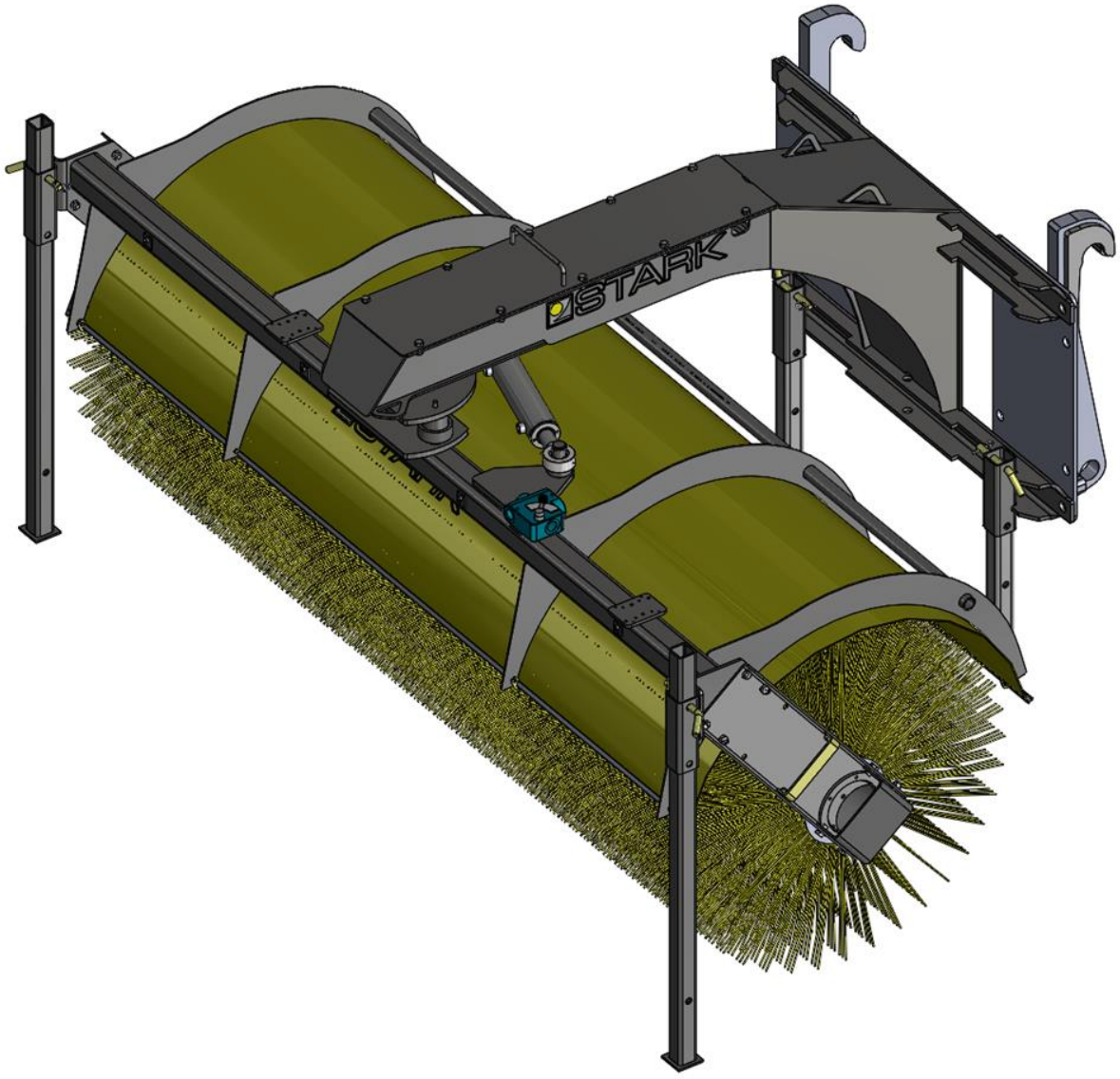
Original

Operating and maintenance manual

Rotary broom



Lametal Oy • Kaskenviertäjäntie 2, 73100 LAPINLAHTI, FINLAND
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General

Congratulations on the purchase of your STARK Rotary broom!

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



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: Rotary broom
Models: STARK AH 2000, AH 2500, AH 2500 S, AH 3000 S

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

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2. PURPOSE OF USE

The rotary brooms are intended for sweeping of streets, yards and areas small and large.

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! Rotating rollers!



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

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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 of time, clean it thoroughly after use and lubricate as instructed.

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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

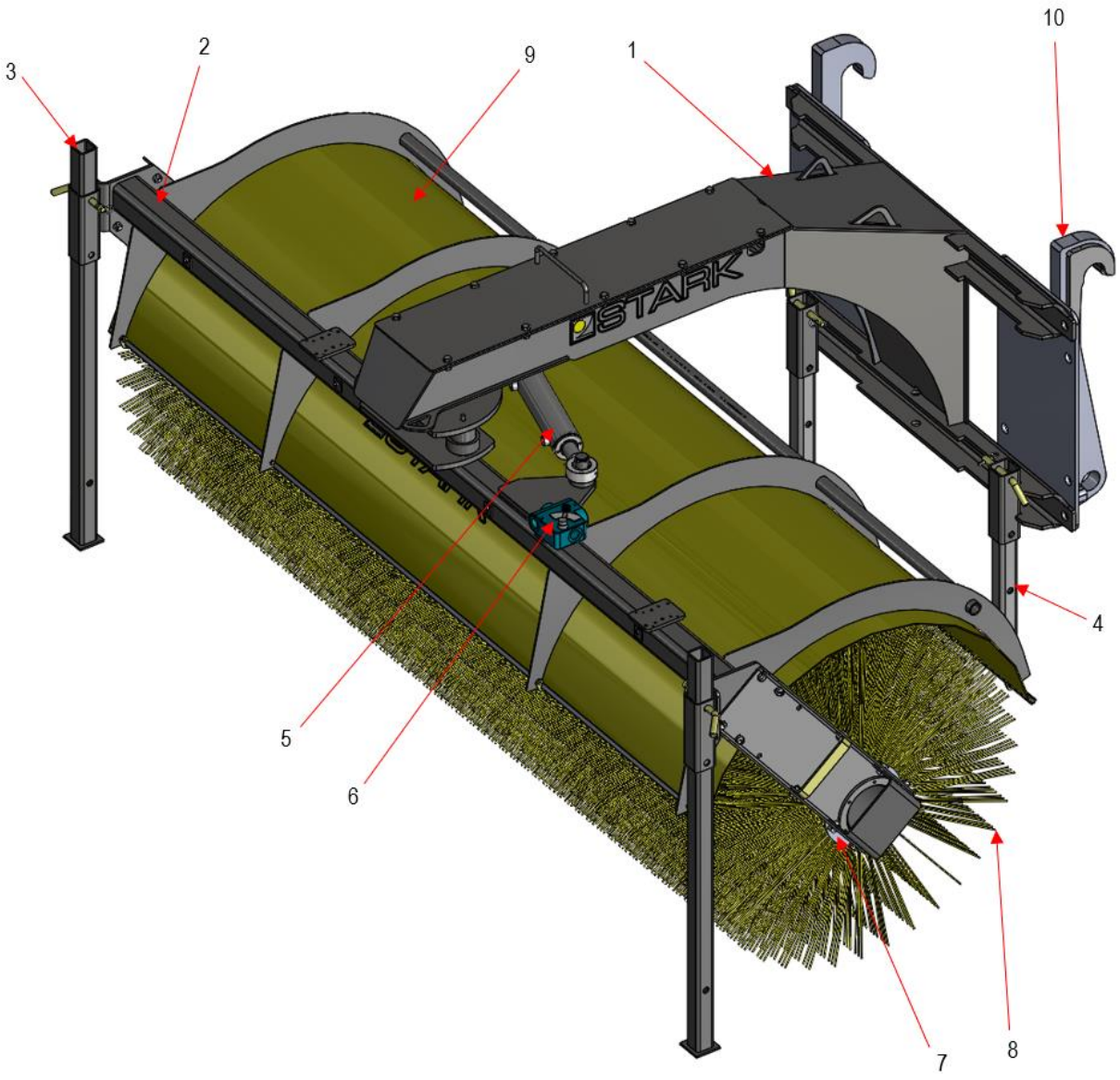
Take down the machine type and the serial number of your rotary broom:

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 rotary broom 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 rotary broom (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 (0)17 731 565, e-mail info@stark.fi
tel. +358 (0)44 758 6221, e-mail parts@stark.fi

5. MAIN PARTS OF THE ROTARY BROOM



Picture 1. Main parts of the device

1) Rotary broom's frame
2) Mudguard's frame
3) Front support leg
4) Back support leg
5) Hydraulic cylinder
6) Flow control valve
7) Broom beam
8) Brush ring
9) Mudguard
10) Bolt-on STARK FIT -fitting

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6. USING THE ROTARY BROOM

When attaching the rotary broom 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 collecting sweeper to a new base machine.

6.1. Attaching the broom to the base machine

The rotary broom is attached to the base machine by welded or bolted STARK FIT quick hitches. The machine is connected to a hydraulic system. Hydraulic circuit diagrams can be found in a later section in this manual. Ask your retailer for available STARK FIT quick hitches.

Before using the rotary broom, MAKE SURE all locking cotters are secured and intact.

When coupling rotary broom 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. Apply parking brake. The rotary broom is attached to the coupler on the base machine (e.g. a loader). Attach the rotary broom to the base machine, and make sure the locking cotters are secured.

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 needed space for hydraulic hoses and -attachments is adequate. Check that the brush roll rotates outwards from the. If not, switch hoses in the base machine.

6. During first hours of operating the attachment, bolts, nuts and connectors might loosen up. **Retighten them** after the first day of operating the attachment.

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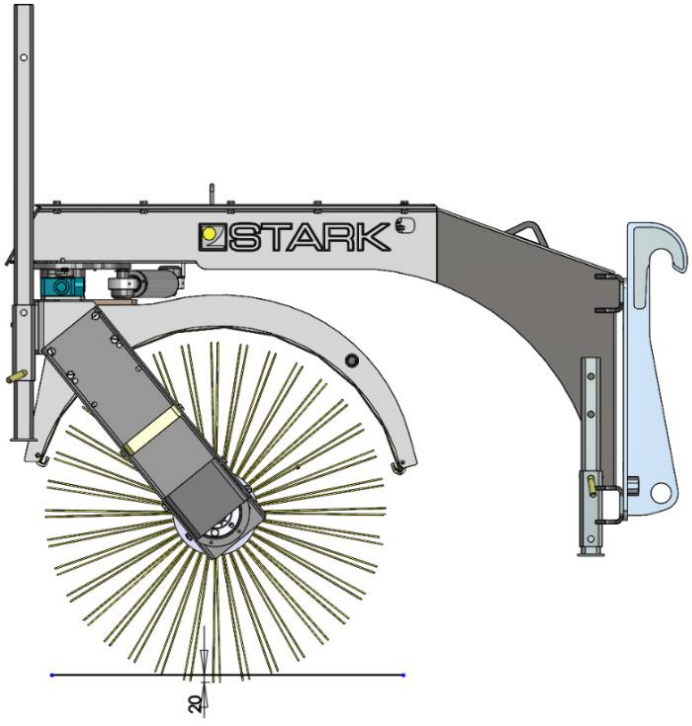
7. OPERATING THE ROTARY BROOM

Check following before using the rotary broom:

- Broom is installed properly to the base machine
- All locking cotters are in place
- Hydraulic hoses are attached properly
- Hoses are intact
- There are no oil leaks in attachment
- All functions are in order
- Learn the functions of the rotary broom in an enclosed area before actual usage.
- Observe all unusual activity and oil leaks when operating the rotary broom.

7.1. Using the rotary broom

1. Make sure that the attachment and the base machine are compatible in terms of mechanical solutions, hydraulics and electricity.
2. Apply parking brake. The rotary broom is attached to the coupler on the base machine (e.g. a loader). Attach the rotary broom to the base machine, and make sure the locking cotters are secured.
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 needed space for hydraulic hoses and -attachments is adequate. Check that the brush roll rotates outwards from the. If not, switch hoses in the base machine.
6. Lift rotary brooms front and back support legs. Lock them in upward position with locking cotters.
7. Keep the rotary broom in suitable distance from ground (picture 3). Brush ring should bend approx. 20mm. Do not press the broom too hard with a base machine. Brush rings wear down faster and **the attachment could be damaged!**
8. Stay alert for any abnormal behaviour and oil leaks also during driving.

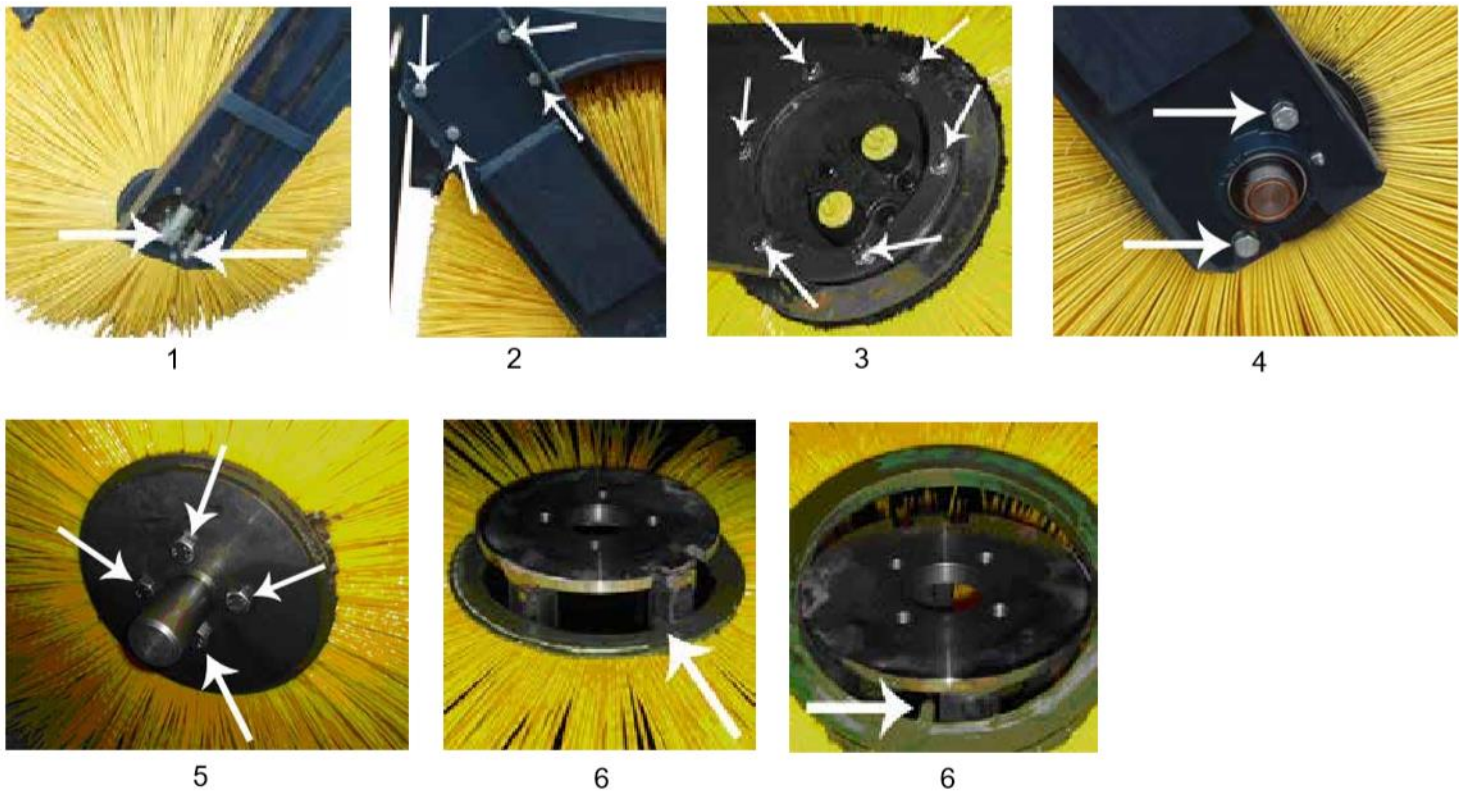


Picture 3. Brurshing height of the broom

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7.2. Changing the brush rings (S-model)

1. Detach the hydraulic hoses from the engine and protect them with plugs (picture 4).
2. Remove 8 bolts from broom beam and detach the beam
3. Remove the attachment bolts of the hydraulic engine.
4. Remove bearing unit's attachment bolts (2 pc) and hexbolt from bearing
5. Detach bearing flanges bolts which is under the bearing unit
6. Remove brush rings. Remember in which order they were in beam, because every other ring needs to be turned when inserting new ones.



Picture 4. Changing the brush rings

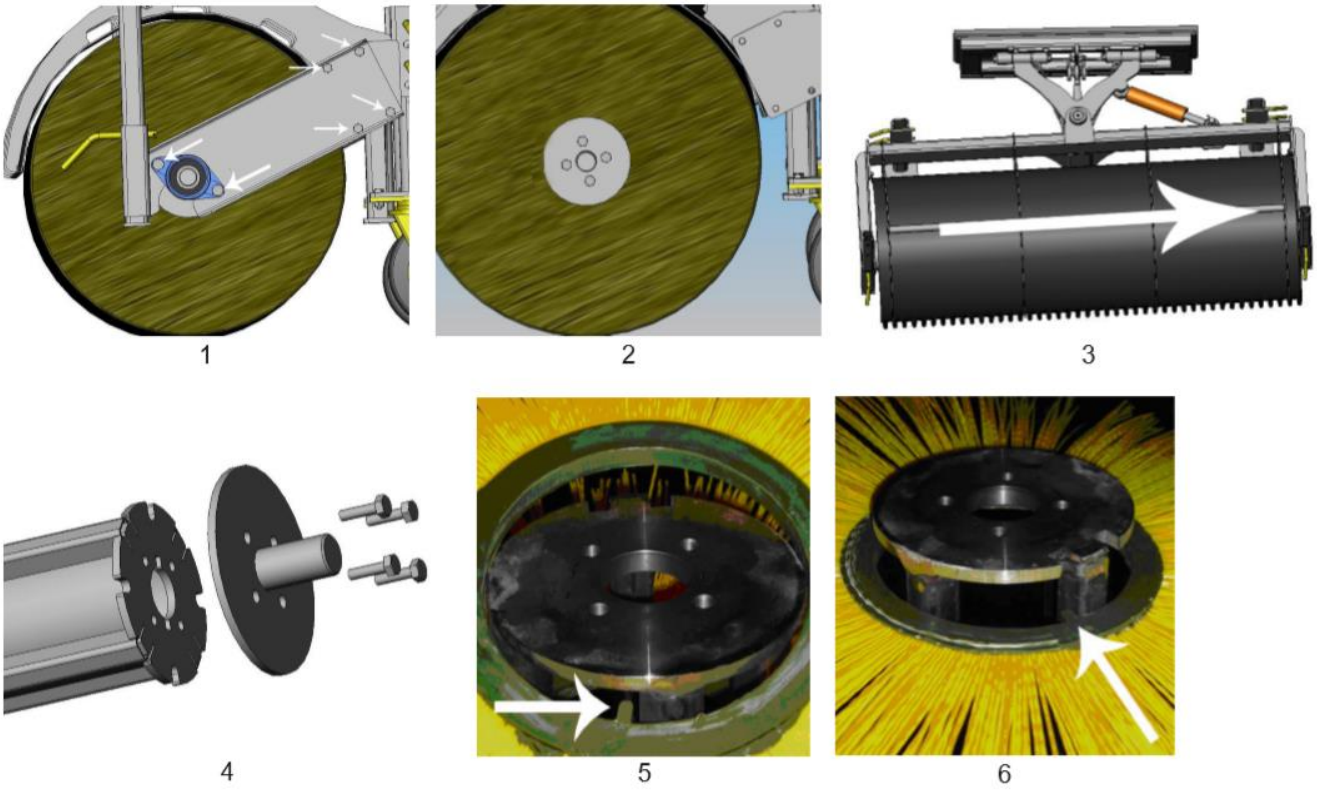
First six brush rings need to be inserted same way (unlike rest of them) since engine's case can only fit them one way.

After changing the brush rings assemble the brush beam in reverse order. Keep hydraulic connectors clean.
It is recommended that you add for example copper paste between bearing and brushes axle. It prevents the axle to be jammed in the bearing.

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7.3. Changing the brush rings

1. Remove four attachment bolts of the spindle from the bearing's side. (Picture 5)
2. Remove the bearing from the spindle.
3. Pull the broom off the chassis.
4. Remove the bearing flange under the bearing. It is attached with four bolts.
5. & 6. Take the brush rings off but remember to check how they are placed because every other brush ring is to be turned 180 degrees.



Picture 5. Changing the brush rings

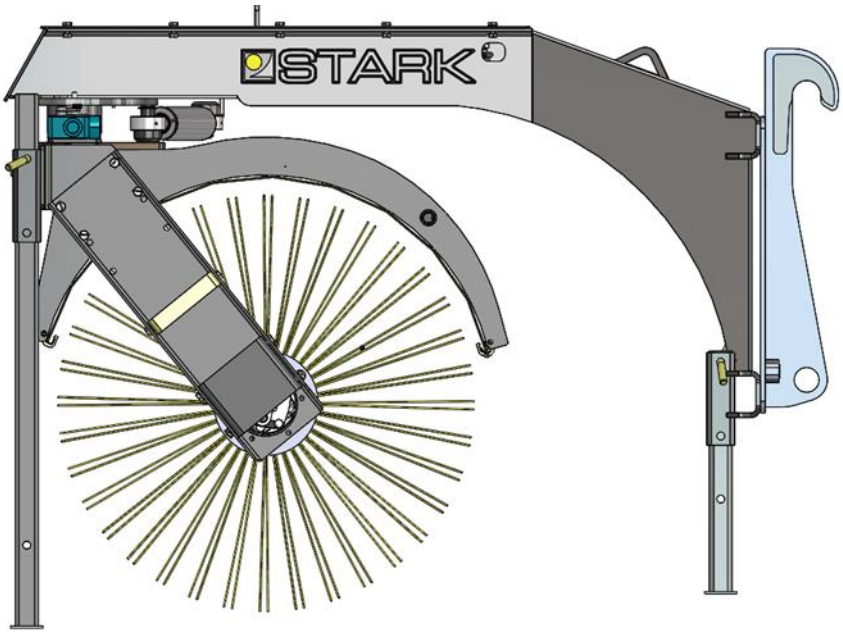
It is important to turn every other guided vane, because otherwise the broom will be uneven, and the quality of brooming suffers. The broom can also be damaged.

After changing the guided vanes, do the assembling in a reversed order. When you are putting the broom axle back in its place, make sure, that it goes all the way down. The easiest way to do this is to rotate the axle while you are pressing it to its place. Remember to keep the hydraulic connectors clean. It is recommended to put e.g. copper paste between the broom axle and the bearing to prevent the axle from jamming to the bearing.

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7.4. Detaching the rotary broom from the base machine

1. Lower the rotary broom down on an even surface on its support legs (picture 6).
2. Turn off the base machine, apply the parking brake and depressurize the system.
3. Detach the hydraulic hoses and protect hose ends with plugs.
4. Unlock the coupling mechanism and detach the device.
5. If the equipment is not likely to be used for a longer period of time, clean it thoroughly after operating and lubricate as instructed. Remove water from irrigation system's hoses. If possible, store the unit inside.



Picture 6. The rotary broom on its support legs

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7.5. Irrigation system

A watering system with 155 or 255 liter tank can be installed to the rotary broomer. The watering system reduces the amount of sand dust, improves the cleaning outcome, greases the brushes and decreases the wearing off of the sweeper. Water is sprayed to the area to be sweeped through the nozzles demonstrated on the pictures (picture 7). Detergents can be added to the water to intensify the controlling of the amount of sand dust. The tank can be opened and closed from the faucet behind the tank (picture 8). The faucet next to the pump (picture 9) can be used for, e.g., putting extra detergent back to its container.

If the watering system is not used in a long time, empty the tanks, either by spraying or opening the faucet circled in picture 9.

USING SALT WATER IS FORBIDDEN



Picture 7. Irrigation nozzles



Picture 8. Pump's faucet

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Picture 9. Faucet behind the tank

7.6. Accessories for rotary broom

- Piping for the low-pressure irrigation system
- Mechanical rotation for the broom
- Low-pressure irrigation system, 255 L, 12 V / 24 V (only for the S-models)
- Control valve for the broom's rotation 12 V / 24 V
- Change valve for the rotation's direction 12 V / 24 V

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8. MAINTENANCE OF THE ROTARY BROOM

8.1. General safety precautions for the use and maintenance

- Comply with existing laws and regulations and the instructions given in this manual.
- Never go under an unsecured device.
- Always apply the parking brake of the base machine before performing any actions on the device.
- Only use tools that are in proper working order.
- Be careful with the pressurized hydraulic hoses and components.
- Make sure there is no pressure in the hydraulic system. Take into account the pressure accumulator.
- Make sure hydraulic fluids or greases do not leak to the ground.
- Use all necessary personal protectors.

8.2. Tightening torque

	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 torque

8.3. Daily maintenance

In order to prevent further damages, it is important to inspect the device visually for possible defects. Inspect at least the following daily:

- hydraulic hoses and components for possible leaks
- general mechanical functioning

8.4. Maintenance after first 10 hours of operation

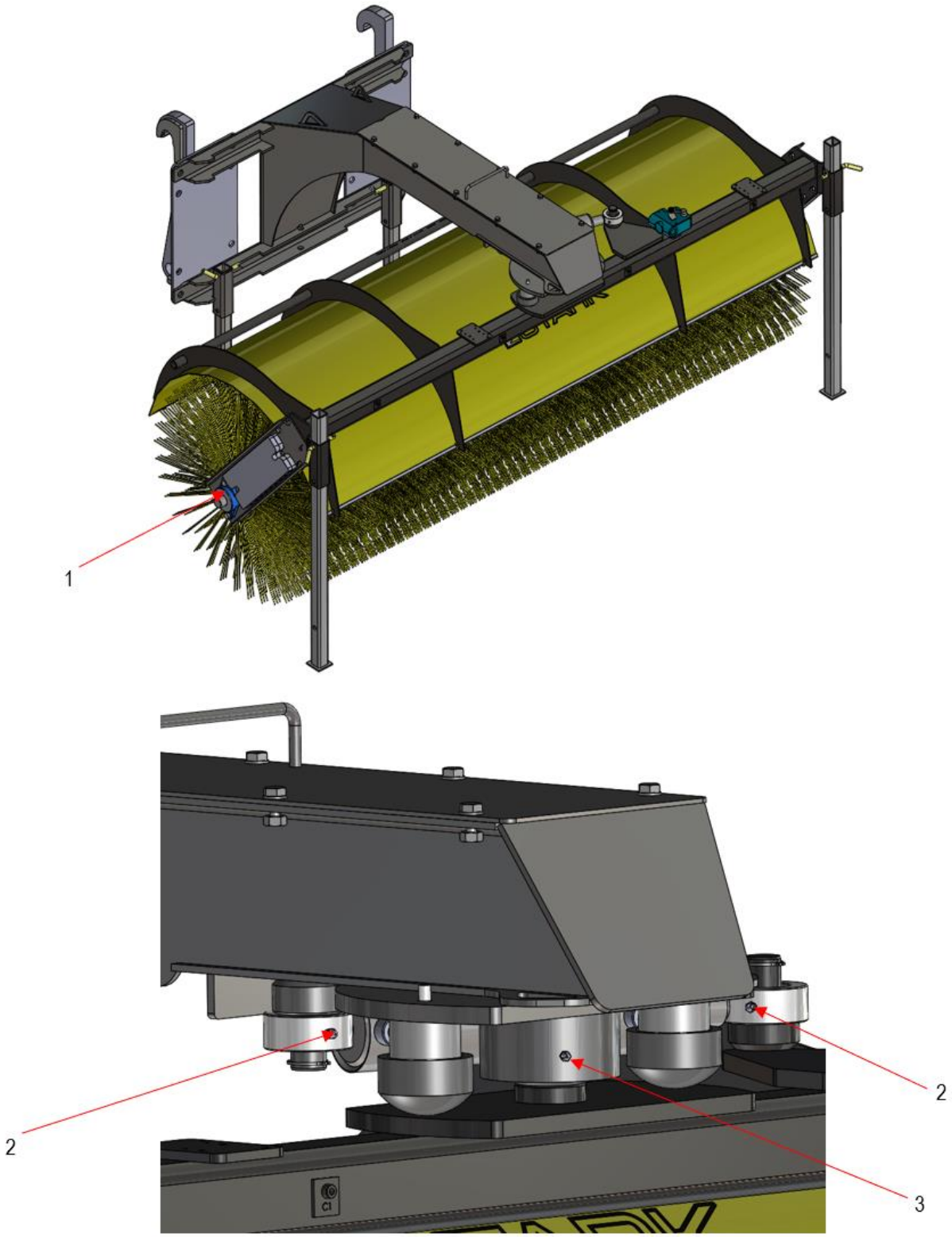
- Lubricate, preferably with a NLGI-2 grease or equivalent (see instructions in later section)
- Check all bolts and nuts for tightness (table 1)

8.5. Maintenance at 50-working hour intervals or on a weekly basis

- Lubricate, preferably with a NLGI-2 grease or equivalent (see instructions in later section)
- Check the mechanical condition of the device for bends, distortions or breaches
- Check fastening bolts for tightness (table 1)

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8.6. Lubrication points



Picture 10. Lubrication points

1) Grease nipple for the bearing unit
2) Grease nipples for hydraulic cylinder
3) Grease nipple for frame's bearing

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9. HYDRAULICS

The rotary broom can be connected in two different ways, either with two (figure 1) or four (figure 2) hoses. When connecting with two hoses, the hydraulics of the basic machine is connected to quick connectors and a separate switch is used to choose whether the broom is rotated or turned. When connecting with four hoses, a rotation cylinder and the rolling of the engine are connected separately to the hydraulics of the basic machine. This means that the lifting and rotating of the broom can be done with the hydraulics of the basic machine, and no separate control valve is needed.

The rotation speed of the broom is adjusted with the valve shown on figure 1. The suitable position is usually found between 5 and 8. If there is a flow controller in the basic machine, the speed control valve can be set to position 10. The shock absorber cylinder, which is inside the chassis, must be air-free if it needs to be released, so the cylinder must be moved to its maximum positions when it is attached to the system. If there is air left in the cylinder, the shock absorption does not work, and the broom starts to “jump”. Also, a too slow a rotation speed of the broom causes the broom to “jump”

The rotary broom is equipped with a complex closed hydraulic system, which has been tested and adjusted by the manufacturer. Any repairs to the system are to be performed by replacing one component at a time by a professional in hydraulics. Any alterations or modifications to the hydraulic system are on the sole responsibility of the client.

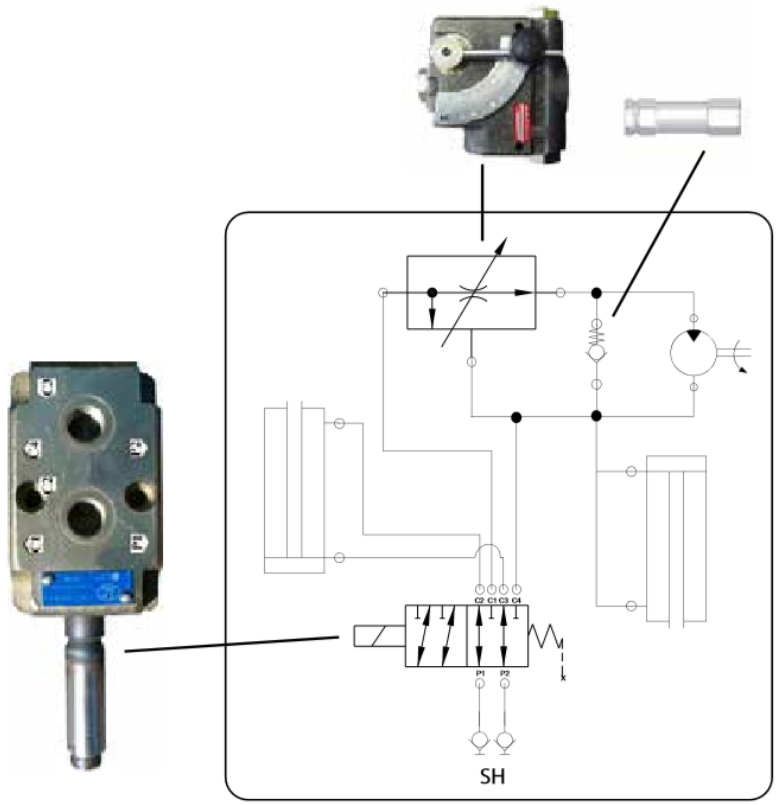


Figure 1. 2-hose hydraulics

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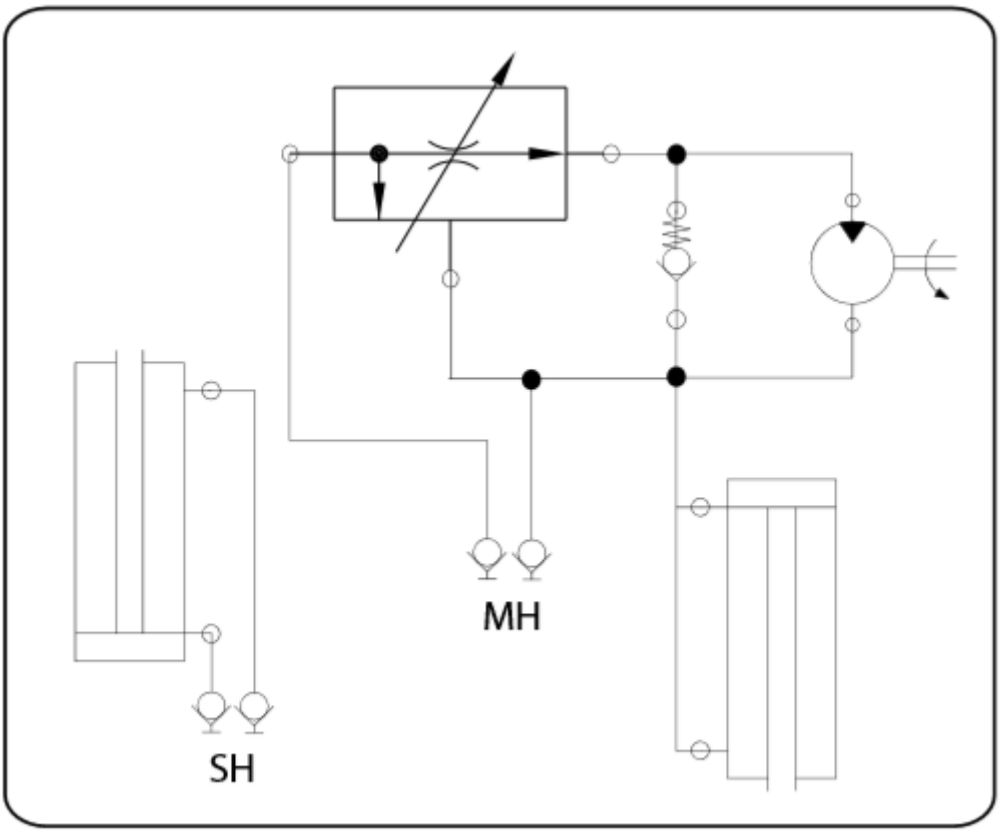


Figure 2. 4-hose hydraulics

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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.

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