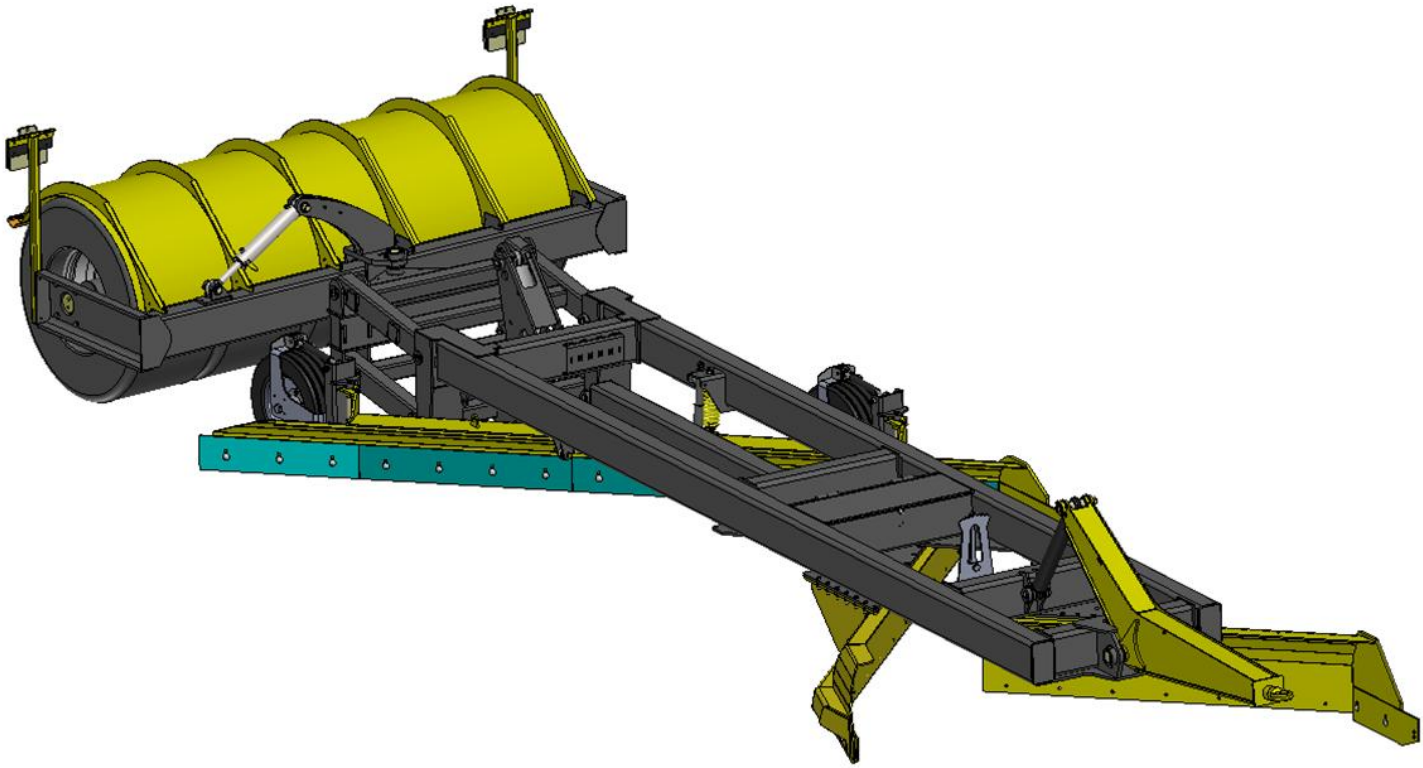
Original

Operating and maintenance manual

Road Grader



STARK / Lametal oy
Kaskenviertäjäntie 2
73100 Lapinlahti, FINLAND

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

General

Congratulations on the purchase of your STARK Road Grader!

For us, the long lifecycle and efficiency of your new equipment is a priority. To keep the road grader 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 road grader, 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

Make sure you know your equipment before you start using it.
Equipment may be operated only by an individual who is thoroughly familiar with its use.
All operators must be properly instructed before use and maintenance of the equipment. Use by individuals with insufficient instructions may pose serious risks to the operators themselves, to the environment and the equipment.



When coupling the attachment to the base machine, make sure:

- that all locking cotters are intact and in order
- there is no pressure in the hydraulic system
- that hydraulic hoses are intact
- there is no skin contact to hydraulic oil when connecting hydraulic hoses
- not to pull by the hydraulic hoses, but only by the hydraulic fitting



During operation, pay attention to:

- safe, appropriate travel speed
- other traffic, people and animals
- danger zones and objects that block your view
- children

NEVER use the machine if there is someone in the danger zone.
NEVER go under the attachment.

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1. DECLARATION OF CONFORMITY

The original manufacturer's EC declaration of conformity:
Generic product name: Road grader
Models: RD 4.5, RD 6

Manufacturer:
Lametal Ltd
Kaskenviertäjäntie 2 73100 LAPINLAHTI, Finland
tel. +358 17 731 565

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
Managing director
Kaskenviertäjäntie 2
73100 Lapinlahti, FINLAND

2. PURPOSE OF USE

STARK Road graders are used for grading gravel roads and flat areas and for transferring ice (removal of packed snow). The device can also be used to shape and align fields.

3. SAFETY PRECAUTIONS

Make sure you know your equipment before you start using it. Equipment may be operated only by an individual who is thoroughly familiar with its use.



Before connecting hydraulics to the base machine, make sure that:

- there is no-one between the attachment and the base machine
- the base machine is turned off and the parking brake is on.

When coupling the attachment to the base machine, make sure that:

- all locking cotters are intact and in order
- hydraulic hoses are intact
- there is no skin contact to hydraulic oil when connecting hydraulic hoses
- you do not to pull by the hydraulic hoses, but only by the hydraulic fitting.

During operation, pay attention to:

- safe, appropriate travel speed
- other traffic, people and animals
- danger zones and objects that block your view
- children
- use of turn signal when driving



NEVER use the machine, if there is someone in the danger zone
NEVER go under the attachment



WARNING! Pressurized hydraulic hoses and components!

During maintenance, the hydraulics of the base machine MUST be turned off. The base machine MUST also be turned off and the parking brake MUST be applied. The equipment must be properly supported, if maintenance can only be performed by going under the equipment. Never go under the equipment if it is not properly supported.
Daily maintenance:

- check general condition of structures, make repairs if needed
- check the hydraulic hoses and fittings, and replace damaged parts

After every 50 hours of operation:

- lubricate points specified in later section of this manual
- check all bolts and nuts for tightness

Check all bolts, nuts and hydraulic fittings for tightness after the **first day** of operation!
If the equipment is not likely to be used for a longer period, clean it thoroughly after use and lubricate as instructed.

4. IDENTIFICATION INFORMATION AND SPAREPARTS

4.1. Identification plate

Identification plate is placed on the side of the equipment. The plate includes contact information, machine type, year of manufacture, serial number and weight. (See an example of an identification plate in picture 1 below).
The first four numbers in the serial number indicate the month and year of manufacture (month first). The remaining five numbers constitute the machine tracking number, which is stored in the manufacturer's database (13971 in the example below).



Picture 1. Identification plate

Take down the machine type and the serial number of your road grader:

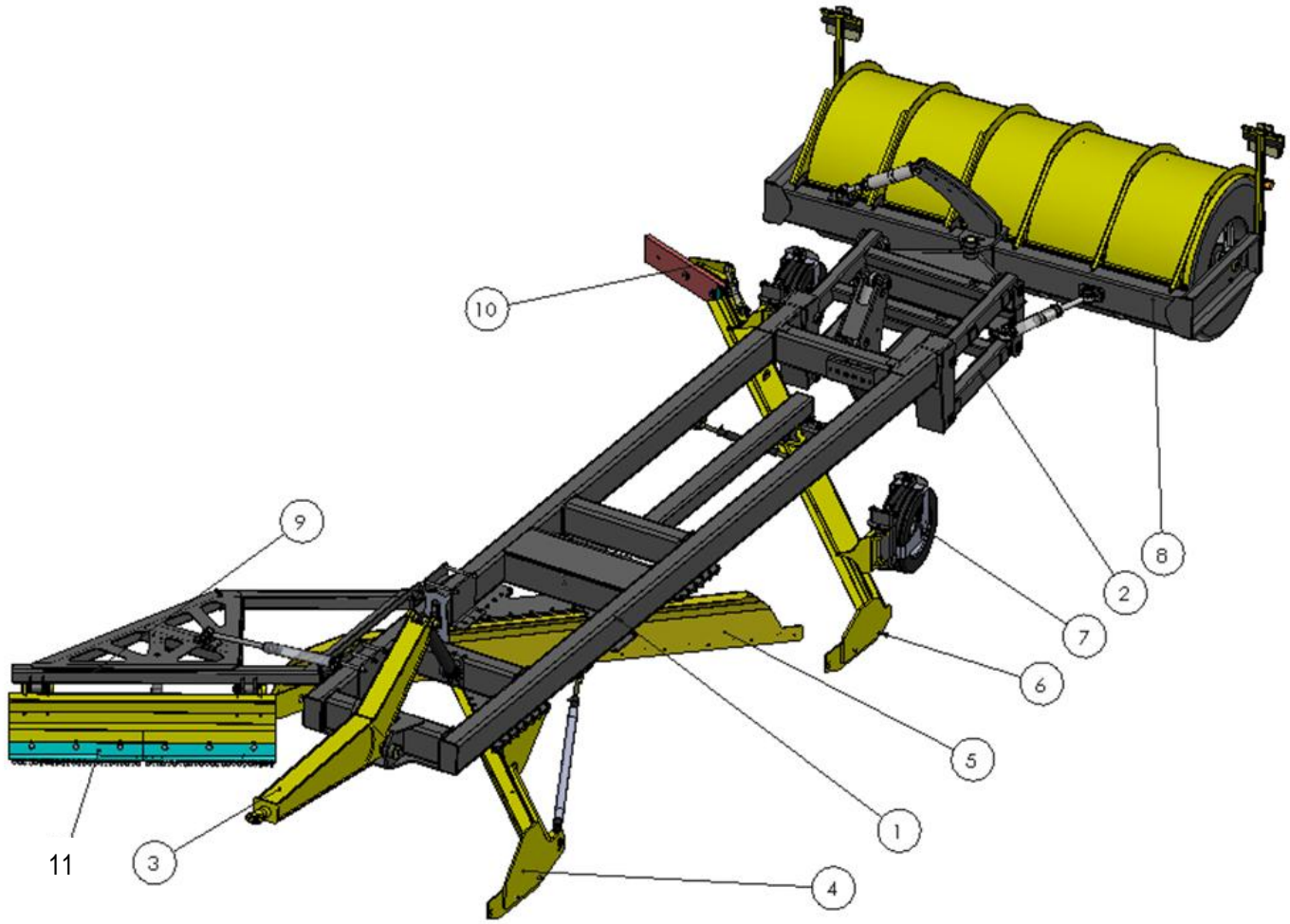
Product and model _____Serial number_____

4.2. Maintenance services

When replacing parts, use original, manufacturer spare parts only. By using original spare parts, you ensure dependable operation of the road grader and comply with the warranty policy. To facilitate the supply of spare parts, always inform the manufacturer/retailer of the model and serial number of the road grader (marked in the identification plate) when you order spare parts.
For more information on maintenance and spare parts, please contact the STARK maintenance and spare part services or your retailer.
Contact information for STARK maintenance services:
tel. +358 400 480 401, e-mail info@stark.fi

tel. +358 400 480 401, e-mail parts@stark.fi

5. MAIN PARTS OF THE ROAD GRADER



Picture 2. Main parts of the road grader

1) Frame of the road grader
2) Floating frame
3) Pull shaft
4) Front wing
5) Middle wing
6) Windrow spreader
7) Support wheels for windrow spreader
8) Tire packer
9) Ditch wing (accessory)
10) Extension for windrow spreader (accessory)
11) Pin blade for the ditch wing (accessory)

6. ATTACHING THE ROAD GRADER

When attaching the road grader for the first time, make sure it is compatible with the base machine by following the instructions below. Always check the compatibility when attaching the road grader to a new base machine.

Make sure that the base machine allows installation of the road grader. Minimum requirements of the base machine:

- Minimum weight of 6,000 kg
- without remote controller the hydraulics require 4 pc of 2-action hydraulic valves
- With wireless controller, 1 x 2-way hydraulic valve
- 7-pin trailer light plug
- 3-pin power socket
- Towing hook

6.1. Attaching the road grader to the base machine

Before using the road grader spreader, MAKE SURE all locking cotters and pins are secured and intact.

When coupling the road grader to the base machine, please pay attention to the instructions on the use of the base machine.

1) Make sure that the attachment and the base machine are compatible in terms of mechanical solutions, hydraulics and electricity.

2) The road grader is connected to the base machine's towing hook and hydraulic system.

3) Connect the grader to the base machine's towing hook and move the tractor arms to lower position.

4) Turn off the base machine, engage the parking brake and release pressure from the hydraulic jacks.

5) Connect the hydraulic connectors to the base machine and make sure that the grader does not damage the cable connectors while in motion.

6) Connect the power socket/plugs.

7) During the first use, exercise extreme caution when using the product and make sure that grader does not collide with the tractor when in motion. The warranty does not cover damage caused by an improperly installed device.

8) When the attachment is new, bolts, nuts and connectors can loosen up among first hours of operation. **Retighten them** after the first day of operating the attachment.

7. OPERATING THE ROAD GRADER

Before operating the road grader, make sure:

- the road grader is installed correctly
- all locking pins are in place
- hydraulic hoses are connected right and properly
- hoses are intact
- there are no oil leaks
- all functions are working properly
- learn to operate the road grader in a closed area before actually using the device

7.1. Operating instructions

1. Make sure that the attachment and the base machine are compatible in terms of mechanical solutions, hydraulics and electricity
2. The road grader is attached to the towing hook on the base machine. Engage the parking brake. Attach the road grader to the base machine.
3. Turn off the base machine and make sure the parking brake is applied.
4. Make sure there is no pressure in the base machine hydraulic system. When connecting, always make sure the hydraulic connectors are clean and the hoses are intact.
5. Check carefully the attachment's, the base machine's and the fitting's trajectory for collision. Make sure that the hydraulic hoses and attachments have enough space. If needed change places of the hoses in the base machine.
6. Stay alert for any abnormal behavior and oil leaks also during driving.

7.2. Grading adjustmets

- Press back-lift cylinder all the way down, then lift it to the transfer position with a synchronized lift. If you do not press the back-lift cylinder down first, it won't go all the way up.
- Press the grader down with a synchronized movement. This way both of lift cylinders will move.
- Adjust the main blades so that they will drag evenly with a lift cylinder located on back.
- Adjust the desired slope of the road with a tilt cylinder.
- Adjust the windrow blade to the desired height with wheel's turnbuckle and lock it.
- Windrow blade is at right height when gravel from the main blades spreads evenly on the windrow blade.
- If needed use the ditch wing available as an accessory. Wing's descent velocity can be adjusted without steps with restrictor valve. Open the valve to lower the ditch wing.
- Adjust the driving speed and the drag of the main blades with a synchronized lift to get best results. Alternatively adjust the height of the tire packer.
- If needed use the tire packer's rotation to get more width and when dragging on curves (this way the grader can be kept at own side of the road). Tire packer's rotation can also be used for tight turns and while reversing.
- When finishing operating the road grader, lift the main blades up with a synchronized lift so that gravel won't be transferred to the windrow spreader. Lift the grader to the transferring height after the windrow spreader doesn't get more gravel.
- Stay alert for the condition of the blades while operating the grader. If needed, adjust the blades or change them to new ones.

7.3. Transporting the road grader

Road grader is a very wide attachment in traffic. **Be very cautious in traffic while transporting the road grader.**

- Lift the road grader to the height where the blades don't touch the ground.
- Maximum speed when transporting the road grader is 25 km/h. Greater speed can damage the tire packer or frame of the road grader.
- Slow down the driving speed when close to people or other vehicles.
- Slow down the driving speed on bumpy and uneven roads.
- Take note of the width of the tire packer while transporting the road grader.



Maximum speed when transporting the road grader is 25 km/h.
Be aware of people and other vehicles while transporting the road grader.

7.4. Detaching the road grader

- When you disconnect the blade assembly from the tractor, lower the assembly on a flat surface and rest it on the blades.
- Rest the blades on top of strong support brackets.
- Turn the restrictor valve's adjustment cap into closed position (picture 3). Lift the ditch wing up with hydraulics, wing locks upward position hydraulically.
- When transferring road grader for long distances, ditch wing must be secured to upwards stance with e. g. a cargo strap.
- Turn off the base machine and remove pressure from the hydraulic hoses. This facilitates the re-installation.
- Disconnect the hydraulic quick connectors and sockets and protect them.
- Start the base machine and remove the blade assembly from the tractor hook-up.



Picture 3. Restrictor valve

7.5. Wireless controller

Wireless controller is available as an accessory for the road grader, which allows to control all movements of the grader with one 2-action section valve. Controller, it's fastener and power socket are added to the base machine. Controller is used to control electric valves added to the grader.

Operating instructions:

- Attach electricity from the base machine with a 3-pin power socket.
- Turn the controller on with a green START-button (must be done every time the power supply stops).
- Operate controllers' buttons simultaneously with the base machine's directional valve.
- When transferring the grader turn off the controller with a red STOP-button. This way base machine's directional valve only operates the rotation of the tire packer.
- The warning light of the controller lights up 100 hours before the batteries are empty.
- If there is an error in controller, recode it.

There are 5 actions available for the controller (1+4 electrically controlled actions)

Hydraulic section (picture 4.)

- Tire packer's rotation
- 1. section: Tilt of the grader
- 2. section: Back lift / adjusting the drag
- 3. section: Synchronized lift (shaft's cylinder and grader's back lift cylinder move simultaneously
- 4. section: Operating the ditch wing or the windrow spreader's extension (is left unused if ditch wing is operated from the base machine's own hydraulic section)
- 5. section: Adjusting the windrow blade (additional section)
- 6. section: Adjusting the windrow blade (additional section)

Additional sections require 6-action wireless controller

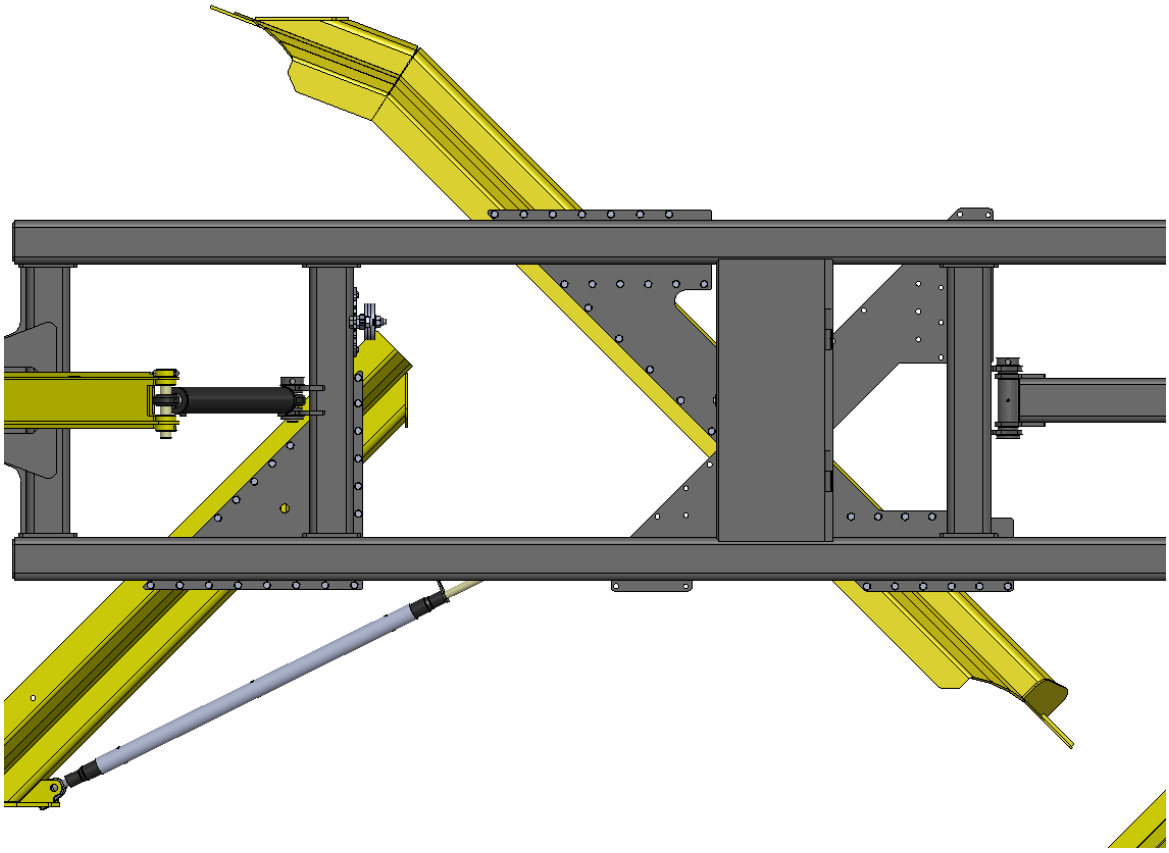


Picture 4. Hydraulic sections

7.6. Removal of packed snow

It is possible to rotate the middle wing of the road grader to the “packed snow removal” -position. The point of rotating the middle wing is to move ice and snow to the side of the road.

Middle wing is rotated by removing the bolts holding it (32 pc of M16 bolts). M30 bolt in the joint of the middle wing is loosened for rotation. Some of the bolts are in the toolbox. (Picture 5)



Picture 5. Middle wing’s position

7.7. Accessories

The following accessories are available for the road grader:

- Flat-, pin- and hardened metal blade set
- Ditch wing 1500/1800
- Hydraulic extension for the windrow spreader
- Pin blade set for the ditch wing

8. MAINTAINING THE ROAD GRADER

8.1. General safety precautions for the use and maintenance

- Comply with the applicable laws and regulations and the instructions in this manual
- Never go under the road grader if it is not supported
- Always put on the base machine's parking brake before any servicing on the road grader.
- Use only tools which are in good condition.
- Watch out for pressurized hydraulic hoses and components.
- Make sure there is no pressure in the hydraulic system. Take into account the pressure accumulator
- Do not let hydraulic fluids or lubricants to the ground.
- Wear appropriate personal protective equipment.
- Pay attention to the attachment's width, weight and other factors that can alter the operating experience. Adjust the driving speed according to circumstances. Make sure there are no other people in the working area.

8.2. Minimum requirements of the base machine

- Minimum weight of 6,000 kg
- With wireless controller, 1 x 2-way hydraulic valve
- 7-pin trailer light plug
- 3-pin power socket
- Towing hook

The road grader is attached to the towing hook of the base machine.

1. Attach the road grader to the base machine and move the tractor arms to lower position.
2. Turn off the base machine, engage the parking the break and remove pressure from the hydraulic connectors.
3. Attach the hydraulic connectors to the base machine and make sure that the road grader won't damage the hoses.
4. Connect the power socket/plugs.

When operating the grader for the first time, be extremely cautious and make sure that the grader doesn't collide with the base machine. Warranty does not cover damages caused by incorrect installation.

8.3. Tightening torque

	Nm (Strenght 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 torque

8.4. Daily maintenance

It is important to perform a daily visual inspection of the road grader for early detection of possible faults and to prevent further damage. Inspect the following items on the road grader daily:

- Hydraulic hoses and components for possible leaks
- General mechanical condition

8.5. Maintenance after every 10 hours

- Lubricate marked components (see a later section for instructions)
- Check the bolts for tightness (table 1)

8.6. Maintenance after 50 hours or weekly

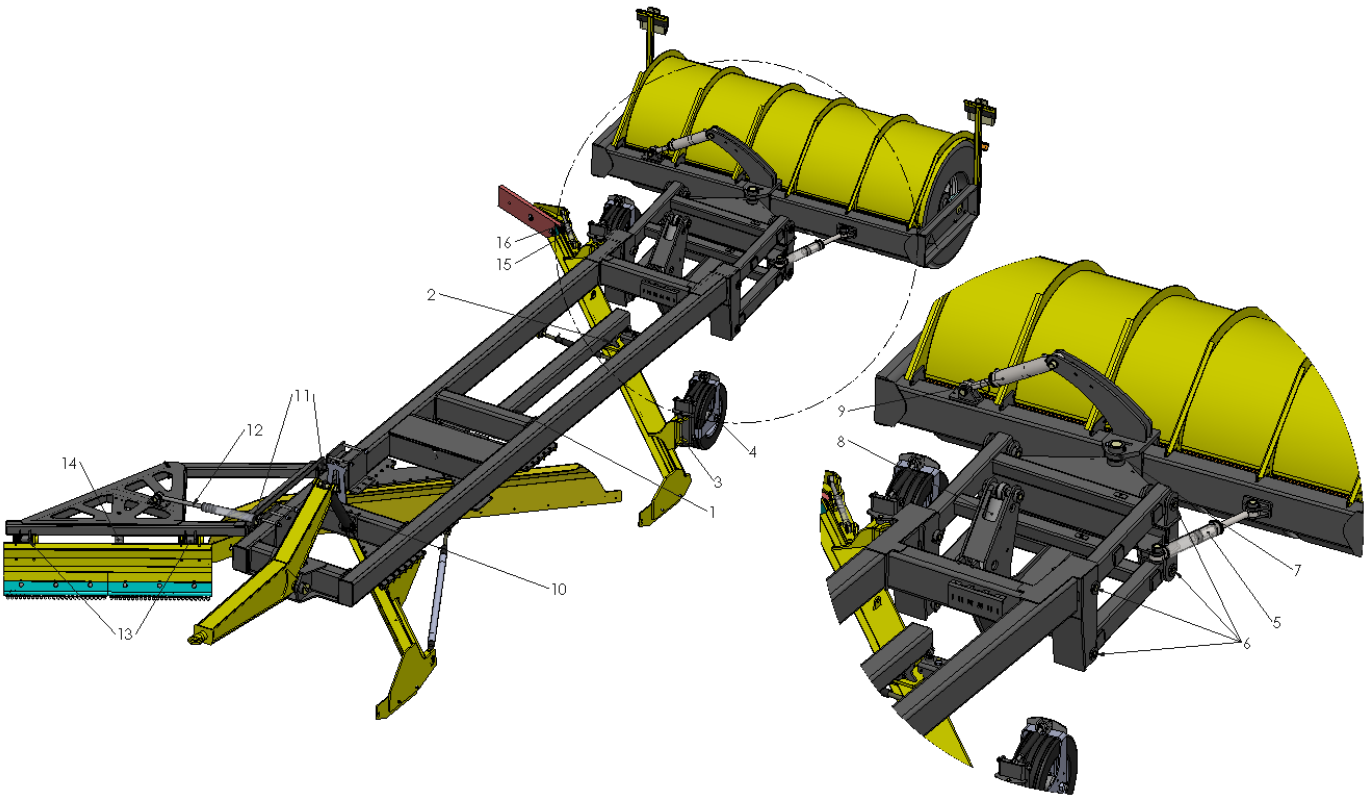
- Check the bolts for the tightness (table 1)
- Lubrication, recommended quality NLGI-2 grade grease or equivalent (see a later section for instructions)
- Check the mechanical condition of the road grader for distortion or rupture
- Check fastening bolts for tightness
- Check the drawbar eye for wear and tear
- Apply oil to the steel tenons so that they turn in the blade chassis
- Check the wheel pressures (windrow wheel 3,0 bar and the tire packer 0,8-1,0 bar)

Ditch wing is protected with hydraulic cylinder which is connected to the pressure accumulator. If needed, oil can be added to the cylinder with quick connector. Attach the hose to the quick connector, open 3-way tap and add oil to the cylinder, **max. 150 bar.** Then close the 3-way tap. (Picture 6)



Picture 6. 3-way tap

8.7. Lubrication points



Picture 7. Lubrication points

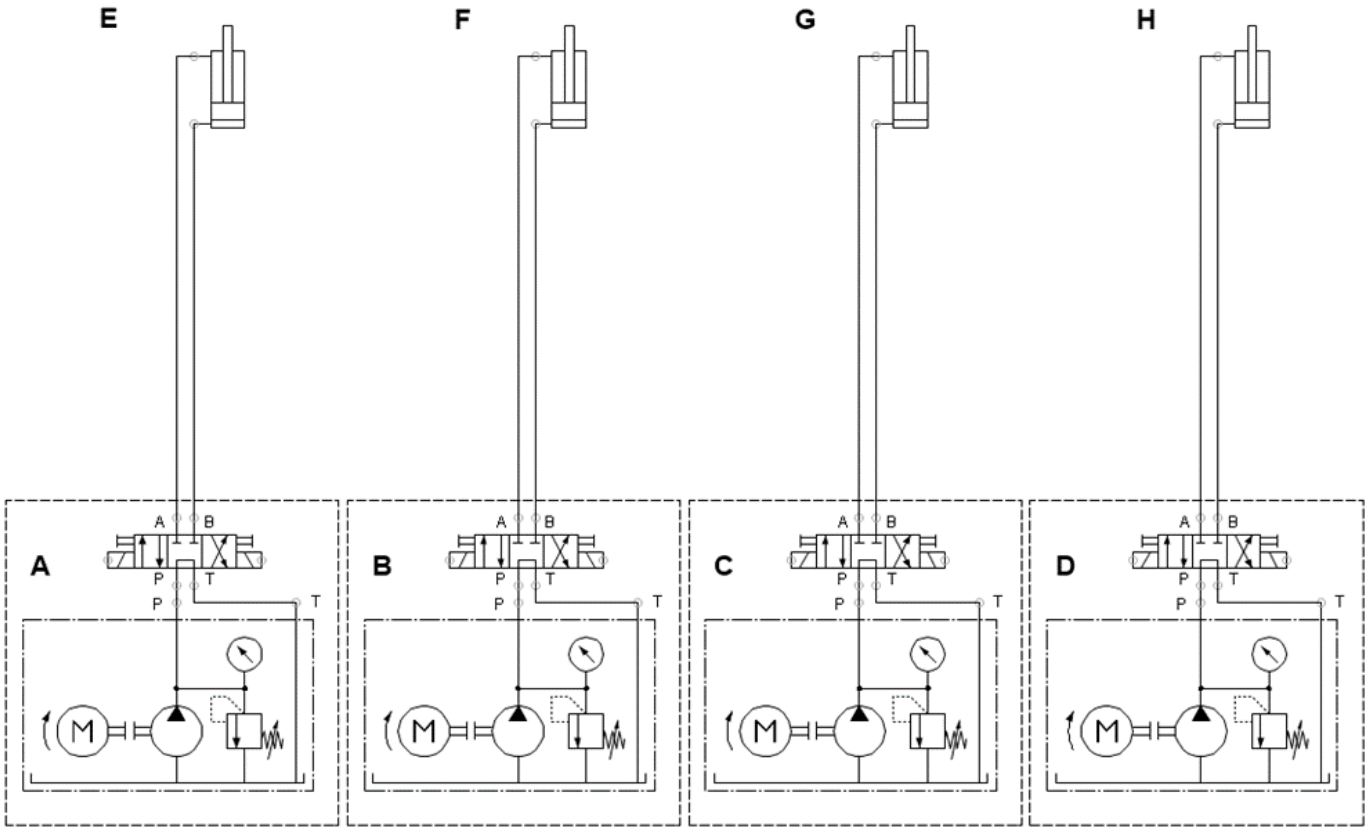
1. Peg of the windrow spreader's shaft
2. Tilting peg of the windrow spreader
3. Peg of the windrow spreader's support wheel
4. Axle of the windrow spreader's support wheel
5. Joint bearings of the tire packers' hydraulic cylinder
6. Pegs of the floating frame (8 pc)
7. Hydraulic cylinder of the tire packer
8. Joint bearings of the floating frame's lift cylinder
9. Joint bearings of the tire packers' tilting cylinder
10. Joint bearings of the pull shaft's hydraulic cylinder
11. Pegs of the ditch wing (accessory)
12. Joint bearings of the ditch wing's hydraulic cylinder (accessory)
13. Rotation pegs of the ditch wing (2 pc, accessory)
14. Joint bearings of the ditch wing's padding cylinder (accessory)
15. Joint bearings of the windrow spreader's extension (accessory)
16. Peg of the windrow spreader's extension (accessory)

9. HYDRAULICS

The road grader is attached to the base machine with 2-, 4- and 8-hose hydraulics. The system has been tested and adjusted by the manufacturer. Any alterations or modifications to the hydraulic system are on the sole responsibility of the client.

Max. pressure: 200 bar
Max. oil flow: 100 L/min
Max. return line pressure: 80 bar

9.1. 8-hose hydraulics

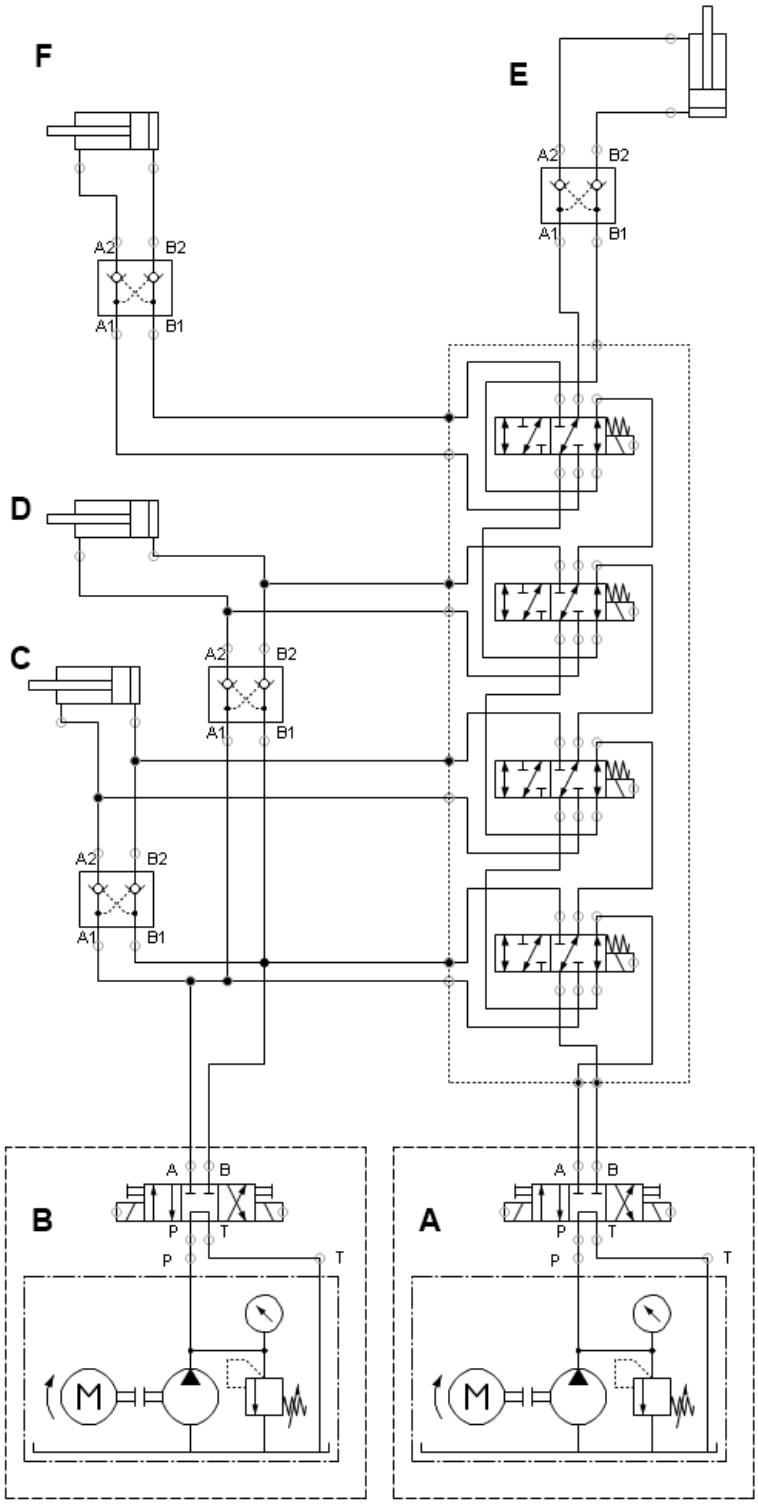


E. Base machine's control block 1
F. Base machine's control block 2
G. Base machine's control block 3
H. Base machine's control block 4

A. Pull shaft's lift cylinder
B. Floating frame's lift cylinder
C. Tire packer's hydraulic cylinder
D. Tire packer's tilting cylinder

Figure 1. Hydraulic chart for the 8-hose hydraulics

9.2. 4-hose hydraulics

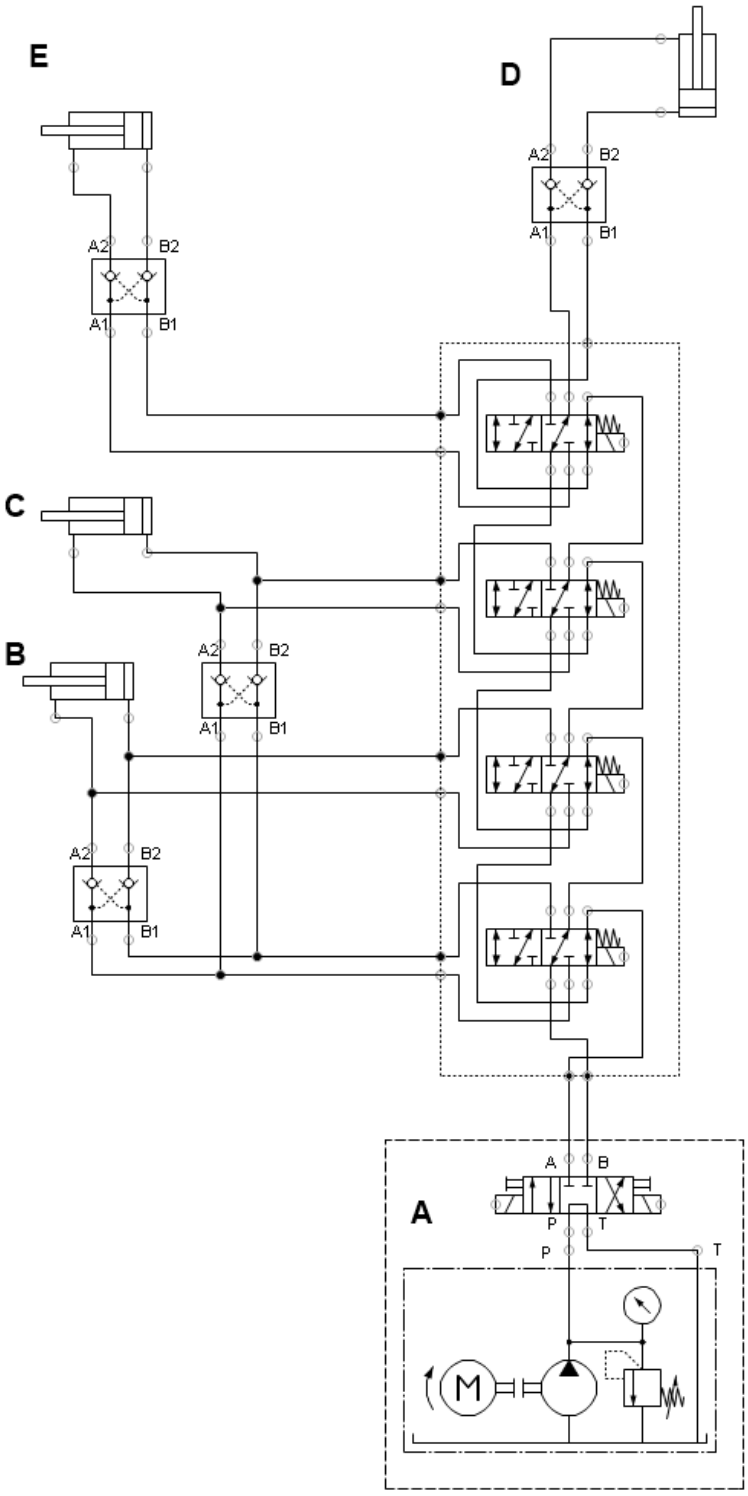


With a wireless controller

A. Base machine's control block 1
B. Base machine's control block 2
C. Pull shaft's lift cylinder
D. Floating frame's lift cylinder
E. Tire packer's hydraulic cylinder
F. Tire packer's tilting cylinder

Figure 2. Hydraulic chart for the 4-hose hydraulics

9.3. 2-hose hydraulics



With a wireless controller

A. Base machine's control block 1
B. Pull shaft's lift cylinder
C. Floating frame's lift cylinder
D. Tire packer's hydraulic cylinder
E. Tire packer's tilting cylinder

Figure 3. Hydraulic chart for the 2-hose hydraulics

10. 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.