0310

1 Oil tank
2 Oil level indicator
3 Breather filter
4 Return filter
5 Motor
6 Coupling
7 Pump
8 Hand control valve
9 Pressure gauge
10 Locking brake valve
11 Pressure gauge
12 Pressure valve
13 Cylinder
14 Piston
15 Valve
a = Extending piston
b = Retracting piston

Supply connection:

All PEINER cranes are switched for connection to a three-phase 380V, 50Hz supply when they leave the factory.

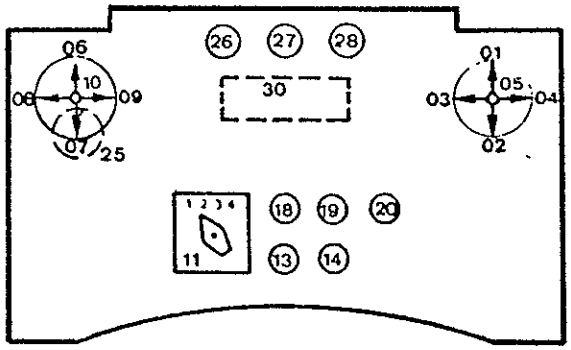
Current supply

Current is supplied on principle via a four-core rubber conduit, which is passed in the crane tower free from tension to the isolating switch. In the case of var. E, a cable drum is housed in the undercarriage, on which drum the conduit is wound on and off during crane travel. The required cross-section for the rubber conduit can be found in the table "Technical data". Care must be taken, to use the fourth core of the cable only as a protective conductor. The lowest ring of the slipring converter is reserved for the connection of the protective conductor.
If crane travel round narrow bends occurs, a cable drum with winding device makes it possible to wind the cable

Operator's stand

The control of the crane be carried out from the control stand in the driver's cab or via a portable control desk from outside. The slewing brake is electrically released.
Each two drive units are actuated via a control lever by master switches built into the control desk. The right-hand control lever has a dead-man switch acting over the entire crane, which becomes effective when a drive unit is actuated.
In the HOLLAND - construction each control lever of the control desk or control stand has a dead man circuit acting independently of one another on the crane switches.
When a control lever is actuated, it must be pushed down in order to release the associated crane movements, The control desk is connected to the switch cabinet via a multi-core cable.
The isolator switch which must be operated manually, is positioned below the slipring converter. A main contactor, which may be switched on and off at the control desk, is positioned in the switch cabinet.
The warning klaxon may be actuated by push-button from the control desk.
Normally the switch cabinet contains a transformer with separate windings for lighting. The driver's cab contains separate connections for lighting and heating.

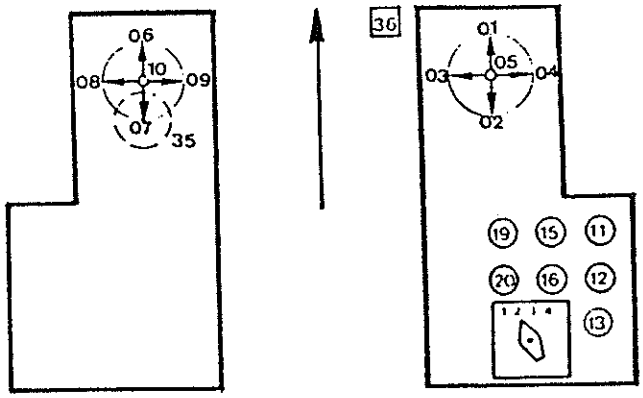
Control desk



No.	Inscription	Control	
01 02		Master switch hoist unit	Lower Lift
03 04		Master switch crane travel unit	Crane forward Crane back
05		Push-button for dead man-circuit	
06 07		Master switch for trolley unit	Trolley forward Trolley back
08 09		Master switch for slewing unit	Left Right
10		Push-button for dead man - circuit	
11	Gear I-II / gear 1-2-3-4	Selector switch for gear change	
13	Klaxon	Push-button for klaxon	
14	SB	Push-button for brake operation	
18	stop	Push-button for main contactor off	
19	Ward-Leonard	Push-button for Ward-Leonard on	
20	Main contactor	Key-button for main contactor on	
25	SB	Eddy current brake slewing unit	
26	Telescoping	Signal lamp yellow for telescoping	
27	Ward-Leonard	Signal lamp green for Ward-Leonard on	
28	Main Contactor	Signal lamp red for main contactor on	
30		Socket for connection line to control panel	

No. 19 and 27 only by the hoist unit with Ward-Leonard No. 10 only by special equipment

Control stand



No.	Inscription	Control	
01 02		Master switch hoist unit	Lower Lift
03 04		Master switch crane travel unit	Crane forward Crane backward
05		Push-button for dead man circuit	
06 07		Master switch trolley unit	Trolley forward Trolley backward
08 09		Master switch slewing unit	Left Right
10		Push-button for dead man circuit	
11	Stop	Punch button for main contactor off	
12	Klaxon	Push button for klaxon	
13	Telescoping	Signal lamp yellow for telescoping	
15	Main contactor	Signal lamp red for main contactor on	
16	WL	Signal lamp green for Ward-Leonard on	
17	Gear I—II/Gear 1—2—3—4	Selector switch for hoist gear change	
19	Main contactor on	Key button for main contactor on	
20	WL	Push-button for Ward-Leonard on	
35		Socket	
36		Foot pedal for slewing brake	

No. 16 and 20 only by the hoist unit with Ward-Leonard
No. 10only by special equipment

7209 0601

Electrical control

Hoist unit (Three-phase drive with eddy current brake)

The hoist unit is driven by a three-phase slipring motor with built-on eddy current brake and is controlled via contactors in lowering brake circuit with 5—0—4 stages.
The coupling of the slipring motor with the eddy current brake achieves a fine gradation during lifting and lowering.

The hoist circuit is constructed as follows.
Lifting:
The stator of the lifting motor is connected to the three-phase supply in the lifting sense.
Stage 1:
A partial resistance is switched into the rotor circuit. At the same time, the eddy current brake is fully excited; the leads to a slow lifting speed, even if the hook is empty.
Stage 2:
The excitation of the eddy current brake is reduced; this increases the hoisting speed.
Stage 3:
The excitation of the eddy current brake is switched off.
Stage 4 and 5:
Step-wise switching-off the rotor resistances leads to increase up to the nominal speed.
Lowering:
The stator of the hoist motor is connected to the three-phase supply in the sense of lowering.
Stage 1:
The entire resistance is switched into the rotor circuit. The eddy current brake is fully excited, so as to produce a strong braking moment. A low lowering speed results.
At this stage, the excitation of the eddy current brake is supervised by a current relay.

Stage 2:
A partial resistance in the rotor circuit is switched off. The eddy current brake is excited at this stage also; this leads to a higher lowering speed.
Stage 3:
The motor runs without resistances in the rotor circuit and the eddy current brake is switched off. The lowering speed is slightly higher than the nominal speed.
Stage 4:
The eddy current brake is switched off a partial resistance is switched into the rotor circuit of the motor, so that in the case of greater loads the lowering speed considerable exceeds the nominal speed.

7209 0151/0476

Trolley unit

The trolley unit is driven by a three-phase slipring motor with built-on eddy current brake. The motor is controlled via contactors in three-phase current travel circuit with 4-0-4 switching stages. The switching stages 1 and 2 are fine adjustment travel stages. In these stages, the eddy current brake undergoes a varied excitation, which produces varied braking moments and thus varied fine travel speeds. Stage 4 is controlled by a time relay against excessively fast switching-through.
The limitation of the end positions is carried out by means of an auxiliary current drive cam end switch. The pre-end switch has been reached, in relation to the load, the moment overload limit switches via zero release the trolley unit in the direction jib head off.
Travel in the opposite direction is possible.

Slewing unit

The slewing unit is driven by two three-phase slipring motors with built-on eddy current brake. The motors are switched via contactors in 4-0-4 switching stages. In the first stage, the eddy current brakes are effective. The two last stages are controlled by a time relay against excessively rapid switching-through. The first stage is so designed that it can be used for countering. At the control stand, the strength of braking the slewing gear may be regulated by pushing a foot pedal, and at the control desk by turning a turn-button; the regulation is continuous. During this process, the motors are switched off and braking is effected by the eddy current brakes only. The brakes are released by actuating the control lever for the slewing unit. They can be engaged by pushin in the foot pedal belonging to the control stand completely or by pushing at the control desk the push-button "Engage brake". When the crane is put out of operation, the brakes must be released by hand.

A t t e n t i o n!

When the control lever is switched back, the brakes remain released.

Telescoping hydraulics

The telescoping hydraulics is connected to a socket on the isolator switch beneath the slipring converter. A water-proof motor protection switch with thermal release is mounted on the platform of the telescoping hydraulics near the hydraulic pump for switching on and off.

Electrical gear change (four-step, remotely controlled hoisting unit drive SKKA)

The gears can be changed by means of an auxiliary motor. A limit switch (1a to 4a) is provided for each gear speed. The overload limit associated with each gear limits the maximum load.
The safety circuit ensure that:

1. A gear speed is not possible as long as the hoist unit is switched on.
2. The gear speed is changed only when the brake is closed.
3. No gear speed can be used when its overload limit is actuated.
4. The hoist unit cannot be used if a wrong gear has been engaged.

Crane travel unit

The crane travel units are driven by three-phase slipring motors and controlled via contactors in normal symmetric travel circuit with 4-0-4 switching stages. Stages 3 and 4 are controlled by a time relay against excessively fast switching-through. During this process, the holding brakes remain released. After a period, the motors are switched off and the brakes built onto the motors engage. The crane travel units are switched off at the track ends by a roller lever end switch with dual action. When the limit switch is approached, the brakes engage directly. The crane travel units have their own high voltage fuses.

Safety devices

PEINER rotary tower cranes are equipped with all safety devices which are prescribed on the day of delivery. All safety devices are to prevent that due to an operating fault the crane is damaged, since this may endanger the lives of all people employed at the building site. During normal crane operation, the individual limit switches must not be approached, since the response of the safety devices always consists of an emergency stop. Only at the beginning of the crane operation proper must be functioning of the limit switches be checked by carefully approaching the terminal positions.

7209 0101/0476

Forced zero positioning

The main contactor is locked via the zero contacts of the master switches. The main contactor can only be switched on if all master switches are at "0". This ensures that unintentional switching-on of a drive unit is not possible.

Locking of trolley travel

The trolley travel locking device is positioned in the trolley. Should a trolley rope break, a lever, on which a pretensioned limb spring acts, is twisted. This lever protrudes above the trolley and engages in the lower bracing of the jib. Independant travel of the trolley is thus prevented. The trolley travel locking device also serves for tensioning the trolley ropes.

Trolley limit switch

Trolley travel is limited in the outer and inner position by a cam limit switch with auxiliary current drive. In each case, the travel direction is blocked against the rail end. The switch is actuated by a spur gear from the trolley drum.

Hoist limit switch

The upper and lower terminal position of the hoist unit are limited by a cam limit switch with auxiliary current drive. The drive is effected via a chain from the hoist drum.

Moment overload limit

The moment overload limit is positioned at the lower part of the tower head. The overload limit is actuated by the load acting on the jib and the loading of the chord struts resulting from it. The limit switch is actuated and switch off, when the max. permitted load is reached, the hoist unit in the lifting direction and the trolley unit in the spire direction.

Constant load limit

The spring-loaded moment support of the hoist unit serves also as constant load limit. During lifting, the rope pull pushes, according to its magnitude, the rubber discs together.
When the maximum admissible rope pull has been reached, which depends in each case on the working speeds, i.e. on the various gear speeds, the hoist unit is locked by a load switch box in zero release. Also, if the gear speed is changed under load, the gear change is blocked if the load is greater than that admissible for the respective gear speed.

Crane travel limit switch

A stop rail must be provided at both ends of the track, which actuates the travel limit switch. The limit switch must switch off in such a manner, that the crane at full travel speed comes to a stand-still 0.5 m before the rail end protection.

Safety hook

All load hooks are provided with a safety flap which prevents unhooking of the fastening means when the load is set down. Even where the parts to be lifted are continually changed, the safety flap must not be removed.

7209 0101/0179

Rope straps

All rope pulleys are provided with rope straps which prevent the ropes from jumping out of the rope pulleys. The crane must not be operated if the rope straps are missing.

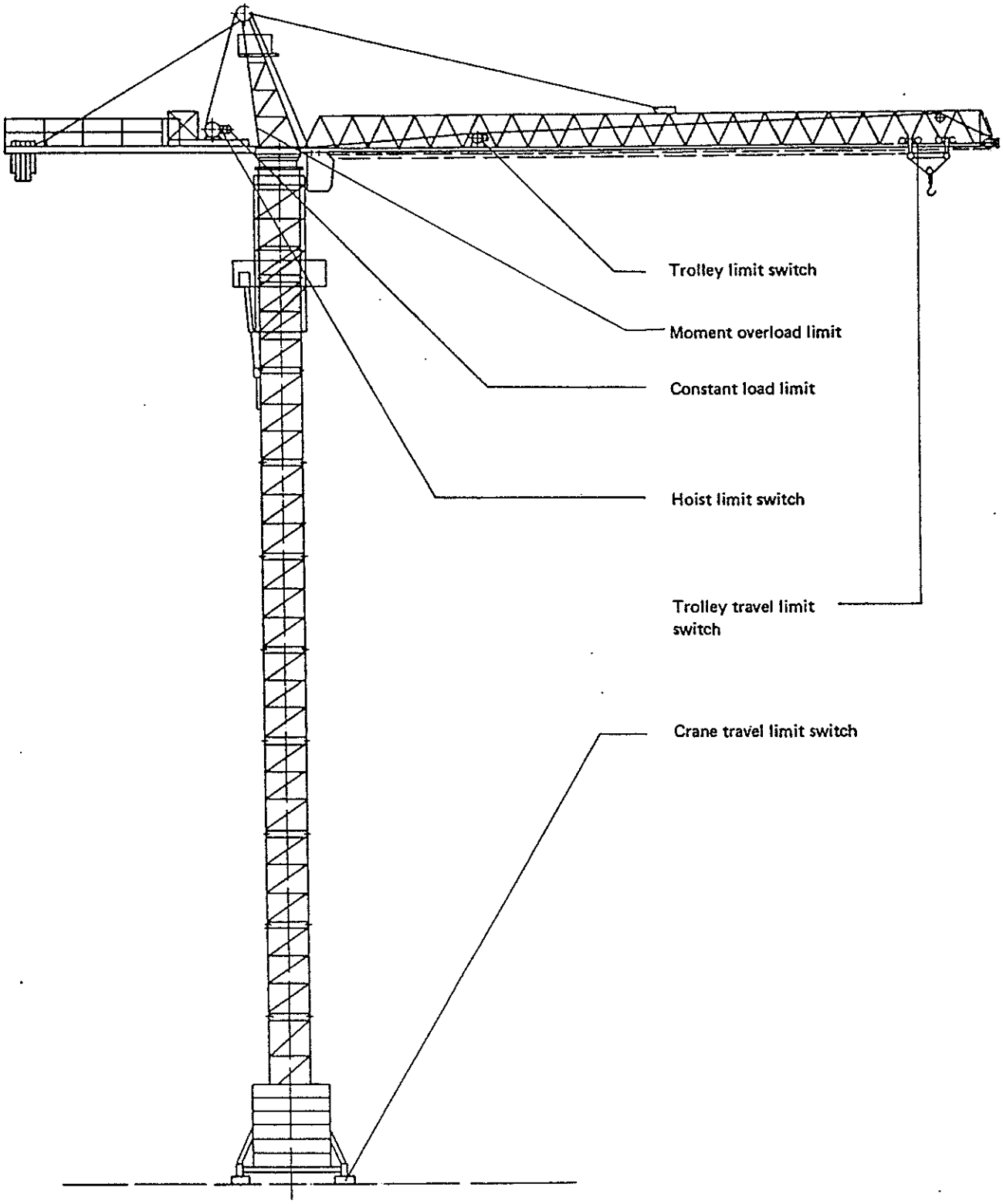
Wind protection

When the crane is out of operation, it must be protected against being moved by the wind. Each travel bogie is equipped with a rail clamp, since the crane travel brake must not be used for wind protection.

Travel bogie tipping safety device

The travel bogie tipping safety device is an additional securing means which reduces the derailing hazard due to rail settlements of faulty track laying.
The tipping safety device prevents the derailing of the travel bogie when the driven bogie lifts off the rails. Furthermore, during transporting, the travel bogie tipping safety device serves to maintain the travel bogies in horizontal position.

Position of safety devices



7209 0501

Preparations for assembling the crane plant

Rails

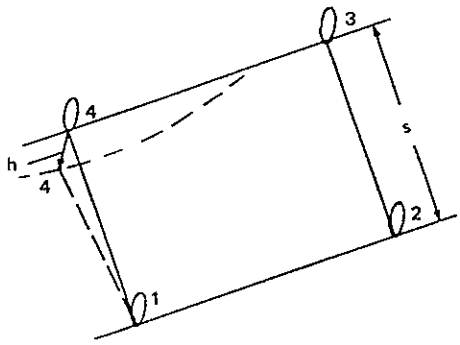
The construction of the track depends on the soil characteristics and the maximum bogie pressures of the crane (see chapter "Technical data"). The track must be laid at a safe distance from the foundation ditch, since soil falls may topple the crane.
The rails must be laid in such a way that those parts of the crane which reach out farthest have a safety distance of at least 0.50 m from solid objects in the vicinity, such as buildings, scaffolding, struts, railings and the outlines of vehicles. This distance must be adhered too also in the case of building materials etc. stored near the rails.
The horizontal position of the track in longitudinal and cross direction is of the highest importance for trouble-free crane operation. The tolerances given below must under all circumstances be adhered to.

Track tolerances

The admissible amount of rail unevenness depends on the geometric dimensions of the undercarriage, expressed by gauge and construction. In the case of a perfectly level rail, the contact points of the four wheels 1,2,3,4 lie in the plane determined by the points 1,2,3. If the rail rises or falls, the point 4 deviates from this plane by +–h. The admissible height deviation of a contact point for a 4-wheel undercarriage from the plane determined by the three remaining points, upwards or downwards, is:

$h = \frac{1}{250}$ s for low-slewing tower crane .

$h = \frac{1}{500}$ s for high-slewing tower crane.



Height difference between the two rails, measured at the same location of the track: max. 1/250 of gauge
Gauge difference, also in curves: max. + 1% of gauge
Max. slope of both rails: max. 0.5 %
(larger slopes may be admissible an request, depending on tower height and jib length, if special instructions are carried out).

7201 0101/0376

Soil pressure

The surface pressure between sleeper and soil must not exceed the values stated in DIN 1054. It amounts for

mud, peat and marshy ground to 0 kp/cm^2
dumped, not artificially stamped ground, depending upon the age of dumping and provided that the grown ground layer has greater stability to 0–1 kp/cm^2
for grown, not binding sufficiently solidly settled ground according to the following table:

Foundation dept under ground level		Sand, fine to middle				Coarse sand to gravel			
		at the smallest foundation width of							
		0.4m	1.0m	5.0m	10.0m	0.4m	1.0m	5.0m	10.0m
Up to	0.5 m	1.5	2.0	2.5	3.0	2.0	3.0	4.0	5.0
	1.0 m	2.0	3.0	4.0	5.0	2.5	3.5	5.0	6.0
	2.0 m	2.5	3.5	5.0	6.0	3.0	4.5	6.0	8.0

Note: Intermediate values may be interpolated in a straight line. In the case of strip substructures of conventonal high buildings, the values given for 1 m foundation depth may be accepted, even when their lower edges lies less than 1 m below the cellar floor, provided the usual cellar transverse walls or a solid cellar floor prevent the substructure from sliding inwards.

For grown, binding soil:

puply	soft	stiff	semi-solid	hard
0 kp/cm^2	0.4 kp/cm^2	1.0 kp/cm^2	2.0 kp/cm^2	4.0 kp/cm^2

Rock, not badly cracked, in sound undecayed state and favourable position (in the case of bad cracking or unfavourable position, the following values must be halved):
in closed layer sequence 15 kp/cm^2 in solid or column form 30 kp/cm^2 .

Rails

Only rails must be used which correspond in height and head width to the values given in the chapter "Technical data". Rails having obliquely worn heads or ridge formation on the rail head are not permitted. For the entire track, rails having the same profile must be used. The rail sections must be carefully joined by fish-plates.

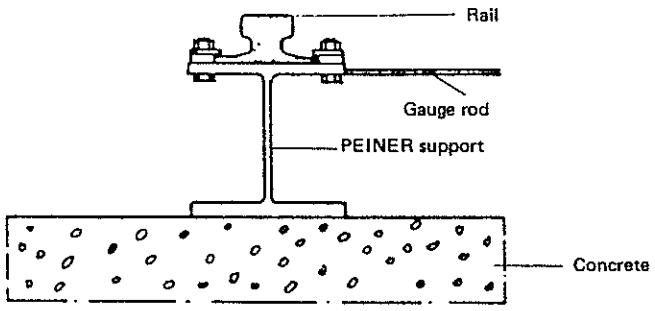
The track must be laid over its entire length having the gauge indicated in the chapter "Technical data". In curves, the track must be laid with uniform (concentric) gauge. The inside radius must not fall below the value given in the chapter "Technical data". The track must not be banked in curves.

Substructure

There is a variety of supports for rails.

Laying rails on steel supports

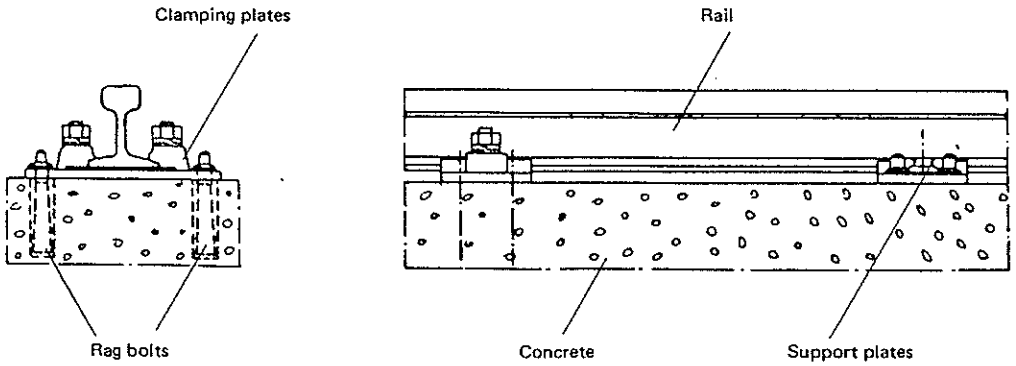
The rails are laid on Peiner-bearers. They are secured against transverse slip by welded-on guides. The are fastened in usual manner by means of clamping plates against lifting off. The rails must be fastened to the bearers staggered, so that they protrude on one side approx. 10 cm and thus lie on the adjacent bearer. By means of distance pieces, the Peiner-bearers are linked to form a rigid frame. This connection of the two parallel bearers is best carried out with overlapping U-profiles, so that different gauges can be set with the same material.
The support for the Peiner-bearers must be chosen according to the ground conditions, the wheel pressure, the size of the bearer. A gravel bed, individual concrete foundations, concrete plates or a strip foundation may be used. In each case, an exact calculation must be made.



7209 0101/037b

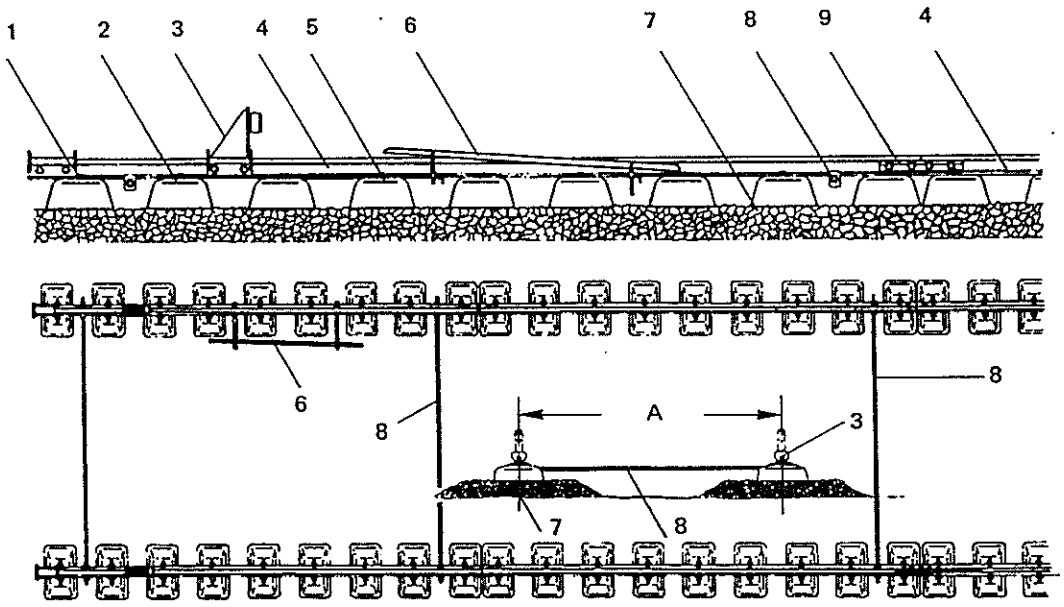
Laying rails on concrete beams

The rails are fastened via clamping plates by means of rag bolts which are inserted in the concrete beams. The rail foot must be padded, so that it has full support. Alternatively, support plates must be used, which are linked with the concrete foundation by way of rag bolts.
To ensure against the slipring of a concrete foundation strip, which may occur specially on a sloping bank, armoured concrete straining beams of steel porfiles must be used.



SRS – Crane rail system

Another, more modern, rail laying System comes from Sweden. It is the so-called "SRS-Crane Track". In this system, the rails are laid on short concrete sleepers, which must be placed at a larger or smaller distance depending on the crane weight. This system only functions well if the foundation has been constructed very carefully. Steel gauge rods are used as distance pieces. Curves can be laid especially easily. Another advantage is the possibility of building points into the track.



7209 0101/0376

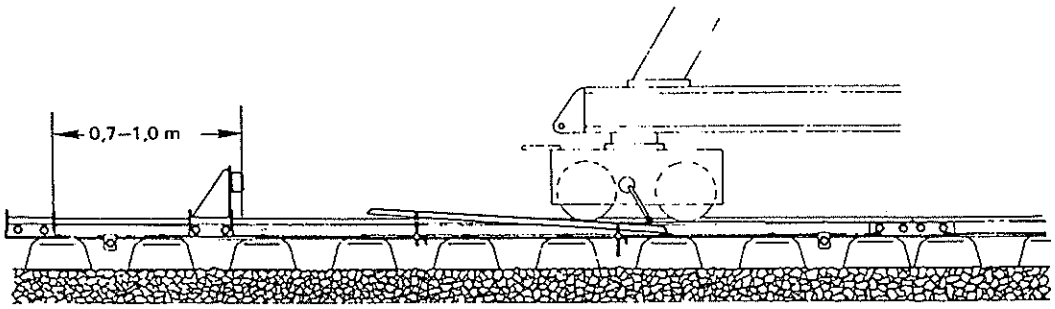
1	Buffer stop	6	Stop rail
2	Concrete sleeper	7	Rail bed
3	Movable part of buffer	8	Gauge rod
4	Rail	9	Fishplates
5	Rail fastening	A	Gauge

Timber sleepers

The rails for this crane must not be laid on timber sleepers.

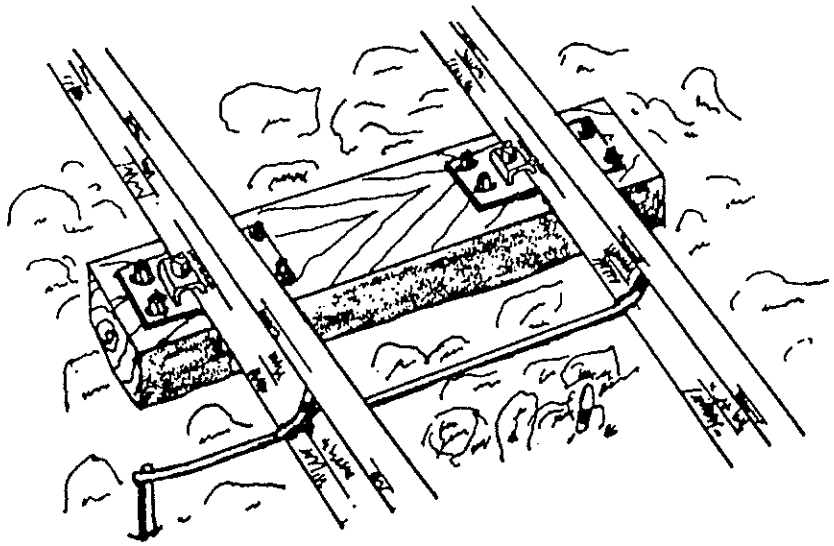
Rail end protection

At both ends of the crane path, rail end protection devices must be fixed at equal height. The rail end protection devices may be rigid stops or buffers. They must be fastened at a sufficiently safe distance from the rail end. At both ends of the crane path, one stop rail each is required. It actuates the crane travel limit switch. See chapter "Safety devices". The stop rail is adjusted after the crane has been erected.



Electrical safety measures

The entire crane plant must be included in the protective measures according to VDE 0100 against excessive contact voltage and must therefore be reliably earthed.
The rails of the track must be provided with an electrically conductive cross-connection. In the case of longer rails, approx. every 50 m. Moreover, the track must be connected to a good earthing means, for example to an existing lightning conductor or to tube conduits in the soil in electrically conductive manner.
It is recommended to use for all connections galvanized steel band of a minimum thickness of 3 mm and a cross-section of at least 100 mm^2. To ensure contact, spring rings or spring washers should be inserted below the connection screws. Contact must not be prevented by protective paint or rust.
If the water supply system is to be used as earth, permission of the water supply company must be obtained in advance.
Since today water supply systems frequently contain non-conductive tube connections, insulating protective coating or tubes made of non-conductive materials, it must be checked in advance whether the earthing resistance of the water supply system fulfills the requirements of the VDE regulations 0190.
If there is no earthing means, earthing may be achieved by laying 20 m galvanized steel band of a minimum thickness of 3 mm and cross-section 100 mm^2, 0,5 – 1 mm deep in the soil. The efficiency of the protective measure must in each case be checked against the VDE regulation 0100.



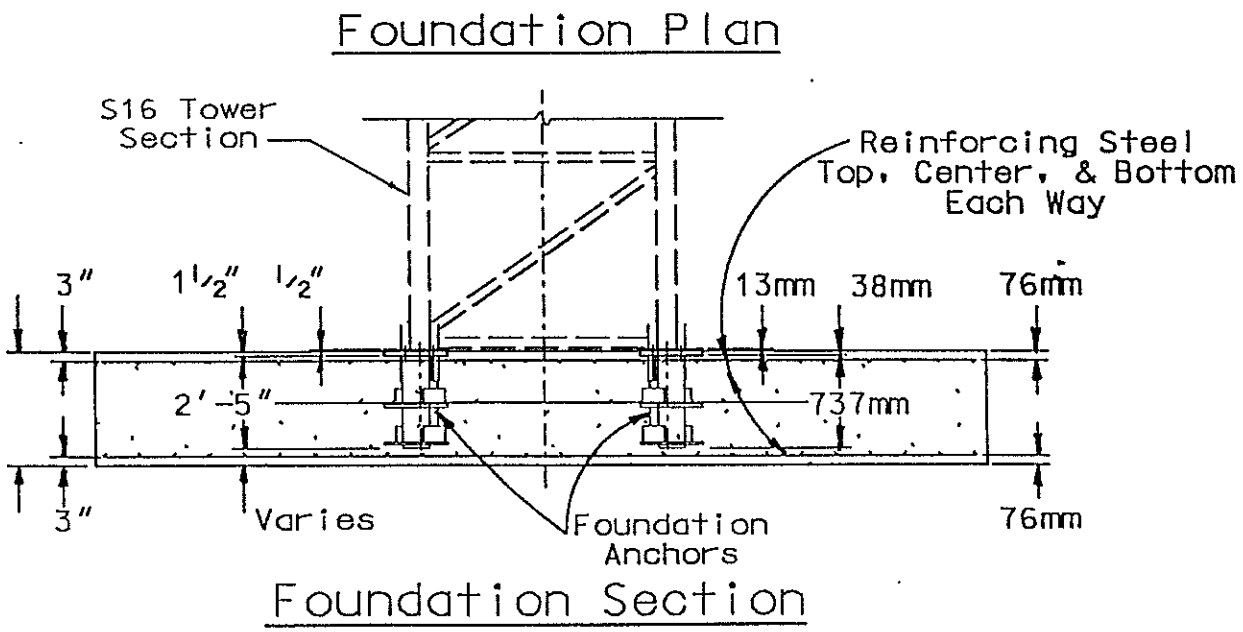
The building company operating the crane is exclusively responsible for accidents caused by incorrectly laid crane tracks.

Electrical connection

The connection must be prepared before arrival of the crane, because current is required for erecting the crane. The crane is connected via a fault current – (FI) – safety switch to a three-phase current grid 380 V, 50 Hz. The cross-section of the supply line must be arranged according to the connection value of the crane. See table "Technical data". We recommend to provide a fault current safety switch for each machine at the building site isolator, so that in the case fo a fault, only the defective machine is eliminated. The fixed point for the movable rubber tube conduit should expediently be arranged in the middle of the crane travel range. The voltage at the feed point must not exceed or fall below 380 V by more than 5 %.

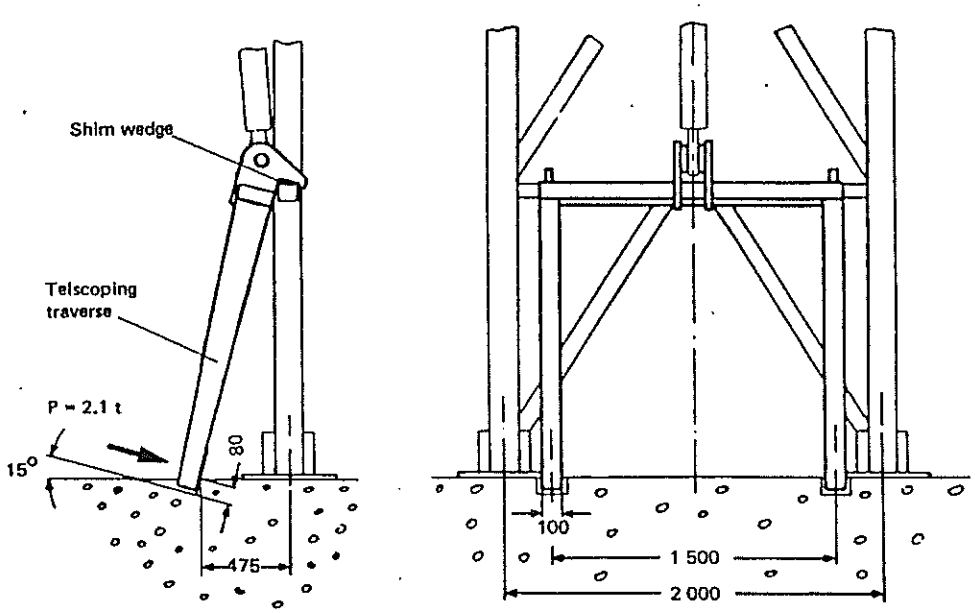
7201 0101/0376

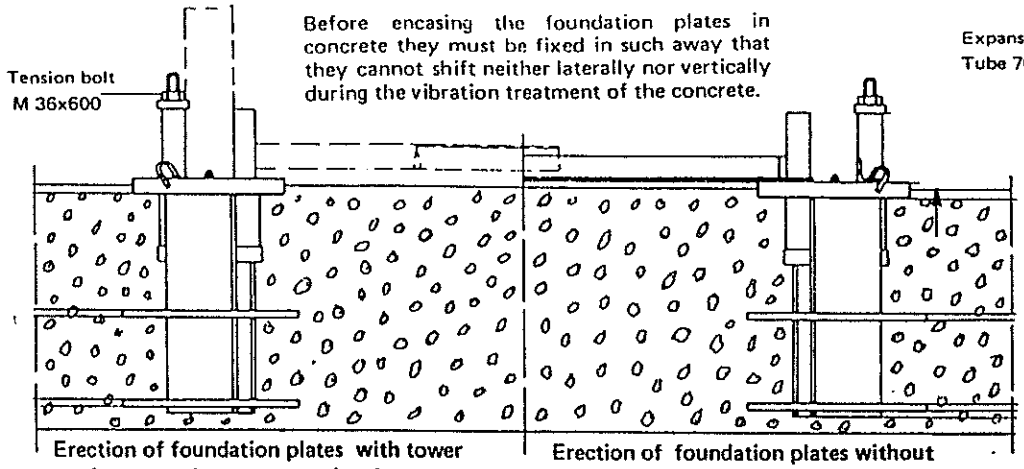
Foundation, variant A 1



7209 0101/1279

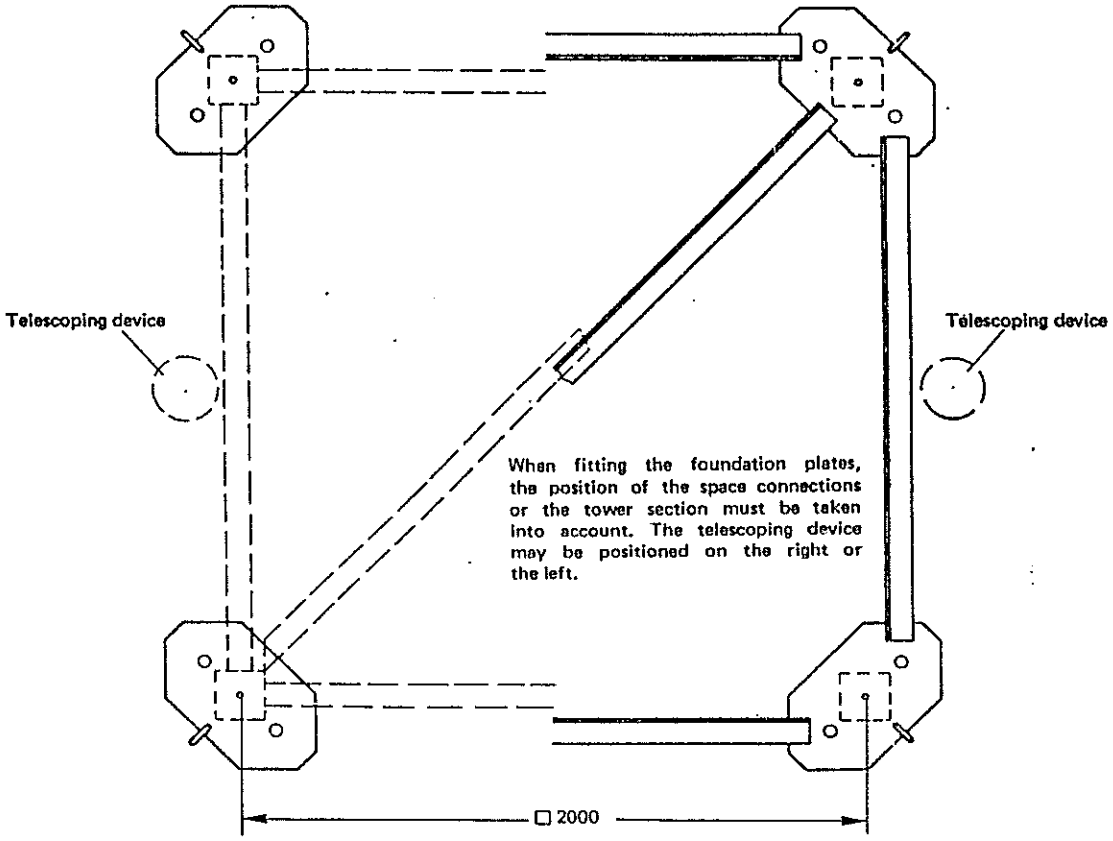
Note: This drawing is for illustration only and is not to be used for actual foundation dimensions. Consult Morrow Equipment for proper foundation details regarding your specific application.





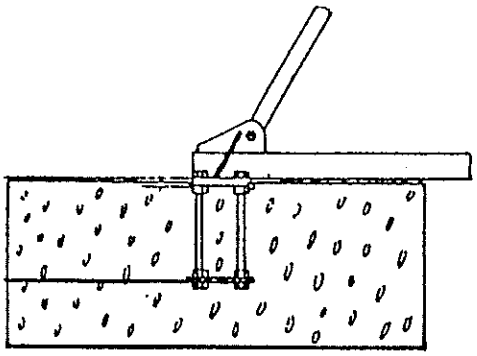
Erection of foundation plates with tower section normal or tower section 1

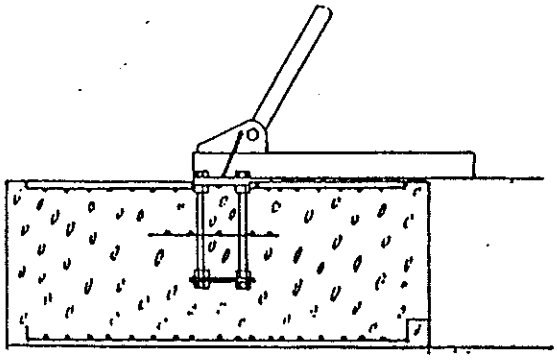
Erection of foundation plates without tower section normal or tower section 1. Connection of foundation plates by means of angle pieces.

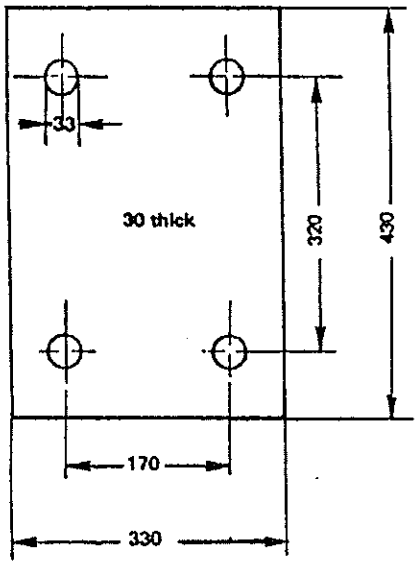


7209 0101/1278

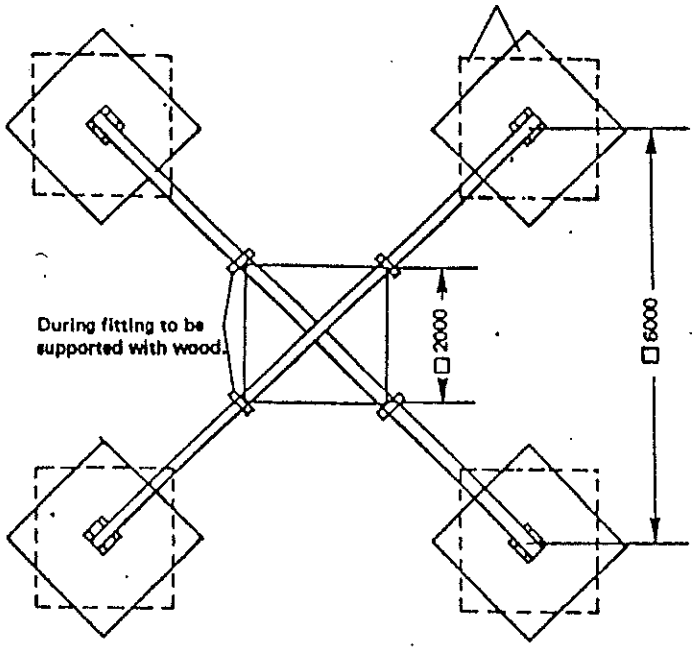
Foundation, variant A 2

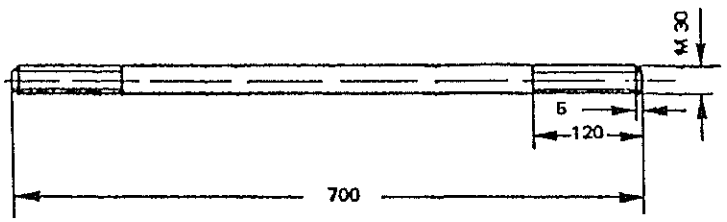






Position of concrete blocks according to room conditions





7209 3101/3376

Bolt and pin connections

High-strength bolts and nuts are used for all load-bearing screw connections.
The strength class is stamped on the bolt head or, respectively, on the front face of the nut. For renewal or when substituting a loss, no other strength class should be used. Thread flanks and bolt stem must be absolutely without visible damage. Insert bolts in slightly oiled condition or coated with "Molykote". When using "Molykote", the different tightening values should be followed. The bolts/screw should be tightened to the torque indicated in the table with the aid of a torque wrench or initially tightened with a bolt spanner, again in accordance with the table.
Bolts which are pretightened with a bolt spanner must be checked for correct pretightness immediately after the first pretightening using the same bolt spanner. Thereafter, only occasional visual checks are necessary. Bolts which are tightened with a torque wrench must be tested to ascertain that the torqie is still correct using the same torque wrench, after 50 hours of operation.
Further checks at approximately yearly intervals should be carried out with the same torque wrench. These checks of bolts in the rotary connection are of the utmost importance. Bolts must be exchanged without fail when as a result of a controlling check it is established that pretightness is inadequate or that the bolt head or nut is contacting unilaterally.

Pin connections

Pins should be well greased before each assembly. After assembly, all accessible parts of the pins should be regreased.
Pin connections secured with split pins must have new split pins for each assembly.
New split pins to be used each time the pins are removed.

Hydraulically pretightened bolt connections

(f. inst. rotary connection, tower section connection)
Bolt connections at the rotary connection are correctly made in the factory before shipment. Each of these bolts must be checked for correct tightness on the site after the first load cycles. Pretightening of the bolts in the tower section connection is to be carried out on the site when erecting the crane. Immediately after this all bolts of the respective connection should again be checked all around with the same pretightening device for the prescribed pretension. The checking process makes sure that any settlements ocurring during the first pretightening are corrected already during the erection using the erection pedestals.
The next checking is to be made at random once a year on the bottom tower connection. Furthermore, we recommend to check the tower section connections regularly. Gaps between the connecting surfaces are an evidence of irregularities in the bolt connections, the origin of which should be found out at once and corrected with the pretightener.

ab 7209 0101/11.78

Tightening torque in Nm

Tightening torques for hex. screws in lightly oiled condition with metric thread and head support dimensions according to DIN 912, 931 and 933.

Strength class Tightening torque in Nm		8.8	10.9	12.9
Hex. bolts Dimensions	M 12	86	120	145
	M 16	210	295	355
	M 18	290	405	485
	M 20	410	580	700
	M 22	550	780	930
	M 24	710	1 000	1 200
	M 27	1 050	1 500	1 800
	M 30	1 450	2 000	2 400
	M 33	1 970	2 770	3 330
	M 36	2 530	3 560	4 280
	M 39	3 290	4 630	5 560
	M 42	4 070	5 730	6 870

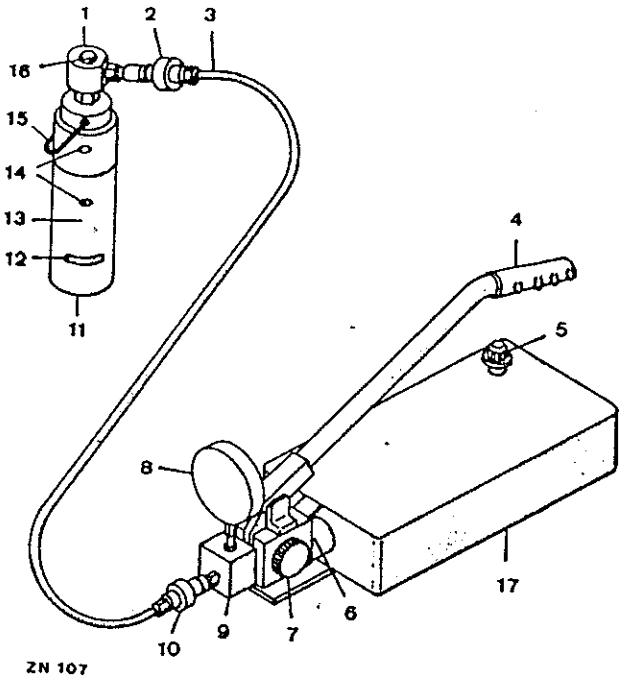
Tightening torques in Nm and pretightening force in N for hex. bolts according to DIN 6914 and DIN 7968.

		10.9		
Strength class		N	Nm*	Nm**
Hex. bolts Dimensions	M 12	50 000	100	120
	M 16	100 000	250	350
	M 20	160 000	450	600
	M 22	190 000	650	900
	M 24	220 000	800	1 100
	M 27	290 000	1 250	1 650
	M 30	350 000	1 650	2 200
	M 33	430 000	2 200	2 700
	M 36	510 000	2 850	3 950

* Hex. screws greased with Molykote
** Hex. screws lightly oiled

Bolt tightening device

1 Rotary angular connection
2 Quick-action coupling
3 High-pressure hose
4 Pump lever
5 Oil filler
6 High-pressure pump
7 Vent valve
8 Pressure gauge
9 Distributor
10 Quick-action coupling
11 Tightening element
12 Resetting recess for rotary sleeve
13 Changeable bush
14 Breather
15 Carrying handle
16 SW 27 across flats
17 Oil tank



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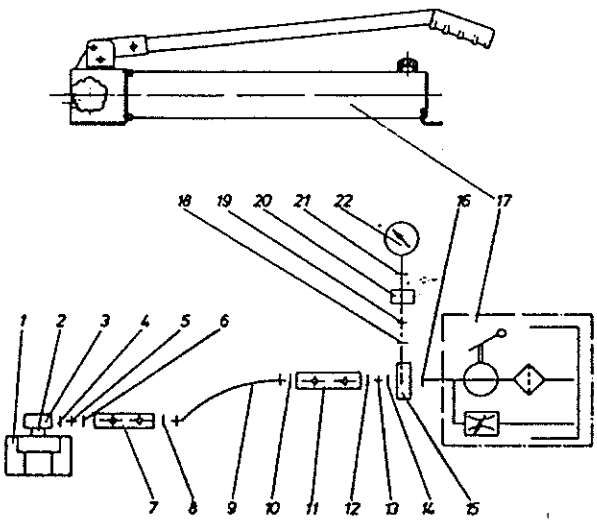
Preparation

For bolts and anchoring bolts, particularly when the prestressing has to be applied with the hydraulic bolt prestresser, it is necessary to ensure that the threads in the nuts and on the bolt or on the anchoring bolt are completely clean and free of dirt and also that there is no damage of the sort that can for example occur during packing and transport during dismantling, to the thread flanks. It is recommended that prior to fitting in, the nuts of the bolts or the anchoring bolts should be screwed onto the threads to ensure that the threading is easy and thus enable the nut to be screwed up to its bearing surface on the prestressed hydraulic anchor.

Please note:

These threads must be generously coated with grease. With hydraulical pretightening it makes no difference wether it is slightly oiled or heavily greased.
It is a fundamental rule that zinc-coated anchoring bolts must have MoS 2-lubrication between the anchoring bolt and the nut.
This lubrication with MoS 2 prevents flaking of the zinc coat and seizing up.
It should also be observed that the rotary sleeve in the tightener is moving freely, if not, grease accordingly.



ZN 108

1 Hydro-tightening element
2 High pressure seal
3 Rotary angular connection
4 High-pressure seal
5 Double nipple
6 High-pressure seal
7 Quick-action coupling
8 High-pressure seal
9 High-pressure hose
10 High-pressure seal
11 Quick-action coupling
12 High-pressure seal
13 Nipple
14 High-pressure seal
15 Distributor
16 High-pressure metal seal
17 Hand lever pump
18 High-pressure metal seal
19 Nipple
20 Union nut
21 High-pressure metal seal
22 High-pressure gauge

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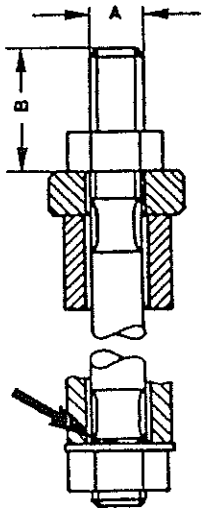


ZN 112

Anchoring bolt assembly

Screw the nut onto the anchoring bolt by hand.

Note:
Particular care should be taken to ensure that the bolt projection (B) for the anchoring bolt is identical with that shown in the drawing. Be sure that all threads carry and that the nut does not extend into the relief.

- The anchoring bolts must not be tightened with a spanner but must be inserted loosely. This has the advantage that during tightening with the tightening tool the anchoring bolt can center itself.
- If this precaution is not observed it could lead to jamming in the tightener or in the bolt connection.

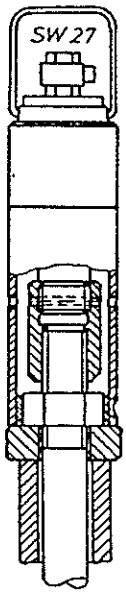
A	B
M 27 – M 39	90 mm

Mounting the tightening cylinder

The tightening cylinder is attached to the large projecting threaded end by means of an SW 27 spanner applied on the hexagon of the rotatable angular connection.
It must be ensured that

- The piston is pressed fully back into its end position,
- the groove of the support sleeve or the worm gear, respectively, remains accessible for tightening the hexagon nut.

If, when screwing on the cylinder, the high-pressure hose is in the way, then can be removed from the quick-action coupling.



Putting into operation the bolt tightening device

After screwing the cylinder on the bolt connection to be tightened and connecting the high-pressure hose, the tightening device may be put under pressure. Make sure the vent valve at the hand pump is closed. The tightening cylinder has two vent screws where the hydraulic system can be vented when under pressure. For this loose vent screws with pin spanner SW 4 by about 2 to 3 turns letting the air escape. The moment only oil without air bubbles is emerging at the vent bores, the venting process is finished. Tighten the vent screws again. Venting should be repeated a few times to ensure that all the air did escape. Afterwards you may pump up to provide the tightening device with the required pressure.
Having obtained the desired tightening pressure it should be waited a few seconds with that tightening force to observe the settling behavior of the tie rod or anchoring connections.
Then readjust the nut over the rotary sleeve or by means of a worm gear, respectively.
The device is relieved opening the vent valve at the hand pump so that the pressure fluid may flow back into the tank. Returning of the piston into its starting position takes place automatically by the cup spring packs.

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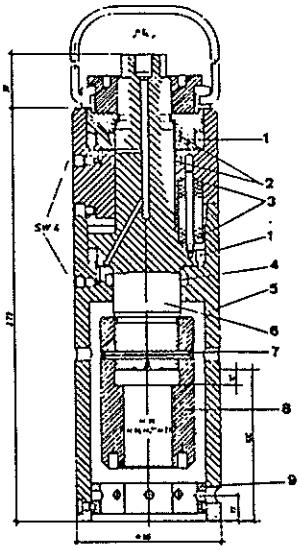

ZN 109

Renewing the changeable bush

Loosen the hexagon socket head bolts SW 4 so that the rotary sleeve can be taken out of the support. After driving out the locking pin, the changeable bush can be unscrewed from the piston rod with a curved two-nut driver.

1 High pressure seal Ø65 x 77 x 9
2 High pressure seal Ø40 x 48 x 6
3 Cup spring
4 High pressure seal Ø45 x 55 x 7,5
5 Cylindrical tube
6 Piston rod
7 Tightening sleeve
8 Changeable bush
9 Rotary sleeve

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Values for hydraulic bolt tightener

Hexagon bolt dia.	Strength of bolt	Prestress N	Required pressure bar
M 27	8.8	235 000	357
	10.9	330 000	501
	12.9	395 000	601
M 33	8.8	350 000	531
	10.9	495 000	751
	12.9	595 000	903
M 36	8.8	425 000	645
	10.9	585 000	888
M 39	10.9	660 000	1 002

These values are valid only for the hydraulic bolt tightener type: PLARAD

Hydro fastening piece:

02 035 060.36 – H 00004 and
02 066.66 – 130

Lattice work components

All lattice work components must be carefully transported and stored. They must be lifted only at the intersection points of the straps. During erection and storage, tower and jib must be supported by timbers beneath the intersection points.

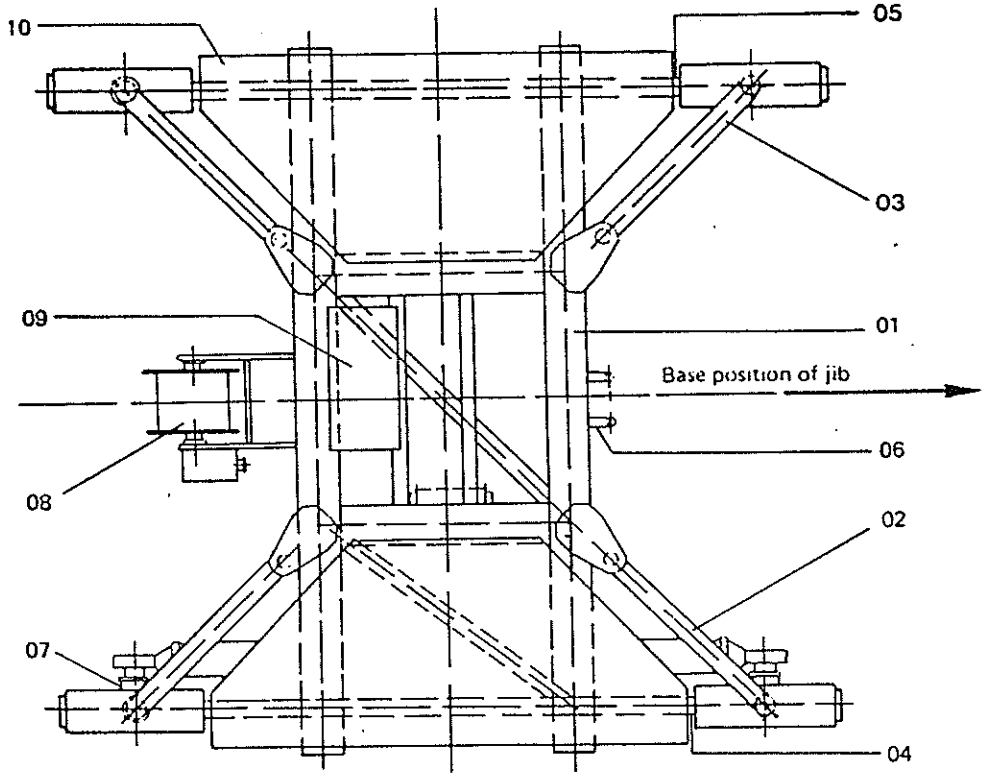
Pin connections

In the case of pin connection secured with split pins, the split pins must be used once only; if split pins are dismantled, new ones must be used in a subsequent erection.

Erection of variant E

Undercarriage

When the track has been constructed correctly, the undercarriage (9.85t) may be placed on the rails by means of an erection crane. For lifting the undercarriage, four eyes are provided at the frame, which serve at the same time as boundary for the central ballast. If the crane is to travel round curves, it must be ensured that the driven travel bogies lie on the outer rail ($Ra_{min.} = 2.5 \times S$; S = gauge). The slewing arm supports on the non-driven side must be removed when the crane is to be used on a curved track. The moment the crane is working again only on straight rails then the slewing arm supports should be installed anew. These slewing arm supports reduce the derailing risk of the crane (folding away the slewing arms) during rail settlements or faulty rail laying.
The line drum can be built on even prior to setting the undercarriage on the rails.
The direction in which the climbing device is to be built onto the crane is determined during the setting up of the undercarriage or construction of the foundation. Therefore before setting up the undercarriage or constructing the foundation, give consideration to the building which ultimately follows. This is to allow in the later dismantling (climbing down) sequence of the climbing procedure for sufficient jib clearance.



Description of parts

01	Undercarriage frame	06	Ascent
02	Slewing arm 1	07	Crane travel unit
03	Slewing arm 2	08	Line drum
04	Slewing arm support	09	Control panel
05	Slewing arm support (containing longitudinal)	10	Central ballast

Erection of tower and telescoping device, single

1. Setting the tower section I (4.1t) onto the undercarriage.

   Attention:
   The movable struts (with rocker bearings) are bolted to the side of the undercarriage where the non-driven travel bogies are located; the movable struts must always remain on the tower section I. Care must be taken to make sure that the struts do not engage on the undercarriage cross.

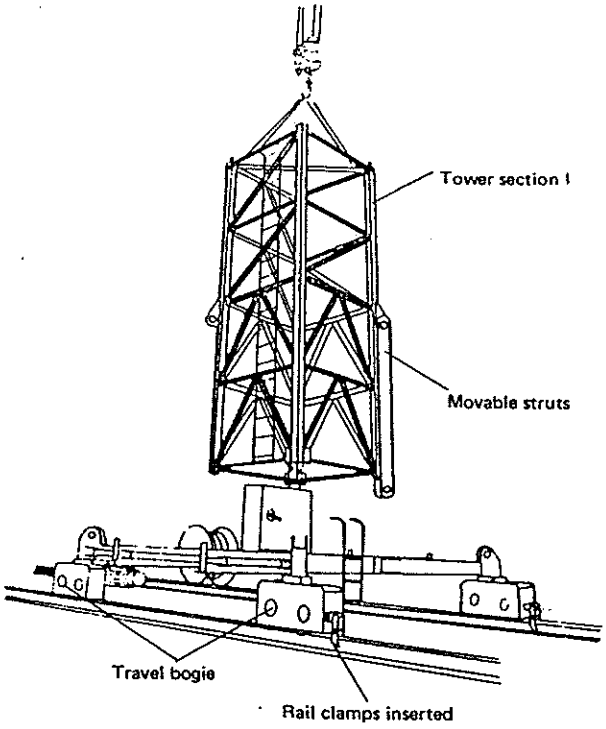
2. Bolt up tower section I with the undercarriage The bolting-up is effected by means of the hydraulic bolt pre-tensioner (see table in chapter "Bolt connections".)

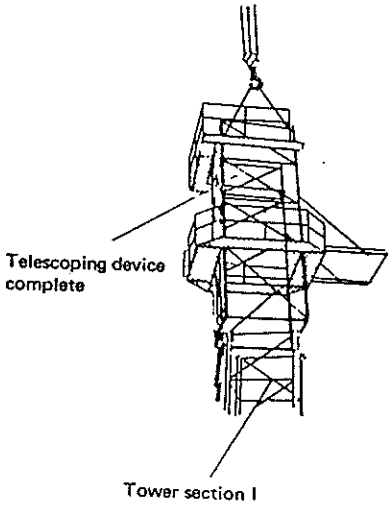
3. Bolt up the struts with the undercarriage.

4. Fit the central ballast, at least 30 t. If the crane is erected with a coupling height of over 22.7 m by means of an erection crane, the undercarriage must be ballasted for the erection with the central ballast required for operation (see chapter "Ballasting").

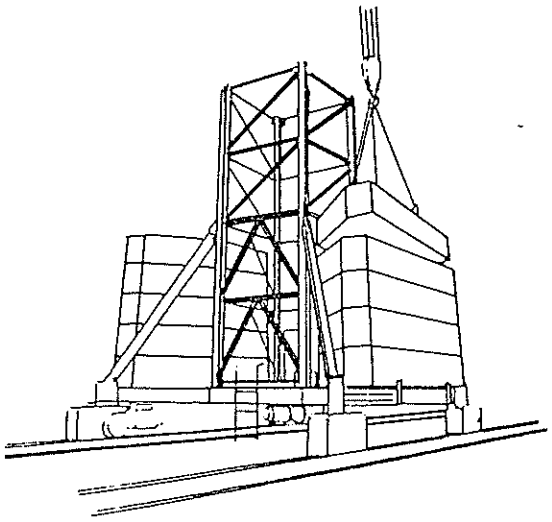
5. Fasten the telescoping device (5.2t) above the tower section I. The telescoping device is held in the required position by the setting-down bolt and the guide rollers. All platforms may be fitted previously.

6. Fitting a tower section "normal" onto tower section I.
   The tower section "normal" must be linked with tower section I in such a manner that the K-connections are positioned in a line above one another so that the setting-down bolts of the telescoping traverse can engage. Bolt up the tower section I with the tower section "normal" and tighten the tie rods to the required pre-stress.





Minimum ballast 30 t



7209 0101/476

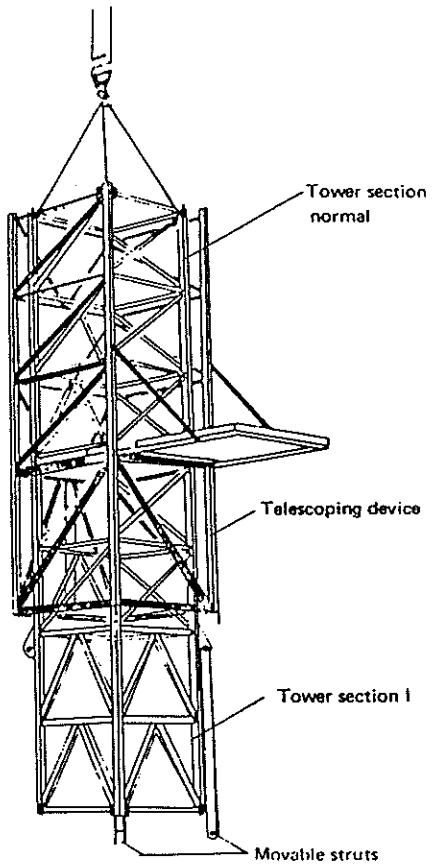
1. Set the unit (tower section I, tower section "normal" and telescoping device) onto the undercarriage (weight 11.4t).The tower section I and tower section "normal" must be so connected that the K-connections are positioned in a line above one another, so that the setting down bolts of the telescoping traverse can engage.
   Attention:
   The movable struts (with rocker bearings) are bolted up with the side of the undercarriage to which the non-driven travel bogies are fixed. The movable struts must always remain on tower section I. Care must be taken to ensure that the struts do not engage on the undercarriage cross.

2. Bolt up tower section I with the undercarriage. The bolting-up is effected by means of the hydraulic bolt pre-tensioner. (Table in chapter "Bolt connections").

3. Bolt up the struts with the undercarriage.

4. Fit central ballast, at least 30 t. If the crane is erected with a coupling height of over 22.7m by means of an erection crane, the undercarriage must be ballasted for the erection with the central ballast required for operation. See chapter "Ballasting".

5. Fit the platforms of the telescoping device. These platforms can be fixed to the telescoping device prior to fitting the central ballast and prior to setting onto the undercarriage.



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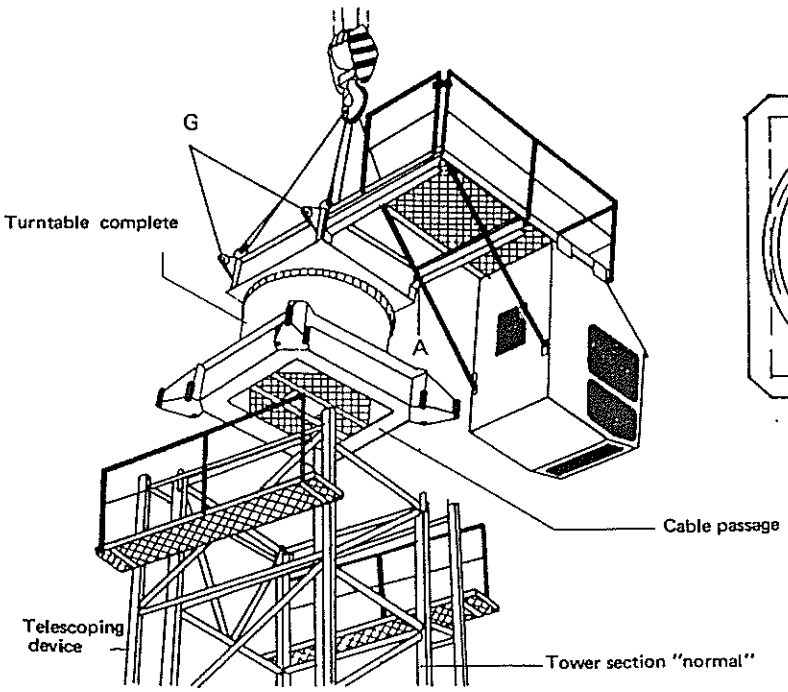
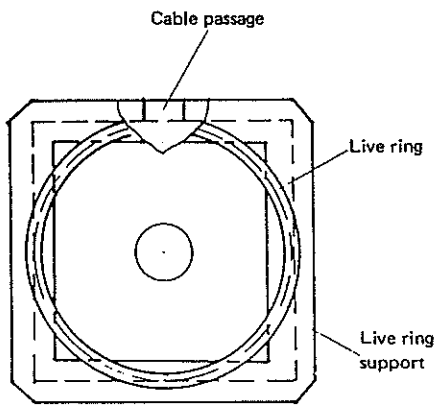
Fitting of turntable

1. The complete turntable is set onto the tower (tower section "Normal").
2. Bolt up rigidly turntable and tower.
   If the crane is to be telescoped immediately after the basic erection, the bolts need only be hand-tightened.

A = Jib
G = Counter jib

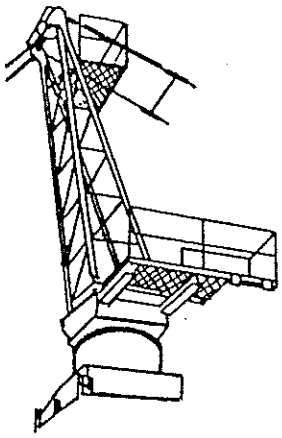




Care must be taken to ensure that the live ring support is built on in such a manner that the cable passage is at the side of the tower.

Fitting of tower head (1,6t)

The tower head must be bolted up complete with platform and bracing for jib and counter jib with the turntable.



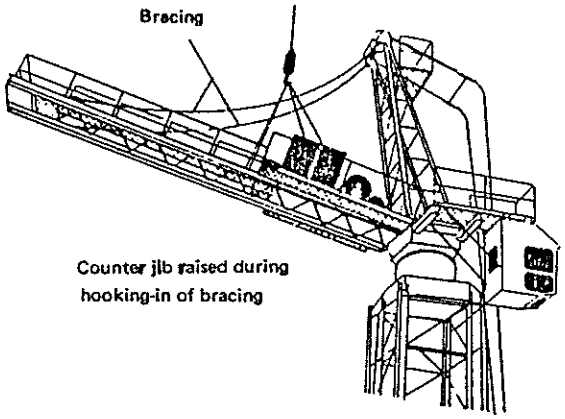
Fitting of counter jib

The counter jib is first fastened to the turntable and then to the bracing.

Thereafter the ballast blocks have to be inserted in the counterjib, see table of ballast weight.

Important!

Attention: When erecting the crane special attention has to be paid to the exact positioning and weight of the required ballast blocks.
"Danger of crane falling over". The instructions must be followed under all circumstances.

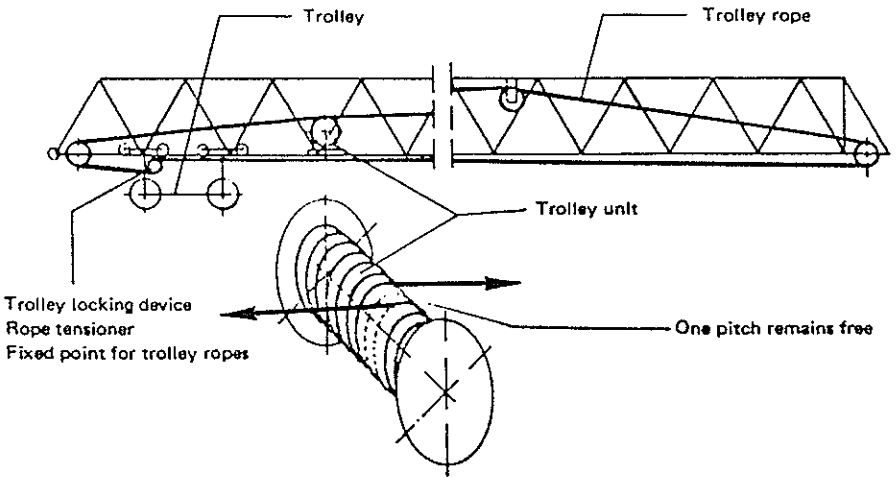


7209 0501

Jib

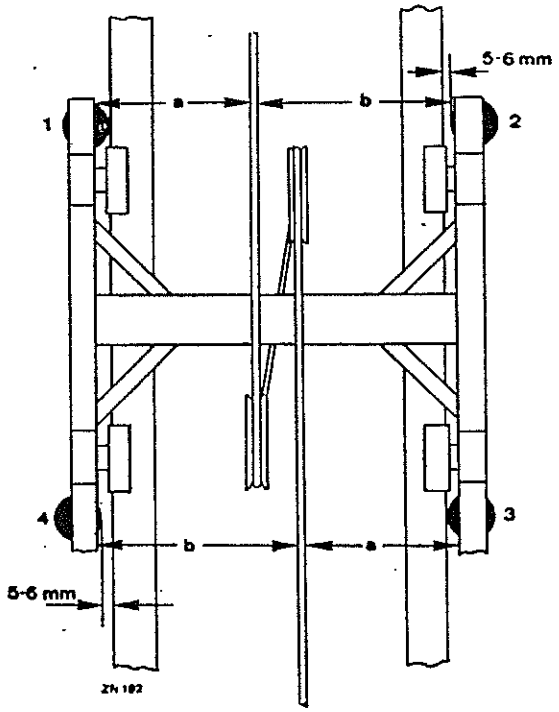
The jib assembled on the ground to the required length, complete with trolley and trolley rope. The sequence of the tower sections can be learned from the chapter "Jib division". The trolley must be so built-in that the tensioning drum for the trolley rope points to the coupling point. The trolley rope must be reeved according to the drawing and be tensioned by means of the trolley travel blocking device.

The capacity plates must be built on to the diagonals. The exact place is shown in the table "Fixing of capacity plates".



Adjustment of the guide pulleys on the hoist trolley

Drive the trolley to the widest point of the jib and in this way ascertain that all travelling wheels on both sides have equidistant overlap at the outer edge of the jib bottom chord.
The two diagonally arranged guide pulleys (1) and (3), which are the nearest to the hoist rope running into the trolley (Measurement a), are to be adjusted so that there is no air space left between them and the jib bottom chord.
The two remaining guide pulleys (2) and (4) to be adjusted so that 5 to 6 mm of air space is left between the pulleys and the bottom chord.

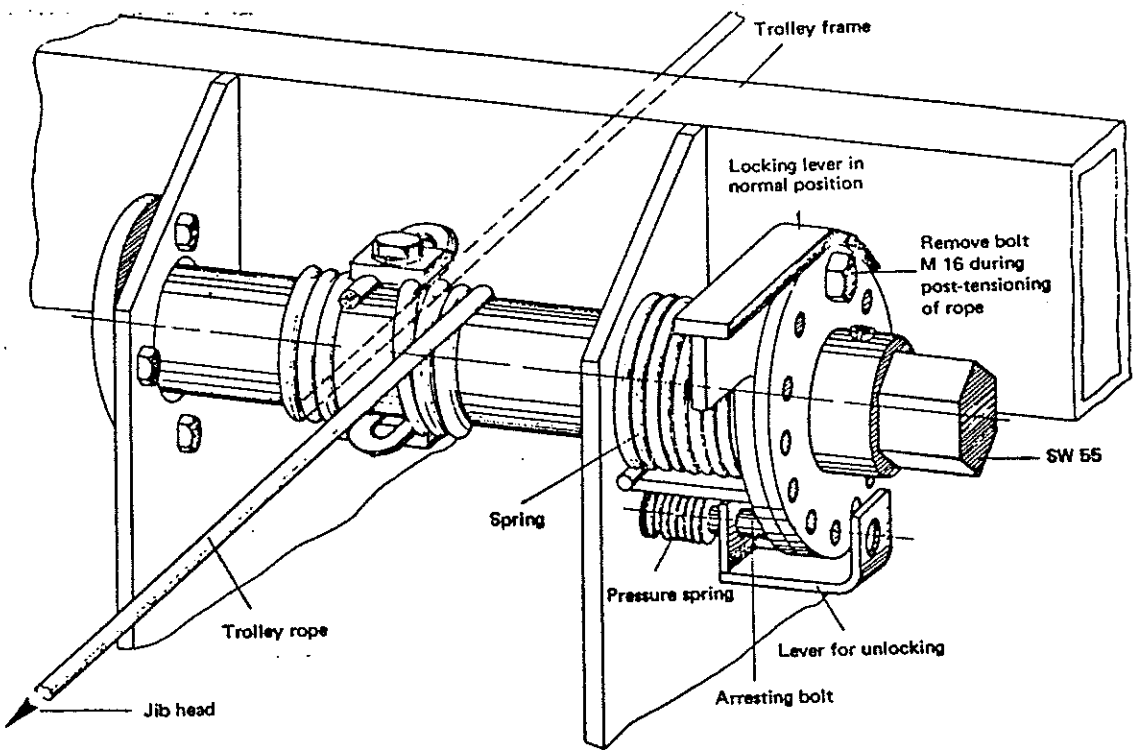


a < b

7209 0101/1278

Tensioning of trolley ropes

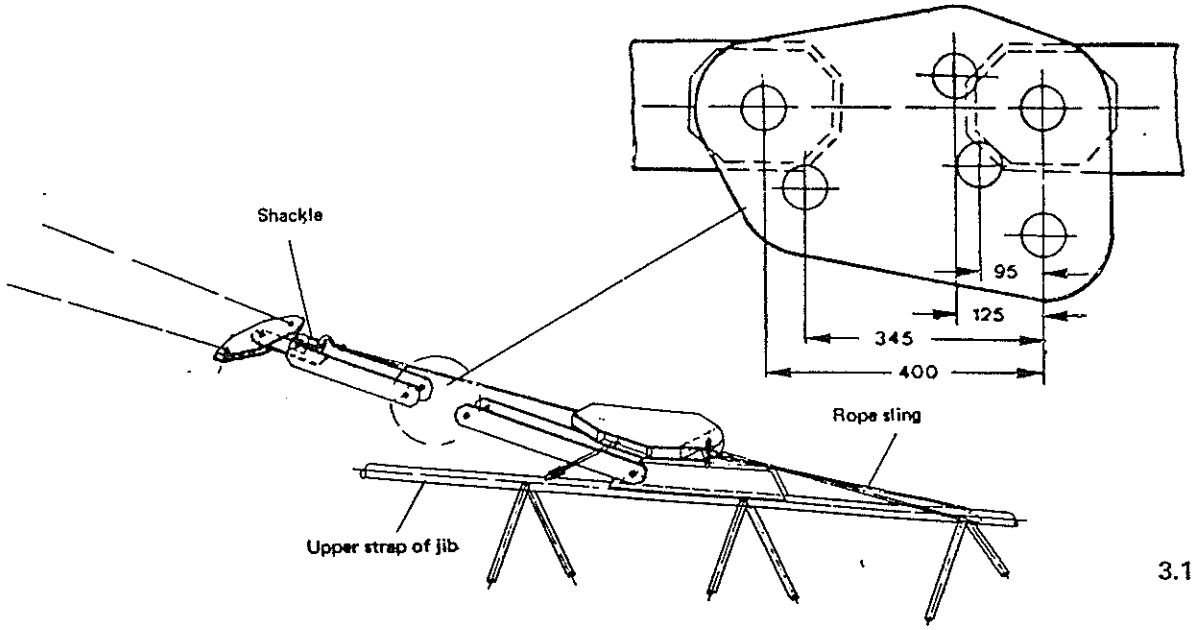
For tensioning the trolley ropes, several bores for the arresting bolts are provided in the locking lever and the slotted disc linked with the drum. For tensioning the trolley ropes, the connection bolt between the slotted disc and the locking lever must be removed. The arresting bolt is pushed from the slotted disc during rotation of the drum in the direction "Tensioning" and locks only during counter rotation. When the trolley ropes are tensioned, the connection bolt to the locking lever is screwed into the next suitable bore. The arresting bolt is pushed back so that the tension of the trolley rope pushes the locking lever into the normal position.



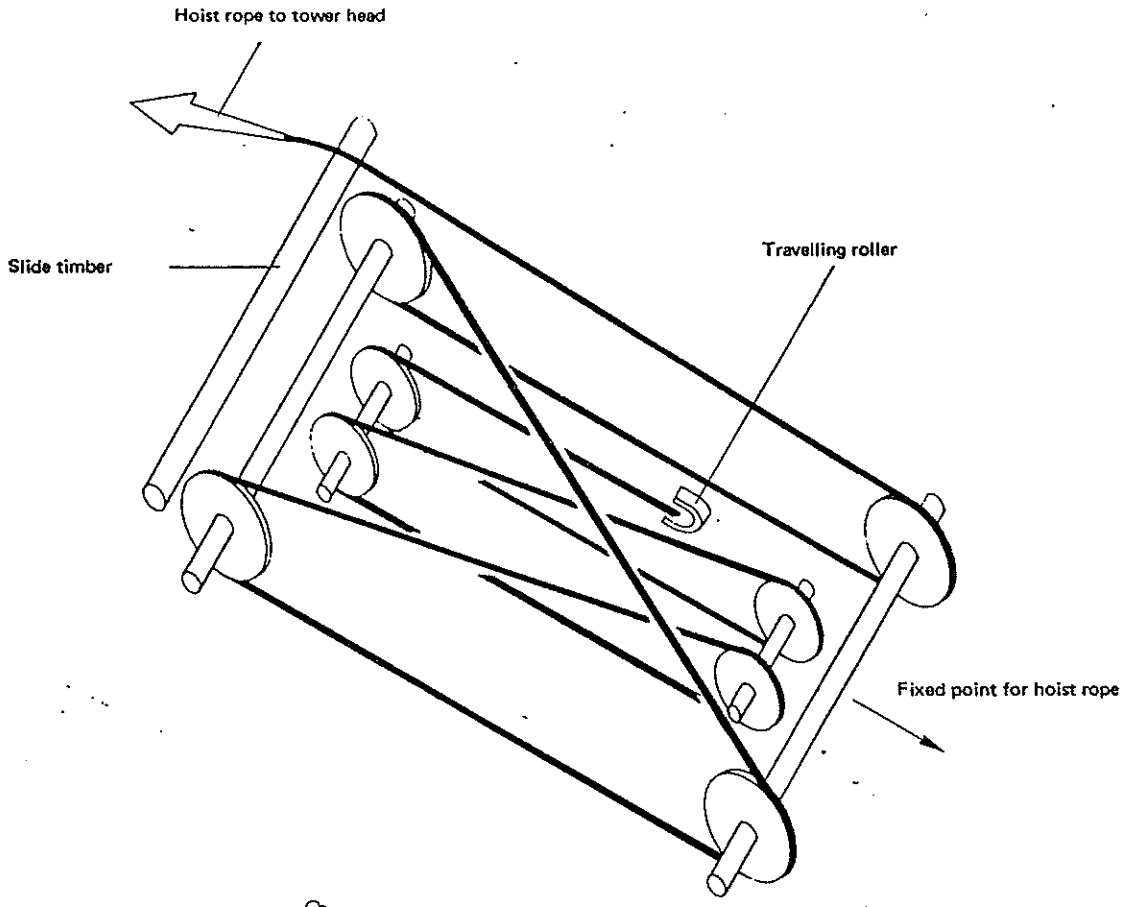
Positioning the trolley on minimum working radius

7209 0501

If the jib is to be mounted only with the auxiliary crane, the jib is to be raised at its center of gravity up to the turntable for pin-fastening it at the pivot point.
By further raising with the auxiliary crane, slightly superelevate the jib.
Using a hoisting jack, pull the guying toward the jib and pin-fasten it at the adjusting straps. These straps serve to adjust any possible length differences of the guying. If no special mounting marks for the bores to be used can be found, then use the ones depicted in the sketch (bore distance: 400 mm).
After pin-fastening, bring the jib into its operating position lowering it with the auxiliary crane.



If the jib is to be hoisted not by an erection crane but by the hoist winch operated in auxiliary circuit, care must be taken to let the inclination of the jib not exceed 35° . For fitting, the hoist rope must be reeved into the jib erection pulley block as shown in the drawing.



Inclination of jib with erection ballast.

The inclination of the singly-suspended jib should be approx. 1° in the tower direction $1^{\circ} \triangleq$ 17,5 mm/m.

Inclination of jib with operational ballast.

The superelevation of the singly-suspended jib should be approx. 1° . $1^{\circ} \triangleq$ 17,5 mm/m.
These values refer to an approximate tower height of 15 – 20 m.

ab 7209 0101/1278

Ballasting of counter jib

The counter weight ballast can be raised by means of the erection crane or an erection trestle and hoist rope. The rope is reeved according to the following drawing. The table "Ballasting" in the chapter"Technical data" and the following list must be consulted for the position and number of ballast blocks.
The ballast blocks must consist of concrete of a quality according to Bn 250/DIN 1045. Prior to each erection, the ballast blocks must be checked for cracks. The suspension devices must be preserved particularly at the transition to the concrete and the joint must having cracks or starting to crumble must not be re-used.

Twist catcher

The twist catcher is fastened at the jib head (fixed point for hoist rope). Its purpose is to prevent an accumulation of twist. During the fitting of the ballast blocks (hoisting) on the counter jib it is removed from the jib head and fastened to the ballast block suspension.
When the fitting is completed, it is re-fastened to the jib head.

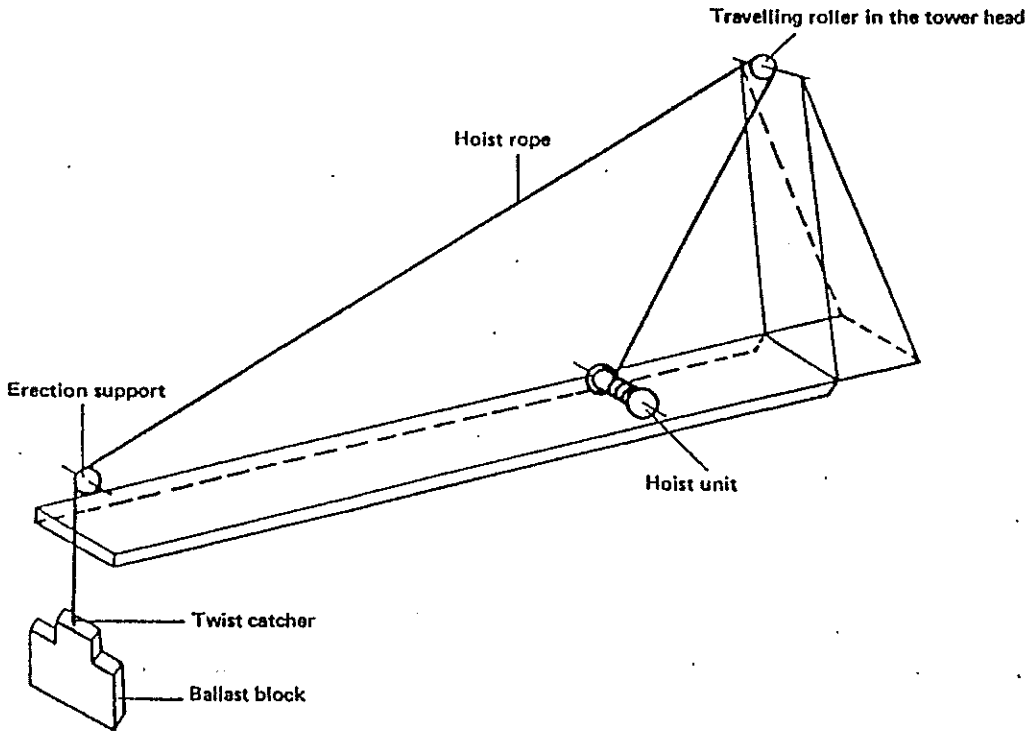
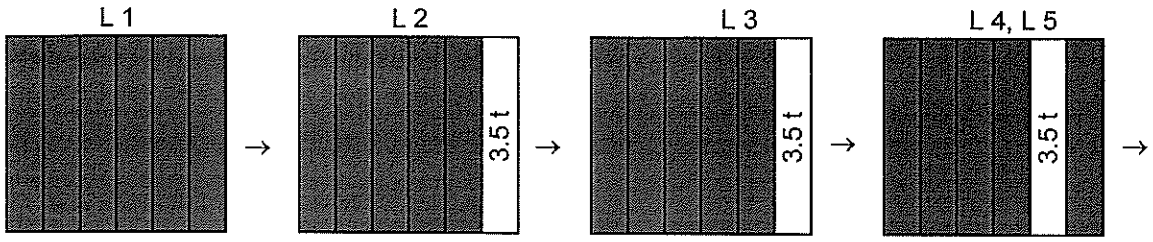
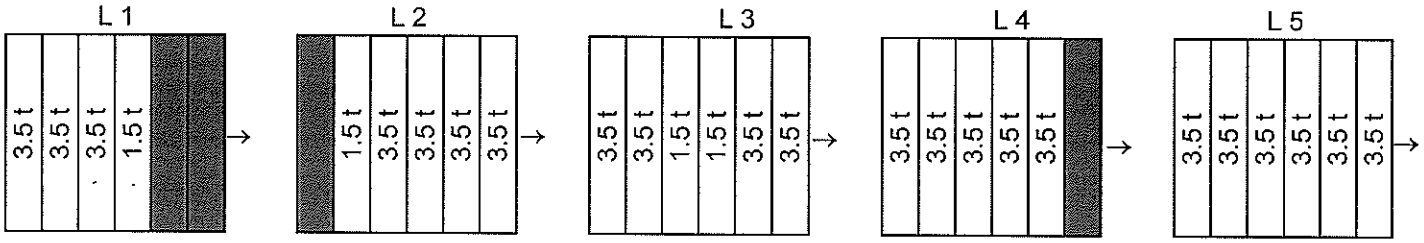


TABLE OF BALLAST WEIGHTS

POSITION OF BALLAST BLOCKS DURING ERECTION OF JIB



POSITION OF BALLAST BLOCKS FOR OPERATION



→ DIRECTION OF TOWER

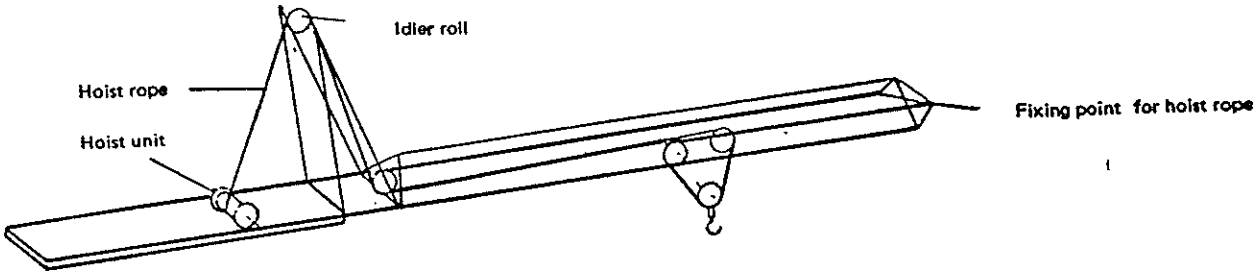
NO BALLAST BLOCKS ARE TO BE PLACED HERE

1.5 METRIC TONS = 3,300 LBS.

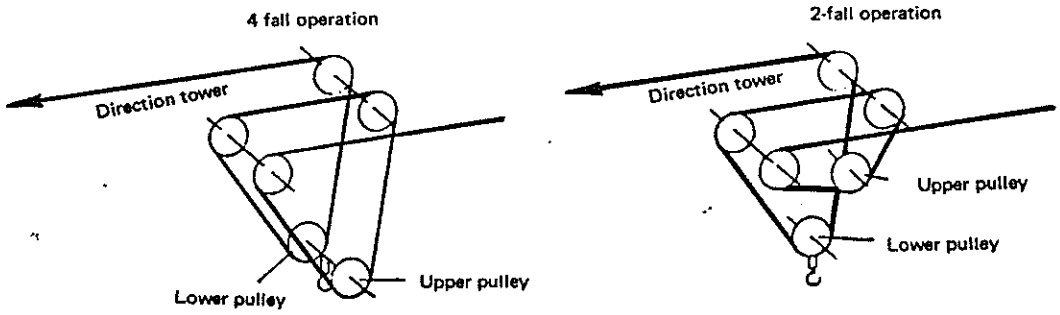
3.5 METRIC TONS = 7,720 LBS

Reeving of hoist rope

Trolley for 2-fall rope reeving



Trolley for 4-fall rope reeving



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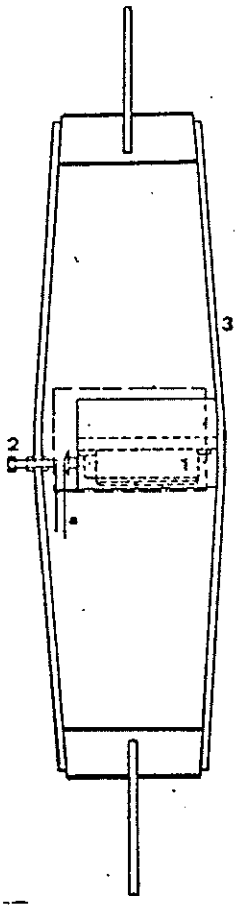
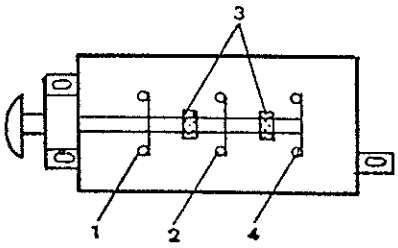


Load moment limiter

The moment overload limit is positioned in the lower part of the tower spire. The overload limit is actuated by the load acting on the jib and the loading of the chord struts resulting from it. The limit switch is actuated and switches off, when the max. permitted load is reached, the hoist unit in the lifting direction and the trolley unit in the jib spire direction.
The distance (a) is set by means of trial loads.

1 Moment overload limit
2 Hex. bolt SW 19
3 Tie rods

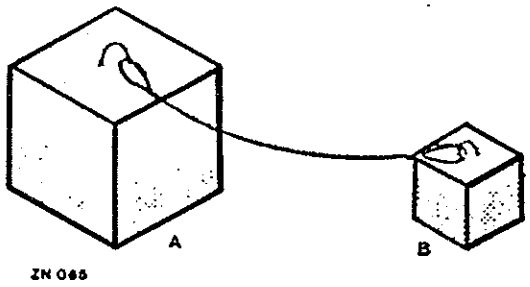


Switches (Moment overload limit)

1 Switch contact for trolley OFF at 100% nominal load. This switch contact it set after unscrewing the four fastening screws and moving the switch in the longitudinal holes.
2 Switch contact for hoist unit UP at 105% nominal load.
3 Adjustment for switch contacts 2 and 3.
4 Switch contact remains free.

Test loading

The overload safety device is to be tested regardless of the yearly test prescribed in the rules for the prevention of accidents (VBG 9 cranes) and after reassembling or rearrangings, as required f. inst. after frequent response of the overload safeyt device, after standstill times or after extreme waether and temperature changes.
Reassembling or rearranging the crane are f. inst. jib extension, alterations in the rope guidance or tower extensions.



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Adjustment

● Load trolley with the rated load (weight "A") for a radius approx. 5 m in front of maximum radius and advance it in direction jib spire. When reaching the rated radius, the trolley travel unit must switch off.
Slow gear changing in the hoist sense is still possible.
● Now apply 105% of nominal load (weight "A" and "B"). Change from gear speed 1 to 2 in the hoist sense can still be carried out slowly. If carried out fast the hoist unit will be blocked in the hoist sense too.

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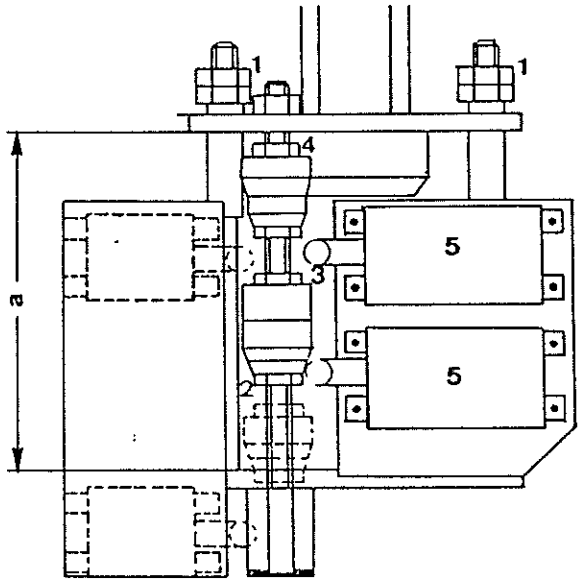
Hoist gear — even load limiter

The moment support of the hoist gear is constructed as constant load limit. During lifting, the rope pull causes, depending on its magnitude, the compression of a pressure spring. Depending on the existing working speed and gear speed, the hoist unit is blocked by the limit switch in zero release when the max. permitted rope pull is reached. When switching the gear under load, the gear changing process is blocked if the load exceeds the amount permitted for the specific gear speed.

- Adjust the pretension a by means of hex. nuts (1) to 303 mm.
- Load the crane with 105% of the load permitted for the particular gear speed.
- Adjust the adjustment nuts (2) and (3) until the limit switch for the corresponding gear speed control responds.
- After the adjustment, counter the adjustment nuts (2) and (3) with hex. nuts (4).

1 Hex. nut
2+3 Adjustment nuts
4 Hes. nuts
5 Switch

a = Pretension 303 mm



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Trolley limit switch

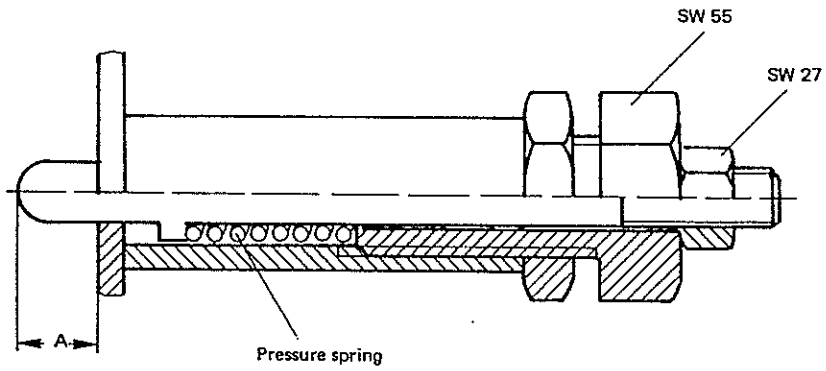
The trolley limit switch must be so adjusted by turning the switching cam that it stops the trolley running at full speed prior to reaching the end buffers.

Hoist limit switch

The contacts of the cam end switch must be so adjusted, taking account of the slowing down of the drum, that the hoist winch is switched off in the sense of lowering when there are only three rope windings (safety windings) left on the drum. The hoist winch must be switched off in the hoisting sense when the pulley block has reached a distance of approx. 2,50 m from the trolley.
If the crane is equipped with a 12,5 t trolley, care must be taken to adjust the cam limit switch during 4-fall rope reeving.

Interlocking of the upper pulley

For 2-fall rope operation, the upper pulley must be interlocked with the trolley. During re-reeving to 4-fall operation, the weight of the entire hook block must pull the upper pulley out of the interlocking. If this is not the case, the spring pre-tension of the interlocking is too small and must be adjusted. If the spring pre-tension is too small, the upper pulley is not kept in the interlocking arrangement on the trolley when re-reeving from 4-fall operation to 2-fall operation takes place.

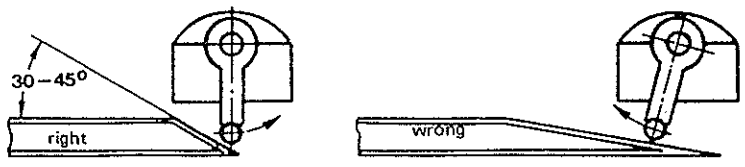


The spring tension is adjusted by turning the nut SW 27; this changes the dimension A. The dimension A must be adjusted to a maximum of 37 mm by turning the bolt SW 55.

Crane travel limit switch

A stop rail must be provided at both ends of the track, which actuates the travel limit switch. The limit switch must switch off in such a manner, that the crane at full travel speed comes to a stand-still 1.64" before the rail end protection. The stop rail must have such a length that the switch cannot switch on again before the rail end is reached. The angle of the stop rail must be between 30 and 45°. By permanent use, the built-in spring in the travel limit switch may become fatigued, the lever may not return into the starting position and may switch off the travel unit in the opposite direction if the inclination of the stop rail is too small.

The stop rail must have such a width, that the switching lever can in no case slip off laterally. The length of the cable on the cable drum must be watched. Travel in the opposite direction is possible, even after the travel limit switch has responded.



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Telescoping process, var. E, A2

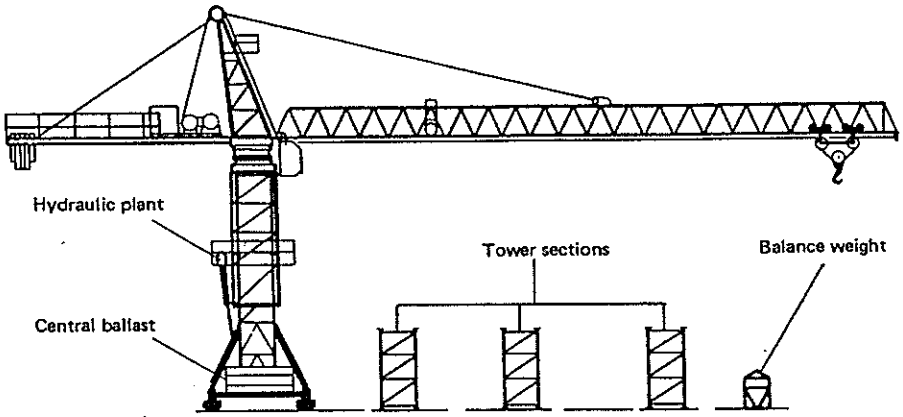
General

During telescoping, the tower is given added height by pushing up the upper crane by means of the hydraulic cylinder and feeding in new tower sections by way of the telescoping device. The tower can be telescoped only if the wind speed does not exceed 50 km/h (wind strength 7).The crane must be free of moments during telescoping, and must not be slewed.

Preparation

For telescoping, the following preparations must be carried out:

1. The number of tower sections, which are to be inserted, must be lined up below the jib opposite the hydraulics plant.



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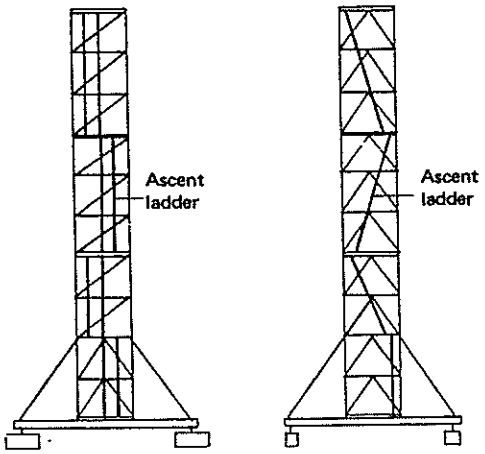
2. The balance weight for ballasting the upper crane must be ready; for weight data, see table "Approximate values for ballasting the crane". In variation E, a test must be made to see, whether the existing central ballast suffices for the requirements of the new height (see bogie pressures var. E).

3. Care must be taken, to build-in the tower sections in such a manner that the ascent ladders are staggered. Electric lines that may be fastened in the tower must be released before telescoping.



Telescoping process

1. Move telescoping device towards the live ring support.

2. Bolt up the live ring support with the telescoping device. The bolts M 36 must not be tightened to the torque, but only properly tightened.

3. Adjust the "guidepath for erection carriage" at the suspension in such a manner that it points upwards. This facilitates the introduction of the tower section on, the erection carriage. During dismantling, the guidepath must point downwards and the suspension must be bolted up correspondingly(at most to the second bore).

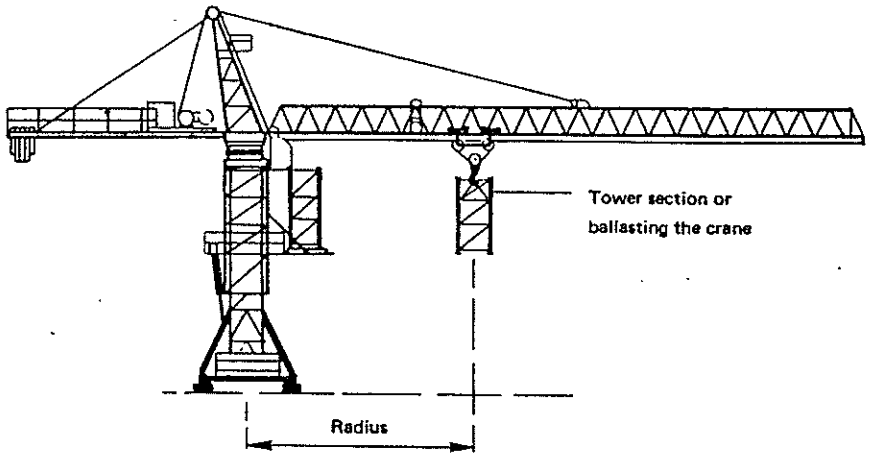
Attention:

The railings on the upper erection plateform must be adjusted so as to provide the required railing height. After this, the crane must not be slewed.

The back of the isolator switch contains a socket for the telescoping device. A socket for the hydraulic bolt pre-tensioner is provided next to the socket for the telescoping hydraulics.

4. Lift a tower section by means of the load hook and set down on the erection carriage. Interlock the erection carriage with the guide path.

5. Take up another tower section by means of the load hook or, when inserting the last tower section, take up the balance weight.



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Approximate values for ballasting the crane

Jib length m	Weight		Radius (trolley 6.3 t)			Radius (trolley 12.5 t)		
	Tower section	Balance weight	Unloaded trolley	Trolley+ tower section	Trolley+ compensating weight	Unloaded trolley	Trolley+ tower section	Trolley+ compensating weight
60.15	–	–	5.00 m	–	–	4.00 m	–	–
56.75	2.12.t.	–	56.00 m	10.60 m	–	35.80 m	9.40 m	–
51.65	2.12 t	1.00 t	–	14.60 m	28.85 m	–	12.95 m	21.45 m
41.45	2.12 t	1.30 t	–	17.05 m	24.85 m	–	15.15 m	21.25 m
31.25	2.12 t	1.60 t	–	21.25 m	26.55 m	–	18.95 m	23.15 m

Weight tolerances and residual moments must be balanced by trolley moment.

6. Bolt connection live ring support – tower must be loosened with the hydraulic bolt pre-tensioner. Carry out tests for the moment-free upper crane. The test is carried out at the guide rollers of the telescoping device. The play of the guide rollers between telescoping sleeve and tower must be evenly distributed.
Excessive play may be balanced with the eccentric pin of the guide rollers.

7. Telescoping upper crane (1 tower section)

a) Retract hoist cylinder completely.

b) Swivel-in telescoping traverse by raising actuating device for telescoping traverse (see drawing 1).

c) First telescoping step:
The hoist cylinder is extended by actuating the reversing switch at the hydraulics aggregate and the entire upper crane is thus pushed upward. The extent of this telescoping step is approx. 1.5 m and is completed when the setting-down bolt has engaged (see drawing 2).

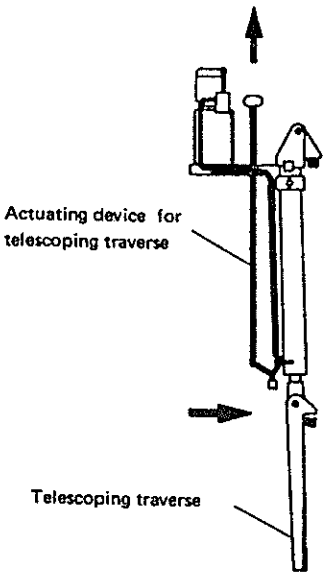
d) The upper crane is let down slightly, until the setting-down bolt is supported by the tower. Subsequently the hydraulic cylinder is retracted and the telescoping traverse swings automatically outwards.

e) Swivel-in the traverse as under b.

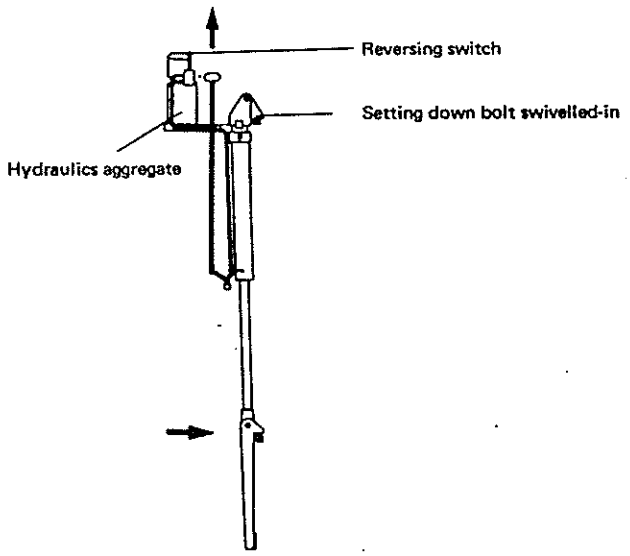
f) The second telescoping step is carried as under c and d.

g) Third telescoping step:
The hoist cylinder is now completely extended. The extent of the 3rd telescoping step is approx. 1.8 m. In this position, the crane stops until the new tower section is introduced by means of the erection carriage.

Drawing 1



Drawing 2



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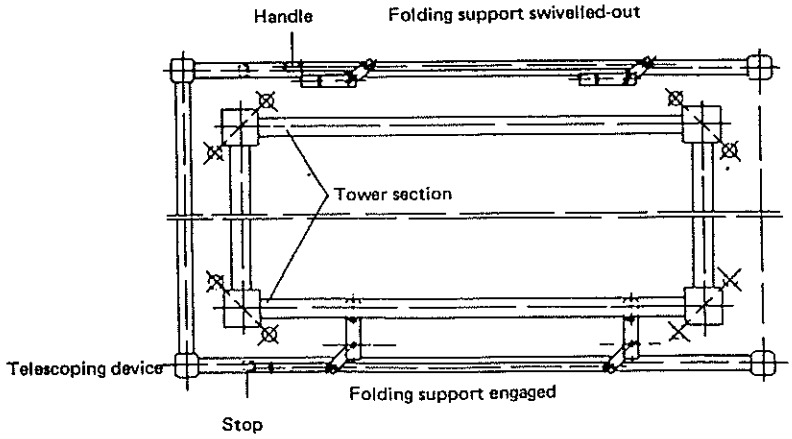
8. Fitting of tower section

a) Insert tower section by means of erection carriage.

b) Slightly de-telescope upper crane, until the folding supports can be fitted into the tower section.



c) Raise the upper crane again.
The inserted tower section is entrained upwards by the folding supports. This releases the erection carriage which can be moved outwards.

d) The tower section is now set down on the tower by de-telescoping

e) The folding supports are swivelled out

f) The tower section is bolted up by means of a tie rod.

g) The tie rods must be tightened by means of the hydraulic bolt pre-tensioner to the pre-tension required (see table for the hydraulic bolt pre-tensioners).

9. While the tower connections are pre-stressed, the upper crane can be set down on the tower. For safety, one tie rod pro connection corner (live ring support-tower) must be fastened without play. The next tower section must now be set down on the erection carriage. The upper crane must be rendered free of moments by taking up a section or the balance weight (see section 5).

10. When all tower connections have been tightened to the required pre-tension by means of the hydraulic bolt pre-tensioner, the tie rods required for securing the connection corners live ring support-tower can be removed.
Telescoping can be continued as desoribed under 7, 8 and 9.
When telescoping has been completed, the hoist cylinder must be completely retracted in order to avoide damage to the piston rod.

11. When the crane has been telescoped to the required coupling height, the live ring support is bolted up with the tower (the tie rods must be pre-tensioned with the hydraulic bolt pre-tensioner). If the telescoping device must subsequently be let down, the setting-down bolt must be swivelled out prior to bolting up the live ring support with the tower. For this purpose, the upper crane is telescoped until the setting-down bolt can be swivelled out by means of the hand lever. The upper crane must the be let down again onto the tower. The setting-down bolt must in the meantime be held. The bolting-up can then be carried out as described above.
Letting down the telescoping device becomes only necessary when the max. full height of the crane (54.2 m or 58.7 m) has been reached or when the telescoping device is required for another crane.

If the telescoping device remains at the crane height, the railings on the upper erection platform must be changed. Only then can the crane again be slewed.

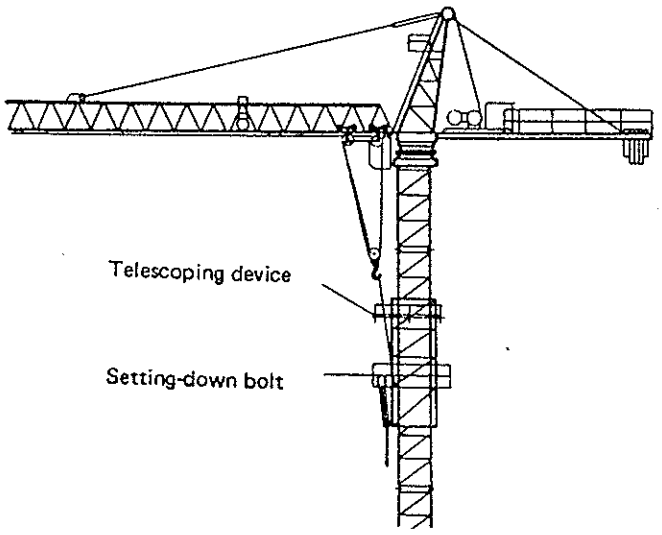
12. Letting down the telescoping device

a) Undo the bolt connection between live ring support and telescoping device

b) De-telescope by one section the telescoping device by means of the hydraulics

c) Slew the cran 180°.

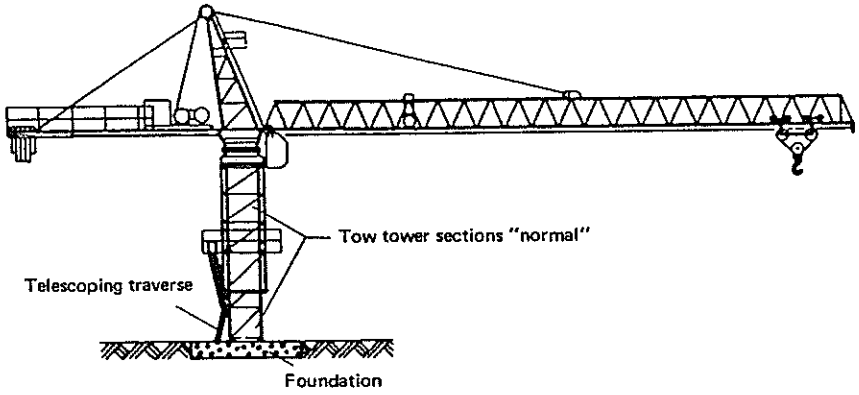
d) Fasten the telescoping device to the setting-down bolt and let it down by means of the hoist rope. During the letting-down the setting-down bolt remains swivelled out



e) Support the telescoping device on the lowest tower section by way of the setting-down bolt.

Telescoping process, var. A1, D

In the basic form, the crane is erected of two tower sections "normal".



The foundation must be built according to the drawing.

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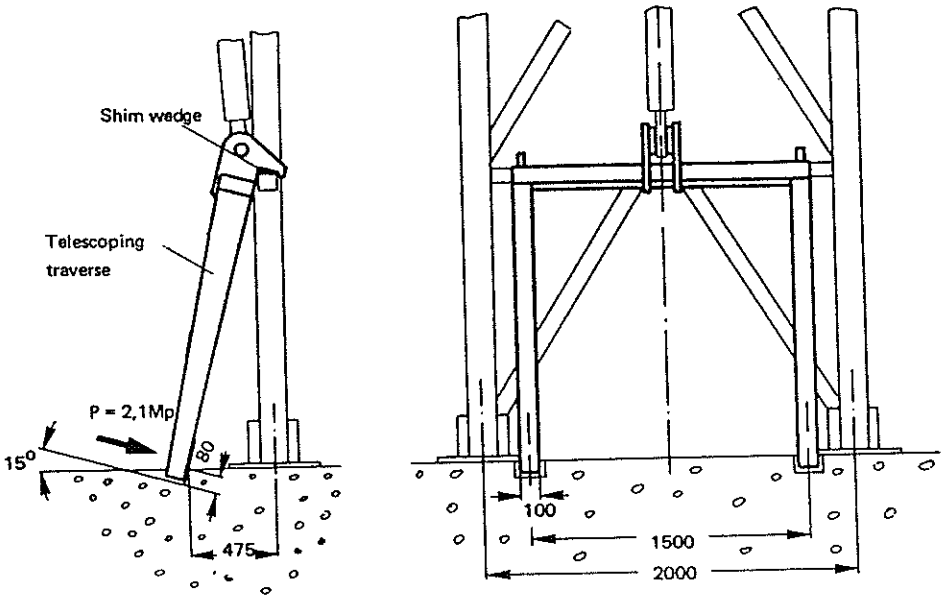


Telescoping of the crane is carried out as described in the chapter "Telescoping process, Var. E, A 2".

During dismantling, the last telescoping step is carried out analogously, as shown in the drawing of the basic form.

De-telescoping the crane

General

De-telescoping of crane can also be carried out only at a wind speed of up to 50 km/h, i.e. a wind strength of 7.
During the de-telescoping process, the upper crane must be free of moments and slewing is not permitted.

Preparation:

Prepare the balance weight for ballasting the upper crane (for weights, see table "Approx. values for ballasting the crane" in the chapter "Telescoping process, var. E, A 2, A3").

De-telescoping process

1. Raising of telescoping device
   a) The telescoping device is fastened to the setting-down bolt and hoisted by means of the hoist rope as far as the transverse pull of the rope will permit.
   b) Raise completely the telescoping device by means of the hydraulics.
   c) Slew the cran 180°.

2. Bolt up the live ring support with the telescoping device. The bolts M 36 need not be tightened to the torque, but only tightened.

3. The "Guide path for the erection carriage" must be so adjusted at the suspension, that it is inclined outwards. This facilitates the travel of the tower section on the erection carriage.

   Attention:

   The railings on the upper erection platform of the telescoping device must be changed, so that the required height of the railings is obtained; the crane can then not be slewed.

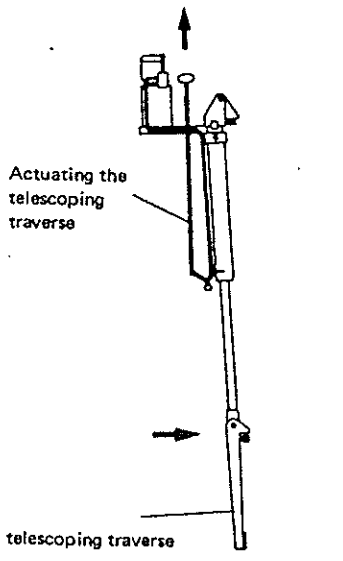
4. The balance weight is taken up with the load hook and the upper crane is rendered free of moments by moving the trolley (for weights, see table "Approx. values for ballasting the crane" in the chapter "Telescoping process, var.E,A2 A 3").Weight tolerances and residual moments must be balanced by trolley movements.

5. By means of the spanner the bolt connections live ring support-tower. Carry out the tests for the moment-free upper crane. The test is carried out on the guide rollers for the telescoping device.

6. The tie rods of the tower section to be dismantled by means of the hydraulic bolt pre-tensioner. The tie rods can be deposited and secured on the platform in the tower section.

7. Dismantling of tower section
   a) Insert folding supports
   b) Extend hoist cylinder
   c) Swivel-in the telescoping traverse by raising the "Actuating device for the telescoping traverse"
   d) Extend completely the hoist cylinder. The upper crane is pushed up and the tower section is entrained by the folding supports.
   e) Insert the erection carriage
   f) Slightly lower the upper crane until the tower section sits on the erection carriage
   g) Swivel out the folding supports
   h) Move the tower section outwards by means of the erection carriage and interlock with the guide path
   i) Carry out test for moment-free upper crane. Residual moments must be balanced by moving the trolley

Illustration to section 7c



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8. De-telescoping of upper crane (1 tower section)

   a) Extend hoist cylinder
   b) Swivel-in telescoping traverse by raising the "Actuating device for the telescoping traverse".
   c) Further extend the hoist cylinder, so that the setting-down bolt can be swivelled out.
   d) Swivel out setting-down bolt by means of hand lever. The setting-down lever must be held until it cannot engage in the upper K-lattice work.
   e) First de-telescoping step
      The hoist cylinder is retracted by actuating the reversing switch on the hydraulics aggregate and the entire upper crane is lowered. The de-telescoping step is completed when the setting-down bolt is supported by the next-lower K-lattice work.
   f) Further retract the hoist cylinder so that the telescoping traverse can swing outwards.
   g) The second de-telescoping step is correspondingly carried out according to points a to f.
   h) The third telescoping step follows the instructions of points a to e.

9. Set the upper crane down on the tower. For safety, one tie rod pro connection corner live ring support — tower must be fastened free of play.

10. Set down the balance weight.

11. Take up the tower section from the erection platform and render the upper crane free of moments by moving the trolley (see table "Approx. Values for ballasting the crane" in the chapter "Telescoping process, var. E, A2, A3")

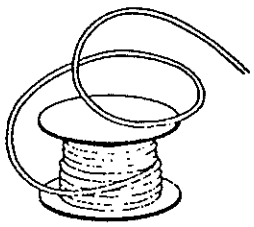
12. Remove the tie rods fastened for securing the connection live ring support-tower.

13. De-telescoping may be continued as under point 6 — 12

14. When the crane is completely de-telescoped, the live ring support must be bolted up with the tower. The tie rods need only be handtightened.

Reeving of ropes

Ropes must be reeved with particularly great care. In many cases inexpert reeving loads to premature wear of the ropes. For this reason, the ropes must be reeved by an expert. The following points must be noted:
The rope, when delivered must be checked for the correct make (plaited, twisted), the direction of lay (right-handed, left-handed), length and diameter (largest diameter of cross-section), and compard with the data of the rope table and the operating instructions.
The pitch of the winch drum must be opposite the lay direction of the rope.
Great care must be taken to prevent the rope from touching the ground, and to place it on a support.
If the rope is not delivered on a drum, a reel must be used for unwinding.



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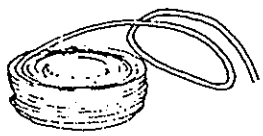
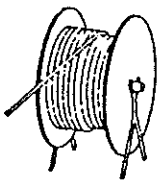
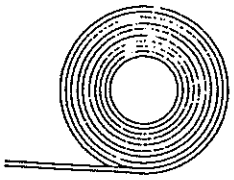




right

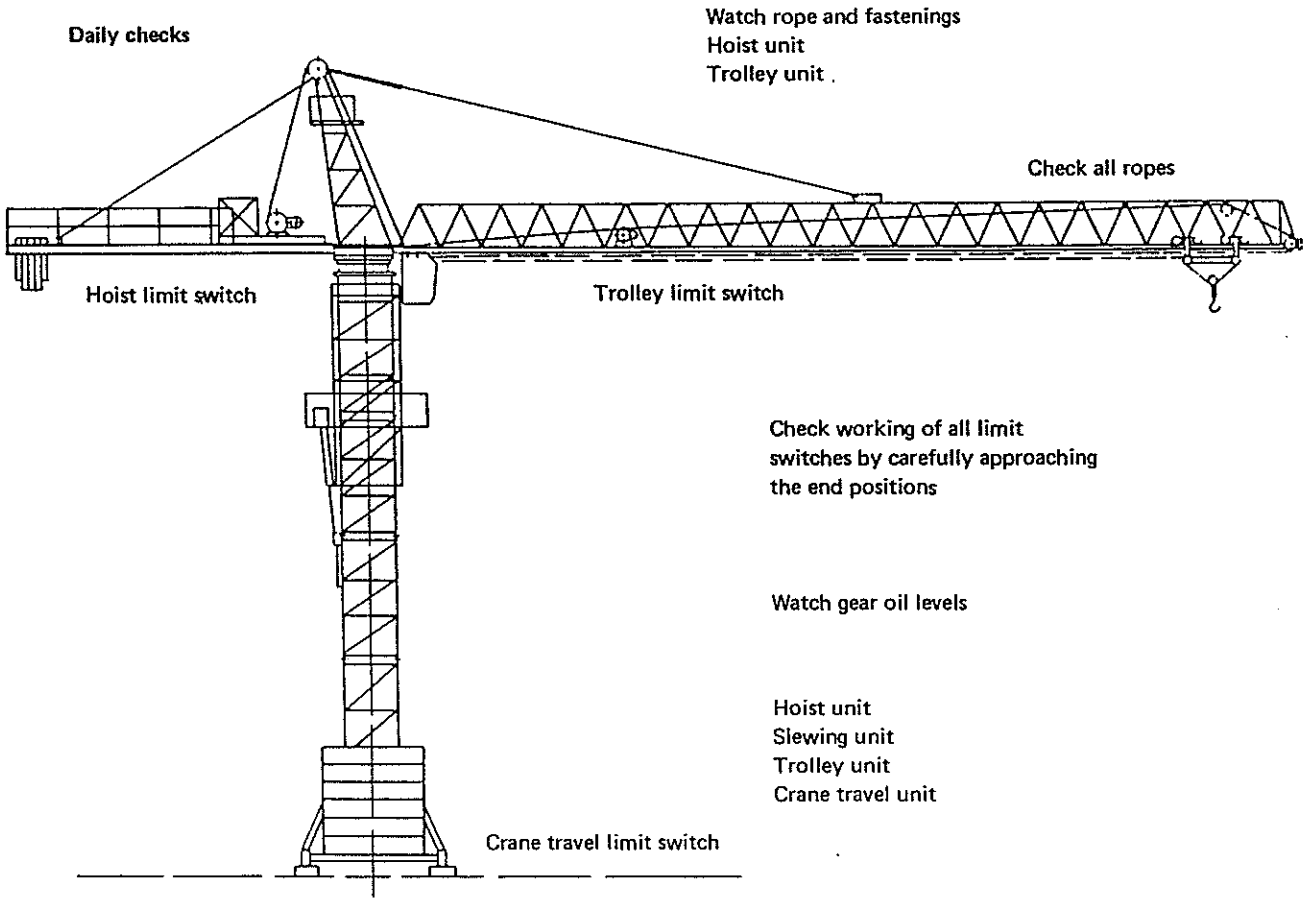


For reeving the rope, a twist-free pilot rope or the existing discarded rope must be used. A rope stocking is used to connect the pilot rope with the rope to be reeved. When the old rope is used as pilot rope, the two rope stockings must be linked by a hemp rope of 3 — 4 m length, to prevent that a twist that may be present in the old rope is transferred via the rope stockings to the new rope.
When the rope has been pulled through to the winch, the rope stocking must be separated and the twist that may have accumulated in the new rope let out. When the new rope has been fastened to the drum, it must be wound on as tightly as possible. If necessary, the rope should be pulled through a pair of timbers clamped together; this is particulary important for multi-layer operation. No slack rope must occur on the drum.
The new rope must be greased during reeving.
Newly laid-on ropes must not immediately be loaded up to the maximum, so that the unavoidable lengthening of the rope takes place slowly, the load twist is distributed over the rollers by running the rope and the rope can better run in. New hoist ropes must first be moved, carrying a small load, from the lowest to the highest hook position. The rope must then be loaded in several stages up to the maximum load while it being moved slowly. In the case of multi-fall reeving of the hoist rope, the hook block must be carefully watched during the subsequent load-free operation.

Putting into operation

The daily putting into operation is carried out according to the following plan (points 1 – 4 only for var. E):

1. Free the track in the travel region.
2. Check the horizontal position of the track, watch particulary for subsistence near foundation ditches. If required, pack sleepers and tighten fishplates at rail joints.
3. Check fastening of stop rails for travel limit switches and of buffers at the two track ends.
4. Open rail clamps.
5. Check oil level of gears and pressure oil pumps.
6. Check oil level in hydraulic tank before telescoping
7. Check all ropes, rope end fastenings and rope pulleys.
8. Set all control switches at the control desk to zero.
9. Switch on isolating switch.
10. Switch on main contactor; control lamp light up.
11. Approach all end positions and check correct functioning of limit switches and overload protection. Be particularly careful in this!
12. Check condition of brakes; adjust if required.
13. Test brakes: hoist-, slewing-, crane travel brakes.



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Relevant are the accident prevention regulations for "Slewing Tower Cranes"
The following applies especially:
Switch uniformly and without interruption, keep a distance from step to step and do not remain at small switching positions, since the lower switching stages are not operational stages but only starting stages. In the Ward-Leonard, however, even the lower stages are designed as operational stages according to the switching-in period. The gear speed of the hoist unit must be selected according to the load to be lifted see chapter "Technical data" or the load table in the driver's cab. The hoist and trolley gears may be changed under load but only at stillstand.

Forbidden is:

1. Any cross-pull, caused by lifting, crane or trolley travel or slewing
2. Tearing away of loads that are stuck
3. Pulling and pushing of loads by means of the undercarriage
4. Transport of persons

Attention:

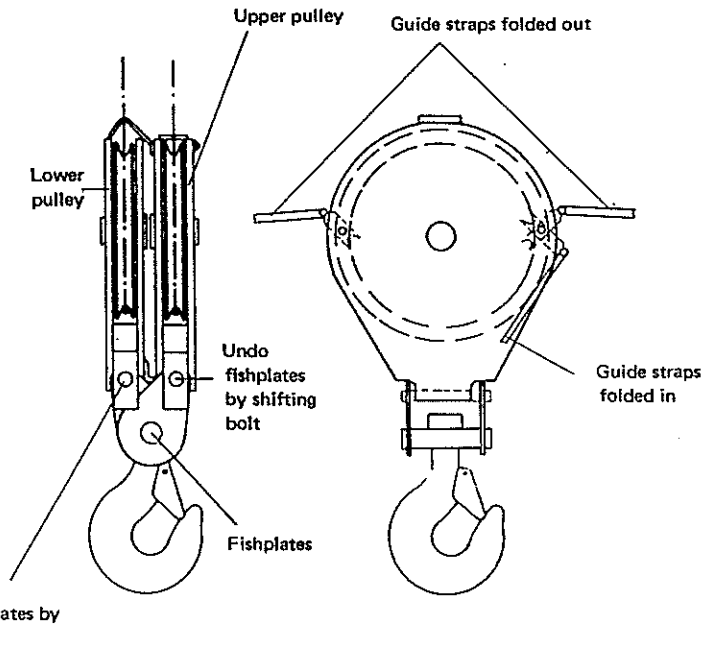
For braking the slewing unit by countering, only stage 1 may be used. Countering in any other stage is forbidden.

The alarm bell is actuated by push-button. If, due to a fault, the load is unintentionally lowered, an attempt must be made to catch the load by switching on the counter movement. In the case of any other danger during operation, the push-button on or dead-man-button must be used to switch off the main contactor immediately. If the voltage fails, the main switch is immediately switched off. All control levers must be set to zero and the re-appearance of the voltage must be expected.
When a storm gathers (wind strength 9, i.e. 70 km/h wind speed), crane operation must be stopped and the same safety measures carried out as for putting the crane out of operation. Close the rail clamps because the crane travel brakes cannot hold the crane in a storm.

Change of hoist rope reeving between pulley block and trolley
(only for 12.5 t trolley)

Re-reeving from 4-fall operation to 2-fall operation:

Let down the pulley block till shortly above the ground. Remove the fishplates from the upper pulley and fasten them to the lower pulley. This is effected by pulling out the cotter pins and shifting the bolts. Fold out the guide straps on the upper pulley. Raise the upper pulley until the lower pulley lifts off the ground. Suspend a weight from the load hook. The upper pulley must now engage in the interlocking device on the trolley. If this does not happen, the spring pre-tension of the interlocking device is too large and must be reduced.
After the upper pulley has engaged, it must not automatically leave the interlocking device when the hoist unit is actuated in the sense of lowering and the lower pulley is still on the ground. This would mean that the spring pre-tension of the interlocking device is too small.



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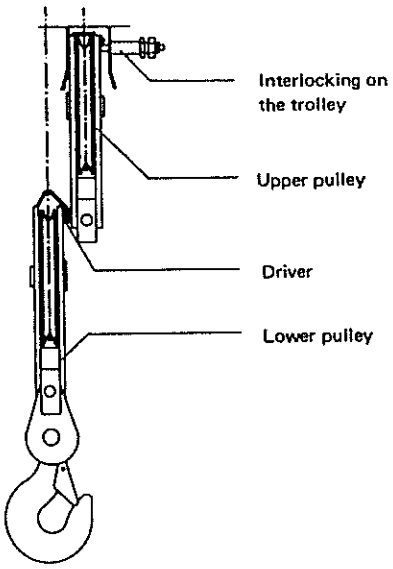
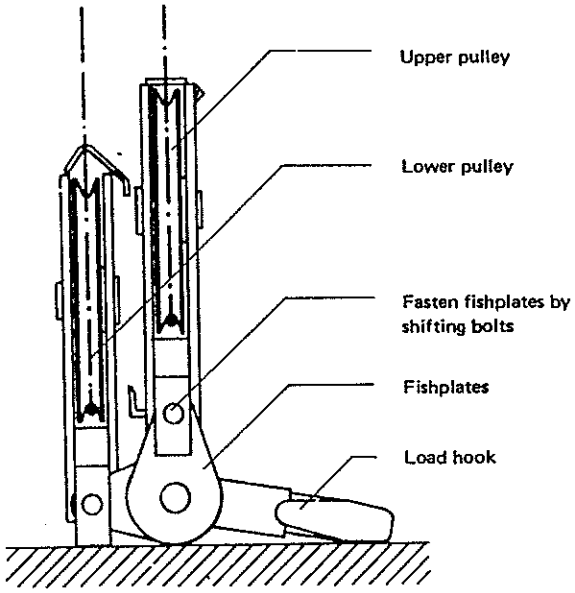
Re-reeving from 2-fall operation to 4-fall operation:

Bridge the limit switch for the hoist unit in the switch cabinet.
Move the lower pulley upwards till over the driver of the upper pulley.
Let down the lower pulley. Hook upper and lower pulley together.
The weight of the lower pulley has the effect, that the upper pulley releases itself from the interlocking on the trolley. See drawing 1.
Let down pulley block till just above the ground.
Loosen the fishplates of the upper pulley on the lower pulley.
Half deposit the lower pulley on the ground.
Bolt up the upper pulley with the fishplates. See drawing 2.
Fold in guide straps on the upper pulley. Render the limit switch for the hoist unit in the switch cabinet ready for action.

Drawing 1



Drawing 2



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Putting out of operation

1. Lift the empty hook block till shortly before the upper limit position.
2. Release the slewing brakes (also during work breaks) and arrest in released position (see "Brakes"). During a storm, the jib must be capable of turning like a wheather vane in wind direction. If the crane is provided with a slewing brake release actuated by the trolley, the push-button in the control desk "Trolley inside" must be actuated and the trolley carefully moved in the tower direction up to the stop. This automatically releases the slewing brakes. Damages arising from non-observance of this instruction are the sole responsibility of the crane operator. In special cases, where slewing is not permitted, the manufacturer or his representative must be consulted.
3. Set all control switches and push-buttons to zero.
4. Switch off the main contactor.
5. Switch off lighting in driver's cabin, heating and all other electrical devices that may be connected.
6. Check ropes and initiate renewal if required.
7. Switch off isolating switch.
8. Check all bearing positions of winches, wheels, motors and gears for unusual heating.
9. Check all gears and the hydraulics devices of the brakes and the telescoping unit for leaks.
10. Close the rail clamps.
11. Switch off main isolating switch at building site isolator.

All faults discovered during the shift must be reported, entered in the check book, and their immediate repair must be initiated.

Attention:

It is not permitted to leave the crane in a rail curve after putting it out of operation.

During each erection, the bolts should be inserted freshly greased. A general inspection and overhaul including dismounting and clearings, guides, and joints should be carried out every two years.

Connecting components located on machined surfaces (precision fits) should be, if removed for repairing, treated with suitable anticorrosion agents, like:

Altemp Q Paste (from Klüber)
Never Seez (from Weidling, Münster)

Lubrication

Faults and premature wear may be avoided by correct lubrication. Lubrication should therefore be carried out with particular care and regularity. Essentially, the following types of lubrication positions are provided at the crane.

Ball bearings

The shortest lubrication intervals are those of the ball bearing slewing ring, which requires particularly careful maintenance, being the bearing subjected to the greatest strain. The remaining ball bearings (rope pulleys, running wheels, trolley runners) run almost without maintenance. The bearings should not be over-lubricated, because during operation they would overheat.
It is expedient to dismantle the ball-bearings every two years during an all-over overhaul of the crane, to clean them and fill them with fresh grease up to about half the running space.

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Slide bearings

These are to be greased with lubricants according to the lubrication plan. Slide bearings without grease nipples require hardly any maintenance and should only be treated with slide laquer during the bi-annual overhaul of the crane.

Open greasing points

Ropes and chains should regularly be treated with acid-free grease. Toothing at the ball bearing slewing ring should be regularly greased with a brush, or, when blank spots appear at the tooth flanks. All guides at the overload protection, the gear support, the brakes and the rollers at the limit switches should be kept sliding by machine oil.

Gears

All oil-lubricated gears are supplied without oil filling, due to transport. This is indicated on the gear. Before putting into operation, the gear must be filled with oil until it emerges at the oil overflow or has reached half the height of the oil levle glass. The suitable oil grade is indicated on a plate on the gear housing.
Care must be taken not to let the oil level fall below the mark during operation. Lack of oil leads to rapid destruction of bearings and wheels.
The first oil change is due after 500 hours of operation. Each further oil change after 2000 hours, but at last once a year.
To remove dirt from the gear, it is advisable to clean the gear with rinsing oil before each fresh filling. For grease-lubricated ball bearings, having a re-greasing device (Stauffer grease cup, grease nipple etc), a small amount of greased must be added after each 500 hours of operation.

Cable drum

Winding device
The leading spindle must be cleaned, if possible, weekly, (e.g. washed with petrol for cleaning purposes) and be well greased with water-insoluble grease. The bearing of the leading spindle does not require maintenance.

Chain drive
The roller chains and chain tension bearing should be well greased, if possible every week. Care must be taken that the chains are always sufficiently tensioned.

Deflexion link chain
The deflexion link chain of the supply line should be greased if possible every week in the joints, and should be freed of larger dirt.

Turbo-coupling
Oil quality:
For the hydraulic force transfer with turbu-coupling applied to cable drums, the oil quality is of particular importance. The hydraulic oil to be filled into the coupling must have a viscosity of 1.8° Engler at 20° C and a setting point at approx. — 40° C. The amount of oils is approx. o.4 l; the producer fills in Shell Tellus 11.

Faults arising from non-observance of amount of filling:

a) too much oil:
The oil temperature rises. At approx. 140° C the metal melts from the fuse screw and the oil runs out.
Repair of fault: let out oil by removing filling and fuse screw, briefly eject, insert new fuse screw and fill in the indicated amount of oil.
By too high an oil filling or too high a temperature, the shaft seal may be damaged. In this case the turbo-coupling must be exchanged and sent to the factory.
Too high an oil filling overloads the motor, the current accepance rises and releases the motor protection switch.

b) too little oil:
Too large an air volume in the interior of the coupling makes the oil foam too strongly; correct moment transfer is not ensured and the pull in kp indicated on the type plate of the drum will not be achieved. This may lead to faults during the winding of the cable.
Removal of fault: let oil out and refill to the amount indicated.

Since the ball bearings in the interior of a coupling are also lubricated by the oil filling, the oil ages and is reduced in its lubrication capacity. For this reason it is recommended to change the oil after 5000 hours of operation.

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Pressure oil pumps

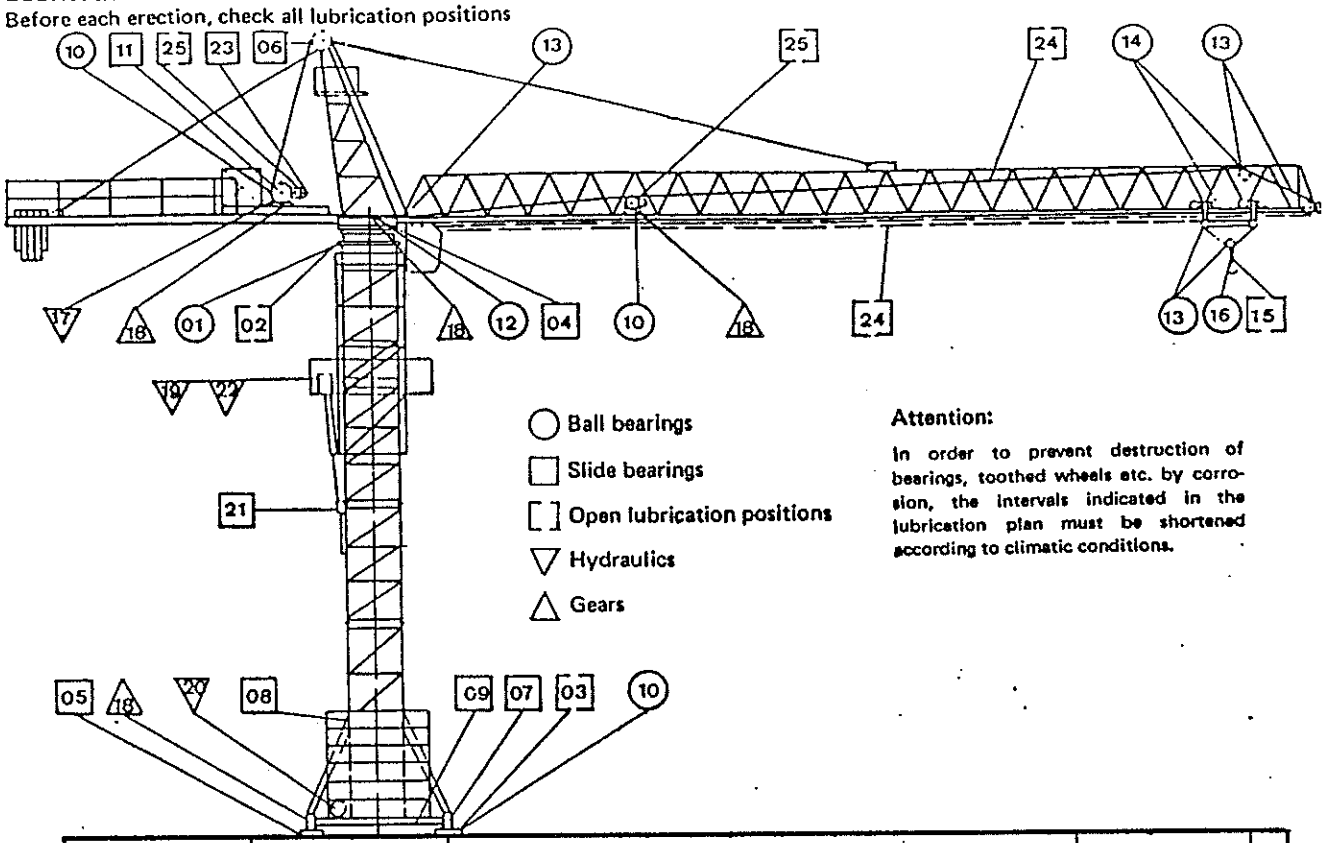
The condition of the pressure oil pump must be checked continuously and the first oil change is to be carried out after 3 months, thereafter at least once a year (see chapter "Pressure oil pumps").

Hydraulics

Oil check and oil change: The oil level must be checked prior to each climbing process. Since oil losses can be caused only by leaks, the plant must be checked for leaky pipe connections, damaged seals etc.. If required, replenish oil.
Attention!
Pipe connections must not be tightened when the hydraulics plant is under pressure.
Carry out the oil change according to the lubrication plan. Remove oil discharge screw and let out oil. Screw off oil filter and fill in the oil. Cleanliness is of the greatest importance during oil filling. Foreign bodies, in particular cloth threads, shavings/fillings, sand and water must under no circumstances enter the installation. Cleaning of breather filter. Clean the breather filter immediately after the first operation of the crane. For further checks and cleaning, see maintenance plan. If dirty, clean the breather filter in washing gasoline or kerosene and then blow out with compressed air. On the return flow filter there is a pressure gauge fitted for 0 — 2.5 bar readings. This indicates the pressure flow resistance and therewith also the degree of impurity present. A by pass nonreturn valve is built into the filter. If the filter is very dirty, then the valve opens at approx. 2.5 bar and allows the unfiltered oil to flow back into the tank. Air filter and return flow filter if dirty should be cleaned in washing gasoline or kerosene and then blown out with compressed air. Do not clean the oil filter but replace it according to the maintenance plan.
After the oil change ven the hydraulics system. On the cylinder head and the cylinder cover there are venting screws for letting out any air. The piston chamber can, however, also be vented via the brake valve. For venting purposes the cylinder is moved inwards or outwards to just before the end position. The venting screw of the appropriate end position is opened and the cylinder is moved into its end position. Any air which may be present can then escape.
For venting the piston chamber through the brake valve, the hex. socket - head screw on the righthand side of the valve is opened sufficiently with a hex. pin spanner SW 4 until only oil emerges at the vent opening. Care should be taken to ensure that the venting screws are properly tightened again.

Lubrication

Before each erection, check all lubrication positions



○ Ball bearings

□ Slide bearings

[ ] Open lubrication positions

▽ Hydraulics

△ Gears

Attention:

In order to prevent destruction of bearings, toothed wheels etc. by corrosion, the intervals indicated in the lubrication plan must be shortened according to climatic conditions.

Lubrication interval: longest intermediate periods	Lubrication positions Index and kind		Number	Remark Position of lubricating points	Lubricant
weekly	01	○	8	Ball bearing slewing ring	Ball bearing grease
	02	[ ]	1	Toothing at ball bearing slewing ring	Toothed wheel grease
	03	[ ]	4	Running wheel rims	Toothed wheel grease
	04	□	1	Slipring converter	Slide bearing grease*
	05	□	je 1	Running wheels	Slide bearing grease*
	06	□	1	Idler on tower head	Slide bearing grease *
every two weeks	07	□	12	Pivot pin on travel bogies	Slide bearing grease*
every six weeks	08	□	2	Bearing for movable struts	Slide bearing grease*
	09	□	4	Bearing for slewing arms	Slide bearing grease*
	10	○	8	Drum and drive bearing,pinion shaft-crane travel unit	Ball bearing grease
	11	□	1	Double shoe brake on hoist drive	Slide bearing grease*
	12	○	2	Latern wheel axle-slewing drive (If grease nipples installed)	Ball bearing grease
before each erection at least annually	13	○	11	Rope pulleys	Ball bearing grease
	14	○	8	Rope pulleys of trolley	Ball bearing grease
at least annually	15	[ ]	1	Load hook traverse	Ball bearing grease
	16	○	1	Axial bearings in the hook block	Ball bearing grease
	17	▽	1 (2)	Oil change-pressure oil pumps	Hydraulic oil
after 2000 hours at least annually	18	△	6	Oil change- hoist, slewing, trolley and crane travel units	Gear oil
every two years	19	▽	1	Oil change-hydraulics plant	Hydraulic oil
after 5000 hours	20	▽	1	Oil change-turbo-coupling-cable drum	Hydraulic oil
after each fresh telescoping	21	□	1	Hinge eye of hydraulic cylinder	Slide bearing grease*
	22	▽	1	Check oil level of hydraulics plant	Hydraulic oil
after 30000 switch.	23	□	(1)	Electro-regulating device at remote controlled hoist unit	Calypsol grease**
when required	24	[ ]	-	Grease all ropes	Rope grease
	25	[ ]	2	Chain drives of limit switches at hoist and trolley units	Acid-free grease
	26	[ ]	-	Keep all joints and guides sliding	Machine oil
before each erection	27	[ ]	-	Insert all bolts freshly greased	Slide bearing grease*

Lubricant selection according to lubricant recommendation (appendix)

Values in brackets for 86 kW hoist unit only

** Type Wacal

*Pressure - resistant lithium-based greases, preferably with molybdenum sulphide additives; recommended type:Wälzerol FM, make SKF

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Oil amounts

The values given are approximate. In any case, the filling must reach at gear stillstand to the middle of the oil sight glass or to the overflow screw or to the mark on the oil stick.
The selection of the oil is according to the lubrication agent recommendation for PEINER cranes.

	Type	Make	Oil amount in l
Hoist drive	HF 40-1600/12,5-20-31,0-50	Flender	36,0
Trolley travel drive	FCAM 200/20-40	Flender	3,6
Slewing drive	SP 1000/125	Flender Zollern	20,0 5,0
Crane travel drive	FCAM 450/12,5	Flender	3,5
Telescoping unit	1–1644 123553 B	Sauer & Sohn	80,0
Hydr. double shoe brake	Pressure oil pump, size 2 Pressure oil pump, size 3	Gensel Gensel	6,0 11,5
Hydr. dics brake	Pressure oil pump, size 3 (spec)	Gensel	55,0

Geared motor (hoist transmission)

The worm-gear-equipped geared motor has an oil filling sufficient for the operation of various years, making it nearly maintenancefree. After a few years service, that is, after approx. 3000 hours of operation, we recommend a throrough cleaning of the gear unit and the renewal of the oil filling. Any refilling, particularly with unsuitable lubricants, is harmful and should thus be avoided. Do never mix oils of different types and makes.
We recommend the following or equipvalent lubricants:

	Gear space	ball bearing space (B side of motor)
Make of lubricant	Type of oil*	Type of grease
Aral	Aral Oil CML	BV-Grease HL 3
BP	BP Energol GR 300–EP	BP Energrease LS 3
Calypsol	Bison Oil MRS 114	Calypsol H 443
Esso	Pen-O-Led EP 3	Beacon 3
Mobil	Mobil Compound DO	Mobilux Grease No. 3
Shell	Macoma Oil 72	Shell Alvia Grease No. 3

* These types of oils have a viscosity of approx. 120 cSt or 16° E at 50° C.

With increasing load or effort, also warming of the geared motor is increased which can reach 60° C beyond the ambient temperature. Oil and transmission temperatures from 30 to 100° C are harmless and have no effect on the smooth performance of the geared motor.

Brakes

Work on the brakes and braking moment tests must only be carried out when the drive gears are free from load, i.e. the load hook of the hoist gear must be laid on the ground. The brakes must neither be too fierce nor too soft. After the brake engages, the motor must still carry out a few revolutions. The vehicle brakes must have such a tightening moment that they hold the crane even in a strong wind, but they must not lock.

Hydraulically released double shoe brake

Mode of operation:

The brake is released by an hydraulic cylinder. The pressure of the hydraulic oil is produced by a pump which is driven by a three-phase squirrel cage rotor motor via an elastic coupling. When the drive gear is switched on, the pump motor also starts. The pump immediately produces oil pressure which actuates the hydraulic control valve and acts upon the working piston in the hydraulic cylinder. The working piston is pressed against the outer stop in the direction 'Release' in the cylinder. In this position the brake is released. When the drive gear is switched off, the pump motor is likewise switched off. The hydraulic control valve now frees the way to emptying the hydraulic cylinder. Under spring force, the brake rapidly engages according to the oil return time.
The rotational direction of the pump motor is indicated on the pressure oil pump and must be absolutely adhered to, since the pump otherwise does not transport hydraulic oil. When the tubes are connected, care must be taken to ensure that the oil pressure connection is on top of the pump, the leak oil connection at the bottom. The leak oil tube must be screwed into the lower connection of the cylinder, it only passes the leak oil that may occur back into the pump pot. The oil (according to recommendation) is filled in through the filling screw marked red. After some trial switching a small quantity of oil must be re-filled, since the pressure tube and a part of the cylinder space must be filled up.

Attention:

The set screw (with counter nut) on the lid of the pump pot serves for the adjustment of the maximum pressure valve. It is adjusted in the factory and must not be changed!

General

When the indicated operations are carried out, the disc brake (if there is one) acting upon the flanged wheel of the winding drum must released.
After brake repairs, trial operation with a small load must be carried out and the correct functioning of the brakes must be checked.
The brakes must be continuously watched and the linings must be checked for wear (reaching the measure S_B) and tears. Oil and grease must be removed from the linings. Oiled-up or greased-up linings must be renewed. Guided and joints must be kept sliding. The oil level in the pressure oil pumps must be watched (oil change at least once a year).

Adjustment of brake for operation:

With closed brake, the piston rod is to be adjusted in such a manner, that only the indicated release stroke H_L is available (see dimension sheet). This is achieved by setting the assembly measure L_M at the piston rod. The brake shoes must be clamped by means of the clamping screws S_K between the brake levers. The required moment must be re-established by setting the original spring length L_E. By means of a torque key, this must be checked. If required, the spring must be adjusted accordingly. For this purpose, the drive must be free from load.
The stop screws must be so adjusted that both shoes lift off uniformly. When the brake is fully released, however, a clearance of 0,1 – 0,3 mm (S_1) must remain between brake lever and stop screw.
With newly laid on brake shoes, the braking moment must be checked after a short time, since it may be increased by complete grinding-in of the brake lining.

Re-adjustment of brake:

The wear of the brake lining must continuously be watched. The re-adjustment of the brakes is definitely required when in the closed state the re-adjustment measure L_N (see dimension sheet) has been reached. The piston rod must the be adjusted to the assembly measure L_M (see dimension sheet) while the brake is closed. The stated braking moment is re-established by adjustment of the spring length L_E measured during a fresh erection (see dimension sheet). It must be checked at the braking shaft by means of a torque spanner while the gear is free of load. If required, the spring must be adjusted accordingly.

Dimension sheet

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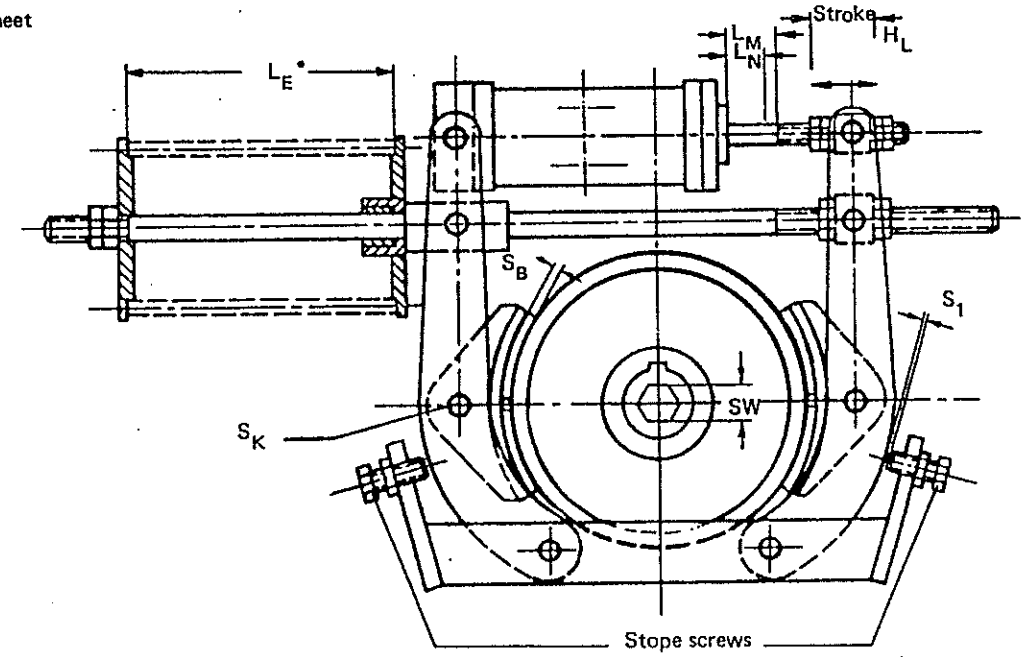


Drive unit / hoist unit	Braking moment (ft/lbs)	Stroke (mm)	Release Stroke H_L (mm)	Assembly measure L_M (mm)	Readjustment measure L_N (mm)	Set spring Length L_E* (mm)	Brake Lining S_B (mm)	Spanner width SW (mm)
78 Kw	590	30	7	33	23	250	5	41

* L_E is a guide measure. The exact braking moment must be set with the torque spanner.

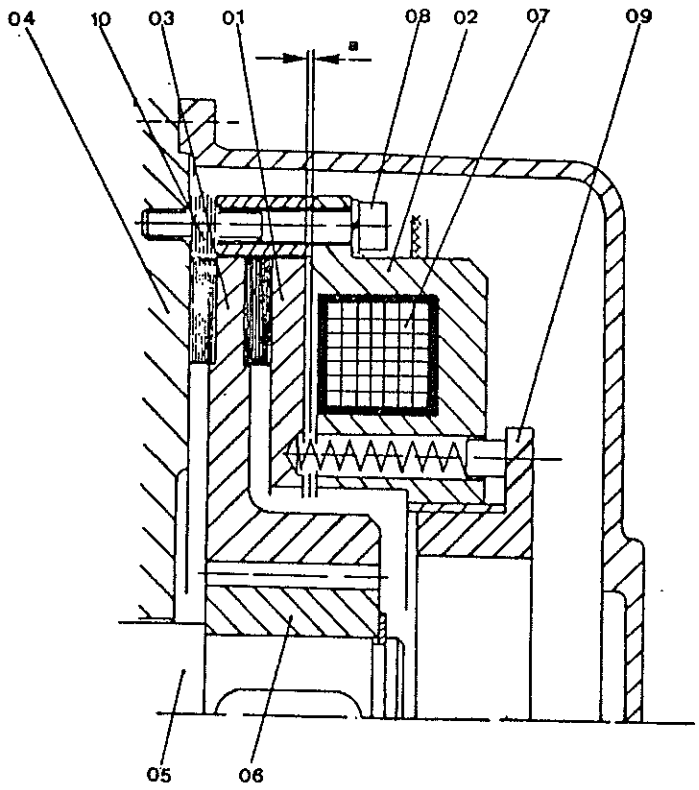
The brake shoes must be renewed at the latest when the minimum thickness S_B of the brake lining has been reaches (see dimension sheet). The value must under no circumstances fall below this thickness, since otherwise the copper rivets at the braking disc abrade. 'Jurid 854' has been used as brake lining. If, however, a different brake lining is to be used for renewal, this must correspond to the friction value $\mu \sim 0{,}32$ and to a value $p \cdot v = 20\text{–}30 \frac{kp \cdot m}{cm^2 \cdot sec}$ (p·v = contact pressure x peripheral speed). The linings are fastened to the shoes with copper rivets. After renewal, uniform wear of the brake linings must be watched. If considerable unevenness occurs, an adjustment must be made. The brake shoes are to be clamped between the brake levers by means of clamping screws S_K. The shoes must lie centric.

Grinding-in of new brake lining:

The new brake linings are to be ground-in, ready fitted, at one quarter of the normal spring tension, according to the spring length L_E while the release cylinder stands still. (Interruption of electric supply). For this purpose, the drive unit must frequently be switched off, to avoid overheating of the brake disc. The highest admissible temperature of the brake disc during grinding-in is approx. 80°C.

Simplatroll holding brake

The Simplatroll holding brake is used as slewing unit brake and trolley brake.



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Mode of operation:
The spring-loaded armature disc (01) pushes, when the magnet (02) is without current, the rotor (03) of the brake type 428 against the bearing plate (04). This brakes the shaft (05) which is twistproof connected with the rotor (03) via the toothed hub (06). When current flows through the exciter winding (07) the armature disc (01) is pulled against the pole surface of the magnet (02) and the brake is released. The holding brake can be released in the current-less state by actuating the manual release lever protruding from the hood.

Maintenance of spring brake:
Normally the brake does not require any maintenance. The friction linings are designed for more than 1 million switching operations. The wear on the brake linings must be checked periodically. When a maximum air gap of a = 0,8 mm has been reached, it must be re-adjusted to 0,3 mm. The procedure is as follows:
Loosen the fastening bolts (08) and remove as many distance washers (10) uniformly from the periphery, as is required to adjust the air gap to 0,3 mm. Re-tighten the bolts (08). The adjusted air gap measure "a" must several times be checked on the periphery means of a feeler gauge.

Adjustment of braking moment.

The brake is equipped with an adjustment ring (09) for setting the braking moment. By turning the adjustment ring, the spring force and thus the braking moment can be adjusted from nearly 0 to the nominal moment of 5 daNm (mkp). The brake must be adjusted to the nominal moment maximum of 5 daNm (mkp).

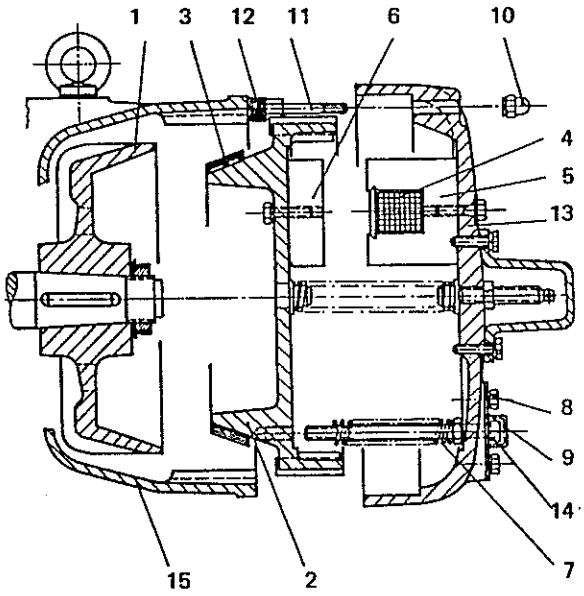
Crane travel brake (Make: "Conz", if provided)

General:

When not running, the motor is kept braked. The magnetic field formed between magnet yoke (5) and armature (6) by switching on the magnet coil (4) lying in the yoke, pulls on the guide disc (2) against the pressure of the springs (7). The guide disc is positioned concentrically in the brake housing (15) and carries the brake lining (3). The guide disc is secured against twisting by fitting keys. When the magnet coil (4) is switched on, the guide disc (2) with brake lining (3) is attracted and releases the brake disc (1) on the motor shaft. When the magnet coil (4) is switched off, pressure springs (7) push the guide disc with brake lining against the rotating brake disc (1) thus braking the motor. Magnet coil and motor are to be switched off simultaneously.

Brake release without current

Screws (8) and protective caps (9) are to be taken off. Turn setscrew (14) clockwise until the guide disc (2) with brake lining (3) releases the brake disc (1). The motor shaft can now be turned by hand.
Reestablish correct operating by setting again the gap between housing cover (13) and head of setscrew (14) to 3 mm with the magnet coil (4) switched on. With the aid of the protective caps align the boltheads (14) and put on all the protective caps (9).



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Re-adjsutment of brake

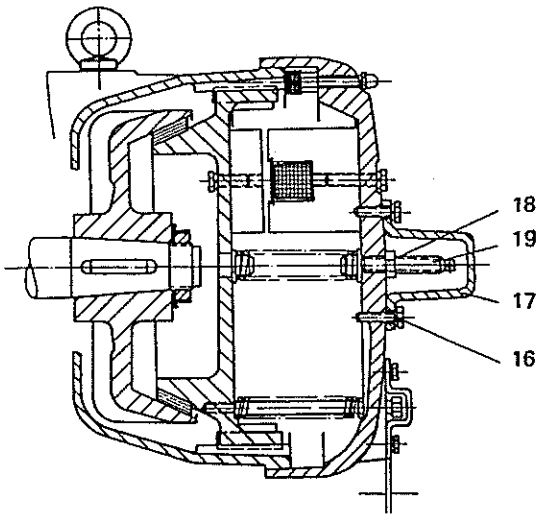
If the air gap between setscrews (14) and housing cover (13) has become smaller than 0,5 mm (rated gap 2 mm) then the brake is to be readjusted (fig. 2). For this, remove cap nut (10) and with draw housing cover (13) with attached brake components. Remove studs (11) and depending on the wear, take 1 or 2 washers (12) off the studs (1 washer = 1 mm). Keep those excess washers for the moment your have to renew the brake lining. After reassembly reestablish the gap between housing cover (13) and setscrew (14). If a further readjustment of the brake is not possible any more because all the washers had already been removed, then renew the guide disc (2) with the attached brake lining (3).

Renewing the brake lining

Remove cap nuts (10) and withdraw cover (13) with the attached brake components. Remove screws (8) and protective caps (9). Unscrew setscrews (14) (mind the spring tension!). Take out guide disc (2). From this old guide disc (2) unscrew aramture (6) fastening it on the new guide disc. With screws (14) fasten new guide disc. Remove studs (11) and place an even quantity of washers (12) under the studs (with new guide disc carrying a new brake lining it takes approx. 6 to 8 washers per stud). Install again housing cover (13) with brake components. With the magnet coil (4) switched on, adjust the gap between housing cover (13) and boltheads (14) to 3 mm. In case after switching off the coil no gap is be left between housing cover (13) and bolthead (14), which should be of 2 mm, then reduce the quantity of washers (12) till this distance is obtained. On the contrary, the washers should be increased accordingly if the brake is not being released when switching on. With the aid of the protective caps align the boltheads (14) and finally put on all the protective caps.

Adjusting the brake torque

On motors with brake torque adjusting device, the maximum brake torque (rated torque) indicated on the rating plate can be reduced at the ratio 3 : 1. Fully screwed-in adjusting spindle (19) sets the brake torque to the rated maximum value. Fully loosened adjusting spindle (19) presents the smallest adjustable brake torque. For adjusting the brake torque remove bolts (16) and take off protective cap (17). Loosen lock nut (18). Turning the adjusting spindle (19) clock wise, you increase the brake torque. Turning it counterclockwise you reduce the brake torque accordingly. After establishing the desired brake torque, tighten again the lock nut (18) and fasten the protective cap (17).



Gap when magnet attracted:
max.: 3 mm
Gap when magnet is switched off
max. 2 mm / min 0,5 mm

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Crane travel brake (Make "Siemens", If available)

Method of operation

The fan (1) transmits the brake torque to the motor shaft and it is secured by two keys to prevent the fan from shifting. The axial adjustment of the fan and the brake ring is carried out in the factory. The brake linings (3) are bonded to the brake ring (2) which can be replaced as a unit (wear part). The brake inset is adjusted to the specified brake torque in the factory.
The magnet coil of the brake is energized when tie motor is switched on. The magnet attracts the armature disc and thus releases the brake. The armature disc completes the magnetic circuit. The armature disc is guided by studs in the magnet base. The braking force is produced by springs which force the armature disc against the rotating brake ring and the latter against the brake housing. The brake permits quick and precise stopping even of high-inertia machines. The brake also remains effective when the motor is at a standstill. The air gap of the magnet is sealed off by a rubber sleeve.

Reducing the brake torque

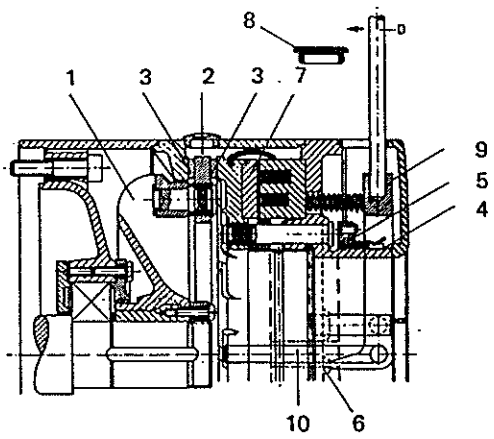
Teh rated brake torque can be reduced by up to 50 %. The treaded ring (4) displaces the thrust plate (5) which presses the compression springs (6) against the armature disc (7), thus altering the brake torque. For this a special wrench (11) is necessary which fits into the toothing of threaded ring (4).

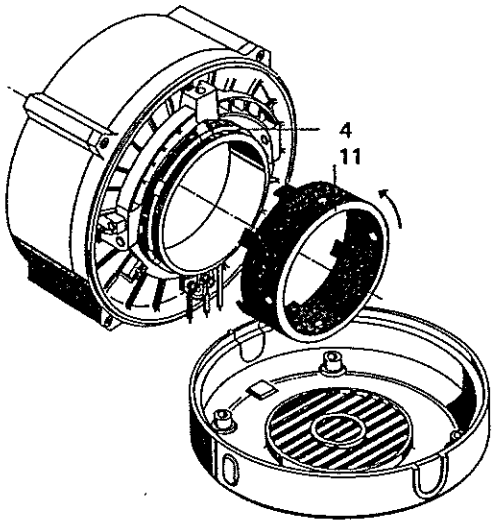
Releasing the brake manually without current

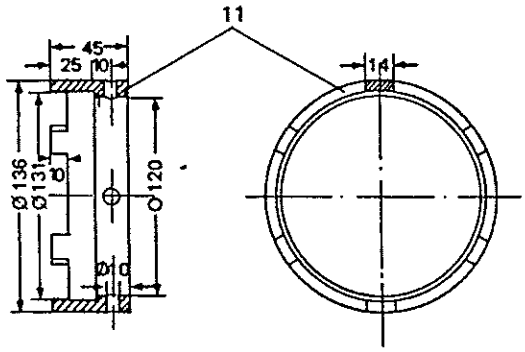
For manual releasing remove gasket (8). Insert pin (D) into the hole of the releasing lever (9). Move pin (D) in the direction of arrow. The releasing lever now lifts releasing pin (10) and the armature disc (7) is retracted.

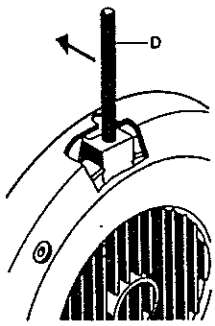
Renewing the brake linings

The only parts of the disc brake subject to wear are the brake linings on the brake ring. When the linings have worn down, the lock washers of the bolts knock against the armature disc.
Unscrew the 4 hexagon-socket bolts. Take off the entire brake inset. Remove the 5 lock washers from the pins carrying the brake ring, and replace the brake ring. Re-install in the reverse order. Any special adjustment is not necessary.









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Electrical plant

The servicing of the electrical plant of the crane must only be carried out in the absence of current.

Switch cabinet

All connection terminals in the switch cabinet and at the other electrical instruments must be tightened after approx. 200 hours of operation. This holds good also for not connected terminals, since the loosening of contact screws may lead to dangerous electrical faults. All terminals must be checked after each change of position.
All infiltrated dust must be blown out with compressed air.
Do not keep tools in the switch cabinet!

Contactor and switch contacts

The contactor and switch contacts must be checked at least half-yearly as to burnt-off spots. They have contacts provided with a sliver layer, which come into contact over a large area without pushing or sliding movement. No lubrication must be carried out, since oil and grease promote spark formation. The silver oxide formed by switch fire formation is, as opposed to copper oxide, fully electrically conductive and must in no case be removed. The contacts must so burn in, that the entire contact area is used for current conduction. Sooting-up and crater formation on working contacts cannot be avoided. Contact grease, files and emery cloth must be kept away from the contacts. In the case of unusual wear (Pearl formation on the contact surfaces), an expert must be consulted.

Motors and generators

All motors and generators are provided with ball bearings. They are given a grease filling in the factory which under normal operating conditions lasts 4500 operational hours. The bearings should be checked every two years. For this purpose the motor must be dismantled. The coils should be cleanded at the same time. The bearings should be well washed with petrol or benzene. After the petrol has evaporated, fill the bearings with ball bearing grease. Only the hollow spaces between the roller bodies and roller paths should be half-filled with grease, so that the bearings do not overheat due to overgreasing. The shaft passages in the closure lids are also to be lined with grease.
Larger motors contain grease nipples and greasing instructions on the capacity plate. The carbon brushes must be in contact over their entire surfaces with the sliprings or the collector. New carbon brushes must previously be ground with emery cloth according to the rounding and the dust must carefully be sucked off. Before putting into operation, check the carbon brushes for mobility and spring tension. With slipring rotor motors, the seat of the carbon brushes in the brush holders must be checked at short intervals and equal pressure on all carbon brushes must be ensured.
If at beginning of operation louder noises appear at the brushes, they must be greased with good-quality vaseline.
To avoid damage to the machines, dust oil and dirt that may have accumulated must be removed at regular intervals and the insulation value must be checked.
All the cooling air passages are best blown out with dry compressed air. It must be insured that the openings for air are not blocked.
Machines should be cleanded only at stillstand and when without current.

Slipring converter

Watch the carbon wear and the easy running of the brush fingers.
Every six months clean the running surfaces of the sliprings with Cramolin "FL" made by R. Schäfer & Co., Mühlacker/Württemberg, or a similar combined contact protection and cleaning preparation.
The pivots at the brushholder limbs must be lubricated at certain intervals with thin acid-free oil. The pivots must be oiled very lightly, so that the slipring converter is not contaminated with dripping oil.
The slipring converter runs in roller bearings. This roller bearing should be lubricated with ball bearing grease according to the greasing plan.

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Load switch box at remote controlled hoist gear

In the context of a total overhaul after two years, the pressure pins in the regulating screws should be lightly oiled with fine instrument oil (use only oil which is guaranteed not to resin and does not thicken at low temperatures).

Eddy current brake

The ball bearings of the eddy current brake contain permanent lubrication. They obtain in the factory a filling of lithium-saponified grease which under normal operating conditions, according to experience, need be renewed only after a number of years. The re-lubrication intervals are 5500 – 6000 operational hours. Under normal operating conditions, re-lubrication is not required, since the bearings should be checked, and therefore dismantled, every two years. For this purpose, the eddy current brake must be dismantled and at the same time the coil and other parts must be cleaned. Wash the bearings well with washing petrol or benzene. After evaporation of the washing agent, fill the bearings well with ball bearing grease on lithium, having a dripping point of at least 180°C. To prevent overheating of the bearings due to overfilling of the grease chambers, only the hollow spaces between the roller bodies and the roller paths should be filled entirely, and the grease chambers halfway. The shaft passages in the bearing lids should also be lined with grease. If the re-greasing time is reached earlier, greasing must be carried out at the grease nipples only during running.

Cables and conduits

The outside of all cables must be checked once a year. Crumbly cables and conduits must be renewed. The supply line must be watched specially.

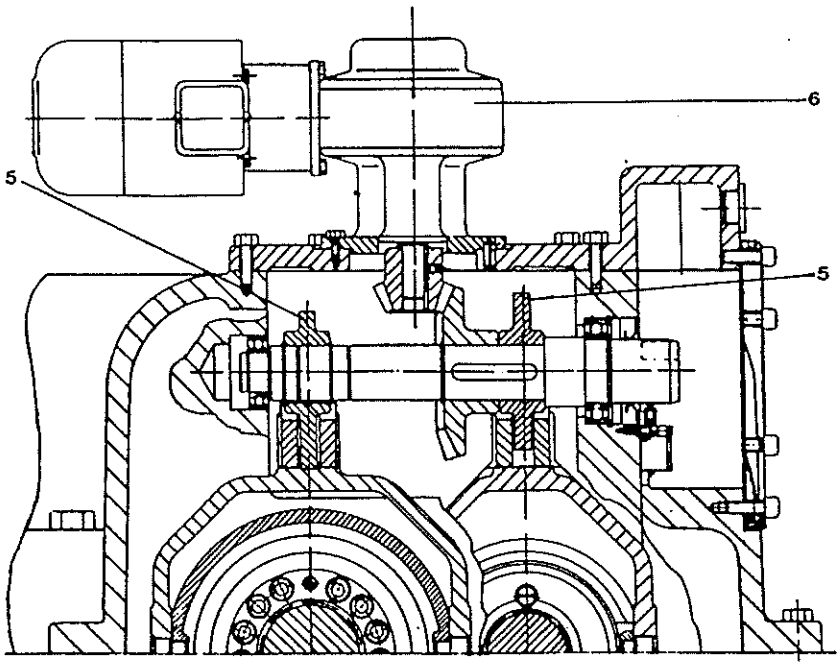
Limit switches and brake release devices

The plungers and rollers of the switches must be cleaned and lightly greased every six weeks. Thin oil is recommended for winter operation.

Four-step, remotely controlled hoisting unit drive SKKA

Description

As switching elements, the proven SZDF-couplings are used. The couplings for the gears 1 to 4 are switched via the cam plates 5, driven by the switching motor 6; this very much simplifies the control. For each gear speed, a limit switch 1a to 4a is provided, which brings the switching to a standstill in the selected position. It then confirms via a second contact that the selected gear has been switched in.



The limit switches are housed in a protected space and are safe from outside destruction. a plexiglas windos permits the observation of the switching position from outside. The limit switches need not be adjusted.

There is a limit switch for each gear. The motor drives the switching shaft clockwise (when viewing the switch housing). The set gear frees the associated limit switch. The switch-over takes plase only when the breaking contactor is switched off. The drive gear can only be actuated again. when the switch-over process is completed.

The gear switch-over is actuated from a selector switch at the control stand.

The switching sequence of the gears is 1–4–3–2.

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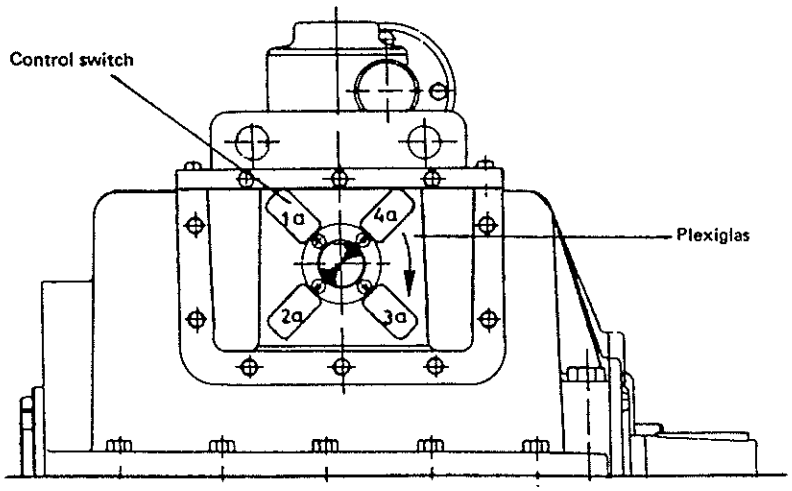
Electrical gear change

1. When built in as a load drive (hoist unit) the electrical gear change must not be arranged between the drum and the load-holding brake.
   When changing gear electrically, the brake need not be released or the load be set down. If gear change takes place under load, a change to a higher gear speed cannot take place if its overload limit has responded. The hoist unit continues running in the former gear.
2. The electrical gear change can be actuated only at standstill.
3. The clutch and the limit switches need not be adjusted, because they are set by the manufacturer.
4. The switching and drive motor is delivered containing an oil filling sufficient for several years "operation and therefore requires practically no maintenance.



Pressure oil pumps

When the tubes are clamped on, care must be taken to ensure that the pressure oil tube of the cylinder at the upper connection and the leak oil tube at the lower connection of the pressure oil pumps are correctly located. The leak oil tube only passes the leak oil that occurs in the pressure oil cylinder back into the pump pot.
As pressure agent, a well lubricating oil, not too viscous, should be used. The setting point of the oil should be as low as possible. (see lubricator recommendations in the appendix).
The oil is filled in through a filling screw marked red. After a number of trial switchings, some oil must be added, since the pressure tube and part of the cylinder space must be filled up.
The tube connections are easily sealed, if they are not forcibly turned too far. During the first three days of operation, the formation of oil drops there must be checked. If no drops form, the connections are permanently sealed and no oil need be added. Oil change is carried out by removing the motor and pump from the housing after removal of the 3 M 6 screws, and during out the oil. The oil container is then cleaned with a cleaning cloth (not cleaning wool) of residual oil sludge. Further instructions for oil change are to be found in the chapter "Lubrication service" or in the lubrication plan.

Ball bearing slewing ring

The re-greasing must be undertaken with a good acid-and resin-free ball bearing grease according to the lubricant recommendations. The grease must be pressed with a grease gun into all greasing nipples for the ball bearing slewing ring. The crane is then slewed by about 15^{o} and grease is again pressed in. This process is operated four or five times until the grease protrudes over the entire circumference from the bearing gap. The grease collar serves as a seal and must not be removed.
Re-grease every week or before a longer operational standstill.
The teeth of the ball bearing slewing ring must be greased when blank spots appear.
The fastening screws must be tightened every week with a torque spanner or the torque indicated under "Crane erection". This must always be carried out crosswise.
If the crane operates only within a certain range, say from $0 - 90^{o}$, the ball bearing slewing ring must be advanced every half to one year, with reference to this range.

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Steel construction

Blank spots must immediately be painted with an anti-corrosion paint and aluminium bronze. Rusty spots must be cleaned before painting. Bent, broken or damaged parts must immediately be straightened or exchanged. Name plates and the like can be fastened only to the closed driver's stands.
Repair welding on bearing parts must be carried out by the manufacturer or a welding engineer from the factory or an expert from the Technical Supervision Office must be called in prior to starting the work.
The steel grade used by the manufacturer is marked by the type plate shape.
St 37 = rectangular type plate
St 52 = type plate with bevelled front sides.

Rope maintenance

Besides correct application and assembly, the working life of the wire ropes lies literally – by way of immaculate care – in the hands of the user. A rusty rope endangers human life. The grease to be used are indicated under "Lubricant recommendations".
Ropes with hemp cores must be lubricated only with acid-free lubricants penetrating to the inside, being liquid. This not only prevents the scouring-off of hemp fibres by the steel wires, but also keeps the hemp core soft and ensures the suppleness of the rope. Careful greasing of the rope keeps umidity out, which may lead to internal corrosion, and also prevents bacteria growth in the hemp.
Frequent but not excessive lubrication of the wire ropes better results than occaisional but strong lubrication. As soon as the grease film disappears from places on the rope, re-greasing becomes necessary. An interval cannot be stated. During rainy periods more frequent greasing is required than during warm, dry period.

Once a year the rope must be treated with an impregnation means. Recommended is "Lotex S", manufactured by Chemische. Fabrik, Oberol, Bremen. Resinous and crusty greases are thus given back their lubricating properties. The ropes must be re-greased only when completely dry, since otherwise humidity, that may be present in the rope, may be enclosed and so promote corrosion from inside.
Re-greasing is best carried out on the drum by means of a brush when the drum stands still. The rope nestling against the drum curvature is slightly open, which greatly facilitates the penetration of the lubricant into the interior of the rope. If required, the lubricant should be thinned by heating. Under no circumstances must crude oils, paraffins, old oils or other oils be used, which are not chemically neutral for the wires and the hemp core.

Time for discarding ropes
Acoording to DIN 15020, sheet 2, the cross-lay ropes used in PEINER cranes corresponding to DIN 655 or DIN 3064 FE, must be discarded at:
30 visible wire breaks over a length of 6 x rope diameter or
60 visible wire breaks over a length of 30 x rope diameter.

Cross-lay ropes according to DIN 656 G should be discarded at:
18 visible wire breaks over a length of 6 x rope diameter or
36 visible wire breaks over a length of 30 x rope diameter.

Plated ropes according to DIN 6895 should be discarded at:
10 visivle wire breaks over a length of 1 m.

All ropes must be discarded when
one rope strand breaks
or the diameter is reduced by 10%
or rust occurs which cannot be removed with a wire brush or is formed internally due to humidity or sea air,
or when electric lines, carrying current, are touched,
or when the rope has been squeezed, or subjected to buckling or particularly serve wear.

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Hook block

Traverse, axial bearing and hooks must be checked yearly according to DIN 15 405. At the same time, the ball bearings of the rope pulleys should be greased.

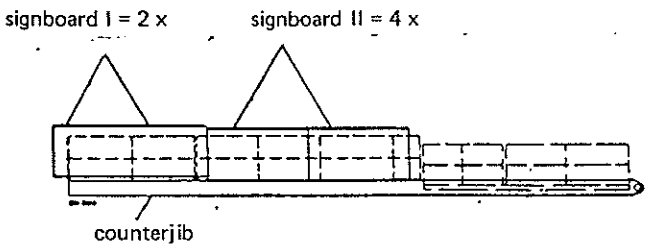
Signboards

By using the jib L 1 and L 2 signboards may only be attached on either side at the counterjib utilizing the already existing surfaces exposed to wind action. It is forbidden, however, to create any additional wind-action surfaces by attaching any additional boards.

Signboards size I = 3.75 m x 1.25 m

Signboards size II = 2.50 m x 1.25 m

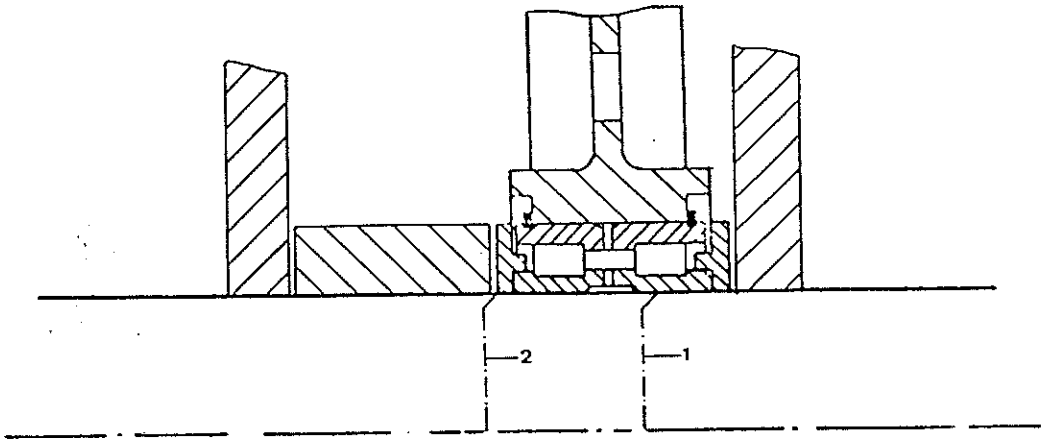
View for mounting the signboards by using jib L 3, L 4 and L 5.



Renewing the rope pulleys

Installation of the rope pulleys

1. Slightly oil the axle.
2. Insert the rope pulley, install the axle.
   With several rope pulleys on one axle proceed as follows:
   a) Insert 1st rope pulley. Install axle up to middle of the bearing (see line 1). Insert auxiliary ring and advance axle to the end of the bearing (see line 2).
   b) Remove auxiliary ring and insert second rope pulley. Complete installation of the axle.



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Installation of the bearings

1. Carefully clean and deburr bearing seats on the axle and in the bore.
2. Check pulley bores, pulley width and axle for dimensional accuracy.
   Bore tolerance: N 7
   Axle tolerance: f 8
3. Slightly oil or grease seat (we recommend the following lubricants: Altemp paste from Klüber, or Never seez from Weidling).
4. Place rope pulley on the correct spacer ring (3) to avoid any contacting of the cylindrical roller bearing when it is pressed in.
5. When inserting by hand, put on the cylindrical roller bearing at an angle, but never cog it. When installing it in or under a press, place cylindrical roller bearing on pressing-in tool (4).
6. Using pressing-in tool (4) press in cylindrical roller bearing at the outer ring down to the distance $\frac{B1-B4}{2}$.
7. Snap in retaining ring.
8. Put on cover rings.