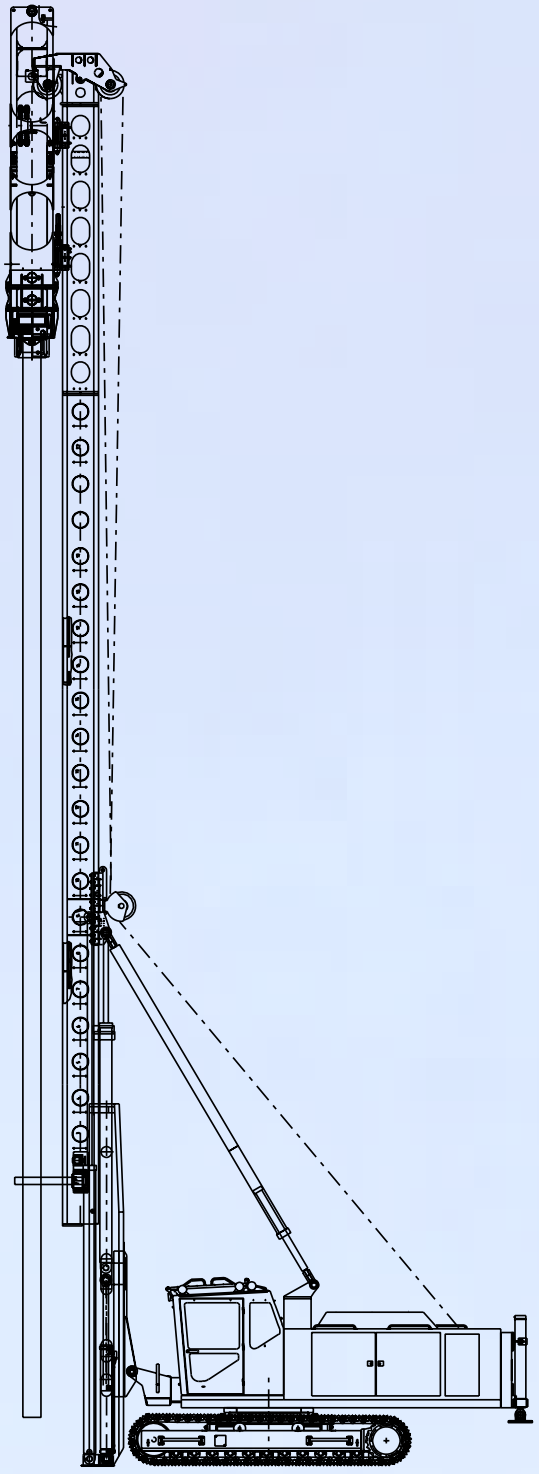
OPERATOR'S MANUAL

JUNTTAN

PM 20L Piling rig s/n 1461



OPERATOR'S MANUAL

MANUAL REFERENCE NUMBER: PM2014612013

THIS MANUAL COVERS THE OPERATOR'S INSTRUCTIONS OF

JUNTTAN PILING RIG

MODEL	PM 20L
SERIAL NUMBER	1461
YEAR OF MANUFACTURE	2008

Manufacturer:	JUNTTAN OY
Full address:	Matkuksentie 7 FI-70800 KUOPIO FINLAND
Mail address:	PL 1702 FI-70701 KUOPIO FINLAND
Phone:	+ 358 10 195 221
Fax:	+ 358 17 287 44 11
Homepage:	www.junttan.com
Email:	junttan@junttan.com

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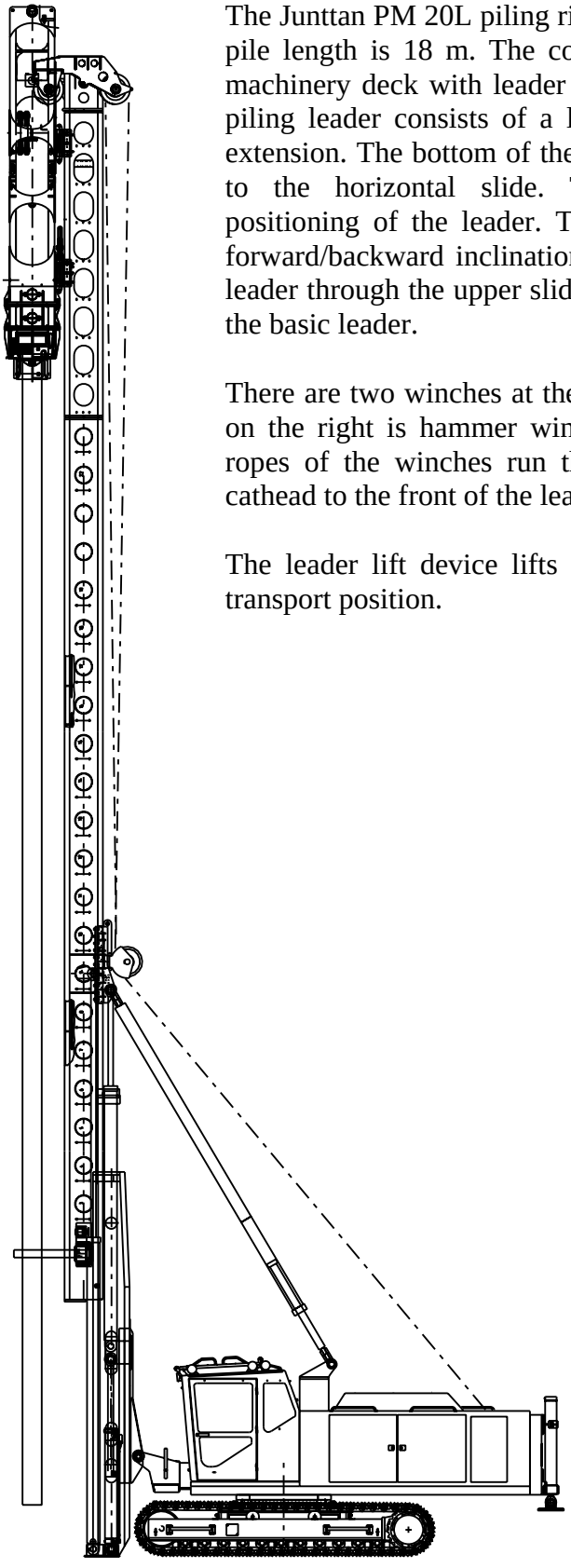
1. INTRODUCTION SECTION



The Junttan PM 20L piling rig is designed for pile driving. Maximum pile length is 18 m. The construction of the machine is a rotating machinery deck with leader on crawler-mounted undercarriage. The piling leader consists of a leader, basic leader and optional leader extension. The bottom of the leader is connected with the cross joint to the horizontal slide. These allow vertical and horizontal positioning of the leader. The lateral inclination cylinders and the forward/backward inclination cylinder control the inclination of the leader through the upper slide. The leader slides axially in relation to the basic leader.

There are two winches at the rear of the machinery deck. The winch on the right is hammer winch and the left one is pile winch. The ropes of the winches run through sheaves in the upper slide and cathead to the front of the leader.

The leader lift device lifts and lowers the leader from and to the transport position.

2. SAFETY SECTION

2.1 IMPORTANT ASPECTS OF SAFETY

Pay special attention to the sections which are identified with Safety Alert Symbol. Follow the instructions in the safety message.

⚠ WARNING

⚠ DANGER

⚠ ATTENTION

You should read and understand all the safety instructions and operating instructions before you start using, maintaining, lubricating or repairing this machine.

Accidents can be caused by ignorance of instructions, neglect of safety measures and carelessness.

A person operating, servicing or repairing should always be alert and have adequate training and skill to operate the machine and conduct the other actions properly and according to the instructions. An operator is responsible for the proper use of the machine.

Incorrect use, lubrication or repair can be dangerous and lead to physical injury or damage to the machine.

The instructions in these manuals, specifications, illustrations and drawings are based on the information available at the time of writing.

The above information can be changed. These changes may affect the use, lubrication, service and repair procedures. Junttan or its dealer will provide you with up-to-date information regarding the operation and maintenance of this machine.

If the operator's manual is missing or worn out you can get a new one from Junttan or its dealer.

Safe and efficient operation of this machine requires that it be maintained in good condition and that its operator be thoroughly familiar with the controls and the general capability of the machine.

2.2 SAFETY ASPECTS REGARDING THE MACHINE

The fluids used in the machine are flammable and smoking is forbidden during fill up and maintenance of the fuel system.

The hydraulic oil is under pressure during operation and can be hot. Prior to disconnecting any parts from the hydraulic system make sure that you relieve the pressure.

Take adequate measures when working with hot machine parts.

The batteries of the machine contain corrosive acid and may develop toxic or explosive gases. Do not smoke, avoid creation of sparks when working with the batteries, and be careful not to tip the batteries over when lifting them.

Keep all materials and fluids in properly designed and marked containers.

Do not keep any loose items on the machine or in the cab. They should be stored in appropriate compartments or elsewhere outside the machine.

Report damages to machine components immediately. Repair oil leakages without delay.

Avoid staying near the engine exhaust when the engine is running.

⚠ WARNING

Do not to stay within the operating radius.

2.3 SAFETY ASPECTS REGARDING THE WORK SITE

The machine should only be operated on ground which gives sufficient support. Working or travel on slopes should be avoided.

You should be familiar with the dimensions of the machine and use the mirrors to detect objects hidden by parts of the machine.

When working near power lines or high voltage lines find out the proper safe working distance.

Danger zone is shown in the picture at the end of safety section.

Do not stand on any mobile parts of the machine during operation. Do not stand or walk on any steel ropes, hydraulic tubes or hoses. During operation do not stand over a rope. Keep a minimum distance of one metre from pressurised tubes and hoses.

Do not go under the machine or any part of it and preferably stay out of the working radius during operation. Do not let outside personnel into the working area. Keep doors and covers closed secured to their positions.

No adjustments should be made during operation unless expressly instructed to do so. Keep you hands away from fans and any moving parts. Do not start using the machine if a wind exceeding 20 m/s (72 km/h, Fresh gale). When the wind velocity exceeds 20 m/s, fresh gale, the machine has to be lowered to the transport position. Recommended operating temperature is -20°C – +40 °C.

Check that the emergency stops of the engine are in working order before start of each shift.

2.4 SAFETY ASPECTS DURING NON-OPERATION

The machine should always be parked on level ground, leader foot on ground, hammer against ground and leader at a slight backward inclination. Alternatively the machine can be parked to the transport position.

During storage lock the doors and covers, remove the ignition keys and turn the main switch off. In transport the slewing mechanism lock must be engaged. When you lift the machine with slings use only the indicated lifting points.

⚠ ATTENTION

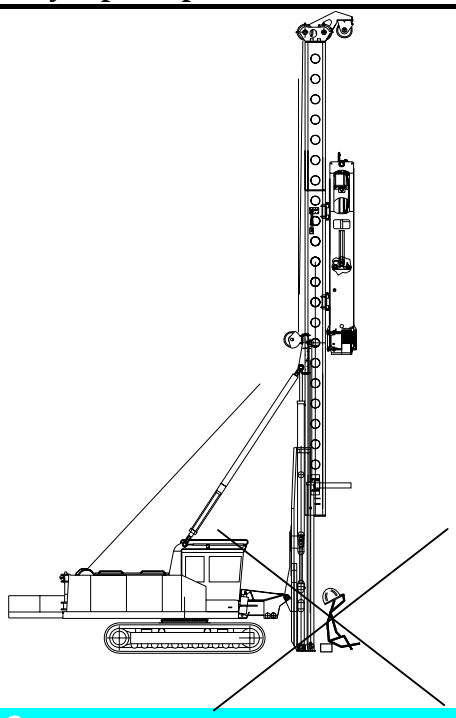
There shall be always at least two persons (operator, helper) when servicing or maintaining the machine in the working site. One of them shall supervise the safety of other workers. The operator shall have possibility to use emergency stops in all situations when machine is used. Always use sufficiently lights in the operation area. Secure communication between workers and operator in all situations.

2.5 PERSONNEL SAFETY

When working on the jobsite near the machine in operation use a helmet. Do not use oil stained or damaged clothing. Do not wear objects that may get entangled. Use ear protection during operation. Use gloves when working with steel ropes. Use goggles to protect your eyes and safety shoes to protect your feet.

⚠ WARNING

Do not place yourself under hammer or any rope suspended loads.



2.6 EMERGENCY SYSTEMS

The machine has low voltage (24 VDC) electric system. The ignition switch switches off the instruments in the cab and the main switch turns off all the power. There are fuses in all the circuits. The engine emergency stop is in the cab and both sides of the machine. Machine is equipped with two extinguishers (one in the cab and one beside the swing drive). In case of emergency it is possible to exit cab through a window or a door.

There are main relief valves and work port relief valves in the hydraulic system. The load carrying hydraulic cylinders are equipped with load holding valves against hose breakage. When the safety lever in the cab is in the back position it turns off the pilot pressure from all the hydraulic functions. For the locations of the controls mentioned above see chapter Operator's controls.

2.7 WARNING SIGNS

There are several warning signs on this machine. Please read all warning signs. Keep signs clean and replace them if the words cannot be read.

WARNING
HOT SURFACE

WARNING
STAY CLEAR OF
ROTATING PARTS

WARNING
STAY CLEAR OF
STABILIZER CYLINDER

WARNING
DO NOT GO UNDER THE HAMMER OR ANY PART OF IT AND STAY OUT OF THE WORKING RADIUS DURING OPERATION.

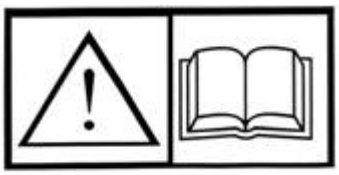
WARNING
KEEP CLEAR
OF PILE DRIVER
WHEN IN OPERATION

WARNING
MOVING
COUNTERWEIGHT

DANGER
IT IS STRICTLY FORBIDDEN
TO WORK OR STAND
UNDER HAMMER OR ANY
ROPE SUSPENDED LOAD

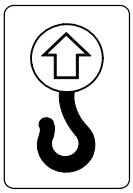
CAUTION
Pressurized vessel.
Discharge prior
to disassembly.
Use only nitrogen

GENERAL INFORMATION



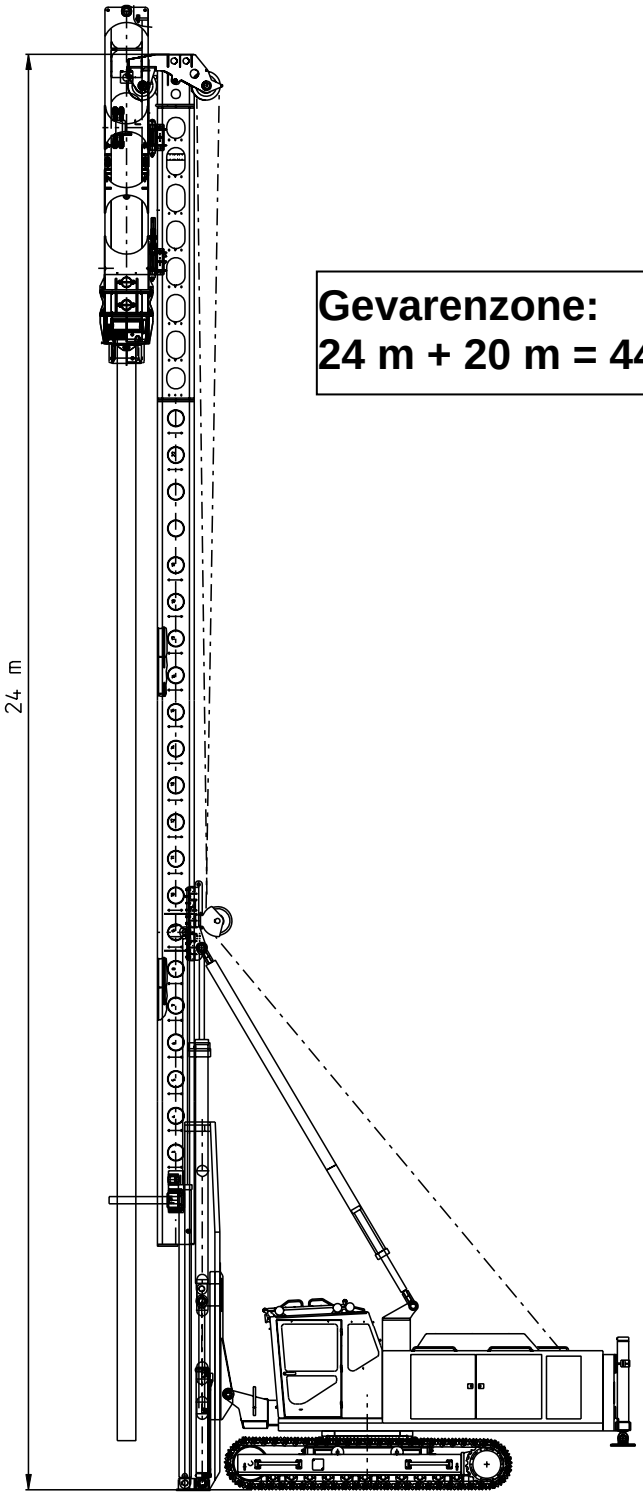
Read all safety instructions and operating instructions before start using or servicing this machine.

Emergency exit



Lifting point

2.8 DANGER ZONE



Gevarenzone:
24 m + 20 m = 44 m

3. SPECIFICATIONS SECTION

3.1 GENERAL IDENTIFICATION

Trade mark of the machine:	Junttan PM 20L
Type of the machine:	Piling rig for impact driving
Model:	PM 20L
Serial number:	1461
Name and address of manufacturer:	Junttan Oy PL 1702 70701 KUOPIO FINLAND
Year of manufacture:	2008

3.2 GENERAL DIMENSIONS

Maximum height:	23 450 mm
Maximum width in working:	4 350 mm
Maximum length:	9 230 mm
Maximum pile length (with hammer HHK 3/4AL):	18 000 mm

3.2.1 TRANSPORT DIMENSIONS

Length (leader turned):	19 450 mm
Width:	3 350 mm
Height:	3 300 mm
Height (with hammer HHK 3/4AL):	3 700 mm

3.2.2 CRAWLER

Dimension between sprocket axis and the idler axis:	3 920 mm
Total length of crawler base:	4 760 mm
Transverse width over tracks in transport:	3 350 mm
Transverse width over tracks in full working width:	4 350 mm
Size of track shoes:	900 mm
Number of track shoes:	2*61
Number of rollers upper run:	-
Number of rollers bottom run:	12

3.3 ENGINE

Name of manufacturer:	Cummins
Type of engine:	Turbo-charged diesel
Model of engine:	QSB6.7 Tier3
Serial number of engine:	**21791780**
Number of cylinders:	6 (in line)
Bore:	104 mm
Stroke:	132 mm
Rated power:	176 kW/240 hp at 2000 rpm
Type of fuel filter:	FS-19732, FF-5485
Type of oil filter:	LF-3970
Type of air filters:	P77-7414 P77-7409
Type of cooling system:	By liquid

3.4 HYDRAULIC PUMPS

Main pump

- model:	A8VO80LA1KH3
- type:	adjustable double axial pump with summing power regulation
- rated capacity/rotation speed:	max. 2 * 170 l/min at 2200 rpm
- service operating pressure:	max. 350 bar

Secondary pump

- model:	A2FO45
- type:	fixed displacement pump
- rated capacity/rotation speed:	max. 98 l/min at 2200 rpm
- service operating pressure:	max. 350 bar

Auxiliary pump

- model:	0510665354
- type:	double fixed displacement gear pump
- rated capacity/rotation speed:	22+32 l/min at 2000 rpm

3.5 HYDRAULIC MOTORS

Travel motor and transmission (2)	
- model:	H1CR90-S/Brevini CTU 3700
- type:	hydraulic axial piston motor with build in transmission
- torque:	70 000 Nm
- operating pressure:	300 bar
- drive speed:	1,5 km/h
Swing motor and transmission	
- model:	H1C20-S/Brevini RPR3150
- type:	hydraulic axial piston motor with build in transmission
- torque:	12 500 Nm
- operating pressure:	220 bar
- uppercarriage rotation speed:	2,5 RPM

3.6 CYLINDERS

Leader lift device cylinders (2)	
- type:	double acting telescopic cylinder
- stroke:	1050 mm
- load holding valve installed	
Lateral inclination cylinders (2)	
- type:	double acting
- stroke:	1400 mm
- load holding valve installed	
Forward inclination cylinder	
- type:	double acting
- stroke:	3700 mm
- load holding valve installed	
Leader extension cylinder	
- type:	double acting
- stroke:	4000 mm
- load holding valve installed	
Leader foot cylinder	
- type:	double acting
- stroke:	1500 mm
- load holding valve installed	

Horizontal slide cylinder

- type:	double acting
- stroke:	1500 mm

Track width adjustment cylinders (2)

- type:	double acting
- stroke:	1000 mm
- load holding valve installed	

Pile arm cylinders (2)

- type:	double acting
- stroke:	265 mm
- load holding valve installed	

Stabilizer cylinder (2)

- type:	double acting
- stroke:	1150 mm
- load holding valve installed	

3.7 HYDRAULIC FILTERS

See attached schematic diagram of hydraulic circuits of the machine and of the various items of equipment.

Piping: Steel hydraulic pipes and reinforced hydraulic hoses
Cooling system: Hydraulic oil coolers with fans

Filters

- pressure: FF7006.Q020.BS35.GL20, cartridge FC7006.Q020.BK (3)
- return: FF1097.Q010.BA16.SX32-M, cartridge FC1097.Q010.BS (2)
- leak oil: FF1003.Q005.BA16.GT12, element FC1003.Q005.BS (1)

3.8 ELECTRICAL COMPONENTS

Battery type and capacity:	2 * 12 V 180 Ah
Details of electrical controls and equipment:	24 VDC with fuses and relays

See attached schematic diagram of electric circuits of the machine and of the various items of equipment.

3.9 WINCHES

Pile winch (left)

- model:	BB7
- lifting capacity:	8 ton
- ropeline specification:	Ø22 mm-70 m, 35*7 Compacted 2160 N/mm^2

Hammer winch (right)

- model:	BB7
- lifting capacity:	10 ton
- ropeline specification:	Ø25 mm-52 m, 6x36-IWRC 1770 N/mm^2

3.10 SAFETY DEVICES

AUDIBLE ALARMS

- hammer top position on the leader
- pile winch top position on the leader
- drive
- swing
- pressure of the forward inclination cylinder too high
- by-pass switch of the winches top limits

VISUAL ALARMS

- position of the safety lever
- leader inclinometer
- forward inclination cylinder released
- base carrier inclination meters
- winches top position
- winches brakes
- filter blockage
- backward inclination >30°
- hydraulic oil level
- horizontal slide and lateral inclination cylinders in
- leader lift device fully up
- leader against leader lift device
- air filter
- engine oil pressure
- engine temperature
- charge indicator
- fuel level
- piling switch position
- engine indicator lamps

WARNING SIGNS

- warning signs are shown in safety section

OTHER

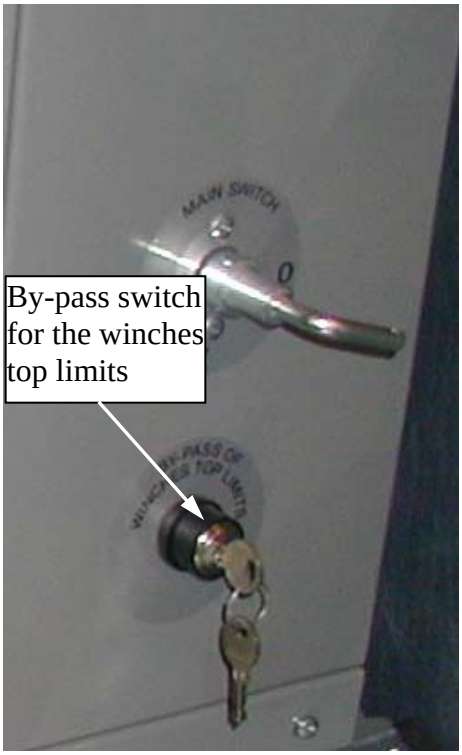
- safety lever to deactivate controls in the cab
- engine emergency stop
- sensor for horizontal slide in-position
- sensor for leader position on leader lift device
- sensor for leader lift device top-position
- sensor for lateral inclination cylinder in-position

WINCHES TOP LIMITS

Stops the following functions, which can lead to damage of the steel ropes:

- leader foot cylinder (pull-in function prevented)
- forward inclination cylinder (push-out function prevented)
- leader telescope cylinder (push-out function prevented)
- lateral inclination cylinders (push-out function prevented)
- horizontal slide cylinder (push-out function prevented)

If the winch top limit or cable is broken and the leader is in the vertical position, it is not possible to lower the leader. In this case you must by-pass the top limits, switch on the left console. See also section Signal lights in the upper console.



3.11 WEIGHT (WORKING)

Base machine with leader:	39 000 kg
(net including full fuel and oil tanks, etc.)	
Counterweight:	7 500 kg
Rotary head (JD 1.5):	500 kg
Hammer (HHK 3AL):	6 400 kg
Hammer (HHK 4AL):	7 700 kg
Base machine with counterweight and hammer 3AL:	**52 900 kg**
Base machine with counterweight and hammer 4AL:	**54 200 kg**

3.11.1 TRANSPORT WEIGHT

Approximate weight with hammer 3AL:	52 900 kg
Approximate weight with hammer 4AL:	54 200 kg

3.12 FLUID AND LUBRICANTS CAPACITIES

Location	Type, factory filled	Standards	Capacity
Engine oil	Neste turbo LXE 15W-40 mineral	API CH-4/SJ, ACEA E5, E3, B3, CES 20071	17 litres
Engine coolant	Neste coolant 50% mixture	BS6580:1992, Afnor R15-601, ASTM D 3306	35 litres
Hydraulic oil	Neste hydraulic 46 mineral, VG46	ISO 3448, DIN 51524 HVLP	600 litres
Fuel	Diesel	ASTM No. 2 D above 0 ºC No. 1 D below 0 ºC	600 litres
Swing drive planetary	Neste hypoidi LF SAE 80W(77W)-90	API GL-5, MIL-L-2105 D	10 litres
Track drive planetary	Neste hypoidi LF SAE 80W(77W)-90	API GL-5, MIL-L-2105 D	5.5 litres

Minimum purity of grade of hydraulic oil: 20/18/15 -ISO-4406 (c)

⚠ ATTENTION

Recommended operating temperature is -20°C - +40°C.

Recommended oil brands:

Location	Manufacturer					
	Neste	Mobil	Esso	Shell	Castrol	Teboil
Engine oil	Turbo LXE	Delvac XHP, Delvac HP	Essolube XT 501	Rimula Super, Super FE	RX Super Plus	Super HPD, Power
Hydraulic oil	Hydrauli 46	Flowrex 86, DTE 15M	Univis N 46	Tellus T 46, TX 46	Hyspin AWH 46	Hydraulic oil 46 S, Lift 46
* Swing drive planetary	Hypoidi LF S 80W (77W)-90	Mobilube 1 SHC	Gear Oil TDL	Transaxle Oil 75W-90, Spirax ASX	Syntrax Universal	Hypoid SAE 75W-90
* Track drive planetary	Hypoidi LF S 80W (77W)-90	Mobilube 1 SHC	Gear Oil TDL	Transaxle Oil 75W-90, Spirax ASX	Syntrax Universal	Hypoid SAE 75W-90

* See also transmission manufacturers instructions.

⚠ ATTENTION

Incorrect fuel, oil, grease or fluid can damage the machine.

GREASING		
Location	**Type, factory filled**	**Standards**
General greasing, bearings and slewing ring	Neste Allrex EP2	DIN KP2N-30, ISO-L-XCDIB2
Guide claws of hammer and rotary head	Neste Molygrease	NLGI 2
Pinion gear of swing drive	Würth Vaseline	
Steel ropes	Würth HHS 2000	
Central lubrication system	Teboil Universal CLS	

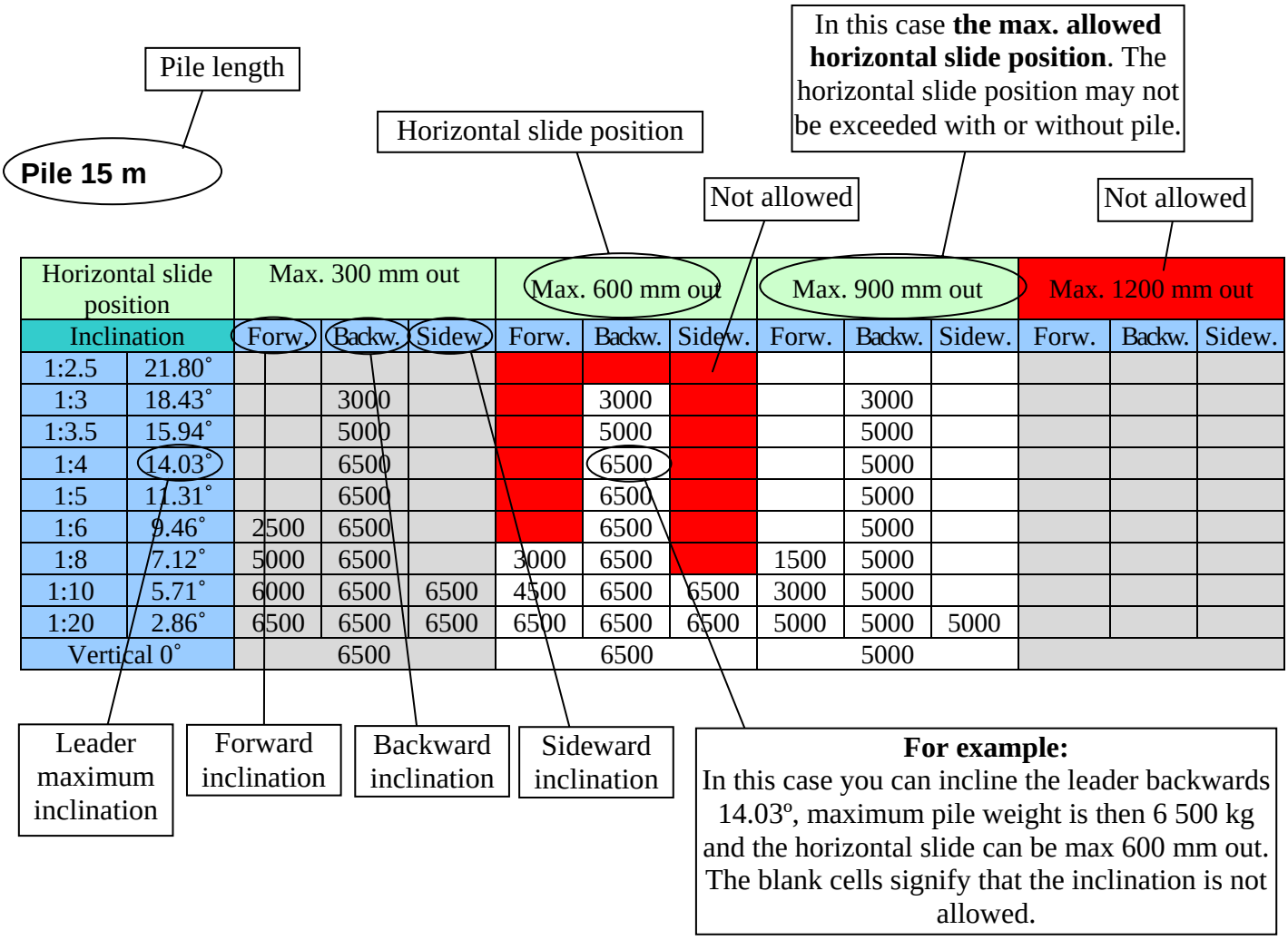
Recommended grease brands:

Location	Manufacturer					
	Neste	Mobil	Esso	Shell	Castrol	Teboil
General greasing, bearings and slewing ring	Allrex EP2	Mobilgrease MP	General grease	Retinax EP2, EPL 2	LM Plus	Multi-purpose grease
Guide claws of hammer and rotary head	Molygrease	Mobilgrease Special	Moly Grease 2	Retinax HDX 2	MS1	Universal M
Pinion gear of swing drive		Mobiltac 81	Surret Fluid NX	Malleus Fluid D		
Steel ropes						
Central lubrication system	Teboil Universal CLS	See instructions from manufacturer of central lubrication system.				

3.13 CAPACITY TABLES

Instructions how to read capacity tables:

Tables are calculated for the hammer HHK 3/4A. Counterweight is 7 500 kg. Leader foot is slightly above ground or against hard ground before inclinations. Maximum allowed pile weights are shown in kilograms.



Horizontal slide position		Max. 300 mm out			Max. 600 mm out			Max. 900 mm out			Max. 1200 mm out		
Inclination		Forw.	Backw.	Sidew.	Forw.	Backw.	Sidew.	Forw.	Backw.	Sidew.	Forw.	Backw.	Sidew.
1:2.5	21.80˚												
1:3	18.43˚		3000			3000			3000				
1:3.5	15.94˚		5000			5000			5000				
1:4	14.03˚		6500			6500			5000				
1:5	11.31˚		6500			6500			5000				
1:6	9.46˚	2500	6500			6500			5000				
1:8	7.12˚	5000	6500		3000	6500		1500	5000				
1:10	5.71˚	6000	6500	6500	4500	6500	6500	3000	5000				
1:20	2.86˚	6500	6500	6500	6500	6500	6500	5000	5000	5000			
Vertical 0˚			6500			6500			5000				

Leader maximum inclination

Forward inclination

Backward inclination

Sideward inclination

For example:
In this case you can incline the leader backwards 14.03º, maximum pile weight is then 6 500 kg and the horizontal slide can be max 600 mm out. The blank cells signify that the inclination is not allowed.

CAPACITY TABLE, EN996

Machine type: Piling rig
Machine model: PM 20L
Serial number: 1461
Horizontal slide: Horizontal slide is projected 300, 600, 900 and 1200 mm out.
Counterweight: Weight 6 000 kg (include stabilizers).

1. **With tracks in full width and on horizontal, level and firm ground.**
2. **Counterweight position: full weight.**
3. **Leader foot is slightly above ground, and the pile is resting on the ground before inclinations.**
4. **Stabilizers (optional): Support stabilizers against ground always when driving backward inclined piles.**
5. **See Users' Manual for details.**

Leader length: **18.6 m** + cathead 0.85 m and 4 m telescope.
Leader sections: 13.8 + 4.8 m
Hydraulic hammer: **HHK 3AL, total weight 6 400 kg**

Maximum pile weights in kg

Pile 18 m

Horizontal slide position		Max. 300 mm out			Max. 600 mm out			Max. 900 mm out			Max. 1200 mm out		
Inclination		Forw.	Backw.	Sidew.	Forw.	Backw.	Sidew.	Forw.	Backw.	Sidew.	Forw.	Backw.	Sidew.
1:3	18.43˚												
1:3.5	15.94˚		3000			3000			3000			3000	
1:4	14.03˚		5500			5500			5500			5000	
1:5	11.31˚		6500			6500			6000			5000	
1:6	9.46˚	2500	6500			6500			6000			5000	
1:8	7.12˚	4500	6500		3000	6500		2000	6000			5000	
1:10	5.71˚	6000	6500	6500	4500	6500	6500	3000	6000			5000	
1:20	2.86˚	6500	6500	6500	6500	6500	6500	5500	6000	6000	4000	5000	5000
Vertical 0˚			6500			6500			6000			5000	

Pile 16 m

Horizontal slide position		Max. 300 mm out			Max. 600 mm out			Max. 900 mm out			Max. 1200 mm out		
Inclination		Forw.	Backw.	Sidew.	Forw.	Backw.	Sidew.	Forw.	Backw.	Sidew.	Forw.	Backw.	Sidew.
1:3	18.43˚		3500			3500			3500			3500	
1:3.5	15.94˚		5000			5000			5000			5000	
1:4	14.03˚		6500			6500			6000			5000	
1:5	11.31˚	2000	6500			6500			6000			5000	
1:6	9.46˚	3500	6500		2000	6500			6000			5000	
1:8	7.12˚	5500	6500		4000	6500		2500	6000		1500	5000	
1:10	5.71˚	6500	6500	6500	5000	6500	6500	3500	6000		2500	5000	
1:20	2.86˚	6500	6500	6500	6500	6500	6500	6000	6000	6000	4500	5000	5000
Vertical 0˚			6500			6500			6000			5000	

Leader length: **18.6 m** + cathead 0.85 m and 4 m telescope.
Leader sections: 13.8 + 4.8 m
Hydraulic hammer: **HHK 3AL, total weight 6 400 kg**

Maximum pile weights in kg

Pile 14 m

Horizontal slide position		Max. 300 mm out			Max. 600 mm out			Max. 900 mm out			Max. 1200 mm out		
Inclination		Forw.	Backw.	Sidew.	Forw.	Backw.	Sidew.	Forw.	Backw.	Sidew.	Forw.	Backw.	Sidew.
1:2.5	21.80˚		2000			2000			2000			2000	
1:3	18.43˚		4500			4500			4500			4500	
1:3.5	15.94˚		6000			6000			6000			5000	
1:4	14.03˚	1500	6500			6500			6000			5000	
1:5	11.31˚	3000	6500		2000	6500			6000			5000	
1:6	9.46˚	4500	6500		3000	6500		2000	6000			5000	
1:8	7.12˚	6500	6500		5000	6500		3500	6000		2000	5000	
1:10	5.71˚	6500	6500	6500	6000	6500	6500	4500	6000		3000	5000	
1:20	2.86˚	6500	6500	6500	6500	6500	6500	6000	6000	6000	5000	5000	5000
Vertical 0˚			6500			6500			6000			5000	

Pile 12 m

Horizontal slide position		Max. 300 mm out			Max. 600 mm out			Max. 900 mm out			Max. 1200 mm out		
Inclination		Forw.	Backw.	Sidew.	Forw.	Backw.	Sidew.	Forw.	Backw.	Sidew.	Forw.	Backw.	Sidew.
1:2.5	21.80˚		3000			3000			3000			3000	
1:3	18.43˚		5500			5500			5500			5000	
1:3.5	15.94˚		6500			6500			6000			5000	
1:4	14.03˚	2500	6500		1000	6500			6000			5000	
1:5	11.31˚	4500	6500		3000	6500		1500	6000			5000	
1:6	9.46˚	6000	6500		4000	6500		2500	6000		1500	5000	
1:8	7.12˚	6500	6500		6000	6500		4000	6000		3000	5000	
1:10	5.71˚	6500	6500	6500	6500	6500	6500	5000	6000		3500	5000	
1:20	2.86˚	6500	6500	6500	6500	6500	6500	6000	6000	6000	5000	5000	5000
Vertical 0˚			6500			6500			6000			5000	

CAPACITY TABLE, LEADER FOOT ON THE GROUND

Machine type: Piling rig
Machine model: PM 20L
Serial number: 1461
Horizontal slide: Horizontal slide is projected 300, 600, 900 and 1200 mm out.
Counterweight: Weight 6 000 kg (include stabilizers).

1. **With tracks in full width and on horizontal, level and firm ground.**
2. **Counterweight position: full weight.**
3. **Leader foot and the pile are resting on the ground before inclinations.**
4. **Stabilizers (optional): Support stabilizers against ground always when driving backward inclined piles.**
5. **See Users' Manual for details.**

Leader length: **18.6 m** + cathead 0.85 m and 4 m telescope.
Leader sections: 13.8 + 4.8 m
Hydraulic hammer: **HHK 3AL, total weight 6 400 kg**

Maximum pile weights in kg

Pile 18 m

Horizontal slide position		Max. 300 mm out			Max. 600 mm out			Max. 900 mm out			Max. 1200 mm out		
Inclination		Forw.	Backw.	Sidew.	Forw.	Backw.	Sidew.	Forw.	Backw.	Sidew.	Forw.	Backw.	Sidew.
1:3	18.43˚												
1:3.5	15.94˚		3000			3000			3000			3000	
1:4	14.03˚		5500			5500			5500			5000	
1:5	11.31˚	5000	6500		5000	6500		5000	6000		5000	5000	
1:6	9.46˚	6500	6500		6500	6500		6000	6000		5000	5000	
1:8	7.12˚	6500	6500		6500	6500		6000	6000		5000	5000	
1:10	5.71˚	6500	6500	6500	6500	6500	6500	6000	6000		5000	5000	
1:20	2.86˚	6500	6500	6500	6500	6500	6500	6000	6000	6000	5000	5000	5000
Vertical 0˚		6500			6500			6000			5000		

Pile 16 m

Horizontal slide position		Max. 300 mm out			Max. 600 mm out			Max. 900 mm out			Max. 1200 mm out		
Inclination		Forw.	Backw.	Sidew.	Forw.	Backw.	Sidew.	Forw.	Backw.	Sidew.	Forw.	Backw.	Sidew.
1:3	18.43˚		3500			3500			3500			3500	
1:3.5	15.94˚		5000			5000			5000			5000	
1:4	14.03˚	4000	6500		4000	6500		4000	6000			5000	
1:5	11.31˚	6500	6500		6500	6500		6000	6000		5000	5000	
1:6	9.46˚	6500	6500		6500	6500		6000	6000		5000	5000	
1:8	7.12˚	6500	6500		6500	6500		6000	6000		5000	5000	
1:10	5.71˚	6500	6500	6500	6500	6500	6500	6000	6000		5000	5000	
1:20	2.86˚	6500	6500	6500	6500	6500	6500	6000	6000	6000	5000	5000	5000
Vertical 0˚		6500			6500			6000			5000		

Leader length: **18.6 m** + cathead 0.85 m and 4 m telescope.
Leader sections: 13.8 + 4.8 m
Hydraulic hammer: **HHK 3AL, total weight 6 400 kg**

Maximum pile weights in kg

Pile 14 m

Horizontal slide position		Max. 300 mm out			Max. 600 mm out			Max. 900 mm out			Max. 1200 mm out		
Inclination		Forw.	Backw.	Sidew.	Forw.	Backw.	Sidew.	Forw.	Backw.	Sidew.	Forw.	Backw.	Sidew.
1:2.5	21.80˚		2000			2000			2000			2000	
1:3	18.43˚		4500			4500			4500			4500	
1:3.5	15.94˚	5000	6000		5000	6000		5000	6000			5000	
1:4	14.03˚	6500	6500		6500	6500		6000	6000			5000	
1:5	11.31˚	6500	6500		6500	6500		6000	6000		5000	5000	
1:6	9.46˚	6500	6500		6500	6500		6000	6000		5000	5000	
1:8	7.12˚	6500	6500		6500	6500		6000	6000		5000	5000	
1:10	5.71˚	6500	6500	6500	6500	6500	6500	6000	6000		5000	5000	
1:20	2.86˚	6500	6500	6500	6500	6500	6500	6000	6000	6000	5000	5000	5000
Vertical 0˚			6500			6500			6000			5000	

Pile 12 m

Horizontal slide position		Max. 300 mm out			Max. 600 mm out			Max. 900 mm out			Max. 1200 mm out		
Inclination		Forw.	Backw.	Sidew.	Forw.	Backw.	Sidew.	Forw.	Backw.	Sidew.	Forw.	Backw.	Sidew.
1:2.5	21.80˚	2000	3000		2000	3000			3000			3000	
1:3	18.43˚	5500	5500		5500	5500			5500			5000	
1:3.5	15.94˚	6500	6500		6500	6500		6000	6000			5000	
1:4	14.03˚	6500	6500		6500	6500		6000	6000			5000	
1:5	11.31˚	6500	6500		6500	6500		6000	6000		5000	5000	
1:6	9.46˚	6500	6500		6500	6500		6000	6000		5000	5000	
1:8	7.12˚	6500	6500		6500	6500		6000	6000		5000	5000	
1:10	5.71˚	6500	6500	6500	6500	6500	6500	6000	6000		5000	5000	
1:20	2.86˚	6500	6500	6500	6500	6500	6500	6000	6000	6000	5000	5000	5000
Vertical 0˚			6500			6500			6000			5000	

CAPACITY TABLE, EN996

Machine type: Piling rig
Machine model: PM 20L
Serial number: 1461
Horizontal slide: Horizontal slide is projected 300, 600, 900 and 1200 mm out.
Counterweight: Weight 6 000 kg (include stabilizers).

1. **With tracks in full width and on horizontal, level and firm ground.**
2. **Counterweight position: full weight.**
3. **Leader foot is slightly above ground, and the pile is resting on the ground before inclinations.**
4. **Stabilizers (optional): Support stabilizers against ground always when driving backward inclined piles.**
5. **See Users' Manual for details.**

Leader length: **18.6 m** + cathead 0.85 m and 4 m telescope.
Leader sections: 13.8 + 4.8 m
Hydraulic hammer: **HHK 4AL, total weight 7 700 kg**

Maximum pile weights in kg

Pile 18 m

Horizontal slide position		Max. 300 mm out			Max. 600 mm out			Max. 900 mm out			Max. 1200 mm out		
Inclination		Forw.	Backw.	Sidew.	Forw.	Backw.	Sidew.	Forw.	Backw.	Sidew.	Forw.	Backw.	Sidew.
1:3	18.43˚												
1:3.5	15.94˚												
1:4	14.03˚		2500			2500			2500			2500	
1:5	11.31˚		5500			5500			5000			4000	
1:6	9.46˚		5500			5500			5000			4000	
1:8	7.12˚	2500	5500			5500			5000			4000	
1:10	5.71˚	4000	5500	4500	2500	5500	4500		5000			4000	
1:20	2.86˚	5500	5500	5500	5500	5500	5500	3500	5000	5000	2500	4000	4000
Vertical 0˚			5500			5500			5000			4000	

Pile 16 m

Horizontal slide position		Max. 300 mm out			Max. 600 mm out			Max. 900 mm out			Max. 1200 mm out		
Inclination		Forw.	Backw.	Sidew.	Forw.	Backw.	Sidew.	Forw.	Backw.	Sidew.	Forw.	Backw.	Sidew.
1:3	18.43˚												
1:3.5	15.94˚		3000			3000			3000			3000	
1:4	14.03˚		4500			4500			4500			4000	
1:5	11.31˚		5500			5500			5000			4000	
1:6	9.46˚	1500	5500			5500			5000			4000	
1:8	7.12˚	3500	5500		2000	5500			5000			4000	
1:10	5.71˚	5000	5500	5500	3500	5500	5500	2000	5000			4000	
1:20	2.86˚	5500	5500	5500	5500	5500	5500	4500	5000	5000	3000	4000	4000
Vertical 0˚			5500			5500			5000			4000	

Leader length: **18.6 m** + cathead 0.85 m and 4 m telescope.
Leader sections: 13.8 + 4.8 m
Hydraulic hammer: **HHK 4AL, total weight 7 700 kg**

Maximum pile weights in kg

Pile 14 m

Horizontal slide position		Max. 300 mm out			Max. 600 mm out			Max. 900 mm out			Max. 1200 mm out		
Inclination		Forw.	Backw.	Sidew.	Forw.	Backw.	Sidew.	Forw.	Backw.	Sidew.	Forw.	Backw.	Sidew.
1:3	18.43˚		2500			2500			2500			2500	
1:3.5	15.94˚		4500			4500			4500			4000	
1:4	14.03˚		5500			5500			5000			4000	
1:5	11.31˚		5500			5500			5000			4000	
1:6	9.46˚	2500	5500			5500			5000			4000	
1:8	7.12˚	4500	5500		3000	5500		1500	5000			4000	
1:10	5.71˚	5500	5500	5500	4000	5500	5500	2500	5000			4000	
1:20	2.86˚	5500	5500	5500	5500	5500	5500	5000	5000	5000	3500	4000	4000
Vertical 0˚			5500			5500			5000			4000	

Pile 12 m

Horizontal slide position		Max. 300 mm out			Max. 600 mm out			Max. 900 mm out			Max. 1200 mm out		
Inclination		Forw.	Backw.	Sidew.	Forw.	Backw.	Sidew.	Forw.	Backw.	Sidew.	Forw.	Backw.	Sidew.
1:2.5	21.80˚		1500			1500			1500			1500	
1:3	18.43˚		3500			3500			3500			3500	
1:3.5	15.94˚		5500			5500			5000			4000	
1:4	14.03˚		5500			5500			5000			4000	
1:5	11.31˚	2500	5500			5500			5000			4000	
1:6	9.46˚	4000	5500		2000	5500			5000			4000	
1:8	7.12˚	5500	5500		4000	5500		2500	5000		1000	4000	
1:10	5.71˚	5500	5500	5500	5000	5500	5500	3500	5000		2000	4000	
1:20	2.86˚	5500	5500	5500	5500	5500	5500	5000	5000	5000	4000	4000	4000
Vertical 0˚			5500			5500			5000			4000	

CAPACITY TABLE, LEADER FOOT ON THE GROUND

Machine type: Piling rig
Machine model: PM 20L
Serial number: 1461
Horizontal slide: Horizontal slide is projected 300, 600, 900 and 1200 mm out.
Counterweight: Weight 6 000 kg (include stabilizers).

1. **With tracks in full width and on horizontal, level and firm ground.**
2. **Counterweight position: full weight.**
3. **Leader foot and the pile are resting on the ground before inclinations.**
4. **Stabilizers (optional): Support stabilizers against ground always when driving backward inclined piles.**
5. **See Users' Manual for details.**

Leader length: **18.6 m** + cathead 0.85 m and 4 m telescope.
Leader sections: 13.8 + 4.8 m
Hydraulic hammer: **HHK 4AL, total weight 7 700 kg**

Maximum pile weights in kg

Pile 18 m

Horizontal slide position		Max. 300 mm out			Max. 600 mm out			Max. 900 mm out			Max. 1200 mm out		
Inclination		Forw.	Backw.	Sidew.	Forw.	Backw.	Sidew.	Forw.	Backw.	Sidew.	Forw.	Backw.	Sidew.
1:3	18.43˚												
1:3.5	15.94˚												
1:4	14.03˚		2500			2500			2500			2500	
1:5	11.31˚		5500			5500			5000			4000	
1:6	9.46˚	3000	5500		3000	5500		3000	5000		3000	4000	
1:8	7.12˚	5500	5500		5500	5500		5000	5000		4000	4000	
1:10	5.71˚	5500	5500	4500	5500	5500	4500	5000	5000		4000	4000	
1:20	2.86˚	5500	5500	5500	5500	5500	5500	5000	5000	5000	4000	4000	4000
Vertical 0˚			5500			5500			5000			4000	

Pile 16 m

Horizontal slide position		Max. 300 mm out			Max. 600 mm out			Max. 900 mm out			Max. 1200 mm out		
Inclination		Forw.	Backw.	Sidew.	Forw.	Backw.	Sidew.	Forw.	Backw.	Sidew.	Forw.	Backw.	Sidew.
1:3	18.43˚												
1:3.5	15.94˚		3000			3000			3000			3000	
1:4	14.03˚		4500			4500			4500			4000	
1:5	11.31˚	5500	5500		5500	5500		5000	5000		4000	4000	
1:6	9.46˚	5500	5500		5500	5500		5000	5000		4000	4000	
1:8	7.12˚	5500	5500		5500	5500		5000	5000		4000	4000	
1:10	5.71˚	5500	5500	5500	5500	5500	5500	5000	5000		4000	4000	
1:20	2.86˚	5500	5500	5500	5500	5500	5500	5000	5000	5000	4000	4000	4000
Vertical 0˚			5500			5500			5000			4000	

Leader length: **18.6 m** + cathead 0.85 m and 4 m telescope.
Leader sections: 13.8 + 4.8 m
Hydraulic hammer: **HHK 4AL, total weight 7 700 kg**

Maximum pile weights in kg

Pile 14 m

Horizontal slide position		Max. 300 mm out			Max. 600 mm out			Max. 900 mm out			Max. 1200 mm out		
Inclination		Forw.	Backw.	Sidew.	Forw.	Backw.	Sidew.	Forw.	Backw.	Sidew.	Forw.	Backw.	Sidew.
1:3	18.43˚		2500			2500			2500			2500	
1:3.5	15.94˚		4500			4500			4500			4000	
1:4	14.03˚	5500	5500		5500	5500		5000	5000			4000	
1:5	11.31˚	5500	5500		5500	5500		5000	5000		4000	4000	
1:6	9.46˚	5500	5500		5500	5500		5000	5000		4000	4000	
1:8	7.12˚	5500	5500		5500	5500		5000	5000		4000	4000	
1:10	5.71˚	5500	5500	5500	5500	5500	5500	5000	5000		4000	4000	
1:20	2.86˚	5500	5500	5500	5500	5500	5500	5000	5000	5000	4000	4000	4000
Vertical 0˚		5500			5500			5000			4000		

Pile 12 m

Horizontal slide position		Max. 300 mm out			Max. 600 mm out			Max. 900 mm out			Max. 1200 mm out		
Inclination		Forw.	Backw.	Sidew.	Forw.	Backw.	Sidew.	Forw.	Backw.	Sidew.	Forw.	Backw.	Sidew.
1:2.5	21.80˚		1500			1500			1500			1500	
1:3	18.43˚		3500			3500			3500			3500	
1:3.5	15.94˚	5500	5500		5500	5500		5000	5000			4000	
1:4	14.03˚	5500	5500		5500	5500		5000	5000			4000	
1:5	11.31˚	5500	5500		5500	5500		5000	5000		4000	4000	
1:6	9.46˚	5500	5500		5500	5500		5000	5000		4000	4000	
1:8	7.12˚	5500	5500		5500	5500		5000	5000		4000	4000	
1:10	5.71˚	5500	5500	5500	5500	5500	5500	5000	5000		4000	4000	
1:20	2.86˚	5500	5500	5500	5500	5500	5500	5000	5000	5000	4000	4000	4000
Vertical 0˚		5500			5500			5000			4000		

APPLICABLE RESTRICTIONS

Only trained personnel are allowed to operate this machine. Operation not according to the operator's manual may damage the machine and cause personal injury.

If you need more information about the capacity of the rig please contact to Junttan or its representative. In order to avoid interruptions in the operation, please allow Junttan enough time to make the necessary calculations.

Operate only on firm ground with less than 5° slope. All the inclinations given refer to vertical and not to ground level.

1. Tracks in full width.
2. Tables apply for 360° swing position.
3. When doing 360° swing with uppercarriage, leader must be vertical or slightly backwards inclined.
4. The drive cap weight is included in the hammer weight.
5. The capacity table applies for max. 20 m/s (Fresh gale) wind velocity.
6. Recommended operation temperature is -20 °C - +40 °C.
7. Make all function of the machine without sudden movements.
8. Do not travel distances on the site with the pile.

3.14 LIFTING LOADS WITH PILE WINCH

DIAGRAM READING INSTRUCTIONS

Diagram shows distance which can be reached for listed forward inclinations to lift loads with the pile winch and what is maximum load weight for appropriate inclination.

For example, as shown in diagram below, to lift a load which is placed **7 m** far from the center of the rotation, needed forward inclination is **10°** and maximum weight of the load is **4 000 kg.**

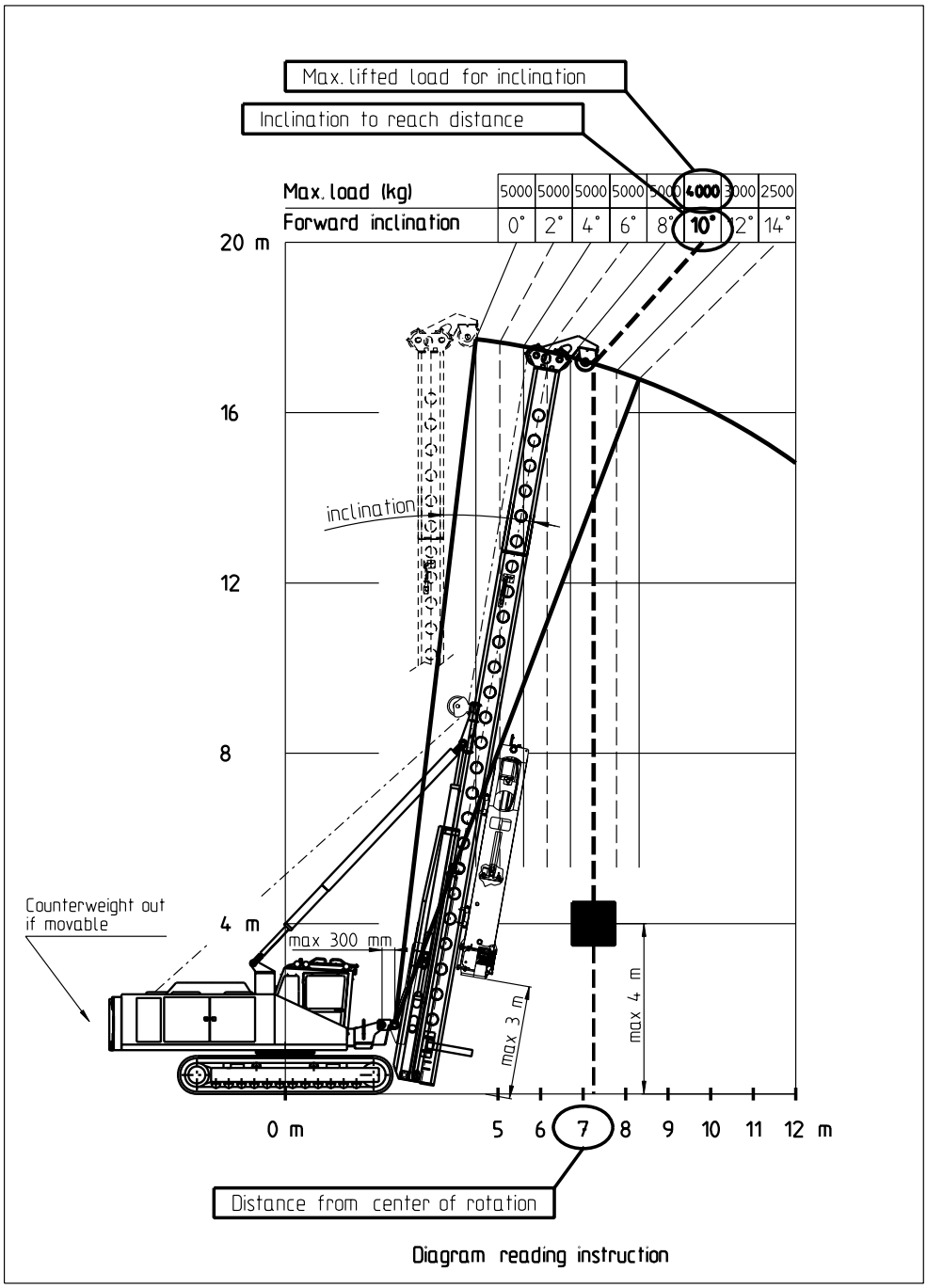
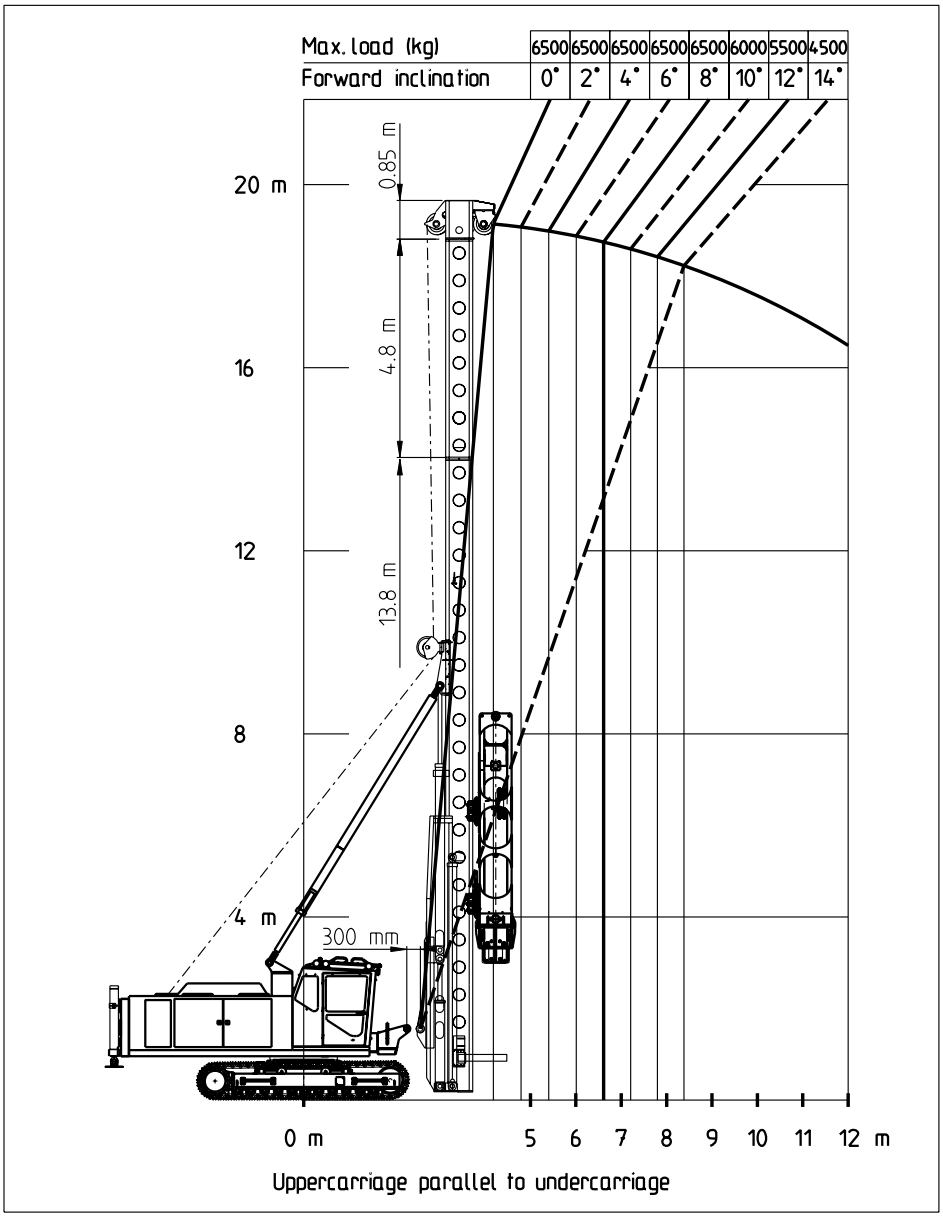


Diagram reading instruction

Machine type: Piling rig
Machine model: Junttan PM 20L
Serial number: 1461

Leader length: **18.6 m**. The telescope is down. Leader foot is slightly above the ground but it is allowed to be lifted up when needed.
Leader sections: 13.8 + 4.8 m, cathead 0.85 m
Hydraulic hammer: **HHK 3AL**, total weight **6400 kg.**
Hammer is **max 3 m** from the ground.
Horizontal slide: Horizontal slide **max 300 mm** out.
Counterweight: Full weight **6000 kg** (include stabilizers)
Undercarriage: With tracks in full width and on horizontal, level and firm ground.

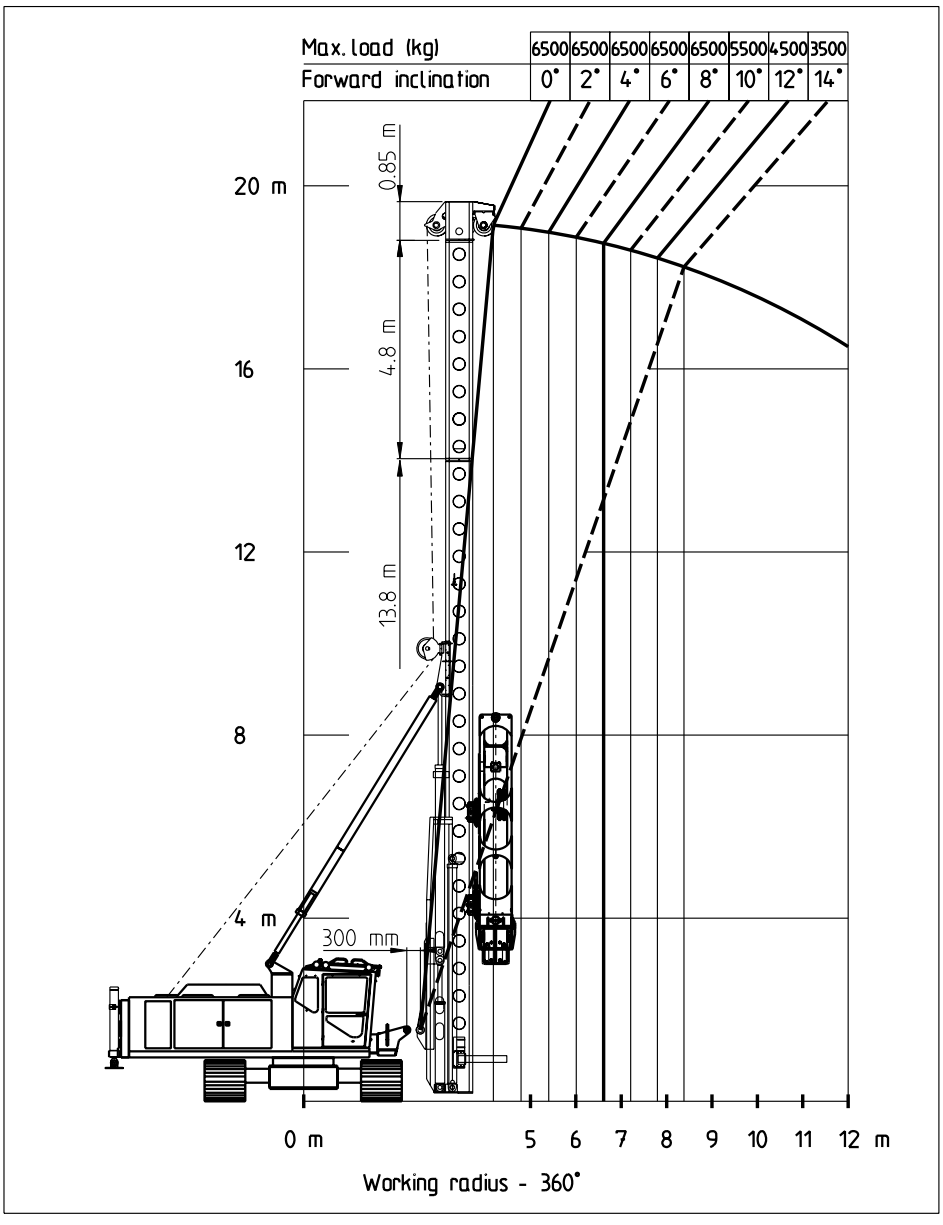
Load maximum height from the ground is 4 m.
See Diagram Reading Instructions and Users' Manual for more details.



Machine type: Piling rig
Machine model: Junttan PM 20L
Serial number: 1461

Leader length: **18.6 m**. The telescope is down. Leader foot is slightly above the ground but it is allowed to be lifted up when needed.
Leader sections: 13.8 + 4.8 m, cathead 0.85 m
Hydraulic hammer: **HHK 3AL**, total weight **6400 kg.**
Hammer is **max 3 m** from the ground.
Horizontal slide: Horizontal slide **max 300 mm** out.
Counterweight: Full weight **6000 kg** (include stabilizers)
Undercarriage: With tracks in full width and on horizontal, level and firm ground.

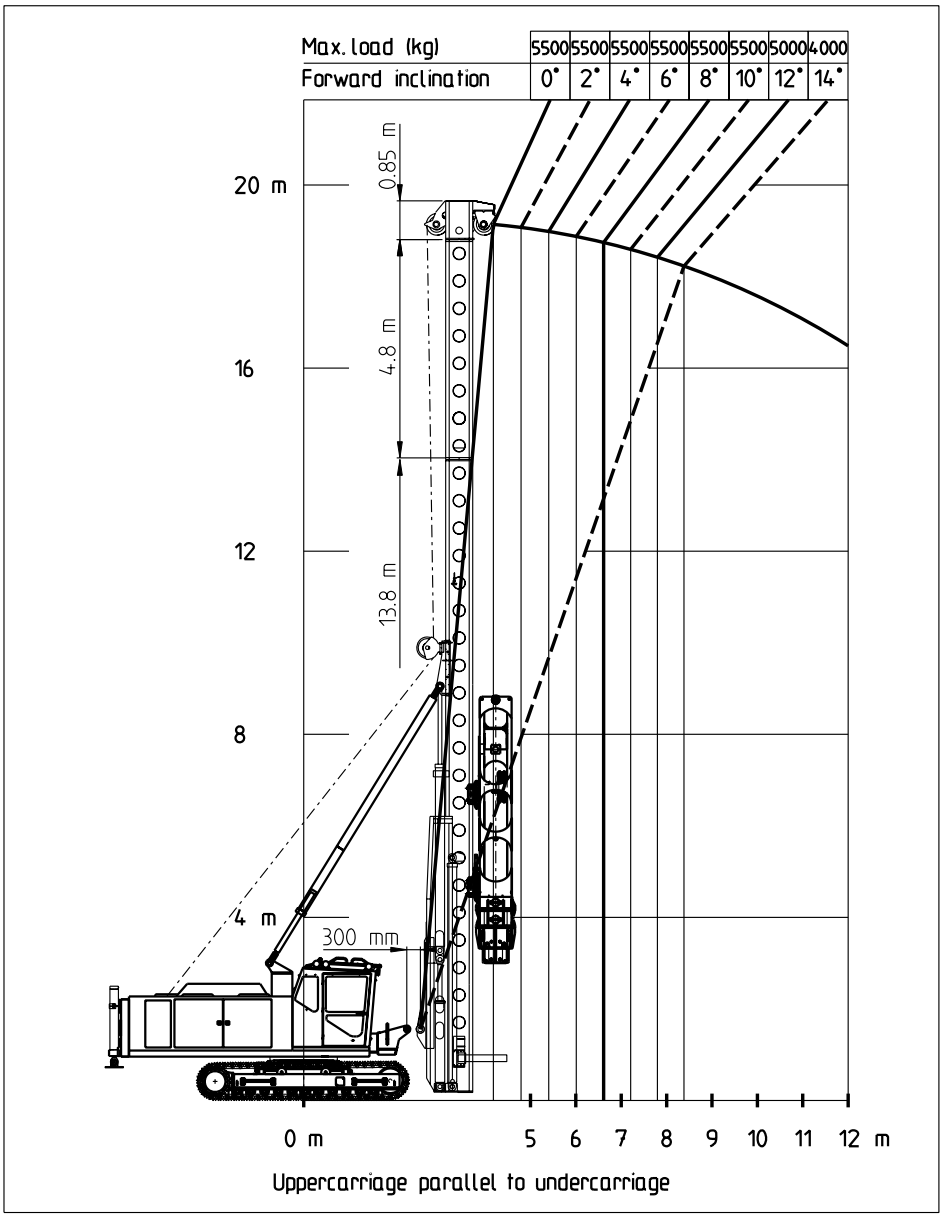
Load maximum height from the ground is 4 m.
See Diagram Reading Instructions and Users' Manual for more details.



Machine type: Piling rig
Machine model: Junttan PM 20L
Serial number: 1461

Leader length: **18.6 m**. The telescope is down. Leader foot is slightly above the ground but it is allowed to be lifted up when needed.
Leader sections: 13.8 + 4.8 m, cathead 0.85 m
Hydraulic hammer: **HHK 4AL**, total weight **7700 kg.**
Hammer is **max 3 m** from the ground.
Horizontal slide: Horizontal slide **max 300 mm** out.
Counterweight: Full weight **6000 kg** (include stabilizers)
Undercarriage: With tracks in full width and on horizontal, level and firm ground.

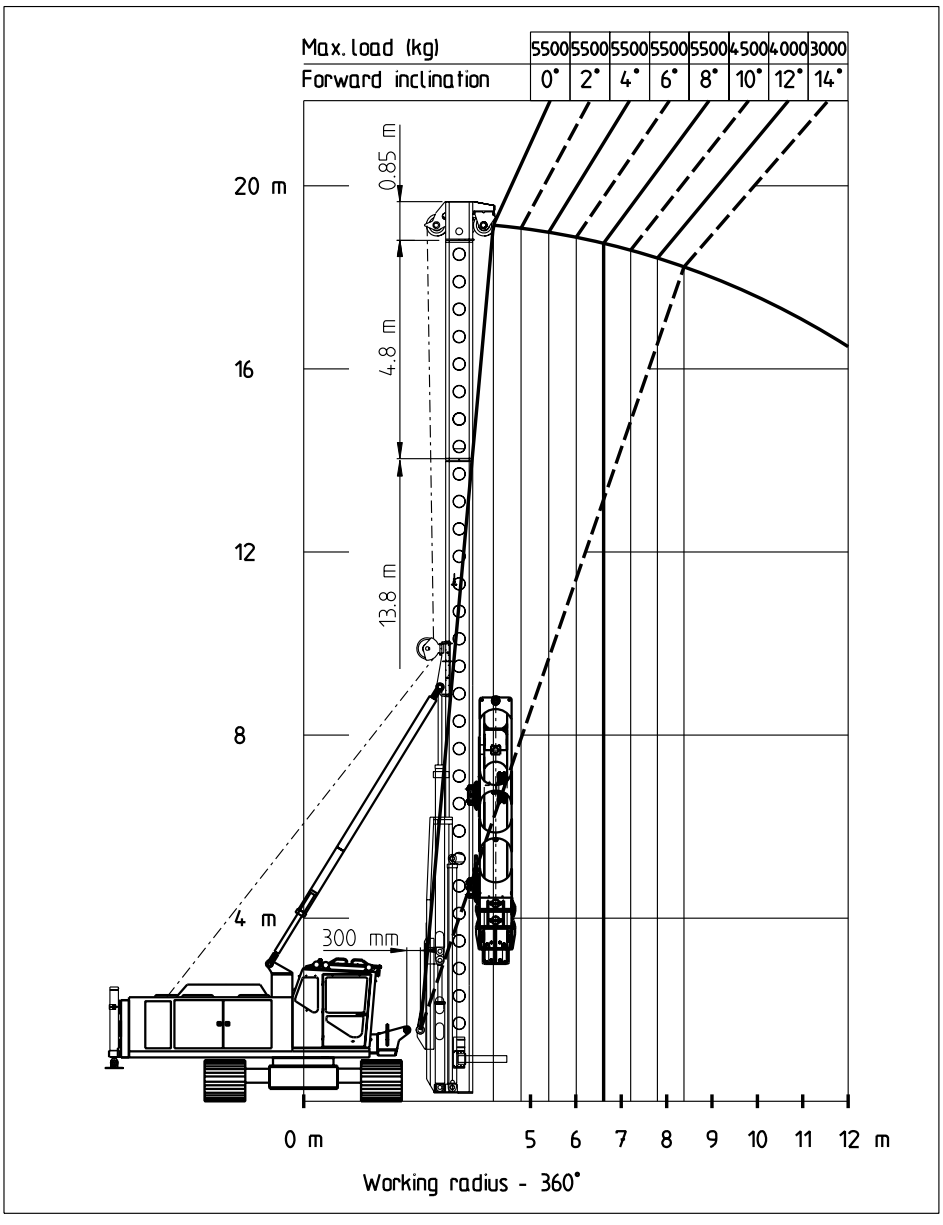
Load maximum height from the ground is 4 m.
See Diagram Reading Instructions and Users' Manual for more details.



Machine type: Piling rig
Machine model: Junttan PM 20L
Serial number: 1461

Leader length: **18.6 m**. The telescope is down. Leader foot is slightly above the ground but it is allowed to be lifted up when needed.
Leader sections: 13.8 + 4.8 m, cathead 0.85 m
Hydraulic hammer: **HHK 4AL**, total weight **7700 kg.**
Hammer is **max 3 m** from the ground.
Horizontal slide: Horizontal slide **max 300 mm** out.
Counterweight: Full weight **6000 kg** (include stabilizers)
Undercarriage: With tracks in full width and on horizontal, level and firm ground.

Load maximum height from the ground is 4 m.
See Diagram Reading Instructions and Users' Manual for more details.

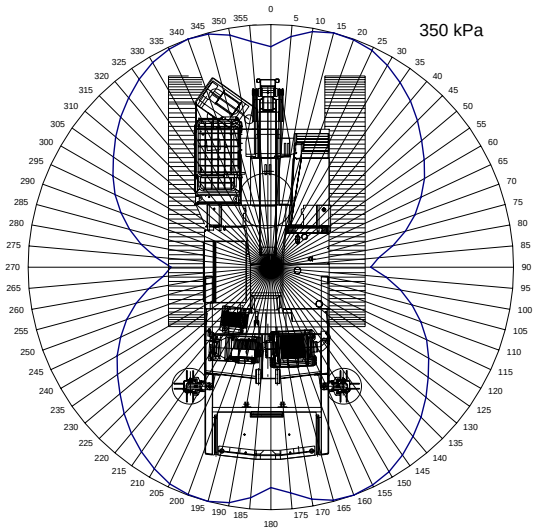


3.15 GROUND PRESSURE

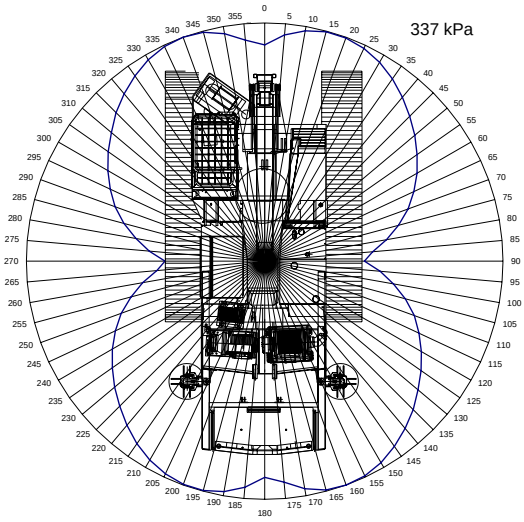
Machine: PM 20L
Serial number: 1461

Hammer:	HHK 3AL	Hammer:	HHK 4AL
Hammer weight:	6 400 kg	Hammer weight:	7 700 kg
Pile:	12 m	Pile:	12 m
Pile weight:	6 000 kg	Pile weight:	4 000 kg
Horizontal slide:	300 mm out	Horizontal slide:	300 mm out
Forward inclination:	9.46º	Forward inclination:	9.46º
Maximum ground pressure **350 kPa** when upper carriage is turned 15º against under carriage.		Maximum ground pressure **337 kPa** when upper carriage is turned 160º against under carriage.	

PM 20L 1461



PM 20L 1461

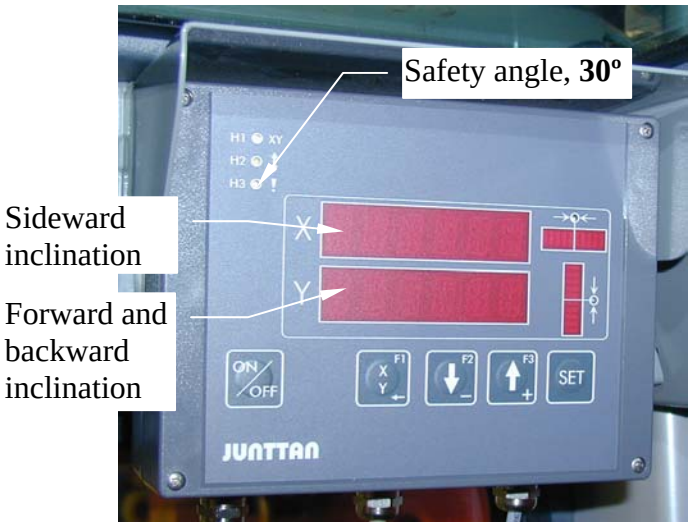


⚠ NOTICE

Depending on leader foot position, the maximum ground pressure can be bigger when using values from "leader foot on ground"-capacity tables.

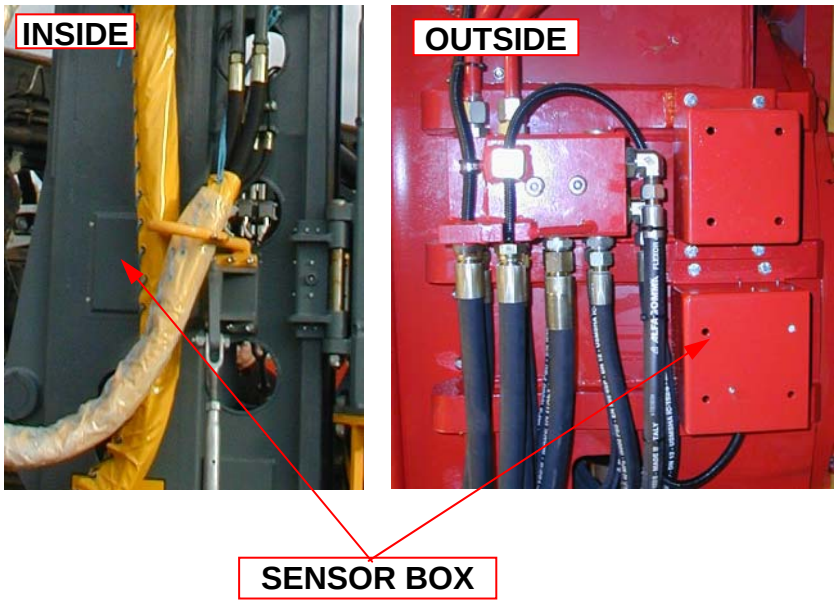
3.16 INCLINOMETER

See also inclinometer manufacturers operation and installation manual.



3.16.1 CALIBRATION OF THE INCLINOMETER

1. Check first that the sensor box of the inclinometer is tight on the leader.
2. Sensor box is assembled either inside or outside of the leader.
3. Drive the leader to vertical position. Use the spirit level to check that the leader is in vertical position.
4. If the inclinometer display shows Zero when the leader is in vertical position it is not necessary to calibrate inclinometer.
5. If the inclinometer display do not shows Zero calibrate inclinometer.
6. Switch OFF the display of the inclinometer.
7. Press simultaneously F1+F2+SET about 4 s to move to setting mode.
8. Press F2 until on the display is shown inclination display (XZ, YZ).
9. Press SET until display shows Zero.
10. Press ON/OFF



4. GENERAL SECTION

4.1 MAJOR COMPONENTS

The construction of the machine is a rotating machinery deck with leader on crawler-mounted undercarriage. The piling leader consists of a leader, basic leader and optional leader extension. The bottom of the leader is connected with the cross joint to the horizontal slide. These allow vertical and horizontal positioning of the leader. The lateral inclination cylinders and the forward/backward inclination cylinder control the inclination of the leader through the upper slide. The leader slides axially in relation to the basic leader. There are two winches at the rear of the machinery deck. The ropes run through sheaves in the upper slide and cathead to the front of the leader. The leader lift device lifts and lowers the leader from and to the transport position.

4.2 LOCATION OF THE SERIAL NUMBERS

For the location of the product identification number (PIN) see Figure 4.
For the location of the engine serial number see Figure 5.
For the location of the track drive serial numbers see Figure 6.
For the location of the swing drive serial number see Figure 7.

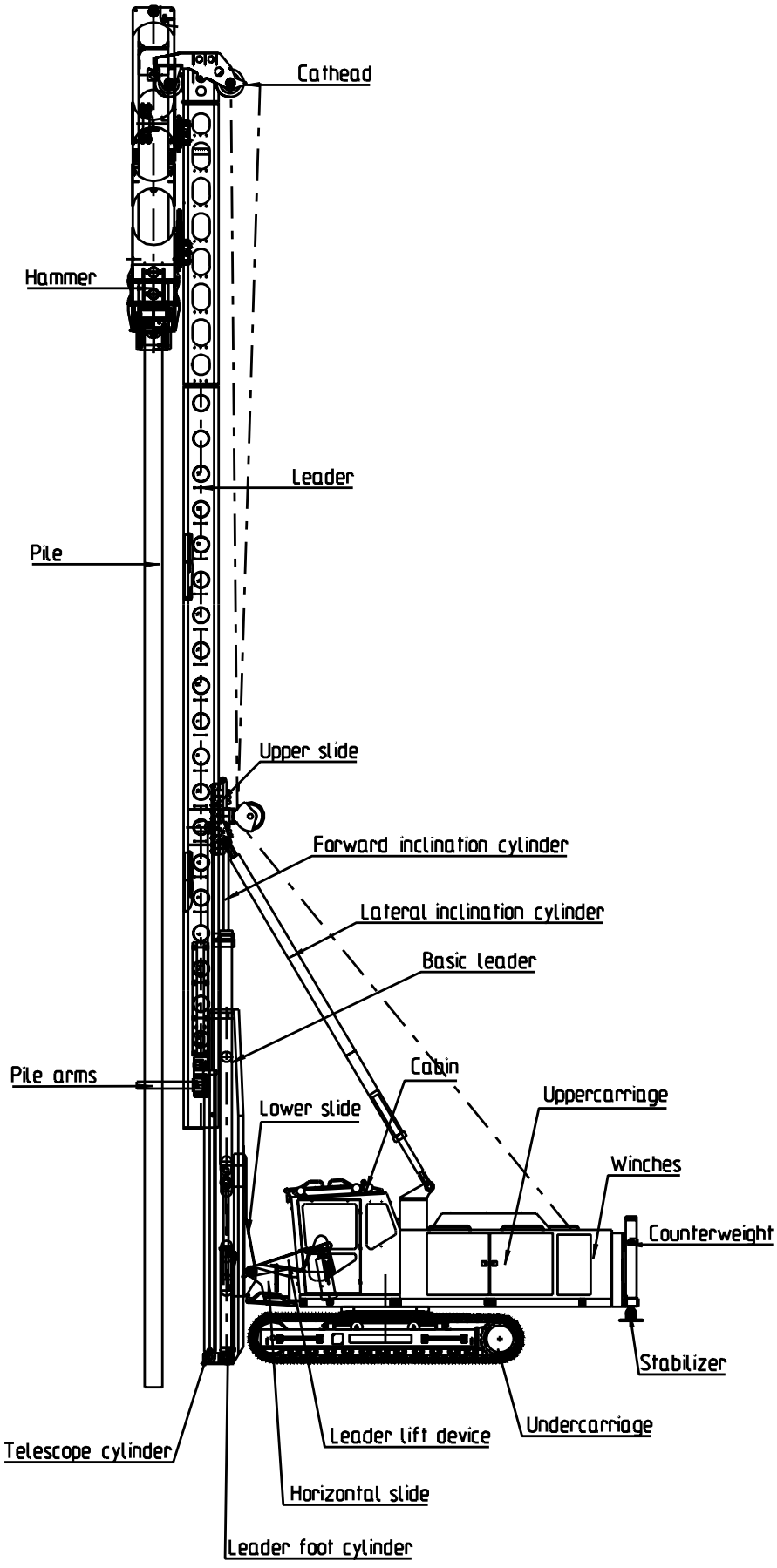

Cathead
Hammer
Leader
Pile
Upper slide
Forward inclination cylinder
Lateral inclination cylinder
Basic leader
Pile arms
Cabin
Uppercarriage
Lower slide
Winches
Counterweight
Stabilizer
Undercarriage
Leader lift device
Telescope cylinder
Horizontal slide
Leader foot cylinder

Fig. 1

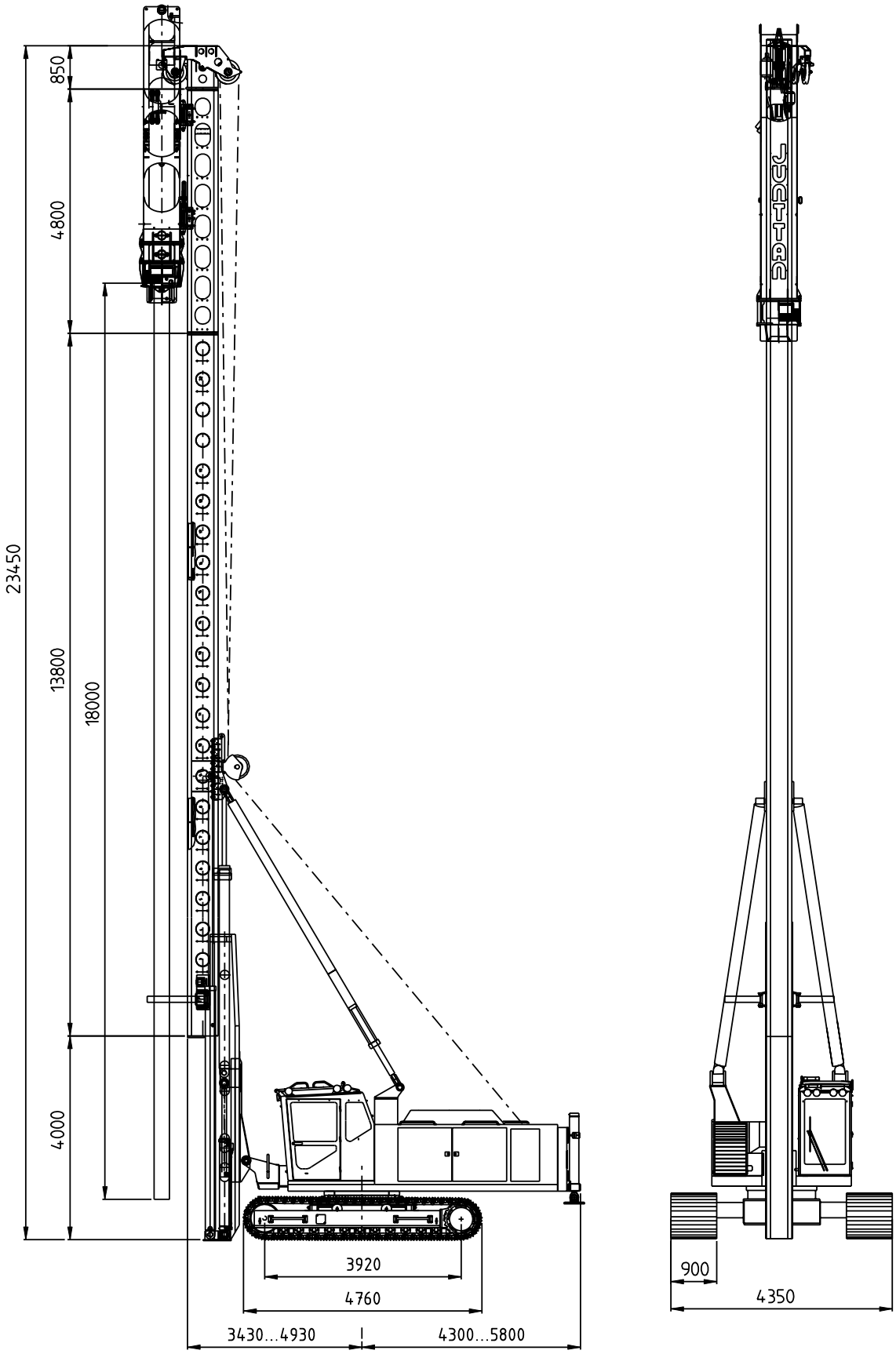

850
4800
13800
18000
23450
4000
3920
4760
3430...4930
4300...5800
900
4350

Fig. 2a

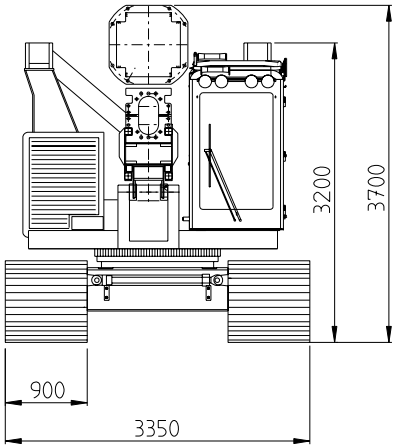

3200
3700
900
3350

Fig. 2b

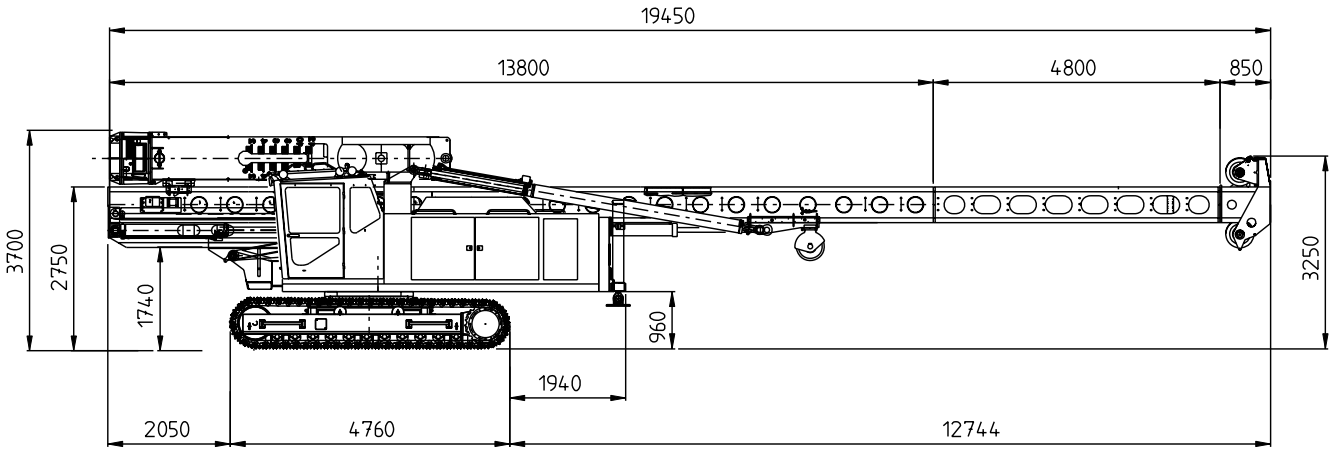
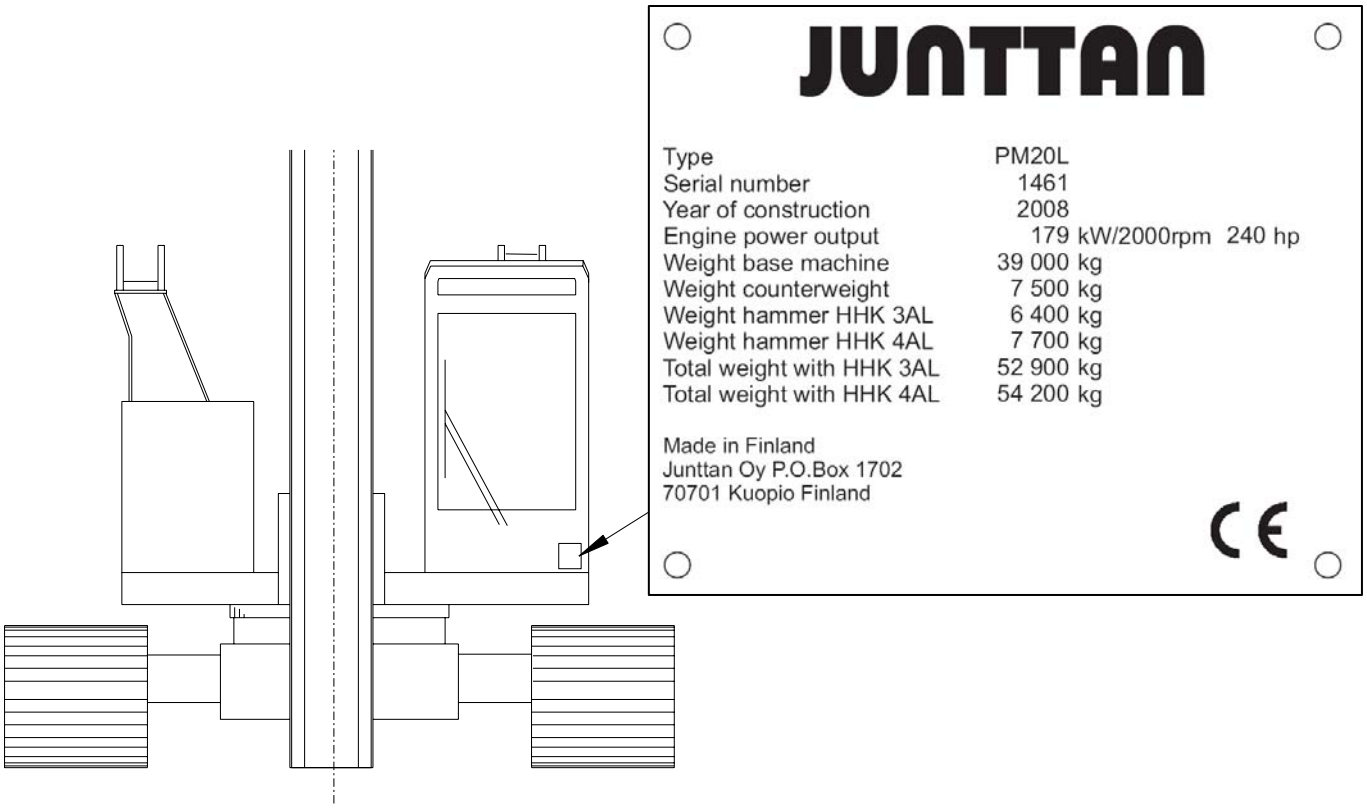

19450
13800
4800
850
3700
2750
1740
960
3250
1940
2050
4760
12744

Fig. 2c



Location of product identification number Fig. 4

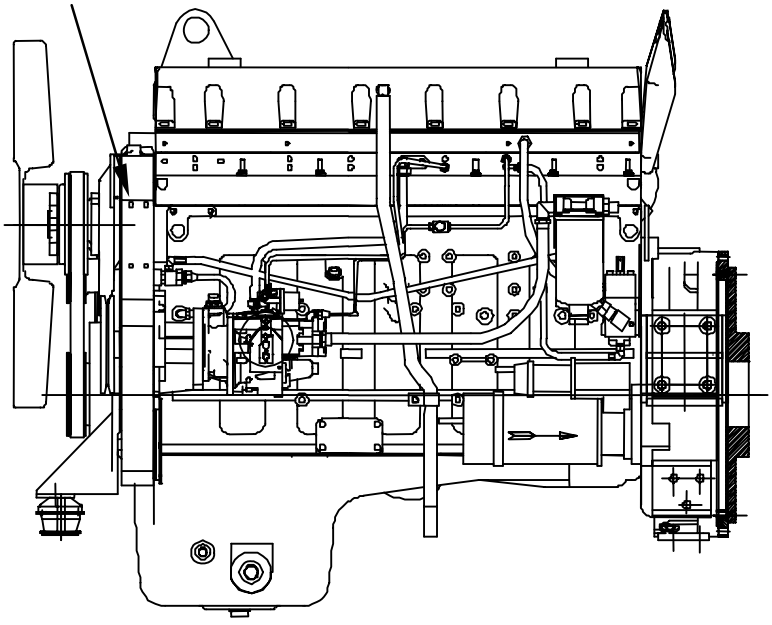
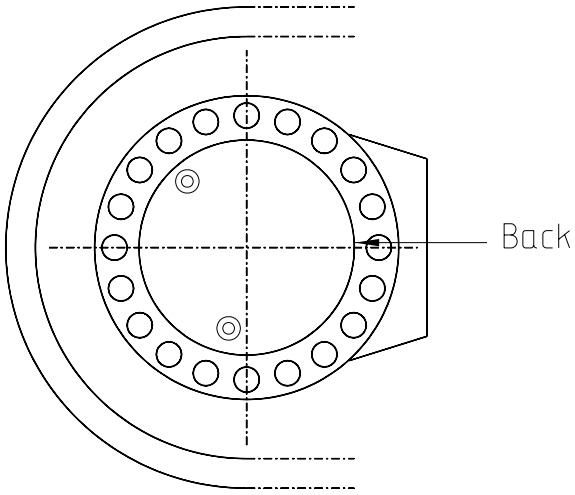
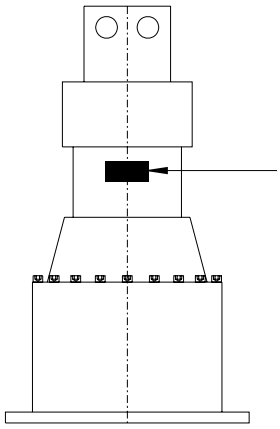


Fig. 5 LOCATION OF ENGINE SERIAL NUMBER



Location of track drive serial number Fig. 6



Location of swing drive serial number Fig. 7

5. CONTROLS SECTION

5.1 GENERAL LAYOUT

⚠ DANGER

Do not operate the machine unless you are trained and authorized to do so. Unintentional misuse of controls may damage the machine and cause personal injury.

Figure 8 illustrates the general layout of the operator's controls and instrumentation in the cab. Note the position of the ignition switch and safety lever. The operator's controls include those located on the right and left consoles and the foot pedals on the floor. The following sections list their functions and the symbols used.

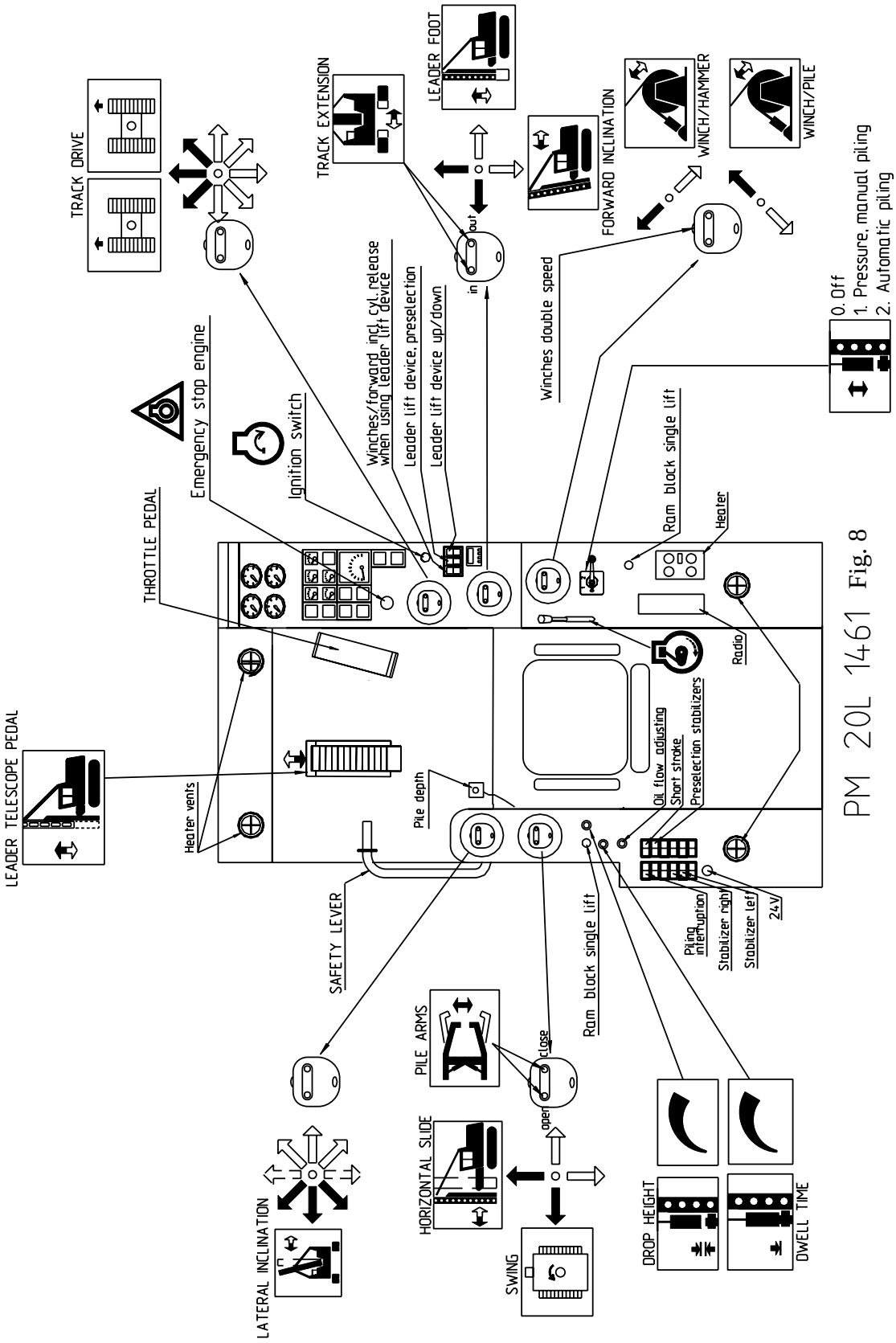
Before starting the engine make sure that all the controls are in their neutral positions and the safety lever is in back position (controls are not activated).

Safety lever

back position: controls are not activated

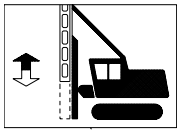
Safety lever

front position: the pilot circuits are engaged and all the controls are active



PM 20L 1461 Fig. 8

5.2 FOOT PEDALS ON THE FLOOR

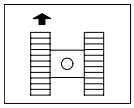
Leader telescope pedal		middle: front down: back down:	rest position telescope down telescope up
Throttle pedal (D)			engine rpm

5.3 CONTROLS ON THE RIGHT CONSOLE

The black arrows in the symbols and beside the control indicate the same direction of the functions. The central rest position is neutral for all levers. The controls on the right console are illustrated Figure 10.

All the control levers have eight active positions in the shape of a star. The positions forward - backward - left - right engage only one function while the diagonal positions engage two functions **if two functions are assigned to a lever**. There are also push buttons at the top of the lever.

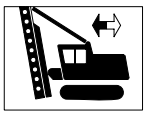
TRAVEL LEVER

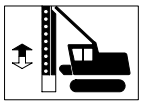
Forward  Both tracks forward
Backward Both tracks backward

Diagonal Combinations

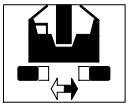
The functions described here refer to the normal travel position when the drive motors are at the rear of the machine.

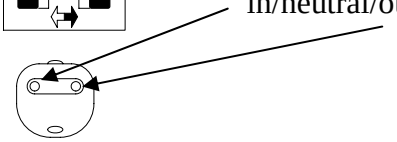
FORWARD INCLINATION AND LEADER FOOT LEVER

Forward  Leader is inclined forward
Backward Leader is inclined backward

Left  Leader foot up
Right Leader foot down

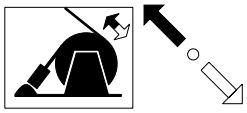
Diagonal Combinations

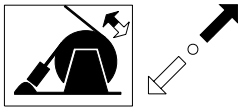
Top switch  Track extension hydraulic cylinders in/neutral/out



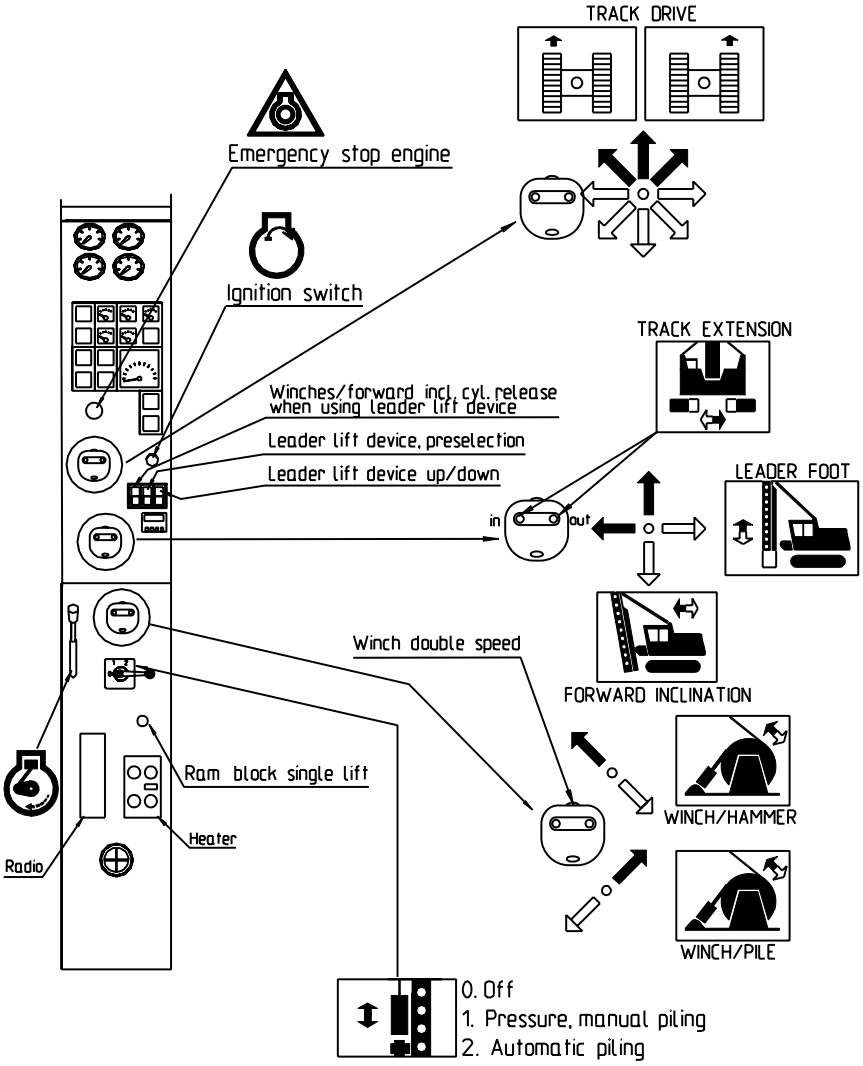
WINCH LEVER

Forwards Both winches unwind
Backwards Both winches wind up

Diagonally  The hammer winch unwind/wind up

Diagonally  The pile winch unwind/wind up

Top switch (front)  Winches double speed

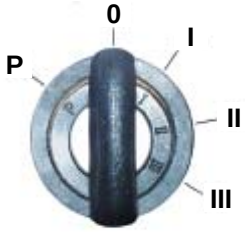


Controls on the right console Fig. 10

SWITCHES

Emergency stop Engine emergency stop

Ignition switch Key operated



P = not connected
0 = engine stop/key remove
I = current on
II = not connected
III = engine start

Blow counter

Switch 1: Winches/forward inclination cylinder release when using leader lift device, see sections lifting/lowering leader how to use the switch.
Switch 2: Forward inclination cylinder release when using leader lift device, see sections lifting/lowering leader how to use the switch.
Switch 3: Leader lift device, pre-selection switch.
Switch 4: Leader lift device up.
Switch 5: Leader lift device down.

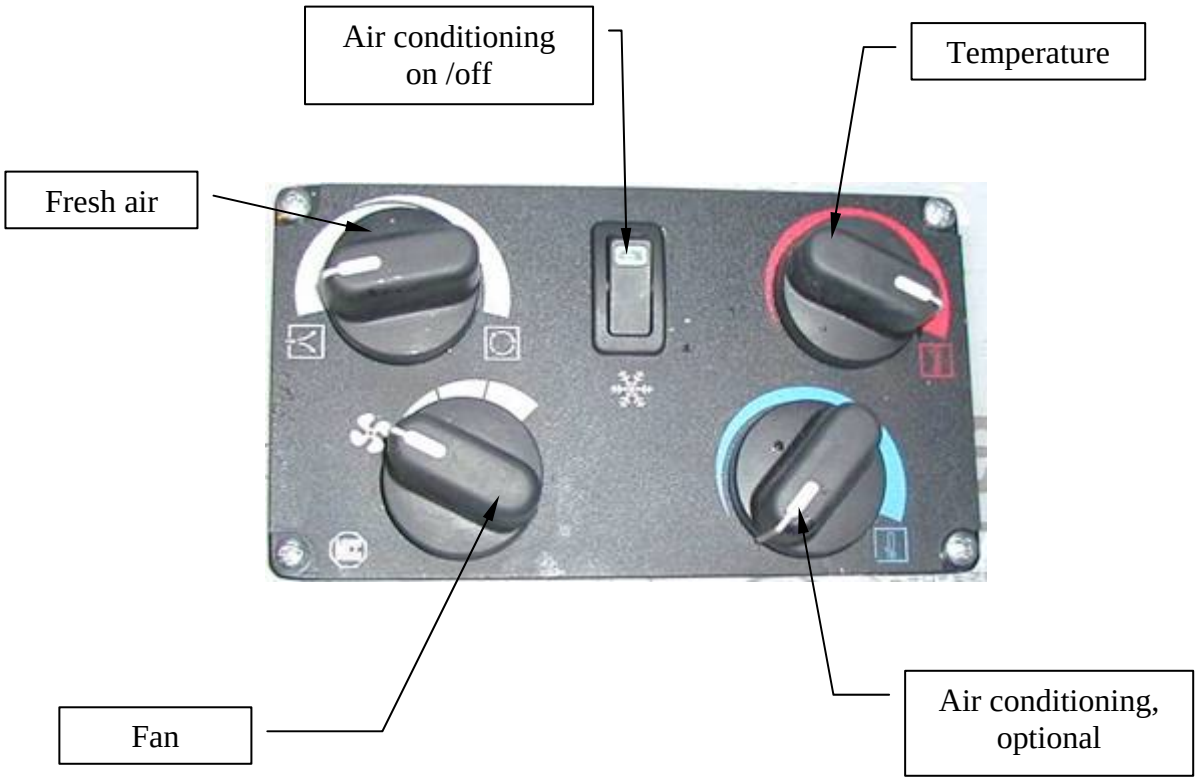
Throttle lever Engine rpm control

Piling mode switch
0 hammer hydraulics not connected
1 hydraulics connected for manual operation
2 hydraulics connected for continuous mode

Ram block single lift Lift of the ram block, piling start switch/releasing of pile winch in vibrator mode

Heater

Radio


Air conditioning on /off
Temperature
Fresh air
Fan
Air conditioning, optional

5.3.1 INSTRUMENTS ON THE RIGHT CONSOLE

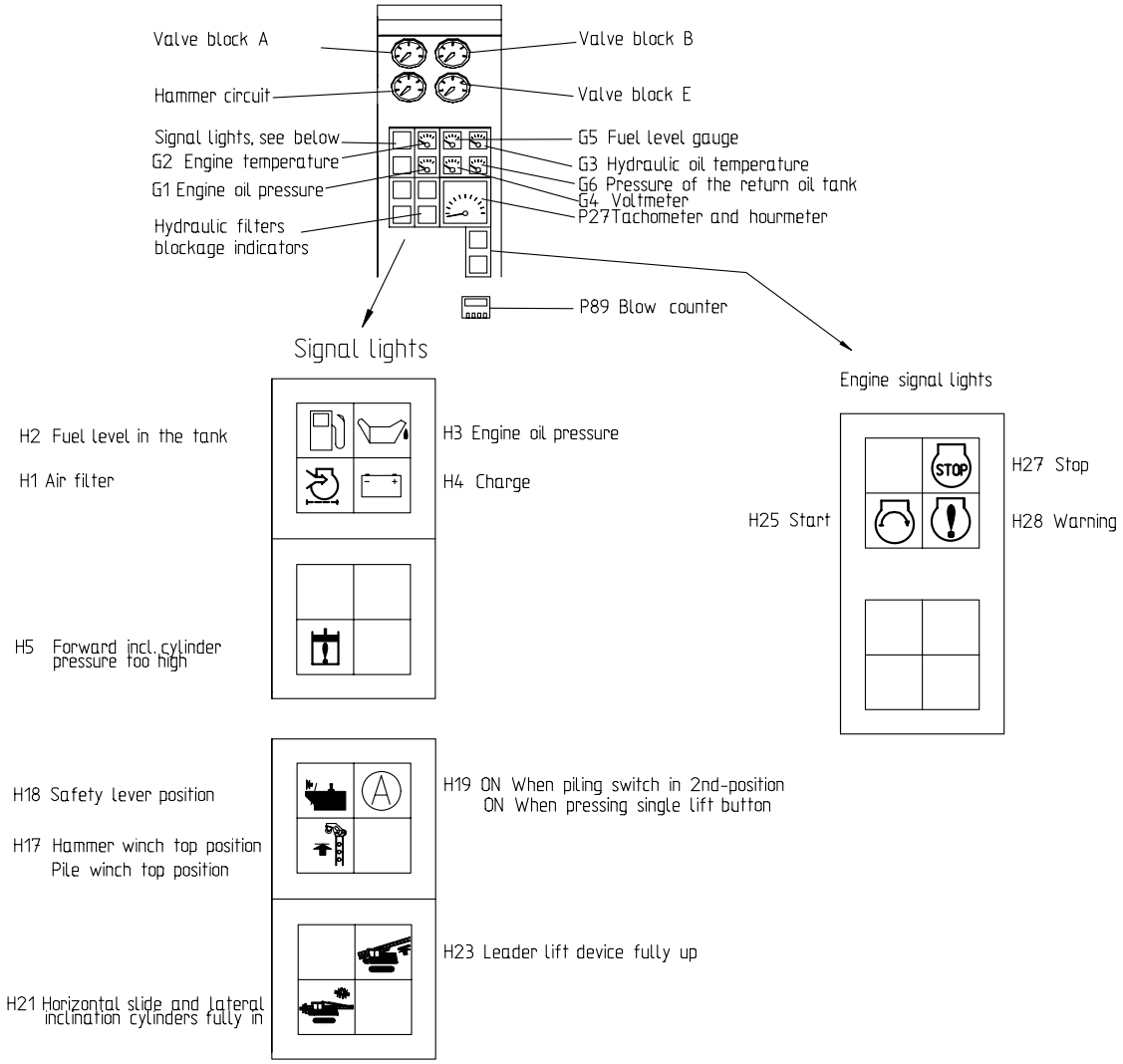
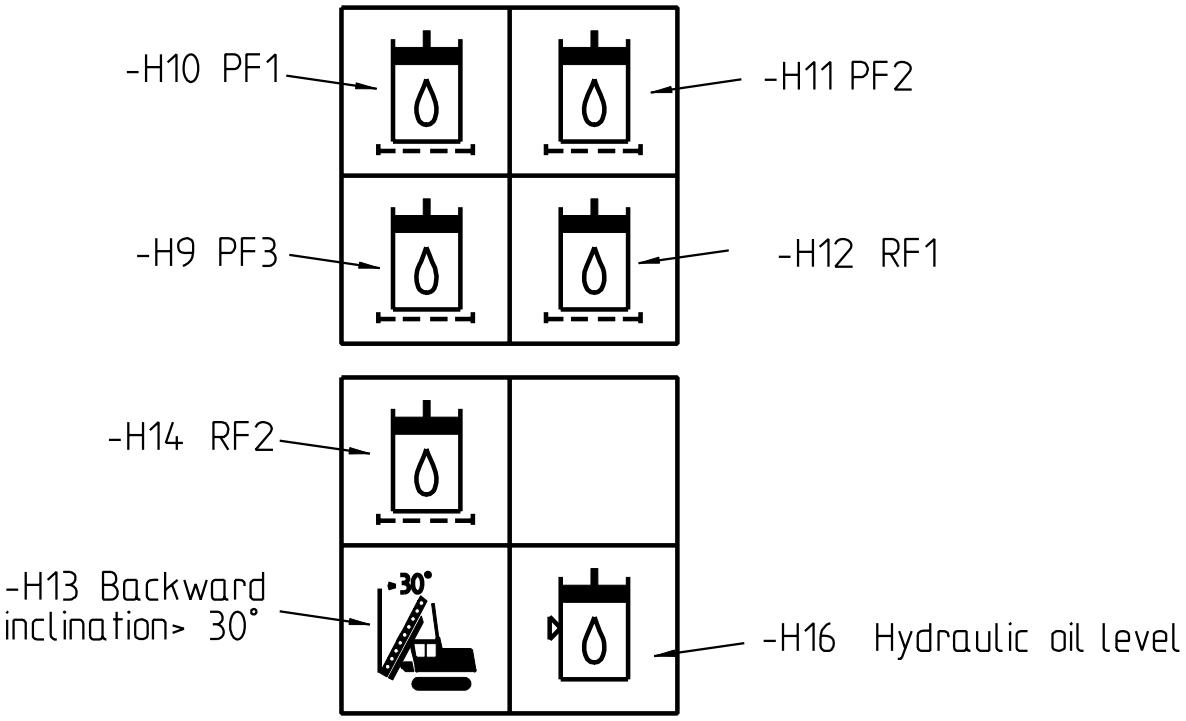


Fig. 12 Instruments on the right console



HYDRAULIC FILTER BLOCKAGE INDICATORS ON THE RIGHT CONSOLE FIG. 13

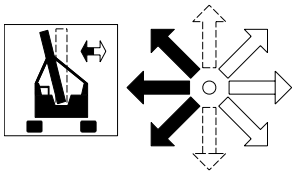
5.4 SWITCHES ON THE TOP CONSOLE

1. Windshield wipers
2. Roof window wiper
3. Signal horn
4. Hydraulic oil cooler, manual on/off
5. Washer
6. Washer
7. Swing lock
8. Energy measurement system
9. Work lights
10. Work lights
11. Work lights
12. Cabin light
13. Hydraulic pump minimum output
14. Swing brake
15. Pre-selection switch, hand throttle
16. Pre-selection switch, engine diagnostic
17. Engine diagnostic

5.5 CONTROLS ON THE LEFT CONSOLE

LATERAL INCLINATION LEVER

Diagonally forward



The leader is inclined (raked) to the respective side (cylinder is pushed out)

Diagonally backward

The leader is inclined (raked) to the opposite side (cylinder is pulled in)

Forward

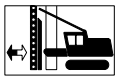
The leader is inclined (raked) forward (both cylinders are pushed out)

Backward

The leader is inclined (raked) backward (both cylinders are pulled in)

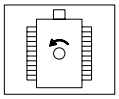
SWING LEVER

Forward
Backward



Horizontal slide out
Horizontal slide in

Left
Right

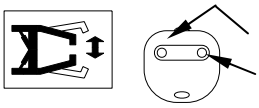


Swings machinery deck to the left
Swings machinery deck to the right

Diagonal

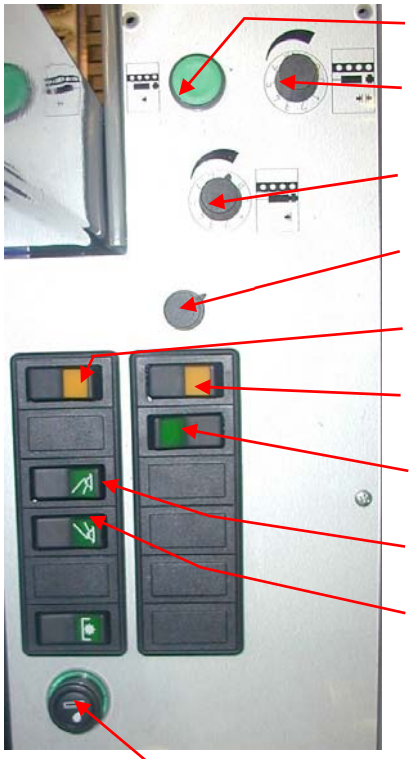
Combinations

Top switch



Pile arms open
Pile arms close

SWITCHES



Ram block single lift

Drop height dial

Dwell time dial

Oil flow adjusting

Piling interruption

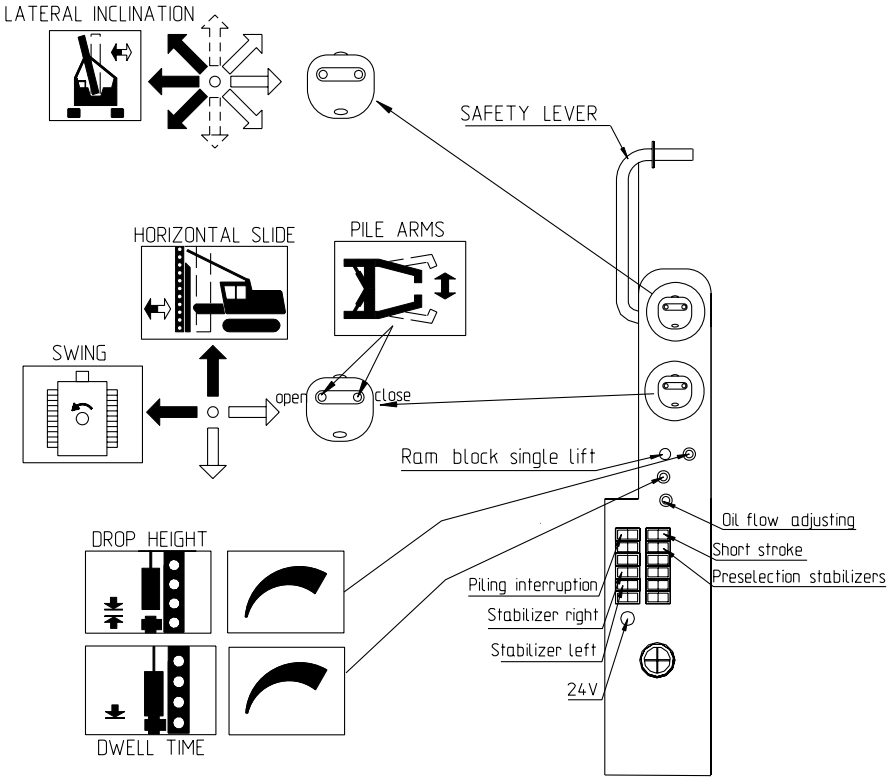
Short stroke

Pre-selection stabilizers

Right stabilizer

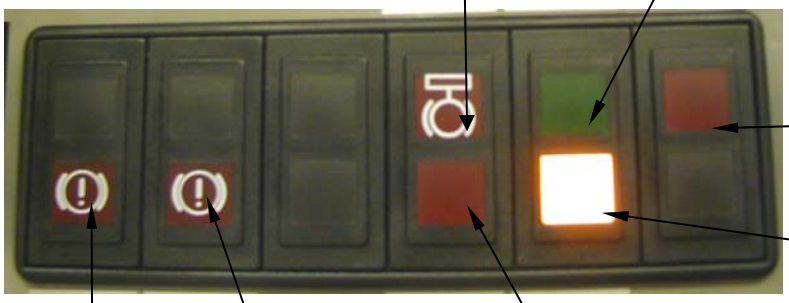
Left stabilizer

24V



Controls on the left console Fig. 14

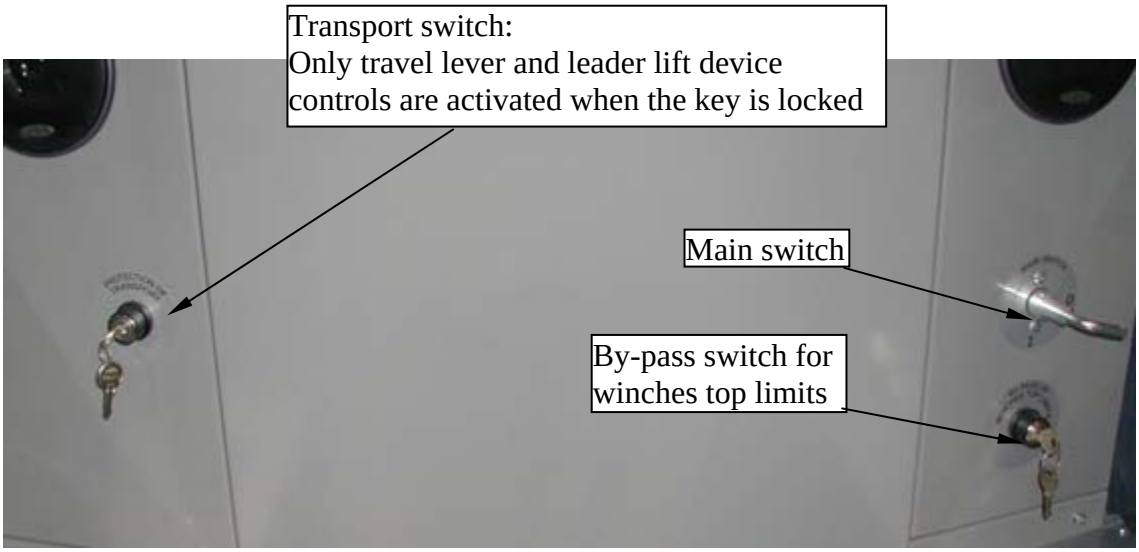
5.6 SIGNAL LIGHTS IN THE UPPER CONSOLE



⚠ WARNING

If one or all signal lights are on and function(s) is in neutral position, then there is something wrong in the system. You must not continue operating the machine until you find reason for signal and repair it.

5.7 CONTROLS ON THE REAR CONSOLE



6. DAILY OPERATION SECTION

6.1 GENERAL

These instructions are written for operating the machine on land. Operation on floats is not covered in this manual (always consult the manufacturer or importer before start operating on floats).

When entering and exiting the cab use only the accesses provided with handles and steps. You should face the machine and use both hands. Do not mount onto or dismount from the machine while it is moving.

- Operate the machine only when you are seated in the cab.
- Adjust the seat for your height.
- Use the controls only when the engine is running.
- The cab is designed for one person only.
- Clear the machine working area of outside personnel.
- Make sure that the ground around the machine is level and firm and that there are no ditches, soft areas, obstacles, power lines etc.
- Clean the windows if necessary and close the doors and windows or secure them in their open positions. Adjust the mirrors to give the best view.
- Do not start the engine unless instructed to do so if you know that there is somebody servicing the machine or there is a sign "Attention, machine being serviced" in the cab etc.
- Note while piling rigs can handle long and heavy piles even at inclinations, their stability is different from any other type of machine. For stability consult the capacity tables.
- Use the machine only when it is in proper working order and has been lubricated and serviced according to the schedules in the respective manuals.

⚠ NOTICE

Use crane to lower the hammer or other tool from the leader if the engine is out of order.

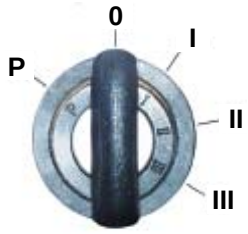
6.2 COMMISSIONING, STARTING AND STOPPING

There is a separate manual for the engine. The engine may be started and operated only in an area with good ventilation. Indoors and in other closed areas the exhaust gases must be piped outside.

Before starting the engine make sure that all the controls are in their neutral positions and the safety lever is in back position (controls are not activated). Make sure the main switch is activated. The machines supplied for cold climate are equipped with engine and hydraulic oil heaters. Use the heaters prior starting the engine.

6.2.1 STARTING ENGINE

- Before starting engine, read engine operator's manual carefully.
- Turn the ignition switch to position **I** and wait 30 sec and until engine signal lights are off.
- Turn the ignition switch to position **III** until the engine starts and then release it.
- Do not crank the engine for more than it is said in the engine operator's manual.
- The engine oil pressure signal light goes off when the engine is running and none of the filter indicators should be on.
- If the warning lights keep a longer period on, stop the engine, check for reason.
- Normally, the signal light of return filters can be on for 1 to 5 minutes after starting the engine (if the temperature of the hydraulic oil is lower, the period is longer).
- When the engine is running at idle the pressure gauges for the hydraulic oil in the instrument panel should show low pressure in the system if no function is being used.



P = not connected
0 = engine stop/key remove
I = current on
II = not connected
III = engine start

⚠ NOTICE

Do not rev up the engine while it is cold.
Do not operate the hydraulics while the oil is cold.

While the engine is warming up direct the heater vents to remove any fog on the windows and check the head and working lights. Test the horn.

It is important that the temperature of the hydraulic oil reaches 40 °C before operating the engine at full rpm and applying hydraulic loads. You should operate all the hydraulic functions without load in order to get the warm oil in cylinders and drives. Therefore when the engine has warmed up, start using all the functions slowly. This acts also as a check that everything is in working order.

Check the temperature and pressure gauges on the instrument panel during the normal operation. Prior to stopping the engine, follow the instructions for storing the machine.

6.2.2 STOPPING ENGINE

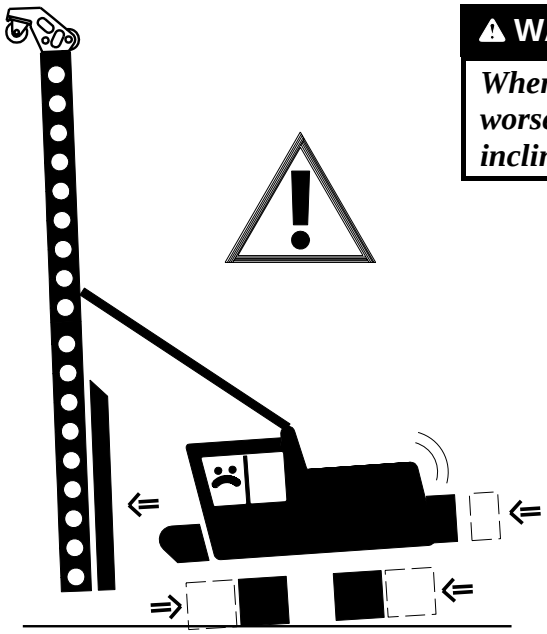
- Stopping engine according to engine operator's manual.
- Before stopping the engine, turn all switches to the neutral positions.
- Pull the safety lever to back position.
- Turn the ignition key to position **0** to stop the engine.
- If you leave the machine unattended for a longer period turn the mains switch off and lock the doors.

6.3 STABILITY

See capacity tables (specifications section). If you need more information about the capacity, contact the manufacturer Junttan Oy, and for more details about the applicable restrictions, see the respective Sections. Operate only on level and firm ground. Use stock mats when the ground is soft. When you are travelling on a slope adjust the position of the leader to vertical in order to maintain balance. Do not work or travel on ground which inclined more than 5°.

⚠ DANGER

When working with the machine always keep the tracks at full width.



⚠ WARNING

When moving with the machine the stability gets worse if you narrow tracks, pull in counterweight, incline or move leader forward.

6.4 MOVING THE MACHINE BETWEEN WORK SITES

6.4.1 LIFTING OF THE LEADER

The machine is designed for lifting and lowering the standard length leader.

6.4.1.1 PREPARATION FOR LEADER LIFTING

Drive the machine to even and solid ground. Swing the machinery deck parallel to the undercarriage. Slight ground slope forward (max 5º) is allowed. Ground inclination to the side and backward is forbidden during erection. Do not lift the leader if a wind exceeding 20 m/s (72 km/h, Fresh gale). When the wind velocity exceeds 20 m/s, fresh gale, the machine has to be lowered to the transport position.

CHECK LIST PRIOR TO LEADER LIFTING

1. **There is sufficient headroom for the leader to be raised safely.**
2. **All the ropes are in their grooves in pulleys and drums.**
3. **All the ropes and hoses are free to rise with the leader.**
4. **The winch ropes are attached to the machine or equipment.**
5. **The leader is locked to the basic leader.**
6. **The equipment (hammer, rotary head) is locked to the leader.**
7. **The ram block is locked to the hammer frame.**
8. **The horizontal slide is fully in.**
9. **The leader foot cylinder is fully out.**
10. **The lateral inclination cylinders are fully retracted.**
11. **The safety lever in the cab is in the forward position.**

⚠ ATTENTION

There is a proximity switch for detecting the correct position of the horizontal slide (i.e. in) and two proximity switches for detecting the correct position of the lateral inclination cylinders (i.e. in) during leader lifting. The leader lift device will only move (up or down) if these three proximity switches are activated. Moving out of lateral inclination cylinders and horizontal slide is prevented when the leader is on the leader lift device.

⚠ DANGER

Hammer or other winch operated equipment must be locked always to the leader or to be removed before using the leader lift device.

6.4.1.2 TESTING RELEASING VALVES OF FORWARD INCLINATION CYLINDER

- The forward inclination cylinder is released during leader lifting and lowering.
- If there is any rubbish in the releasing valves it is possible that valves do not hold the load.
- The valves must be tested every time when lifting the leader to working position.

Test method:

1) Leader lift device fully up

- Lift the leader up about 5-10 cm from the leader lift device with the forward inclination cylinder.
- Stop the leader lifting and check out that leader do not sink down against the leader lift device.
- If the leader stays its place everything is OK and the valve Y5A is closed.
  - You can continue leader lifting.
- If the leader sinks down against the leader lift device.
  - Lower the leader to transport position and repair the valve Y5A.

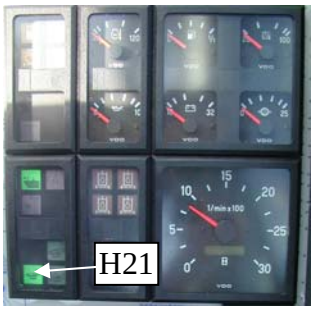
2) Leader in vertical position

- Leader in vertical position (see inclinometer).
- Lower the equipment (rotary head/hammer) and the leader foot near ground.
- Check out that the leader do not sink forward.
- If the leader stays its place everything is OK and the valve Y5B is closed.
  - Go to the next test (leader inclined 5º forward).
- If the leader sinks forward stop sinking by pulling backwards forward inclination cylinder lever.
  - Lower the leader to transport position and repair the valve Y5B.

3) Leader inclined 5º forward

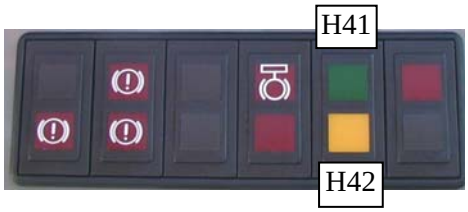
- The equipment (rotary head/hammer) and the leader foot near ground.
- Incline leader forward about 5º (see inclinometer).
- Stop leader inclining and check out that leader do not sink forward.
- If the leader stays its place everything is OK and the valve Y5B is closed.
  - You can start normal working.
- If the leader sinks forward stop sinking by pulling backwards forward inclination cylinder lever and if necessary lower the leader foot against ground.
  - Lower the leader to transport position and repair the valve Y5B.

6.4.1.3 LIFTING WITH THE LEADER LIFT DEVICE



- Switch power to the leader lift device system with the switch (3).
- **If the signal light (H21) is not on** then the horizontal slide and/or the lateral inclination cylinders are not fully in. The leader lift device will only move up if the cylinders are fully in. Press down simultaneously the "leader lift device up"-button (4) and the “winches/forward inclination cylinder release”-button (1) and at the same time pull fully in the horizontal slide and the lateral inclination cylinders. After that the leader lift device starts moving up.
- **If the signal light (H21) is on** then start to lift the leader by pressing simultaneously the "leader lift device up"-button (4) and the “winches/forward inclination cylinder release”-button (1).
- Notice that winches are freewheeling when you press the buttons simultaneously.
- The leader lift device will stop automatically at its top position or when you release the button(s).
- During lifting check that ropes and hoses are free to rise with the leader.
- Test releasing valves of forward inclination cylinder according to section 6.4.1.2.

There are two signal lights on the top console which are important when lifting or lowering the leader.
Green (H41): this signal light is on when the forward inclination cylinder is released
Yellow (H42): this signal light is on when leader is against the leader lift device



⚠ WARNING

Stop the leader lifting if the signal lights are not working properly as told before. Do not continue lifting until you find the reason for that and repair it. Do not continue the leader lifting if you hear the signal horn during lifting. Then there is too much pressure in the forward inclination cylinder. You must not continue lifting until you find reason for signal and repair it.

⚠ ATTENTION

When you erect the leader with the leader lift device, let the engine run at idle. If the engine stops because it cannot lift the leader at idle, then there is something wrong. Reason can be incorrect position of the leader or the horizontal slide or incorrect idle speed of the engine. Do not continue leader erection until you have found the cause and can erect the leader at engine idle speed. If you do, you are likely to damage the machine.

6.4.1.4 FINAL LIFTING

- Lift the leader to the vertical position with the forward inclination cylinder and the lateral inclination cylinders.
- Follow the course of the leader foot and, if necessary, lift the leader foot up so that it does not plough into the ground.
- When you operate the forward inclination cylinder you have to unwind the ropes manually.
- Test releasing valves of forward inclination cylinder according to section 6.4.1.2.
- Unlock the leader from the basic leader.
- Unlock the hammer from the leader.
- Unlock the ram block from the hammer frame.
- Extend the tracks fully out.

6.4.1.5 LOWERING THE LEADER LIFT DEVICE

- Lower the leader lift device by pressing the button (5) on the right console.
- Turn off the power from the leader lift device with the switch (3).

6.4.2 LOWERING THE LEADER

6.4.2.1 PREPARATION FOR LOWERING THE LEADER

Drive the machine to even and solid ground. Swing the machinery deck parallel to the undercarriage. Slight ground slope forward (max 5º) is allowed. Ground inclination to the side and backward is forbidden during lowering.

⚠ DANGER

Hammer or other winch operated equipment must be locked always to the leader or to be removed before using the leader lift device.

CHECK LIST PRIOR TO LOWERING THE LEADER

1. **There is sufficient headroom for the leader to be lowered safely.**
2. **All the ropes are in their grooves in pulleys and drums.**
3. **All the ropes and hoses are free to lower with the leader.**
4. **The winch ropes are attached to the equipment.**
5. **The equipment (hammer, rotary head) is locked to the leader.**
6. **The ram block is locked to the hammer frame.**
7. **The leader is locked to the basic leader.**
8. **The leader foot is on the ground.**
9. **The horizontal slide is fully in.**
10. **The safety lever in the cab is in the forward position.**

⚠ ATTENTION

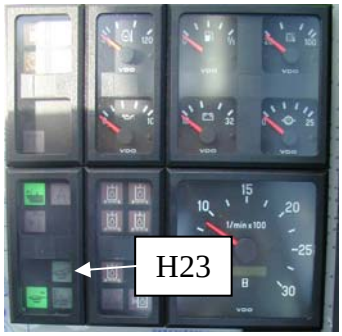
If the horizontal slide and the lateral inclination cylinders are not in their proper positions, you can damage the inclination cylinders when lowering the leader. There are proximity switches for these positions. If the switches are not activated, the leader lift device will not move. Do not move the horizontal slide while lowering the leader.

6.4.2.2 LOWERING THE LEADER TO THE LEADER LIFT DEVICE

⚠ DANGER

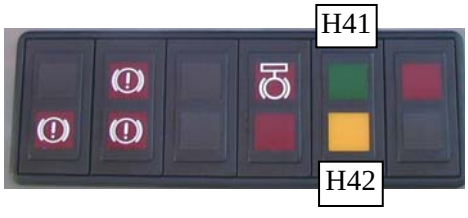
Always raise the leader lift device fully up (signal light H23 will light on and leader lift device stops moving) before you start lowering the leader with forward inclination cylinder.

- Pull the horizontal slide fully in.
- Retract the lateral inclination cylinders fully into their minimum length.
- Power the leader lift device with the switch on the rear of the right console and raise the leader lift device fully up by pressing the "leader lift device up"-button (4).
- ⚠ **DANGER: Do not touch the "winches/forward inclination cylinder release"- button (1) when you raise the leader lift device.** This button is used only when the leader is lifted with the leader lift device.
- The leader lift device will stop automatically at its top position. Let the engine run at idle.
- Incline the leader back with the forward inclination cylinder until it reaches the leader lift device.
- While you incline the leader down, lower the leader foot so that it is slightly above the ground until it is at the end of its stroke.
- If the proximity switch S108 does not function, the forward inclination cylinder stops at the safety limit 30° (if the inclinometer is switched off, you can not extend forward inclination cylinder).



There are two signal lights on the top console which are important when lifting or lowering the leader.

Green (H41): this signal light is on when the forward inclination cylinder is released
Yellow (H42): this signal light is on when leader is against the leader lift device



6.4.2.3 LOWERING THE LEADER LIFT DEVICE WITH THE LEADER

- To lower the leader, press simultaneously the “leader lift device down”-button (5) and the “forward incl. cylinder release”-button (2) on the right console.

⚠ WARNING

Stop the leader lowering if the signal lights are not working properly as told before. Do not continue lowering until you find the reason for that and repair it. Do not continue the leader lowering if you hear the signal horn during lowering. Then there is too much pressure in the forward inclination cylinder. You must not continue lowering until you find reason for signal and repair it.

⚠ ATTENTION

When you lower the leader with the leader lift device let the engine run at idle. If the engine stops because it cannot lower the leader at idle then there is something wrong. Reason can be incorrect position of the leader or the horizontal slide or incorrect idle speed of the engine. Do not continue lowering the leader until you have found the cause and can do so at engine idle speed. If you do, you are likely to damage the machine.

- When you lower the leader pay attention to the ropes and if necessary, wind up the slack.
- Pay attention also to the location of the hydraulic hoses so that they are not squeezed between the leader and the base machine.
- When you have the leader down on the support at the rear of the machinery deck, wind up all the slack from the ropes and check that the hoses lay properly. Do not over tighten the ropes otherwise the rope rollers of the winches may break down.
- Turn off the power from the leader lift device with the switch (3).

6.5 DAILY OPERATION

Daily operation on the work site consists of traveling with the machine and performing various tasks associated with lifting piles off the ground, positioning them and doing the actual driving. The preferred way of doing each step is detailed in the sections below.

⚠ ATTENTION

To rotate machinery deck the horizontal slide must be 150 mm out or leader foot lifted up in order to go over tracks, otherwise the machine will damage.

When operating the machine do it in the most stable and fuel-saving manner which will put the least strain on the machine. That way you will increase the life of the machine and minimize the risks.

6.5.1 LIFTING OF THE PILE

Lifting of piles may be necessary to move them near piling rig or to unload them from a lorry.

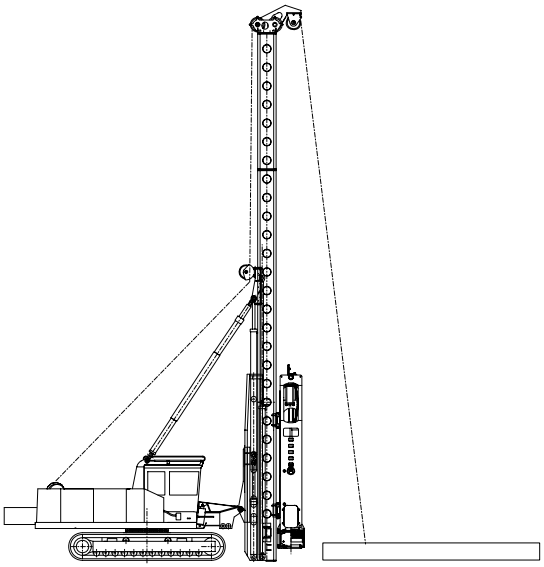
⚠ DANGER

When lifting piles be careful not to exceed the capacity of the winches. Do not exceed values which are given in load lifting tables. Make sure that there is nobody under the pile while you lift it.

- Keep the telescope leader down.
- Keep the hammer as down as possible. If necessary hammer can be lifted to 3 m height.
- Keep the horizontal slide maximum 300 mm out.
- Keep the leader foot as down as possible.
- If necessary leader foot can be lifted so that is possible to turn uppercarriage over tracks.
- Do not exceed values which are given in load lifting tables.
- Attach chains or ropes to the pile lifting points according to the pile manufacturer's instructions.
- Be careful that pile does not hit the machine or people on the work site when lifting it.
- Lower pile to desired position carefully

6.5.2 HAULING OF THE PILE

When piles are brought to the work site they should be positioned so that you can haul them with the machine near to the area where they are to be driven. Ensure that the piles are in the sequence they are needed.



- Turn the uppercarriage towards the pile.
- Pulling from the side is not recommended.
- Pull the horizontal slide in.
- Incline the leader slight (2-5º) forwards.
- Lower the telescope leader and the hammer down.
- Keep the leader foot on ground whenever you can.
- Attach chains or ropes to the pile lifting points.
- Follow pile manufacturer's instructions.
- Pull the pile closer and be careful that the pile does not hit the machine or persons.
- Do not exceed the machine allowed pulling force.
- You may have to move the machine closer to the pile in order to lift the pile over obstacles.
- Lower pile again to the ground when it has bee lifted over obstacle, move machine to the work spot and continue pile hauling according to instructions above.

⚠ WARNING

The maximum angle of the pile rope pulley to the left is 10º when you haul the pile from the side. Hauling from the right side is not allowed. If the angle is bigger the pile rope can be broken and the machine may damage. Anyway it is not recommended to haul pile from the side.

When hauling piles be careful not to exceed the capacity of the winches. Keep the uppercarriage towards the pile, leader foot against ground and do not turn the uppercarriage at the same time when you haul the pile. Otherwise you may cause excessive stress to the track beams.

There has to be always at least 3 coils of pile rope on the winch drum.

6.5.3 LIFTING PILE TO THE LEADER

When you have the pile near the machine and the pile is top end towards the machine you can start lifting the pile.

- Lifting the pile from the top end.
- Check that the chains and ropes are properly attached to the pile.
- Check allowed rope stresses before start lifting the pile.
- When the top end of the pile starts moving up, lift the hammer up with the winch so that the drive cap stays above the top of the pile.
- When the pile has been raised enough lower the hammer drive cap into the top of the pile.
- When the pile is vertical and the bottom end is still on the ground, close the pile arms around the pile.
- Once you locate the pile into the drive cap you can use the leader telescope to lift it up further. This gives you the advantage that both the hammer and the pile are raised at the same speed. The pile is then less likely to slip out of the drive cap than when using the winches.

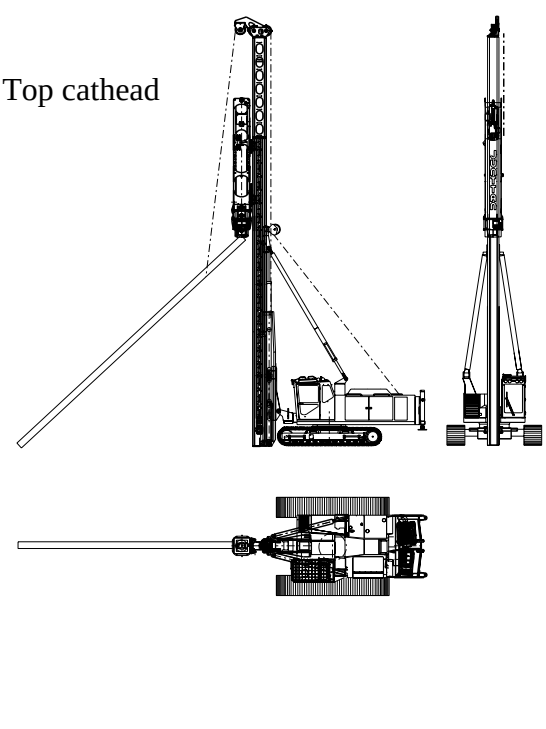
⚠ WARNING

Make sure that there is nobody under the pile while you lift it. After you have located the pile top into the drive cap you must ensure that you do not allow the top to come out of the drive cap any more until the pile has penetrated the ground, because if you do the pile may fall down with severe consequences.

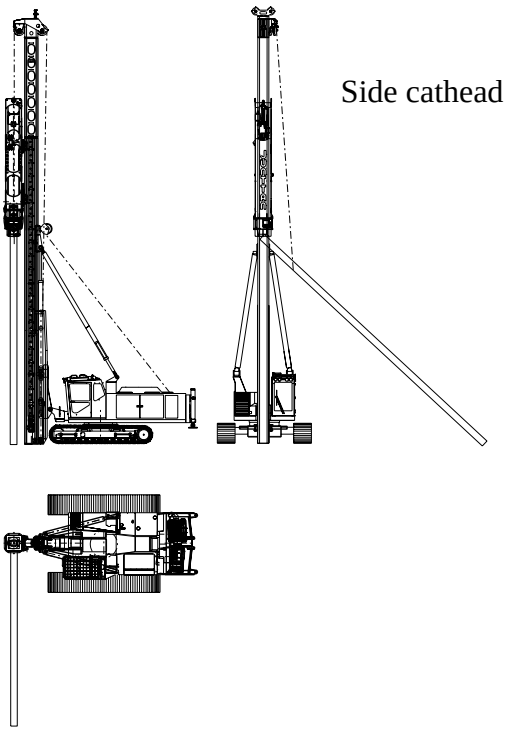
⚠ NOTICE

The function of the pile arms is to hold the lower end of the pile against the leader. Never use pile arms to lift objects.

Top cathead

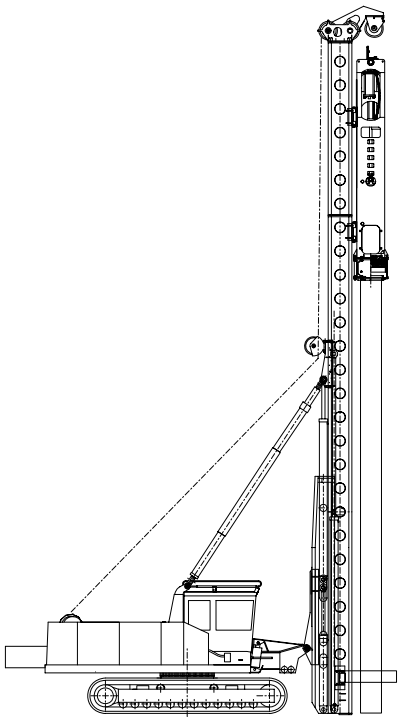


Side cathead



6.5.4 POSITIONING OF THE PILE

- Lift the pile slightly above ground.
- Move the machine and swing the machinery deck as needed so that you get as close as possible to the spot where the pile is to be driven.
- The final positioning of the pile should be done by swinging the machinery deck and pushing the horizontal slide out as told in the capacity table.
- Positioning the machine so that the movement of the horizontal slide is minimized, because the further it is extended, the more strain there is on the construction.
- Lower the bottom end of the pile to the ground and let the hammer rest on the pile.
- Open pile arms before start piling.



⚠ WARNING

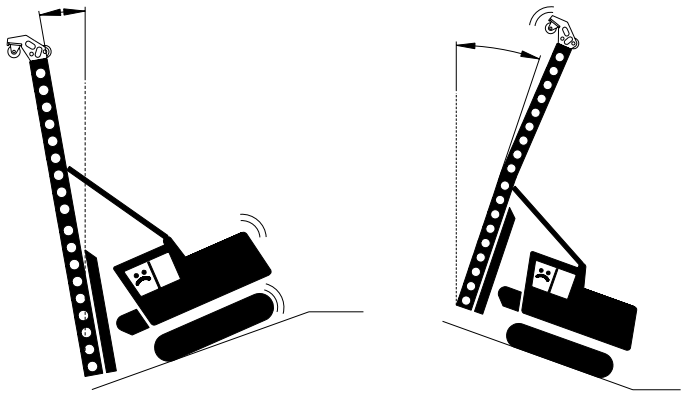
It is recommended not to travel distances on a site with the pile lifted up because there may be soft areas, humps, ditches, etc. may cause the machine to loose its stability. Drive piles only when the machine is on stable and firm ground. All functions must be performed slowly with care and without sudden movements.

6.5.5 MOVING MACHINE ON THE WORKING SITE

- Before moving the machine check the following things:
  - There is no person in the machine danger zone.
  - The ground on the working site is level and stable.
  - Leader foot is slightly above ground.
  - Telescope leader has been lowered down (if the machine is equipped with telescope leader).
  - Equipment (hammer/rotary head/vibrator) is as down as possible.
  - Counterweight is fully out.
  - Uppercarriage is parallel to undercarriage.
  - Horizontal slide is max. 300 mm out.
  - Leader is slightly (c. 5°) backwards inclined when moving on the level ground.
  - There are not any extra loads hanging on ropes, because the swinging of the load may cause the falling of the machine.
  - All functions must be performed slowly with care and without sudden movements.

- The stability of the machine does not support sudden movements. Use support mats under the tracks when needed.
- It is recommended not to travel long distances with the pile in the leader because there may be soft areas, humps, ditches, etc. which may cause the machine to loose its stability.
- If you have to move further, the pile has to be removed from the leader and the equipment (hammer/rotary head/vibrator) has to be lowered as down as possible. The leader has to be lowered to the transport position, if necessary.

- If you have to move the machine in the slope (max. 5°) the leader has to be inclined according to enclosed tables, in order to maintain the machine stability. It is, however, recommended, that the pile is removed from the leader and the equipment (hammer/rotary head/vibrator) is lowered as down as possible before driving the machine to the slope.
- Drive the machine to the slope only at right angles up- or downwards, not diagonally to slope inclination. The uppercarriage has to be parallel to the undercarriage.
- Drive extremely carefully in the turning point. Lower the leader foot as near the ground as possible in order to use it as a support to reduce the swinging of the machine in the turning point.



⚠ WARNING

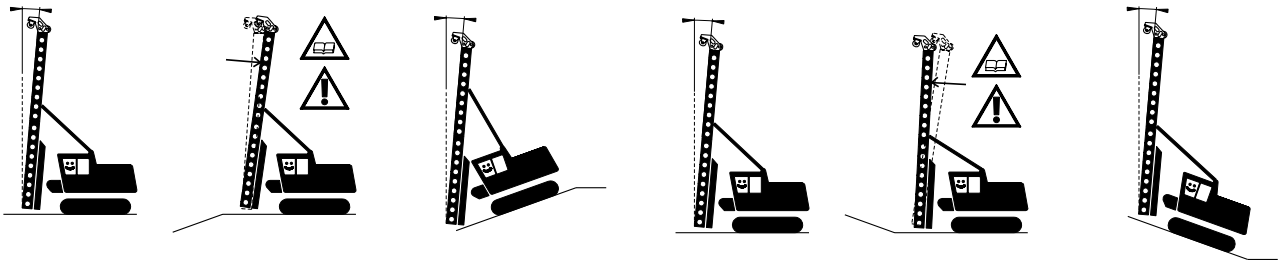
Make sure that there is no person in the danger zone when moving with the machine. Make sure that the ground in the working site is level and stable enough and the border areas are properly marked.

For example

- If you drive to a 5° downward slope, you incline the leader 10° backwards before driving to a slope.
- If you drive to a 3° upward slope, you incline the leader 2° backwards, before driving to a slope.
- **Notice!** See the capacity tables for maximum allowable pile weights and lengths before inclining leader backwards.

DOWNWARD SLOPE	LEADER BACKWARD INCLINATION	INCLINOMETER DISPLAY ON THE SLOPE
5°	10°	-5°
4°	9°	-5°
3°	8°	-5°
2°	7°	-5°
1°	6°	-5°
LEVEL GROUND	5°	-5°

UPWARD SLOPE	LEADER BACKWARD INCLINATION	INCLINOMETER DISPLAY ON THE SLOPE
5°	0°	-5°
4°	1°	-5°
3°	2°	-5°
2°	3°	-5°
1°	4°	-5°
LEVEL GROUND	5°	-5°



6.5.6 WORKING ON THE SLOPING GROUND

- Before starting the work on the sloping ground check the following things:
  - There is no person in the machine danger zone.
  - The ground is level and stable enough and the border areas are marked properly.
  - Max. ground inclination on the working site is 5°.
  - Leader foot and pile are slightly above ground.
  - Telescope leader has been lowered as down as possible (if the machine is equipped with telescope leader).
  - The position of the counterweight, see capacity tables.
  - There are not any extra loads hanging on ropes.
  - All functions are performed slowly with care and without sudden movements.

- It has to be exercised caution and carefulness when working on the sloping ground, especially when the machine is equipped with heavy equipment (hammer/rotary head/vibrator) and with long pile, auger or working tube.
- When the uppercarriage is turned, at the same time has to be made sure that the leader inclination angle does not increase too much by adjusting the leader position correspondingly.
- To maintain the machine stability on the sloping ground it is recommended that the uppercarriage is no longer turned when the pile is on the leader.
- Use of the swing brake (optional) may be beneficial if the machine is working on the sloping ground. The swing brake is operated with a switch on the right console. If you use the swing brake do not forget to release it when you no longer need it.

⚠ WARNING

Make sure that there is no person in the danger zone when moving with the machine. Make sure that the ground on the working site is stable and firm enough and that the border areas are properly marked.

6.5.7 INCLINING (RAKING) A PILE

⚠ DANGER

Pay attention to the capacity table and do not try to exceed the capacity of the machine. Do not use larger inclinations in any direction, nor heavier nor longer piles than is allowed.

When working, keep the tracks always at full width. Lower the telescope as far down as the pile length allows, while allowing the hammer to rest on the pile. Lower the pile against ground and the leader foot near to the ground so that it may still turn while you take the leader to the required inclination. Take the leader to the required inclination by adjusting the position of the top of the leader with the forward inclination or lateral inclination hydraulic cylinders.

6.5.8 PILE EXTENSION

Follow the pile manufacturer's instructions when you extend the piles.

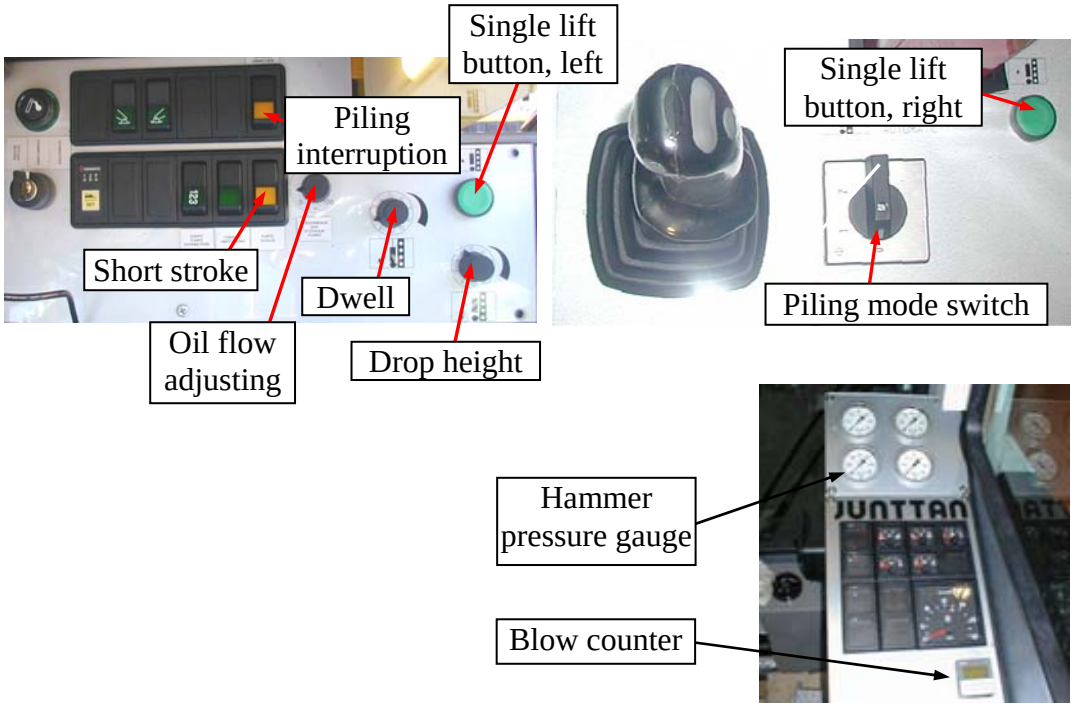
⚠ WARNING

Never stay under the leader, hammer or the pile. Secure communication between workers and operator in all situations. Use helmet.

6.5.9 OPERATING THE HAMMER

The hammer is operated with
- piling mode switch
- ram block single lift buttons
- drop height dial
- the dwell time dial
- pump flow adjusting dial
- short stroke switch
- piling interruption switch
- In the instrument panel on the right console there is a blow counter and a gauge for the hammer circuit pressure.

LEFT CONSOLE **RIGHT CONSOLE**



⚠ WARNING

Operate the hammer only while it is resting on a pile to be driven into ground. The drive cap needs to be at the top of its stroke so that it can move down at the impact. That is only possible when the hammer is resting on a pile. Never operate the hammer when the hammer or the pile is rope suspended. Before your start operating the hammer lower all loads, suspended by the winches, to the ground.

Before start operating the hammer check always that there is no person in the machine working radius. Check also position of the ropes and hydraulic hoses.

⚠ NOTICE

Do not operate the hammer while the temperature of the hydraulic oil is not in the operating range.

When you are ready to drive the pile which you have positioned according to the previous sections, release all the controls into their neutral positions.

⚠ NOTICE

It is recommended to keep the leader foot on ground during hammer operation. This way the vibrations from the impact will not be transmitted to the machine and the leader foot cylinder will not be damaged if the pile suddenly races down.

When you drive piles you should keep the drive cap, the hammer guide claws and the leads of the ram block always properly creased. The pulling with the winches is prevented, if the piling switch is on position 1 or 2. The pilot pressure from lifting side of the hydraulic control block is released.

LIMITATION OF USE OF THE PILING HAMMERS

General

As with all machinery there is a limit as to the operational conditions under which the machinery is expected to function safely, efficiently and longer lasting. A general definition for the piling hammers limit is described below.

Limitation of use

Under normal piling conditions, the hammer must be stopped when a **10 blows or more per 25 mm of penetration is recorded, over 6 consecutive intervals of 25 mm (For example 60 blows per 150 mm)**.

Continued use of the hammer over this limitation will result in hammer breakage within a short period of time. The hammer must be stopped immediately. For more information and guidance please contact your local dealer or manufacturer before proceeding beyond this limitation.

6.5.9.1 MANUAL HAMMER OPERATION

- **Check that there is no person in the machine working radius.**
- Check that the hammer is resting on a pile.
- Drive cap is its top position.
- Unwind hammer and pile winch ropes enough so that there is no load suspended by the winches.
- Turn the piling mode switch on the right console to position 1 - manual piling. In this position the hammer hydraulic circuit is pressurized and you can follow the pressure increase to the pre-set limit in the gauge.
- The pressure setting used for the hammer is stated in the specifications manual of the hammer. Make a habit of monitoring that the hammer circuit pressure stays in the specified range during operation of the hammer.
- To operate the hammer manually giving single blows, push the ram block single lift buttons down simultaneously (green buttons on the left and right consoles).
- The brakes of the hammer and the pile winch open when you press the single lift buttons and close when you release single lift buttons.
- The ram block will be lifted as long as you press the single lift buttons down and released to drop when you release one or both single lift buttons.
- When you have lifted ram block manually up and you release your finger from the single lift buttons, the ram block goes down. Never push the buttons when the ram block moves downwards.
- When you stop hammer operation turn the piling mode switch to position 0.

⚠ WARNING

Do not turn the piling mode switch to position 1 or 2 if the hammer is not resting on a pile. Check also that there is enough slack in the ropes of the winches.

If the hammer starts working before you press the single lift buttons stop working immediately. Find the reason for that and repair it.

⚠ DANGER

In the manual mode the winches brakes are released when the single lift buttons are pressed. The brakes are open until you release single lift buttons. Pay special attention to the ropes and unwind them if necessary. If you start to lift the ram block while it is bouncing up and down after the previous impact there can be excess strain on the hammer that eventually can cause damage.

6.5.9.2 CONTINUOUS HAMMER OPERATION

- **Check that there is no person in the machine working radius.**
- Check that the hammer is resting on a pile.
- Drive cap is its top position.
- Turn the drop height dial to minimum and the dwell time to maximum.
- Turn the piling mode switch to position 2.
- To start continuous hammer operation, push the ram block single lift buttons down simultaneously (green buttons on the left and right consoles).
- Hammer and pile winch brakes opening when continuous piling is started by pressing single lift buttons.
- Increase the drop height as required.
- While driving continues, the dwell time should be turned back to minimum unless there is recoil from the pile.
- On hard ground and when the pile is against rock the return stress wave makes the ram block bounce. On such occasions you should increase the dwell time so that all the bouncing of the ram block stops prior to the next lift.
- In order to get small drop heights switch on short stroke, turn the drop height dial to minimum and let the engine speed drop.
- A further reduction in the drop height can be obtained by locking the hydraulic pumps to minimum output with turtle switch on the top console. Also you can adjust pump flow with potentiometer on the left console.
- Three ways to stop continuous hammer operation:
  - **1:** Turn the piling mode switch to position 1. The hammer and pile winch brakes are close during interruption. To start continuous hammer operation again, turn the piling mode switch to position 2 and push the ram block single lift buttons down simultaneously.
  - **2:** Switch ON piling interruption switch on the left console. The hammer and pile winch brakes are open during interruption. To start continuous hammer operation again, switch OFF piling interruption switch.
  - **3:** Pull back the safety lever. The hammer and pile winch brakes are closed during interruption. To start continuous hammer operation again, push the safety lever to front position and push the ram block single lift buttons down simultaneously.
- When you stop hammer turn the piling mode switch to position 0.

⚠ WARNING

Do not turn the piling mode switch to position 1 or 2 if the hammer is not resting on a pile. Check also that there is enough slack in the ropes of the winches. If the hammer starts working before you press the single lift buttons stop working immediately. Find the reason for that and repair it.

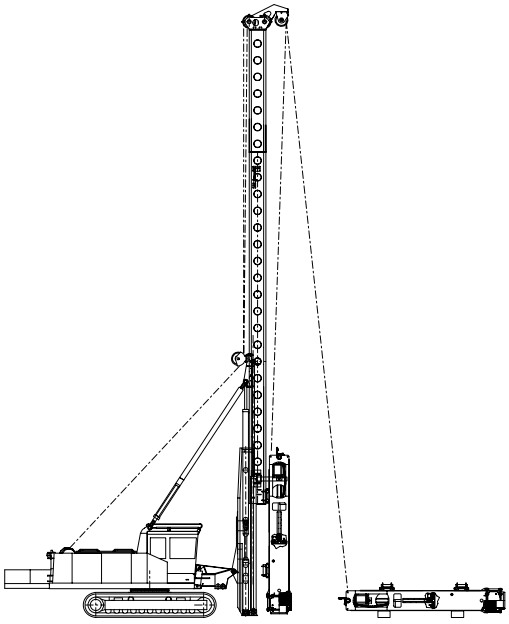
Pile fast sinking in the soft soil:

- Sometimes the pile may sink faster if the soil is soft below the pile.
- In this case the hammer stroke must be stop with piling interruption switch on the left console.
- The hammer and pile winch brakes are open during interruption.
- When sinking is finished start continuous hammer operation again, switch OFF piling interruption switch.

6.6 MOUNTING AND DISMOUNTING OF EQUIPMENT

When you mount and dismount equipment on the machine ensure that the hydraulic hoses and the ropes do not get tangled with machine parts. Pay attention also to the pile arms, they should be wide open in order not to touch the hammer and other pieces of equipment. Close the pile arms only when you position the pile. You can mount the equipment on the machine in different sequences. The steps are described in the respective sections below. In normal operation you may need to replace the drive cap cushion or to dismount the ram block which are detailed in hammer-manual.

6.6.1 MOUNTING OF THE HAMMER



Use the two lifting points on the top side of the hammer to lift it. Lay the equipment on the ground in front of the machine as shown in the picture. Place wooden supports underneath the equipment. Any sand or dirt which goes into the guides will be detrimental to the life of the wear pads.

Plug the hydraulic hoses with plastic caps at both ends temporarily during mounting and transport of the equipment. Be careful that no dirt enters the hoses, as that will eventually be detrimental for all the hydraulics.

Lower the leader foot down and incline the leader forward so that the cathead is above the lifting points. Attach the rope of the pile winch with two slings to the lifting points. Lift the equipment to the vertical position. Move the machine as necessary. Adjust the inclination and position of the leader so that guide claws are in the right position. Lock guide claws to the leader.

Attach the hammer rope to the lifting eye of the equipment. Remove the rope and chains which you used to lift the equipment. Connect the hydraulic hoses to the hammer. If necessary, put the hammer to the transport lock and lower the leader with the hammer. Also connect the electric cable to the hammer. Open the valves of the hammer hydraulic hoses, which are located on the front side of the machinery deck. Dismount the hammer in the opposite sequence.

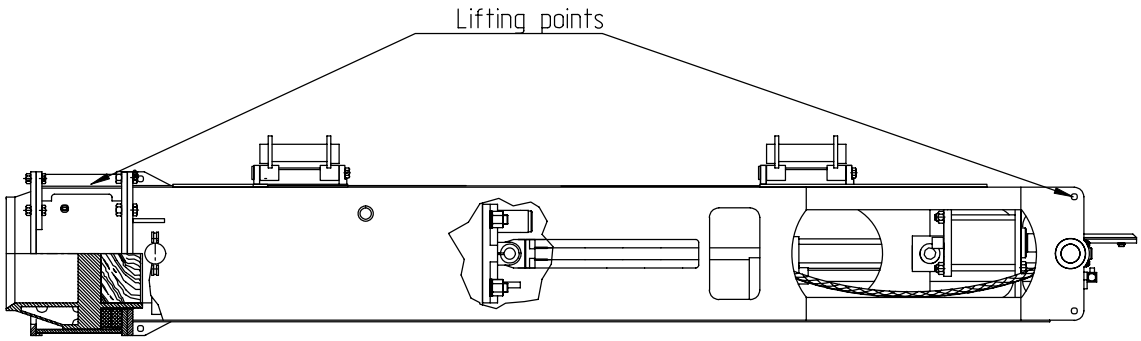
Before dismounting the hammer:
- lift the hammer to the top of the leader
- stop the engine
- open the tank pressure relieve valve, located in the hydraulic compartment
- wait 5 to 10 minutes
- close the tank pressure relieve valve and valves of the hammer hydraulic hoses on the front of the machine
- start the engine
- lower the hammer down

6.6.2 LIFTING OF THE HAMMER

Always use shackles when lifting the hammer. Fasten the ropes to the shackles (four pieces) and lift the hammer up. Know your dimensions and pay attention to the overhang in turns and corners.

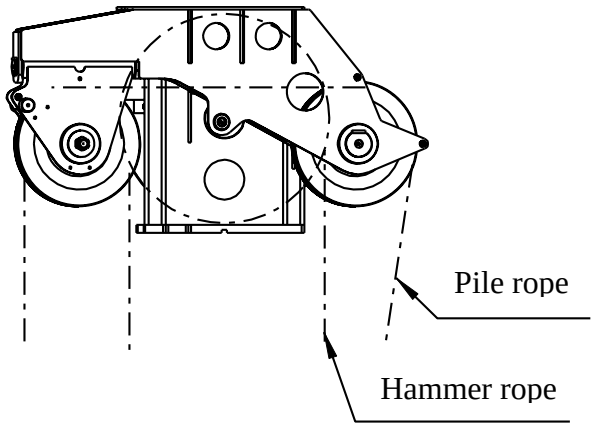
⚠ ATTENTION

Remove the shackles before start piling.



6.6.3 MOUNTING OF THE CATHEAD

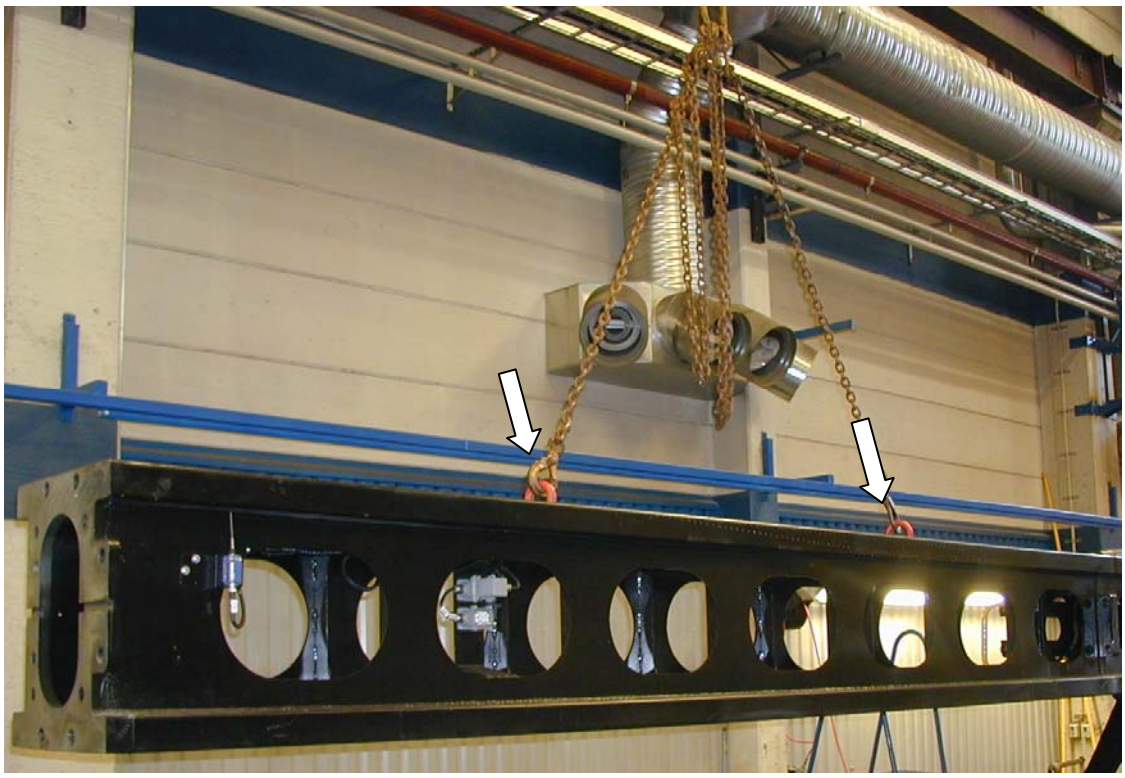
1) Attach the lifting rope to the lifting points of the cathead and lift the cathead in place
2) Attach the bolts inside and outside
3) Connect the electric wires



6.6.4 LEADER SHORTENING

1) Loosen the ropes
2) Disconnect the hydraulic hoses (when needed) and electric wires
3) Connect the lifting rope to the lifting points of the leader extension
4) Remove the bolts
5) Remove the leader extension
6) Connect the hydraulic hoses (when needed) and electric wires
7) Place the electrical limit switch of the hammer to the leader
8) Change the rope(s) when needed
9) If you dismount the uppermost leader extension, first you have to dismount the cathead
   - disconnect the hydraulic hoses (when needed) and electric wires
   - attach the lifting rope to the lifting points of the cathead
   - remove the bolts

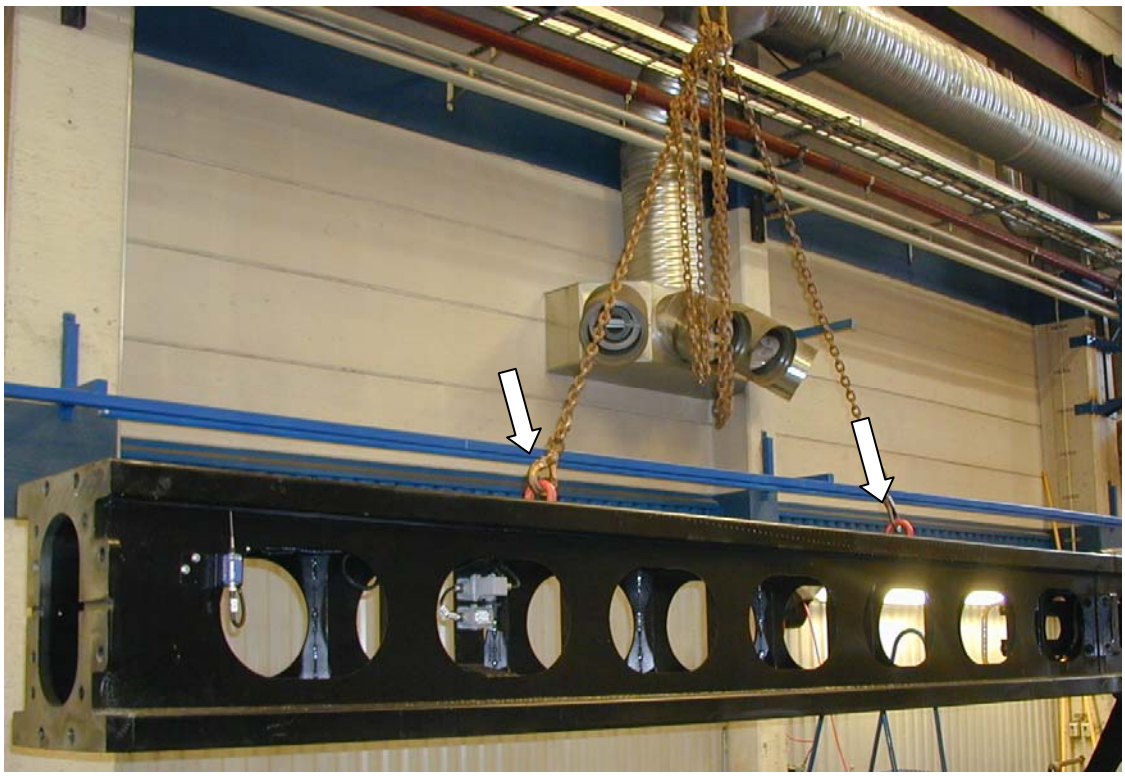
   Mount the cathead after shortening the leader (see separate instructions)



6.6.5 LEADER EXTENSION

1) Loosen the ropes
2) Disconnect the hydraulic hoses (when needed) and electric wires
3) Connect the lifting rope to the lifting points of the leader extension
4) Lift the leader extension in place
5) Attach the bolts
6) Connect the hydraulic hoses (when needed) and electric wires
7) Place the electrical limit switch of the hammer to the leader
8) Change the rope(s) when needed
9) If you mount the uppermost leader extension, first you have to dismount the cathead
   - disconnect the hydraulic hoses (when needed) and electric wires
   - attach the lifting rope to the lifting points of the cathead
   - remove the bolts

   Mount the cathead after extending the leader (see separate instructions)



6.6.6 USE OF STABILIZERS

OPTIONAL

The rear stabilizers (if they are on place) can be used to lift up the machine with the leader foot to rotate the undercarriage. Also the stabilizers give support to machine when you lift/lower the leader or take backward inclination. You can move the stabilizers up and down with the switches on the left console.

6.7 TRACK WIDTH ADJUSTMENT

The track width can be adjusted by positioning the crawler frames at the desired position with hydraulic cylinders. At both ends of the middle body of the undercarriage there are slides (1) with adjustable stops for the maximum width. You can widen and narrow the tracks from the cab. The track width is adjusted with the switch at the top of the control lever for the forward inclination and leader foot on the right console.

⚠ DANGER

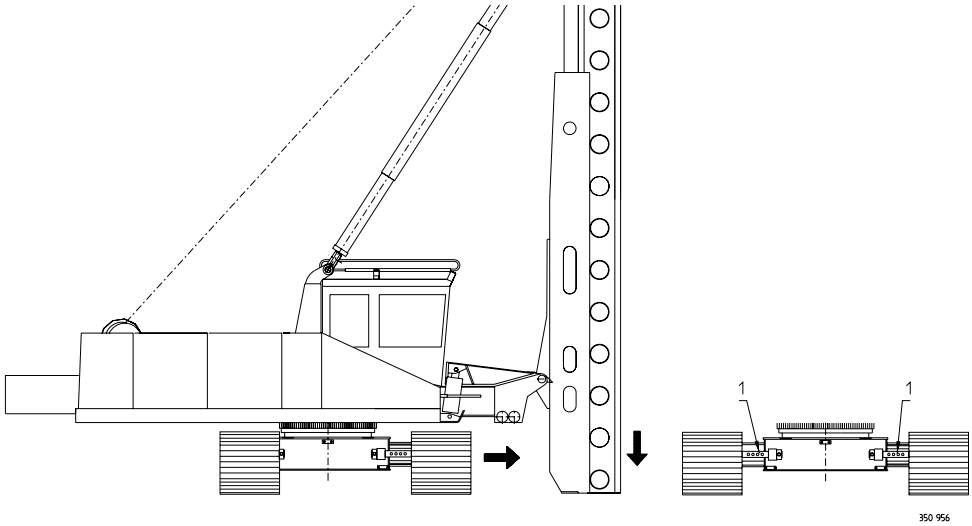
The tracks must be fully out in working.

LIFTED LEADER

When you want to change the track width, turn the machinery deck crosscarriage and push the leader foot against ground to raise one side of the tracks. Now you can widen or narrow the track width. Raise the leader foot and swing the machinery deck around to the other side and repeat the procedure.

⚠ ATTENTION

When you widen the track width push the tracks against the stops in the slides mentioned above, and when you narrow the tracks, narrow them until they stop against the middle body.



6.8 TRANSPORTING AND STORING THE MACHINE

6.8.1 DRIVING ONTO A TRAILER

Check that the trailer is on level and stable ground. Use ramps to drive the machine onto the trailer. Do not exceed the maximum climbing angle (15º) when using ramps. While you are on the ramps you may have to lift the leader slightly so that the cathead does not touch ground. Once you have the machine on the trailer, centre it in relation to the width of the trailer and drive it as far to the front end of the trailer as you can, so that it will clear the lorry and any gooseneck on the trailer. Always lock the slewing mechanism for transport.

6.8.2 DRIVING OFF A TRAILER

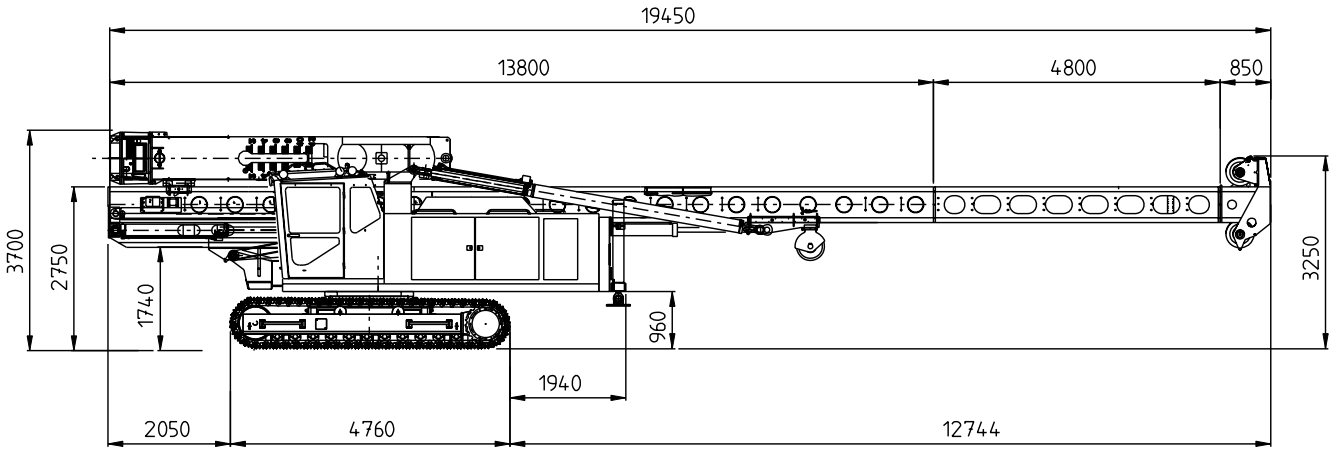
Position the trailer on level and stable ground with sufficient space to swing the machine around with the leader lowered. Disengage the slewing mechanism lock with the switch on the right console. Do not exceed the maximum climbing angle (15º) when using ramps.

While you drive the machine off the trailer, you may have to lift and lower the leader slightly at times in order to clear the lorry, any gooseneck on the trailer, and the ground. Always use ramps when you drive the machine off a trailer.

6.8.3 TRANSPORTING THE MACHINE

During transporting the machine must be secured to the trailer with chains. Attach chains over the tracks. The slewing mechanism lock must be engaged.

Follow the regulations for transport. Know your dimensions and pay attention to the overhang in turns and corners. Stay clear of power lines. If you are in doubt about clearances, check before you try to pass a narrow or low spot. Lock the transport switch (see the operation section, rear console) during transporting. Only travel lever and leader lift device controls are activated when the switch is locked.



6.8.4 STORING THE MACHINE

When you store the machine and leave it unattended, follow the steps listed below. During storage the machine should be protected from moisture, dust, mechanical damage and vandalism. Park the machine on level and solid ground, out of the way and away from anything moving which might damage it.

For short time (over the weekend) the machine can be stored with lifted leader.

Keep tracks fully extended.
Attach the ropes to the machine or equipment.
Wind up the slack from ropes.
Engage the slewing mechanism lock.
Lock all doors and cover.
Clean the tracks from excess dirt.
Lower the leader foot on ground and the hammer/rotary head down.
Put the leader slightly backwards inclined.

For longer periods (more than weekend) the machine is stored in the transport position.

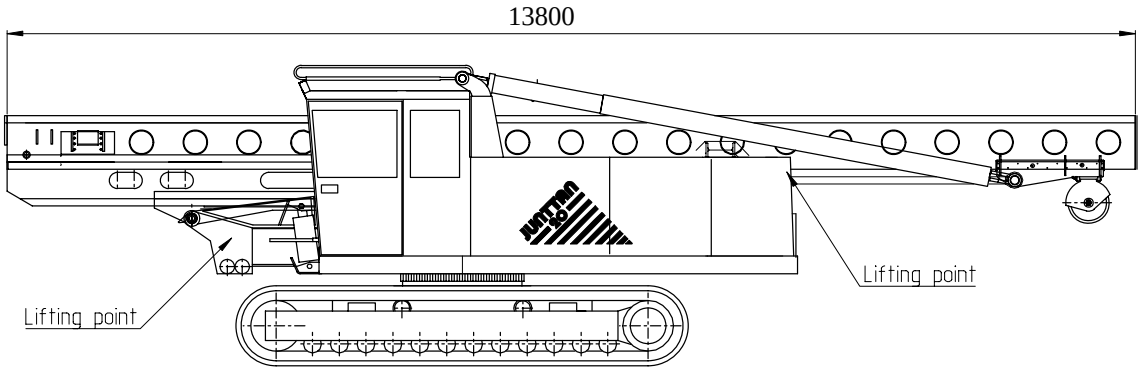
Keep tracks fully extended.
Attach the ropes to the machine or equipment.
Wind up the slack from ropes.
Engage the slewing mechanism lock.
Remove all items from the cab.
Turn off the main switch.
Lock all doors and cover.
Clean the tracks from excess dirt.

⚠ ATTENTION

When you start to operate the machine always remember to disengage the slewing mechanism lock and to widen the tracks fully out.

6.8.5 LIFTING THE MACHINE

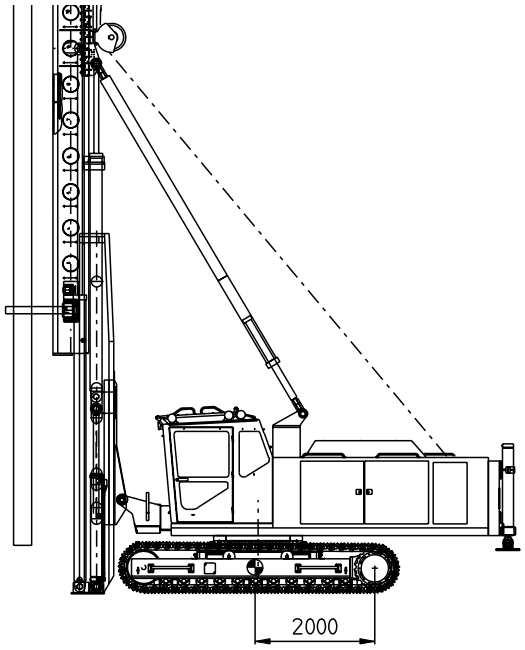
Always use the indicated lifting points when lifting the machine, see picture below. Maximum leader length 12.6 m is shown in the figure. **Check center of gravity line position before start lifting.**



6.8.6 CENTER OF GRAVITY OF THE MACHINE

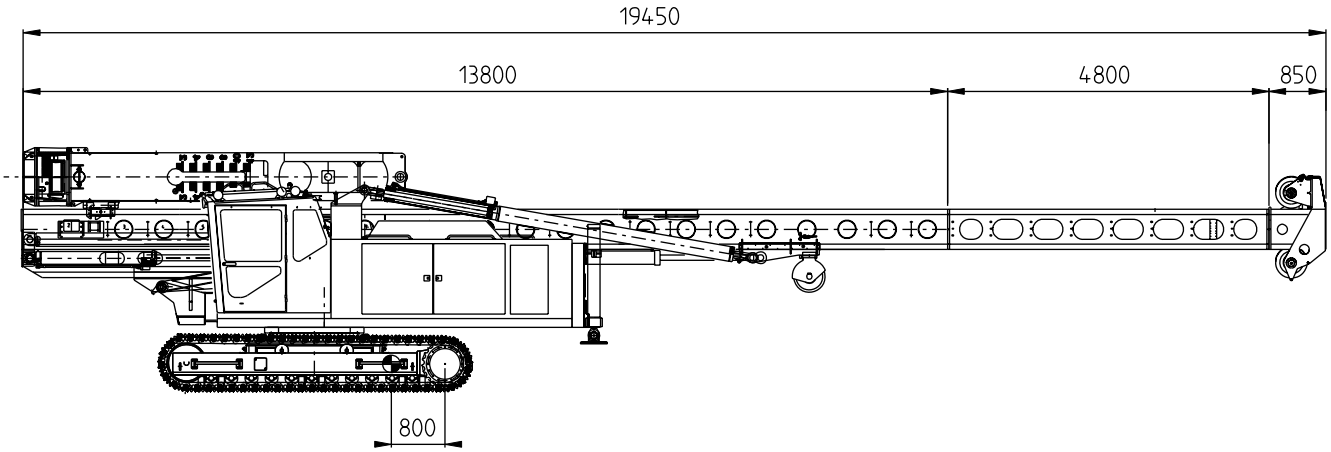
Working position

- leader in vertical position
- leader length 18.6 m (13.8 + 4.8) + cathead
- horizontal slide in
- counterweight (7 500 kg) fully in
- hammer (7 700 kg) on the leader



Transport position

- leader length 18.6 m (13.8 + 4.8) + cathead
- hammer (7 700 kg) on the leader
- counterweight (7 500 kg) fully in



7. ROUTINE SERVICE SECTION

7.1 SAFETY REGARDING LUBRICATION AND SERVICE

When you service the machine, relieve pressure and allow time for cooling of the hydraulic system and engine. Remove the physical forces presented by the load or other machine parts prior to dismounting any component. Remember that the fluids are flammable, the exhaust is toxic and the batteries contain corrosive acid.

Perform the service in an area and in a manner that no water, dirt or other type of contamination can get into the systems of the machine. Take the necessary precautions so that your skin does not come into contact with the fluids, and ensure that there is no spillage to the environment.

Before placing this machine in service, the Service Manual supplied with, and considered part of this machine, must be studied and understood by each person responsible for operation and maintenance of the machine. Safe and efficient operation of this machine requires that it be maintained in good condition and that its operator be thoroughly familiar with the controls and the general capability of the machine.

Follow the instructions for performing routine service in the appropriate sections of this manual and accompanying manuals (engine, etc.). Familiarize yourself carefully and completely with each item before you begin the service. If you are in doubt or have any questions, consult the manufacturer. Do not service the machine while it is in operation, mobile or while the engine is running, unless expressly instructed to do so.

⚠ DANGER

Do not place yourself under any rope suspended loads.

⚠ ATTENTION

Incorrect or negligent service can be detrimental to the life of the machine. There shall be always at least two persons (operator, helper) when servicing or maintaining the machine on the working site. One of them shall supervise the safety of other workers. The operator shall have possibility to use emergency stops in all situations. Always use sufficiently lights in the operation area. Secure communication between workers and operator in all situations.

7.2 FUELS, LUBRICANTS AND HYDRAULIC FLUIDS

7.2.1 FLUID AND LUBRICANTS CAPACITIES

Location	Type, factory filled	Standards	Capacity
Engine oil	Neste turbo LXE 15W-40 mineral	API CH-4/SJ, ACEA E5, E3, B3, CES 20071	17 litres
Engine coolant	Neste coolant 50% mixture	BS6580:1992, Afnor R15-601, ASTM D 3306	35 litres
Hydraulic oil	Neste hydraulic 46 mineral, VG46	ISO 3448, DIN 51524 HVLP	600 litres
Fuel	Diesel	ASTM No. 2 D above 0 ºC No. 1 D below 0 ºC	600 litres
Swing drive planetary	Neste hypoidi LF SAE 80W(77W)-90	API GL-5, MIL-L-2105 D	10 litres
Track drive planetary	Neste hypoidi LF SAE 80W(77W)-90	API GL-5, MIL-L-2105 D	5.5 litres

Minimum purity of grade of hydraulic oil: 20/18/15 -ISO-4406 (c)

⚠ ATTENTION

Recommended operating temperature is -20 °C - +40 °C.

7.2.2 OIL AND GREASE TYPES

⚠ ATTENTION

Incorrect fuel, oil, grease or fluid can damage the machine.

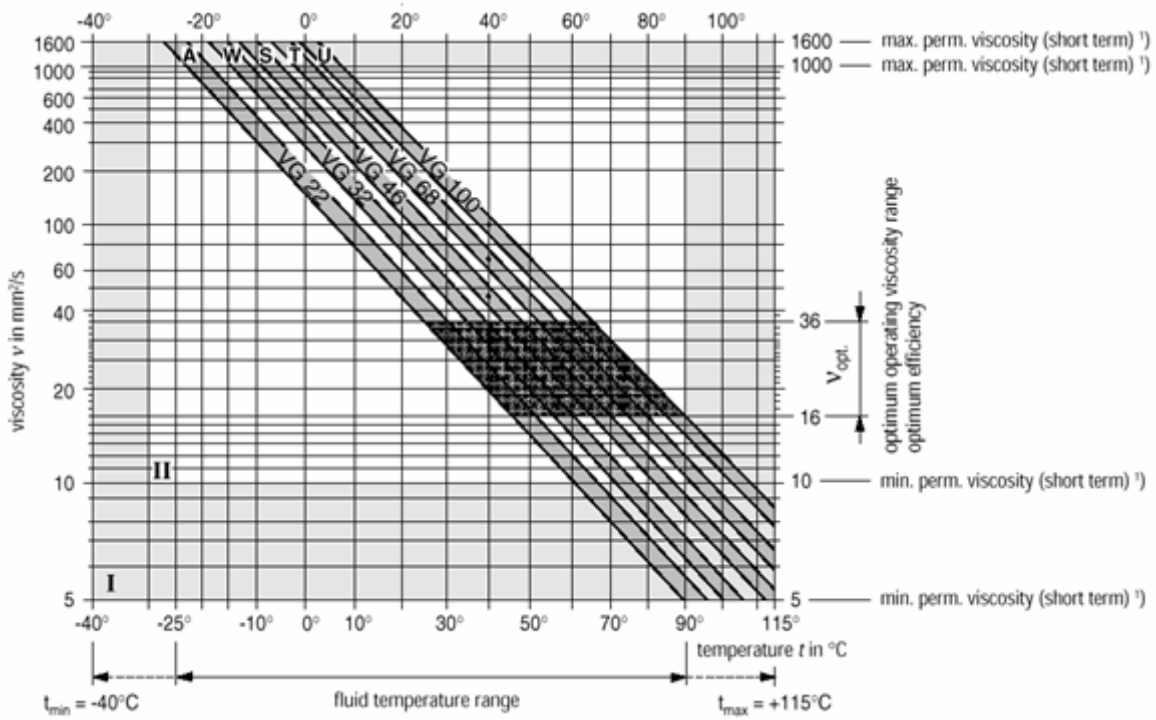
For engine oil specification, see the respective operation and maintenance manual

Transmissions oil type: API-GL-5-80/90 SAE 80W/90
VG 150 or VG 220, ISO 3448

Hydraulic oil type for this machine: Neste hydraulic 46 mineral, VG46

VG 32 is recommended to used in Northern Europe,
VG 46 is recommended to used in Central Europe
VG 68 is recommended to used in Asia

Solidification point of the hydraulic oil has to be 10-20°C below the lowest operating temperature. Viscosity of cold oil should be less than 1000 cSt (when the engine is started), and between 16-36 cSt during operation in normal operating temperatures.



Selection Diagram:
A = for arctic conditions or for extremely long pipelines
W = for winter conditions in Central Europe
S = for summer conditions in Central Europe or for enclosed areas
T = for tropical conditions or for areas with high temperatures
U = for excessively high temperatures (e.g. due to internal combustion engines)
1) Depending on the product resp. the sizes the following viscosity ranges are valid:
I : 5 mm^2/s (t max = +115ºC) … 1600 mm^2/s (t min = - 40ºC),
II: 10 mm^2/s (t max = +90ºC) … 1000 mm^2/s (t min = - 25ºC)
(Please find the max. permissible viscosity range in the catalogue sheets of the singular products optimum efficiency)

Recommended oil brands:

Location	Manufacturer					
	Neste	Mobil	Esso	Shell	Castrol	Teboil
Engine oil	Turbo LXE	Delvac XHP, Delvac HP	Essolube XT 501	Rimula Super, Super FE	RX Super Plus	Super HPD, Power
Hydraulic oil	Hydrauli 46	Flowrex 86, DTE 15M	Univis N 46	Tellus T 46, TX 46	Hyspin AWH 46	Hydraulic oil 46 S, Lift 46
* Swing drive planetary	Hypoidi LF S 80W (77W)-90	Mobilube 1 SHC	Gear Oil TDL	Transaxle Oil 75W-90, Spirax ASX	Syntrax Universal	Hypoid SAE 75W-90
* Track drive planetary	Hypoidi LF S 80W (77W)-90	Mobilube 1 SHC	Gear Oil TDL	Transaxle Oil 75W-90, Spirax ASX	Syntrax Universal	Hypoid SAE 75W-90

* See also transmission manufacturers instructions.

⚠ ATTENTION

Incorrect fuel, oil, grease or fluid can damage the machine.

GREASING		
Location	**Type, factory filled**	**Standards**
General greasing, bearings and slewing ring	Neste Allrex EP2	DIN KP2N-30, ISO-L-XCDIB2
Guide claws of hammer and rotary head	Neste Molygrease	NLGI 2
Pinion gear of swing drive	Würth Vaseline	
Steel ropes	Würth HHS 2000	
Central lubrication system	Teboil Universal CLS	

Recommended grease brands:

Location	Manufacturer					
	Neste	Mobil	Esso	Shell	Castrol	Teboil
General greasing, bearings and slewing ring	Allrex EP2	Mobilgrease MP	General grease	Retinax EP2, EPL 2	LM Plus	Multi-purpose grease
Guide claws of hammer and rotary head	Molygrease	Mobilgrease Special	Moly Grease 2	Retinax HDX 2	MS1	Universal M
Pinion gear of swing drive		Mobiltac 81	Surret Fluid NX	Malleus Fluid D		
Steel ropes						
Central lubrication system	Teboil Universal CLS	See instructions from manufacturer of central lubrication system.				

7.3 ROUTINE SERVICING OF THE MACHINE

Lubricate the machine according to the service chart. The chart also includes other maintenance tasks which you are to perform during daily operation. Also refer to the lubrication charts of the machine. For details of other equipment refer to the respective sections of the lubrication and maintenance manuals. For routine servicing of the engine refer to the engine manual.

⚠ ATTENTION

Record all service works.

JUNTTAN ROUTINE SERVICE CHART PM 20

DAILY OR EVERY 8 HOURS

Object:	Measure:
Engine crankcase oil	Check oil level
Coolant	Check coolant level
Hydraulic tank oil	Check oil level
Machine	Walk-Around inspection
Lifting devices	Walk-Around inspection
Cross joint	Grease and check
Indicators and gauges	Test
Emergency stops	Test

AFTER EACH 40 HOURS/WEEKLY

1. Grease the slewing ring ball races (lubrication pipes with grease nipples are in the hydraulic compartment).
2. Grease the nipples in the upper and lower slide.
3. Grease the nipples in the upper and lower swivels of the inclination cylinders.
4. Grease the nipples in the stabilizers (optional).
5. Grease the nipples of the leader guides.
6. Apply grease with a brush to the bottom of the horizontal slide.
7. Grease the nipples of the leader lift device .
8. Check the bearings of the sheaves (the bearings are lubricated for life).
9. Check the condition of the ropes and lubricate them with brush (see standard ISO 4309).
10. Grease the slewing ring pinion gear.
11. Check the play of the track frame slide beams.
12. Check the bearings of the winches top limit in the cathead.
13. Check the level of the electrolyte in the batteries, clean batteries and terminals.
14. Check the track drive transmission oil level.
15. Check the swing drive transmission oil level.
16. Check the inclinometer calibration.

MONTHLY

17. Grease the nipples in the cathead.

JUNTTAN ROUTINE SERVICE CHART PM 20

AFTER FIRST 100 HOURS

18. Filter or change the hydraulic oil.
19. Replace the hydraulic oil filter elements.
20. Clean the hydraulic oil tank.
21. Check the pressure settings of the hydraulic system.
22. Check that the hydraulic valve system functions properly.
23. Check the hydraulic hose and pipe connections.
24. Check the mountings of the hydraulic pumps.
25. Torque up the slewing ring and the swing drive bolts.
26. Check the winch brakes.
27. Check the track drive transmission oil level.
28. Check the swing drive transmission oil level.
29. Tighten the track shoe bolts.

AFTER EACH 100 HOURS

30. Check the track drive transmission oil level.
31. Check the swing drive transmission oil level.
32. Check and clean the hydraulic oil cooler if needed.
33. Check the track shoe bolts and tighten if necessary.

AFTER EVERY 1000 HOURS/ONCE A YEAR

34. Change or filter the hydraulic oil and clean the hydraulic oil tank at least once a year.
35. Replace the hydraulic oil filter elements and change hydraulic tank breather.
36. Change the track drive transmission oil.
37. Change the swing drive transmission oil.
38. Torque up the slewing ring and swing drive bolts (700 Nm).
39. Remove water and dirt from the fuel tank sediment bowl.
40. Remove water and dirt from the hydraulic tank sediment bowl.
41. Lubricate the door hinges.
42. Lubricate the top of the horizontal slide.
43. Replace the air filter element.
44. Check the fire extinguishers and refill if necessary.

ENGINE MAINTENANCE SCHEDULE

General information

Perfom maintenance at whichever interval occurs first. At each scheduled maintenance interval, perform all previous maintenance checks that are due for scheduled maintenance.

Daily or Refueling - Maintenance check[3]

- Air tank and reservoirs - drain
- Crankcase breather tube - inspect
- Engine coolant level - check/correct
- Fuel-water separator - drain

Every 250 Hours or 3 Months - Maintenance check[3]

- Air cleaner restriction - check/correct
- Air compressor mounting hardware - check/correct
- Charge air cooler - check/correct
- Charge air piping - check/correct
- Radiator hoses - check
- Air intake piping - inspect
- Cooling fan - inspect
- Coolant level - check/correct
- Drive belts - check/correct

Every 500 Hours or 6 Months - Maintenance check[1,2,3]

- Engine coolant antifreeze - check
- Fuel filter, spin-on-type - replace
- Lubricating oil and filters - change

Every 1000 Hours or 1 Year - Maintenance check[3]

- Cooling fan belt tensioner - check/correct
- Fan hub, belt-driven - check/correct

Every 2000 Hours or 2 Years - Maintenance check[2,3]

- Air compressor discharge line - check/correct
- Cooling system – drain/flush/fill
- Vibration damper, rubber - check
- Vibration damper, viscous - check

Every 5000 Hours or 4 Years - Maintenance check[3]

- Overhead set - adjust

1. The lubrication oil and lubricating oil filter interval can be adjusted based on application, fuel consumption, gross vehicle weight and idle time.

2. Antifreeze check interval is every oil change or 500 hours, or 6 months, whichever occurs first. The operator **must** use a heavy-duty year-round antifreeze that meets the chemical composition of GM6038M. The antifreeze change interval is 2000 hours, or 2 years, whichever occurs first. Antifreeze is essential for freeze, overhead and corrosion protection.

3. Follow the manufacturer's recommended maintenance procedures for the starter, alternator, generator, batteries, electrical components, exhaust brake, charge air cooler, radiator, air compressor, air cleaner, freon compressor and fan clutch.

⚠ Welding on a vehicle with an electronic controlled fuel system

Disconnect both the positive (+) and negative (-) battery cables from the battery before welding on the vehicle. Attach the welder ground cable no more than 0.61 meters (2 feet) from the part being welded. Do not connect the ground cable of the welder to the ECM cooling plate or ECM. Welding on the engine or engine mounted components is not recommended or damage to the engine or components can result.

Engine crankcase oil

Checking the oil level

Check the oil level daily.

⚠ NOTICE

Let the engine be stopped at least for 5 minutes before checking the oil level. Do not overfill. Engine damage can result.

- Stop the engine.
- The crankcase oil level dipstick is located on the right side of the engine. Open the door.

- Remove the dipstick and clean it thoroughly.
- Reinsert the dipstick and pull it out again.
- The oil level should be between the marks on the dipstick.

Adding oil

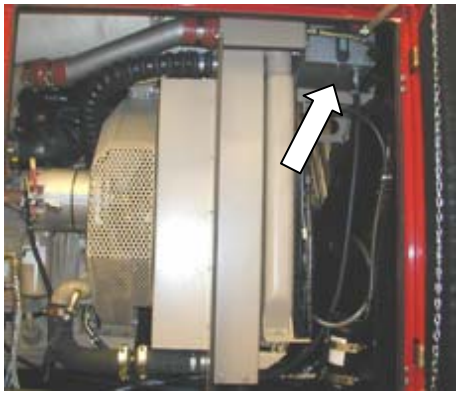
- Remove the oil fill plug and add oil.
- Clean and install the fill plug.
- Close the door.

Coolant

Checking the coolant level

Check the coolant level daily.

- The coolant reservoir is located on the right side of the engine. Open the door.



- Coolant level should be seen on the level gauge on the side of the coolant reservoir.
- If additional coolant is needed, remove the coolant fill cap of the coolant reservoir and add the appropriate coolant/water mixture as necessary.

Adding coolant

⚠ WARNING

Do not open the fill cap of the coolant reservoir when the engine is hot. Wait until the coolant temperature is under 50 ºC. Hot fluid or steam can cause a serious injury.

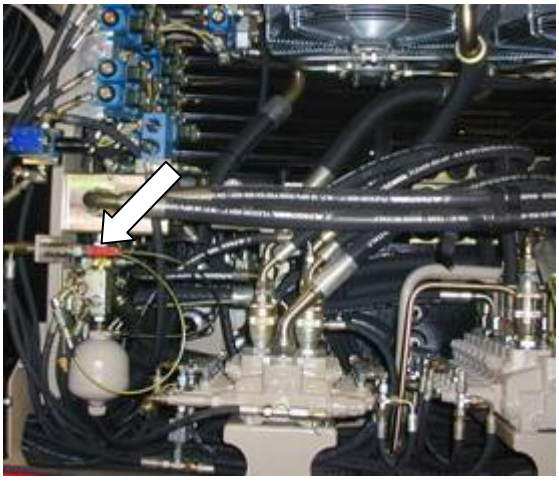
- Stop the engine. Wait until the coolant temperature is under 50 ºC before opening the fill cap.
- Slowly loosen the fill cap to release pressure.
- Add the coolant/water mixture as necessary.
- Inspect the condition of the cap gasket, replace if necessary. Install the cap and close the cover.
- Inspect the radiator fins and clean if necessary.

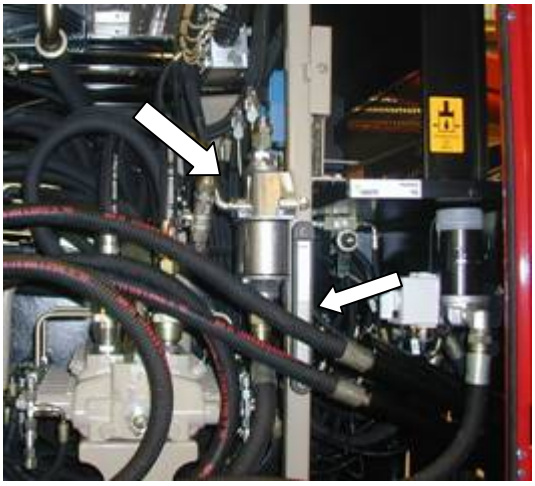
Hydraulic tank oil

Checking the oil level/PM 20

- The hydraulic oil level gauge is located on the left side of the machine. Open the door.

- The hydraulic oil level should be at least in the middle of level glass.





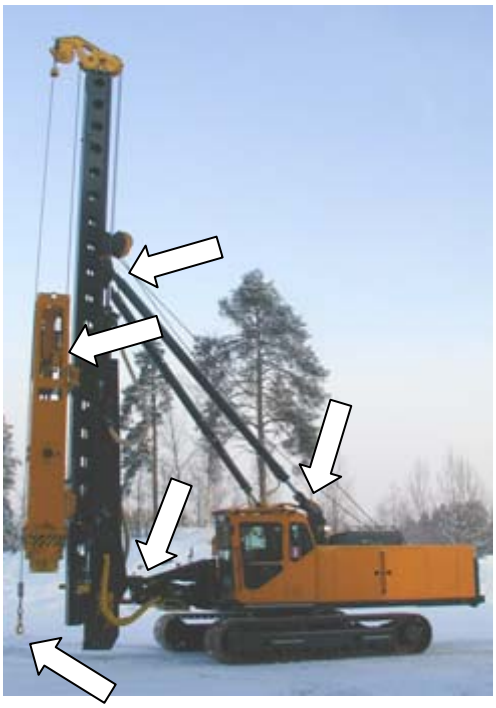
Adding oil

- Open the pressure release valve located in the hydraulic compartment and add oil with manual pump.
- Close the valve after added enough oil to the system.
- Close the door.

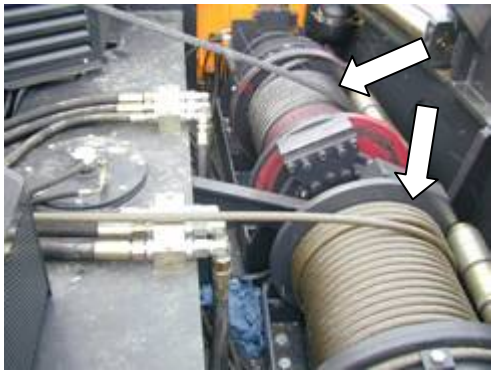
Walk-Around Inspection

Check the machine

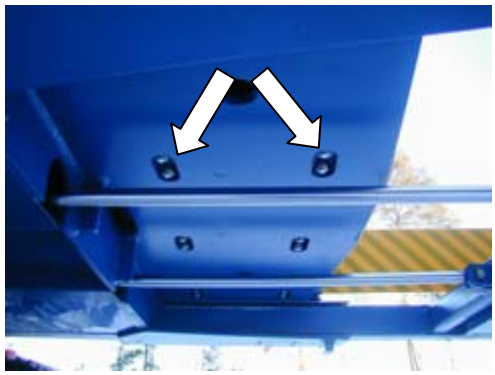
- Check visually upper and lower joints of lateral inclination cylinders and cross joint.
- Inspect the lifting point of leader mounted device (hammer, rotary head, vibrator etc.).
- Keep a close watch for leaks in cylinders. If leaking is observed, find the source and correct the leak.



- Inspect all lifting devices (winches, steel ropes, lifting hooks and chains).
- Check that steel ropes are correctly on winch drums and pulleys.



- Check that winches fastening bolts are not loose, tighten if necessary.
- Checking of bolts is easiest, when counterweight is fully out.
- Inspect the possible leaks of the hydraulic system (cylinders, hoses, tubes, fittings and joints). Correct the leaks as soon as possible.



- Check that all covers are firmly in place.
- Inspect the steps and handholds for their condition and cleanliness.
- Tighten loose bolts.
- Inspect the cabin for cleanliness.
- Inspect the machine for cleanliness. Keep the machine clean from waste, snow and ice.

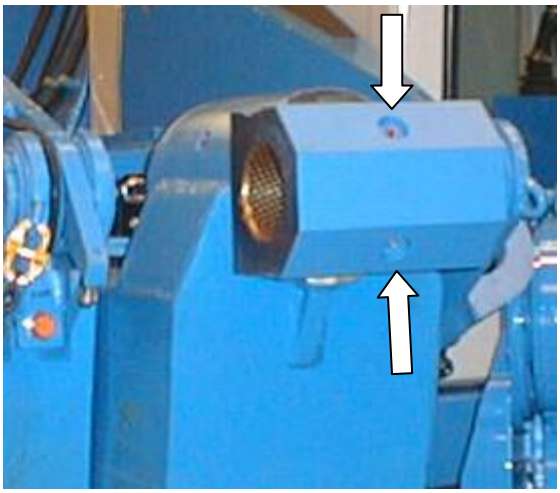
- Inspect the condition of lights. Replace broken bulbs.

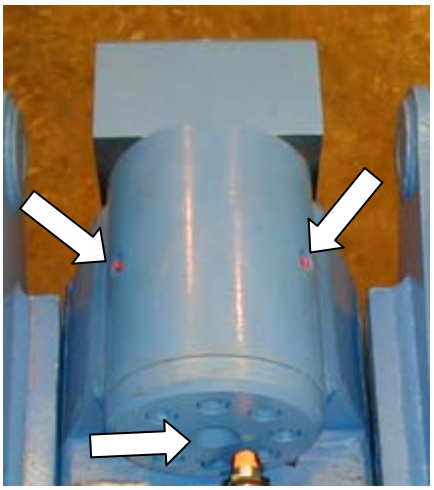
- Check visually the carrier rollers, track rollers, track shoes and idler wheels for wear.
- Check visually the track frame slide beams for wear and check the cylinders for leakages.
- Tighten loose bolts.

Cross joint

Greasing the cross joint

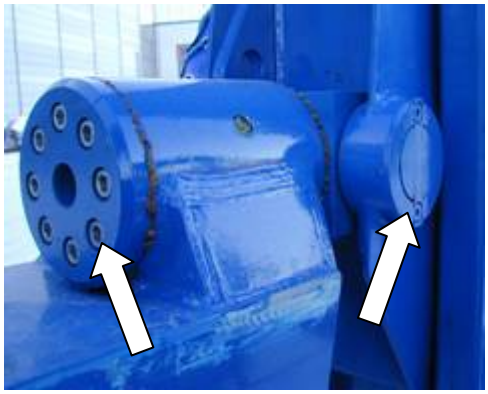
- Grease the cross joint daily.
- Lift the leader foot up to grease the upper nipples of the cross joint.
- Lower the leader foot against ground to grease the lower nipples of the cross joint.





Inspecting the cross joint

- Inspect the locking of cross joint bolts daily.



Indicators and gauges

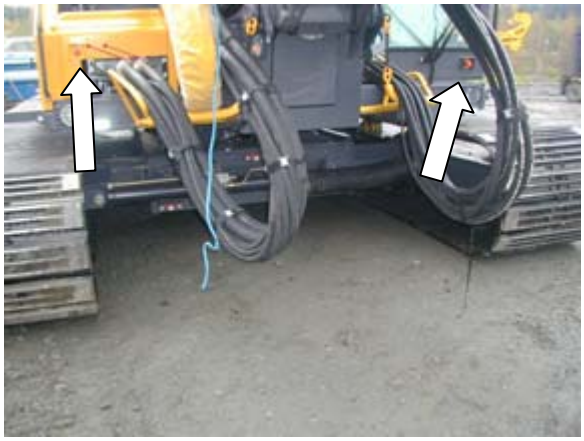
Checking indicators and gauges

- Look for broken gauge lenses, indicator lights and switches.
- Start the engine.
- Look for inoperative gauges.
- Make any needed repairs before start working.

Emergency stops

Inspecting the emergency stops

- Check that the emergency stops are in working order before start of each shift.
- There are three emergency stops in the machine; one in the cabin and two in front of the machine.



- Start the engine and test the function of each button in turns. Repair the damaged buttons immediately.

7.4 HYDRAULIC SYSTEM

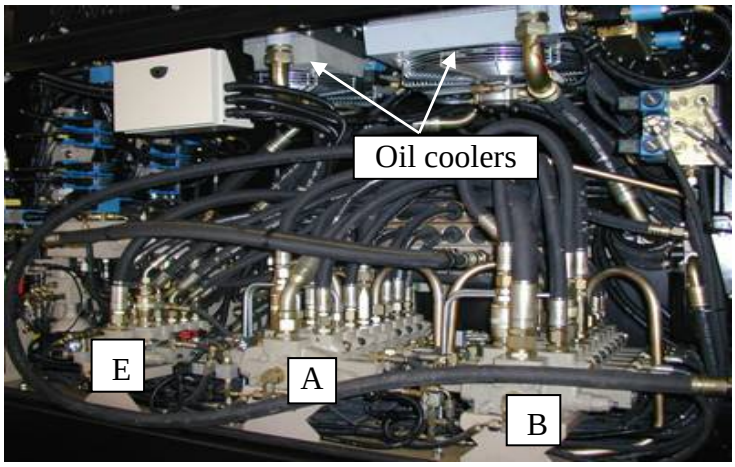
The hydraulic system of Junttan rig is an open design and consists of 3 axial piston pumps, which are mounted directly with a clutch and transmission at the flywheel end of the engine. The displacement of main pumps can be adjusted and they have a power regulation. The displacement of third pump is constant. There is also a small double gear-type pump in the accessory drive of the engine.

The oil is sucked from the hydraulic tank into the pumps. From the first part of double pump the oil goes to valve block A, from the second part to valve block B and from the third pump to valve block E. On each valve block there are main relief valves and pressure relief valves for different functions. For some functions there are also flow restrictors on the valve block. The valves in the valve blocks are operated with electric or hydraulic pilot valves. Some of the hydraulic circuits have hydraulic accumulators to reduce the pressure surges.

The oil flow from the pumps to the hammer goes thru blocks. Depending on oil amount the hammer needs, the main pumps or all three pumps are connected to the hammer. The valves on the blocks have to be in the neutral position, so that the hammer can use all oil.

In the cab there are gauges to indicate the pressures of the main circuits. Additionally there are quick-release couplings in the hydraulic compartment for each of the pumps for connecting a separate pressure gauge. There are pressure and return filters in the system. After passing through the hydraulic motors, cylinders etc. the oil goes to the collection sump. The main part of the oil goes thru the oil coolers to the tank.

During the piling, when piling mode switch is in position 1 or 2, the oil is piloted to hammer circuit and relieve valve regulates the pressure in the circuit. The unloading valve is closed. When the piling mode switch is turned to position 0, the unloading valve opens and pilotes the hammer circuit pressure to the tank line. The pilot valves get the pressure from the hydraulic pumps. The pilot pressure is 35 bar. Depending on the type the winches have a separate drain line equipped with a filter (BB- and 500A-winches). The pressure of collection sump is used in some winch models (BB- and 500A-winches) to build winch case pressure and in some models (500A-winches) also to pre-heating.



7.4.1 THE PRESSURE SETTINGS

The pressure settings of the relief valves are made by Junttan Oy. The set values can be seen in the hydraulic diagrams.

7.4.2 HYDRAULIC OIL COOLING

The oil from the return oil sump goes through two lines to the oil coolers and then through to the return filters. The oil coolers fans are used with the hydraulic motors. Hydraulic power to the motors is taken from the pilot pump. When the oil temperature rises to + 55°C the temperature sensor energizes the solenoid valve which directs the oil to the fan motor. There is also a manual switch for the oil coolers fans in the cab. See Section Operator's controls. The temperature of the oil in the return oil sump is detected by the temperature sensor, and displayed on a temperature gauge in the cab.

7.4.3 RELIEF AND CONTROL VALVES OF THE VALVE BLOCKS

At the end of each valve block there is a main relief valve, which is common to all the functions connected to the valve block. The operating pressure of a function connected to the valve block may be lower than the pressure set by the main relief valve or the pressure of the function may need to be reduced for some reason. In such cases there is one or two work port relief valves mounted on the valve block for this function in question. For some functions it is necessary to adjust their speed. For this purpose there is flow control restrictors mounted on the valve blocks.

7.4.4 CHANGING THE HYDRAULIC OIL

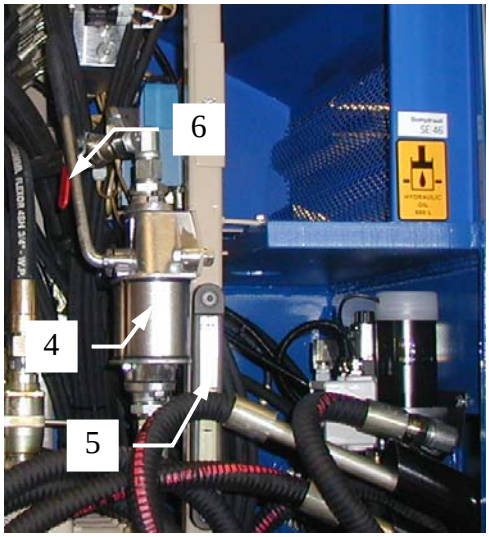
Change or filter the hydraulic oil and clean the tank through manhole (1) after the first 100 operating hours. From then on change or filter the oil and clean the tank after every 1000 hours of operation or at least once a year. When you re-install the covers on the manholes make sure they sit tightly and that the breather (2) is in good working condition.

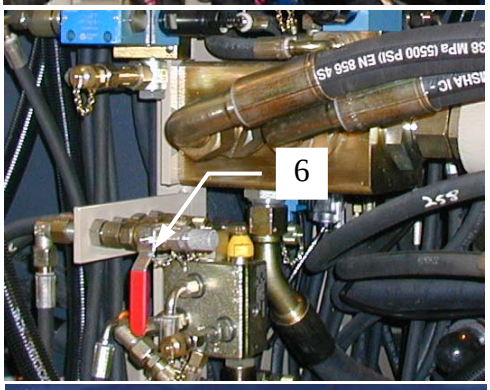
If there has been damage in the hydraulic system, or if impurities or dirt have got into the hydraulic system, change or filter the hydraulic oil and clean the tank. If you find there is water in the hydraulic oil, replace the oil and install water-separating oil filters for the next 24 to 48 hours of operation. Clean the filter bowls and replace the elements whenever you change the oil or filter it. If there have been impurities or water in oil, do not use the machine until you have found and eliminated the cause. Fully retract all cylinders to minimize the amount of oil in the system. Drain the tank through the drain-cock (3).

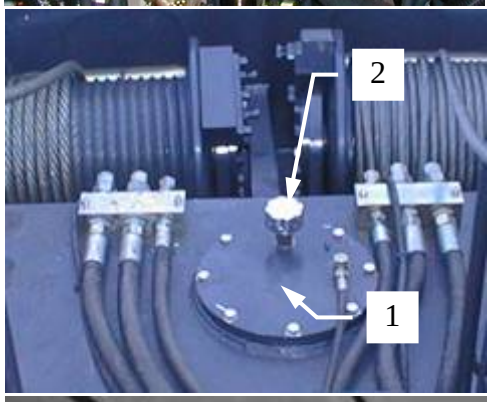
Use new clean oil of the same type that was previously used. Large amounts of hydraulic oil can be fed through the filling hole in manhole (1). Always use pump which filtering the hydraulic oil. Smaller amounts of oil can be pumped in using the pump (4) in the hydraulic compartment. Open valves (6) before start using the pump (4). Close valves (6) after filling.

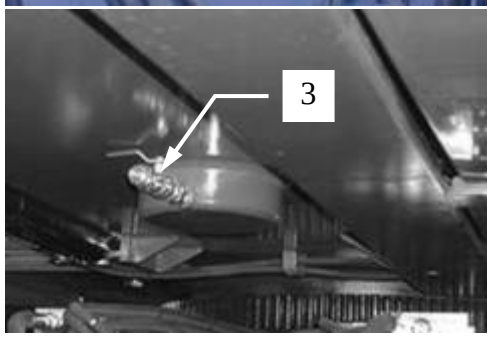
Use level glass (5) to check amount of oil.

Always fill the tank to the maximum level. Do not operate the machine unless you can see the oil level in the upper glass. Do not fill oil over the maximum level, because room is needed for thermal expansion and for turbulence of the return oil. If the hydraulic oil tank is drained, bleed air from the hydraulic pumps before start using the machine.









⚠ NOTICE

Do not mix different kinds of oil when refilling. If the hydraulic oil tank is drained, bleed air from the hydraulic pumps before start using the machine.

CHANGING THE FILTER ELEMENT OF THE BREATHER

Change or clean the filter element of the breather during every oil change (every 1000 hours) or when necessary.

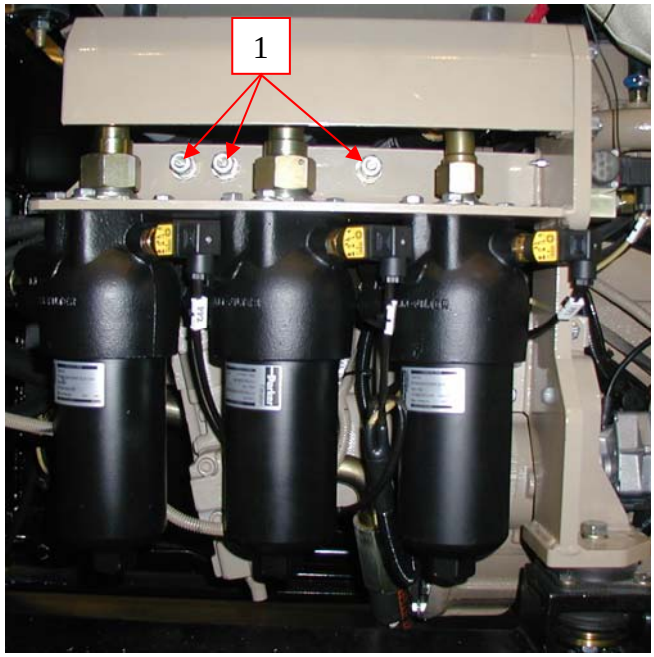


7.4.5 DE-AIRING OF HYDRAULIC PUMPS

After the oil change the pump housings have to be de-aired or filled with oil before starting up engine.

Working order:

1) Drain the tank
2) Clean the tank bottom
3) Fill the tank
4) Use the hand pump (~20 pumpings) to add pressure to tank
5) De-air the main pump housings by unscrewing closing plugs (1)



7.4.6 REPLACING THE HYDRAULIC OIL FILTERS

Refer to Drawings number 451 048 and 451 050.

⚠ ATTENTION

Absolute cleanliness in the hydraulic system is of utmost importance.

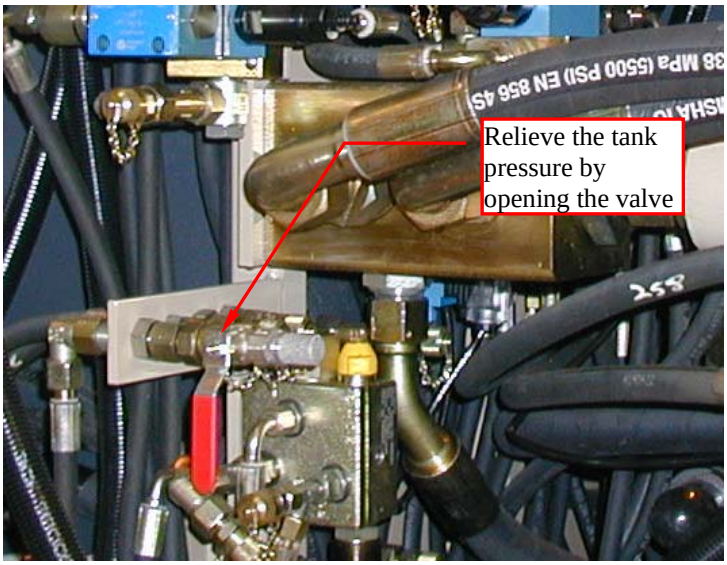
It is therefore essential that you adhere to the prescribed intervals for cleaning filter bowls and replacing elements. Replace all the filter elements and clean the filter bowls after the first 100 hours of operation. From then on do the same after every 1000 hours of operation or at least once a year. Also replace the filter elements and clean the filter bowls every time when damage occurs which contaminates the hydraulic system. The filter elements must be changed when the indicator light for the element in the cab comes on. If the warning lights keep a longer period on, stop the engine, check for reason. Normally, the signal light of return filters can be on for 1 to 5 minutes after starting the engine (if the temperature of the hydraulic oil is lower, the period is longer). There is an indicator gauge for the leak oil filter in the hydraulic compartment.

There are six filters in the hydraulic system (drawing 451 048):
- two return filters (Items 1 and 2)
- three pressure filters (Items 3,4 and 5)
- one leak oil filter (6)

The pressure filters are in the engine compartment. Leak oil and return filters are in the hydraulic compartment. The drain oil from the hydraulic winches flows through the leak oil filter at the back of the hydraulic compartment.

⚠ DANGER

Always relieve the tank pressure before replacing the hydraulic filters.



PRESSURE FILTERS IN DRAWING 451 048, filter 3, 4 and 5

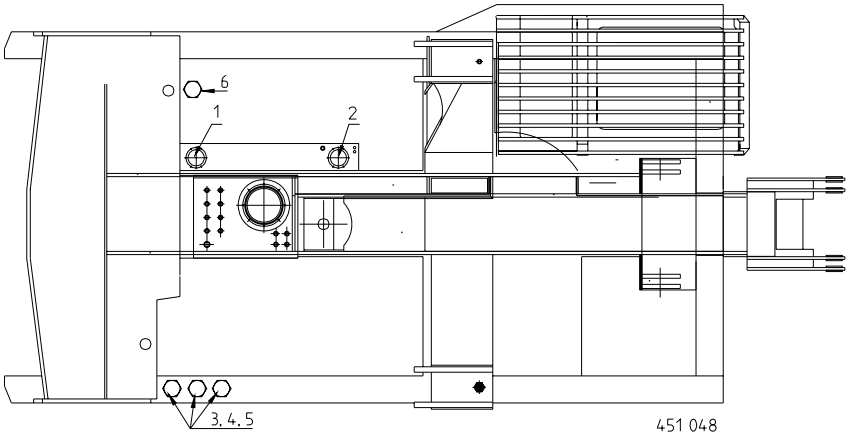
The item numbers refer to Drawing number 451 050/1

- Relieve the tank pressure
- Remove filter bowl (3)
- Remove and discard filter cartridge (1)
- Check and clean filter bowl
- Check the by-pass valves
- Change new seals and o-rings if needed
- Lubricate seals and threads
- Install new filter cartridge
- Reinstall filter bowl
- De-air the hydraulic system
- Check filter for leaks

RETURN FILTERS IN DRAWING 451 048, filters 1 and 2

The item numbers refer to Drawing number 451 050/2

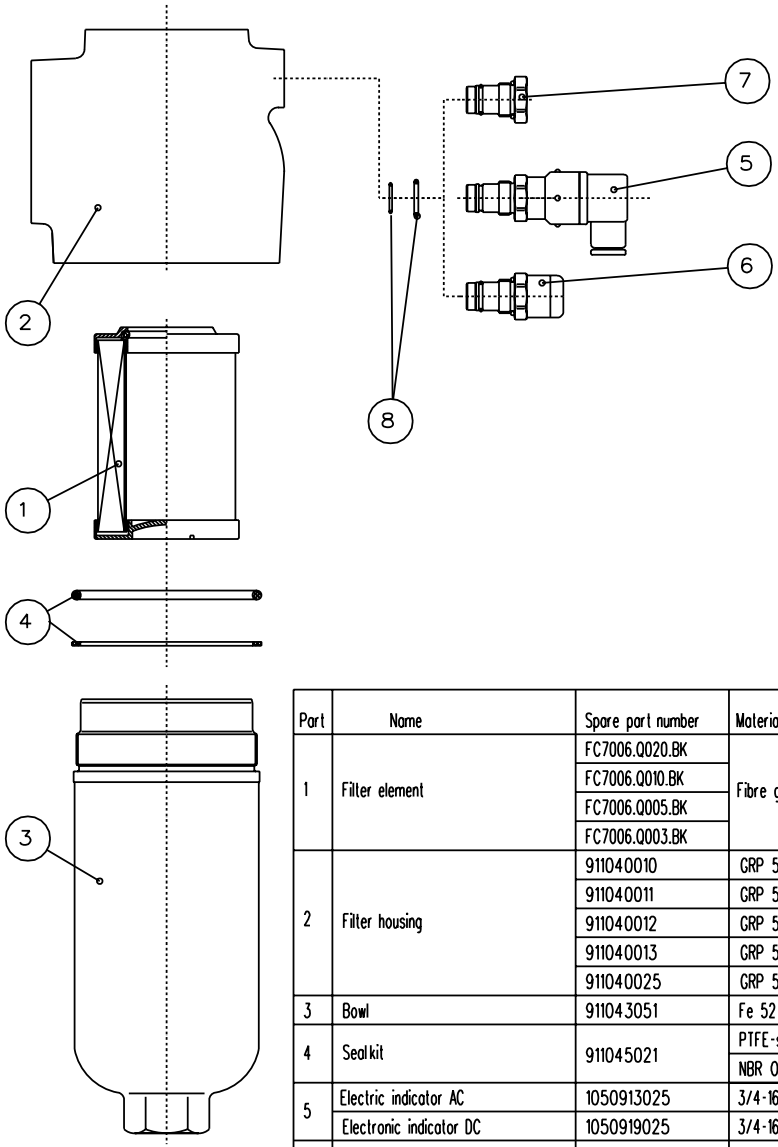
- Relieve the tank pressure
- Open four nuts (11) on the cover (6)
- Pick up the filter cartridge (1) with holder (2)
- Open screw (3) and remove filter cartridge from holder
- Check and clean filter bowl (8)
- Check the by-pass valves
- Change new seals and o-rings if needed
- Lubricate seals and threads
- Insert new filter cartridge to holder
- Install filter cartridge with holder to its place
- Install cover (6)
- Check filter for leaks



FINN·FILTER

SPARE PARTS LIST

FF7006



Part	Name	Spare part number	Material, shape, measures,model	pcs
1	Filter element	FC7006.Q020.BK	Fibre glass with support net	1
		FC7006.Q010.BK		
		FC7006.Q005.BK		
		FC7006.Q003.BK		
2	Filter housing	911040010	GRP 500 G1	1
		911040011	GRP 500 G11/4	1
		911040012	GRP 500 G11/2	1
		911040013	GRP 500 SAE 11/2 210 bar	1
		911040025	GRP 500 SAE 11/2 420 bar	1
3	Bowl	911043051	Fe 52	1
4	Sealkit	911045021	PTFE-support ring 101.1 x 95.1 x 1.5	1
			NBR O-ring 94.84 x 3.53 90 Shore A	1
5	Electric indicator AC	1050913025	3/4-16 UNF Δp 2.5bar	1
	Electronic indicator DC	1050919025	3/4-16 UNF Δp 2.5bar	1
6	Visualindicator	1050910025	3/4-16 UNF Δp 2.5bar	1
7	Indicator plug	916073003	3/4-16 UNF	1
8	Indicator sealkit	911045041	NBR O-ring 16.3 x 2.4	1
			NBR O-ring 13.1 x 1.6	1

4/96 3160

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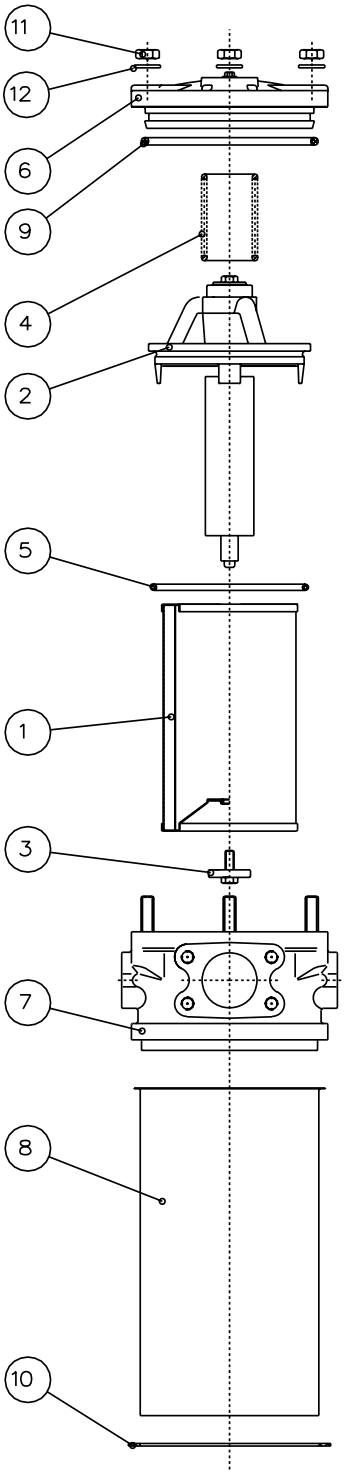

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SPARE PARTS LIST

TYPE 1097

Part	Name	Spare part number	Material, shape, measures,model	pcs
1	Filter element	FC1097.Q020.BS	Fibre glass with support net	1
		FC1097.Q010.BS		
		FC1097.Q005.BS		
		FC1097.Q003.BS		
		FC1097.N010.BS	Cellulose paper with support net	1
		FC1097.N010.BS	Cellulose paper	1
		FC1097.M (• degree of filtration in microns for ex. FC1097.M040.BS	Wire mesh	1
2	Holder assembly	918042028	By-pass 1.6 bar	1
		918042041	By-pass 2.4 bar	1
3	Screw	918060016		1
4	Spring	J011323		1
5	O-ring	OR10039	NBR O-ring 130.0x4.0	1
6	End cap	918041030		1
7	Filterhousing	918040042		1
8	Funnel	918043060		1
9	O-ring	OR10031	NBR O-ring 146.1x5.34	1
10	Seal	TT15006		1
11	Nut	KT20007	M12 DIN 934	1
12	Washer	KT30007	M12 DIN 125	1

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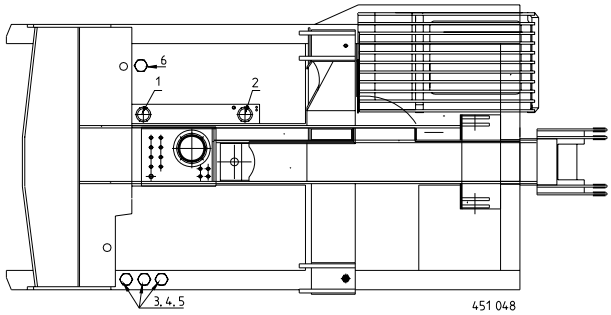
451 050/2

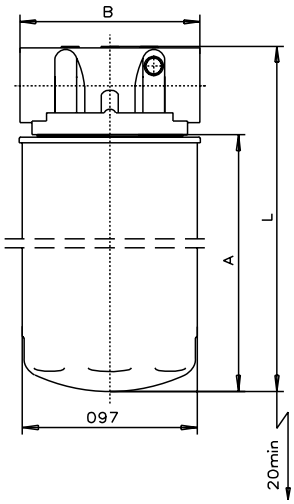
LEAK OIL FILTER IN DRAWING 451 048, filter 6



- Relieve the tank pressure by opening the input hose
- Remove filter bowl by turning it counter-clockwise
- Remove and discard filter element
- Check and clean filter bowl
- Check the by-pass valves
- Lubricate seals and threads of the filter element
- Install new filter element by turning it clockwise, tighten the filter element with hands 3/4 turn
- De-air the hydraulic system and bleed the air from all winch motors
- Check filter for leaks

FINN-FILTER

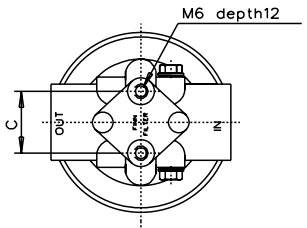
LOW PRESSURE FILTERS
ON-LINE ASSEMBLY
SERIES 1000



TYPE	A	L G 3/4	L G 1	WEIGHT
1001	115	158	163	2.0kg
1002	145	188	193	2.1kg
1003	175	218	223	2.2kg

CONNECTIONS	C	B
G 3/4	37	100
G 1	42	106

Max operating pressure 8 bar
Opening pressure of by-pass valve 1,6 bar



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451 050/3

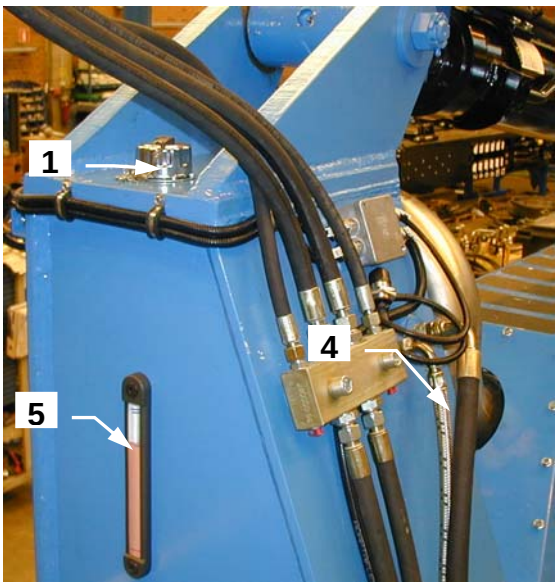
7.5 ENGINE AIR CLEANER

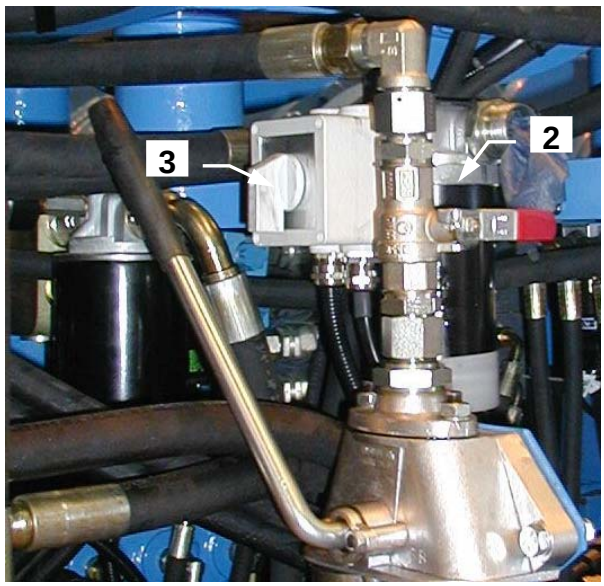
The air cleaner is situated in the engine compartment on top of the engine. The paper cartridge must be changed when the air cleaner indicator in the cab lights up or at least once a year. For further information see attached engine operation and maintenance manual.

7.6 FILLING AND DRAINING OF THE FUEL TANK

You can fill the fuel tank either through the refuelling pipe (1) or with the electric refuelling pump (2). Start the pump with the switch (3). The fuel is pumped to the tank through the hose (4). You can see the fuel level from the gauge in the cab and from the level glass (5). Stop the pump when the tank becomes nearly full. When you fill the tank, leave room for thermal expansion.

To drain the fuel tank, open the valve which is placed near slewing ring. Do not spill fuel on the ground. Drain the tank at least twice a year to clear all dirt and water from the fuel tank. Clean the fuel tank through the manholes. When you close the manholes make sure that the covers sit tightly, otherwise you provide access for water and dirt into the fuel tank. The indicator for the fuel meter is in the manhole.



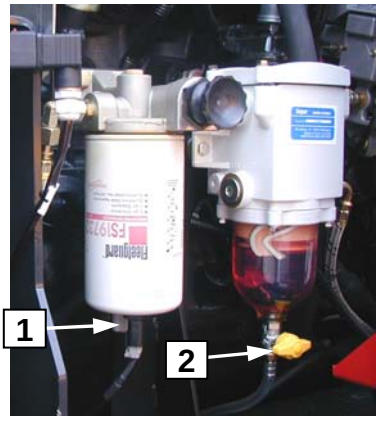


7.6.1 DRAINING AND DE-AIRING OF THE FUEL FILTER AND THE WATER SEPARATOR

⚠ WARNING

Drain the water and fuel into container, and dispose of it in accordance with local environmental regulations.

Draining of the fuel filter:

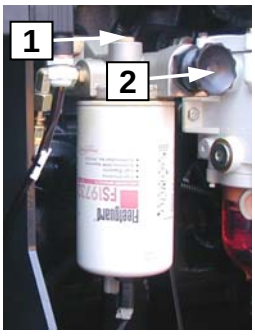


- Stop the engine.
- Use your hand to open the drain valve.
- Turn the valve **(1)** counter-clockwise approximately 3-$^1/_2$ turns until the valve drops down 25.4 mm (1 in) and drain occurs.
- Drain the filter sump until clear fuel is visible.
- **When closing the valve (1) do not over tighten it.** Over tighten can damage the threads.
- To close the valve **(1)**, lift the valve and turn clockwise until it is hand-tight.
- See also instructions in the engine operations manual.

Draining of the water separator:

- Stop the engine.
- Open bleed valve on top of the filter lid.
- Drain water and particulate by opening the valve **(2)**.
- Drain the fuel until the dirt and water are removed from the filter and the bowl.
- Close the valve **(2)**.
- Close the bleed valve on top of the filter lid.
- Start the engine.

De-airing of the fuel filter:



De-air the fuel filter after adding fuel or changing the filter element.

- Open the screw **(1)** slightly.
- Unscrew the pump handle **(2)** and pump until clean fuel comes through the screw.
- Close the screw **(1).**

De-airing of the water separator:

De-air the water separator after adding fuel.

- De-air the by opening the screw **(1)** slightly.
- De-air the water separator until clean fuel comes through the screw.
- Close the screw **(1)**.

BACKFLUSHING THE WATER SEPARATOR

Backflushing is required when dirt and water block the filter element. The following signs will indicate this:

- Loss of engine power
- Black smoke may exhaust from the engine
- Vacuum gauge will indicate a high restriction reading on the element of the filter.

1. **Stop the engine.**
2. **Open the bleed screw.**
3. **Open the drain valve (2).**

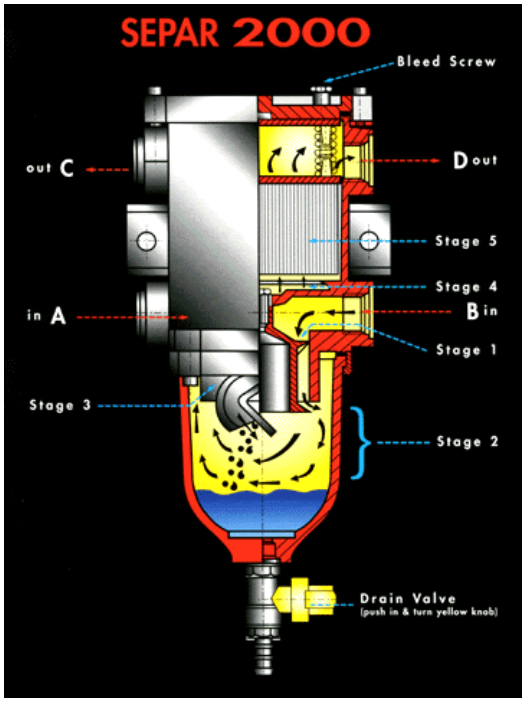
   - The clean fuel above the filter will backflush through the filter element. This will release the smaller dirt and water particles.

   - Drain the fuel until the dirt and water are removed from the filter and the bowl.

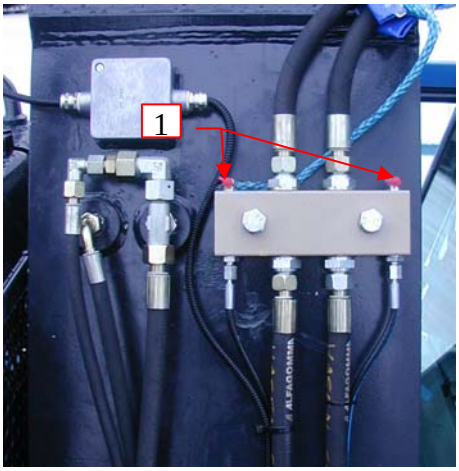
4. **Close the drain valve (2).**
5. **Close the bleed screw (DO NOT OVER TIGHTEN).**
6. **Start the engine.**
7. **If the engine still lacks power, try backflushing the filter again.**
8. **If restriction is still too high, change the filter element.**

Replacing the filter element of the water separator:

1. **Stop the engine.**
2. **Loosen the lid screws.**
3. **Remove the lid.**
4. **Take out the spring cassette.**
5. **Take out the filter element by the handle.**
6. **Replace with new filter element.**
7. **Re-fit the spring cassette.**
8. **Check lid gasket is positioned correctly or replace if necessary.**
9. **Fit lid checking for correct positioning, insert screws and tighten.**
10. **Prime fuel system and check for leaks.**
11. **Start the engine.**



7.7 LUBRICATION OF THE SLEWING RING

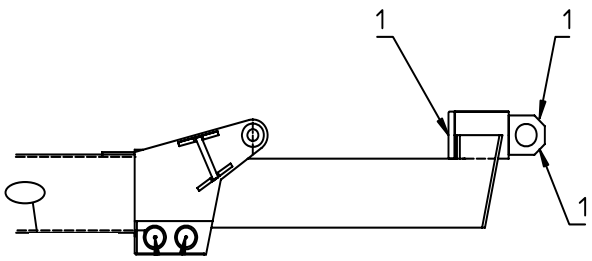


Lubricate the ball races of the slewing ring and pinion gear after every 40 hours of operation or once a week - more often in tropical and humid conditions.

There are lubrication pipes to the ball races of the slewing ring with grease nipples (1) in the hydraulic compartment. Grease each nipple with a grease gun. Rotate the machinery deck during greasing. Continue for one complete revolution. The object is to maintain an adequate amount of grease in the ball races, and to have a small amount exuding slightly all around the seal.

The purpose of the exuding grease is firstly to keep water and dirt out of the ball races and secondly to indicate that the ball races are greased uniformly over their full length. It is more important to lubricate at regular intervals than to have excessive amount of exuding grease. In order to prevent damage due to water, you must grease the slewing ring every time you wash the machine. Use a brush to spread adhesive grease for open gearing on the pinion gear of the slewing ring.

7.8 LUBRICATION OF THE CROSS JOINT AND THE HORIZONTAL SLIDE

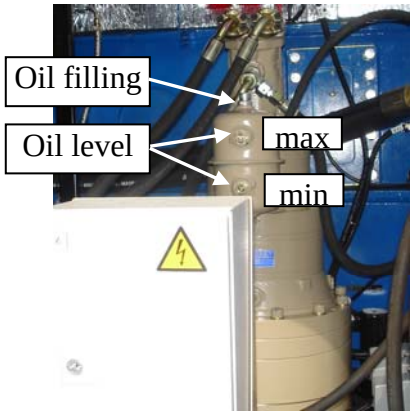


Lubricate the cross joint through the grease nipples (1) daily. To grease the nipples on the top of the cross joint, raise the leader foot. To grease the nipples on the underside of the cross joint push the leader foot down (so that the machinery deck lifts up slightly).

Lubricate the bottom and sides of the horizontal slide weekly. Fully extend the horizontal slide and push the leader foot to the ground to obtain necessary clearance. Spread grease with a brush on the bottom of the horizontal slide, and in the gap between the beams if any.

7.9 CHANGING THE OIL OF THE SWING DRIVE TRANSMISSION

Make the first oil change after 100 operating hours. Check the oil level weekly and refill if necessary. Fill the oil until the oil reaches the min. level. Change the swing drive transmission oil after every 1000 hours of operation or at least once a year. See special manual from manufacturer. Oil can be removed through the hose which is assembled to the swing drive.

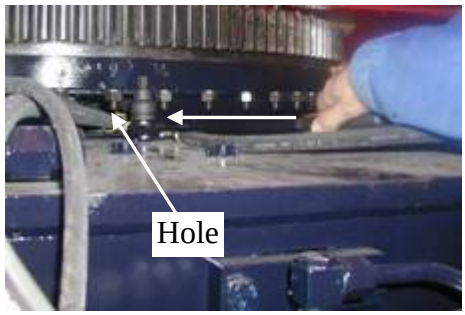


7.10 TORQUE FOR THE SLEWING RING AND THE SWING DRIVE

Torque up the bolts of the swing drive mounting and the slewing ring after the first 100 hours of operation and every 1000 hours thereafter. If any bolt is found loose, a further in deep examination is essential. The necessary preservative measures must then be exercised. Torque setting of slewing ring bolts is 700 Nm (oiled). See also special instructions from slewing manufacturer, section “Slewing ring”.

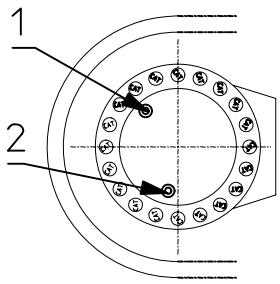
The bolt sizes are given in the spare parts manual in the section UNDERCARRIAGE.

The outer slewing ring bolts can be tightened easily. The inner slewing ring bolts can be tightened through the access hole beside the slewing ring. You can also access the inner slewing ring bolts through the bottom of the undercarriage. When you check the tension of the bolts there should not be any external load on the slewing ring, i.e. the centre of gravity of the masses of the upper structures should be within the slewing ring.



7.11 CHANGING THE OIL OF THE TRACK DRIVE TRANSMISSION

Make the first oil change after 100 operating hours. Check the oil level weekly and refill if necessary. Change the drive transmission oil after every 1000 hours of operation or at least once a year.



Item	Description
1	Oil fill/level plug
2	Oil drain plug

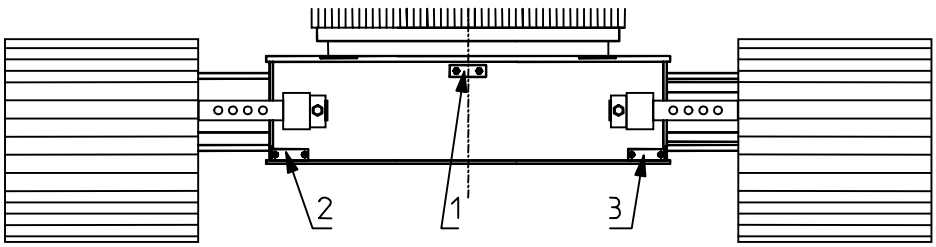
7.12 TRACKS

The track drives are mounted with build-in transmissions on the crawler frames. The sprockets sit directly on the transmissions. The idler can be moved with a grease filled cylinder to tension the tracks.

You can move the crawler frames in and out with hydraulic cylinders. In the middle of the undercarriage frame there are slides.

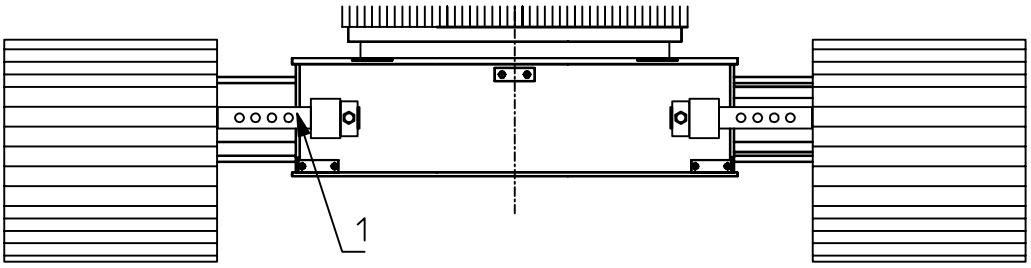
7.12.1 TRACK FRAME SLIDE BEAMS

Check the play of the slides machinery deck crosswise to the undercarriage. Lift the track up with the leader foot a couple of times. If necessary adjust the play with the screws (1, 2 and 3) to move the wedges that adjust the space in the slides. There are three screws on the front side and three on the back side. To reduce the play turn the adjustment screws counter clockwise. Repeat for all wedges.



7.12.2 TRACK WIDTH ADJUSTMENT

In the transport position the crawler frames are against the middle boy of the undercarriage. In working positions the crawler frames are pushed out. On each side there is a limit bar (1) with a stop.



7.12.3 ADJUSTMENT OF THE TRACK TENSION

⚠ DANGER

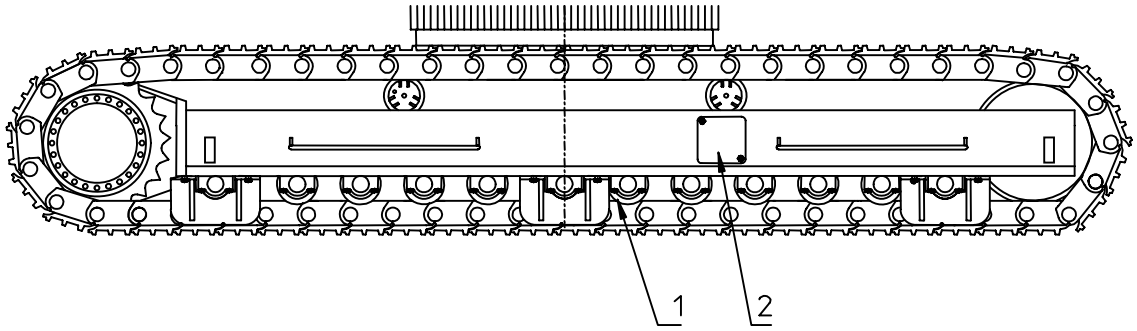
Grease is under high pressure. Do not watch the relief valve to see if grease is escaping. Watch the track or track adjustment cylinder to see if the track being loosened.

The track tension evaluated from the distance the track chain drops from the lower roller when the track frame is raised. The distance from the lower roller (1) to the chain in the middle should be 60-100 mm. To raise the track frame, turn the machinery deck crosswise to the undercarriage and push the leader foot to the ground.

To adjust the track tension remove the access plate (2). There is a grease-filled cylinder under the access plate. In the tool kit provided with the rig you will find an adapter for a grease gun which will fit the nipple on the cylinder.

Track tightening
Add grease through fill nipple until the correct track tension is reached.
Operate the machine back and forth to equalise the pressure.
Check the amount of track sag again and adjust as necessary.

Track loosening
Loosen fill nipple carefully (one turn maximum) until the track begins loosen.
Tighten fill nipple when the desired track tension is reached.
Operate the machine back and forth to equalise the pressure.
Check the amount of track sag again and adjust as necessary.



7.12.4 TRACK SHOE BOLTS

Tighten the track shoe bolts after the first 100 hours of operation and thereafter once a month. The track shoes must be fastened within the exact torque values shown in the following table.

Machine type	Mounting bolt	Torque values Nm / lb-ft	
		With lubricant	Without lubricant
PM 16, 20	5/8” – 18 UNF	**304 - 358** 220 - 259	**365 - 430** 264 - 311
PM 25	3/4” – 16 UNF	**526 - 620** 380 - 448	**631 - 744** 457 - 538
PM 18, 23, 26	M 20 x 1.5	**622 - 731** 450 - 529	**747 - 877** 540 - 635
PM 28, 30, 40	M 24 x 1.5	**1095 - 1288** 792 - 932	**1314 - 1546** 950 - 1118

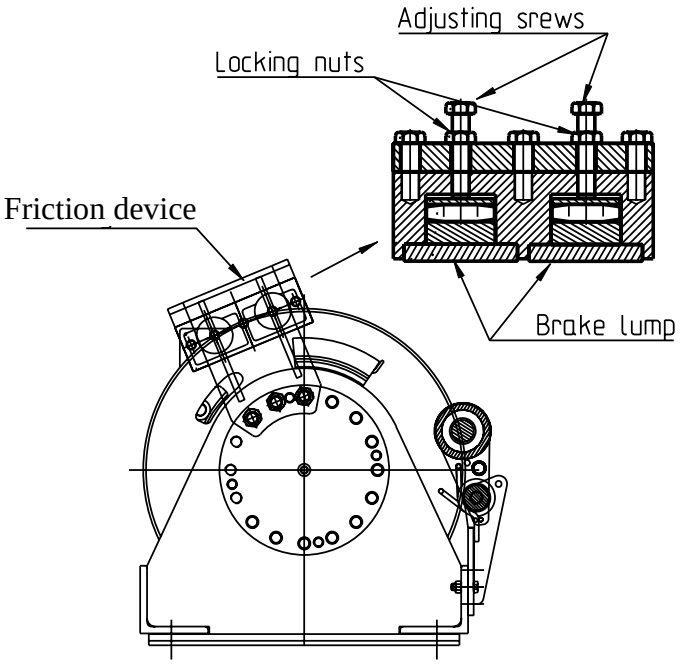
7.13 WINCH SERVICE

Junttan PM 20 is equipped with two winches in the rear of the machinery deck. The right winch is used for the hammer and the left one is used to lift the pile. The leader winch is for the rotary head. These winches have radial piston hydraulic motors.

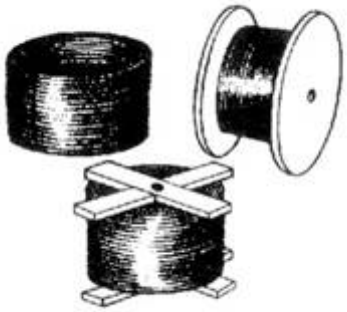
All winches can be driven in both directions. Each winch has a brake. Operation of the brake is automatic. The brake opens with the pressure in the winch pressure line when the winches are operated. The brake also opens during hammer operation with hammer circuit pressure. This allows the drums to unwind the necessary amount of rope as the pile penetrates into the ground and the hammer follows it. See winch brakes function during piling operation, chapter daily operation.

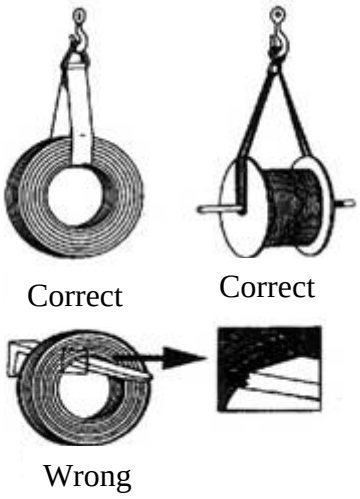
7.13.1 WINCH FRICTION DEVICE

Winches are equipped with friction device. The purpose of the friction device is to slow down the rotation of drum. It is important, when the ground is soft and the pile can sink fast. Adjust the brake lumps with adjusting screws. Check the brake lumps weekly and change when needed.



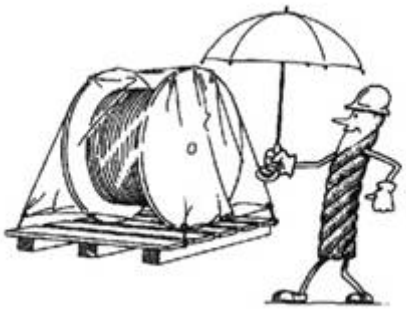
7.13.2 OPERATING INSTRUCTIONS FOR STEEL ROPES

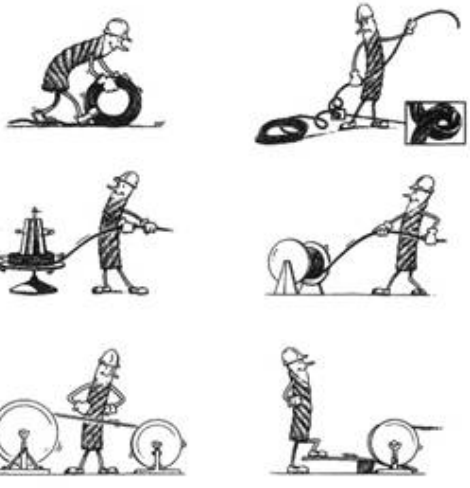




PACKING

Steel ropes are delivered according to customer's wishes normally in bundle, in lattice drum or winded on wooden/plastic drum**.**





LIFT/HANDLING

When you lift and handle steel ropes, make sure that the rope does not get damaged e.g. by truck horn.

⚠ WARNING!
Careless handling can damage steel rope.

STORAGE

Store steel ropes in a dry, good air-conditioned place. When you store the ropes outdoors, shelter the drums under tarpaulin or plastic. Check regularly the condition of ropes and grease them when needed.

⚠ WARNING!
Incorrect storage may damage the rope. Avoid especially big changes in temperature.

UNWINDING THE ROPE

To prevent the damaging of steel rope unwind it in the following way:

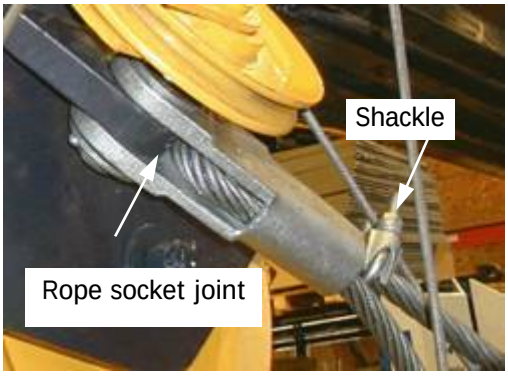
– The rope which is in bundle is unwinded by rotating the bundle from the center.
– Lattice and normal drum is mounted on axle, on which it can rotate freely.
– In some cases it is advisable to slow down the rotating of the drum**.**

⚠ WARNING!

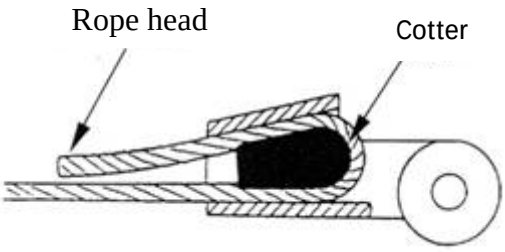
- Unwind the rope from the rope drum to the winch drum always to the same direction of rotation.
- Exercise special caution during the opening of package.
- Careless opening can lead to serious personal injuries.
- Never unwind the rope from a drum which does not rotate or from a bundle.
Attention! Uncorrect handling of steel rope can lead to damaging of rope.

HANDLING OF ROPE HEADS

After you have pulled steel rope through the pulleys, on the other end of it is attached a rope socket.



Pull the rope through the rope socket joint from the narrower side, make a loop and pull the rope back to the bushing. To prevent the rope from getting loose put the cotter to the rope socket and shackle on top of the cable as shown in the picture. After that, tighten the cable until the cotter locks without clearance.



If the rope socket is oblique on other side, make sure that the rope head is mounted on the oblique side.

⚠ WARNING!

Make sure that the steel rope, cotter, rope socket and shackle are of same size and chosen according to standards. Wrong chosen and mounted main pieces may cause loosening of rope from the rope socket, which may cause serious personal damage!

7.13.3 CHANGING ROPE TO WINCH DRUM (BB-WINCH)

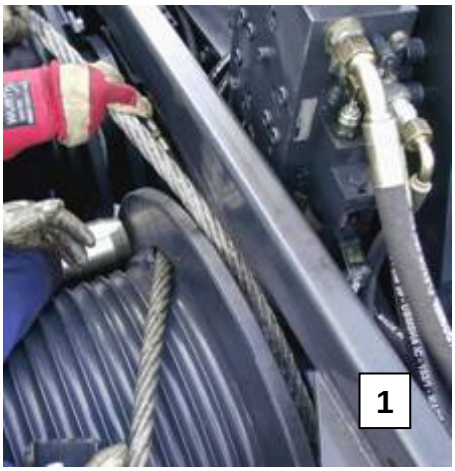
See pictures 1 – 4.

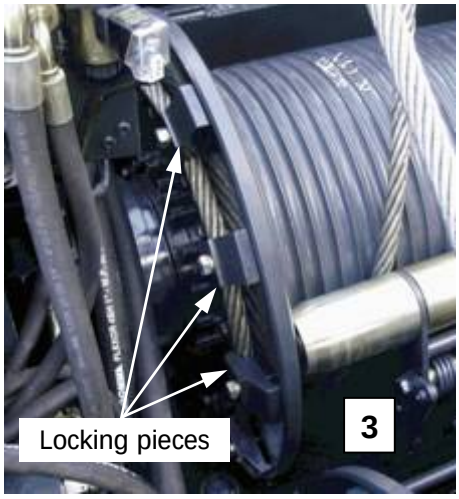
1. The steel rope is pulled through the opening in the winch drum flange and it is bended to the shackle outside the drum flange.

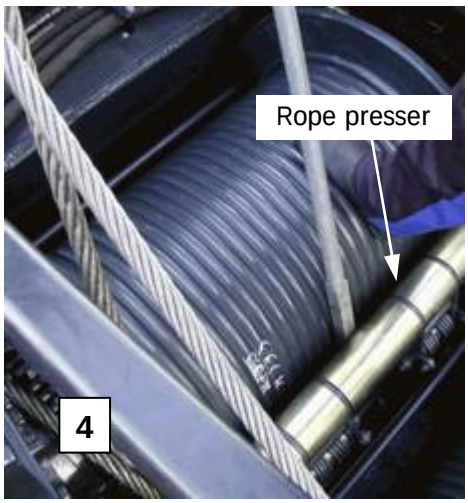
⚠ WARNING!

During the bending sudden straightening of rope may cause serious personal damage.

2. The head of the rope is attached to the drum flange with locking piece and bolt. The torque is 183 Nm (bolt size M16, strengthclass 8.8, with Nord-Lock - washer).
3. When the first locking piece is set, the rope shackle is fastened with other locking pieces around the flange. The number of locking pieces depends on the size of drum.
4. Before winding up the rope on drum, make sure that it is in the outermost groove. When needed, loosen the rope presser with appropriate tool (e.g. with bar). When you wind up the rope on winch drum make sure, that the rope gets tight enough on the drum.

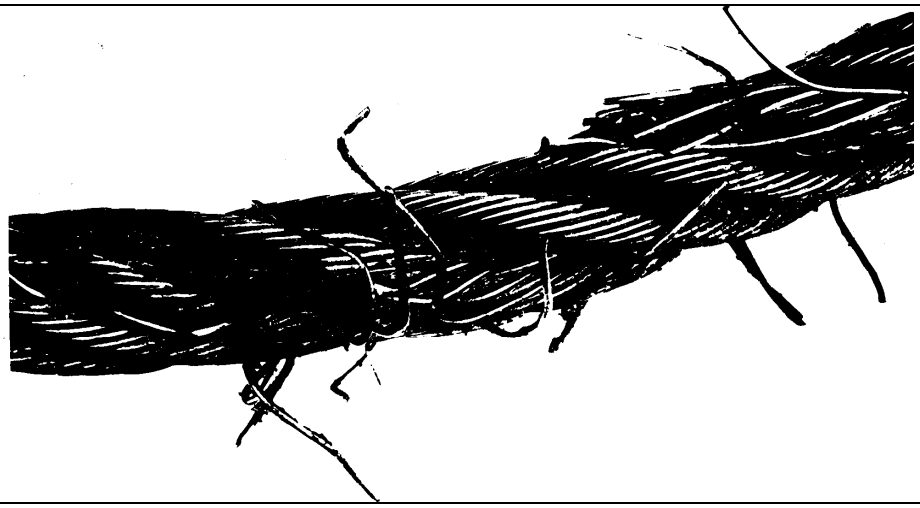
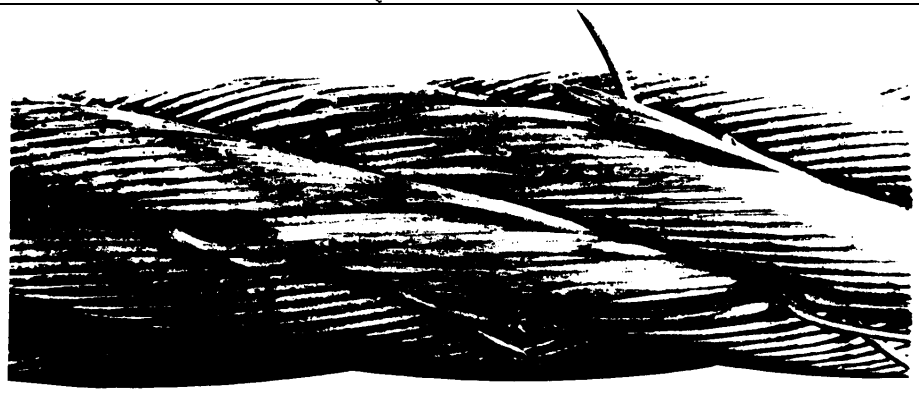
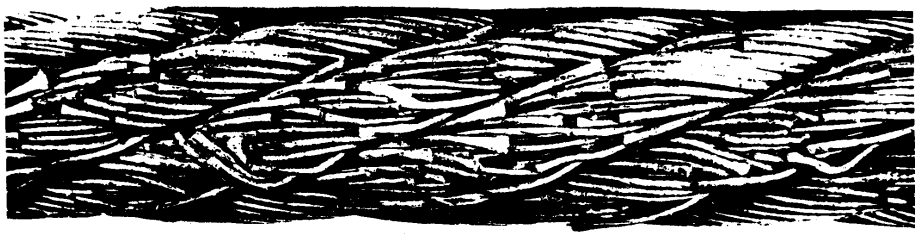
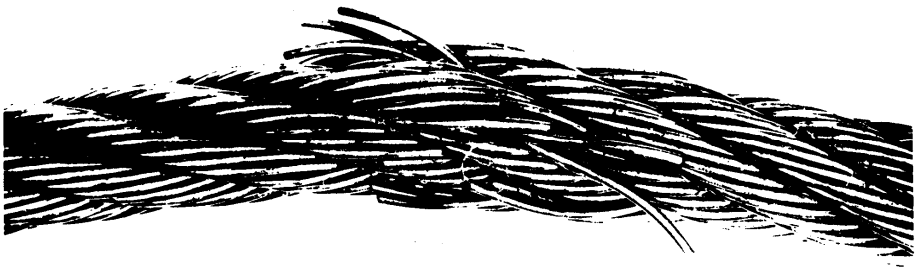


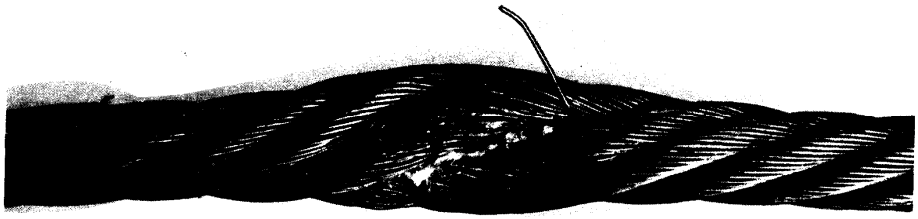




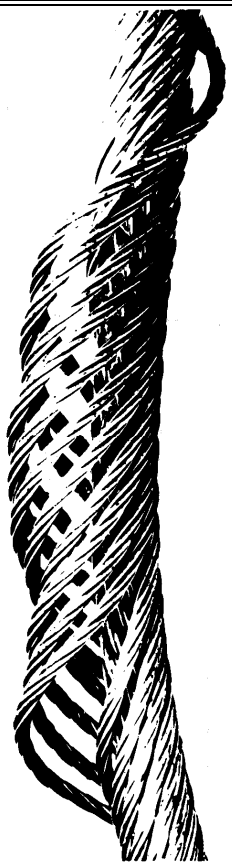
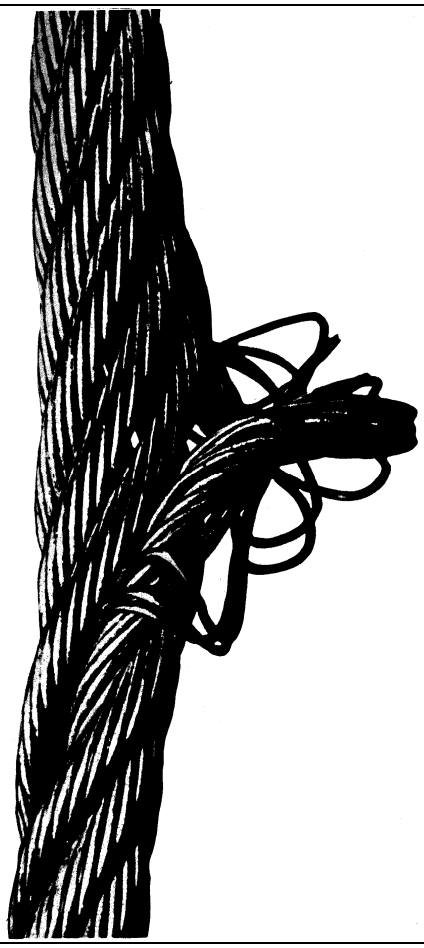
7.13.4 CHECKING OF STEEL ROPES

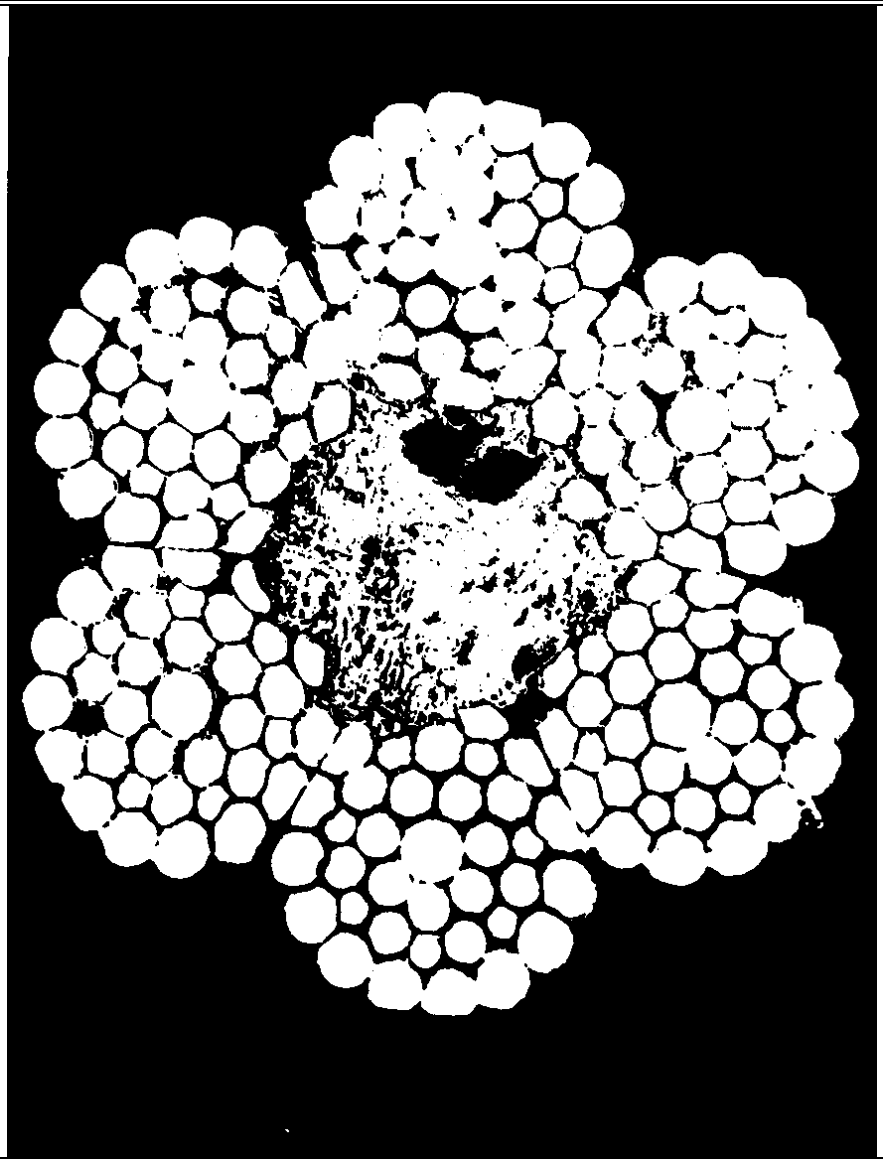
In this section are shown some examples of defects which may occur in steel ropes. Check steel ropes daily or at least every week. If you found any **noticeable changes** in steel ropes contact expert persons to carried out special examination of the ropes. More information how to check and service steel ropes are given in standard SFS-ISO 4309.

	Many wire breaks and local wear. **Change rope immediately**
	Some wire breaks. **Change rope**
	Many wire breaks and heavy wear. **Change rope immediately**
	Wire breaks in many strands. **Change rope**

	Some wire breaks in two strands and heavy wear. **Change rope**
	Wear of the outer wires and looseness of the wires. **Change rope immediately**
	Changes in rope diameter. **Change rope immediately**
	Flattened rope. **Change rope**
	Flattened rope with wire breaks. **Change rope**
	Wire extrusion in one strand at regular intervals. **Change rope immediately**
	Wire extrusion in many strands. **Change rope immediately**

	Kinked rope or tightened loop. **Change rope immediately**
	Bended rope. **Change rope**
	Local increase in diameter of rope. **Change rope immediately**

	Basket in multi-strand construction. **Change rope immediately**
	Extrusion of a steel core. **Change rope immediately**

	Internal corrosion of rope. **Change rope immediately**

7.14 WEAR LIMITS

The maximum play for all hydraulic cylinder swivels and shafts is 0.1 - 0.3 mm.

The maximum play of guides in the leader is for upper slide 6 mm and for lower slide is 8 mm (left to right and forward to backward) and between leader and basic leader the maximum play is 8 mm. Original play is 3 mm.

The maximum play of the slewing ring is 10 mm. Measure the play at the slewing lock and be careful not to measure any deflection of the structural parts.

7.15 TORQUE FOR STEEL BOLTS AND NUTS

Thread	4.6	5.8	8.8	10.9	12.9
	Nm	Nm	Nm	Nm	Nm
M 3	0,5				
M 4	1,2				
M 5	2,4	4,1	6,5		
M 6	4,2	6,9	11		
M 8	10	17	27		
M 10	20	33	53	74	89
M 12	34	57	91	128	154
M 14	54	91	145	204	244
M 16	83	139	222	313	375
M 20	163	271	434	610	732
M 22	219	365	584	822	986
M 24	281	469	750	1050	1270
M 27	406	677	1080	1520	1830
M 30	555	925	1480	2080	2500
M 33	748	1250	1990	2800	3360
M 36	965	1610	2570	3620	4340

Recommended torque values [Nm]

Nord-Lock® electro zinc plated / Dacromet with electro zinc plated bolt 8.8

GF = ratio of yield point
µg = thread friction
µw = washer friction

Range	Dim	Pitch [mm]	Oil GF=0,75 µg=0,12 µw=0,14		MoS2 GF=0,75 µg=0,11 µw=0,12		Dry GF=0,62 µg=0,15 µw=0,17	
			Torque [NM]	Clamp load [kN]	Torque [NM]	Clamp load [kN]	Torque [NM]	Clamp load [kN]
NL3	M3	0,5	1,3	2,4	1,2	2,4	1,3	2,0
NL4	M4	0,7	3,0	4,2	2,7	4,2	3,0	3,5
NL5	M5	0,8	5,9	6,8	5,3	6,8	5,8	5,6
NL6	M6	1,0	10,3	9,6	9,3	9,6	10,2	8,0
NL8	M8	1,3	25	17,6	22	17,6	24,5	14,5
NL10	M10	1,5	47	28	42	28	46,6	23
NL12	M12	1,8	84	40	75	40	82,9	33
NL14	M14	2,0	133	55	119	55	131,8	46
NL16	M16	2,0	204	75	183	75	202	62
NL18	M18	2,5	284	92	255	92	282	76
NL20	M20	2,5	399	118	357	118	396	97
NL22	M22	2,5	554	145	497	145	550	120
NL24	M24	3,0	687	169	616	169	683	140
NL27	M27	3,0	1000	220	896	220	997	182
NL30	M30	3,5	1360	269	1220	269	1361	223
NL33	M33	3,5	1830	333	1640	333	1834	275
NL36	M36	4,0	2360	392	2110	392	2364	324
NL39	M39	4,0	3040	468	2720	468	3053	387
NL42	M42	4,5	3837	546	3428	546	3803	451

Recommended torque values [Nm]

Nord-Lock® electro zinc plated with non-plated bolt 10.9

GF = ratio of yield point
µg = thread friction
µw = washer friction

Range	Dim	Pitch [mm]	Oil GF=0,71 µg=0,14 µw=0,11		MoS2 GF=0,75 µg=0,14 µw=0,10	
			Torque [NM]	Clamp load [kN]	Torque [NM]	Clamp load [kN]
NL3	M3	0,5	1,7	3,2	1,7	3,4
NL4	M4	0,7	3,8	5,6	3,9	5,9
NL5	M5	0,8	7,5	9,1	7,6	9,6
NL6	M6	1,0	13,0	12,8	13,2	13,6
NL8	M8	1,3	31	23	32	25
NL10	M10	1,5	59	37	60	39
NL12	M12	1,8	106	54	108	57
NL14	M14	2,0	169	73	172	78
NL16	M16	2,0	259	100	263	106
NL18	M18	2,5	361	123	367	130
NL20	M20	2,5	506	157	515	165
NL22	M22	2,5	703	194	715	205
NL24	M24	3,0	873	226	888	238
NL27	M27	3,0	1270	293	1290	310
NL30	M30	3,5	1730	358	1750	379
NL33	M33	3,5	2330	443	2360	468
NL36	M36	4,0	3000	522	3050	551
NL39	M39	4,0	3870	624	3930	659
NL42	M42	4,5	4871	727	4946	767

Recommended torque values [Nm]

Nord-Lock® electro zinc plated with non-plated bolt 12.9

GF = ratio of yield point
µg = thread friction
µw = washer friction

Range	Dim	Pitch [mm]	Oil GF=0,71 µg=0,14 µw=0,11		MoS2 GF=0,75 µg=0,15 µw=0,10	
			Torque [NM]	Clamp load [kN]	Torque [NM]	Clamp load [kN]
NL3	M3	0,5	1,9	3,9	2,0	4,1
NL4	M4	0,7	4,4	6,7	4,6	7,1
NL5	M5	0,8	8,7	10,9	9,1	11,5
NL6	M6	1,0	15,1	15,4	15,8	16,3
NL8	M8	1,3	36	28	38	30
NL10	M10	1,5	68	44	71	47
NL12	M12	1,8	123	65	129	68
NL14	M14	2,0	195	88	205	93
NL16	M16	2,0	299	120	314	127
NL18	M18	2,5	417	147	438	156
NL20	M20	2,5	585	188	614	198
NL22	M22	2,5	812	232	853	245
NL24	M24	3,0	1010	271	1060	286
NL27	M27	3,0	1470	352	1540	372
NL30	M30	3,5	1990	430	2090	454
NL33	M33	3,5	2690	532	2820	562
NL36	M36	4,0	3470	626	3640	662
NL39	M39	4,0	4470	748	4690	791
NL42	M42	4,5	5620	872	5905	921

7.16 RECOMMENDED TORQUE VALUES FOR HYDRAULIC FITTINGS

Notice! Torque values are valid when threads <u>are not</u> lubricated before installation.

METRIC

Thread mm	Lb.ft	N.m
M12x1.5	15	15
M14x1.5	19	25
M16x1.5	33	45
M18x1.5	37	50
M20x1.5	52	70
M22x1.5	55	75
M24x1.5	74	100
M26x1.5	81	110
M30x2	96	160
M36x2	162	220
M42x2	170	230
M45x2	220	300
M52x2	367	500

SAE J514 37° Flare (JIC)

Dash Size	Thread Size	Lb.ft Min	Lb.ft Max	N.m Min	N.m Max
-4	7/16-20	11	12	15	16
-5	1/2-20	14	15	19	21
-6	9/16-18	18	20	24	28
-8	3/4-16	36	39	49	53
-10	7/8-14	57	63	77	85
-12	1 1/16-12	79	88	107	119
-14	1 3/16-12	94	103	127	140
-16	1 5/16-12	108	113	147	154
-20	1 5/8-12	127	133	172	181
-24	1 7/8-12	158	167	215	226
-32	2 1/2-12	245	258	332	350

BSPP

Nominal Size mm	Thread Size	N.m Style A with O-ring	N.m Style B without O-ring	Overtorque styles A and B N.m
6	G 1/8	-	10	13
8	G 1/4	20	20	25
10	G 3/8	35	35	45
12	G 1/2	50	60	80
16	G 5/8	60	70	90
20	G 3/4	85	115	140
25	G 1	115	140	170
32	G 1 1/4	190	210	280
38	G 1 1/2	240	290	370
50	G 2	300	400	500

ORFS SAE J1453 O' RING FACE SEAL

Dash Size	Thread Size	Lb.ft Min	Lb.ft Max	N.m Min	N.m Max
-4	9/16-18	10	12	14	16
-6	11/16-16	18	20	24	27
-8	13/16-16	32	35	43	47
-10	1-14	46	50	60	68
-12	1 3/16-12	65	70	90	95
-16	1 7/16-12	92	100	125	135
-20	1 11/16-12	125	140	170	190
-24	2-12	150	165	200	225

7.17 GENERAL FAULT DETECTION

THE ENGINE STALLS AT LOW RPM
If the engine consistently stalls at low rpm when load is applied, the setting of the pump angle may have wandered. Contact Junttan. Check the fuel filters.

THE SWING WORKS ERRATICALLY
If the swing function works erratically check that there is no dirt in the valve which controls the direction of slewing.

THE TRACKS DO NOT STAY UNDER TENSION
If the track chain does not stay under tension, there is a leak in the tensioning system. The leak can be in the grease nipple, in the seals of the piston, or in the seals of the cylinder body.

HYDRAULIC OIL HEATS UP MORE THAN NORMAL
If the hydraulic oil heats up more than normal with no change in pressure settings and no other apparent reason, check the oil coolers.
Check that the fans are working and that the air can circulate. Check that the coolers are clean.

SEVERAL OR ALL HYDRAULIC FUNCTIONS ARE ERRATIC
If several or all hydraulic functions are erratic there is dirt or water in the oil. Take a sample and test it. Drain the water from the hydraulic tank. If there is water in the hydraulic oil make sure that the manhole is properly closed.

THE HYDRAULIC OIL FILLING PUMP MALFUNCTIONS
If you cannot fill hydraulic oil with the hand pump check that there is no oil leak in on the suction side. If the pump is heavy check that the valve is open to the hydraulic tank and check that the filter used is not blocked (You can by-pass the filter for testing).

THE FUEL FILLING PUMP DOES NOT PUMP FUEL
If the fuel filling pump does not fill the fuel check that the pump is rotating, the sieve is not blocked and there is no leak on the suction side.

THE TRACK DRIVE MOTORS DO NOT ROTATE
Check by the pressure gauges in the cab that the pressure builds up when the lever for the track motor is moved. Check for both directions. Next connect a pressure gauge to the brake circuit and check that the brake cylinder gets the proper pressure to open. Dirt can jam the over centre valve of the brake cylinder. If everything checks OK this far, disconnect the motor from the transmission to see if it works when it stands alone.

THE LEADER TELESCOPE DOES NOT HOLD THE LEADER UP
If the leader telescope does not hold the leader up the probable cause is dirt in the valves, the piston seal of the cylinder leaks or the bleed screw leaks.

⚠ DANGER
Do not open valves or bleed screw when the telescope is up position.