

A close-up photograph of a trailer axle assembly, showing multiple axles and suspension components. The word "PATRUUNA" is printed in yellow on the dark grey metal frame.

**PATRUUNA**

**Manual  
Trailer**



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# PATRUUNA

## FOREWORD

This manual will assist you in trailer assembly and operation. Please read this operators manual carefully before commencing work.

We believe that this Patruuna product fulfills your quality expectancy. Patruuna trailers are manufactured from outstanding Finnish materials and use high quality hydraulic components.

## TRAILER INTRODUCTION

1.	Draw-bar
2.	Draw-bar cylinders
3.	Draw-bar bearing
4.	Front guard
5.	Movable bolsters
6.	Bolster pin
7.	Drive Wheel

Patruuna timber trailer is designed primarily to be towed by a tractor. A crane can be mounted onto the draw-bar.

Patruuna trailers are delivered with:

- Warranty card
- Operators manual and spare parts list



# PATRUUNA

## GENERAL SAFETY INSTRUCTIONS

### TRACTOR HITCH

- Confirm tractor hitch capacity is adequate
- Make sure tractor hitch lock is working
- Take care when connecting trailer to tractor. Danger of crushing!

### DRAW-BAR STEERING

- Take extra care when using the draw-bar steering. If used incorrectly it increases the risk of turning over
- Remove steering lock pin before commencing use
- Lock draw-bar steering with a lock pin when driving on public roads

### Type plate

Type plate (see illustration below) is situated on the draw-bar. Type plate has the trailer type, manufacturing number, manufacturing year, manufacturer's name and address.



Illustration Type plate

The design fulfills the following safety criteria:

Machinery directive 98/37/EC

- Study operating instructions carefully before commencing work

- If someone else operates the trailer for you, make sure they study the operating and safety instructions before commencing work.
- If the tractor overturns hold on to the steering wheel, do not jump.
- Always lift on the most stable and level ground available. If the combination starts to overturn, lower the load back to ground.
- Never allow anyone to operate the machine unless you are sure that they fully understand all safety and operating instructions.
- Observe any slack, wear, leaks and other damage to your trailer and act to rectify and prevent them.
- Frost limit for cold start is -20°C.
- Note safe operating distance from overhead cables.

### Minimum safe distance from electricity cables

Voltage kV	Minimum distance from unprotected cable, metres	Minimum distance from protected cable, metres
<0,5	2	0,5
0,5 - 45	3	1,5
>110	5	

### OPERATORS RESPONSIBILITY

The trailer owner is responsible for trailer operating, care and servicing. The manufacturer has no responsibility if the trailer is operated against the law, health and safety instructions or this operators manual.

The operator must study this manual carefully.

Do not dispose of waste oil into the environment.

Keep a waste oil container with you.

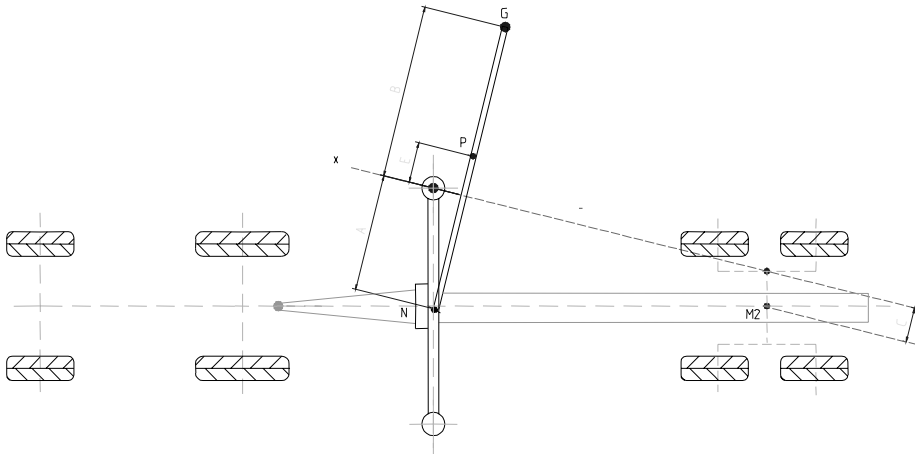
## STABILITY

When a crane is connected to the tractor or to the forest trailer draw-bar the combination must stay stable. The operator must know the combination's stability and it must be secure enough to avoid danger situations. Stability can be calculated mathematically or tested with a trial and error method.

### Calculating stability

The crane is stable when the calculated result  $n = 1,0$ .  
The calculated stability can be observed with the following example :

Crane attached to the forest trailer:



Symbols		Example combination	Actual combination
<b>N</b>	crane mass without booms	490	
<b>A</b>	perpendicular distance from crane rotation center to critical edge	1,15	
<b>M</b>	rear axle weight without load	3765	
<b>C</b>	perpendicular distance from center of tractor rear axle to critical edge	0,9	
<b>G</b>	maximum load with distance A + B	525	
<b>B</b>	perpendicular distance from boom end to critical edge	5,85	
<b>P</b>	P boom mass	470	
<b>E</b>	perpendicular distance from booms center of gravity to critical edge	1,5	

### Testing stability

The combination is stable if during the test only one of the combination support points raises from the ground.

During the test the combination is in its usual operating condition.

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- For the test the combination is tilted 5° to the direction of the critical edge
- The test is done from the most unfavorable side for the stability using 10% overload
- During the test all usual crane movements must be performed taking outmost care.

## Road transport

- Make sure that you are able to control the combination in all circumstances, note the extended braking distance when traveling with a full load.
- At all times observe the crane movements and position when moving the combination
- Always, before commencing the journey, check the condition of all necessary equipment: lights, reflectors, beacon etc.
- Note the height of your combination for low bridges.

## BEFORE USING YOUR CRANE

### Receiving and assembly

- Make sure you have received what you ordered and paid for.
- Before operating your trailer read carefully instructions for assembly and use
- If the trailer is supplied incomplete or you note a fault in manufacturing, make a list and contact your supplier or the manufacturer immediately.
- Remember to follow the manufacturers instructions for operating and servicing.
- The warranty will cover manufacturing faults, and consequential failures only if the manufacturers instructions have been followed.

- After first assembly and long term storage possible air must be bled from the hydraulic system.

Patruuna crane can be mounted to Patruuna timber trailer either with flange or 3-point mounting.

## Assembly

Before commencing assembly:

- The manufacturer recommends that the assembly is carried out by trained personnel. This will minimize the risk of damage caused by a faulty assembly.
- The manufacturer recommends that the tractor hydraulic flow is 45l/min when the trailer is drive assisted

## Mounting timber trailer to the tractor

Timber trailer is connected to the tractor hitch.

In the following connection example:

**P = Pressure connection**

**T = Tank connection (return)**

## Draw-bar steering

Hydraulic connections for the draw-bar steering are made to the tractor double acting valve block.

To avoid danger situations the hoses must always be connected the same way.

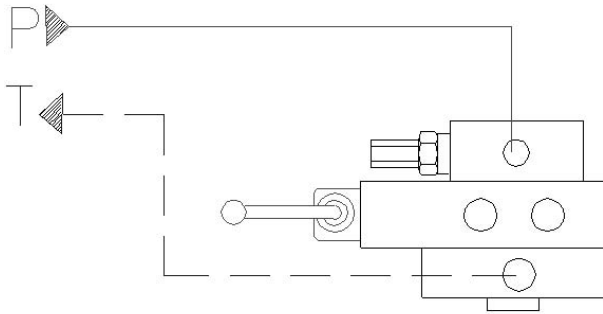
## HYDRAULIC DRIVE

Hydraulically driven trailer hoses are connected to tractor hydraulic outlet using double acting lockable valve block.

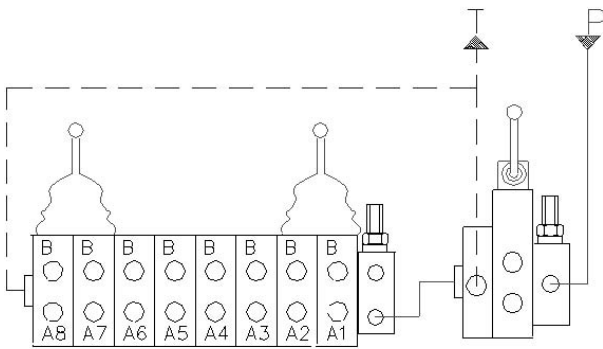
The manufacturer recommends drive direction clutch assembly near gear lever.

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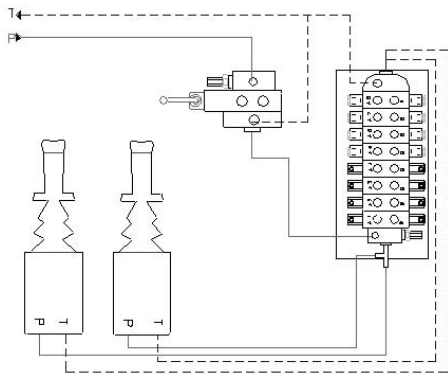
Hydraulic drive is not compatible with standard pressure hydraulics nor with load sensor system (LS -line). If the tractor has the above system the forest trailer must have a separate hydraulic kit and its pump must be operated from tractor pto.



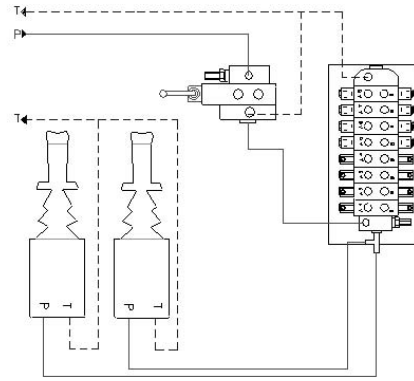
**4WD-trailer basic connection**



**4WD-trailer connection in series with mechanical valves**



**4WD-trailer connection in series with servo-control**



**4WD-trailer connection in series with servo-control that has a filter in return line.**

The Patruuna –trailer is now connected to your tractor.

## Assembly

The manufacturer recommends that the assembly is carried out by trained personnel. This will minimize the risk of damage caused by a faulty assembly.

Have an unhurried practice in trailer operation. If necessary ask for further operating information from your supplier before starting work!

## ASSEMBLY CHOICES

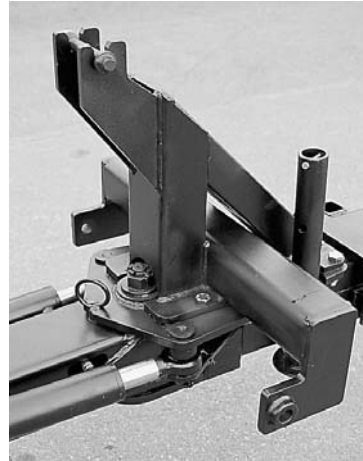
Patruuna cranes can be assembled either on the tractor or the Patruuna forest trailer either with 3-point or flange attachment. These instructions are only for mounting Patruuna cranes. They are not correct for mounting any other cranes.



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## Mounting 3-point connection to the timber trailer

- Connecting the crane from tractor link arms to the forest trailer draw-bar:
- Connect the fitting kit to the trailer draw-bar with six M20x70 8.8 bolts.
- Park the trailer on level ground. The trailer draw-bar should be so low that it fits under the tractor tow bar when the tractor is reversed.
- Turn the booms backwards and lift it so high, that the boom will go over the trailer front guard when you reverse.
- Reverse the tractor so, that the crane is in the middle of the fitting kit and directly above it.
- Attach the grapple to the end of the trailer main beam and lower the support legs near the ground to reduce the risk of overturning.
- Remove the top link from the tractor.
- Drive the crane from the valves so, that the top connecting pin (cone pin) can be attached and connect the pin.
- Drive the crane from the valves and by moving the tractor until the lower connecting pins can be connected to crane rear mounting lugs.
- Remove tractor link-arms from the crane.
- Drive the tractor forward, note hydraulic hoses.
- Tighten the bolts and raise the support legs.
- Connect the timber trailer to the tractor draw-bar and check connections and hoses.



Patruuna fitting kit



Crane connected to the draw-bar

# PATRUUNA

## Removing 3-point crane from the trailer

- Lower the support legs to the ground and set the booms to the side of the trailer so, that the booms are straight and grapple is in the ground on its side and open. Set the booms as close to the trailer as possible. This reduces the risk of falling over.
- Remove top and bottom connecting pins.
- Raise the crane using the support legs. **Danger of falling over and crushing!**
- Carefully reverse the combination.
- Disconnect the timber trailer from the tractor and drive the tractor forward until link arms are level with connecting lugs.
- Connect the crane to the tractor as instructed.

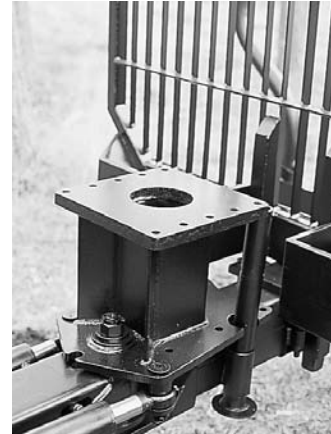
## Mounting the flange model

The crane is fitted with correct connecting parts to the tractor body or the trailer king post. Connecting parts are individual to each model.

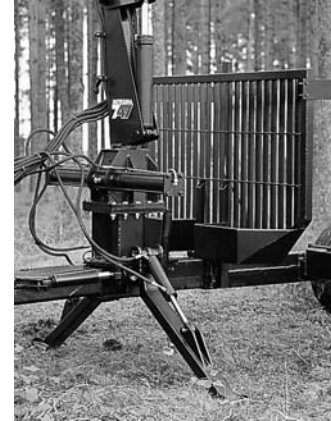
The crane is attached to the column mounting flange by M20 bolts. Strength 10.9, tightness 430 Nm.

Connecting parts are not to be mounted on or lean on to the tractor cabin.

- Set the trailer draw-bar to horizontal position.
- Clean mounting flange top surface
- Lift the crane carefully on top of the post mounting flange. Use lifting equipment with adequate power.
- Match bolt holes and connect the bolts.
- Make sure that flange surfaces are opposed.
- Tighten bolt crossing in two stages to 430 Nm.



Flange model column mounting king post



Crane connected to the trailer

## OPERATING TIMBER TRAILER

Patruuna timber trailers are designed for transporting cut timber in forests.

In the 4WD-models (10-4WD and 12-4WD) hydraulic drive increases the tractor and trailer combination maneuverability on rough terrain.

## SAFE OPERATION

- Study operating and safety instructions carefully before commencing work and follow them.
- Before starting the tractor make sure the hydraulic drive is disconnected.
- When lifting timber into the trailer always lower the support legs and engage tractor hand brake.
- Make sure that the danger zone remains clear of people during operations.

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- Never leave the unit while the engine is running
- Make sure the combination is stable, especially if the ground is soft or on slopes
- Make sure you have good visibility over the full working area

## HYDRAULIC DRAW-BAR

By using the hydraulic draw-bar the trailer will follow the tractor on the track. This will minimize damage to the surrounding trees.

Take care when turning the draw-bar on slopes. Danger of turning over. Stability can be increased by turning the draw-bar to the uphill side.

Use the draw-bar so, that the trailer avoids tree stumps and stones. This will reduce tilts.

The closer the bogie is to tractor the more agile the trailer is.

By using the hydraulic draw-bar you can increase the crane reach when the crane is mounted on to the trailer draw-bar.

## OILS AND LUBRICANTS

- When handling oils and lubricants follow their manufacturers instructions and legal regulations

## EXTRA EQUIPMENT

- If you want to mount on extra equipment that is not originally designed for Patruuna trailers, please contact the manufacturer for advise

## SERVICE INSTRUCTIONS

### Safety aspects

Always before any service, adjustment or cleaning:

- Disconnect hydraulic outlet.
- Switch off the engine
- Never open or tighten any pressurized hoses or other hydraulic components.
- Support the booms carefully before opening a hydraulic connection. For example opening a pressurize connection will cause the booms to collapse rapidly.
- Never place hands or any other part of your body in front of a hydraulic oil discharge.

### General service instructions

Regular and careful servicing supports problem free operations and long operating life.

- In all servicing follow clean working practices, especially when working with hydraulics
- Observe cylinders, hoses and connections. Repair leaks as soon as they appear.
- If you find a breakage, try to find the cause. This will reduce unnecessary work and stop secondary breakage.
- Always use manufacturers original spare parts.

## HYDRAULICS

### Requirements for hydraulic oil and parts

Follow manufacturers instructions and legal regulations when handling oils and lubricants.

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The manufacturer uses Esso Univis N46 as the pre-fill oil. All Tractor hydraulic oils are suitable for use in Patruuna forest equipment.

Hydraulic hoses, pipes, nipples and seals must be checked from time to time. Replace broken parts with new ones to prevent further damage. The return hoses are 1/2" SAE 100 R2AT and pressure hoses type 1/2" SAE 100 R2AT.

## Changing a hydraulic hose

- Correct assembly increases the hoses life considerably. Proceed with the following instructions when changing hydraulic hoses.
- Clean hoses of dirt. Both inside and out.
- Make sure that the hose follows the correct route. After the assembly ensure that the hose is free in all crane positions.
- Make sure that the hose is not twisted. Twists considerably reduce the hoses working life compared to a straight fit.
- After assembly make sure the connections are not leaking.

## Changing a hydraulic cylinder seal

- Support the trailer securely.
- Make sure the system is unpressurized.
- Remove hydraulic hoses and cylinder pins.
- Open cylinder end cap, collecting all oil discharge.
- Pull the hydraulic ram out. If necessary remove the piston and change seals. (Avoid sharp tools).
- To avoid seal damage in assembly add a lubricant to reduce friction.
- Clean the cylinder and ram before assembly.
- Assemble and refit the cylinder, check that connections are tight.

- When commencing work bleed air from the hydraulic system.

## Lubrication

Patruuna timber trailers have following grease nipples:

- draw-bar joint bearing 1
- draw-bar drive cylinders 2  
(left/right)
- bogie axle 1 (left/right)
- drive wheel arm 1 (left/right)
- towing eye 1 (8+, 10, 12T)

Draw-bar joint bearing lubrication is easier when the draw-bar is in opposite extreme position.

## Bogie and wheel hub lubrication

- Remove wheel hub grease cup and fill it with lubricant.
- Insert the grease cup.
- At the same time check the wheel bearing tightness.

## Tightening wheel bearings

Lift wheel from ground.

Move wheel manually. If you can feel it slack, the wheel bearings will need adjusting.

Tightening:

- Remove hub grease cup.
- Remove the split pin and tighten the crown nuts so that the turning is no longer easy when turning with hands.
- Open the crown nut 1/4 turn and lock it with a new split pin.
- Recheck slack and wheel turning again.

## Tightening draw-bar bearings

Draw-bar steering has over- and underside cone ball bearings.

- Remove split pin and tighten crown nut.

- Open crown nut 1/4 turn and lock it with new split pin.
- Check draw-bar steering function.

## Tyre pressure

Tyre manufacturer recommended maximum pressure 4,0 bar (400kPa).

## SERVICE MANUAL

Action	10 h	daily	50 h	200 h
Hose connections in turning cylinder	x		x	x
Wheel bearing tightness	x		x	x
Draw-bar bearing tightness	x		x	x
Bolster connection bolt tightness	x		x	x
Wheel nut tightness	x		x	x
Draw-bar steering bearing tightness	x			x
Draw-bar steering cylinder lubrication	x	x	x	x
Bogie grease nipples	x	x	x	x
Wheel hub lubrication	x		x	x
Towing eye lubrication	x		x	x
Draw-bar steering joint bearing lubrication	x		x	x
Drive wheel arm cylinder lubrication	x		x	x
Tyre condition and pressure			x	x

# PATRUUNA

## 4WD MODELS

### HYDRAULIC DRIVE

The drive is only to be used with stable hydraulic pump. The drive is designed for periodic use only. Avoid long drive sessions as they can overheat the hydraulic oil.

Always engage the drive to neutral if it is not required, or traveling speed increases.

Suitable tractor gear for hydraulic drive can be found with an empty trailer. If the tractor gear is too low the trailer wheels slip (the trailer is trying to push the tractor). If the gear is too high the trailer drive wheels raise up automatically.

Drive valve pressure limit is adjusted to 180 bar.

When the connection is assembled correctly it works as follow:

### Engaging the hydraulic drive

Turn the drive valve lever to working position. The drive wheel begins to rotate and the wheel lowers against the tyre. The speed of the connection depends on the tractor oil flow (2 - 10 s). To speed up the connection rev the tractor engine.

**When the drive wheels are between tyres you MAY only move the tractor when the drive is engaged to ON position. Drive wheels are not to be used as brakes.**

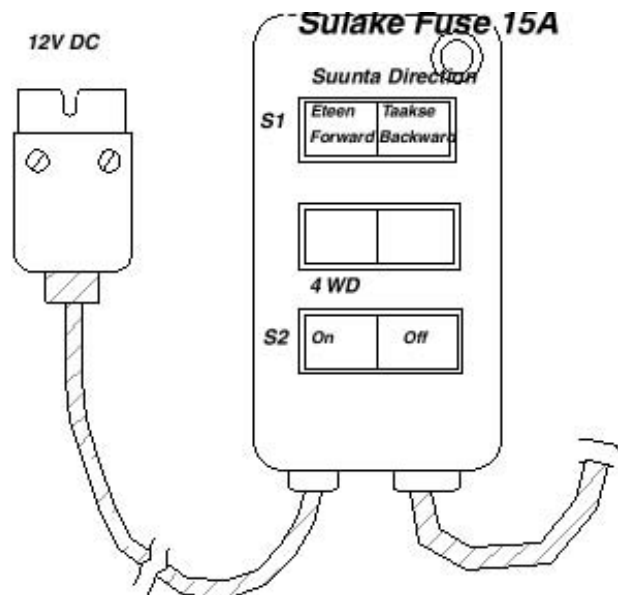
### Drive direction

Drive direction, forward or reverse, is operated from an electric switch. An easy to use position, like the tractor gear lever is recommended.

### Disconnection

When you turn the operating lever to opposite direction the drive wheels raise up. The function can be speeded up by moving the combination slightly and increasing tractor revs.

**MAKE SURE, that the wheels have disengaged themselves!**



### ON / OFF drive valve

The drive is connected by pressing switch (S2) to ON position (lock it). Drive wheels will start rotating and lower down. Speed up the lowering action by pressing the accelerator (the tractor may move). When the drive is ON tractor speed can vary between 0 - 10 km/h. On roads the Hydraulic drive must be switched off.

When you want to stop the trailer, for example for loading, the drive switch is pressed to the center position. When you start moving, first press the drive switch (S2) to ON position, before connecting the tractor pull.

# PATRUUNA

## S1 Change of direction FORWARD / REVERSE

Stop before changing direction

## S2 Connecting drive

When you want to disconnect the hydraulic drive stop the tractor. Press the OFF switch (S2) down (spring action) until the drive wheels are completely raised. On most occasions the action is faster and more certain if you press the accelerator.

## MAKE SURE, that the wheels have disengaged themselves!

At times the drive wheel connection between tyres is so tight, that a small rolling movement with the tractor is needed before they can be released.

When the drive is off, the switch is in the center position.

Note! Make sure the electric connection is + to the fuse. Illustration. ON/OFF – drive.

## HYDRAULIC KIT

Pump (45 cm<sup>3</sup>), connected to the tractor pto, has a flow of 75 l/min. Hydraulic oil reservoir capacity is 75 liters. The pump is connected to the pto with multiplying gear (1:3,1)

The hydraulic kit includes pressure and return filters. They should be changed after first 50 operating hours and thereafter every 200 operating hours.

Fill oil reservoir to the "eye".

## BRAKES

Patruuna 7000, 8+, 9000 and 10 - 4WD timber trailers have drum brakes, 12 - 4WD model disc brakes.

In regular intervals check the brake shoes and pads condition, and the brake cylinder.

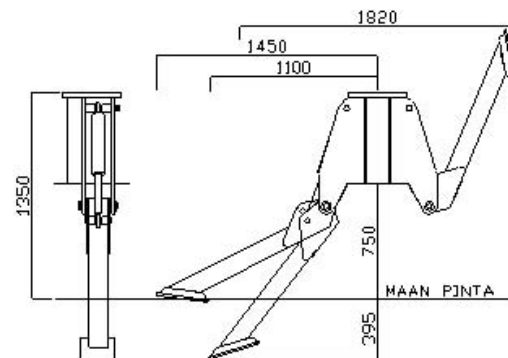
## LIGHTS

Patruuna lights voltage is 12 V and they are connected to tractor rear light socket.

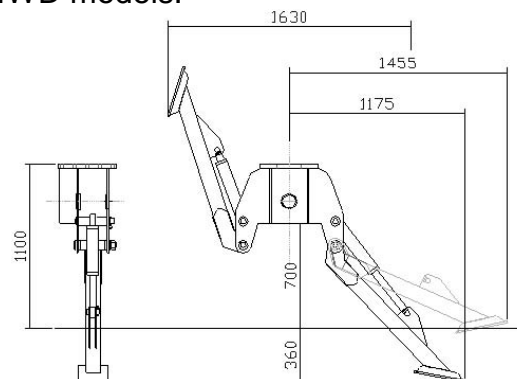
## KING POST AND SUPPORT LEGS FOR FLANGE MOUNTED CRANE

Support legs cylinder ends have grease nipples. They need daily lubrication.

Flange bolt connection must be checked frequently and bolts tightened to 450 Nm.



King post and support legs for 10 and 12 - 4WD models.



King post and support legs for 8+ and 900 models.

## TROUBLE SHOOTING

Fault	Cause	Action
Drive wheel does not lower down	Air in hydraulic system	Bleed lock valve
Drive wheel lowers but does not drive	Drive wheel motor key-way is broken or loose	Check axle and key condition and order necessary spare parts
Axle rotates, but drive wheel does not	Drive wheel motor key-way is broken or loose	Check axle and key condition and order necessary spare parts
Drive wheel does not hold(slips)	Tyre pressure too low. Support arm cylinder seal broken	Pump air to tyres Change the seal
Drive operates forward but not in reverse	Fault in electric connection	Check cables and connections
Drive wheel lowers very slowly	Tractor hydraulic output too low, dirt in hydraulic system	See manual for hydraulic drive. Clean the system



# PATRUUNA

## OPTIONAL EXTRAS

Patruuna timber trailers have many optional extras:

Extra bolsters and bolster pins

- King post and support legs for flange mounted Patruuna cranes
- Fitting kit for 3-point mounted Patruuna cranes
- Lights
- Electric On-Off drive for draw-bar steering and drive
- Separate hydraulic kit for hydraulically driven trailers
- Electric On-Off
- 75 l oil reservoir
- 75 l pump
- Valves and filter

## MANUFACTURER AND SERVICE INFORMATION

### Manufacturer



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Tel. +358 6- 483 5111  
Fax +358 6- 484 6401  
e-mail. junkkari@mako-junkkari.fi  
www.junkkari.fi  
www.patruuna.com

### ORDERING SPARE PARTS

Tel. +358 6- 483 5111  
Fax +358 6- 483 5210  
e-mail. junkkari@mako-junkkari.fi

When ordering spare parts always have the following information:

- Machine type
- Machine serial number
- Spare part type
- Spare part number
- Your name and address
- Supply method

Never order with just a part number, but compare the part to the spare parts list illustration. This way there will be no margin for error.

