MANURE SPREADER

“VIKING”

N272/3, N272/6

INSTRUCTIONS MANUAL – PART II

TRANSLATION OF THE ORIGINAL OPERATING INSTRUCTIONS

REV. III

APRIL 2022

Instruction Manual no. N272/3_6-03-167/2013

Table of Contents

PART I

PART II

Safety symbols used in the Manual:

DANGER

A hazard warning symbol: indicates a severe hazard that, if not avoided, may result in death or serious injury. This symbol warns of extremely dangerous situations.

CAUTION

This symbol indicates very important information and instructions. Non-compliance can lead to serious damage to the machine, resulting from its incorrect operation.

WARNING

This symbol indicates potential hazards that, if not avoided, can result in death or serious injury. This symbol indicates a lower level of risk of injury than the DANGER symbol.

This symbol indicates useful information.

This symbol indicates maintenance activities that should be performed periodically.

4. Instructions for Use

4.1 Preparing the machine for operation

4.1.1 Checking the Spreader after Delivery

The Spreader is delivered to the User as completely assembled and does not require any additional assembly. However, this does not exempt the User from the obligation to check the machine before purchasing and commissioning it.

Before coupling the Spreader, make sure that the tractor is suitable for this purpose. The Spreader can only be coupled with a tractor that meets the requirements listed in Table 1 in the first part of the manual.

CAUTION

CAUTION!

Before coupling and putting the Spreader in operation for the first time, it is mandatory to become familiar with the design of the Spreader, and the layout of its individual components, as well as to read and follow the contents of this Instruction Manual and the PTO shaft Instruction Manual supplied with the machine.

The Spreader can only be coupled with a farming tractor that features a hitch suitable for connecting to single-axle trailers, and suitable connection sockets for the braking, hydraulic and electrical systems.

The oil in the tractor's external hydraulic system must be compatible or miscible with the spreader oil.

Before connecting the machine to the tractor, the operator must check the technical condition of the spreader and prepare it for the start-up. To this end, verify the following:

- the completeness of the machine;
- the condition of the paint coating and mechanical damage to individual components;
- the technical condition of the protective guards and the correctness of their assembly;
- the technical condition of the hydraulic and pneumatic lines;
- the technical condition of the PTO shafts and their guards;
- the hydraulic system and gears for leaks.

4.1.2 Preparing the spreader for the first start-up

Before starting for the first time, check the following:

- lubricating points and, if necessary, lubricate the components;
- the correct tightening of screwed connections (road wheels, drawbar, components of the spreading adapter);
- the oil level in the gears of adapter and the floor conveyor;
- the tensioning of the floor conveyor's chains;
- whether the speed of the tractor's PTO shaft matches the required rotational speed of the Spreader drive.

- make sure that the PTO shaft transmitting the tractor's drive is of sufficient length when connected in all possible positions of the tractor in relation to the machine (Figure 16).

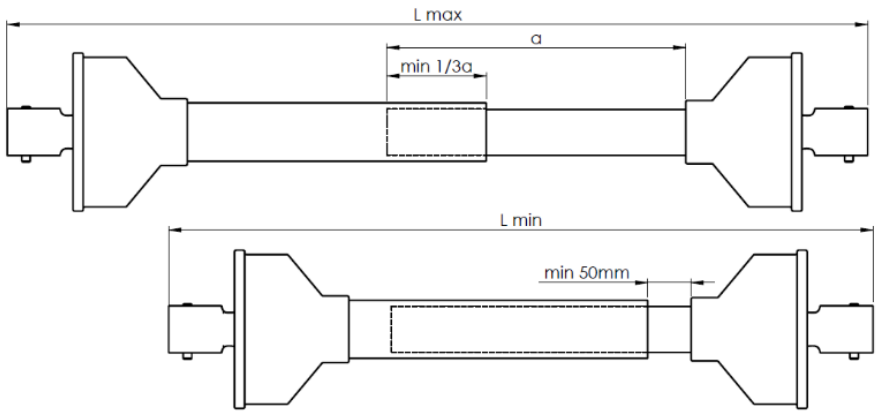


Figure 16. Adjusting the length of the shaft when the spreader is connected to the tractor

CAUTION

CAUTION!

Under normal operating conditions, the tubular profiles of the PTO shaft should work overlapped by 1/2 of the shaft's length, and by 1/3 of the shaft's length, under extreme operating conditions.

Observe the instructions of the shaft Manufacturer, when fitting the PTO shaft.

If fitted incorrectly, the PTO shaft transmitting power from the tractor can be damaged or destroyed, when driving on an uneven terrain and when cornering.

The PTO shaft can only be adapted to the one type of the tractor that works with the Spreader. If the machine is coupled with a different tractor, re-check the correctness of coupling the PTO shaft.

4.1.3 Changing the Position of the Hitch

The pre-assembled Spreader is designed to be coupled only with the lower hitch of the tractor. The hitch (2) features the function of changing the height of the drawbar eye (1) in relation to the ground - see Figure 17. This is done by hydraulic cylinders (3), which also act as drawbar shock absorbers. Additional adjustment range can be achieved by changing the position of the actuator from mounting hole (A) to (B). To adjust the drawbar eye to the correct height in relation to the ground and the tractor hitch, extend or retract the hydraulic cylinders (3) via the tractor's external hydraulics. The drawbar is set at the right height by levelling the Spreader, which ensures an even distribution of the Spreader's weight on the axles. After coupling the spreader, make sure that it is properly levelled, both with and without load. Also check that the piston rods of the drawbar suspension cylinders can operate at a minimum distance of 30-50 mm. Maintaining this distance ensures the proper function of the drawbar shock absorber. If the piston rods are retracted as far as possible (drawbar eye in the topmost

position), the drawbar suspension will not work – this is not permissible. The hydraulic valve (Figure 17) at the right-hand drawbar shock-absorber cylinder is used to block the oil supply when connecting and disconnecting the hitch (drawbar shock-absorber) hydraulic lines.

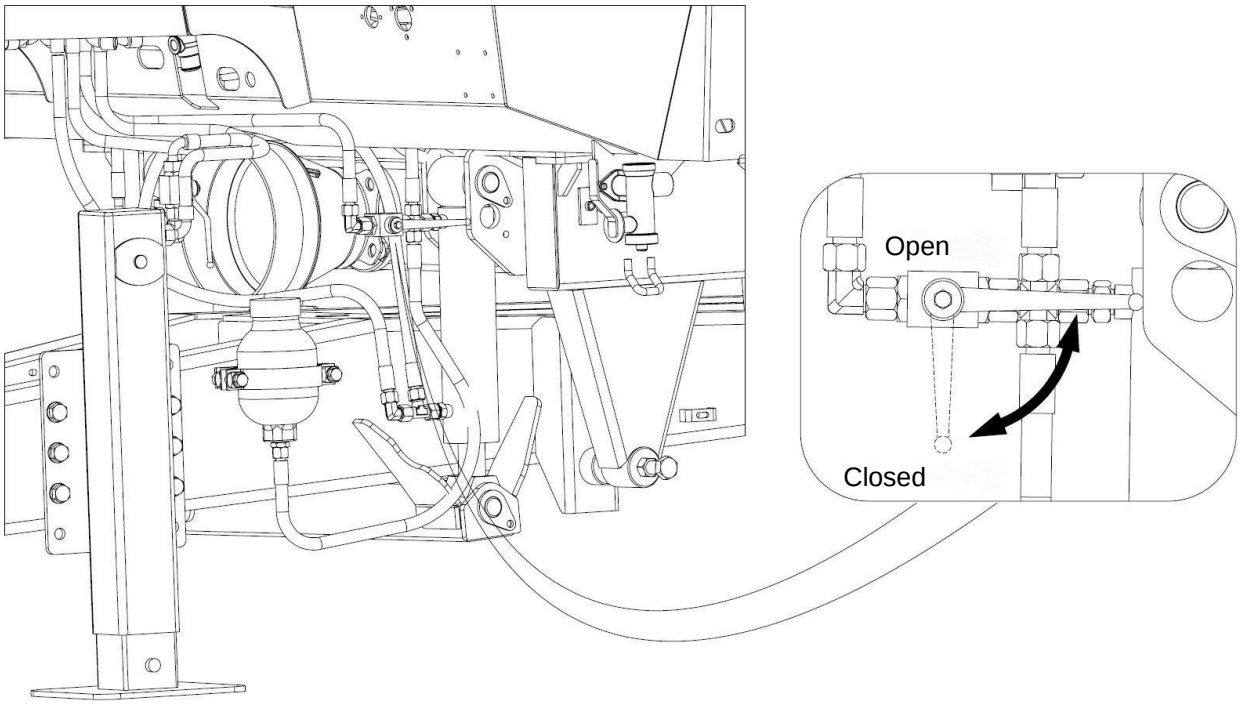


Figure 17. Hydraulic valve for controlling (shutting off) the drawbar shock absorber

See Table 10 for the estimated height ranges between the drawbar eye and the ground.

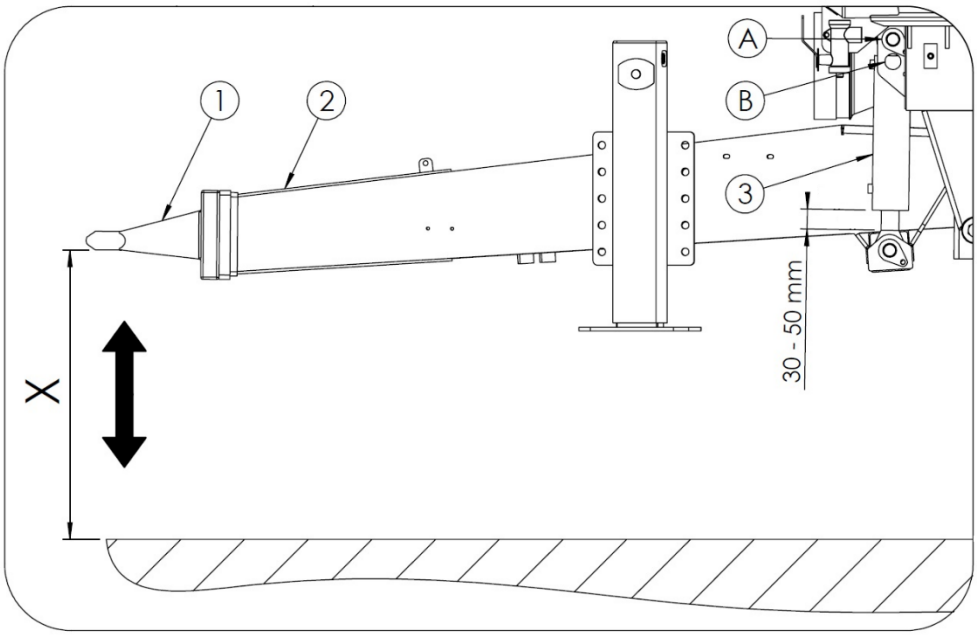


Figure 18. Position of the drawbar in relation to the ground

Table 10. Usable height range of the drawbar eye in relation to the ground

Cylinder fixing hole / Wheel sizes	A	B	A	B
	Spreader N272/3 (14 t)		Spreader N272/6 (18 t)	
	Usable height range of the drawbar eye in relation to the ground			
	X [mm]			
550/60-22.5”	280 - 680	280 - 545	335 - 735	325 - 590
600/55-22.5”	300 - 700	280 - 565	355 - 755	325 - 610
650/55R26,5”	---	---	390 – 790	390 - 655

4.1.4 Commissioning

If the preparatory work has been completed and the spreader is in good working order, couple it with the tractor. After starting the tractor, check the function of the individual systems when parked and without load. Follow the sequence of actions discussed below to start the machine for the first time:

1) Couple the Spreader with a compatible tractor hitch.
2) Connect the power take-off shaft and secure it correctly.
3) Connect the braking, hydraulic and electrical lines.
4) Lift the support foot.
5) Check the proper operation of the lighting system.
6) Release the parking brake of the Spreader.
7) Start the tractor.
8) Check the operation of the main brake, as soon as starting to drive.
9) Check the operation of the floor conveyor:
   - Set the feed rate in the range from “3” to “10” on the flow controller mounted on the right-hand panel of the hopper,
   - use the appropriate distributor lever of the tractor to start the floor conveyor,
   - use the holes in the front guard to observe the movement of the conveyor bars, making sure that its direction of movement is correct; the conveyor’s direction of movement can be changed by changing the position of the distributor lever in the tractor.
10) check the proper operation of the beater unit shields
   - open and close the beater unit shields using a corresponding tractor valve block lever
11) Start the PTO shaft drive at low engine speed (start the drive of the adapter rotors).
12) Allow the adapter to run at low engine speed for a few minutes and check, whether:
   - there in no knocking sound or any other disturbing sounds coming from the drive system and the adapter,
   - the adapter rotors rotate smoothly without jamming.
13) Switch off the PTO shaft drive and the tractor engine, and uncouple the Spreader from the tractor.

CAUTION

CAUTION!

The PTO shaft speeds must correspond to those specified in Table 3.

If all preparatory work has been completed successfully, the Spreader can be approved for operation. If any malfunction or faults of individual systems are found during the initial start-up, report them to the point of sale or directly to the Manufacturer, to have the problem solved or to carry out repairs.

CAUTION

CAUTION!

Failure to follow the recommendations in the Instruction Manual or starting up the machine incorrectly can result in damage.

Ensure that there are no reservations as to the technical condition of the spreader before it is put into operation.

4.2 Coupling and decoupling the spreader

The machine may only be coupled with a farming tractor that is in good working order, fitted with all the necessary connections (braking, pneumatic, hydraulic and electric) and a tractor hitch according to the requirements of the spreader manufacturer.

Before coupling the spreader to the tractor, use the parking brake to make sure that the spreader will not move.

CAUTION

CAUTION!

Before coupling the machine, check the technical condition of the tractor and spreader hitch as well as the connection parts of the braking, hydraulic and electrical systems.

CAUTION

CAUTION!

Use particular caution when coupling the spreader.

The hydraulic oil in the tractor and spreader must be miscible.

After coupling the spreader to the tractor, secure the braking, hydraulic and electrical lines in such a way that they cannot be broken, worn, bent, crushed or accidentally disconnected while driving.

For travel and operation, raise the support foot to its uppermost position, and close the hydraulic valve retaining the foot.

Coupling the Spreader

To couple the spreader, follow the procedure below

1) Use the parking brake to immobilise the Spreader and put the protective chocks under the wheels.
2) Align the position of the tractor straight in front of the Spreader's hitch.
3) Set the drawbar eye to the height that allows for coupling of the machine:
   - connect the hydraulic lines of the support leg to the hydraulic sockets of the tractor's external hydraulic system
   - open the locking valve of the hydraulic support leg (located close to the leg)
   - use the distributor lever in the tractor to raise or lower the drawbar eye to a height that makes it possible to connect it to the tractor's hitch.

DANGER

DANGER!

Bystanders are not allowed to stand between the spreader and the tractor during the coupling procedure.

When coupling the machine, the operator of the tractor should exercise particular caution and make sure that no unauthorized persons are in the danger zone. When connecting the hydraulic lines, make sure that the hydraulic systems of the tractor and spreader are not pressurized.

4) reverse the tractor and couple the Spreader to the tractor's hitch. Check the securing pin of the coupling preventing the machine against accidental disconnecting:
   - if the tractor is fitted with an automatic hitch, make sure that the coupling is completed and the drawbar eye is secured.
5) Use the valve block lever on the tractor to lift the support leg to its uppermost position.
6) Activate the parking brake in the tractor, switch off the tractor's engine, remove the key from the ignition switch, and secure the tractor against unauthorised access.
7) Close the parking jack locking valve (Figure 19). If the tractor has too few hydraulic sockets for connection of other hydraulic systems, the hydraulic lines of the support leg can be disconnected for travel and operation. When disconnecting the hydraulic lines, make sure that the pressure in the lines is reduced.

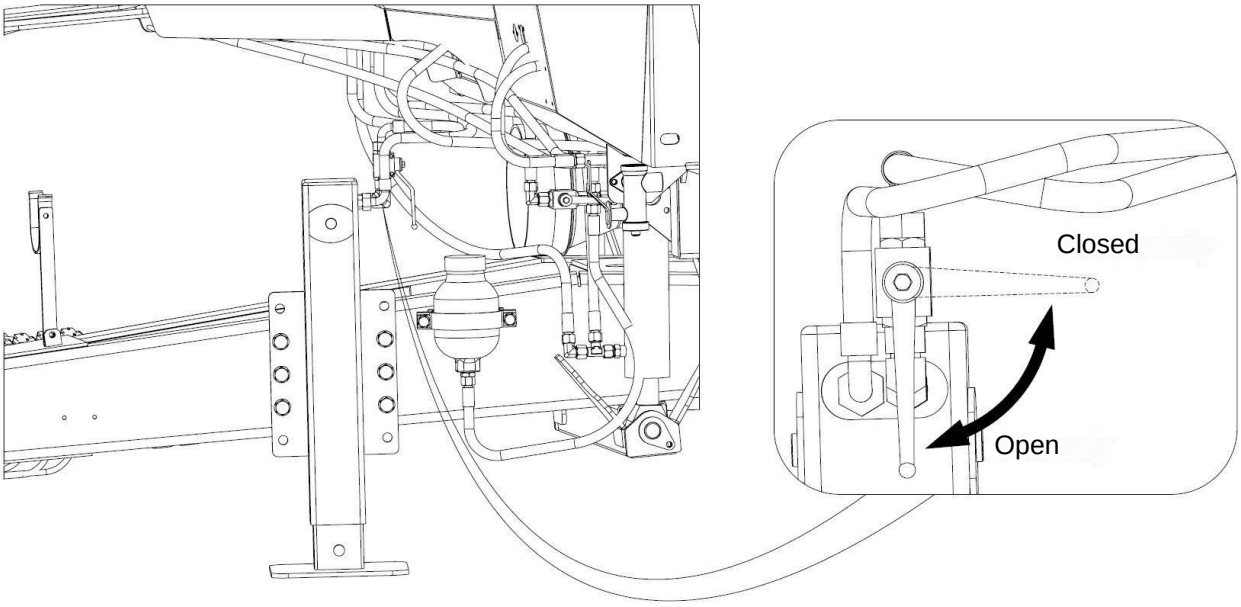


Figure 19. Hydraulic valve to control (shut off) the hydraulic parking jack

8) Connect the lines of the 2-line pneumatic braking system; connect the yellow pneumatic line to the yellow pneumatic socket in the tractor, and the red pneumatic line to the red pneumatic socket in the tractor:
   - if the Spreader is fitted with hydraulic brakes, connect the hydraulic line of the Spreader's brakes to the plug of the hydraulic braking system in the tractor. Then, connect the activating chain of the emergency braking valve to the permanent element on the tractor;
   - if the spreader is equipped with hydraulic-pneumatic brakes, connect the pneumatic or hydraulic braking system depending on which machine brake control system the tractor is equipped with
9) Connect the hydraulic lines of the driving system of the floor conveyor.
10) Connect the hydraulic lines of the slide gate system.
11) Connect the drawbar shock absorber hydraulic lines and open the drawbar hydraulic circuit lock valve.
12) Connect the hydraulic lines of the side extensions.
13) Install the PTO shaft and secure the guards against rotating.
14) Release the parking brake of the Spreader.
15) Level the spreader to the ground using the drawbar shock absorbing hydraulic circuit.

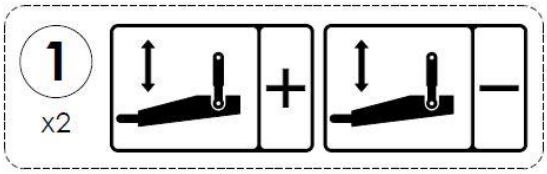
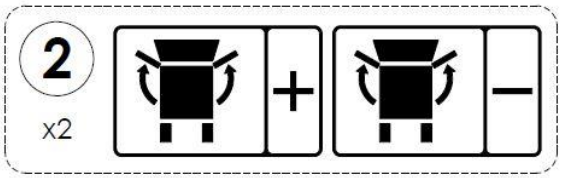
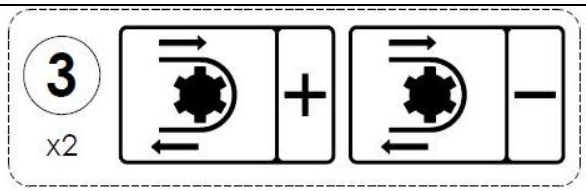
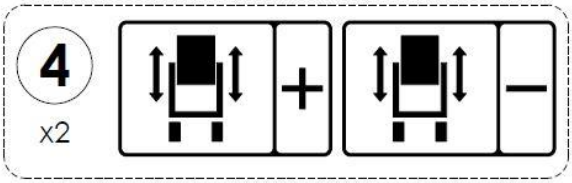
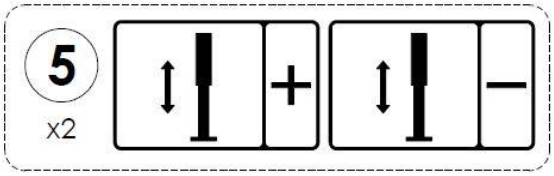
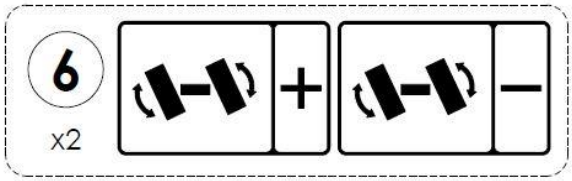
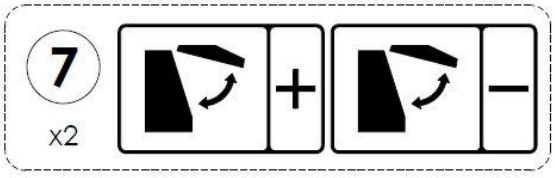
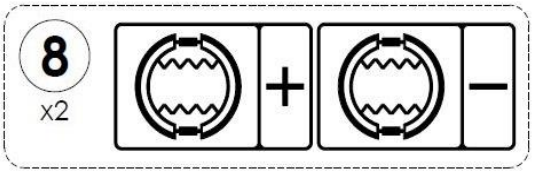
Figure 20. Marking of the hydraulic lines

Figure 21. Pictograms on the hydraulic connectors for easier connection to the tractor

Figure 22. Pictograms for the control levers of the distributor (distributor control is optional)

The pictograms on the distributor control levers are explained below (Table 11).

Table 11. Marking of the distributor control lever pictograms.

No.	Pictograms	Marking
1.		Hydraulic drawbar control
2.		Control of hydraulic extensions
3.		Floor conveyor control
4.		Slide gate control
5.		Hydraulic parking jack control
6.		Steering axle control
7.		Rear tailgate control
8.		Hydraulic brake control

Uncoupling the Spreader

To uncouple the spreader, follow the procedure below

1) Use the tractor's valve block lever to extend the support leg so that the drawbar eye is in a suitable position to safely uncouple the tractor.
2) Activate the parking brake in the tractor, switch off the tractor's engine, remove the key from the ignition switch, and secure the tractor against unauthorised access.
3) Close the locking valve of the hydraulic support leg (located close to the leg)
4) Close the locking valve on the drawbar shock absorber hydraulic circuit (located at the right drawbar shock absorber cylinder).
5) Release pressure in each of the hydraulic systems in the tractor.
6) Uncouple the hydraulic hoses of the systems for the hydraulic parking jack, drawbar shock absorber, floor conveyor, the gate and side extensions, then put covers over them and hang the plugs in the holder.
7) Disconnect the lines of the braking system.
8) Disassemble the power takeoff shaft and secure it correctly
9) Stop the Spreader using the parking brake and place chocks under the wheels.
10) Uncouple the Spreader's hitch from the tractor hitch and move the tractor away.

CAUTION

CAUTION!

Use particular caution when uncoupling the spreader from the tractor.

Uncoupling the loaded machine from the tractor or leaving the loaded spreader parked and supported on the support leg is not allowed.

Dismantling the support leg and supporting the machine on provisional stands is not allowed.

4.3 Loading the load body

Before loading, drive and park the correctly coupled tractor and Spreader on a stable, level ground. Park both machines in a straight-ahead position and secure them both with the parking brake.

Before loading, make sure that there are no persons, objects (stones, pieces of wood, etc.) inside the spreader body, that the body gate is fully lowered and that the floor conveyor is not damaged.

CAUTION

CAUTION!

For transport and operation of the laden spreader, the front axle load of the tractor must be at least 20% of the tractor weight.

Use suitable loaders, front end loaders or conveyors for loading. Start manure loading at the rear of the spreader body and keep loading in layers. During the loading, empty the bucket smoothly from the lowest possible height. Do not try compacting the manure.

The spreader is equipped with hydraulically opened sheet metal extensions. To increase the loading height, it is possible to open the left and right extension or each separately. To open the right extension, close the valve located at the left extension (Figure 23). However, in order to open the left extension, the valve located at the right extension must be closed. When driving the spreader on public roads and during operation, close or open the extensions completely and, in addition to that, set both hydraulic valves to the "closed" position.

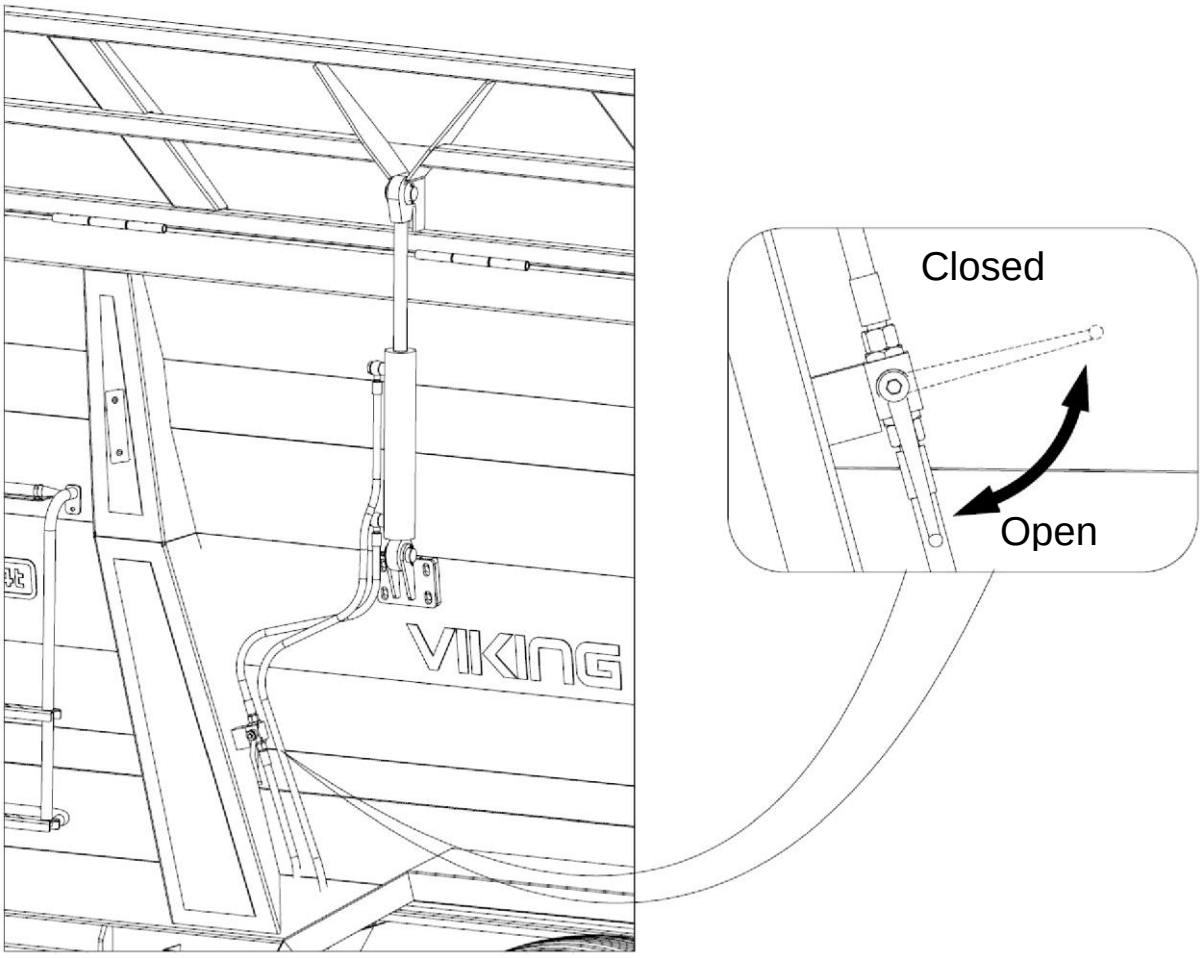


Figure 23. Hydraulic valves that control (shut off) the hydraulic extensions on both sides of the load body

Ensure even distribution of the load to achieve optimum spreading conditions. Due to the differences in the density of the spreading material, using the entire hopper capacity can result in exceeding of the permissible design load bearing capacity of the Spreader. Therefore both the design and (gross) permissible vehicle weights must be observed. See Table 12 for the estimated densities of selected materials.

Table 12. The estimated densities of selected materials

Type of Material	**Density [kg/m^3]**
Fermented manure	700-800
Composted manure	800-950
Fresh manure	700-750
Compost	950-1100
Peat	330-650
Agricultural lime	1250-1300

Regardless of the type of material carried, the user is obliged to secure it in such a way that it cannot move freely and pollute the road. If this condition cannot be met, carrying such materials is prohibited.

CAUTION

CAUTION!

It is forbidden to exceed the gross weight.

An unevenly distributed load causes uneven spreading of the material in the field.

4.3.1 Loading and spreading of lime

It is allowed to spread loose agricultural lime and its derivatives. Failure to observe the following guidance can result in damage to the Spreader.

The general recommendations for spreading agricultural lime:

1) The maximum weight of loaded lime must not exceed: 6.5 t for the N277/3 spreaders i.e: 1/3 of the height of the load body (0.45 m from the body floor) 8.5 t for the N277/6 spreaders i.e: 1/2 of the height of the load body (0.65 m from the body floor)
2) Spread lime immediately after loading, as it can set permanently on the floor of the Spreader after a long period of time, which could stop the movement of chains and bars.
3) Prevent any contact of the lime loaded spreader with moisture, while switching the floor conveyor drive on during any precipitation is not allowed (unload manually if water gets inside the lime loaded spreader)
4) Due to its compaction properties, lime can accumulate in chain links and sprockets. Therefore, regularly inspect the technical condition of all components of the floor conveyor (preferably, after each pass).
5) Thoroughly clean the chains, feeder bars, and sprockets, after each spreading of lime (it is recommended to use a pressure washer with clean water or appropriate agents). Washing and drying must be carried out at temperatures above zero.
6) Degrease all greasy or oily surfaces with extraction naphtha or degreasing agents, and then wash them with clean water mixed with a detergent.

Manure Spreaders are not typically designed for spreading lime and its derivatives. When spreading lime with Spreaders, it is not possible to achieve the optimum spreading parameters, when compared to lime spreading using machines specifically designed for that purpose.

CAUTION

CAUTION!

Strictly adhere to the recommendations provided for lime spreading.

Failure to adhere to the rules for lime spreading with the spreader can result in damage to the machine.

When spreading lime or derived fertilisers, use suitable protective clothing and PPE, and observe the general regulations for fertiliser application.

4.4 Fertiliser application rate control and manure spreading

4.4.1 Adjusting the fertiliser application rate

Dosage of the material spread over a certain area of the field depends on the following factors:

1) The speed of the floor conveyor.
2) The driving speed.
3) The loading height of the hopper.
4) The effective spreading width, depending on the type of spreading material.

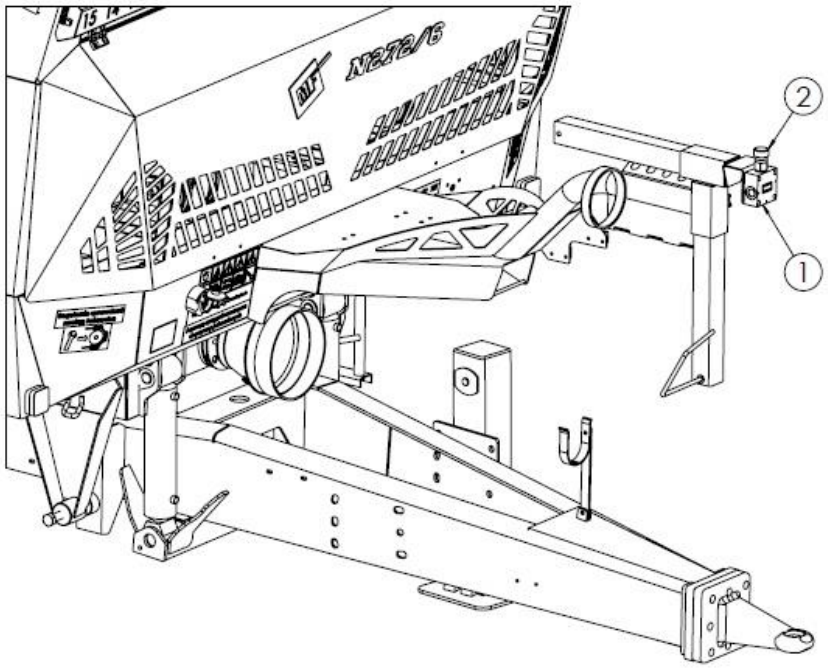


Figure 24. Adjusting the travel speed of the floor conveyor:
1 - oil flow regulator, 2 - regulator knob

Select the feeding speed of the floor conveyor by trial and adjust it with a knob on the flow controller, on the right wall of the spreader body.

Adjusting the travel speed of the floor conveyor:

- the adjustment range is dependent on the capacity of the tractor pump.

- reducing the travel speed of the floor conveyor – turn the knob of the controller clockwise, towards “0”.
- To increase the speed of the floor conveyor: turn the knob of the controller anticlockwise towards “10”.
- for most tractors, the adjustment works between 1 and 7.

A low driving speed and a high speed of feeding the load result in high doses of fertiliser.

A high driving speed and a low speed of feeding the load result in low doses of fertiliser.

Table 13. Manure application rate (with density of 950 kg/m^3) depending on the feeding speed of the floor conveyor and the actual work speed of the 2-auger vertical beater unit

Setting No.	Conveyor Capacity [kg/s]	The Working Speed of the Spreader [km/h]						
		4	5	6	7	8	9	10
		Dose of manure [t/ha]						
2	5.5	10.7	8.6	7.2	6.2	5.4	4.8	4.2
3	9.6	17.4	13.8	11.6	9.6	8.6	7.2	6.5
4	21.4	24.1	19.3	16	13.8	12	10.7	9.6
5	38.4	43.2	34.6	28.7	24.6	21.6	19.3	17.2
6	57.3	64.5	51.6	43	36.8	32.3	28.7	25.8
7	74.8	84.2	67.3	56.1	48	42.1	37.4	33.7
8	96.5	108.6	86.9	72.5	62	54.3	48.3	43.5
9	114.7	129	103.3	86	73.7	64.5	57.3	51.6
10	148.1	167.2	133.7	111.4	95.5	83.5	74.4	66.8

Table 14. Manure application rate (with density of 950 kg/m^3) depending on the feeding speed of the floor conveyor and the actual work speed of the 2-auger vertical disc beater unit

Setting No.	Conveyor Capacity [kg/s]	The Working Speed of the Spreader [km/h]						
		4	5	6	4	8	9	4
		Dose of manure [t/ha]						
3	7.2	8.2	6.5	5.4	4.7	4.1	3.7	3.2
4	16.2	18.3	14.6	12.2	10.3	9.1	8.2	7.3
5	29.1	32.8	26.2	21.8	18.7	16.4	14.6	13.1
6	43.5	48.9	39.2	32.6	27.9	24.5	21.8	19.5
7	56.8	63.9	51.1	42.6	36.5	32.0	28.4	25.6
8	73.3	82.4	65.9	55.0	47.1	41.1	36.6	33.0
9	87.0	97.9	78.4	65.3	55.9	49.0	43.5	39.2
10	112.3	126.9	101.5	84.6	72.5	63.4	56.4	50.7

4.4.2 Spreading of manure

Before starting to spread manure, recheck the condition of the hydraulic connections and safety guards.

DANGER

DANGER!

Operating the spreader with safety guards removed or damaged telescopic articulated shaft poses a direct risk to the life and health of the operator.

Bystanders or animals are not allowed to stand in the spreading zone.

Keep a safe distance from power lines, especially when working with the spreader body gate raised.

Do not operate the PTO shaft at other rotational speeds than the those specified in Table 3. Using different PTO speeds can damage the adapter or its drive.

The Procedure for Starting Manure Spreading

1) Set the tractor coupled with the spreader to drive straight ahead at the location where fertilisation starts.
2) Make sure that the PTO shaft of the tractor is adjusted to the correct range of rotational speed.
3) Start the PTO shaft at a low engine speed and increase the engine speed until the adapter rotors have reached the correct speed, and keep it within this range.
4) Fully raise the slide gate of the hopper.
5) Use the correct distributor lever to start the drive of the floor conveyor, and verify the correct direction of feeding.
6) Engage the tractor gear and start working as soon as a sufficient amount of manure has been fed onto the rotors of the adapter.

Ending the Spreading Procedure:

1) It is recommended to lower the slide gate of the hopper to the height of the fed material, in the final phase of spreading.
2) In order to obtain a uniform dose of spreading material in the final stage of spreading, reduce the travel speed, or use the knob on the flow controller to increase the feeding speed of the floor conveyor.
3) Switch off the drive of the floor conveyor after the hopper has been emptied completely.
4) Fully lower the slide gate in the hopper.
5) Reduce the rotational speed of the engine and switch off the PTO shaft's drive.
6) Clean the spreader after each completion of spreading, if you intend to drive on public roads, in order to avoid surface contamination.

CAUTION

CAUTION!

Strictly observe the sequence provided for starting the spreader. Following a different sequence can damage the spreader and endanger the health or life of the operator.

At headlands, after switching off the floor conveyor drive, switch off the tractor's PTO shaft.

The direction of movement of the floor conveyor can only be reversed if the rotors of the adapter are locked. It is not allowed for the load to come into contact with the front panel of the hopper when the load is moving forward.

4.4.3 Clogging the Spreading Adapter

When spreading manure, the spreading adapter can get clogged, which stops the rotors of the adapter, by shearing the safety pin in the articulated telescopic shaft transmitting power from the tractor to the spreader. If the beater unit augers come to a stop during spreading, immediately switch off both the floor conveyor drive and the tractor PTO shaft drive.

Causes of the adapter's clogging:

- objects such as stones, wood, etc. get into the adapter together with manure,
- the feeding speed of the floor conveyor is too high,
- the rotational speed of the PTO shaft is kept too low,
- inadequate speed of the PTO shaft,
- the load is too dense.

Unclogging the spreading adapter:

1) Switch off the PTO shaft drive and uncouple the PTO shaft from the tractor.
2) Reverse the floor conveyor by switching the distributor lever in the tractor in the direction opposite to the normal working position of the feeder.
   - Perform this action in phases.
   - Reverse the conveyor only as much as required for the load not to press on the rotors of the adapter.
   - It is not permitted to move the conveyor forward when the load is in contact with the front panel of the hopper.
3) Switch off the tractor's engine, activate the parking brake to stop the tractor and the Spreader, remove the key from the ignition switch, and secure the tractor against unauthorised access
4) Use suitable tools to remove any objects blocking the rotors of the adapter.
5) Install the bolt in the coupling of the articulated telescopic shaft and connect it to the tractor.
6) Start the tractor's engine and activate the PTO shaft to clean the adapter's rotors of any residual material.

4.4.4 Blocking of the floor conveyor

The conveyor drive hydraulic system is equipped with an overload valve that protects the gearbox, drive shaft, chain and slats from overloading in the event the conveyor is overloaded or blocked. The overload valve has warranty seals in the form of protective caps. Breaking them will void the warranty.

The following figure shows the hydraulic drive system for a floor conveyor.

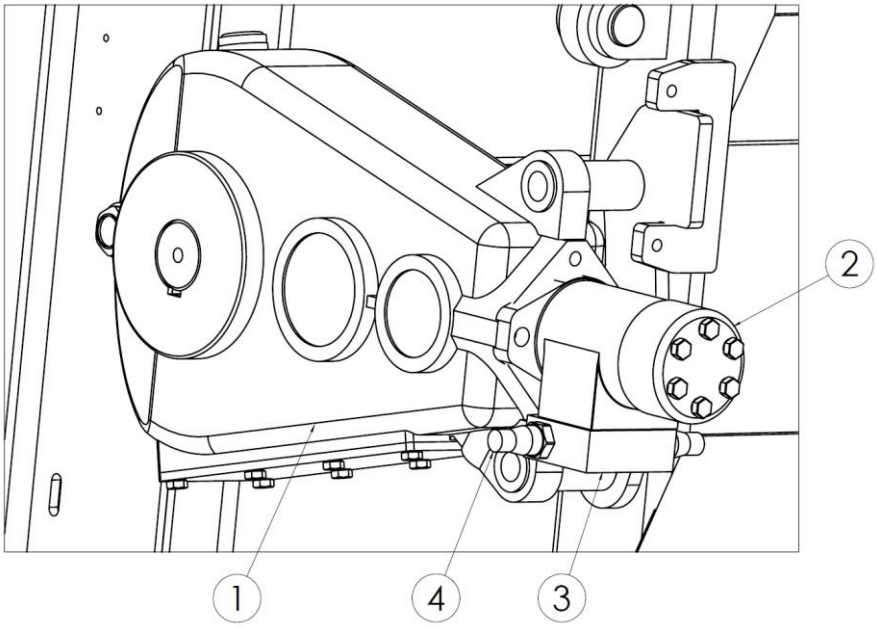


Figure 25. Hydraulic drive system of the floor conveyor
1 – gearbox, 2 – hydraulic motor, 3 – block valve, 4 – valve seal

5. Technical service

5.1 Checking and Adjusting the Tension of the Floor Conveyor Chains

Check the tensioning of the floor conveyor chains during operation daily, especially during the initial period of operation. Carry out the tensioning of the conveyor chains by adjusting screws at the front of the spreader body - Figure 26. To increase chain tension, tighten the adjusting screws (1) so that the tensioner slider (2) and the pulley (3) move forward. Follow the tensioning procedure for both pairs of chains (4), ensuring that their tension is equal

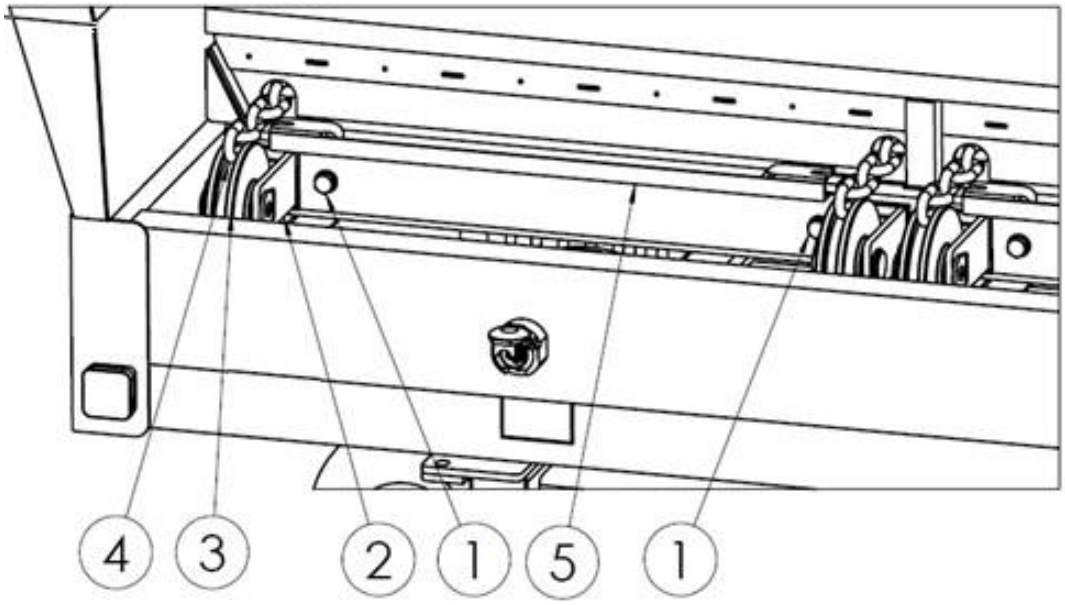


Figure 26. Tensioning the chains of the floor conveyor:
1 – adjusting screw, 2 – tensioner slide, 3 – tensioner pulley, 4 – conveyor chain, 5 – conveyor bar

If tensioned correctly, the chain can be raised to a height of 40-80 mm, when applying a force of 50 kg to the chain in the middle of the length of the hopper.

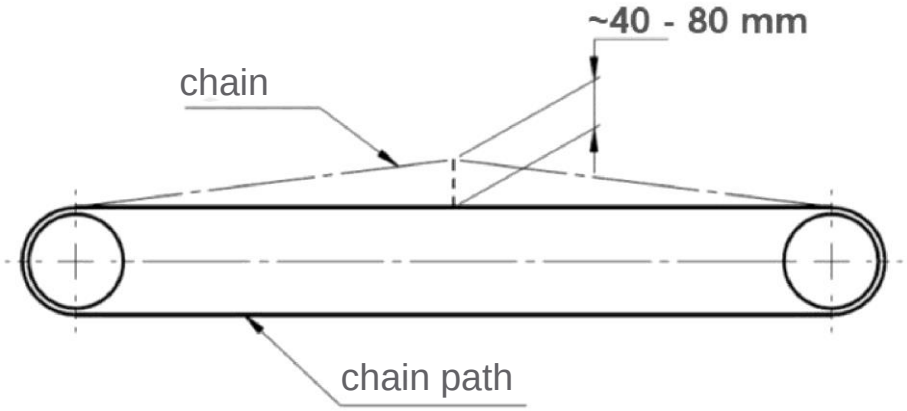


Figure 27. Checking the tensioning of the spreader chains

Should the range of chain tensioning adjustment not be enough, the conveyor chain can be shortened by removing 2 chain links. An overly extended chain can be caused by incorrect chain tension adjustment and clogging of the chain sprockets in the floor conveyor.

Chain wheel clogging is caused by damaged or worn chain sprocket scrapers, so check them regularly for working condition and replace if necessary.

CAUTION

CAUTION!

All conveyor chains must be adjusted to equal tension. If too loose, the chains can damage the Spreader and pose a direct risk to bystanders or operators.

Check the chain tension of the 2-auger disc horizontal beater unit drive systematically every 8 hours of operation, and shorten this interval during the initial period of operation. To check the tension of the chains, remove the side guards of the beater unit. A properly tensioned chain should give by 5-20 mm under a force of 200 N (20 kg) applied in the middle of the chain. If the chain is too loose, loosen the screws (2) and adjust the tensioner (3), retighten the screws and recheck the chain tension. If the tension adjustment range is not enough, the chain must be replaced.

5.2 Checking the tension and tensioning the chains of the 2-auger horizontal disc beater unit

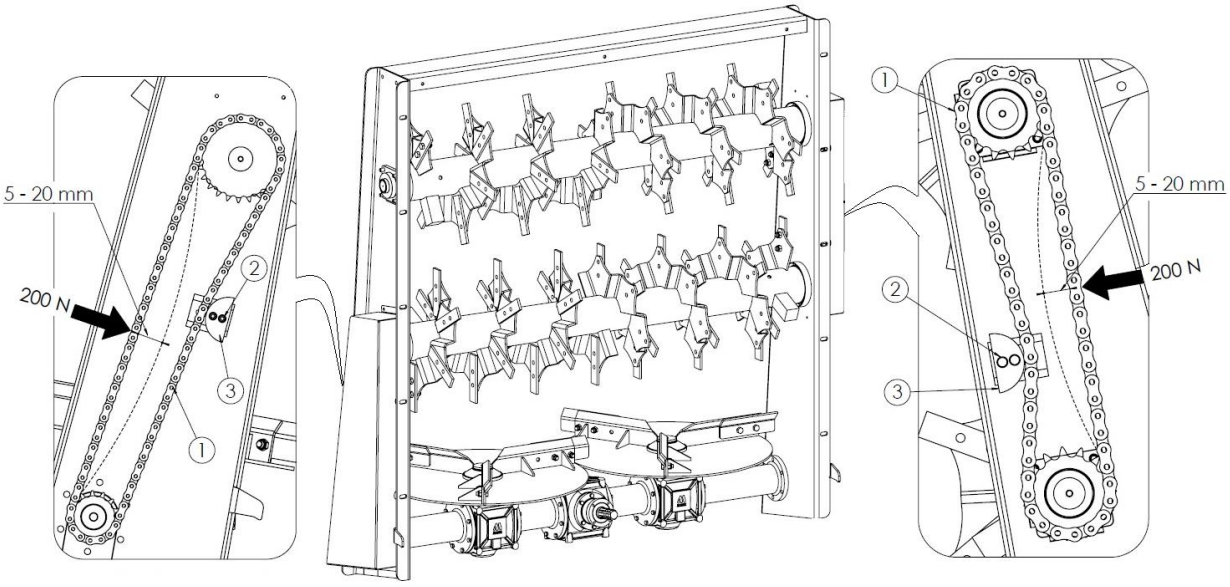


Figure 28. Tensioning the adapter chains

5.3 Maintaining the hydraulic system

The hydraulic system of the spreader must be leak-proof. It is not allowed to operate the spreader with a leaking hydraulic system. To check the tightness of the system, activate each individual circuit of the hydraulic system several times. If an oil leak is found, seal the connection or change the leaking line.

Table 15. The specifications of the HL-46 hydraulic oil

No.	Name	Value
1	Viscosity grade as per ISO 34448VG	46
2	Kinematic viscosity	41.4 - 50.6 mm²/s (40°C)
3	Quality class as per ISO 11158	HL

Each new Spreader has its hydraulic system factory-filled with the HL-46 oil. The oil in the hydraulic system of the tractor should be of the same grade as the oil used in the hydraulic system of the Spreader. It is permitted to mix oils of the same grade, provided that it is approved by the oil Manufacturer. The hydraulic system of the Spreader is not equipped with a filter, which means that the cleanliness of the oil in the system depends on the condition of the filters in the hydraulic system of the tractor. The correct and trouble-free operation of the hydraulic system depends on the cleanliness of the hydraulic oil.

Keep both the hydraulic quick couplings of the spreader and the hydraulic sockets of the tractor clean. After disconnecting the lines from the tractor, wipe the plugs of quick couplings with a clean and dry cloth, and then secure them with protective caps.

Change rubber hydraulic lines every 4 years, regardless of their technical condition, unless a fault has been found earlier.

Change the filters and oil in the hydraulic system of the tractor on a regular basis to ensure reliable and stable operation of the hydraulic system of the Spreader.

CAUTION

CAUTION!

The hydraulic system is under high pressure during operations.

Check the tightness of the hydraulic system and the technical condition of the lines on a regular basis, and eliminate any leaks on an ongoing basis.

Use the hydraulic oil recommended by the Manufacturer.

Never mix two different types of oil.

Contaminated oil can cause the failure of hydraulic components.

The oil used in the hydraulic system is not listed as a hazardous substance, but prolonged skin exposure may cause irritation. Use soap and water to wash the skin that has come into contact with oil.

5.4 Gearbox maintenance

Maintenance of the Spreader's transmission consists in checking the level of, topping up, and changing the gear oil.

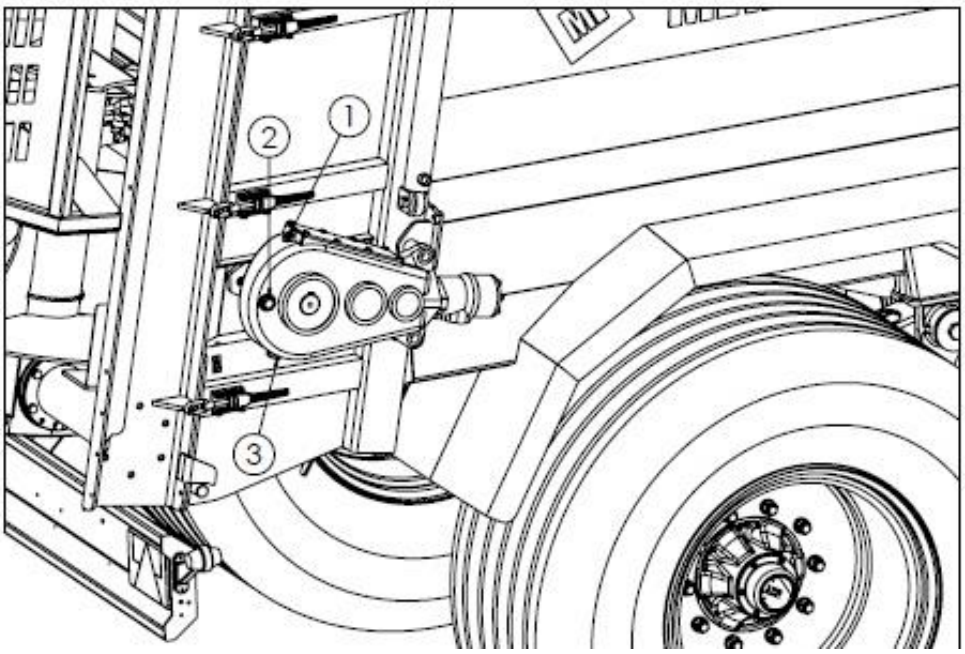


Figure 29. Oil level control points in the floor conveyor's transmission:
1 – oil filler (vent), 2 – oil-level sight glass, 3 – drain plug

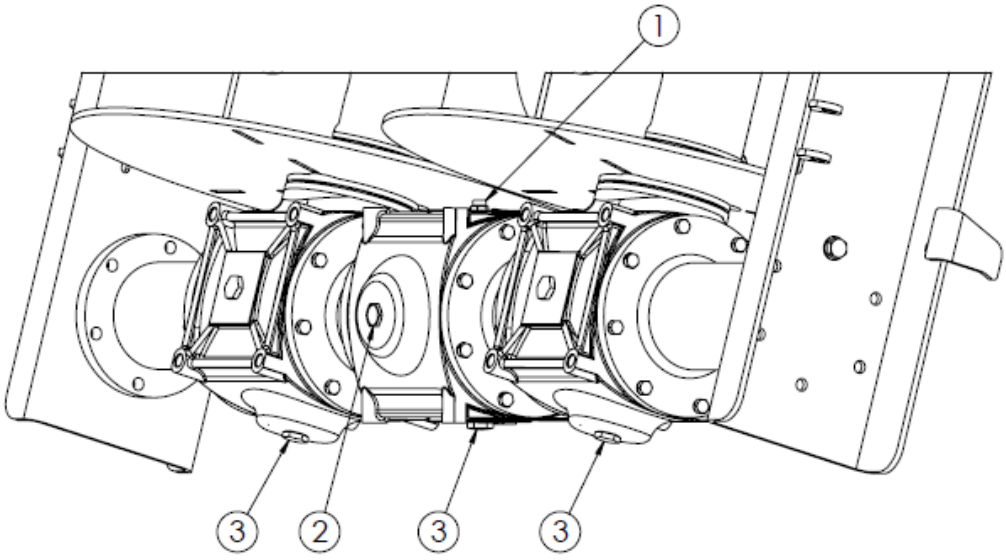


Figure 30. Oil level control points in the adapter's transmission:
1 - oil filler (vent), 2 - oil-level sight glass, 3 - drain plugs

Change oil at the operating temperature immediately after operation is completed, when the oil is still hot. Carry out the work by driving the Spreader on hardened, level ground. When changing oil, use suitable protective clothing, tools, and tanks. Store waste oil in appropriately marked containers, and dispose of it in accordance with the applicable regulations.

To drain the oil from the gear unit (Fig. 29, 30), unscrew the drain plugs (3). Fill the gearboxes with new oil via the oil filler (1) until oil becomes visible in a sight glass (2). The correct oil level is reached when the oil is visible in the middle of the sight glass.

All elements of the adapter's transmission body are interconnected, so it only requires using the filler plug and level sight glass in the central body to top up and check the oil level in the entire unit.

Check the oil level in the beater unit gearbox and the floor conveyor gearbox via a sight glass each time before you start the machine.

Change the oil in the beater unit gearbox and the floor conveyor gearbox after the first 50 operating hours and then every 700 operating hours.

Table 16. Oil volume in N272/3 and N272/6 spreader gearboxes

Name	Type of oil	Volume
2-auger vertical and 2-auger horizontal disc beater unit gearbox	Hipol GL 4 80/W90	12 L
The floor-conveyor gear	Hipol GL 4 80/W90	4.3 L

DANGER

DANGER!

During oil change, use appropriate personal protective equipment such as safety clothing, gloves, glasses and footwear.

Avoid contact with skin.

Oil may cause an allergic skin reaction.

The oil has a harmful long-term effect on aquatic species.

5.5 Lubrication

Proper lubrication is one of the most important factors that determine the efficient operation of each individual unit and the mechanisms of the Spreader.

Compliance with the lubrication requirements of the Manufacturer will significantly reduce the risk of damage or premature wear and tear of individual parts. Lubrication points are indicated in Figures 31, 32 and 33 and the lubrication schedule in Table 17.

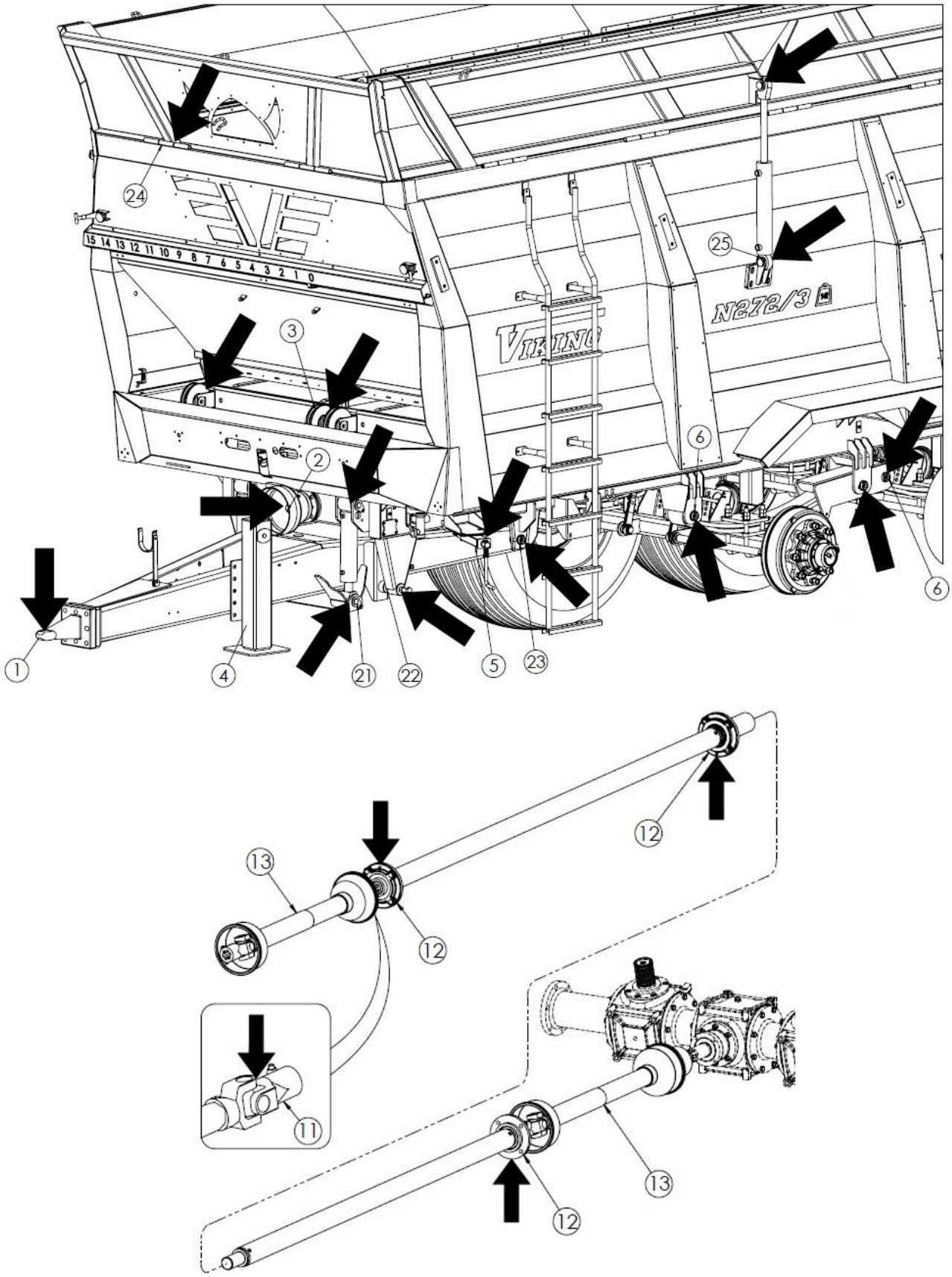
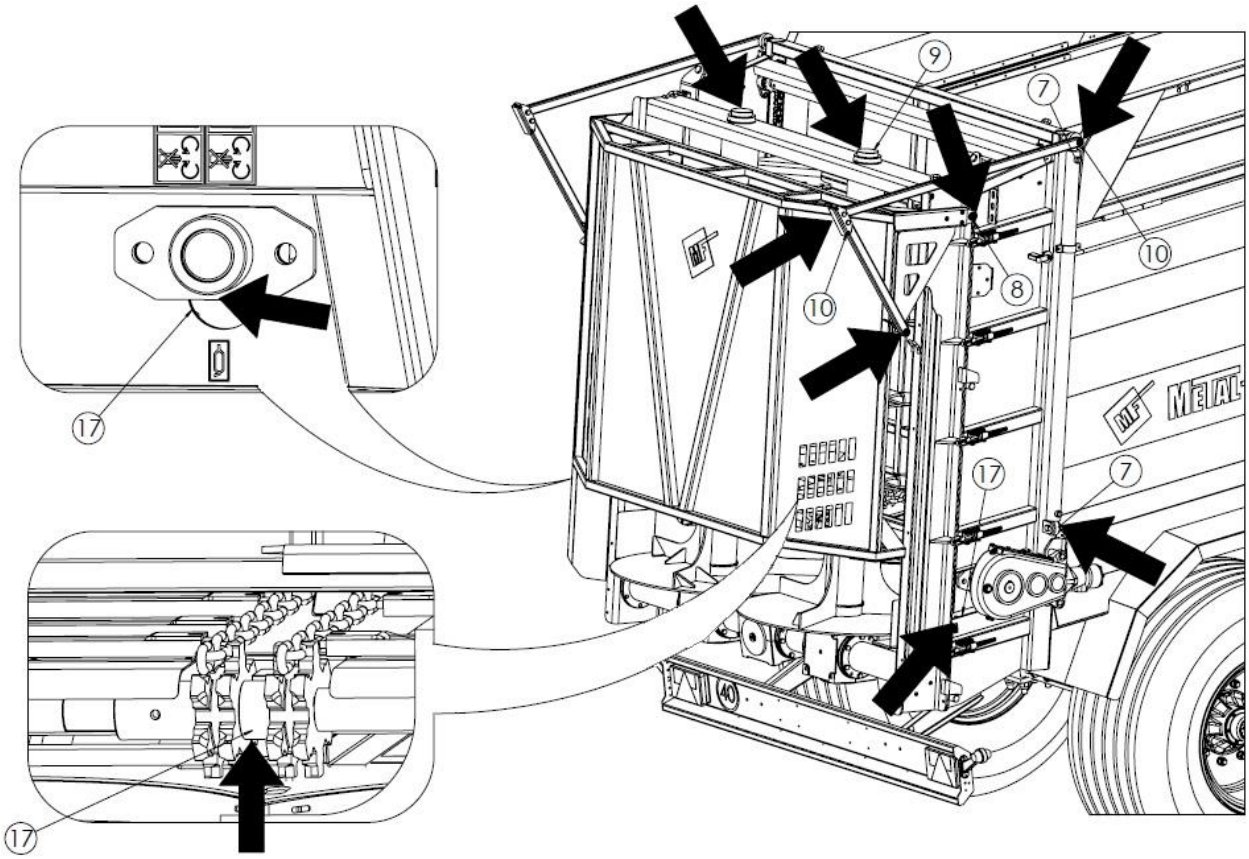


Figure 31. Spreader lubrication points



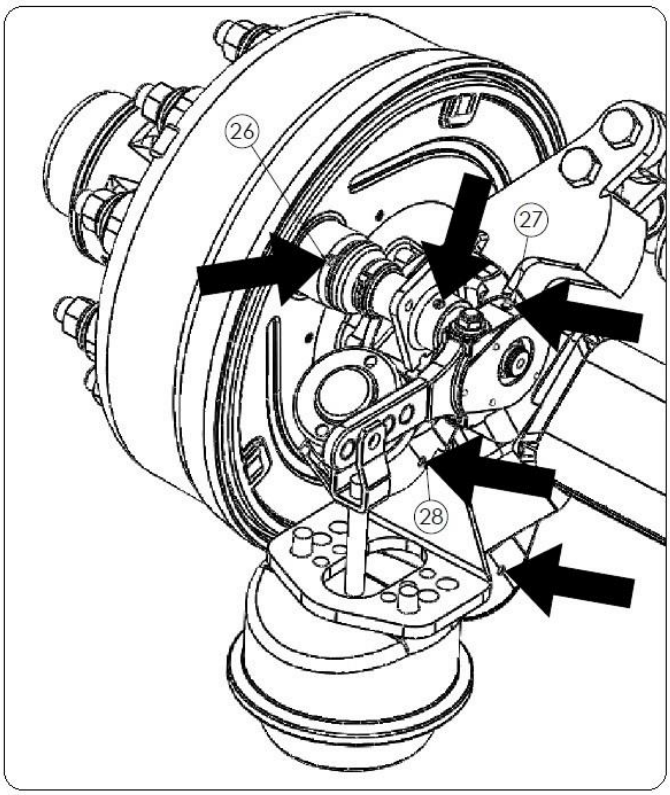


Figure 32. Spreader lubrication points

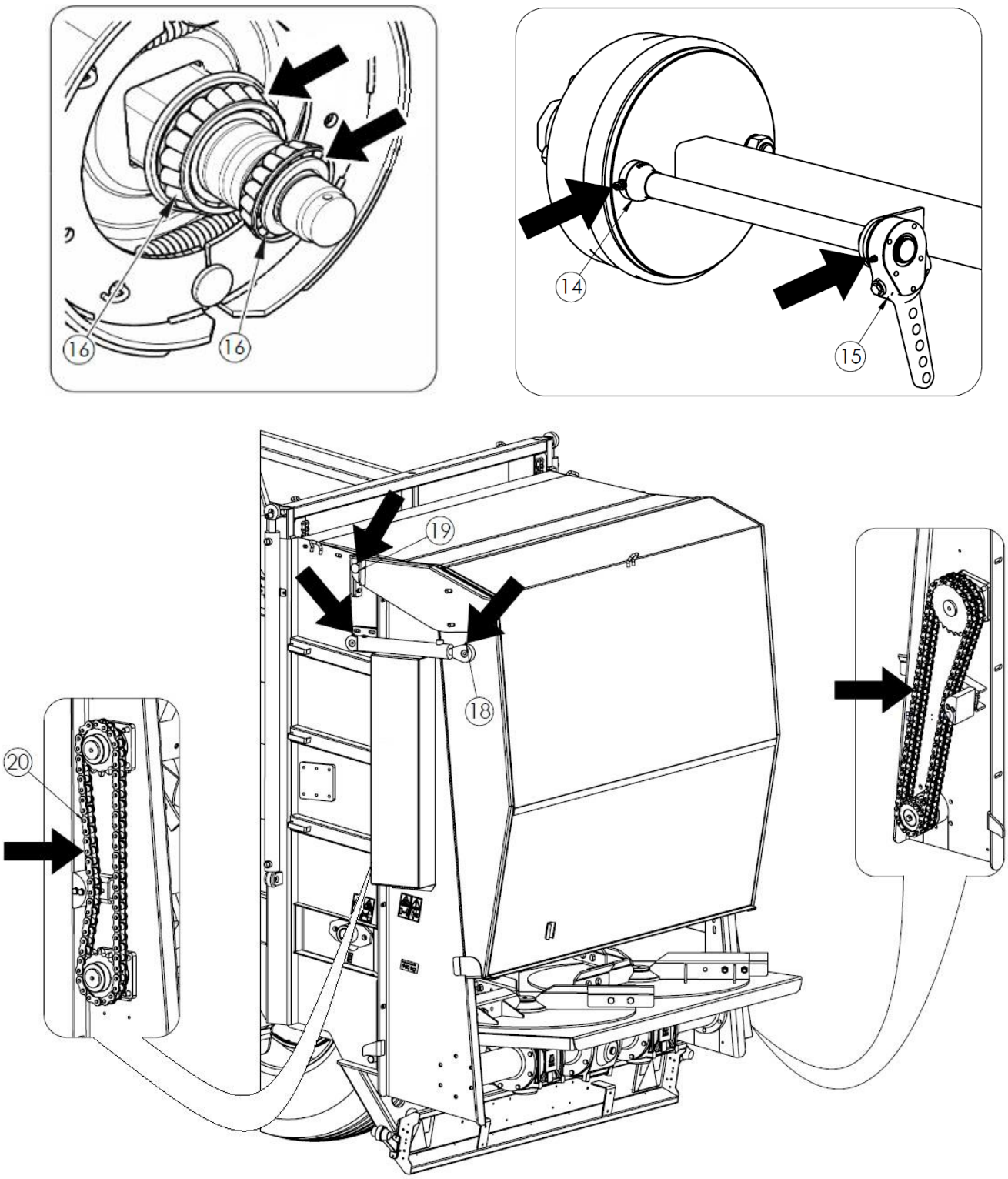


Figure 33. Spreader lubrication points

When lubricating, follow the guidelines below:

- Clean the grease nipple before you start pumping the grease
- Pump in the grease until fresh grease starts coming out from the slots (through which the used grease is squeezed out when changing the grease). After lubrication, leave some grease on the grease nipple head

Table 17. The lubrication schedule

No.	Name of mechanism	Number of lubricating points	Grease type	Interval
1.	Drawbar eye	1	ŁT	2D
2.	The splines of the shaft of the drive system	1	ŁT	6M
3.	Tension pulley	4	ŁT	8H
4.	Parking jack	1	ŁT	24M
5.	Parking brake assembly	1	ŁT	6M
6.	Suspension pins	6	ŁT	2D
7.	Spherical plain bearings of the gate cylinder	4	ŁT	6M
8.	Spherical plain bearings of the beater unit shield cylinder	4	ŁT	6M
9.	Upper bearings of the adapter	2	ŁT	8H
10.	Beater shield hinges	8	OM	6M
11.	Shaft universal joints	4	ŁT	24H
12.	Bearings of the drive unit	3	ŁT	6M
13.	Articulated telescopic shafts	*	*	*
14.	Sleeves of the expander shafts	4	ŁT	6M
15.	Lever of the brake expander	4	ŁT	6M
16.	Bearings of the wheel hub	8	ŁT	24M
17.	Feeder shaft sleeves	3	ŁT	8H
18.	Spherical plain bearings of the beater unit shield cylinder	4	ŁT	6M
19.	Beater shield hinge sleeves	2	OM	6M
20.	Beater unit drive chains	2	OM	6M
21.	Sprung drawbar pin	4	ŁT	24H
22	Hitch bumper	2	ŁT	6M
23.	Drawbar pin	2	ŁT	24H
24.	Extension hinges	36	ŁT	6M
25.	Extension actuator	2	ŁT	6M
26.	Sleeves of the expander shafts	4	ŁT	6M
27.	Lever of the brake expander	2	ŁT	6M
28.	Knuckle pins	4	ŁT	24H

***** – Observe the guidelines provided in the Instruction Manual supplied with the PTO shaft

Lubrication interval codes: H - working hour, D - working day, M - month

Table 18. Lubricants

Codes from Table 10	Description
ŁT	ŁT-42, ŁT-43 General purpose grease
OM	Machine oil

Wipe the parts to be lubricated with machine oil with a clean cloth and then apply a small amount of oil to the lubricated parts. Wipe off excess oil.

Lubricate the wheel hub bearings by applying fresh grease after removing the hub and removing used grease. Each time when changing grease, assess the condition of the bearings and change them, if necessary. After mounting the hub, adjust the bearing play.

CAUTION

CAUTION!

Driving the spreader without hub caps is not allowed. Dirt entering the wheel bearings causes damage to the wheel bearings.

5.6 Pneumatic system maintenance

Have the air braking system components repaired, changed, and regenerated by professional workshops with all the appropriate qualifications and tools to perform this type of work.

Maintaining the pneumatic system carried out by the User is narrowed down to:

1. Checking the air-tightness of the system and its visual inspection
2. Cleaning the air filters.
3. Draining the air tank and cleaning the drain valve.
4. Changing the flexible connection lines.
5. Cleaning and maintaining the connections of pneumatic lines.

CAUTION

CAUTION!

It is not allowed to operate the spreader if the brake system is faulty.

5.6.1 System tightness and visual inspection of the pneumatic braking system

System tightness and visual inspection:

- At start-up
- after the first 1,000 km
- each time system components are repaired or replaced
- annually

Checking the tightness of the pneumatic system:

- Couple the tractor with the spreader
- use the parking brake to immobilise the tractor and spreader, and put a chock under a spreader wheel
- start the tractor's engine to supply air to the braking system of the Spreader,
- Stop the tractor’s engine;
- check the air-tightness of the pneumatic components after releasing the brake pedal in the tractor,
- check the air-tightness of the pneumatic components when the brake pedal in the tractor is pressed (it is required to have another person to assist you).

If leaking, air will escape outside with the characteristic hissing at the damaged places Minor leaks can be detected by applying a layer of foaming agent to the inspected parts (washing-up liquid or soap).

Change the damaged parts or have them repaired. Eliminate any leaks in the joints, by tightening the joint or changing a fitting or sealing.

When checking the air-tightness of the system, carry out a simultaneous visual inspection of the pneumatic braking system. Pay particular attention to the condition of the pneumatic lines, the manner of their fastening, as well as their cleanliness and completeness. Lines must not show any signs of wear, permanent deformation, partial splitting or bending. It is not allowed for the system's components to be contaminated with oil and grease.

CAUTION

CAUTION!

Have the pneumatic system components repaired, replaced and regenerated by professional workshops only.

5.6.2 Air filter cleaning

DANGER

DANGER!
Depressurise the spreader's brake system before dismantling the filters.

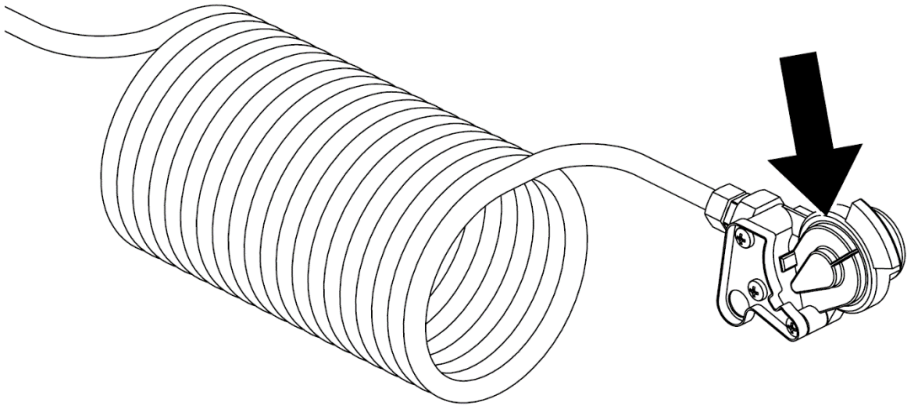


Figure 34. Haldex brake system air filters

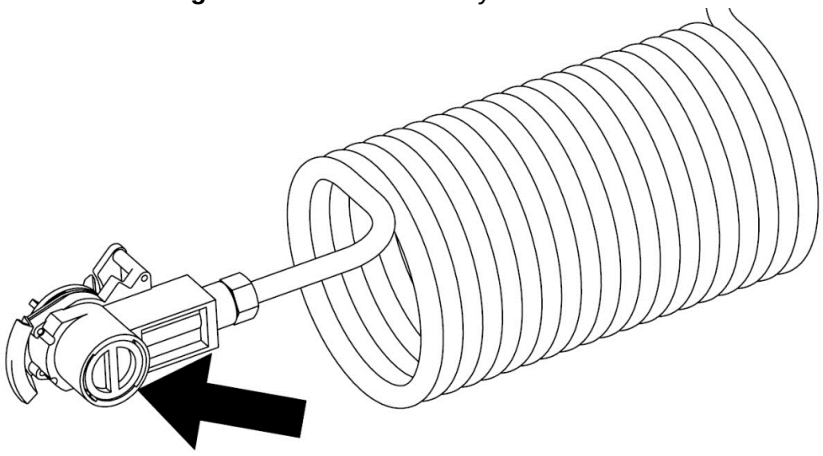


Figure 35. Knorr-Bremse brake system air filters

Clean the air filter inserts depending on the operating conditions, but at least every 6 months. The filters located in the fittings of the pneumatic lines - see Figures 34 & 35. The air-filter elements are reusable and it is not required to change them, unless damaged.

5.6.3 Draining the air tank

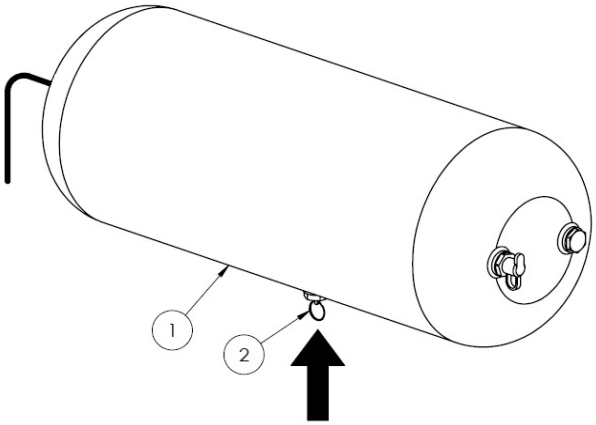


Figure 36. Draining the air tank:
1 - air tank, 2 - drain valve

Drain the air tank, after every 7 days of use.

Draining the air tank:

- Pull the drain valve (2) to let water escape (compressed air will make water escape outside)
- release the stem of the drain valve (the valve will close automatically and cut off the airflow).

If the drain valve is leaking, it must be dismantled and cleaned, or changed, if necessary.

5.6.4 Changing the flexible connection hoses

Change all flexible connection lines every 5 years, unless damage (permanent deformation, wear or cutting) is found earlier.

To change the lines, do the following:

- purge the system completely,
- unscrew the pneumatic fittings from the lines,
- unscrew the flexible lines from the brake valve,
- fit new lines,
- check the air-tightness of any new connections.

5.6.5 Cleaning and maintenance of pneumatic hose fittings

DANGER

DANGER!
Faulty, damaged or dirty air hose fittings can cause malfunction of the brake system.

If any damage to the hose fittings is found, replace them with hose fittings in good working order. If exposed to oils, petrol, greases, etc., gaskets in the connections can be damaged or age prematurely.

If the Spreader is uncoupled from the tractor, the connections must always be protected with caps and placed in the appropriate holders. It is recommended to preserve the gaskets in the connections with a suitable agent, e.g. silicone spray for rubber parts, after the season is over.

Before each coupling of the machine, check the technical condition of the pneumatic connections in the Spreader and the tractor. Keeping the connections clean extends their service life and ensures the correct operation of the entire braking system.

Always check the technical condition of the pneumatic connections, before coupling the Spreader with the tractor.

5.7 Maintaining the driving axle and brakes

5.7.1 Maintaining the driving axle

It is recommended to check the bearings of the driving axle for play - see Figure 37. Carry out this inspection on a newly purchased machine, after the first 100 km. Then, during operation, recheck after driving about 1,500-2,000 km and adjust if necessary.

To adjust the bearing play, follow the procedure below.

1. Couple the Spreader with the tractor and engage the parking brake in the tractor.
2. Lift one side of the Spreader, so that the wheel does not touch the ground, and secure it against falling.
3. If the wheel shows excessive play, remove the hub cap and the safety pin that prevents the castellated nut from becoming loose.
4. Turn the wheel while simultaneously tightening the castellated nut, until the wheel has stopped completely.
5. Release the castellated nut by 1/6 to 1/3 of a turn, until the nearest safety pin groove is aligned with the hole on the hub pivot.
6. Secure the nut with a new safety pin; replace and fasten the hub cap.

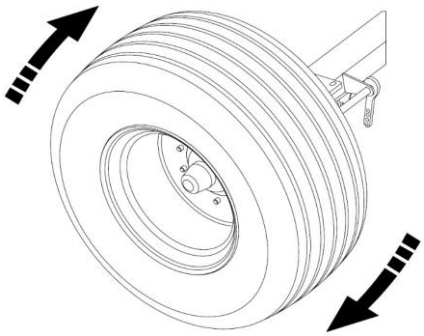


Figure 37. Checking wheel bearing play

If the bearing play is adjusted correctly, the wheel should rotate smoothly, without hesitation or evident resistance (other than the friction of the brake shoes against the drum). Slight friction of the shoes against the drum, particularly in a new Trailer, or after their replacement, is a typical occurrence. After driving for a few kilometres observe how the wheel hubs heat up, to check finally if the bearing-play adjustment is correct. Significant turning resistance of the wheels and overheating of the wheel hubs are caused by incorrect bearing play adjustment and dirt in the bearing grease or bearing failure. The afore-mentioned symptoms make it necessary to disassemble the wheel hub to eliminate the malfunction.

5.7.2 Maintaining the brakes

After purchasing the Spreader, the User must carry out a general inspection of the braking system on the driving axle, and then repeat it periodically.

Have the brake components repaired, replaced and regenerated by professional workshops having all appropriate qualifications and tools to perform this type of work.

The operator is responsible for the following maintenance works of the driving axle brake:

- functional checks of the brakes,
- inspections of the brake-linings for wear,
- adjusting the service brake,
- functional check of the parking brake,
- changing the parking-brake cable and adjusting its tension.

Functional checks of the brakes:

- couple the Spreader with the tractor and place chocks under the tractor wheels,
- check the manner of fastening the pneumatic cylinder and its forks on the brake lever arm,
- check the axle brake components (pins, cotter pins, nuts, etc.) for completeness,
- activate and release the main brake, and repeat the same with the parking brake (the action of the brakes should be smooth and they should retract without resistance or jamming),
- check the stroke of the cylinder piston rod,
- check the pneumatic cylinders for air-tightness,
- carry out a test run, when unladen, by activating the main brake several times to check its functioning.

Inspections of the brake linings for wear

Look through the inspection windows in the brake drum cover to check the brake linings for wear - Figure 38. Replace the brake shoes when the brake lining thickness drops below the minimum value specified by the manufacturer.

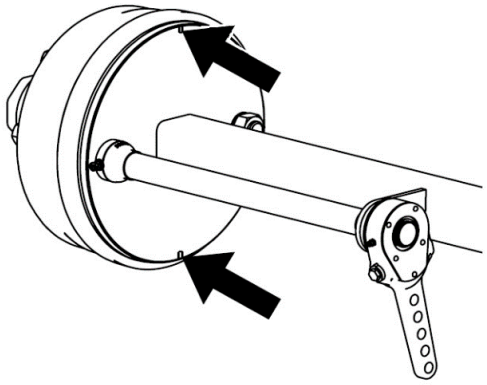


Figure 38. Inspections of the brake linings for wear

The minimum thickness of brake lining is 5 mm.

Inspections of the brake linings for wear:

- every 3 months of operation,
- if the stroke of the cylinder piston rod takes significantly longer than normal,
- or if any strange noises are coming from around the brake drum.

Adjusting the service brake

As the brake linings wear, the work stroke of the pneumatic cylinder piston rod increases. Excessive stroke may reduce the effectiveness of the brakes, therefore check, and adjust the work stroke of the brake to keep it within the specified operating range if necessary, . In a brake that is adjusted correctly, the angle between the piston rod and the expander lever in the braking position shall be 90˚ - Figure 39.

To check the functioning of the brake, measure the stroke length of the piston rod in each pneumatic cylinder. If the stroke of the piston rod is longer than the maximum value (45 mm), the system must be adjusted.

Adjust the stroke of the cylinder piston rod and the angle of the expander lever, by correctly setting the cylinder forks (3) and adjusting the stroke with the adjusting screw (7). Carry out this adjustment for both the cylinder and the expander lever, maintaining the same set values.

The correct stroke of the piston rod should be in the range of 25-45 mm.

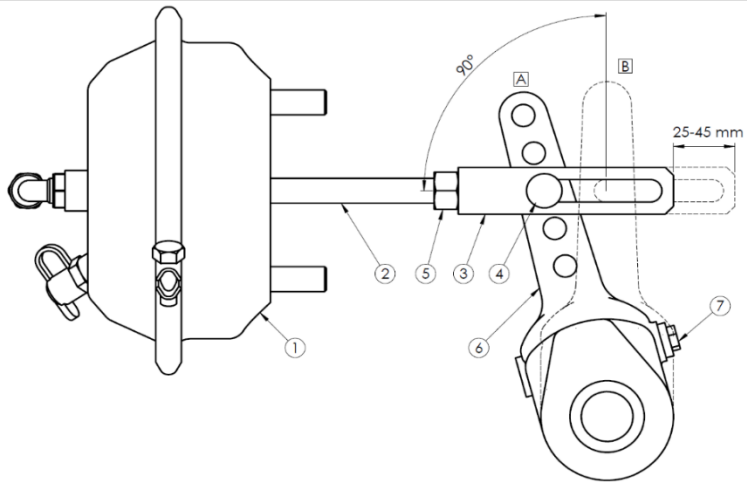


Figure 39. Adjusting the main brake
1 - pneumatic cylinder, 2 - cylinder's piston rod, 3 - cylinder's forks, 4 - fork's pin, 5 - fork's lock nut, 6 - expander lever, 7 - adjusting screw: (A) The lever position when releasing the brake, (B) The lever position when activating the brake

Checking the technical condition of the brake:

- after the first 100 km,
- every 6 months,
- after each repair of the brake system
- if the braking action of the spreader wheels is uneven

CAUTION

CAUTION!

Improperly adjusted brakes can cause the brake shoes to rub against the drum, which can result in faster wear of the brake linings and/or overheating of the brakes.

CAUTION

CAUTION!

Mounting positions of the pneumatic brake cylinder in the holes of the bracket and fork pin of the cylinder in the holes of the expander lever are set by the Manufacturer and any change of their position is prohibited.

Parking brake adjustment

Proper operation of the parking brake depends on the effectiveness of the brakes and the correct adjustment of the piston rod stroke of the membrane-spring actuators of the first travel axle.

Check and/or adjust the parking brake:

- every 6 months,
- if required.

The parking brake adjustment is related to the service brake adjustment and should be performed in case of:

- exceeding the allowable piston rod travel of membrane-spring actuators,
- damage to membrane-spring actuators,
- after repairing the mechanism of the driving axle brake.

5.7.3 Tyre Maintenance, Disassembly of the Wheels

Secure the machine with the parking brake and the wheels with chocks, when maintaining the tyres. Changing the wheel is only permitted, if the hopper is empty. Use suitable tools for repairing the wheels. Due to the risks associated with the maintenance and repair works of tyres, the repairer should be trained for this purpose. It is recommended to check the tightness of the nuts, before the initial start-up, after the first laden drive, and then after each intensive use of the machine, after every 100 kilometres. Repeat these checks each time after you dismantle the wheels.

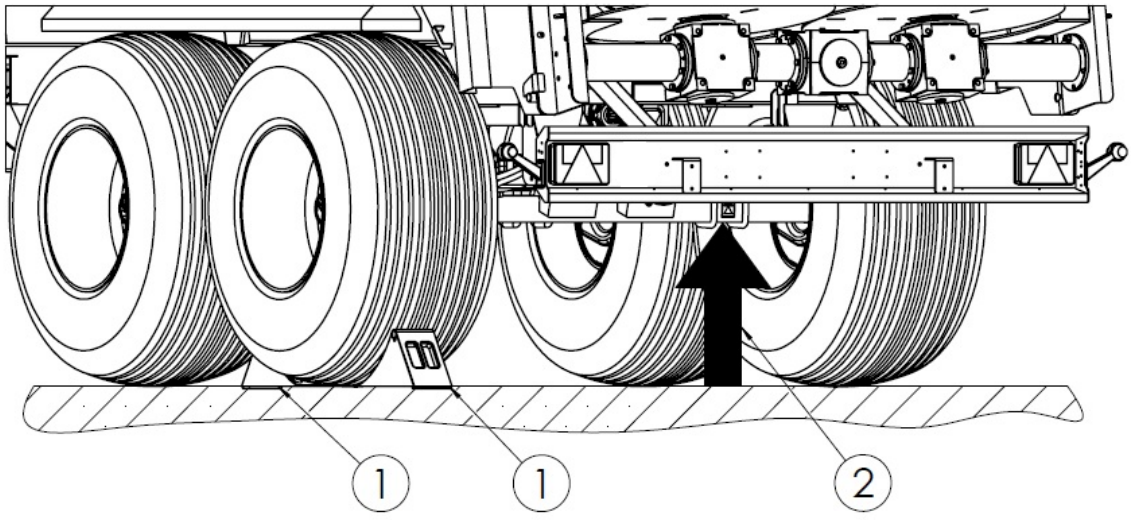


Figure 40. Jacking points:
1 - chocks, 2 - jack

If it is necessary to disassemble the wheel, observe the jacking points (2) under the axle. The lifting point is shown in Figure 40. Place the safety chocks (1) under one wheel only.

Check the tyre inflation pressure routinely. Maintain the recommended tyre inflation pressure. The correct pressure value is indicated on the tyre or as a sticker on the Spreader.

CAUTION

CAUTION!

Inspect the tightening of the wheel nuts regularly.

M18 x 1.5 = 270 Nm, M20 x 1.5 = 350 Nm, M22 x 1.5 = 500 Nm.

- Regularly check and maintain the correct tyre pressure, as recommended in the Instruction Manual and/or the information provided on the tyre.
- Do not exceed the permissible load capacity of the tyres, according to the Instruction Manual and/or information provided on the tyre.
- Do not exceed the permissible speed of the Spreader, according to the Instruction Manual and/or information provided on the tyre.
- Secure the tyre valves with protective caps.
- During the whole day's work, regularly check the temperature of the tyres and, if they heat up, take 30 minutes breaks to cool them down.
- Avoid excessive bumps, inconsistent manoeuvres and high speeds when cornering.
- Regularly check the condition of the tyres and replace them if cut or damaged.

CAUTION

CAUTION!

Do not exceed the permitted transport speed, working speed and load capacity of the spreader.

5.8 Maintaining the electrical system and warning components

CAUTION

CAUTION!

The electric system of the spreader is supplied with a 12 V voltage.

The user's responsibilities related to maintaining the electric system include:

- technical inspection of the electrical system and retro-reflectors
- replacement of light bulbs

Have the electrical system components repaired or regenerated by professional workshops having all appropriate qualifications and tools to perform this type of work.

CAUTION

CAUTION!

It is not allowed to drive when the lighting system is in an usable condition. Damaged lamp covers and burnt bulbs must be immediately replaced before starting to drive. Replace damaged or lost reflectors.

Before driving on a public road, make sure that the lighting and rear reflectors are not dirty.

Maintenance work:

- check the condition of the electrical connecting cable and the socket in the Spreader,
- check the lighting system for completeness, technical condition, and correctness,
- check all the reflectors for wear and for completeness
- check for the correct installation of the indicating plate for slow moving vehicles installed in the bracket,
- before driving on a public road, make sure that the tractor is equipped with a reflective warning triangle,
- before driving on a public road, make sure that the lights and reflectors are not dirty.

Table 19. Light bulb list

Lamp	Type of lamp	Bulb identification/number	Number of lamps
Rear-light cluster, right	HOR45-LZT 478	C5W / 1 item P21W / 2 item	1
Rear-light cluster, left	HOR45-LZT 471	C5W / 1 item P21W / 2 item	1
Marker lamp, right	LO 355	C5W / 1 item	1
Marker lamp, left	LO 355	C5W / 1 item	1
Front running light, right	LO 093	W5W / 1 item	1
Front running light, left	LO 093	W5W / 1 item	1

Check the electrical system:

- each time the Spreader is coupled.

The Spreader lights are equipped with replaceable bulbs. If it is required to change the bulbs, remove the lens and change the bulbs for new ones with the same power rating and marking as the original ones. See Table 19 for a list of bulbs used in the Spreader lights.

5.9 Cleaning the Spreader

5.9.1 Cleaning, Maintenance and Storage

The spreader is recommended to be thoroughly cleaned of any residual manure every day after completion of work.

If the spreader is connected to the tractor, apply the manual brake, disable the engine and remove the ignition key.

During maintenance work, when the flap is open, use locks to secure the cylinders.

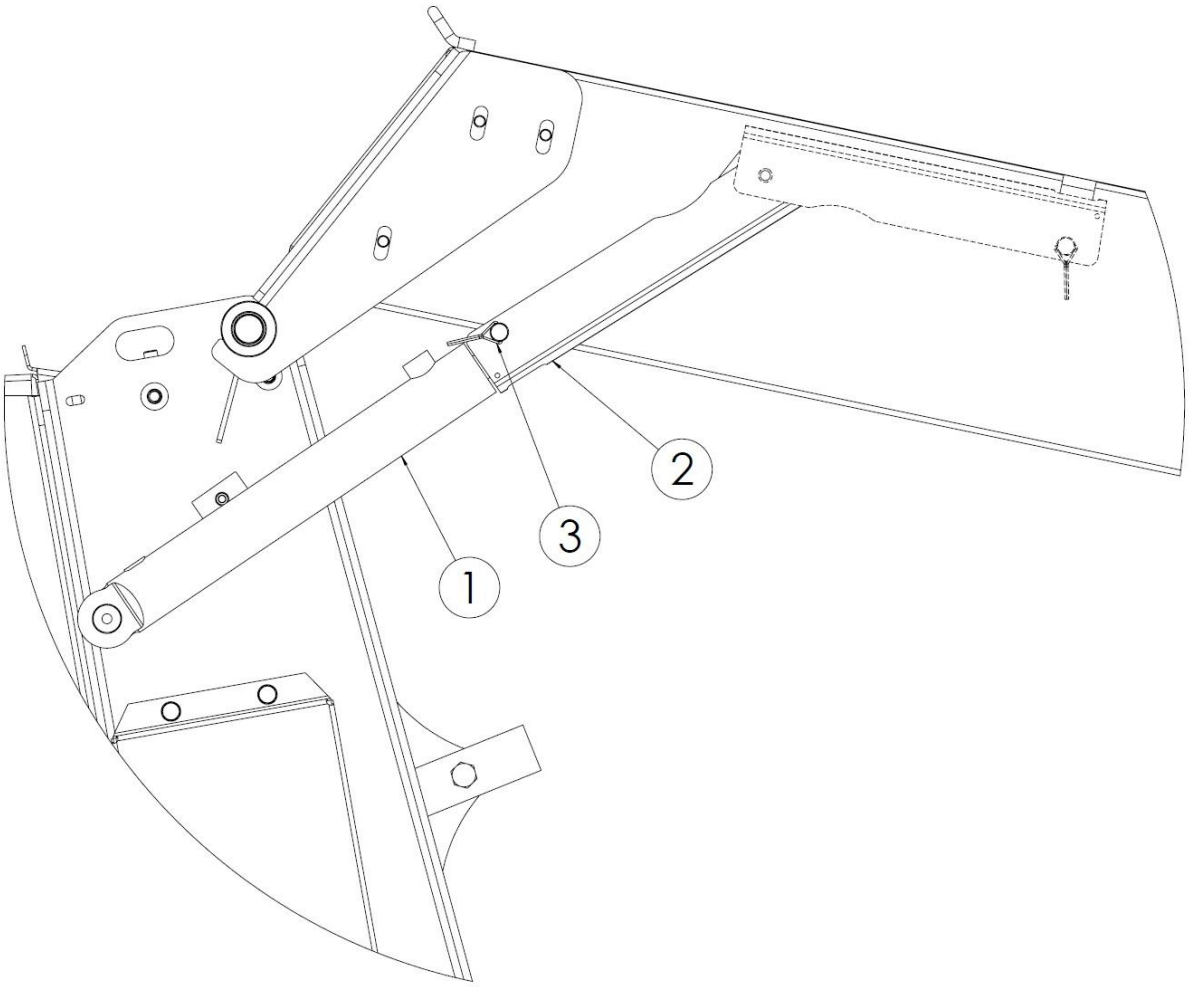


Figure 41. Locks for securing the cylinders

Secure the lifted spreader rear flap in its upper position, as shown in Fig. 41. On both sides of the spreader, use clamps (2) fixed to the upper pins of the hydraulic cylinders (1) to secure them. Move the clamps (2) fully upwards so that they embrace the stretched cylinder rods. Lock them with locking pins (3) against unauthorised cover closing. Unlock the clamps of the cover after completing the planned activities.

After each “seasonal” manure spreading, thoroughly wash the Spreader with clean water, dry it, and carry out maintenance work. It is recommended to use pressure washers for cleaning. Particular caution should be exercised during cleaning.

Cleaning guidelines:

- Do not hold the water jet closer than 40 cm from the surface to be cleaned. Washing surfaces with a strong jet of water from a short distance can damage lacquered surfaces,
- The water temperature must not exceed $50^{O}C$,
- Do not point the water jet directly at the following: electrical components, hydraulic and pneumatic components (cylinders, valves, connections), warning and information stickers, rating plate, lubricating points, etc.,

- If it is necessary to use cleaning agents, carry out a trial washing of the surface on an inconspicuous spot,
- Use petroleum ether or a degreasing agent to clean greasy parts, and then clean them with clean water,
- Do not use organic solvents or substances of unknown origin,
- Use suitable cleaning products to clean plastic or rubber surfaces,
- Wash the Spreader at locations designated for such purposes, according to the environmental protection regulations,
- Clean and dry the Spreader at a temperature above 0°C.

DANGER

DANGER!

Clean with the drive off, the PTO shaft disconnected and the tractor engine stopped. Remove the key from the ignition. Secure the tractor against unauthorized access.

Entering the spreader body is only permitted when the machine is stationary.

CAUTION

CAUTION!

Wash with appropriate safety clothing on and use personal protective equipment.

Refer to the instructions for use for cleaning products and the instructions for use for the pressure washer.

5.9.2 Cleaning the Adapter

Keep the Spreader clean, especially its adapter. If you have to reach the adapter on the inside, i.e. from inside the spreader, secure the tractor against unauthorised start-up, and then uncouple the articulated telescopic shaft and the hydraulic lines of the tractor. Use ladders that meet the safety requirements to enter the shell.

Standard cleaning of the adapter should be carried out with a pressure washer providing a strong jet of water.

Remove any wound cords, nets, etc. with a blade at the location intended for this purpose (see the figure below).

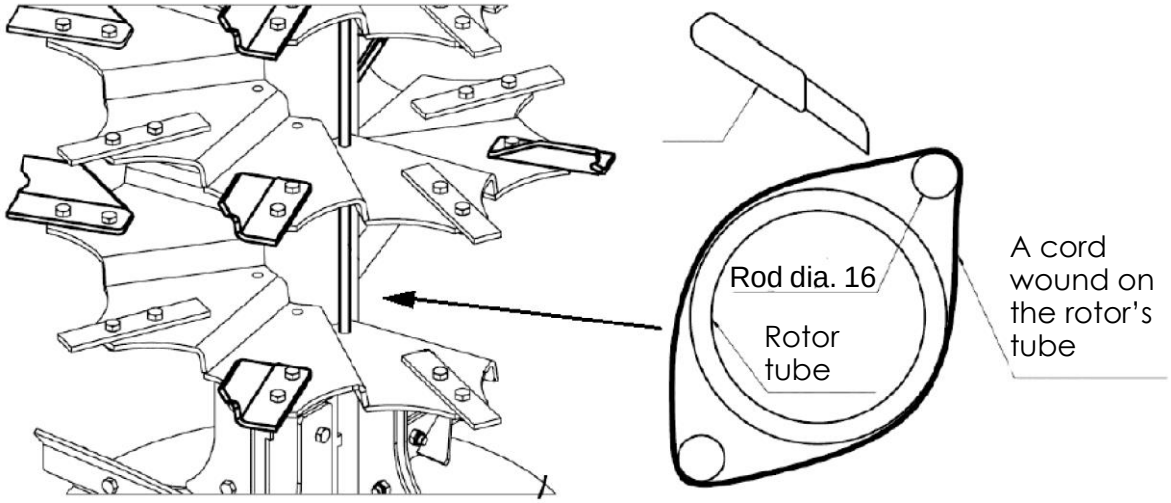


Figure 42. Cleaning wound cords, nets, etc.

After the thorough cleaning and drying of the spreader, carry out proper maintenance work, replace missing paint coating, and lubricate the machine. After lubricating using the appropriate lubricating points, activate all mechanisms of the Spreader to distribute the grease.

Apply a small amount of oil or anti-corrosive products in the locations where the lacquered surface has rubbed off naturally as a result of friction of moving material or friction between the parts rubbing against one another.

Store the Spreader in a roofed area, adequately protected against unauthorised access. If stored outdoors, the Spreader will be exposed to corrosive agents and UV radiation, which cause ageing of the lacquer coating.

5.10 Tightening torques of screw connections

The optimum tightening torques for bolts with metric threads are shown in Table 20.

Table 20. Tightening torques for screws with metric threads

Screw		Tightening torques for bolts with metric threads [Nm]					
Diameter d [mm]	Pitch of thread [mm]	Screw strength classes					Wheel nuts / wheel bolts
		4.8	5.8	8.8	10.9	12.9	
3	0.50	0.9	1.1	1.8	2.6	3.0	
4	0.70	1.6	2.0	3.1	4.5	5.3	
5	0.80	3.2	4.0	6.1	8.9	10.4	
6	1.00	5.5	6.8	10.4	15.3	17.9	
7	1.00	9.3	11.5	17.2	25	30	
8	1.25	13.6	16.8	25	37	44	
8	1.00	14.5	18	27	40	47	
10	1.50	26.6	33	50	73	86	45
10	1.25	28	35	53	78	91	
12	1.75	46	56	86	127	148	
12	1.50						80
12	1.25	50	62	95	139	163	
14	2.00	73	90	137	201	235	
14	1.50	79	96	150	220	257	140
16	2.00	113	141	214	314	369	
16	1.50	121	150	229	336	393	220
18	2.50	157	194	306	435	509	
18	1.50	178	220	345	491	575	300
20	2.50	222	275	432	615	719	
20	1.50	248	307	482	687	804	400
22	2.50	305	376	502	843	987	
22	2.00						450
22	1.50	337	416	654	932	1090	500
24	3.00	383	474	744	1080	1240	
24	2.00	420	519	814	1160	1360	
24	1.50						550
27	3.00	568	703	100	1570	1840	
27	2.00	615	760	1200	1700	1990	
30	3.50	772	995	1500	2130	2500	
30	2.00	850	1060	1670	2370	2380	

5.11 Defects and Methods of Elimination

Table 21. Defects and Methods of Elimination

Defect	Cause	Method of rectification
Impacts on the conveyor during operation	Incorrect adjustment of the conveyor chain tension. Excessive extension of conveyor chains.	Check and adjust the tensioning of the chains.
Blocking the spreading adapter	The feeding speed of the floor conveyor is too high.	Reverse the floor conveyor to unlock the adapter and reduce the feeding speed.
	The blocking objects entered the spreading assembly together with the manure	Remove the cause that is stopping the augers in the beater unit
	Rotational speed of tractor's PTO not correct	Change the rotational speed of tractor's PTO
	The PTO shaft operates at low speed.	Maintain an adequate tractor engine speed
Floor feeder does not distribute the loaded material towards the beater unit	The knob on the flow controller is set to "0-1"	Increase the set value on the flow controller.
	Excessive load weight results in overloaded floor feeder	Unload part of the load
	Low pressure in the tractor hydraulic system	Check the pressure in the tractor hydraulic system The minimum required hydraulic pressure of the tractor, measured with hot oil: 14 MPa, (140 bar)
	The engine overload valve of the hydraulic floor conveyor dirty and non-functional	Change the overload valve for a new one. Check the condition of the filters in the tractor's hydraulic system - if necessary, change both the filters and oil.
	Interrupted oil supply to the hydraulic motor of the conveyor	Check the connection and air-tightness of the hydraulic system.
Spread width too small	Rotational speed of tractor's PTO not correctly selected	Change the rotational speed of tractor's PTO
	The PTO shaft operates at low speed.	Maintain the correct rotational speed of the tractor's engine.

INDEX OF NAMES AND ABBREVIATIONS

dB (A) – scale A decibel, sound pressure unit;

kg – kilogram, weight unit;

km – kilometre, a commonly used multiple measure of the metre, the basic unit of length in the SI system;

kPa – kilopascal, pressure unit

HP – horse power, power unit;

m – metre, length unit;

mm – millimetre, an auxiliary length unit equal to 0.001 m;

kPa – Megapascal, a pressure unit;

N – Newton **–** a force unit in the SI system;

Nm - Newton-metre, a unit for the moment of force in the SI system;

Pictogram – an information plate;

t – tonne, a mass unit;

Rating plate – a manufacturer's plate unambiguously identifying the machine

V – Volt, a voltage unit;

UV - Ultraviolet radiation; It is an invisible electromagnetic radiation with a negative impact on human health; UV radiation has a negative effect on rubber parts;

Transport hitch – hitching components of a farm tractor (see the Instruction Manual of the tractor).

ALPHABETICAL INDEX

PART I

PART II

NOTES

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