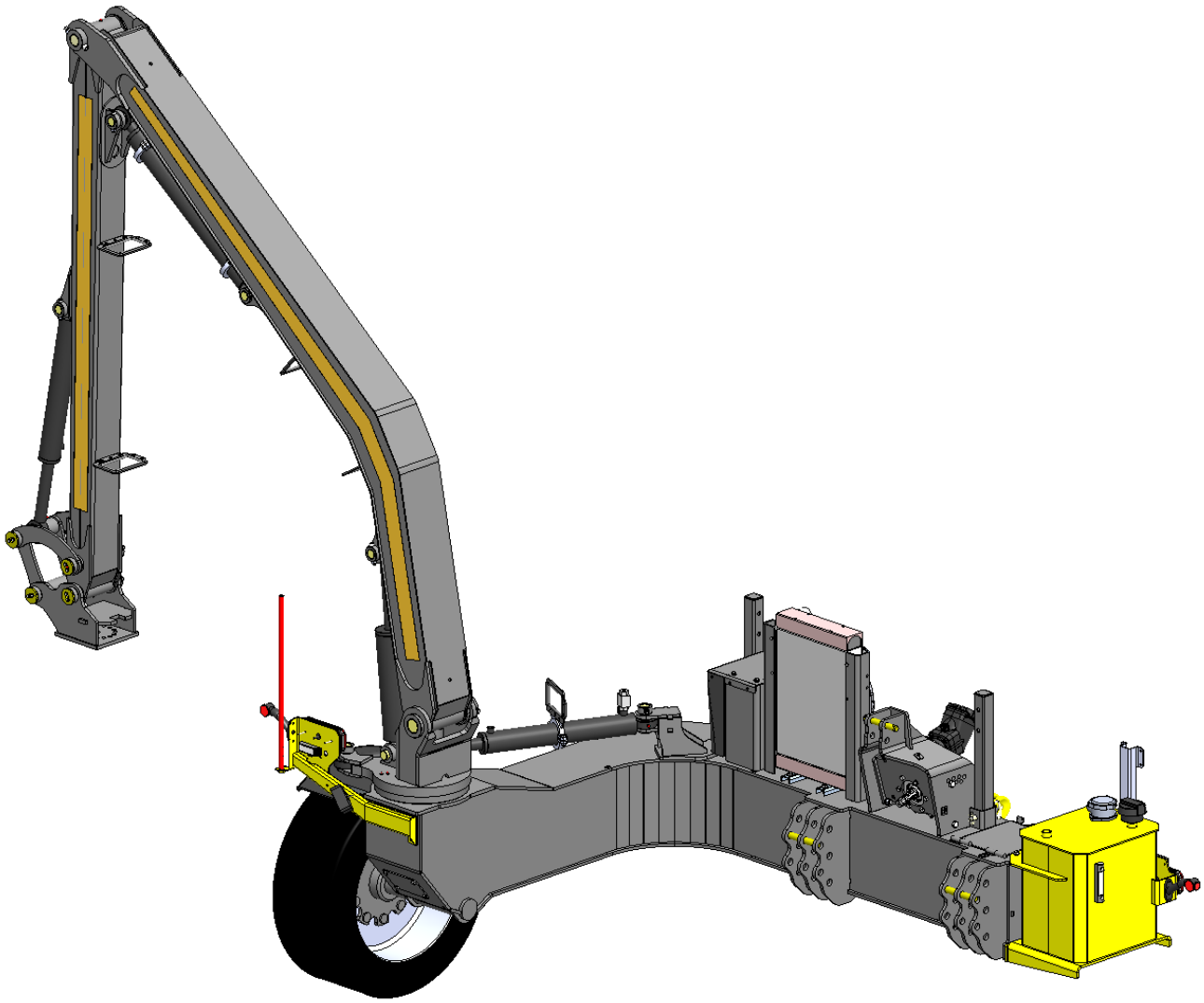
STARK

Original

Operating and maintenance manual

Road Maintenance Boom



STARK / Lametal Oy
Kaskenviertäjäntie 2
73100 Lapinlahti,

www.stark.fi
info@stark.fi, parts@stark.fi

General

Congratulations on the purchase of your STARK Road Maintenance Boom!

For us, the long lifecycle and efficiency of your new equipment is a priority. To keep the sweeper in top working condition, read this manual carefully before using the equipment.
STARK products are engineered and manufactured in Finland, and each of them is equipped according to the needs of the customer. Never let anyone operate or maintain the device without reading this manual carefully! Always make sure that safety precautions are observed in use and maintenance. Keep this manual for future reference and make sure to hand it over to a new owner.
The cornerstones of the product development of STARK attachments are quality, durability and economy. The products are engineered to be high-performing, safe and durable in professional use. Any feedback on our products is welcome and contributes to the further development of our products. If you have any questions about the use or maintenance of the broom, please contact us by e-mail: info@stark.fi
Visit our webpage www.stark.fi for the complete product range, including new products.
The manufacturer reserves the right for structural and technical changes without prior notice. Therefore, some pieces of information given in the manual may have changed after printing this manual.

Read before use



Familiarize yourself thoroughly with the device before commissioning.
The device may only be operated by a person trained in its use.
The machine operators must be carefully trained in the operation and maintenance of the machine. An untrained person can cause serious dangers to themselves, the environment, and the attachment.

Before connecting the hydraulics to the attachment, ensure that:

- no one is between the device and the base machine
- the base machine is turned off and the parking brake is engaged
- When connecting the attachment to the base machine, ensure that:
- locking pins and linchpins are in good condition
- hydraulic hoses are intact
- hydraulic oil does not come into contact with skin when connecting hydraulic hoses
- you do not pull the hydraulic hoses by the hose section

During operation, take into account:



- a safe speed appropriate for the situation
- other traffic, persons, and animals
- danger zones and obstructions to visibility
- that the device is not operated if anyone is in the danger zone
- watch out for children
- use a flashing beacon and sufficient warning markings
- do not go under the device

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1 DECLARATION OF CONFORMITY

The original manufacturer's EC declaration of conformity
Generic product name: Road Maintenance Boom
Models: STARK RMB 8200

Manufacturer:
Lametal Oy
Kaskenviertäjäntie 2, 73100 LAPINLAHTI
FINLAND
tel. +358 (0) 400 480 801

Declares that the above-mentioned equipment meets the provisions of Directive 2006/42/EC on machinery and, where applicable, comply with the standards

- SFS-EN ISO 12100-1,
- SFS-EN ISO 12100-2
- SFS-EN 1050

The person authorized to compile technical documentation:



Lassi Mehtonen
Head of board
Kaskenviertäjäntie 2
73100 Lapinlahti, FINLAND

2 PURPOSE OF USE

The road maintenance boom (RMB) is intended for various road maintenance tasks, such as roadside mowing and clearing.

3 SAFETY PRECAUTIONS



Familiarize yourself thoroughly with the device before commissioning.The device may only be operated by a person trained in its use.The machine operators must be carefully trained in the operation and maintenance of the machine. An untrained person can cause serious dangers to themselves, the environment, and the attachment.

Before connecting the hydraulics to the attachment, ensure that:

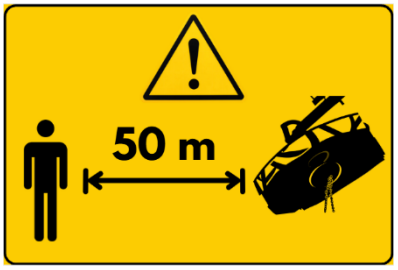
- no one is between the device and the base machine
- the base machine is turned off and the parking brake is engaged

When connecting the attachment to the base machine, ensure that:

- locking pins and linchpins are in good condition
- hydraulic hoses are intact
- hydraulic oil does not come into contact with skin when connecting hydraulic hoses
- you do not pull the hydraulic hoses by the hose section

During operation, take into account:

- a safe speed appropriate for the situation
- other traffic, persons, and animals
- danger zones and obstructions to visibility
- do not go under the device
- bystanders must maintain a distance of at least 50 meters during operation





BEWARE of rolling rollers!



BEWARE of pressurized hydraulic hoses and components!

When servicing the device, the hydraulics of the base machine must absolutely be disconnected, the base machine turned off, and the parking brake engaged. The device must be lowered onto supports if maintenance requires going under the device. Never go under the device unless it is supported.

Daily maintenance:

- check the general condition of the structures, repair faults if necessary
- check the condition of hydraulic hoses and connectors, replace broken ones with new ones

Every 50 operating hours:

- lubricate the grease points (locations are mentioned in the product-specific section)
- check the tightness of bolts and nuts

Check the tightness of bolts, nuts, and hydraulic connectors after the first day of operation! If the device is going to be out of use for a longer period, clean the device well after the last use and perform lubrication.

4 IDENTIFICATION AND SPARE PARTS

4.1 Identification plate

The identification plate is mounted on the side of the device. In addition to the manufacturer's contact details, the plate marks the machine type, year of manufacture, serial number, and weight.
The first four digits of the serial number indicate the month and year of manufacture (with the month of manufacture first: MMYY). The last five digits of the serial number are the machine's actual serial number, which is visible in the manufacturer's systems (13971 in the example below). Below is a sample image of the identification plate.



Figure 1. Identification plate

Record the product type and serial number on the lines below:

Product _____Serial number_____

4.2 Maintenance services

Only original spare parts must be used for repairing the product. By using original spare parts, you ensure the trouble-free operation of the chain crusher and the validity of the warranty. When inquiring about or ordering spare parts, please state the chain crusher type and serial number from the rating plate presented above to expedite the service.

STARK maintenance and spare parts service, as well as your dealer, will answer your questions regarding maintenance or spare parts.
Contact your dealer or

STARK Maintenance service:
tel. +358 (0) 400 480 401, email info@stark.fi
STARK Spare parts service:
tel. +358 (0)44 758 6104, email parts@stark.fi

5 MAIN COMPONENTS OF THE RMB

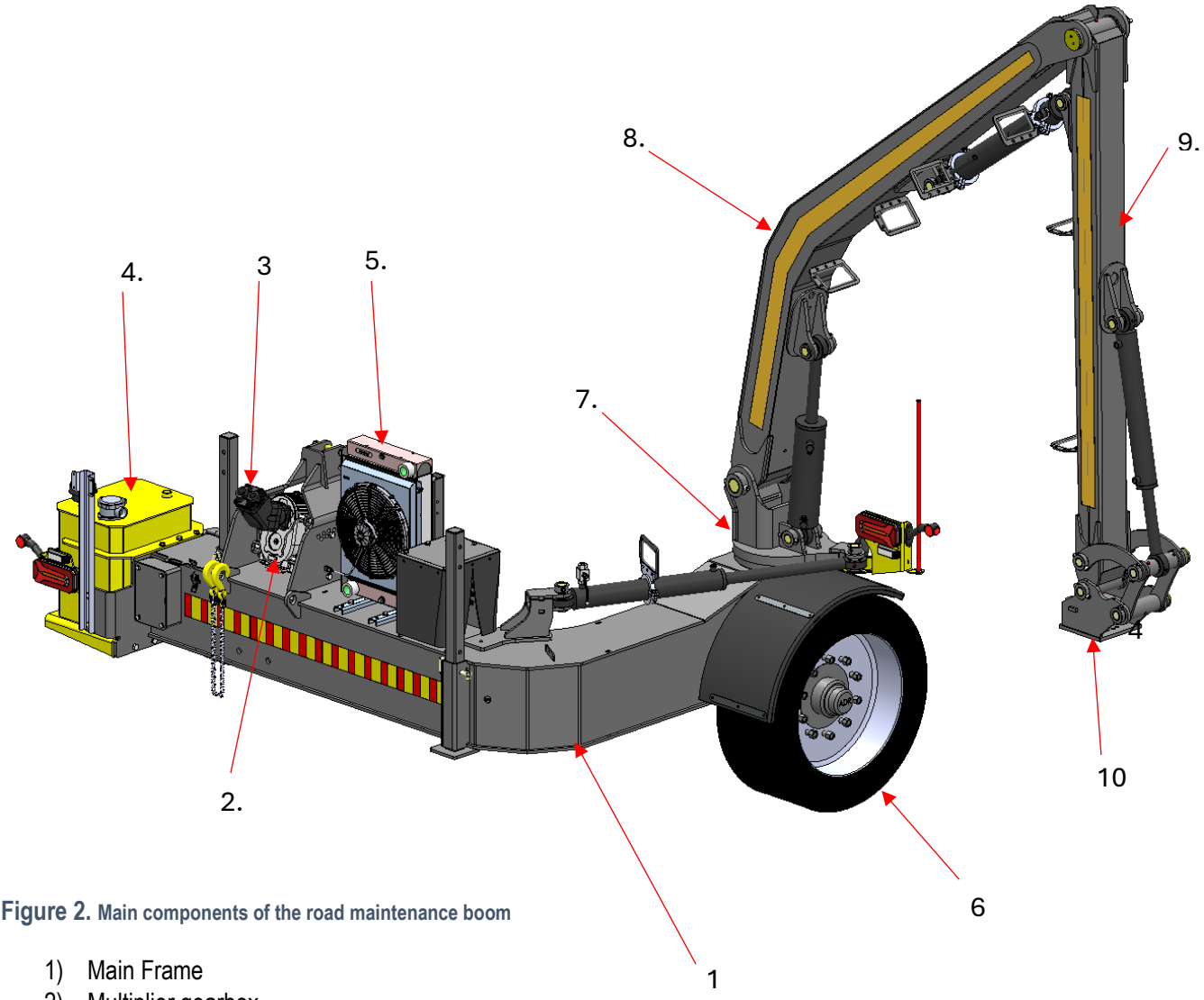


Figure 2. Main components of the road maintenance boom

1) Main Frame
2) Multiplier gearbox
3) Hydraulic pump
4) Hydraulic oil tank
5) Hydraulic oil cooler
6) Support wheel
7) Swivel joint
8) Main boom
9) Outer boom
10) Tilt joint

6 COMMISSIONING

Commissioning ensures that the base machine and the attachment are compatible. Always perform commissioning when the base machine changes.

6.1 Tractor requirements for the road maintenance boom

- The road maintenance boom is attached to the rear 3-point linkage of the tractor using Category 2 or 3 couplings.
- The oil required for the road maintenance boom's attachment is produced by its own hydraulic system. The system is driven by the tractor's PTO shaft. The PTO shaft connection on the attachment is a 6-spline 1" ⅜ ASAE. The power class requirement for the PTO shaft is 70 kW. **NOTE!** The PTO shaft is not included in the delivery..
- The boom system operates hydraulically and is controlled via a hydraulic control valve block. The boom system requires a continuous oil flow of 25 l/min, a return line, and a separate tank line.
- The road maintenance boom has its own control system for operating the boom. The control system requires a 12 VDC power supply.
- The detailed tractor requirements are shown in the figures below:



Figure 3. Rear PTO. Setting max 1000 rpm.



Figure 4. The lower link stabilizers must have sufficient adjustment range.

NOTE! These are used to force the frame to align with the side of the tractor's rear tire (Figure 4).



Figure 5. PTO-shaft. NOTE! Not included in the delivery.



Figure 6. The tractor must be equipped with a hydraulic top link.

This is used to force the frame into the correct position and can also be used to tilt the cutting head.

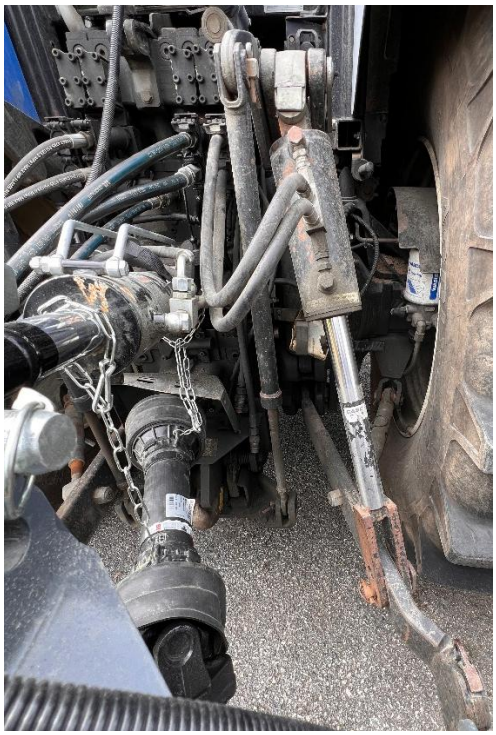


Figure 7. Hydraulic side link/leveling rod.

This is used to achieve the correct position for the frame and can also be used to transfer weight to the support wheel.



Figure 8. Link pins and/or balls for the lower links and top link. Category 2 or 3.

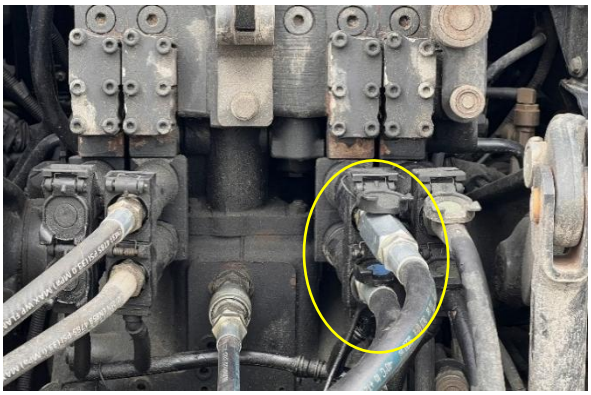


Figure 9. Boom system hydraulic requirements; ½" pressure and return line + tank line

NOTE! Oil must only flow into the boom system's valve block in one direction.
NOTE 2! Under no circumstances must the boom be operated without the tank line.



Figure 10. The road maintenance boom requires a continuous oil flow of 30 l/min to operate.



Figure 11. The joystick and control system display must be installed as an extension of the armrest.

The delivery includes a universal bracket for the display and joystick.



Figure 12. 3-pin plug for oil cooler.

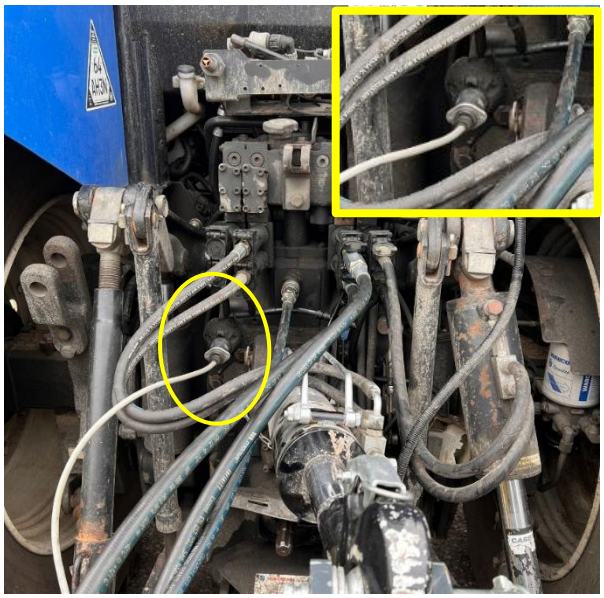


Figure 11. 7-pin plug for driving, warning, and work lights.



Figure 13. Sufficiently large side and auxiliary mirrors for monitoring the tire position.



Figure 14. The side window must be protected against flying debris.



Figure 15. The customer is responsible for installing adequate safety markings and warning lights on the tractor and the attachment in accordance with local regulations.



Figure 16. The attachment is delivered with a mounting bracket for optional warning signs.

(Warning sign not included in the delivery)

6.2 Attaching the road maintenance boom to the base machine

The boom is attached to the rear of the base machine using three-point linkages. Perform the coupling with extreme care!

1. Adjust the pins and implement balls to the frame of the road maintenance boom. The frame includes additional lower link brackets (Figure 18); measure the position of the tractor's lower links and select the appropriate pairs of brackets.
2. Measure and set the lower links to the correct width using the lower link stabilizers (sway blocks/limiters).
3. Connect the lower links to the frame of the road maintenance boom. Check that all locking pins and linchpins are in place and securely locked!
4. Engage the parking brake and attach the hydraulic top link into position.
5. Check that the frame aligns precisely with the side of the tractor tire. If necessary, adjust the position of the lower links using the stabilizers.
6. Connect the PTO shaft, as well as the plugs for the control system, lights, and oil cooler.
7. Connect the hydraulic valve block hoses and the tank line to the tractor.
8. Test the position of the frame by driving the tractor forward and making a sharp turn to the right. Verify that the frame, hoses, or any other parts of the boom do not hit the tractor tire..
9. Level the road maintenance boom frame horizontally. Use the hydraulic top link to push the frame slightly backward, and use the lower link levelling ram (tilter) to apply downward pressure on the frame until weight shifts onto the support wheel.
10. Test by operating the boom from the transport position fully to the side. The main frame must not sway or tilt during this movement. If necessary, increase the downward pressure of the top link and the lower link levelling ram.

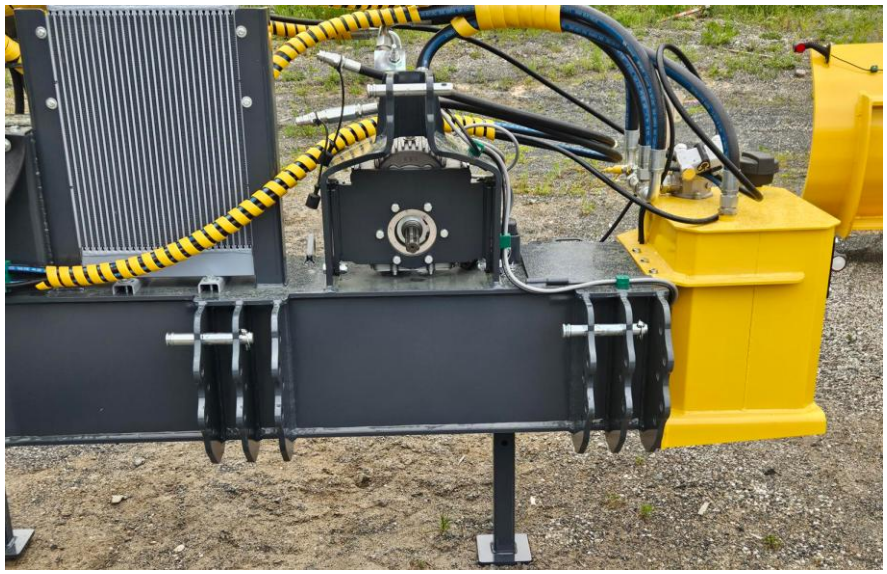


Figure 17. Alternative brackets for lower links.

6.3 Practicing the operation of the road maintenance boom

a. The operation and control of the road maintenance boom must be practiced carefully in a closed area before starting work in road zones.
b. The road maintenance boom is equipped with a control system and a proportional hydraulic valve block. Movement speeds, as well as acceleration and deceleration ramps, can be adjusted for each individual movement (Figure 19 and Figure 20).
c. **Do not modify** the factory settings. If you wish to change the settings, copy and save new user profiles (Figure 21).
d. Practice controlling the road maintenance boom and its trajectories. **Note** that it is possible for the boom and its implement to hit the tractor tire and the main frame.
e. Check the clearance required by the hydraulic hoses and electrical cables to ensure they do not get pinched between the frame and the tractor.
f. Connect the PTO to the 1000 rpm output. Accelerate the engine speed upward slowly.
g. Note that the device is equipped with a multiplier gearbox. The PTO shaft speed **must not exceed 650 rpm!!**
h. Decelerate the PTO shaft speed and disengage the PTO..
i. Drive the tractor and learn to perceive the width of the road maintenance boom; adjust the auxiliary mirror so that you can see the position of the support wheel in the mirror.



Figure 18. Boom movements.



Figure 19. Acceleration and deceleration ramps.

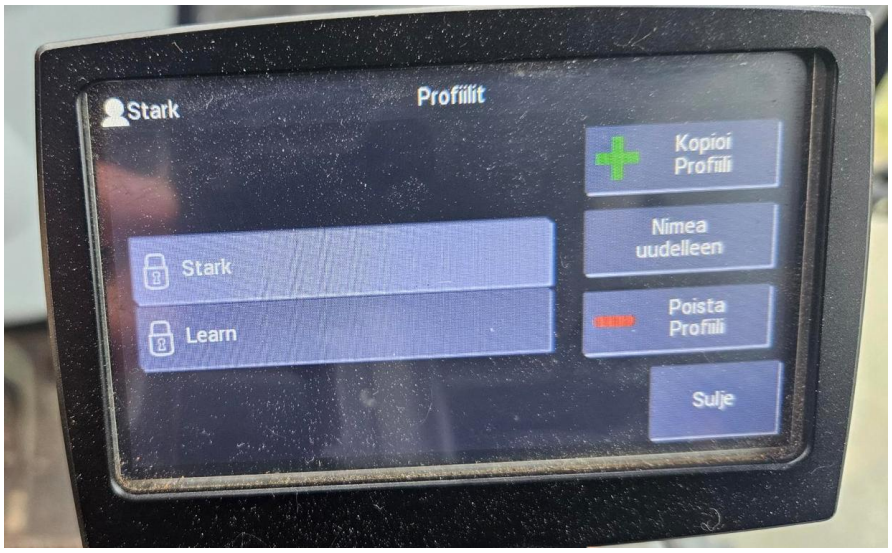


Figure 20. User profiles.

6.4 Attached Implement

The machine can be equipped with a variety of different implements, provided they are compatible with the machine's attachment system. Always verify before use that the attached implement is suitable for the intended application and meets the specified requirements.

Requirements for the implement:

- The maximum weight of the implement is 850 kg.
- Secure the implement to its designated attachment point.
- Ensure that the implement is locked and remains securely attached to the boom.
- Ensure that the implement does not come into contact with the road maintenance boom during operation.
- Ensure that the implement cannot strike bystanders during operation.



Figure 21. Mounting interface

6.5 Operation of the road maintenance boom

1. Before entering public roads, ensure that all necessary warning lights and warning markings comply with local regulations.
2. Guide the road maintenance boom to the rear and check that the boom or the attached implement does not obstruct the tractor's lights (Figure 23)
3. Close the valves (taps) of the slewing cylinder and lifting cylinder, and connect the chain link between the frame and the RMB (Figures 24, 25, and 26). The chain secures the position of the boom and RMB during transport.
4. The support wheel must be kept on the ground during transport driving.
5. Keep the transport speed moderate; slow down well in advance for bumps and speed humps. During transport, the boom is rear-heavy and sways easily. This can reduce the traction of the front tires.
6. Upon arriving at the work site, turn on the warning lights. Open the valves of the lifting and slewing cylinders, and remove the safety chain from between the frame and the implement.
7. Turn the seat to the side to improve working ergonomics and visibility of the work area.
8. Ensure that the windows of the base machine are well-protected against flying debris.
9. Move the boom to the working position, engage the PTO, and slowly accelerate to working speed. **NOTE! The maximum rotation speed of the PTO shaft is 650 rpm.**
10. If necessary, shift weight onto the support wheel using the lower link hydraulic levelling ram.
11. Monitor other traffic. Especially during mowing and bush clearing operations, stones and other debris can be thrown a long distance.
12. Check the oil temperature and oil level from time to time (Figure 27).
13. If you must raise the frame using the three-point hitch, do not run the PTO at high engine speeds, or disengage it completely. Otherwise, the PTO shaft may be damaged.
14. When finishing operation, first decelerate the PTO shaft speed and then disengage the PTO.
15. The bolts, nuts, and fittings of a new implement can loosen during the first hours of operation. Perform a **RETIGHTENING on them after the first working day**.



Figure 23. Transport position.

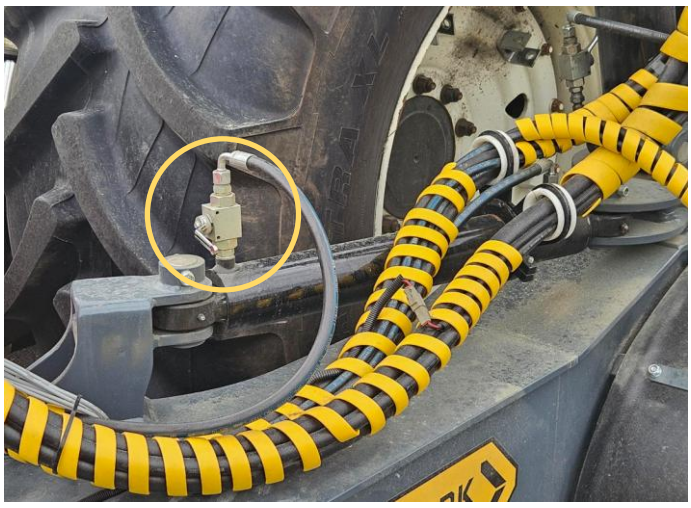


Figure 24. Slewing cylinder shut-off valve.



Figure 25. Lifting cylinder shut-off valve.



Figure 26. Safety chain.



Figure 27. Oil tank.

7 Adjustment and maintenance of the road maintenance boom

Hydraulic valve block:
The road maintenance boom is equipped with a proportional hydraulic valve block (Figures 28). The valve blocks feature fixed relief valves. The slewing and lifting cylinders are equipped with adjustable relief valves. Do not modify the factory settings unnecessarily. If the lifting or slewing action is too weak, the relief valve must be tightened very carefully. Loosen the locking nut on the side (Figure 29) and tighten the relief valve from the end of the valve. Do not tighten more than 1/8 of a turn at a time. Tighten the locking nut of the relief valve after adjustment.

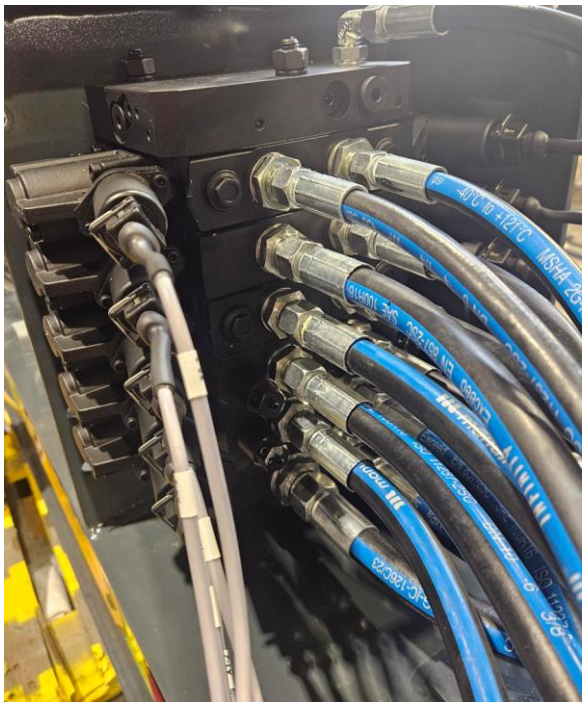


Figure 28. Hydraulic valve block.



Figure 29. Adjustable relief valves.

Road maintenance boom hydraulic system:
The hydraulic oil must be of ISO HV 46 quality. Change the oil every 4 years.
When adding oil to the reservoir, leave approximately 5 cm of empty space in the oil tank to allow air to reach the breather.
The breather / filler cap includes an air filter (Figure 30), which must be replaced with a new one once a year or when it becomes dirty.
The oil reservoir is equipped with a return filter (Figure 31). Its pressure must remain within the green zone. Replace the filter cartridge well in advance before the filter becomes clogged, or at least once a year.
The hydraulic system includes a cooler (Figure 32). Keep its cooling fins clean to ensure proper operation.



Figure 30. Filler- / breather cap and airfilter.



Figure 31. Return filter



Figure 32. Oil cooler.



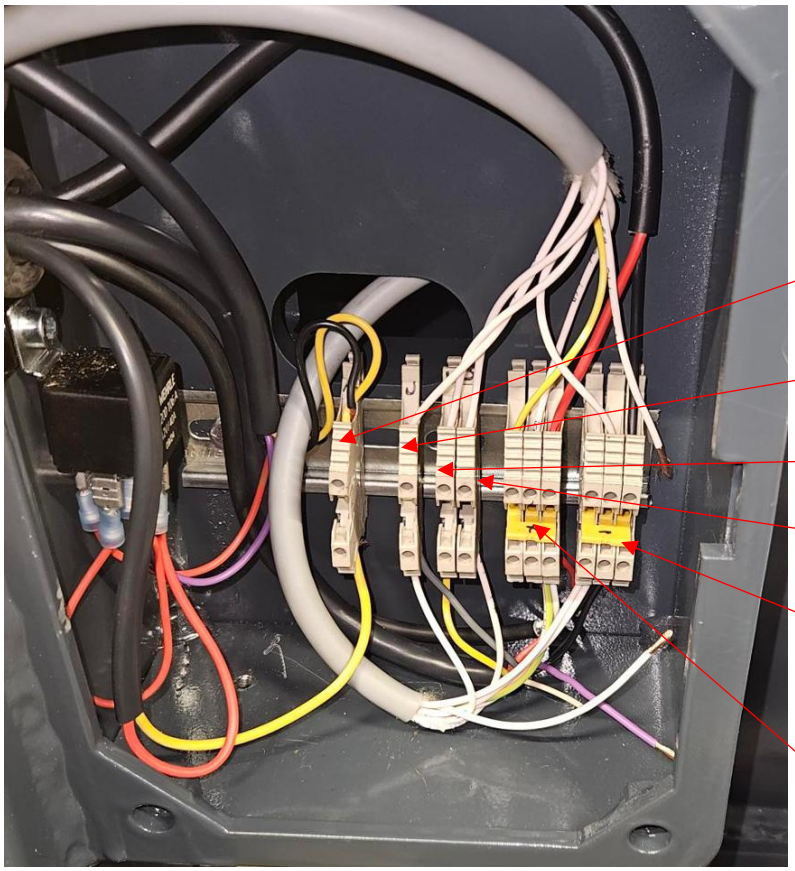
Figure 33. Multiplier gearbox.

Multiplier gearbox:
The oil in the gearbox (Figure 33) must be changed for the first time after 100 hours. It is recommended to change the gearbox oil every 1,000 hours. The oil must be rated API GL 4 Plus or equivalent. The viscosity must be SAE 80W-90.

Warning and work lights:
The road maintenance boom is equipped with driving lights, 3 warning lights, and 2 work lights. The electrical connection is located on the frame under the cover (Figure 34). The electrical system is divided into relays.



Figure 34. Connection box.



1. Power supply –
2. Power supply +
3. Right turn signal
4. Left turn signal
5. Brake light
6. Relay – connection

Figure 35. Electrical relays.

7.1 General safety instructions for operation and maintenance

- Comply with applicable laws and regulations, as well as the instructions specified in this operator's manual.
- Never go under an un-secured machine.
- Always engage the parking brake of the base machine before performing any operations on the device.
- Use only tools that are in good working condition.
- Beware of pressurized hydraulic hoses and components.
- Ensure that the hydraulic system is depressurized. Take the pressure accumulator into account.
- Do not allow hydraulic fluids or greases to spill onto the ground.
- Use the necessary personal protective equipment (PPE).

7.2 Tightening torques

	Nm (Strength 8.8)
M4	3,3
M5	6,5
M6	11,3
M8	27,3
M10	54
M12	93
M14	148
M16	230
M18	329
M20	464
M22	634
M24	798
M27	1176
M30	1597
M33	2161
M36	2778
M39	3597

Table 1. Tightening torques

7.3 Daily maintenance

A daily visual inspection is important to detect potential faults early and prevent further damage. Inspect the following items on the device daily:

- Potential leaks in hydraulic hoses and components
- General mechanical condition

7.4 Maintenance after the first 10 hours

- Perform lubrication; the recommended grease quality is NLGI-2 rated grease or equivalent (see instructions below).
- Check the tightness of bolts, nuts, and hydraulic fittings (Table 1).

7.5 Maintenance every 50 hours or weekly

- Perform lubrication; the recommended grease quality is NLGI-2 rated grease or equivalent (see instructions below).
- Check the mechanical condition of the device for any deformations or cracks.
- Check the tightness of bolts, nuts, and hydraulic fittings (Table 1).
- Lubricate (grease) the PTO shaft.

General maintenance of the road maintenance boom:

- During the season, wash the device regularly to prevent corrosion from advancing in the structures.
- Monitor the frame structures for any potential cracks.
- At the end of the season, clean the device thoroughly and repair any damaged paint surfaces.

7.6 Greasing points

1) Slewing joint (Figure 36)
2) Bearings for slewing and lifting cylinders (Figure 37)
3) Bearings and articulation joint for the folding cylinder (Figure 38)
4) Tilting cylinder and tilting joint (Figure 39)

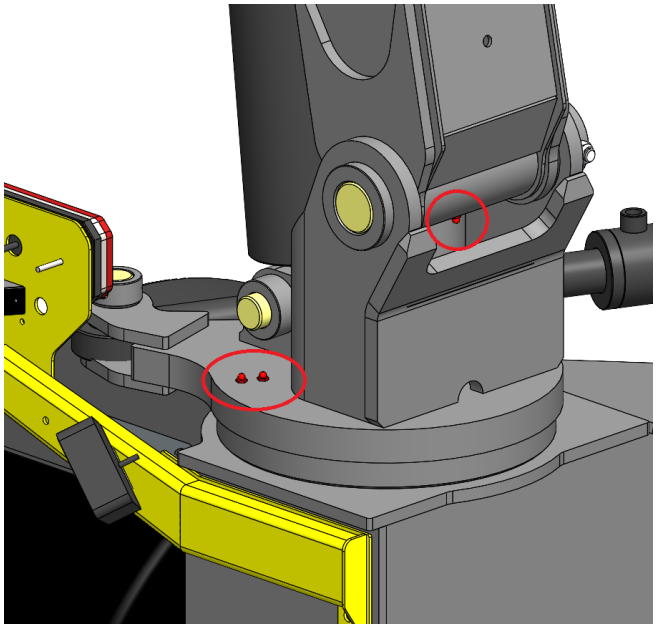


Figure 36. Grease nipples for the slewing joint.

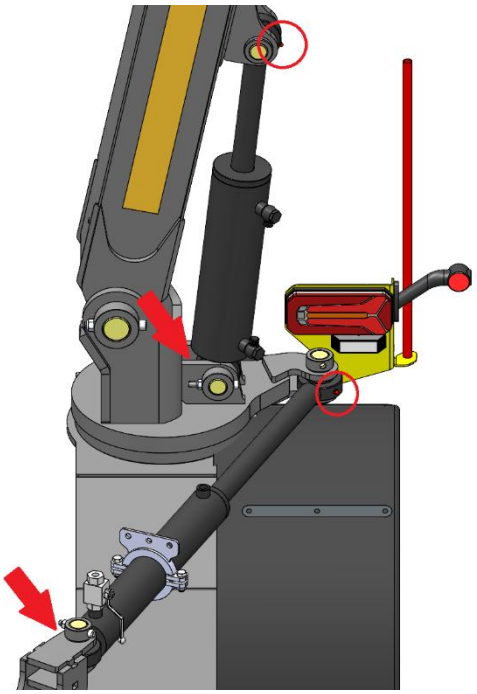


Figure 37. Grease nipples for slewing and lifting cylinder bearings.

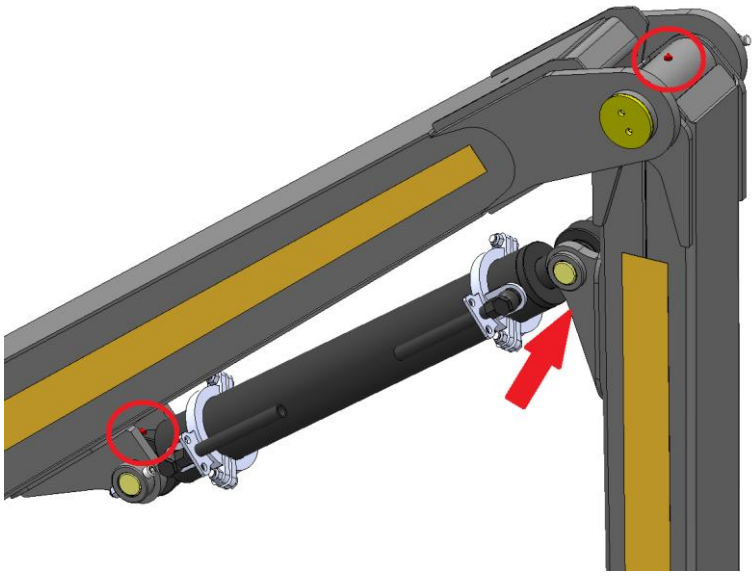


Figure 38. Grease nipples for folding cylinder bearings and folding joint.

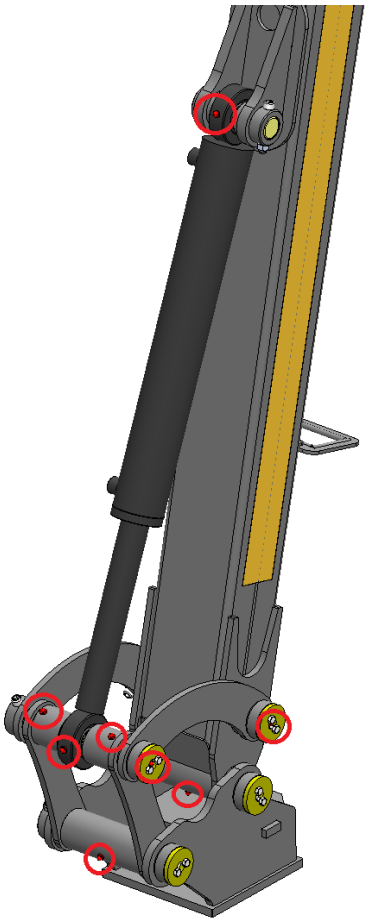


Figure 39. Grease nipples for tilting cylinder and tilting joint.

8 HYDRAULICS

The road maintenance boom can be connected to a 2-hose hydraulic system with a separate tank line. The road maintenance boom features a complex hydraulic system that has been tested and adjusted at the factory. The hydraulic valve block is equipped with adjustable relief valves. Extreme caution must be exercised when adjusting the relief valves (see section 7). Any modifications to the hydraulic system are the responsibility of the customer. Diagram 1 shows a simplified schematic diagram of the hydraulics.

Pump: max 150 l/min / 350 bar
Standby pressure: 14 bar
LS pressure limitation: 200 bar
Pilot pressure: 40 bar (internal)
Coils: 12 VDC, PWM 80 Hz
Max flow A/B: 100 l/min

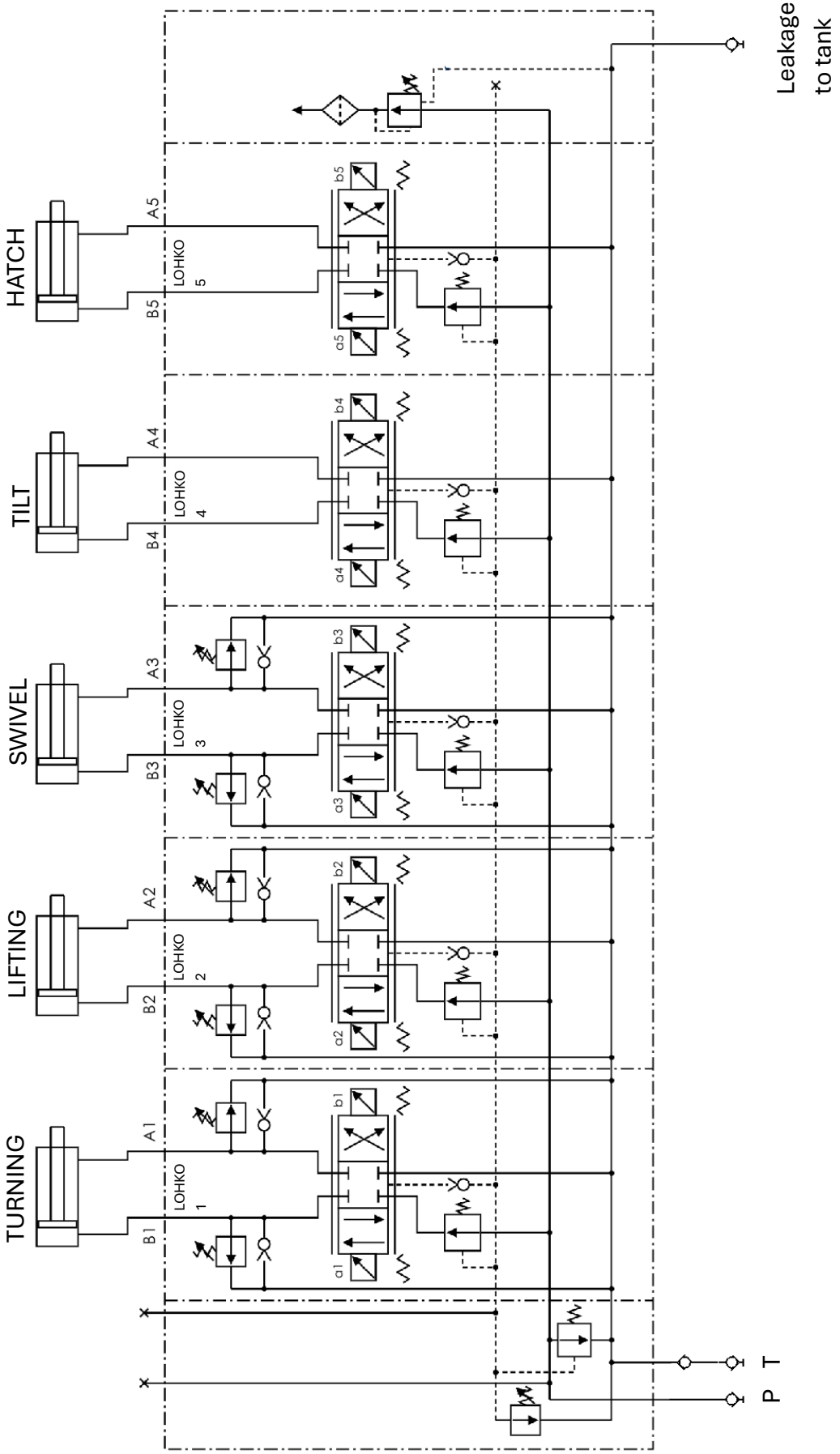


Diagram 1. Hydraulic schematic.

9 WARRANTY POLICY

1. **Warranty coverage**
   Lametal Oy, the manufacturer of STARK attachments, offers new devices a guarantee which covers material and manufacturing defects in accordance with the terms in this warranty policy. Limitations to the warranty are specified in point 7.
2. **Warranty starting date**
   The warranty starts on the agreed date of product delivery to the client, or on the date of approved instalment or on the date the equipment has been taken into operation. The equipment is taken into operation when it has been delivered to the client in accordance with the agreement and the client has acknowledged receipt of the equipment. The client is to check the equipment before use as instructed in this manual and to notify the manufacturer or the reseller of the equipment of any defects or flaws that are noticed during initial inspection. This notification is to be done in writing within eight (8) days after delivery. Hidden defects and defects that are otherwise difficult to detect must be reported immediately after detecting them, within one (1) year after receipt of the equipment at the latest.
3. **Warranty period**
   STARK warranty covers a period of one (1) year. If need be, the client and the manufacturer make separate agreements on warranty concerning repairs and spare parts used in repairs.
4. **Repairs during the warranty period**
   Repairs during the warranty period are carried out free of charge within the normal working hours by the manufacturer repair and maintenance services or by a repair service provider accredited by the manufacturer. If repairs are carried out by a repair service provider which has not been accredited by the manufacturer, the manufacturer does not compensate for costs that are not covered by the warranty, such as travel and waiting hours, daily allowances, travel expenses or costs arising from detaching and reinstalling the equipment. The manufacturer does not compensate for indirect costs caused by repairs during the warranty period, such as lost working hours. Original parts replaced during the warranty period shall remain with the manufacturer. The client must keep the damaged parts for six (6) months unless otherwise agreed, and have them delivered to the manufacturer without delay upon request.
5. **Conditions for repair under warranty**
   Manufacturer's instructions for operation, instalment and maintenance have been followed.
   The equipment was damaged when operated in conditions for which it has been engineered.
   In maintenance and repairs, only original, manufacturer parts have been used.
   The form for the notification of defects provided by the manufacturer or the retailer has been filled in according to the instructions and submitted for processing.
6. **Warranty after repair**
   Warranty holds until the end of the original warranty period. Repair under warranty does not prolong the warranty period.
7. **Limitation to the warranty**
   The warranty does not cover:
   - consequential expenses resulting from the damaged equipment
   - indirect costs, such as loss of working hours
   - damages caused to a third party
   - equipment or components that have been modified or repaired by the client themselves
   - damages caused by normal wear and tear, inappropriate maintenance operations, neglect, accident, connecting error, equipment overloading, user's inexperience or use of other than original parts

   The warranty offered by the manufacturer does not exceed the purchase price of the equipment.

8. **Warranty claim procedure**

For a warranty claim to be processed, the form for the notification of defects provided by the manufacturer or the retailer must be filled in according to the instructions and submitted for processor. The warranty claim procedure is carried out either in Finnish or English.

NOTES:

NOTES:

Important Notes:

- Max. oil flow to the valve block: 50 l/min
- The valve block must be connected to the tank line.
- Oil flow in one direction only.
- Max. PTO shaft speed: 650 rpm
- Valve block oil change interval: every 4 years.
- First oil change for the gear increaser after 100 operating hours. Thereafter, every 1000 hours.