CZAJKOWSKI MASZYNY Sp. z o.o.
ADRES: Sokołowo 1C
87-400 Golub-Dobrzyń
TEL: +48 570 135 960
NIP: 503 00 79 262
REGON: 364665016

INSTRUCTION MANUAL

CZAJKOWSKI STRIP TILL CULTIVATION UNIT

ST 300, ST 400, ST 450, ST 600

Translation of the original

instruction manual

IM-ST-01

7th edition, 06.2023 issue

Before using the machine, read the instruction manual!

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Produkt Polski

DECLARATION OF CONFORMITY

Czajkowski Maszyny Sp. z o.o.
Sokołowo 1C, 87-400 Golub-Dobrzyń, Poland
VAT: PL 5030079262

The person authorized to provide technical documentation is the Chairman of the Board of CZAJKOWSKI MASZYNY SP. z o.o., Sokołowo 1c, 87-400 Golub-Dobrzyń, Poland.

Machine:	Strip Till Cultivation Unit
Type/model:	ST / Czajkowski ST 300 4R / 6R / 8R ST 400 4R / 6R / 8R / 10R ST 450 4R / 6R / 8R / 10R / 12R ST 600 4R / 6R / 8R / 10R / 12R / 16R
Commercial name:	ST 300 / ST 400 / ST 450 / ST 600
Serial number/VIN:	_____
Function:	Strip tillage and seeding

Product name: Strip Till Cultivation Unit Czajkowski ST 300, ST 400, ST 450 and ST 600, to which this declaration relates, complies with all the relevant provisions of Directive 2006/42/EC of the European Parliament and of the Council of 17 May 2006 on machinery, and amending Directive 95/16/EC (OJ EU L 157 of 09.06.2006, p. 24).

In order to meet the health and safety requirements of the EC Directive, the following standards and technical specifications have been taken into account:

PN-EN ISO 4254-1:2016-02; PN-EN ISO 4254-8:2018-08;
PN-EN ISO 4254-9:2019-01; PN-EN ISO 12100:2012;
PN-EN ISO 3600:1998; PN-EN ISO 20607:2019-08

This declaration of conformity only refers to the machine in the state in which it was placed on the market and does not cover components added by the end user or any subsequent actions carried out by him.

The user manual is an integral part of the product. The product can only be transferred to another person if it is technically fully functional, together with the attached user manual and declaration of conformity.

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INTRODUCTION

The Czajkowski ST unit has been designed for strip soil preparation for sowing plants. Before using the machine, read the user manual carefully. Do not read the user manual carelessly, this may cause the machine to malfunction or endanger health or even life. The user manual contains basic rules of conduct and proper use of the machine, as well as instructions that must be strictly followed to ensure your own safety, failure-free operation of the machine, reduction of operating costs as well as reliability and durability of the machine. Everyone operating the machine must read the user manual, be trained and qualified. Machine users should also become familiar with the purpose of all machine components and how to use them. It is necessary to comply with occupational health and safety regulations and pay special attention to warning signs. The strip cultivation unit is intended for field work only. The manufacturer is not responsible for any damage to the machine resulting from its other use. The warranty expires as a result of unauthorized repairs or changes to the machine, as well as neglect and use of non-original parts. If you experience problems operating the machine, please contact the manufacturer's service department.

ATTENTION  The user manual is valid on the date of issue. The manufacturer reserves the right to make changes to manufactured products without making changes to the user manual.

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3. Service

Our company has used its best efforts to ensure that you are fully satisfied with our work together and further use of our products. If you encounter any problems, we recommend direct contact with our company's service or our distributor. In order to solve the problem as fast as possible, we'd like you to prepare the following details:

- full name and address;
- model and serial number of the machine;
- problem description;
- purchase date, hours or hectares worked.

Advice and minor faults - quick telephone assistance:

If you need information or advice beyond the scope of the user manual, or assistance in eliminating a minor fault, please contact the service department by phone.

Serious faults and defects - service request:

In the event of major problems or product defects, in addition to contacting us by phone, please submit a service request by sending an email to:
serwis@uprawapasowa.pl
The email must include the above-mentioned information required for the report, a detailed description, and photos showing the fault or defect.

4. Consequential damages

Despite the correct use of the machine, failures caused by the following factors may occur:

- used wearing parts,
- damage resulting from external factors,
- failure to follow the user manual,
- excessive driving speed,
- neglected maintenance or its performance by an untrained individual,
- machine overload;
- incorrect setting of the machine (failure to follow instructions about settings, incorrect installation).

The machine must be supervised during use and checked for correct working. The company does not bear responsibility for consequential damages caused by mistakes resulting from incorrect handling or transportation of the machine. Claims for damages that do not occur within the machine are automatically rejected.

5. Safety

Fig. 1. Pictogram NP001

This user manual contains safety instructions and warnings that apply to all chapters. Machines have been designed and constructed according to the modern technical requirements and recognized safety regulations. However, threats to third parties, health and property of the user, as well as material losses and damage to the machine, may still occur while operating the machine regardless of kept caution. Before starting work, read and follow bits of information and instructions of this user manual.

Safety regulations:

1. In addition to the recommendations contained in this manual, occupational health and safety regulations must also be followed.
2. It is forbidden for minors and individuals under the influence of alcohol or drugs to operate the machine.
3. It is forbidden for unauthorized persons and animals to remain within the range of the machine.
4. Warnings (self-adhesive labels) placed on the machine provide information regarding the safety of the user and third parties and help to avoid accidents.
5. When driving on public roads, you must comply with the regulations of the applicable Road Traffic Code.
6. Before starting work, familiarize yourself with all components, systems and their operation.
7. The operator's clothing should not be too loose, this will prevent it from getting caught in the moving parts of the machine.
8. Each time before starting the tractor and the machine, check their connection to ensure safe driving and work.
9. Before moving off, check the immediate surroundings of the machine and tractor, especially to make sure there are no unwanted people around. Proper visibility is important.

   ATTENTION It is dangerous for children to be near the unit (especially in the field). Children should be under the supervision of their parents, legal guardian or other adult!!!

10. It is forbidden to stand on the machine during work and transport.
11. Exercise particular caution when attaching to or detaching the tractor.

12. Before attaching the unit, check whether the front axle of the tractor is sufficiently loaded.
13. Strictly follow rules for axle loads, allowable total weight and transport loads.
14. Before leaving on public roads, check the correct location and operation of traffic lights (road lights, reflectors) required by the regulations of the Road Traffic Code.
15. All lines (hoses, cables, etc.) must be secured in such a way that any unexpected disconnection is excluded, as this could result in accidents and damage.
16. Before leaving on public roads, the machine must be in the transport position.
17. When driving the tractor, never leave the operator's cabin.
18. The speed and driving style of the tractor must always correspond to the terrain and road conditions. In all circumstances, avoid sudden changes in direction
19. When cornering, you need to take into account the greater swing range and increased weight of the set.
20. It is forbidden to stay in the working area of the machine and tractor.
21. Before each machine departure, check that all safety devices are in good condition.
22. Pay attention to crush hazard zones, especially those that are remotely and hydraulically operated.
23. The hydraulic folding of the frame can only be activated when there are no people in the deviation zone.
24. Before leaving the tractor cabin, lower the machine to the ground, turn off the engine, remove the key from the ignition and make sure that all rotating units have stopped.
25. Do not stand between the tractor and the connected machine if the parking brake has not been applied or anti-rolling blocks (chocks) have not been placed under the tractor wheels
26. The folded frame and lifting system must be secured in the transport position.
27. Track markers must be locked in the transport position.
28. Before any activities performed on the machine, make sure that it will not start on its own.
29. Do not use a jack or crane to lift the machine when it is full.
30. Keep the machine clean to avoid fire hazards.
31. Pay attention to danger zones near the rotating parts of the machine.
32. When operating, folding or unfolding the machine, stay outside the danger zone.
33. When filling the tank, do not place any unwanted objects inside the tank
34. Before filling, it is necessary to check that the fertiliser and seed chambers are empty and free of any dirt and foreign elements.
35. The specified tank filling amounts must be observed.
36. During each break, the machine drive should be switched off.
37. When filling the tank, do not under any circumstances enter the fertilizer or seed chamber.
38. The hydraulic system is under high pressure. Escaping liquid may penetrate the skin and cause severe injuries. If you are injured, seek medical attention immediately.
39. There are pressure accumulators in the hydraulic system. It is forbidden to modify or open pressure accumulators. Before maintenance, reduce the pressure in the hydraulic system. After emptying, there is gas pressure in the tank.
40. Use only telescopic shafts with CE marking allowed by the producer of the machine.
41. Anti-slip mats should be replaced with new ones if they are damaged or after a maximum of 5 years. New anti-slip mat strips must be at least 5 cm wide.
42. The machine with a filled tank must always be hitched to the tractor. The machine can only be disconnected from the tractor if the tank is empty.

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6. Rules of conduct in event of a breakdown or accident

- In the event of a breakdown or accident on the road or during work, the scene of the incident must be immediately secured, the condition of the injured persons must be checked and the appropriate services must be notified, e.g. ambulance, fire brigade or police.
- In the event of unexpected breakdowns or faults, work must be stopped immediately, the tractor engine must be switched off and the manufacturer must be contacted, providing the contact details and the serial number of the device provided in the operating instructions.

7. Residual risk

Czajkowski Maszyny Sp. z o.o. has made every effort to reduce the risk of accidents. However, there is a certain residual risk that may lead to an accident if the following recommendations are not followed:

- read the user manual carefully;
- precise and careful operation of the machine;
- do not put your hands into forbidden places;
- secure the machine against children access;
- do not stay within area of the machine while it's working;
- keep a safe distance from dangerous places;
- have the machine maintained and repaired only by qualified individuals;
- have the machine operated by individuals familiar with the user manual.

By following the recommendations above, residual risk can be eliminated.

The most common mistakes while operating the machine are:

- use of the machine for purposes other than its intended use;
- having an untrained person operate it;
- having a person under the influence of alcohol or narcotics operate it;
- performing diagnostics while the machine is working;
- machine maintenance and cleaning with the tractor engine running;
- staying outside the tractor cabin while the machine is working;
- staying between the tractor and the machine while attaching them or while the machine is working.

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8. Intended use of the machine

The machine is intended for soil cultivation in agriculture. Any other use (e.g. as a means of transport, etc.) is forbidden and may result in bodily injury or even death. The machine may only be used if it is technically sound and all faults must be repaired immediately. Applicable occupational health and safety regulations, generally accepted principles of occupational medicine, road and technical safety must be followed. The operating manual is an integral part of the machine and should be easily accessible. In the event of reselling the machine, the operating manual must also be passed on to the new owner. Original accessories and spare parts are designed specifically for this machine. The installation and use of non-original parts may result in adverse structural changes and negatively affect the safety of people and machines. The manufacturer is not liable for damage resulting from the use of unauthorized parts.

9. Use other than intended

The machine must not be used for activities that could be foreseen as improper use. The risk associated with using the machine other than for its intended purpose is borne solely by its user.

Examples of using the device contrary to its intended purpose:

- For transporting people or animals,
- For transporting building materials,
- For transporting fuels,
- For subsoiling.

10. Personnel qualifications

In order to avoid accidents, all people using the machine must meet the basic requirements:

- understanding the operation of the machine;
- recognize possible threats and prevent them from occurring;
- have proper physical attributes required to handle the machine;
- carrying out work in a safe manner as described in the manual;
- understanding the operating manual and following the information contained therein;
- have experience in driving vehicles;
- having a driving license for transport on public roads;
- adequate qualifications of people working with the machine;
- having appropriate physical conditions necessary to control the machine;
- supervision by a suitably qualified person of the person being trained in the use of the machine;

The owner or persons who will work with the machine must undergo training conducted by service employees during the first start-up and read the user manual.
It is the owner's responsibility to:

- train and instruct the operator;
- make the operating instructions available to the operator and ensure that the operator understands the information contained therein.

Machine operators must have appropriate knowledge to perform activities such as:

- maintenance;
- use;
- troubleshooting and repairing faults and defects;
- transport on public roads;
- adjustment and setting of the machine.

11. Fire regulations

- The tractor must be equipped with a fire extinguisher and placed in the holder;
- Fuel and hydraulic leaks from the machine and the tractor must be prevented;
- Using open fire or smoking is forbidden when fuelling up and operating the fuel system of the tractor;
- The fuel filler cap on the tractor must be tightly closed;
- The engine must remain turned off while refuelling;
- Flammable materials mustn’t be stored in the vicinity of the machine.

12. Transportation on public roads

- Before transportation, the working elements of the machine should be properly folded and lifted according to the manufacturer's recommendations.
- During transport, the width of the folded machine must not exceed 3 m and the 4 m height. You should also remember about the appropriate transport clearance.
- When driving, the prevailing road conditions must be taken into account.
- Always abide by allowable dimensions and weights.
- The weight of the tractor must be appropriately matched to the machine to ensure proper handling and braking performance of the entire set.
- Before driving, check whether the road and warning lights are properly connected and working.

ATTENTION 

- It is forbidden to transport people and objects on the machine.
- It is forbidden to drive on public roads with the filled tank.
- It is forbidden to drive the machine at a speed above 30 km/h.

13. Danger to children

Children in the close vicinity of the machine are subject to exceptional danger. It's forbidden for children to approach the machine. Before leaving the cabin, you must turn the tractor engine off and remove the keys from the ignition so children cannot start the machine by accident. Before starting work, you must check if there aren't any children in the danger zone. Always secure the machine where it's parked.

14. Complaints

Complaints should be rasied to the service department of Czajkowski Maszyny Sp.zoo.

15. Mounted and trailed equipment

1. Before connecting and disconnecting the suspended device to the 3-point hitch system, the hydraulic lift arms (in an agricultural tractor) should be left in such a position that the hydraulic system cannot start operating automatically.
2. For a three-point linkage system for an aggregated tractor with an STK unit, three-point linkage categories 3 and 4 apply. For a three-point linkage system for an aggregated seeder with an STK unit, three-point hitch categories 1, 2 and 3 apply.
3. Be especially careful in the operating zone of the three-point linkage. You can get crushed or suffer cuts. No one should stand between the Czajkowski STK unit and the PS seed drill or precision seeder when reversing the unit towards the machine.

Fig. 2. Pictogram NP002

4. When operating the three-point linkage from the outside, it is prohibited to:
   - staying between the agricultural tractor and the unit,
   - staying between the aggregate and the precision seeder,
   - staying between the unit and the PS seeding attachment,
   - staying on the unit's platforms.
5. When the machine is in the transport position, pay attention to protruding elements (hooks, rods) of the three-point linkage (if the PS seeding attachment or precision seeder is not connected).
6. It is important to secure the device against unwanted movement and rolling by using the parking brake locks.
7. When hitching with a drawbar, make sure that the drawbar has sufficient range of movement at the hitch point.

16. Warning pictograms

An important safety element of the machine's equipment are warning pictograms that inform about possible threats in dangerous places. The lack of warning pictograms increases the risk of serious and fatal injuries. It is necessary to stick the appropriate warning stickers on spare parts. Dirty warning stickers must be cleaned. Damaged or invisible warning stickers must be replaced immediately. New ones can be purchased from the manufacturer.

Pictograms have the following meaning:

NP001 – Before starting the machine, read the instruction manual and follow its recommendations

NP002 – It is forbidden for people to be between the machine and the tractor when hitching the device

NP003 – It is forbidden to transport people on the machine.

NP004 – Before starting inspection, maintenance or repair work, turn off the engine and remove the key from the ignition.

NP005 – Keep your distance

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NP006 – Do not enter the folding/unfolding area of the machine

NP007 – As long as there is a possibility of parts turning/folding, never reach into the area where there is a risk of crushing

NP008 – The pressure accumulator is under gas and oil pressure. Disassembly and repairs should be performed only in accordance with generally accepted technical principles

NP009 – Keep caution when releasing the high-pressure liquid, follow the instructions of the user manual

NP010 – Do not step on rotating components. Use only the platforms provided for this purpose and use the parking brake

NP011 – After connecting the machine to the tractor, fold the drawbar support

NP012 – It's forbidden to touch working discs while the machine is working

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NP013 – Never direct the water stream directly at electronic devices located under the cover

NP014 – Pay attention to the possibility of excessive hydraulic pressure while operating the machine

NP015 – Never reach into the area around the gears where there is a risk of crushing

17. Warning pictograms placement

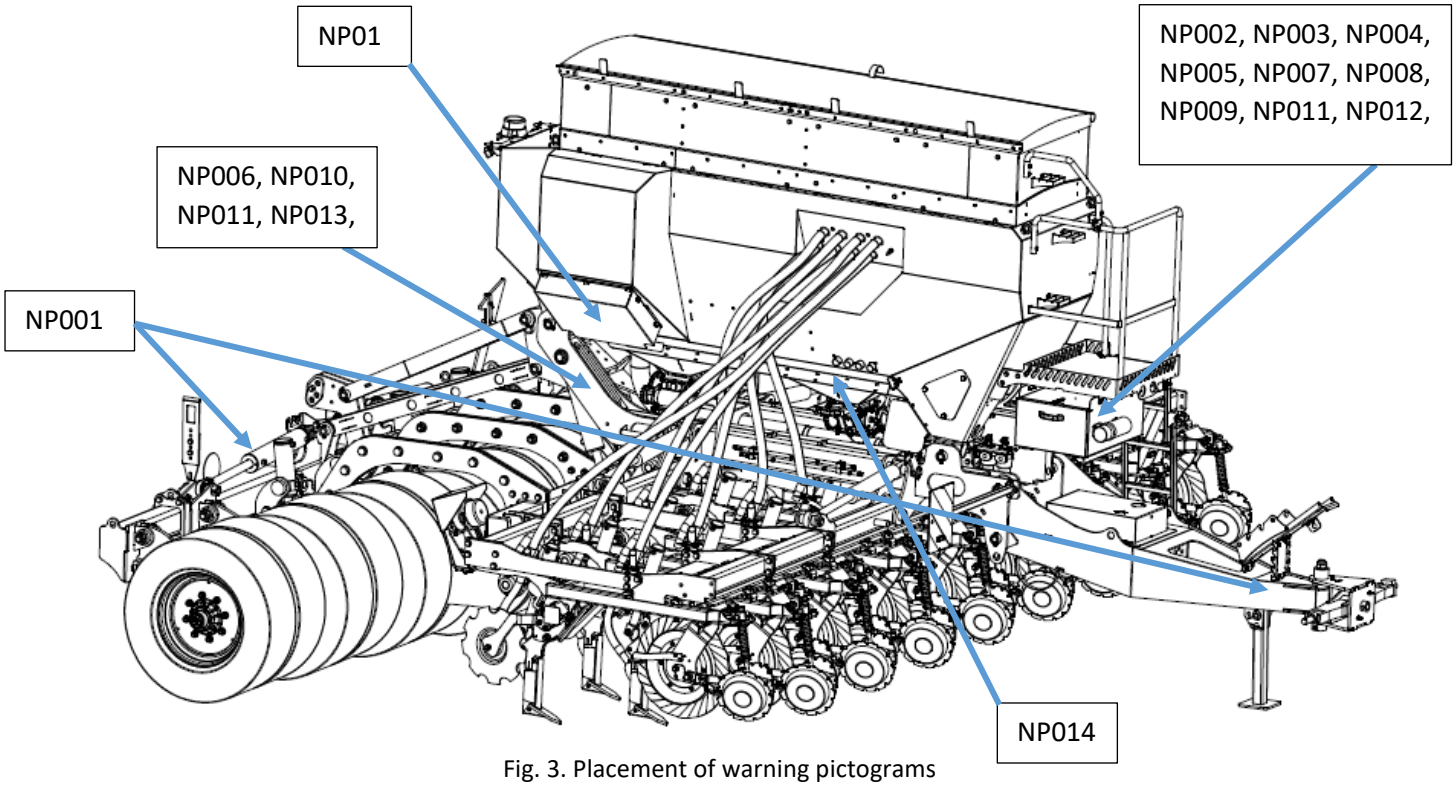

Fig. 3. Placement of warning pictograms

18. Technical data

Table 1. Technical data

MODEL	ST300 8R	ST400 10R	ST450 12R	ST600 16R
Working width	4x70cm / 4x75cm – maize, sunflower. 6x45cm – beetroot, rapeseed. 6x50cm – soybean. 8x37,5cm – grains, rapeseed.	4x70cm / 4x75cm – maize, sunflower. 6x45cm – beetroot, rapeseed. 6x50cm – soybean. 6x70cm / 6x75cm – maize, sunflower. 8x37,5cm – grains, rapeseed. 10x40cm – grains, rapeseed.	4x70cm / 4x75cm – maize, sunflower. 6x45cm – beetroot, rapeseed. 6x50cm – soybean. 6x70cm / 6x75cm – maize, sunflower. 8x37,5cm – grains, rapeseed. 10x40cm – grains, rapeseed. 12x37,5cm – grains, rapeseed.	4x70cm / 4x75cm – maize, sunflower. 6x45cm – beetroot, rapeseed. 6x50cm – soybean. 6x70cm / 6x75cm – maize, sunflower. 8x37,5cm – grains, rapeseed. 8x70cm / 8x75cm – maize, sunflower. 10x40cm – grains, rapeseed. 12x37,5cm – grains, rapeseed. 12x45cm – beetroot, rapeseed. 12x50cm – soybean. 16x37,5cm – grains, rapeseed.
Weight [kg] *	10300	11500	12000	14000
Number of furrow openers	from 4 to 8	from 4 to 10	from 4 to 12	from 4 to 16
Minimum power demand [KM] **	200	250	280	360
Transport width [m]	3			
Max transport height [m]	3,9			
Max transport length [m]	8,4			

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Tank volume / with extension [l]	3900 (60% / 40% or 40% / 60%) 4900 (60% / 40% or 40% / 60%)
Filling height of the tank / with extension [m]	2,8 / 3,3
Spacing of furrow openers	Stepless
Working depth [cm]	from 20 to 35cm
Roller ⌀ [cm]	102,5
Seeders	2x electrical
Hydraulic connectors	4 or 5 pairs + free flow
Rear 3-point linkage	Cat. II or cat. III (4000kg)
Rear PTO	Hydraulic
Power supply	12V
Lightning	LED
Video camera [pcs.]	from 1 to 4
Hydraulic filter [pcs.]	2
Connector type	Beam, cat. III

***** The given values are the maximum weights that occur in a full option of a given version of the machine

****** The minimum power demand will be correspondingly lower depending on the number of working sections.

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ST600/400 PLUS/450 PLUS

6 m working width

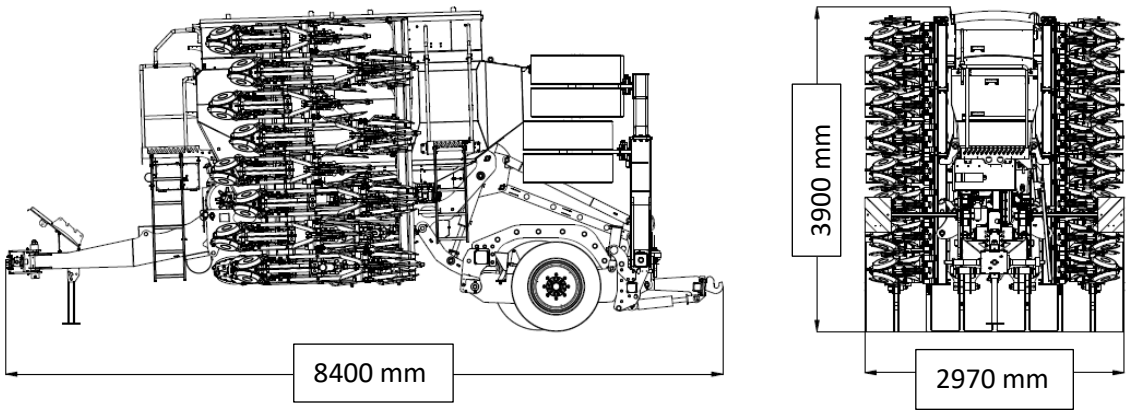

Fig. 4. Overall dimensions of the 6m machine with attachment.

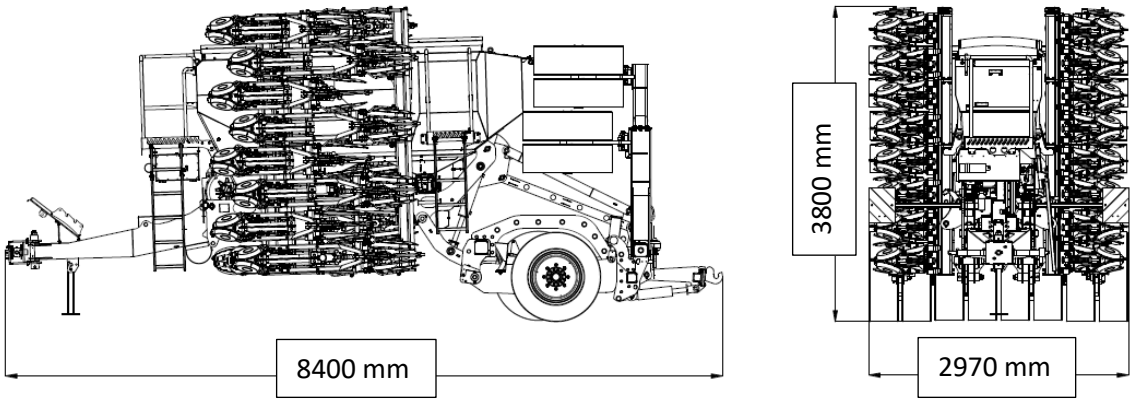

Fig. 5. Overall dimensions of the 6 m machine without attachment.

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4,5 m working width

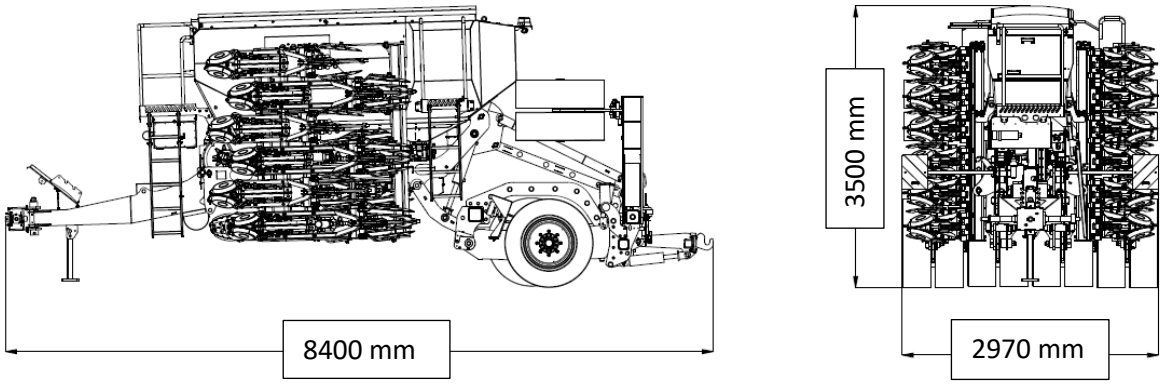

Fig. 6. Overall dimensions of the 4,5 m machine without attachment.

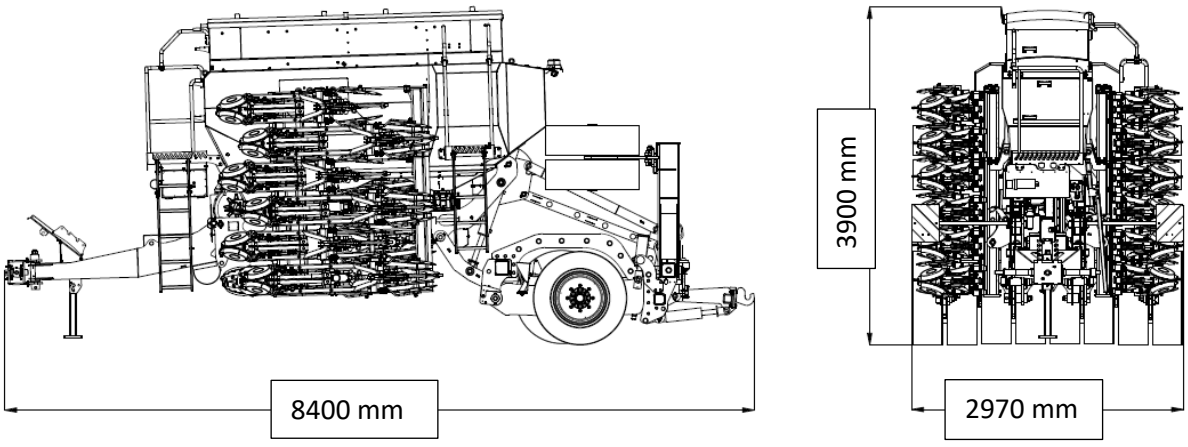

Fig. 7. Overall dimensions of the 4,5 m machine with attachment.

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ST300

3,0 m working width

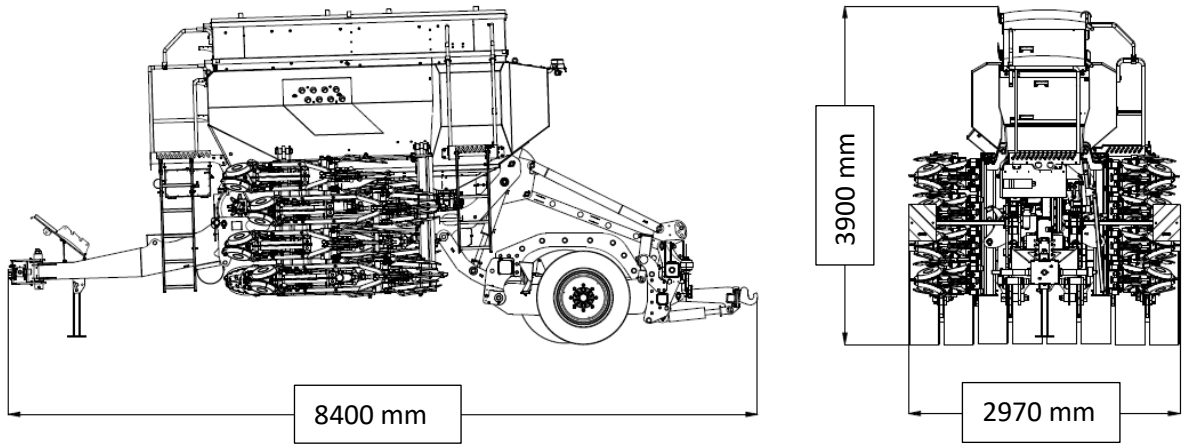

Fig. 8. Overall dimensions of the 3 m machine with attachment

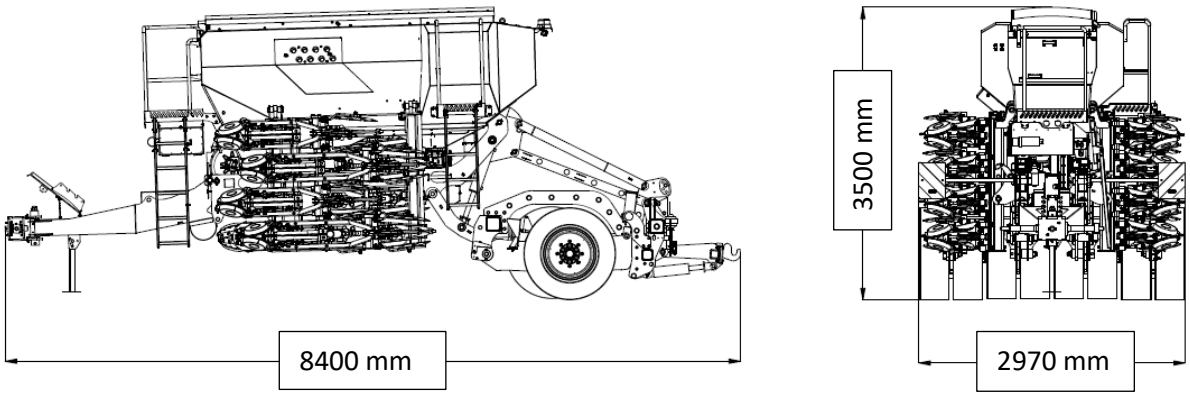

Fig. 9. Overall dimensions of the 3 m machine without attachment

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19. Load calculation

The permissible load capacity of the tyres, axles and tractor weight must not be exceeded when hitching or mounting the equipment. Before road transport, check whether the tractor being used has not been overloaded and is compatible with the machine. The front axle of the tractor must always be loaded with a weight of at least 20% of the tractor's own weight. Due to differences in equipment, machines must be weighed separately to determine their self-weight.

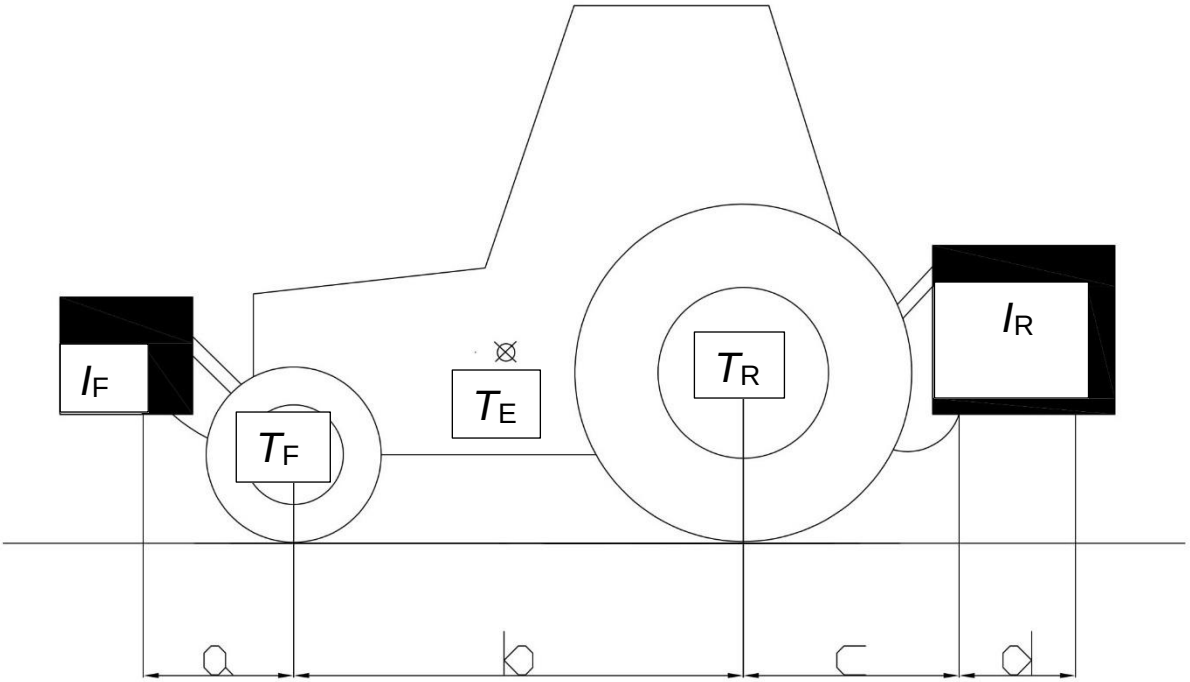

Fig. 10. Load calculation scheme

T_E [kg] – tractor's own weight
T_F [kg] – front axle load of the tractor without load
T_R [kg] – rear axle load of the tractor without load
I_R [kg] – total weight of the rear mounted machine/ rear weights
I_F [kg] – total weight of the front mounted machine/ front weights
a [m] – the distance from the center of the front axle to the center of gravity of the front mounted machine/front weights
b [m] – tractor wheelbase
c [m] – distance from the center of the rear axle to the center of the bottom mounting points
d [m] – distance from the center of the bottom mounting points to the center of gravity of the rear-mounted machine/rear weights
x - the tractor manufacturer's information refers to the minimum rear load (if no additional information is given, enter 0.45).

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1. Calculation of the minimum front load when the equipment is mounted at the rear:

$$I_{Fmin} = \frac{[I_R \ x \ (c+d)] - (T_F \ x \ b) + (0{,}2 \ x \ T_E \ x \ b)}{a+b}$$

2. Calculation of the minimum rear load when the equipment is mounted at the front:

$$I_{Rmin} = \frac{(I_F \ x \ a) - (T_R \ x \ b) + (\mathrm{x} \ x \ T_E \ x \ b)}{b+c+d}$$

3. Calculation of actual front axle load:

$$T_{Fmin} = \frac{[I_R \ x \ (a+b)] - (T_F \ x \ b) + [(T_R \ x \ (c+d))]}{b}$$

4. Calculation of the real total weight:

$$T_{real} = I_f + T_E + I_R$$

5. Calculation of the actual rear axle load:

$$T_{R\,real} = T_{real} - T_{F\,real}$$

Verification of calculations

The calculations should be additionally checked. It is important to weigh up the front axle load and the rear axle load with the attached machine and the load. The measured values should be compared with the limit values.
In addition, the following should be checked:

- minimum front axle load (20% of the tractor's net weight),
- maximum front and rear axle load,
- allowable total weight.

20. Danger zone

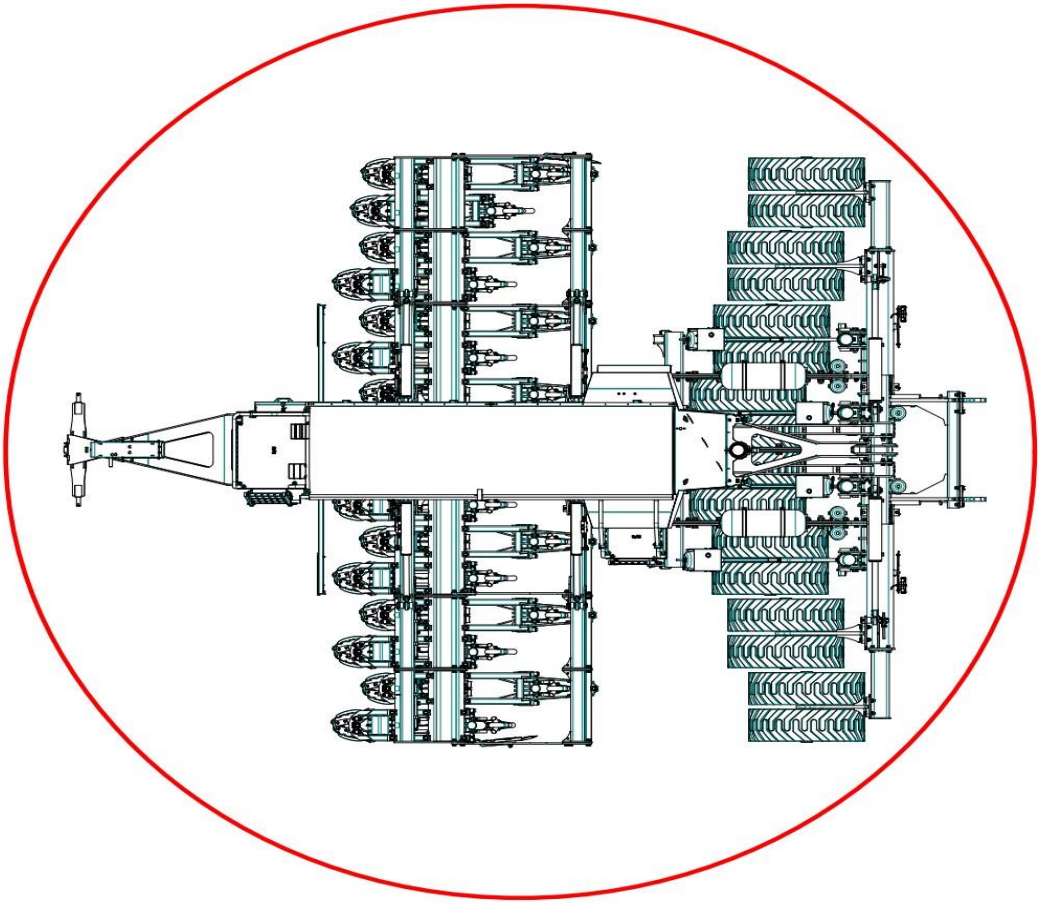

Fig. 11. Danger zone

Figure above shows the machine's danger zone.
The following hazards may occur in this area:

- hydraulically lifted parts may move unnoticed;
- machine movements;
- torn or partially insulated cables may cause electric shock;
- accidental activation of the hydraulic system may cause uncontrolled machine movements.

Entering or remaining in the danger zone may result in serious injury or death. It is forbidden for people to remain in the zone between the machine and the tractor. The tractor engine must be switched off when in the danger zone – this also applies to routine checks. It is forbidden to remain under raised machine elements. If the machine is equipped with a fertilizer spreader, special care must be taken to ensure that no one is on the platform when the side wheels are folded. Compliance with the operating instructions is mandatory

ATTENTION When moving and unfolding the machine, check whether there are no bystanders within the danger zone.

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21. Use of fertilizers and treated seeds

The manufacturer recommends using high-quality original fertilizers with a moisture content that allows the seeder to work without any issues. Both fertilizers and treated seeds must be handled in a professional manner that does not endanger the life and health of the operator.
The manufacturer's safety specifications must also be followed, if there aren't any, please contact the dealer or manufacturer
When working, you need to have personal protective equipment, that complies with information provided by the manufacturer, at hand.

22. Identification plate

Fig. 12. Identification plate

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23. Design of the machine

The strip till cultivation units **ST300, ST400, ST450, ST600** consist of the following main components:

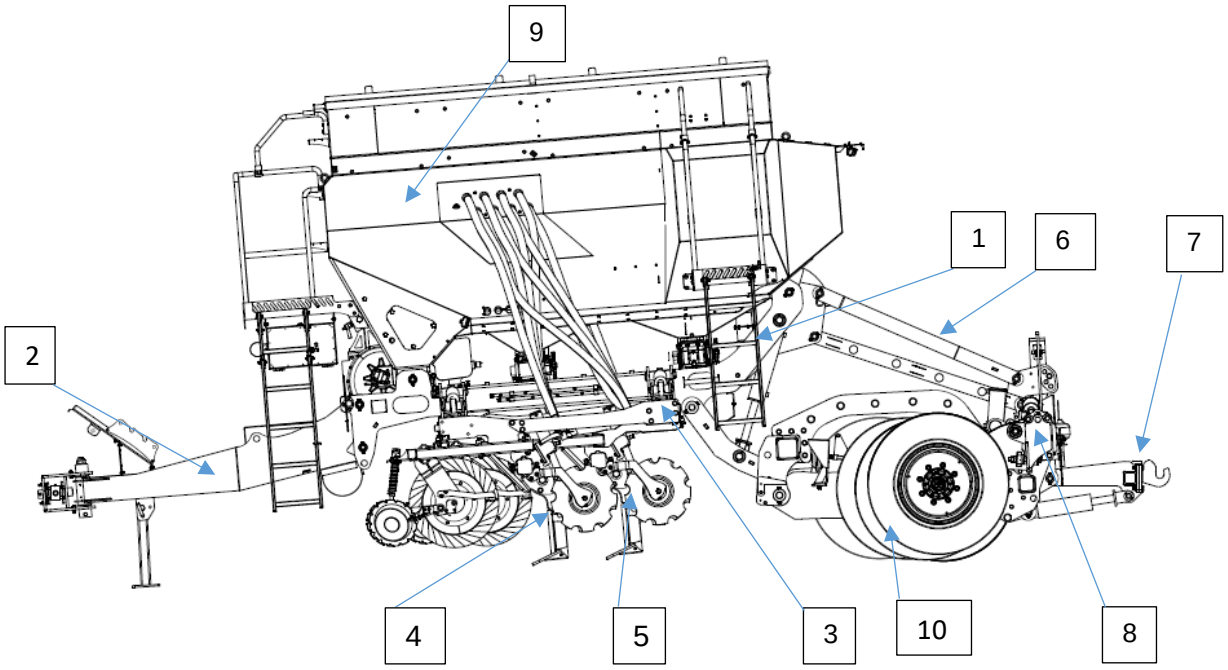

Fig. 13. The machine

1. Mainframe
2. Drawbar
3. Intermediate frame
4. Short working section
5. Long working section
6. Machine lifting arm
7. Rear 3-point linkage
8. Rear side beam
9. Tank
10. Tire roller

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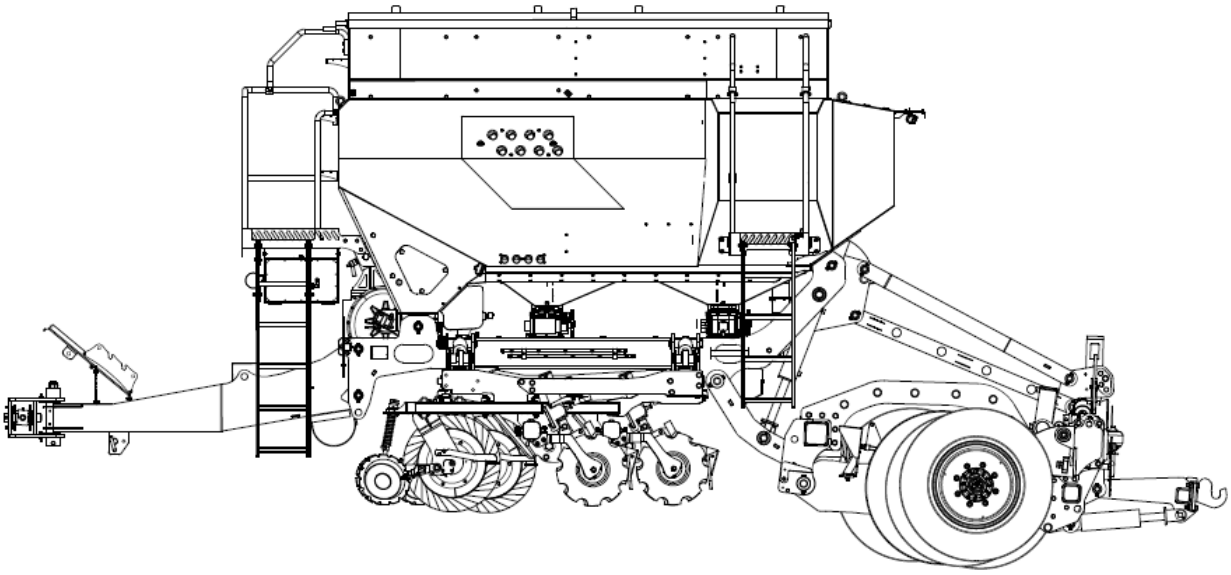

Fig. 14. Lifted machine with folded working parts

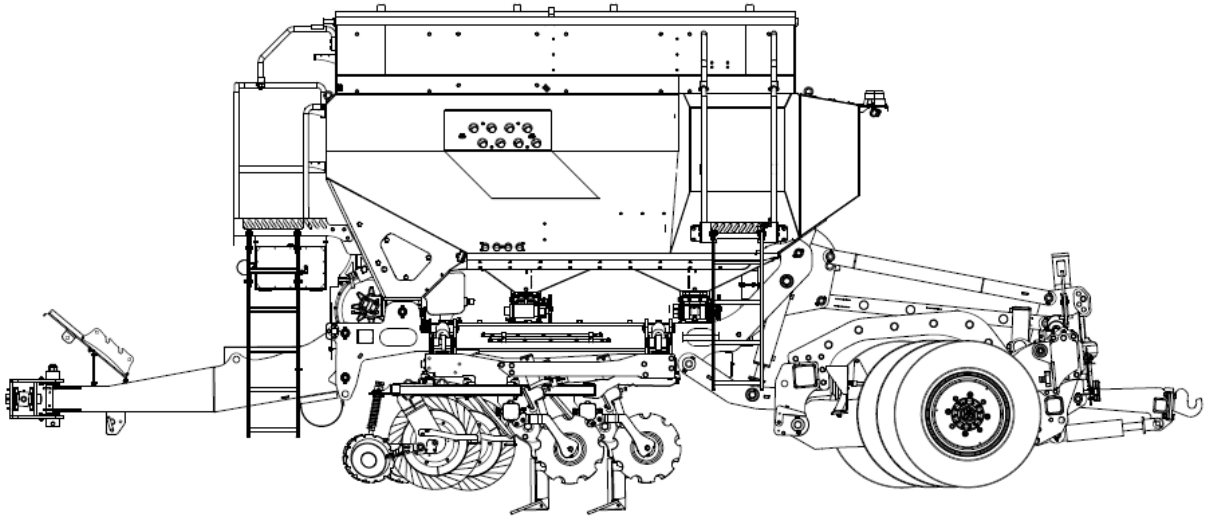

Fig. 15. Lowered machine with folded working parts

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The strip tillage machine has a drawbar with a hitch axle in the front part, which is connected to the main frame using pins. The ST machine has two intermediate frames - left and right, which are attached to the main frame using pins. It is possible to install intermediate frame inserts to increase the working width of the machine. The intermediate frames are lifted using double-acting hydraulic cylinders. Working sections are attached to the intermediate frames using dedicated handles. The tank with all the equipment sowing fertilizer and seeds is mounted on the main frame. At the rear of the machine, the main frame is coupled by pins to the frame in front of the wheels via lifting arms. The main frame is connected with the rear frame using pins via stabilizer arms. The machine itself is lifted using hydraulic cylinders attached on one side to the main frame, and on the other side to the machine's lifting arms. The three-point linkage beam is attached to the rear frame of the machine using pins, which is also lifted using hydraulic cylinders. The three-point linkage beam is used to attach a precision seeder or PS attachment.

Description of actions performed by working parts of the machine:

- Spreading the pre-crop using spreading and tearing discs (mulch).
- Cutting the soil to a depth of 12 cm using a wavy cutting disc
- Loosening and aerating the soil to a depth of 35 cm using a furrow opener, covered with a replaceable, rotating, U-shaped shield together with a first-cut chisel and a self-sharpening, replaceable rotating sword.
- Applying fertilizer using a fertilizer coulter (applicator adjustable in 2 positions).
- Closing the gap using toothed closing discs.
- Compacting and levelling the soil surface using the compacting and levelling roller.
- Sowing plants using the PS attachment (if sowing wheat, peas or rapeseed).

In case of sowing other crops, the PS attachment must be replaced with a precision seeder of an external company. The unit is adapted to connect seeders that meet the spacing requirements of Polish standards

23.1. Working sections

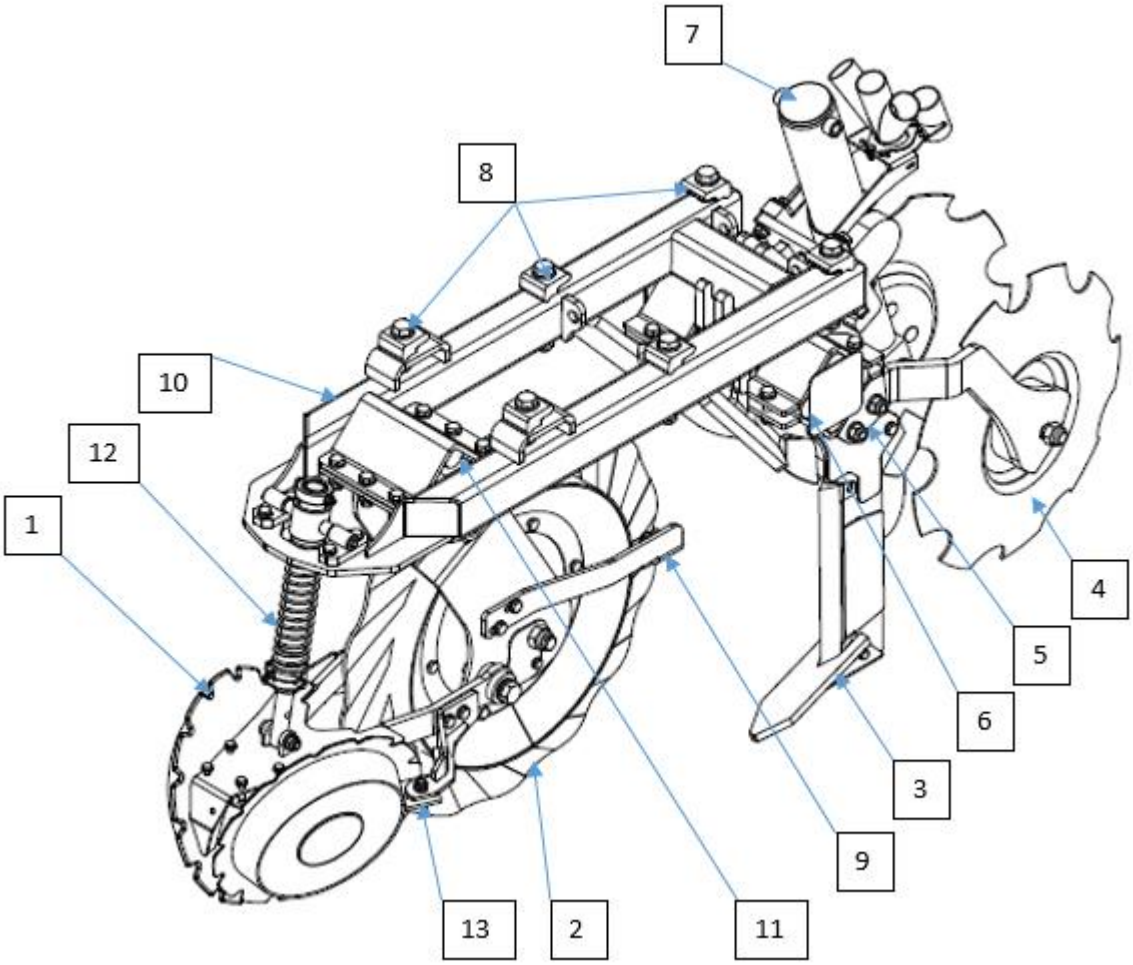

Fig. 16. Short section

1. Spreading and breaking disc
2. Wavy cutting disc
3. Furrow opener
4. Toothed closing disc
5. Adjustment of the toothed closing disc
6. Rubber protection of the toothed closing disc
7. Hydraulic protection of the furrow opener
8. Section mounting frame
9. Scraper
10. Short section frame
11. Rubber protection of the cutting disc
12. Shock absorber of the spreading and breaking discs
13. Scraper of the spreading and breaking disc

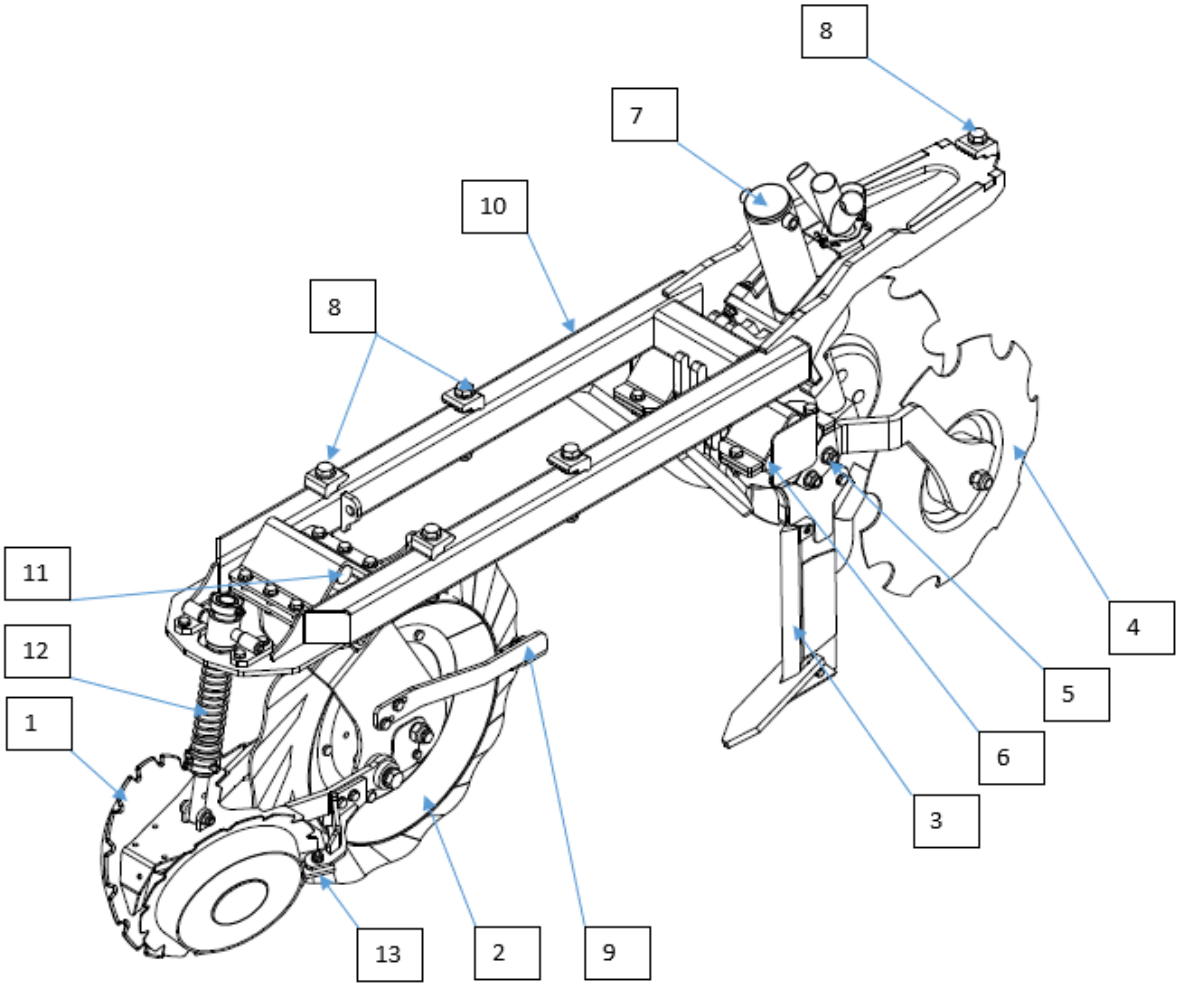

Fig. 17. Long section

1. Spreading and breaking disc
2. Wavy cutting disc
3. Furrow opener
4. Toothed closing disc
5. Adjustment of the toothed closing disc
6. Rubber protection of the toothed closing disc
7. Hydraulic protection of the furrow opener
8. Section mounting frame
9. Scraper
10. Short section frame
11. Rubber protection of the cutting disc
12. Shock absorber of the spreading and breaking discs
13. Scraper of the spreading and breaking disc

23.2. Design of the furrow opener

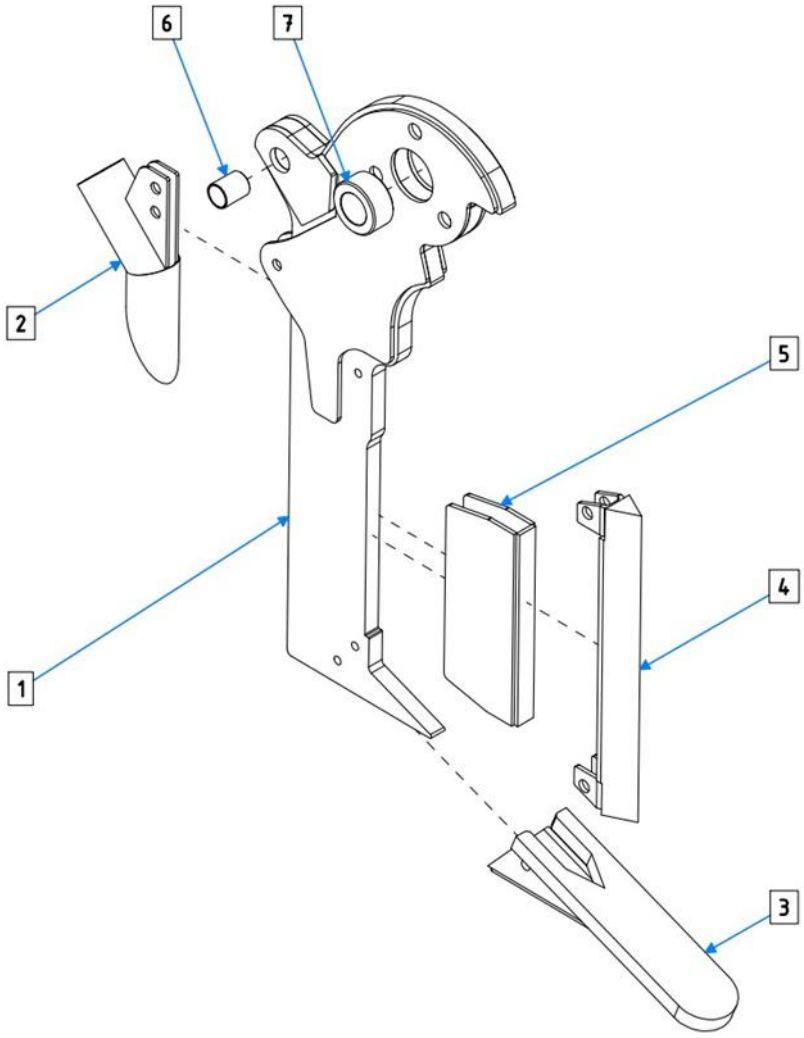

Fig. 18. Design of the furrow opener

1. Coulter beam (not replaceable, doesn't wear out)
2. Seed pipe (not replaceable, doesn't wear out)
3. Chisel fixed with a rawlplug (replaceable element, wears out)
4. Self-sharpening rotating sword (replaceable element, wears out)
5. Coulter beam cover (replaceable element, wears out)
6. d20/D23 sleeve (replaceable element, wears out)
7. d30/D50 L24 sleeve (replaceable element, wears out)

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23.3. Types of chisels

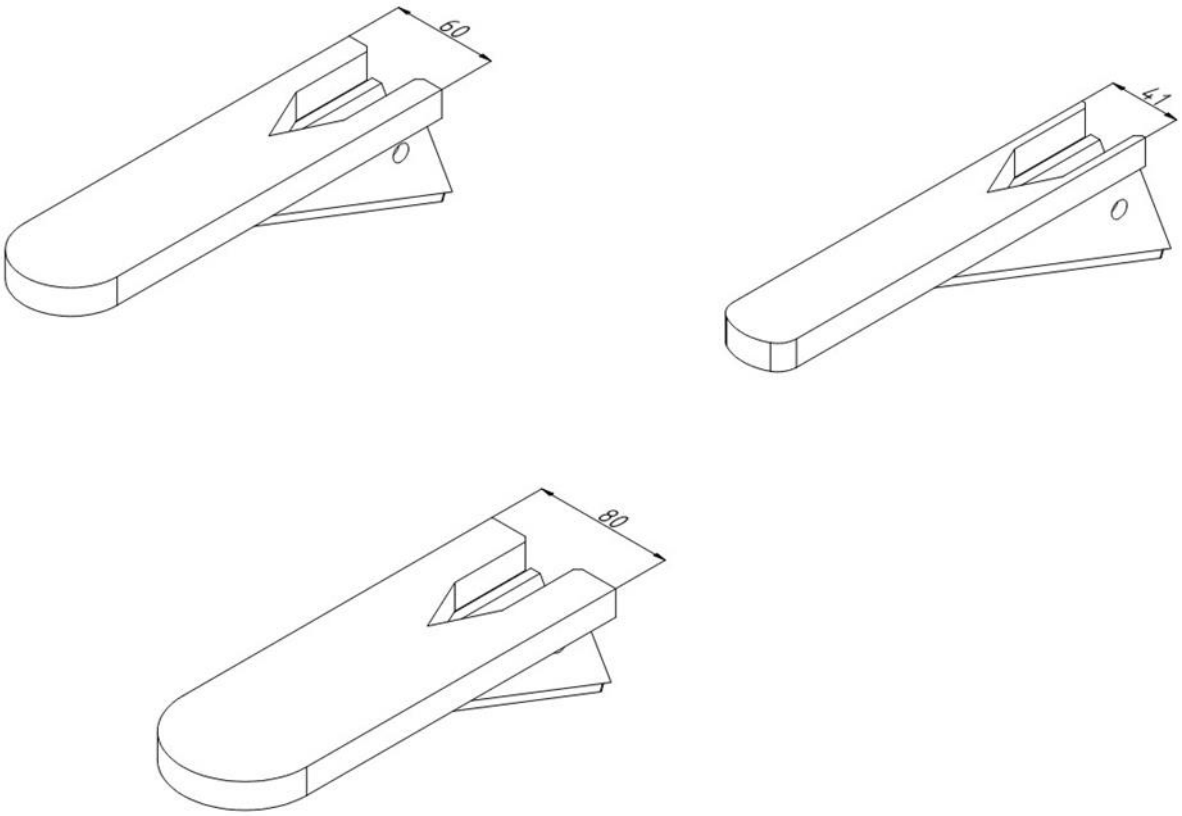

Fig.19. Types of available chisels

The manufacturer recommends using different types of chisels dedicated for specified plants:

- in rapeseed cultivation, it's recommended to use narrow chisels with working width of 41mm;
- in maize cultivation, it's recommended to use wide chisels with working width of 80mm;
- cultivation of plants other than those mentioned above, it's recommended to use standard chisels with working width of 60mm.

Each type of the above-mentioned chisels is available with a soldered carbide plate or an abrasion resistant hard-faced plate.

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23.4. Tank

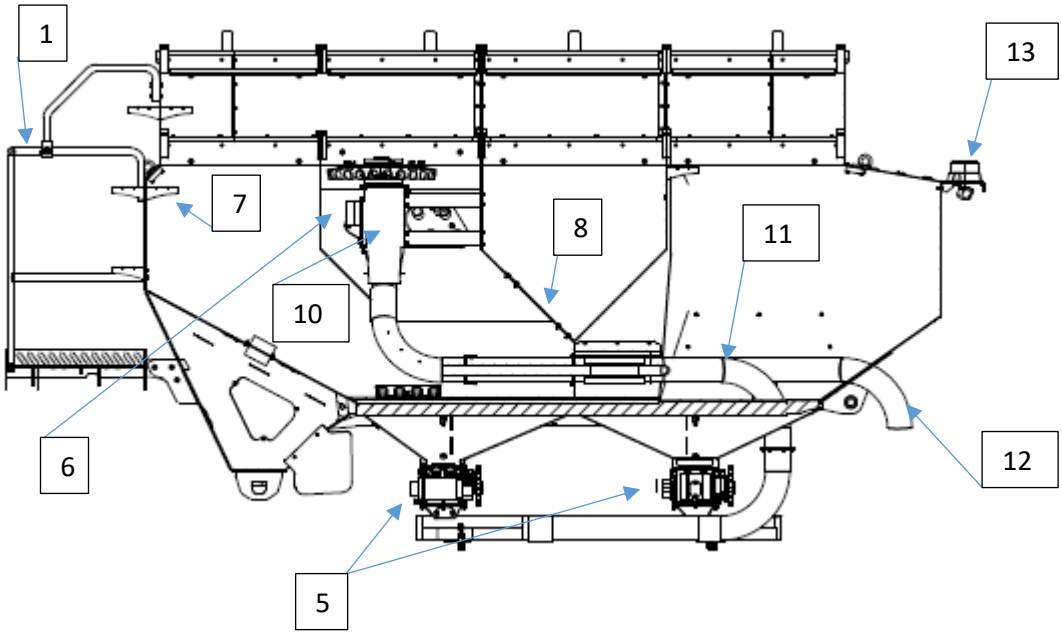

Fig. 20. Tank – View A

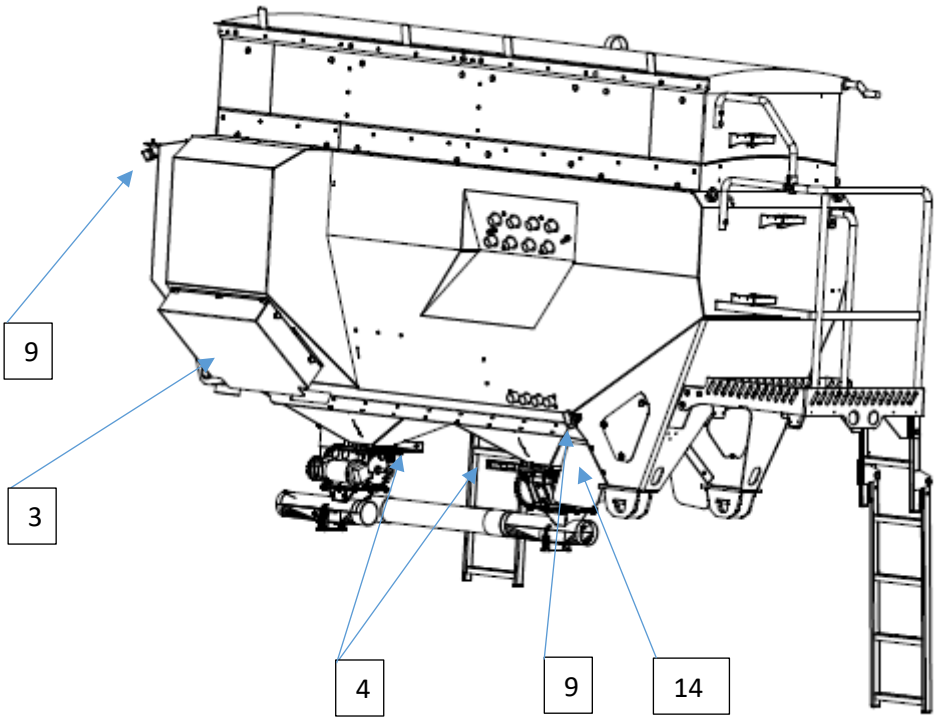

Fig. 21. Tank – View B

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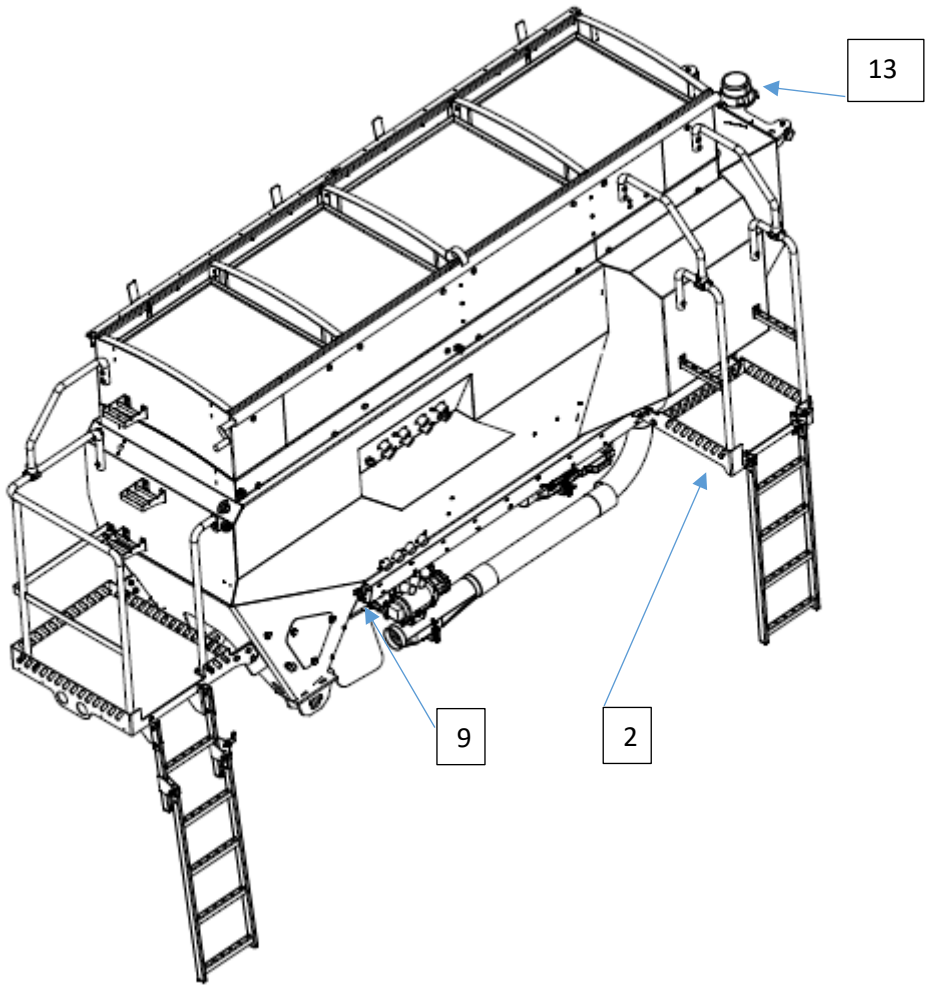

Fig. 22. Tank – View C

1. Front platform
2. Rear platform
3. Electrical switchboard
4. Valve for cutting off the tank from the distributors
5. Seeder
6. Bleed valve cover
7. Step
8. Chamber capacity changing hatch
9. Lightning
10. Pipes in the tank
11. Angle joint
12. Seeder outlet
13. Warning lamp
14. Hydraulic block cover

Percentage division of the tank chambers

Using the flap in the tank, it is possible to change the capacity of the tank chamber in the following proportions: 60%/40% – fertilizer/fertilizer or 40%/60% fertilizer/seeds.

To change, unscrew 7x M6x20 screws and move the flap to the other side of the tank chamber, covering the appropriate cutout. Then secure the flap by screwing in 7x previously unscrewed screws.

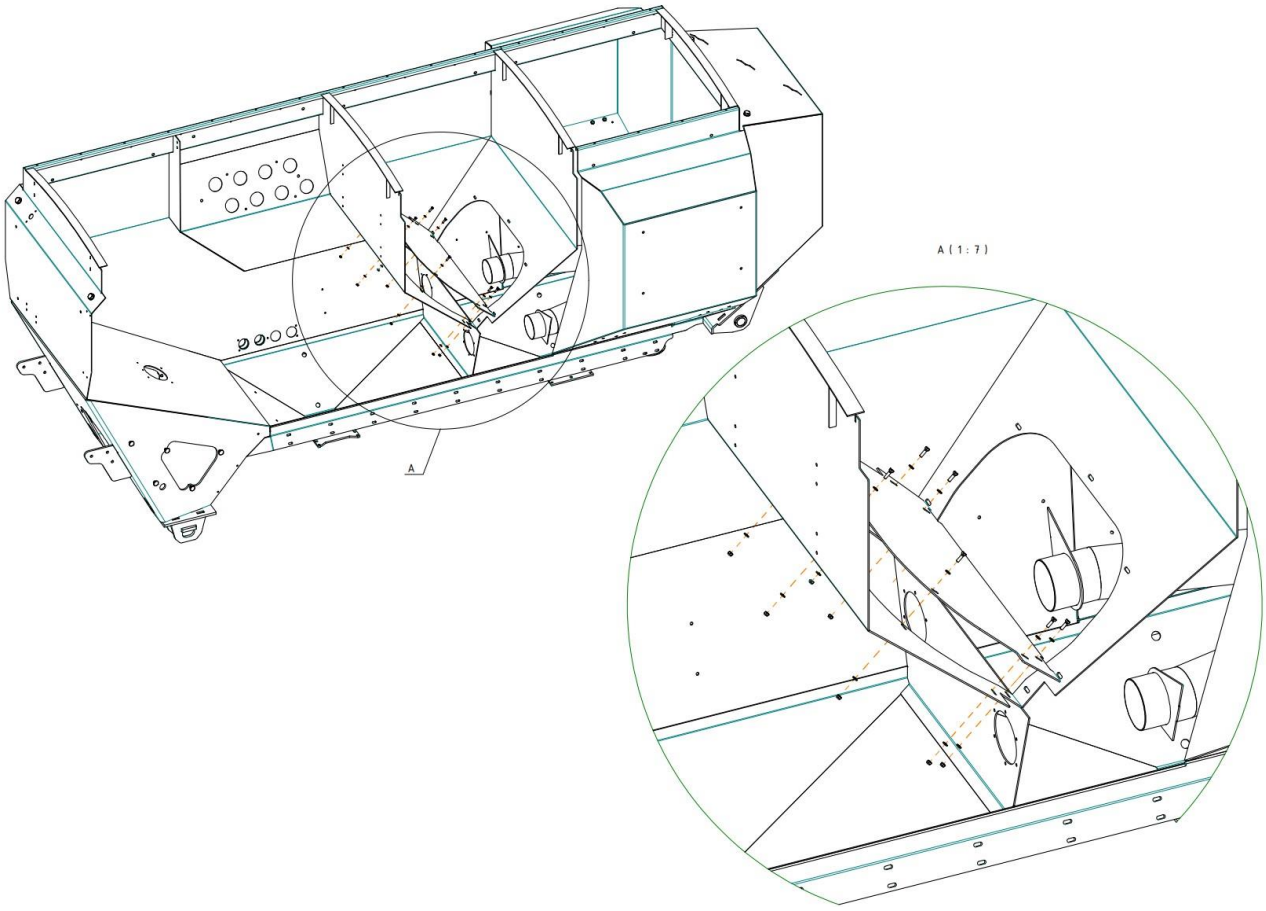

Fig. 23. Division of the tank chambers

If you want to sow fertilizer from two tank chambers, you need to connect both sowing devices to the two rear outlets coming out of the tank.

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23.5. Seed sensor position

The following figure shows the location of the seed or fertilizer sensor on the tank. The sensor indicates the presence of seed or fertilizer in the tank. In the case of rapeseed or catch crops (seeds with low sowing rates per hectare), the sensor should be mounted in a lower position.

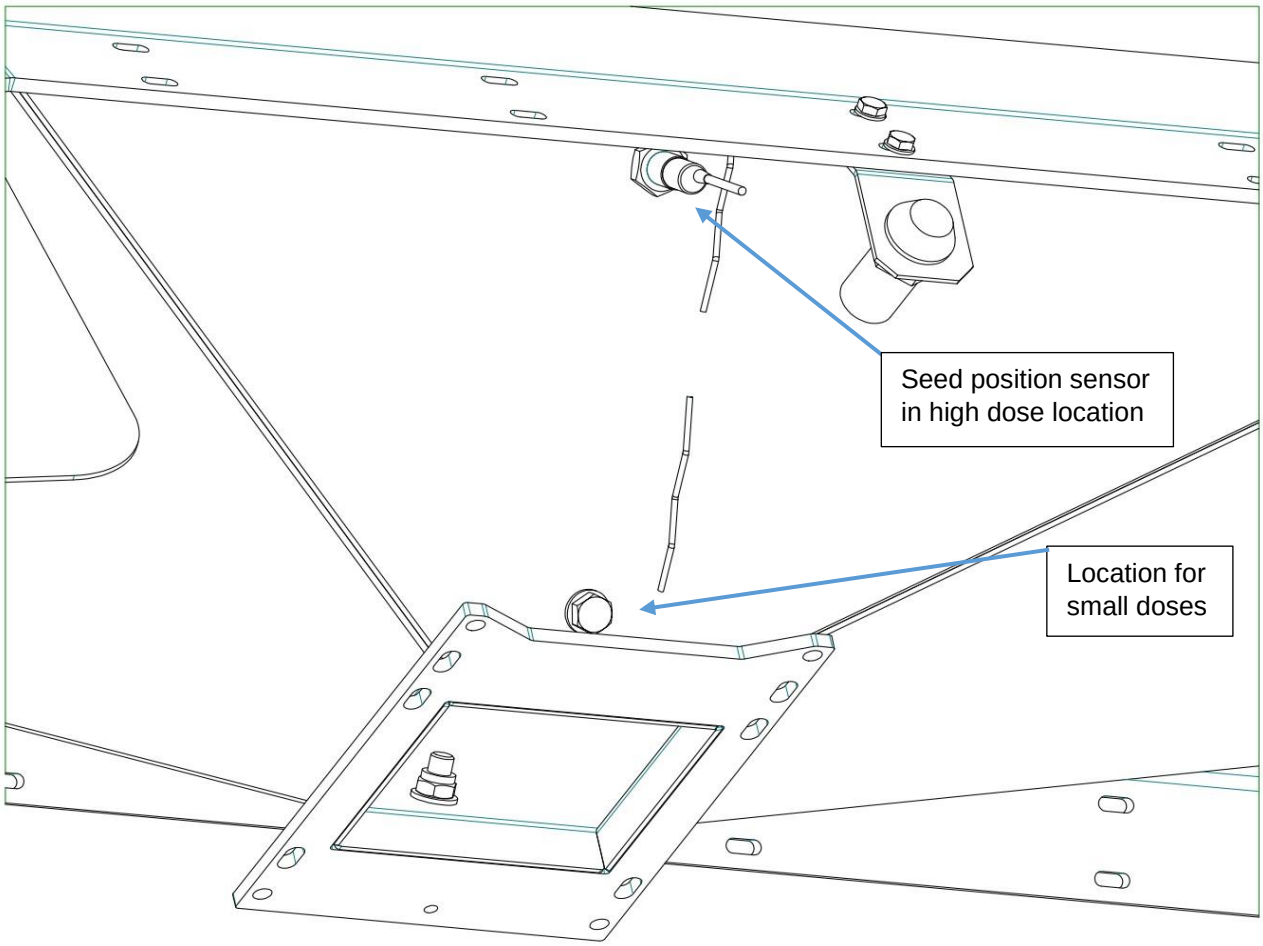

Fig. 24. Changing the place of the sensor in the tank

24. ST300 frame layouts for specific seeding applications

Please note that in the 37.5 cm and 40 cm spacing the toothed closing discs should only be mounted on the outer sections.

24.1. 37.5 cm spacing, ST600 – 16-frame configuration

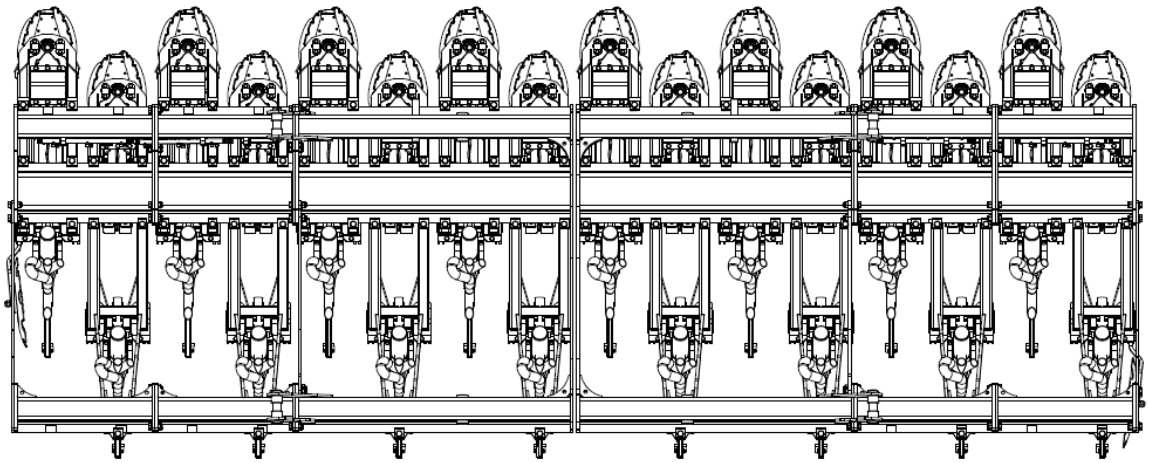

Fig. 25. 37,5 cm spacing for ST600

24.2. 75 cm spacing, ST600 – 8-frame configuration

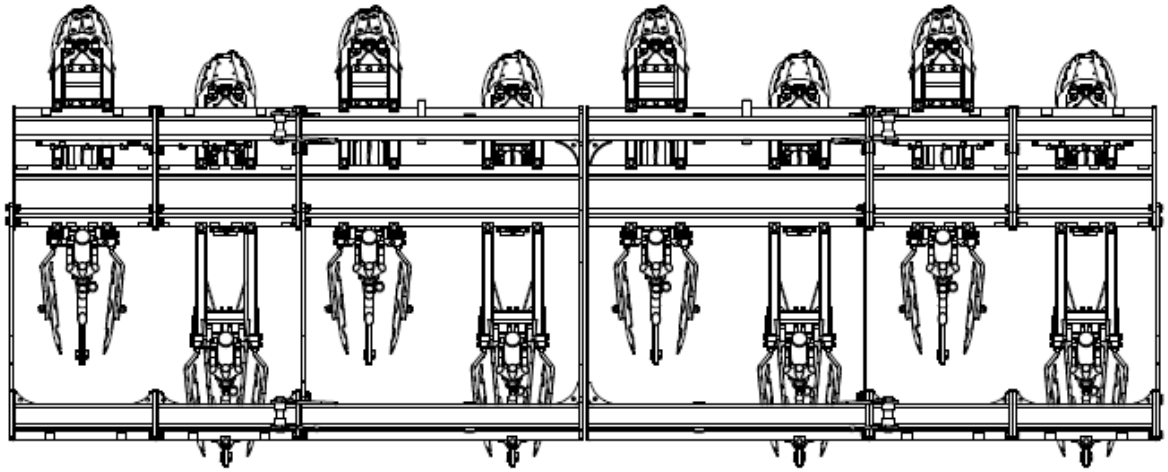

Fig. 26. 75 cm spacing for ST600

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24.3. 70 cm spacing, ST600 – 8-frame configuration

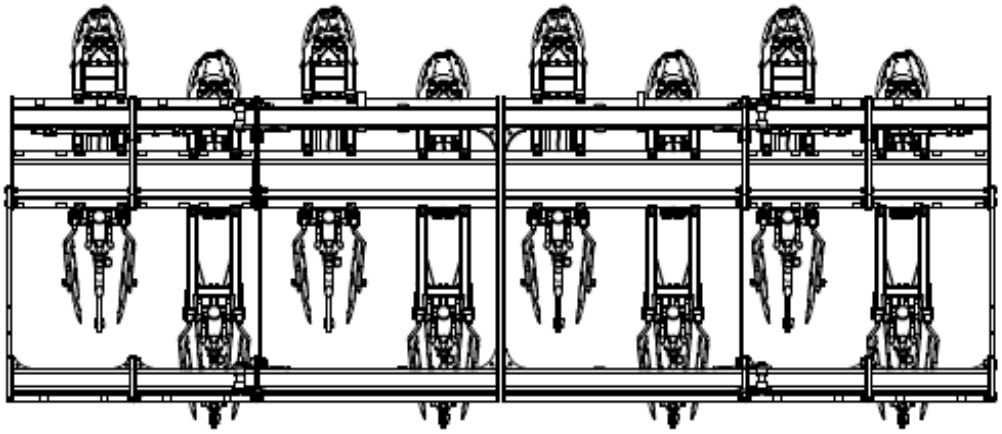

Fig. 27. 70cm spacing for ST600

24.4. 45 cm spacing, ST600 – 12-frame configuration

In the case of 12 x 45 cm spacing, outer wheels of the roller must be removed and replaced with two U-ring sets.

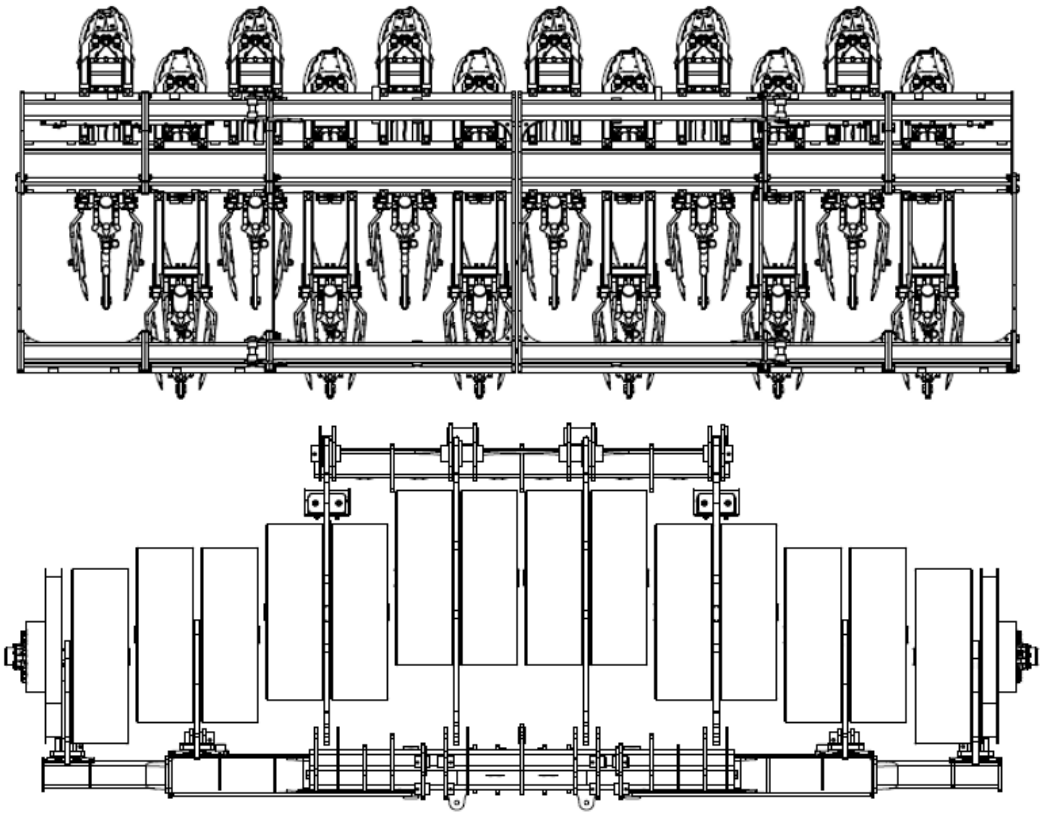

Fig. 28. 45 cm spacing for ST600

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25. ST400/ST450 frame layouts for specific seeding applications

25.1. 37,5 cm spacing, ST450 – 12-frame configuration

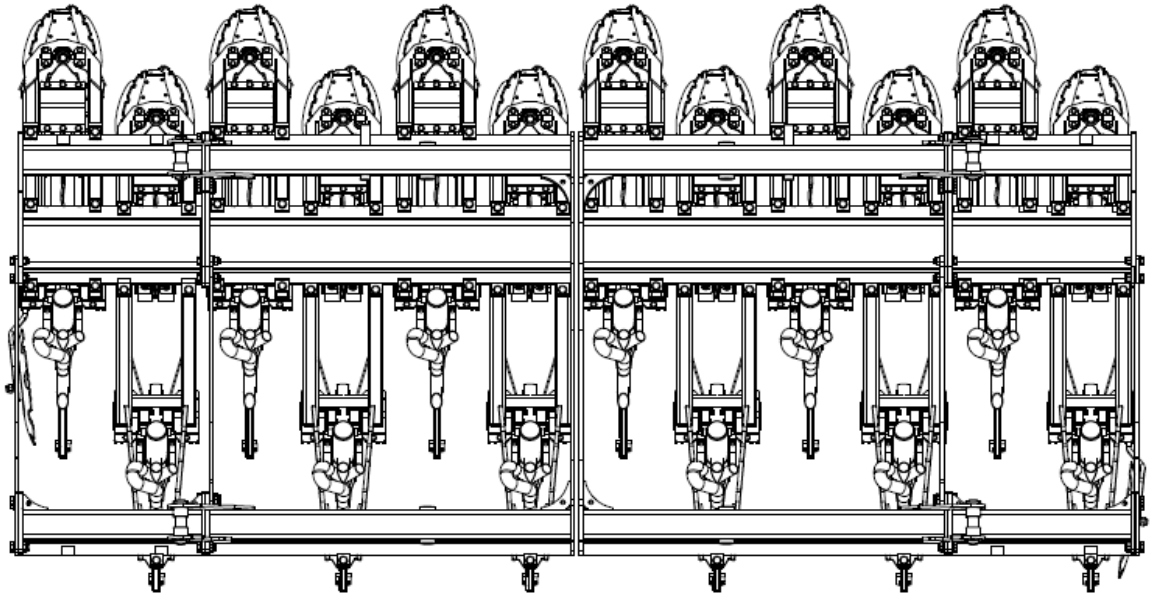

Fig. 29. 37,5 cm spacing for ST450

25.2. 75 cm spacing, ST400/ST450 – 6-frame configuration

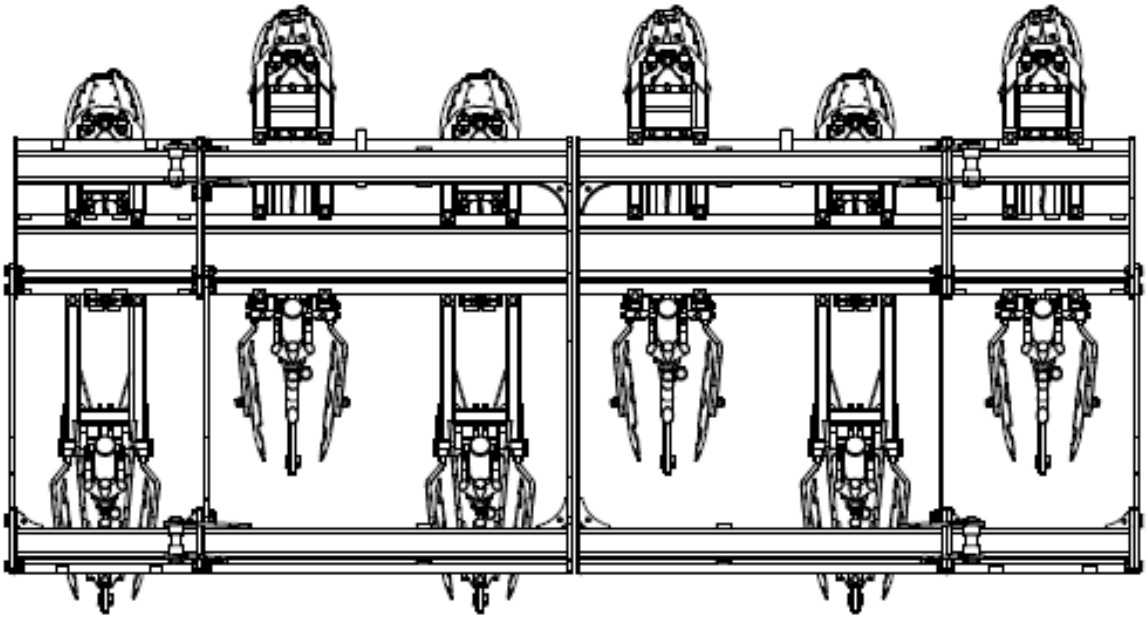

Fig. 30. 75 cm spacing for ST400/ST450

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25.3. 45 cm spacing, ST400/ST450 – 6-frame configuration

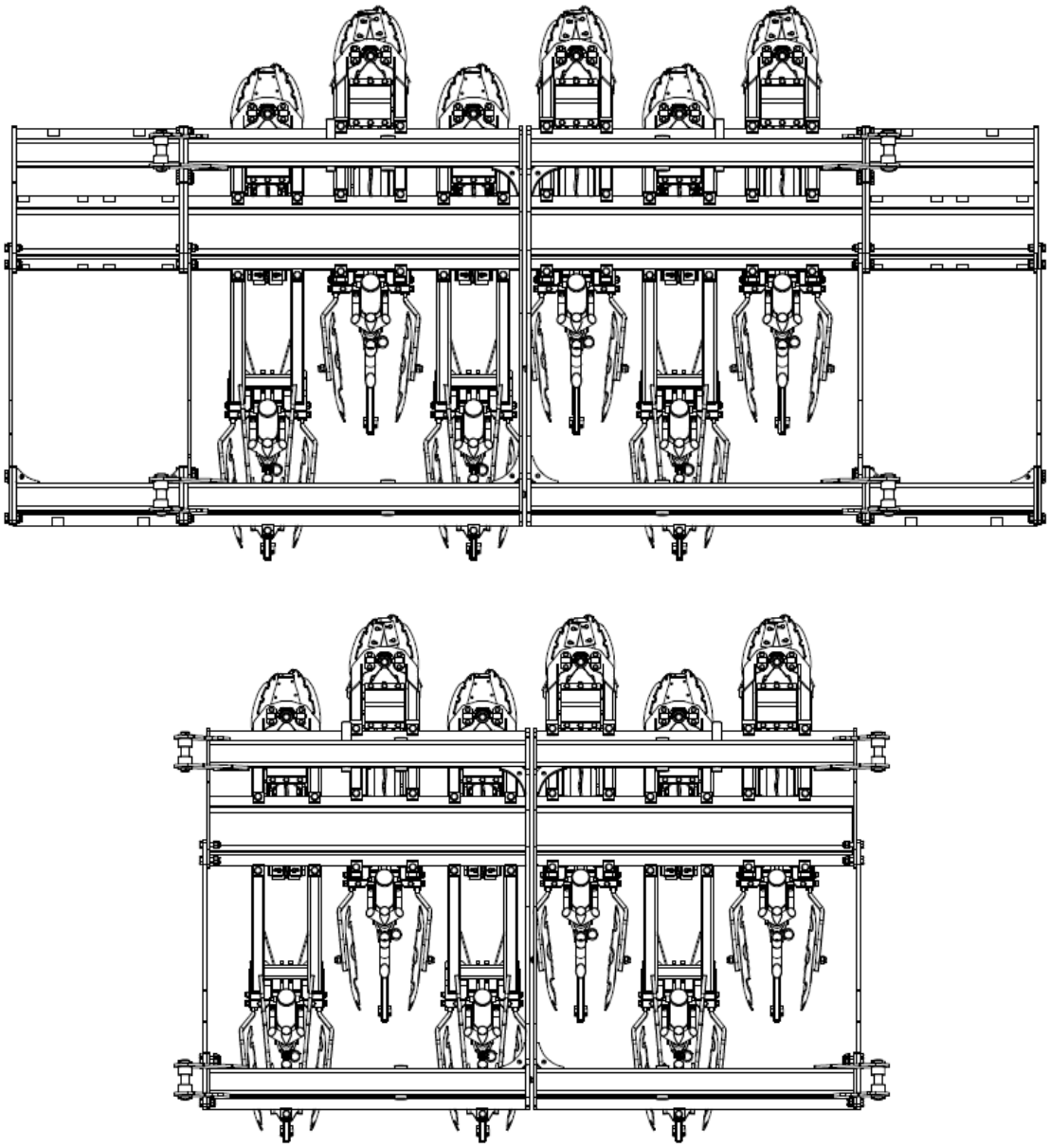

Fig. 31. 45 cm spacing for ST400/ST450

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25.4. 40 cm spacing, ST400 – 10-frame configuration

For a 12 x 40 cm spacing, the two outer wheels in the tire roller must be removed and replaced with two U-ring sets.

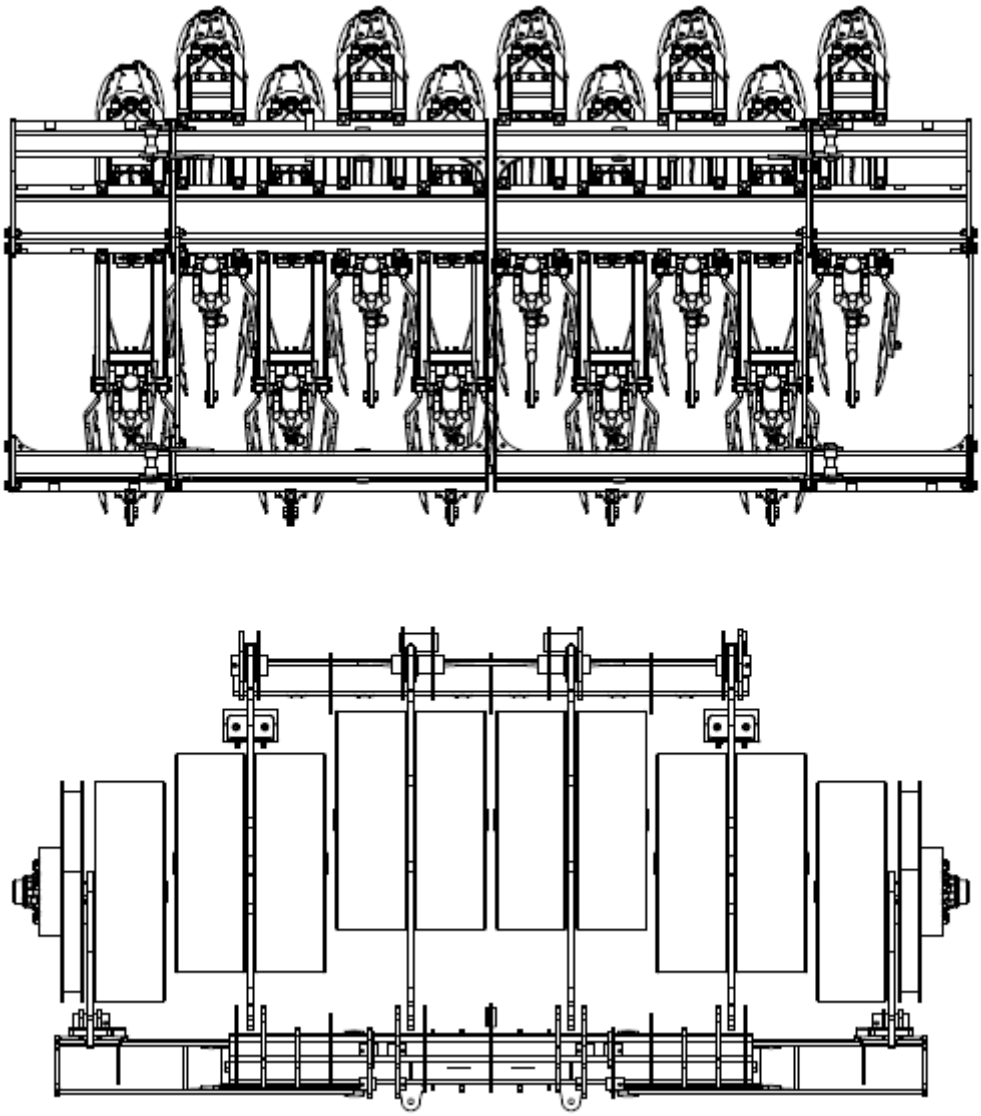

Fig. 32. 40 cm spacing for ST400

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26. ST300 frame layouts for specific seeding applications

26.1. 37,5 cm spacing, ST300 – 8-frame configuration

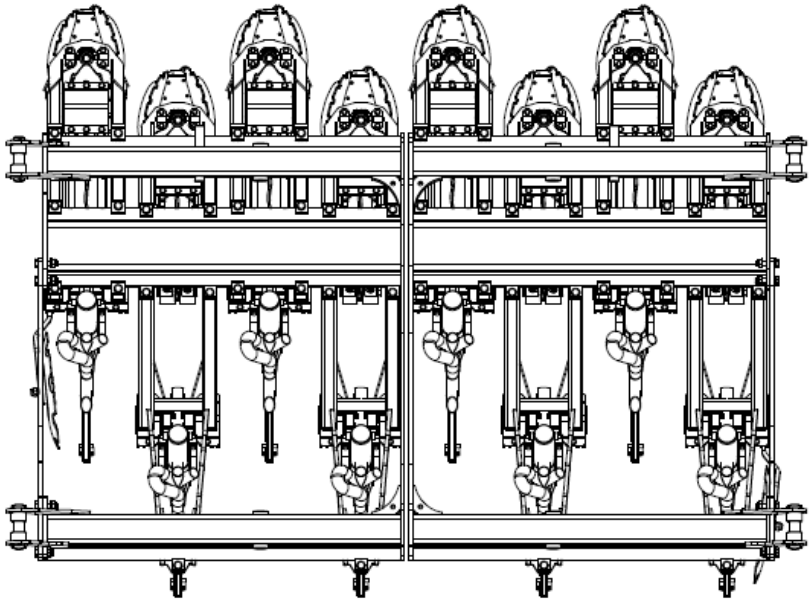

Fig. 33. 37,5 cm spacing for ST300

26.2. 45 cm spacing, ST300 – 6-frame configuration

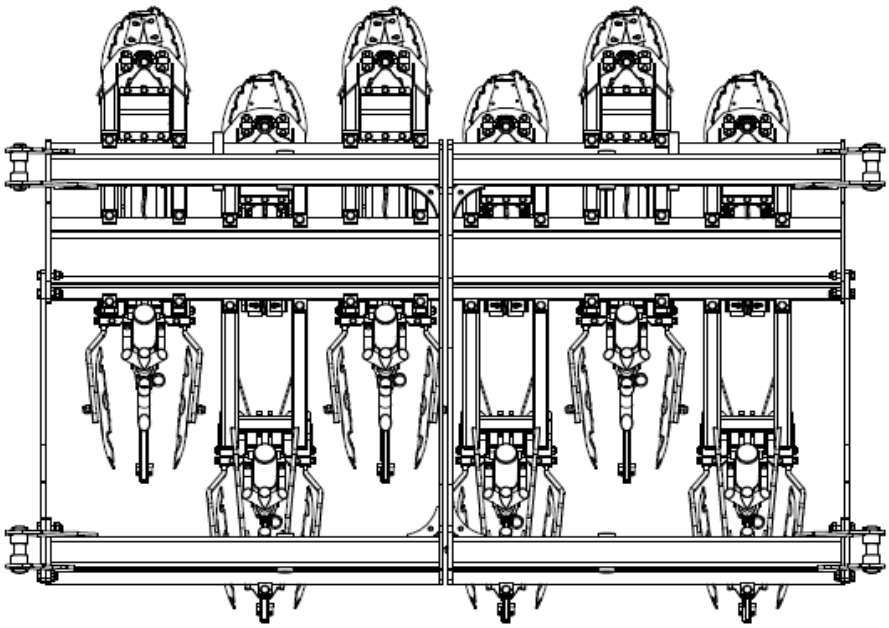

Fig. 34. 45 cm spacing for ST300

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26.3. 75 cm spacing, ST300 – 4-frame configuration

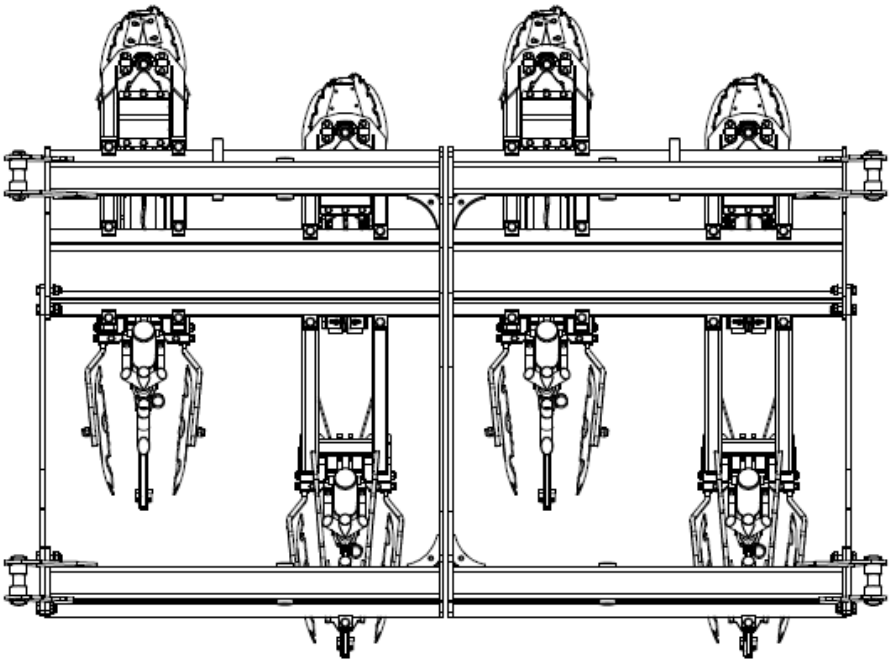

Fig. 35. 75 cm spacing for ST300

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27. Attaching and detaching the working sections

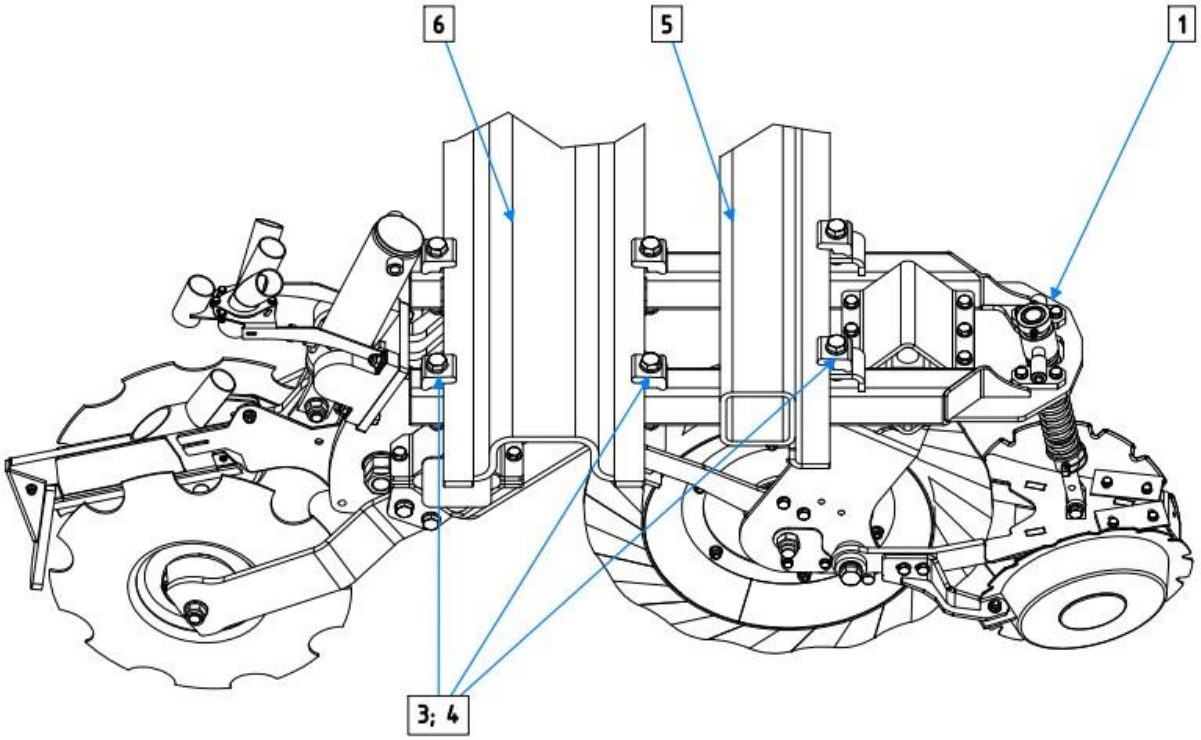

Fig. 36. Attaching the short working section

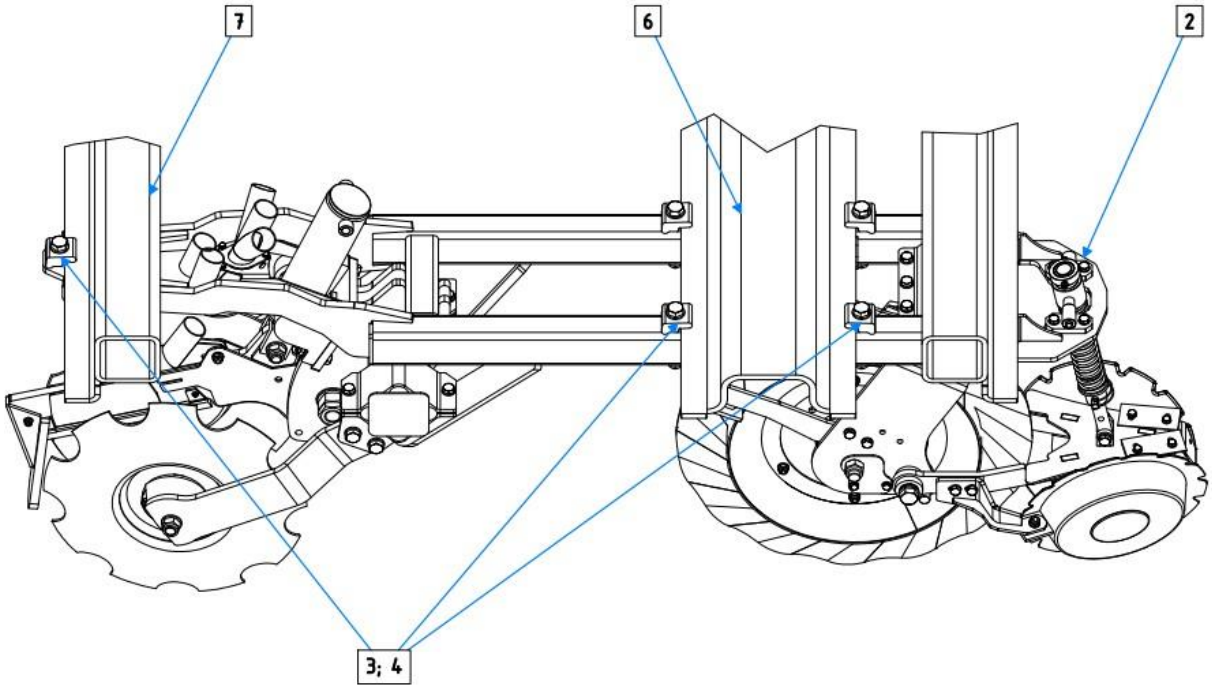

Fig. 37. Attaching the long working section

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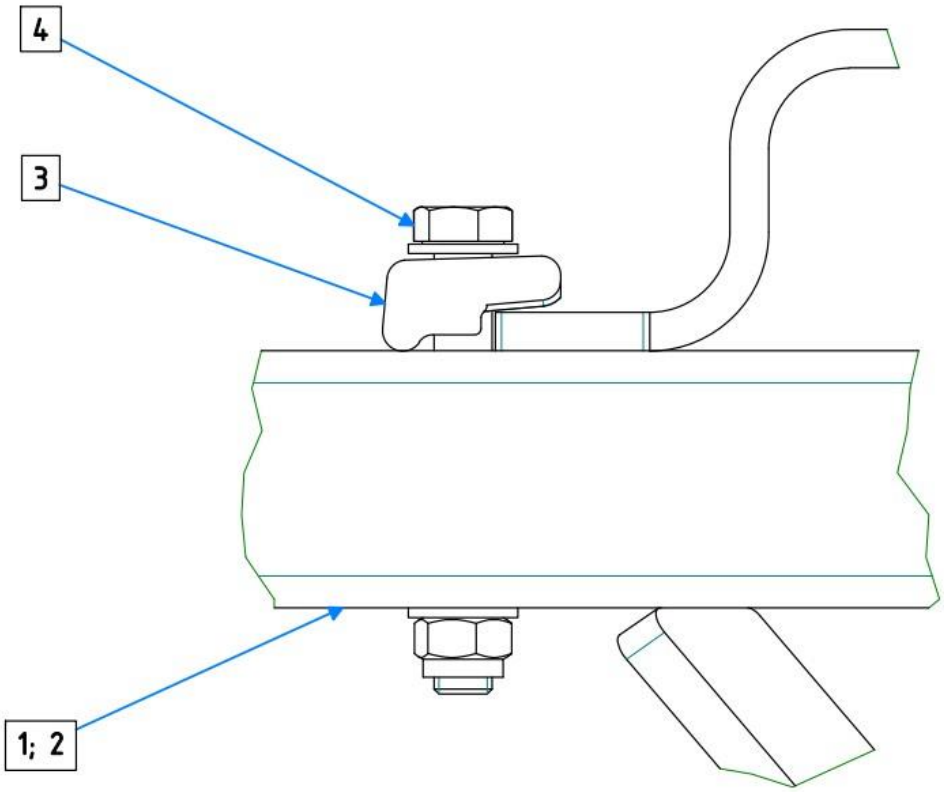

Fig. 38. Attaching the working sections

Working sections are attached to the frame with brackets [3] tightened using the M18 screw [4].

The short working section [1] is attached at the middle [6] and the front [5] section of the frame with 6 brackets [3].

The long working section [2] is attached at the middle [6] and the front [7] section of the frame with 5 brackets [3].

During assembly, the coulter beams must be folded. To dismantle the section, we can use a dedicated trolley.

28. Changing the spacing of working sections

In order to change the spacing of working sections do the following:

1. Fold the coulter beams of the working sections.
2. Set the machine at a height allowing the working sections to move freely.
3. Reduce the pressure in the hydraulic coulter beam protection system.
4. Mount two middle trolleys [8] to the mounting holes for the short section [1]. For the long section [2], attach one middle trolley [8] and one rear trolley [9] in place of the mounting bracket [3]
5. If necessary, unscrew the hydraulic hoses from the hydraulic manifolds.
6. Remove the fertilizer hose from the fertilizer distributor (vent).
7. Loosen the M18 screws [4] which hold the brackets [3] until the trolley rollers [8; 9] start resting on the track of the middle [6] and rear [7] (for the long section) part of the frame.
8. Move the section to the intended location on the frame. To position the section, use the linear division located on the frame
9. To attach the frame, do the above in the reverse order.

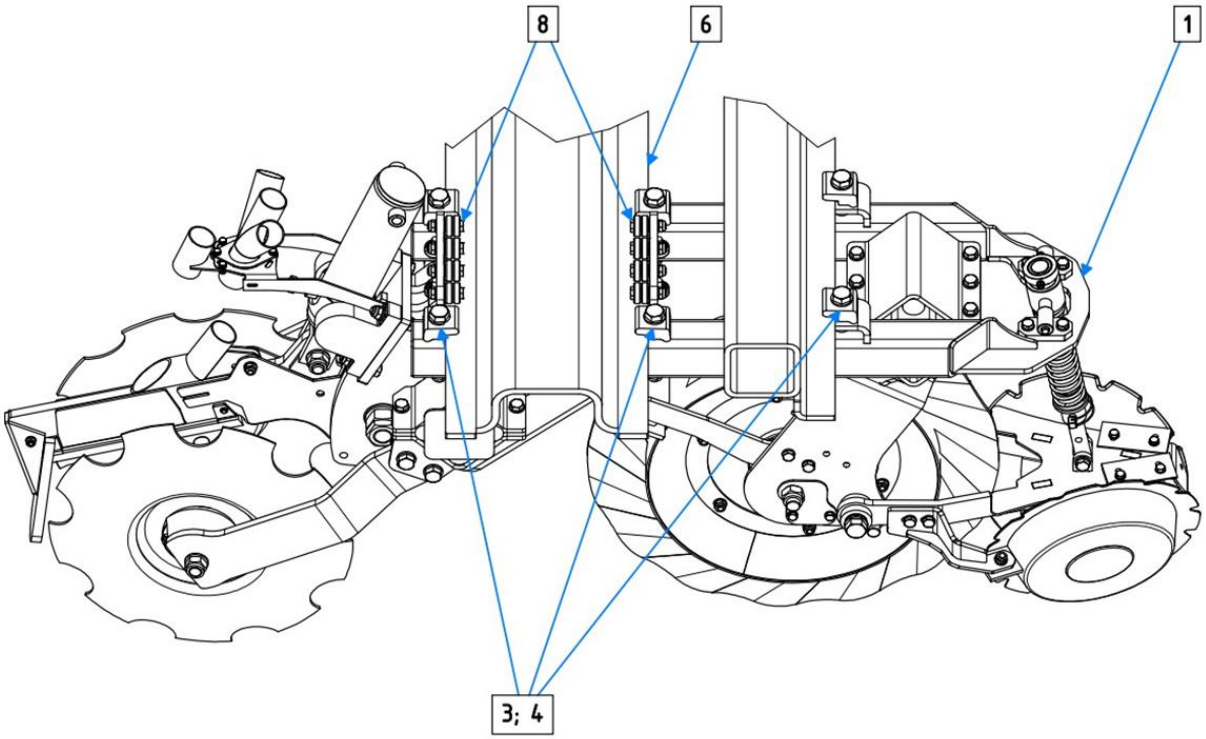

Fig. 39. Changing the spacing of the short working section

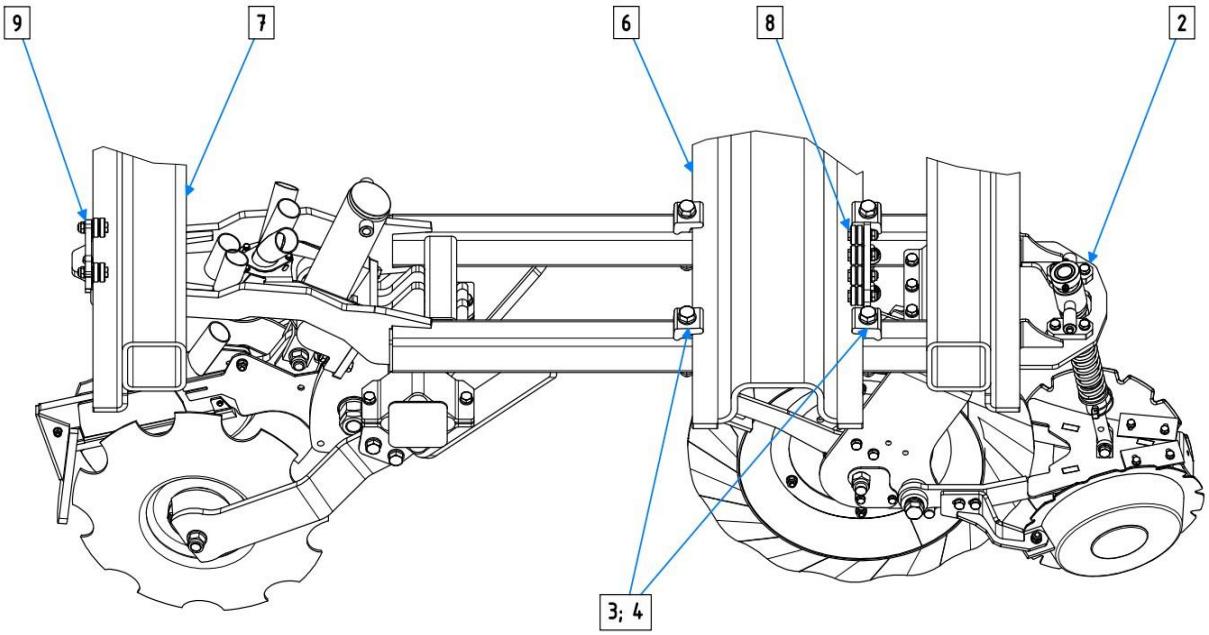

Fig. 40. Changing the spacing of the long working section

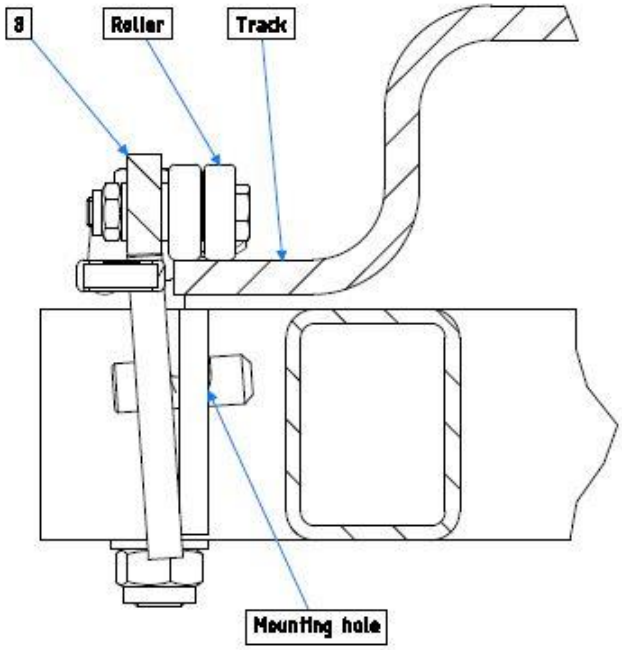

Fig. 41. Mounting the middle trolley

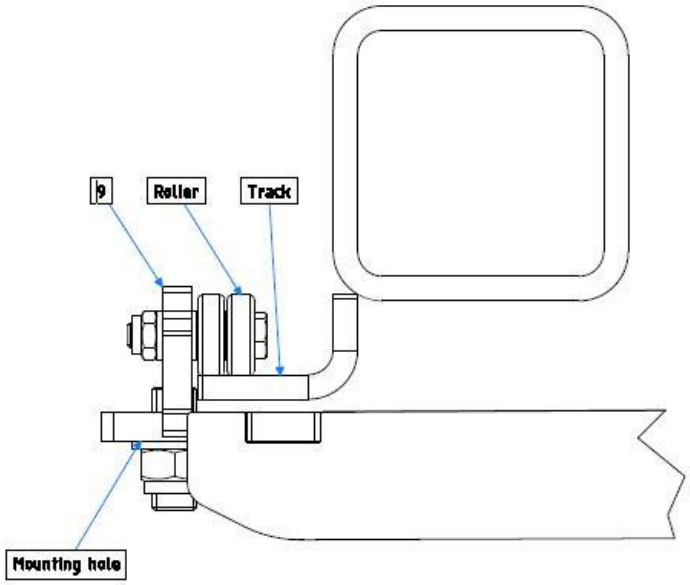

Fig. 42. Mounting the rear trolley

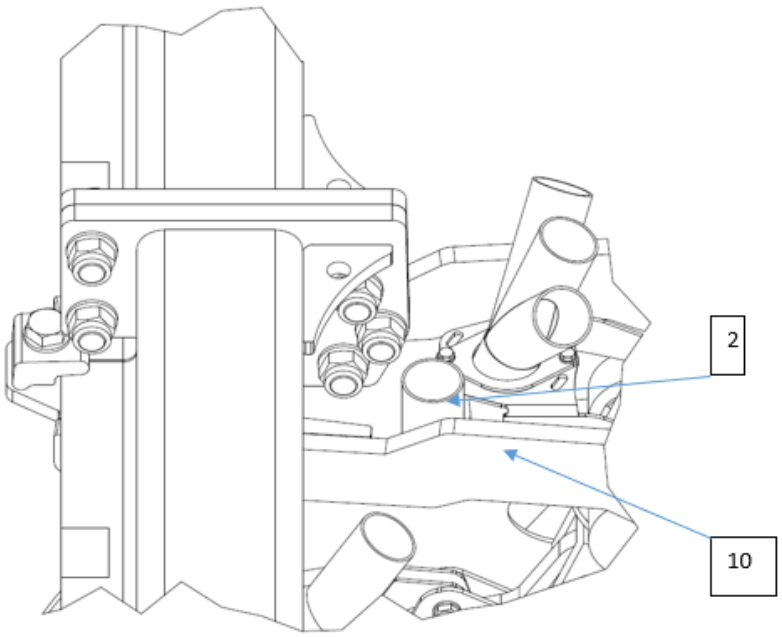

Fig. 43. Mounting the rear trolley

In case of collision during assembly of the long section [2] with the rear frame elements, a side vent [10] should be used.

29. Hydraulic system

- The hydraulic system is under high pressure (about 200 bar).
- When connecting hydraulic cylinders or hydraulically driven engines, special attention must be paid to the correct connection of the hydraulic lines.
- When connecting the machine's hydraulic lines to the tractor's hydraulics, make sure that the lines on both the machine and tractor sides are not under pressure.
- You need to pay attention to the correct hydraulic systems connection (between tractor and machine). Incorrect connection may result in the opposite effect than expected (e.g. alternating lowering and lifting, damage to the hydraulic motors of the blower and multiplier).
- Inspections of hydraulic lines should be carried out systematically and damaged elements should be replaced with new ones.
- If a leak is located, take all precautions to avoid the risk of personal injury.
- Hydraulic oil escaping under high pressure can cause serious injury when in contact with the skin. In this case, seek medical attention immediately, as there is a risk of infection.
- Before repairing the hydraulic system, lower the machine, release the pressure from the circuit to 0 and turn off the key.
- Hydraulic hoses must be replaced every 6 years.
- Used oil should be taken to designated locations for disposal.
- You must control the oil level in the system.

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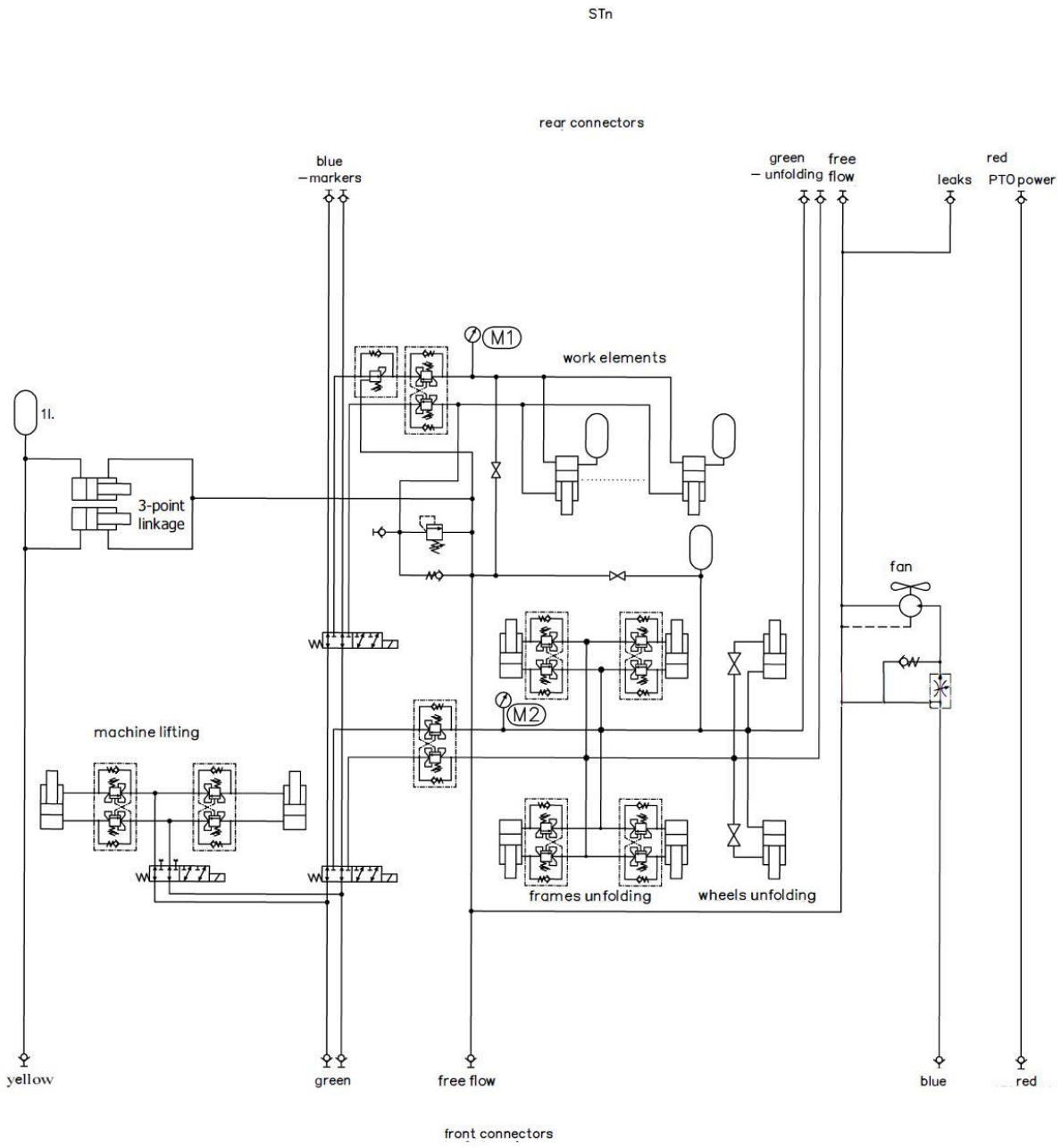

Fig. 44. Hydraulic system of ST

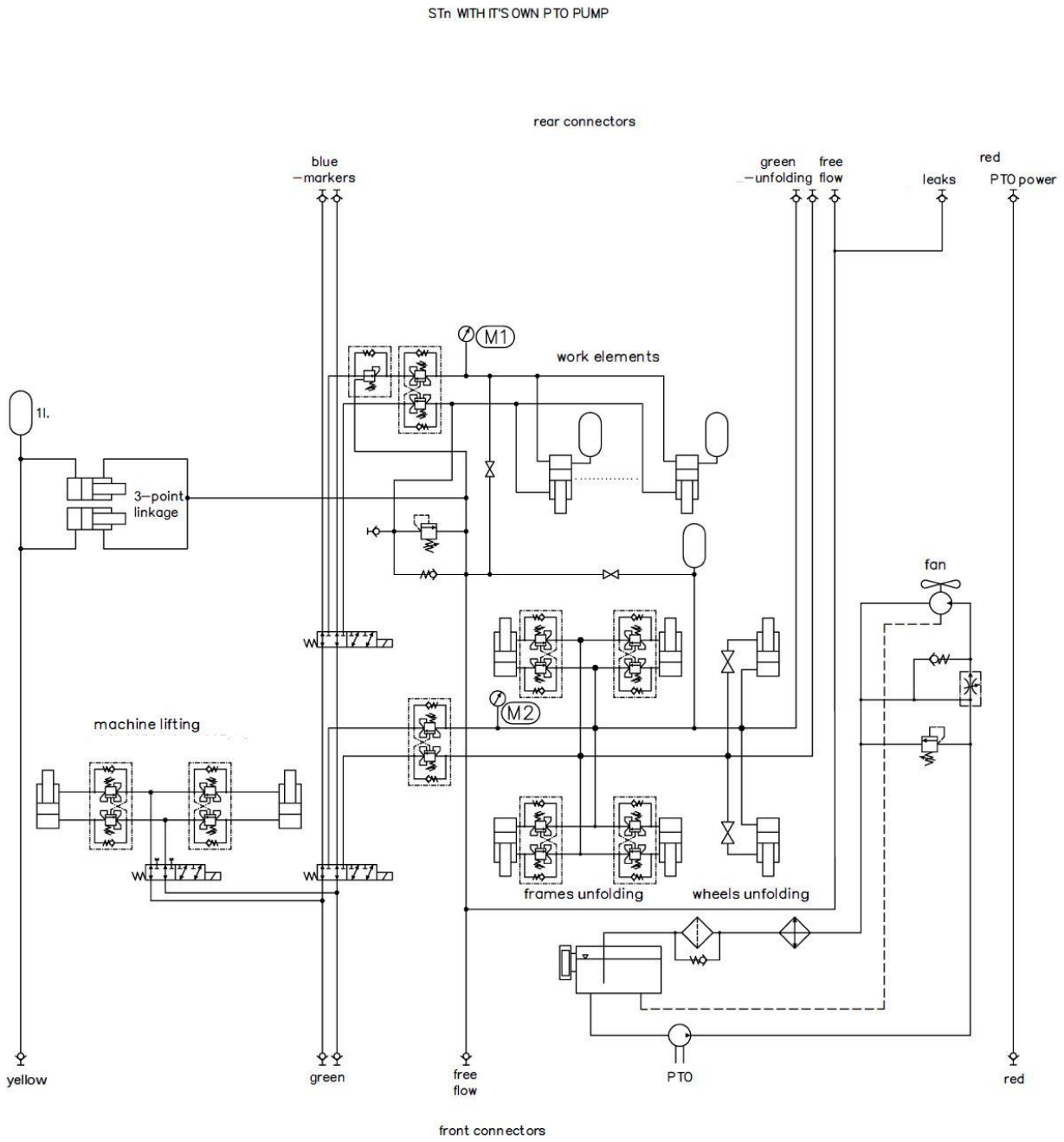

Fig. 45. Hydraulic system of ST it's own PTO pump

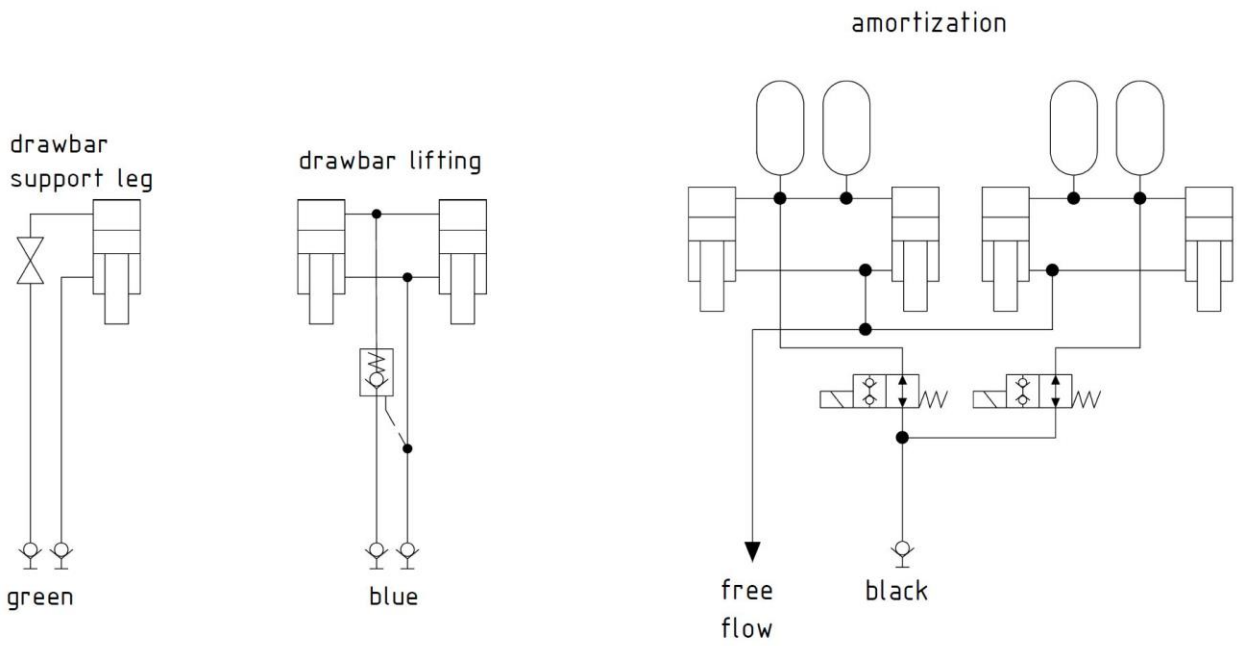

Fig. 46. Hydraulic scheme of amortization

30. Wheel suspension system

The ST strip till cultivation and seeding unit is equipped with a shock-absorbing transport wheel system, which works in two modes:

Field position – used during work. In the field position mode, wheel suspension is inactive. The aim is to achieve an even distribution of the machine weight over the working width and thus achieve even soil compaction. The field position mode will be obtained when the outer axles [1] and inner axles [2] are resting on the bumper [3] and the cylinder [4] is in the minimum position.

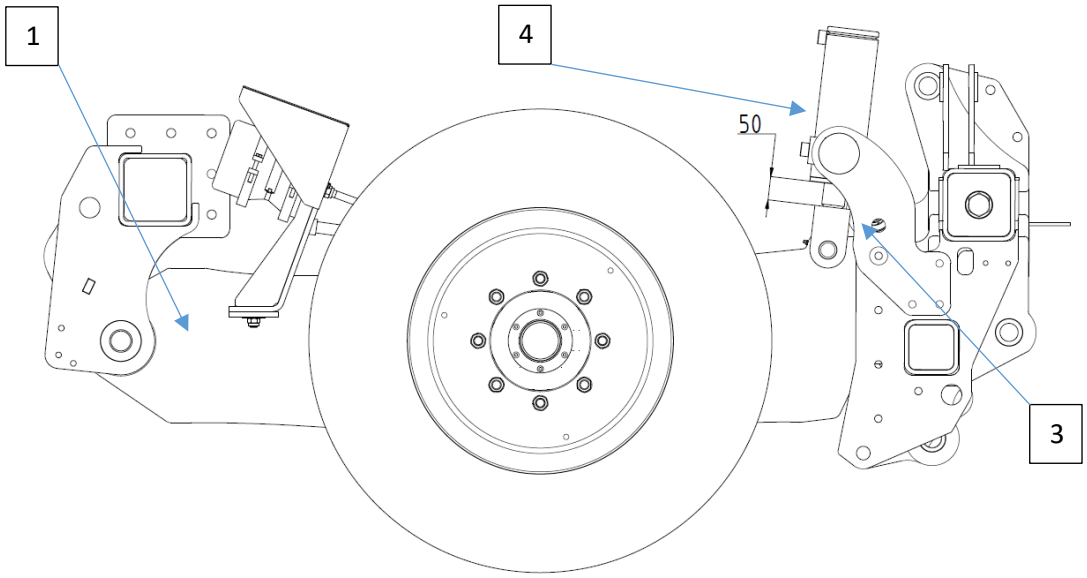

Fig. 47. External axles in the Field Position

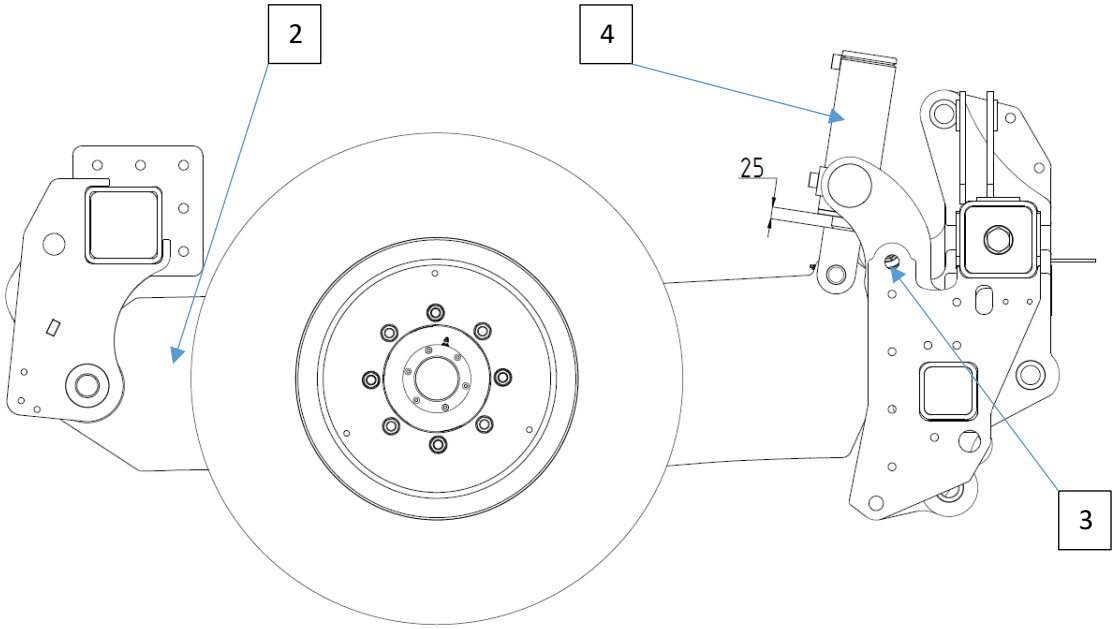

Fig. 48. Internal axles in the Field Position

Road position – used during road transport. In this mode, wheel suspension is active. The aim is to achieve an even distribution of the machine weight over the transport width and thus achieve better braking efficiency and greater machine stability during transport. The road position mode will be obtained when the outer axles [1] and inner axles [2] are in neutral position and the actuator [4] is in the middle of the operating range.

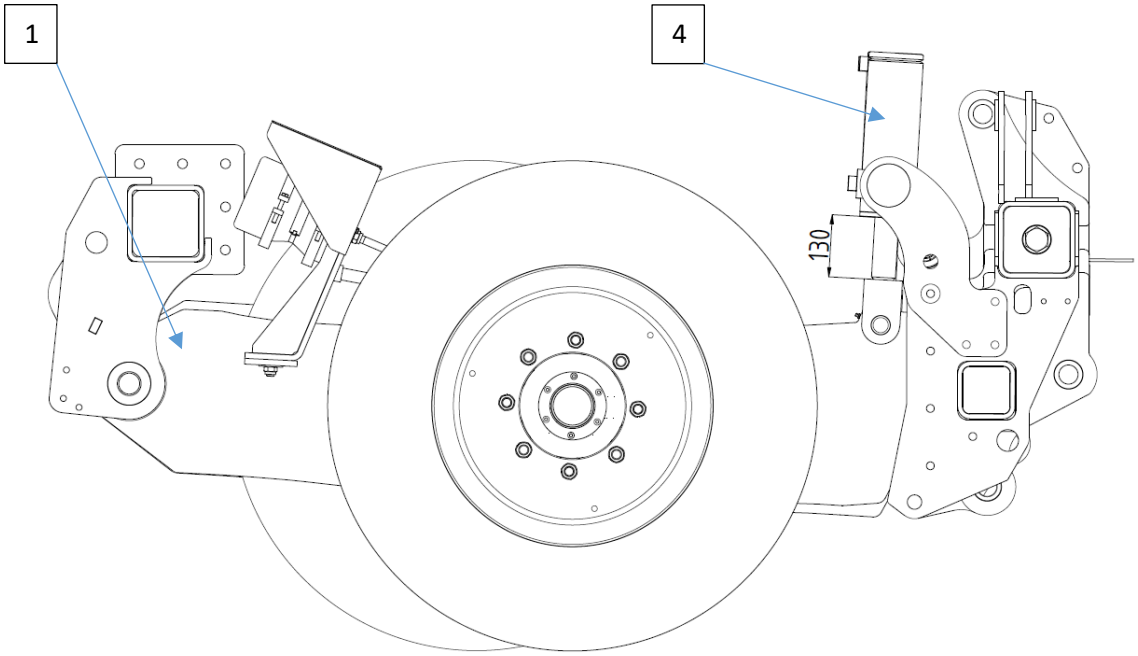

Fig. 49. External axles in the Road Position

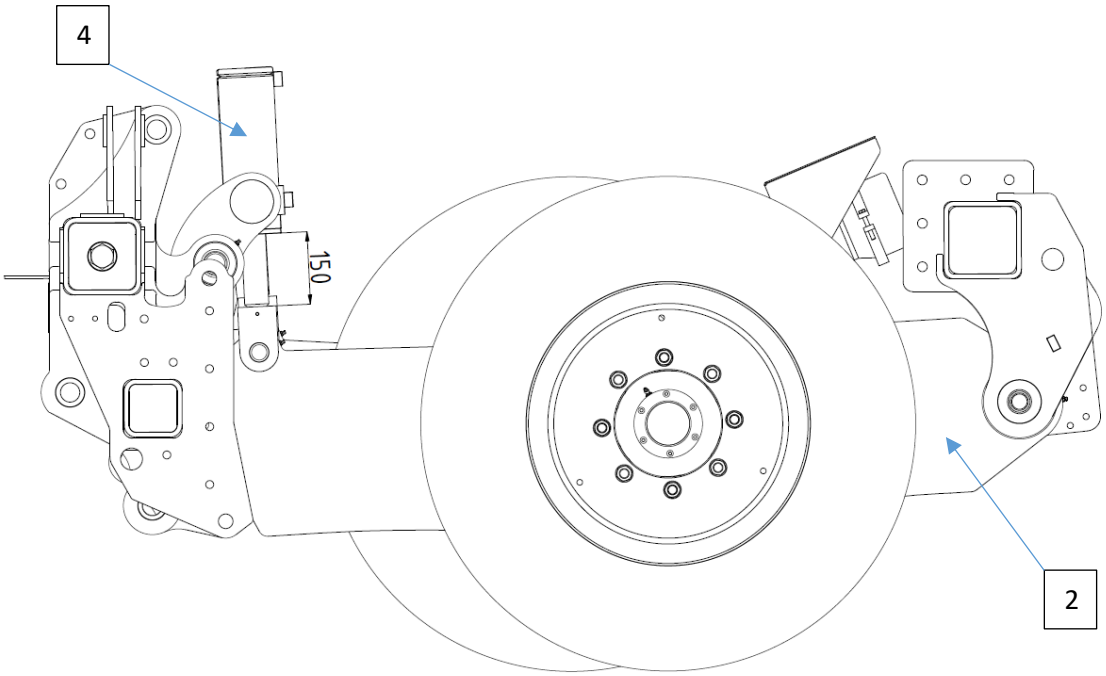

Fig. 50. Internal axles in the Road Position

Axle suspension setting:

To set the appropriate suspension position for road transport or field work, follow the instructions below located on the axle suspension controller:

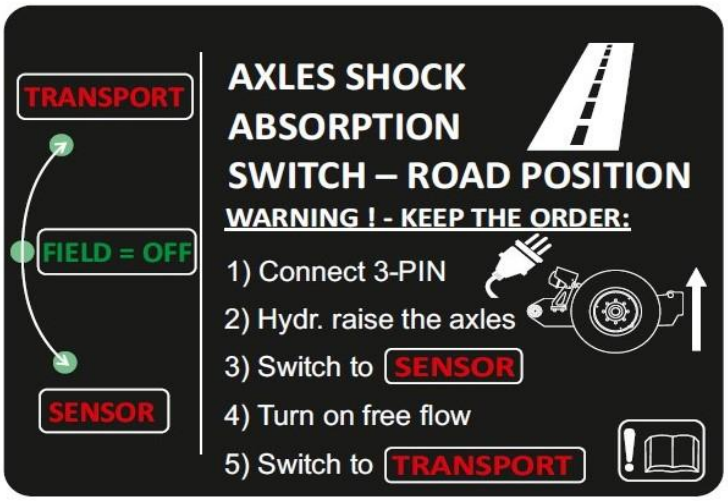

Fig. 51. Shock absorption switch – Road Position

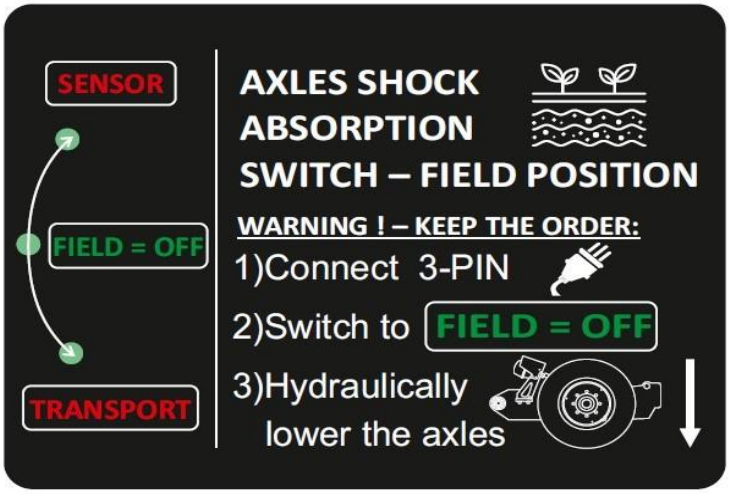

Fig. 52. Shock absorption switch – Field Position

Road position:

1. Connect 3-pin power cable to the tractor,
2. Hydraulically raise the axles,
3. Switch shock absorption system controller lever to the SENSOR position,
4. Turn on free flow,
5. Switch controller lever to the TRANSPORT position,

Field position:

1. Connect 3-pin power cable to the tractor,
2. Switch shock absorption system controller lever to the middle position FIELD,
3. Lower the machine on the axles, using the hydraulic control.

ATTENTION:

In both cases, after adjusting the axle suspension, make sure that the appropriate position (field or road) has been set correctly. To do this, check the position of the arrow relative to the field or road position on the sticker, as shown in the photos below:

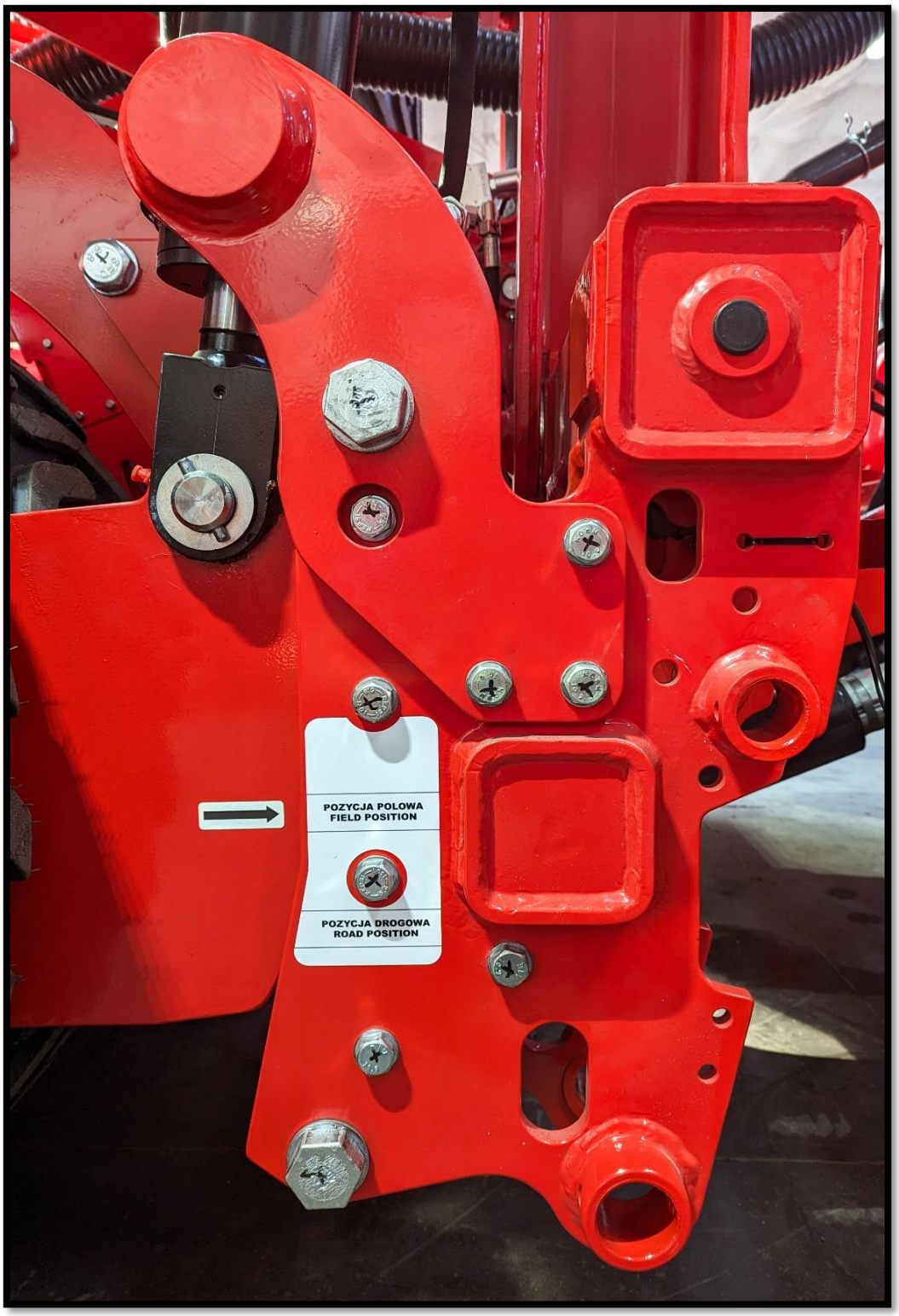

Fig. 53. Shock absorption system in field position

Fig. 54. Shock absorption system in road position

31. Lightning

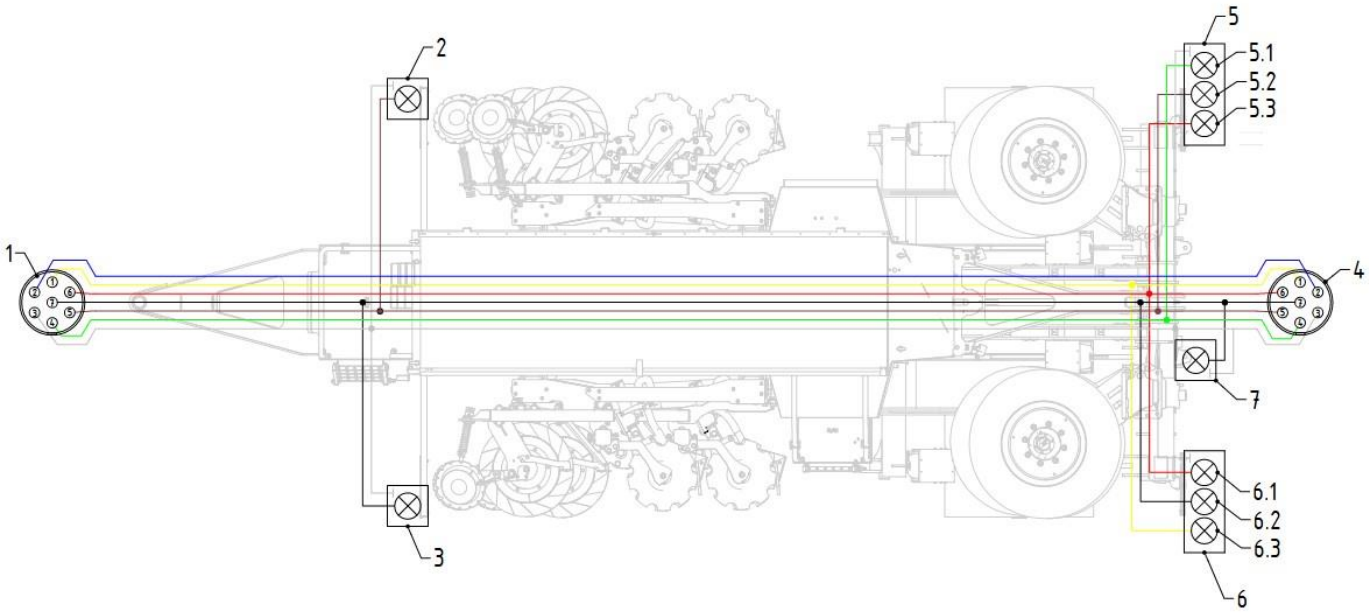

Fig. 55. Lightning electrical system

Lightning installation
1. 7-PIN male connector
2. Right front lamp
3. Left front lamp
4. 7-PIN female connector
5. Right rear lamp 5.1 Right tail light 5.2 Stop 5.3 Right indicator
6. Left rear lamp 6.1 Left tail light 6.2 Stop 6.3 Left indicator
7. License plate lamp

Connectors and wires markings			
Nr.	**Symbol**	**Color**	**Function**
1.	L	Yellow	Left indicator
2.	-	-	-
3.	31	White/Grey	Ground
4.	R	Green	Right indicator
5.	58R	Brown	Right tail light
6.	54	Red	Stop
7.	58L	Black	Left tail light

ATTENTION ⚠

- Electrical repairs can only be performed by a person with electrical qualifications.
- Damaged lighting can lead to an accident.
- Regularly check if the lights are working properly, that they are clean and that the marker boards are clean.

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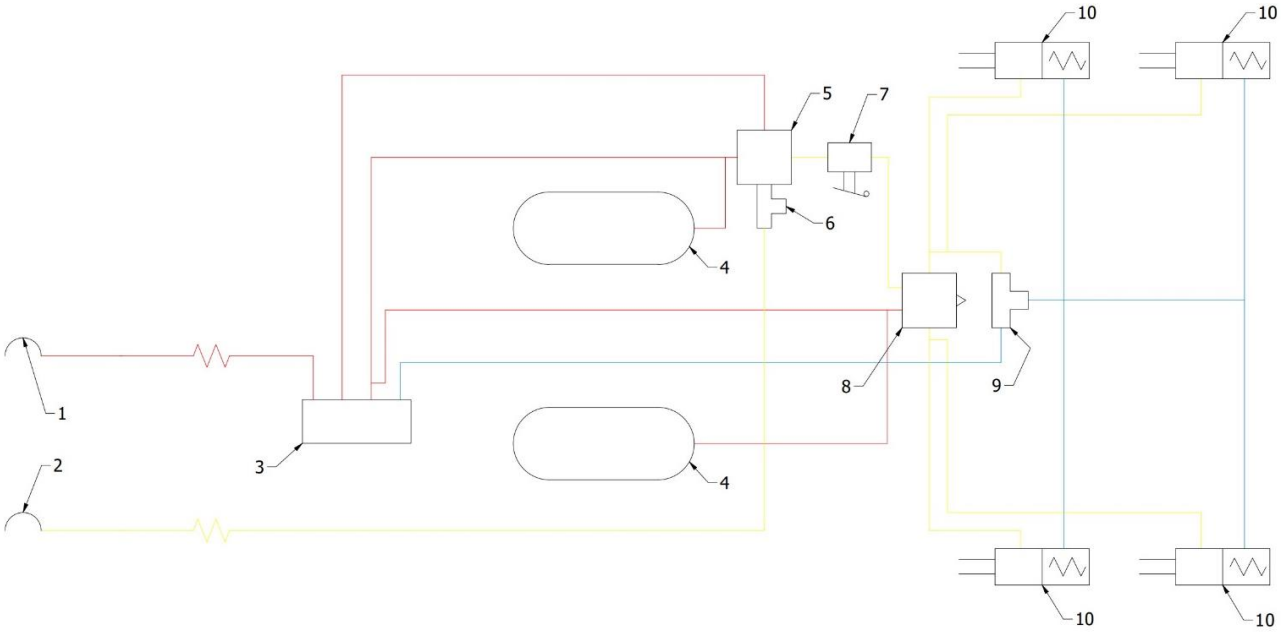
32. Brake system

The cultivation unit ST is equipped with a pneumatic brake system.
The brake system must always be connected and operational when driving on the road. Always check the operation and condition of the brake system before transport. Remember to release the parking brake before setting off. Before disconnecting, secure the machine against rolling away. All repairs and adjustments of the brake system can be performed only by specialized workshop or employees specially trained for that purpose by Czajkowski Maszyny Sp. z o.o.

Brake diagram



1	Red coupling head
2	Yellow coupling head
3	Park and shunt valve
4	Air reservoir
5	Main valve
6	Test point connector
7	Load sensing valve
8	Relay valve
9	Double check valve
10	Spring brake actuator

Fig. 56. Brake system diagram.

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Parking brake

The Czajkowski ST unit is equipped with a parking brake. It is used for immobilizing the machine while its stopped and preventing the machine from rolling and moving.

Fig. 57. Parking brake.

Red button – to park the machine.
Regardless of whether the machine is coupled or uncoupled, the red button must be pulled out to properly park the machine using the spring brake.

Black button – to release the machine.
Release valve – allows the automatically braked, disconnected machine to be moved. Pressing the black button releases the brake.

Tabel 2. Settings of parking brake

MACHINE DECOUPLED FROM THE TRACTOR				
Button color	Button position	Button color	Button position	Brakes
Black	Pressed in	Red	Pressed in	Released
Black	Pulled out	Red	Pressed in	Braked
Black	Pressed in	Red	Pulled out	Braked
Black	Pulled out	Red	Pulled out	Braked
MACHINE COUPLED TO THE TRACTOR				
Button color	Button position	Button color	Button position	Brakes
Black	Pulled out	Red	Pressed in	Released
Black	Pulled out	Red	Pulled out	Braked

Emergency brake release

In the event of a failure of the pneumatic system and the need to unblock the brake cylinders, it is possible to manually release them by using a screw located in a special handle on the side of the brake cylinder. Access to the screw is found under the rubber cap on the top of the brake cylinder cover, as shown in the drawing below:

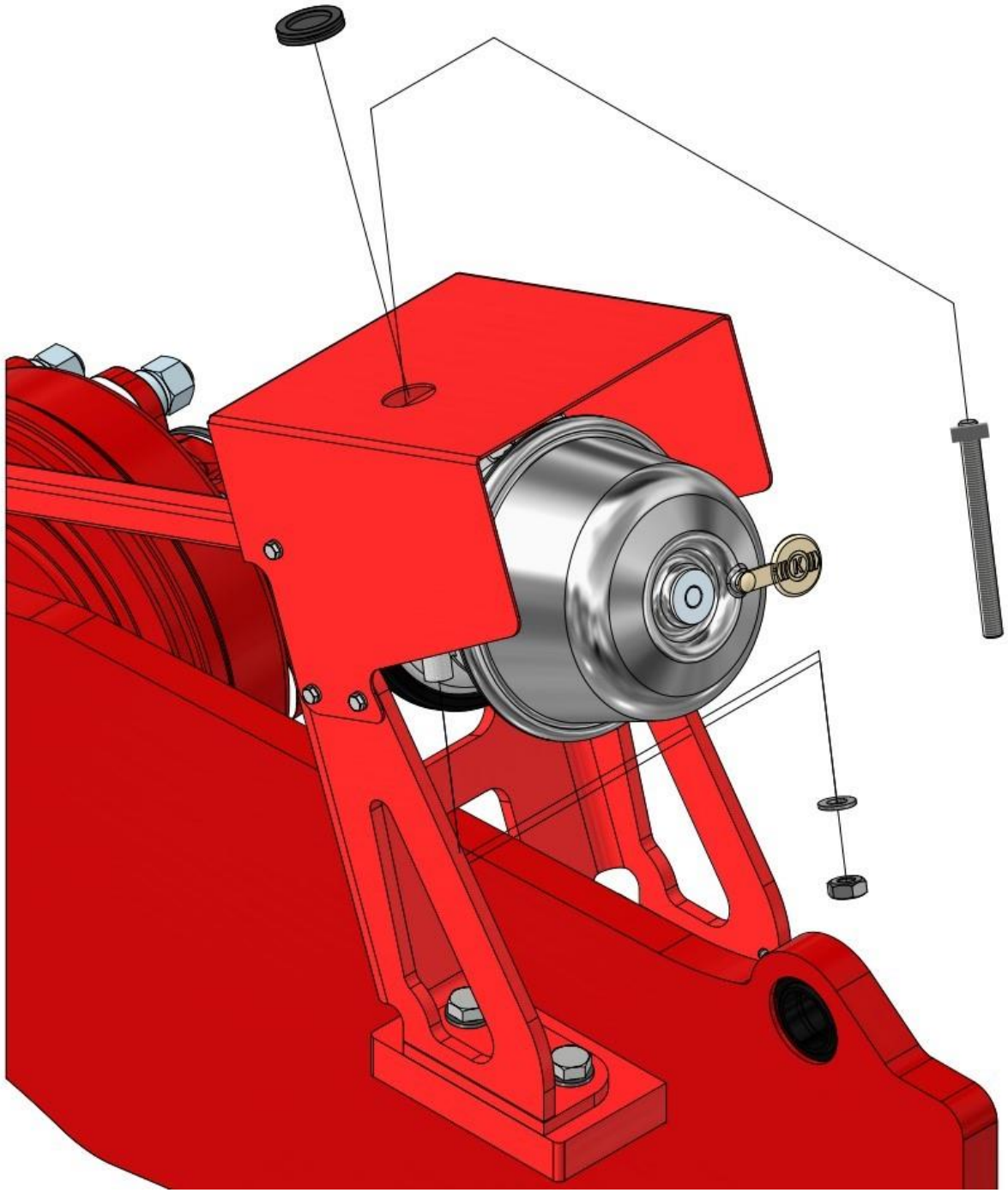


Fig. 58. Location of the unlocking bolt

Place the bolt in the actuator hole so that the "wings" at the end of the bolt can be turned and locked. Then put on the washer and nut and tighten it towards the actuator with a 19 wrench

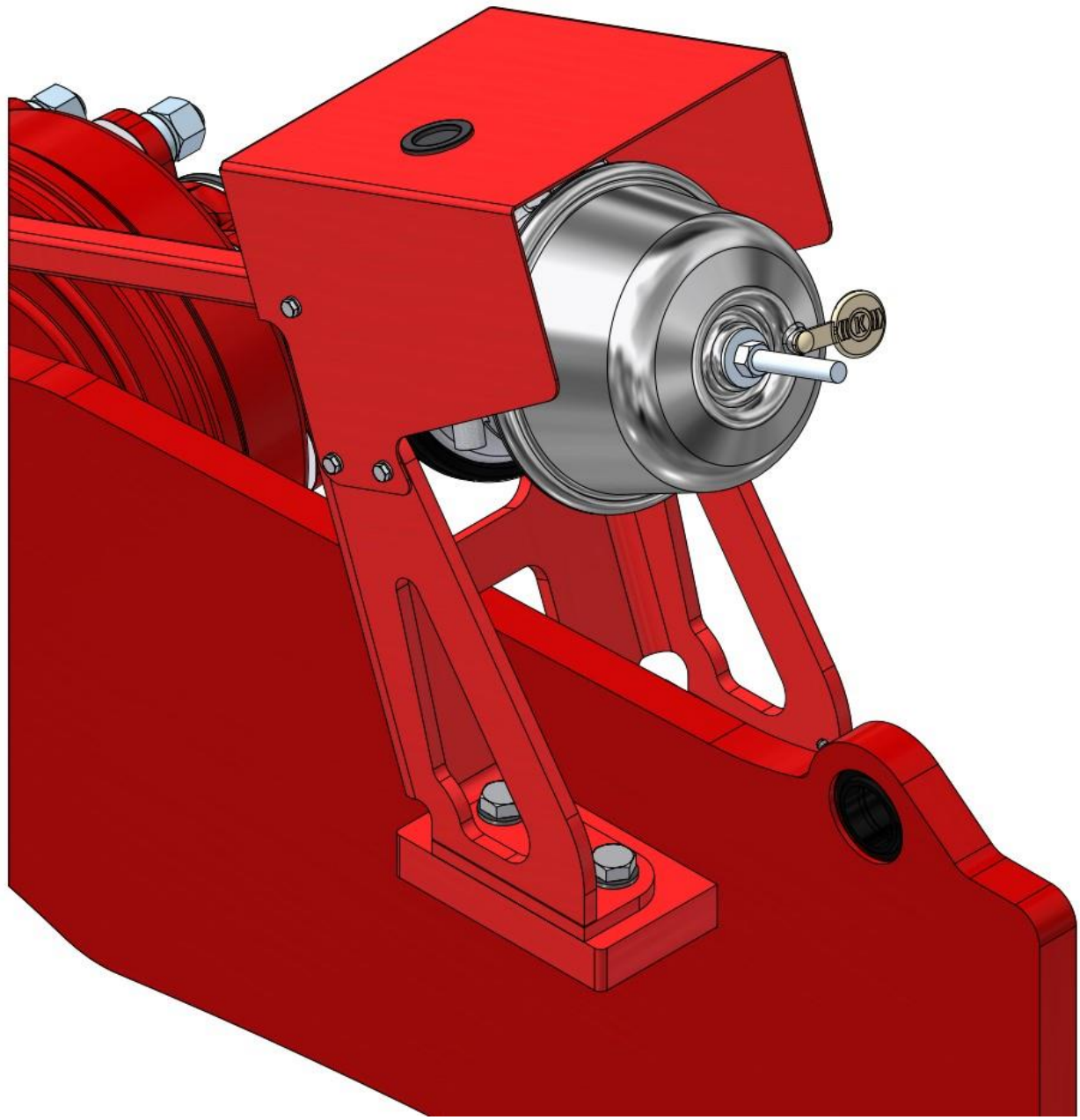


Fig. 59. Unlocking bolt screwed into actuator

If the pneumatic system fails, for example, the air tank, main valve or pipe, then all 4 actuators must be unlocked. However, if, for example, only the actuator membrane fails, only that one actuator needs to be unblocked.

Follow the steps below to unlock the centre wheels:

1) from the transport suspension position shown in the photo below

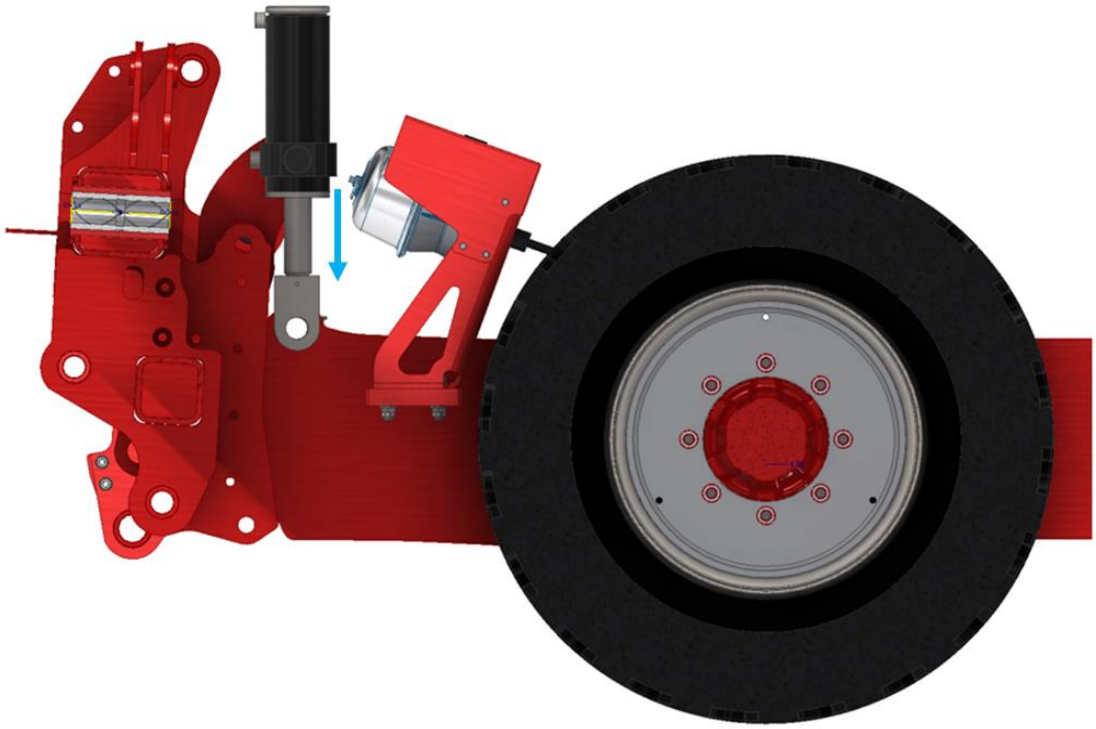


Fig. 60. Transport position of the shock absorber

2) set the machine to the field position:

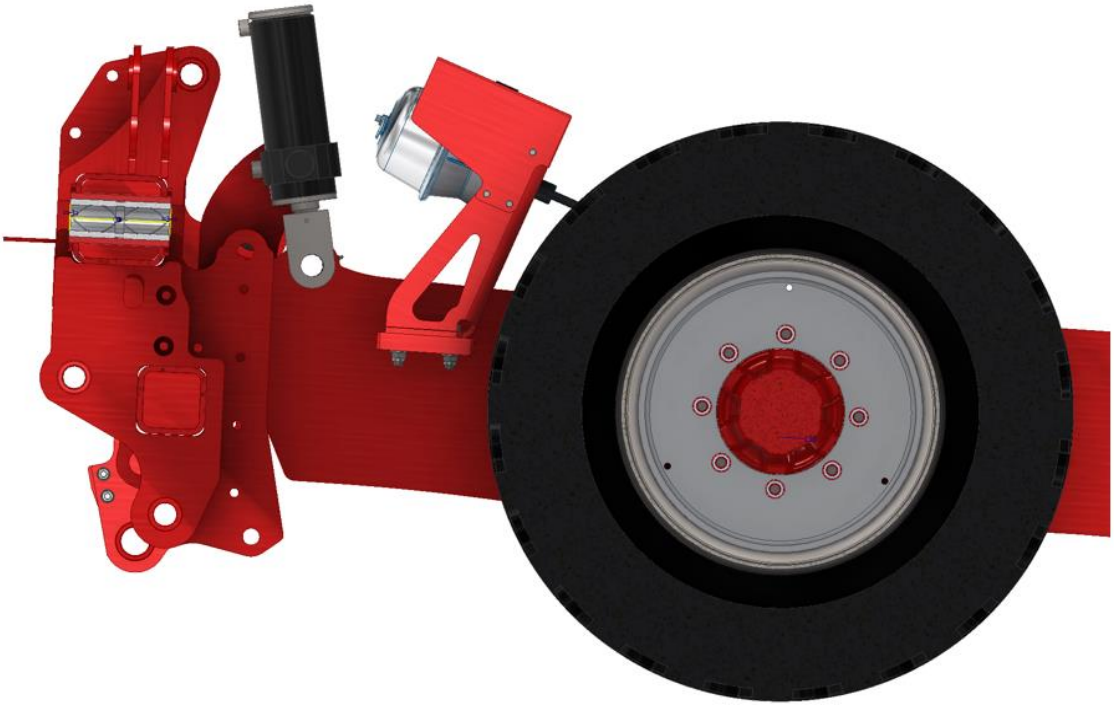


Fig. 61. Field position of the shock absorber

3) then screw the bolt into the brake actuator, unlocking it

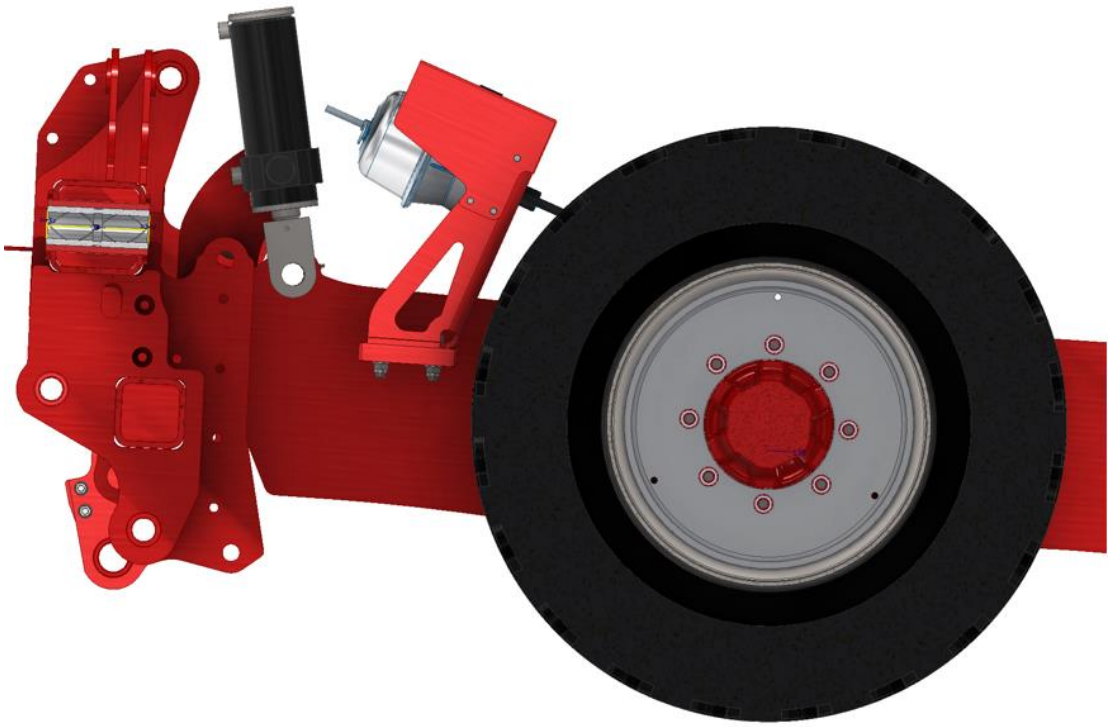


Fig. 62. Field position with screwed in unlocking bolt

ATTENTION ⚠ Lifting the wheel suspension is prohibited when the release bolt is screwed into one of the brake actuators of the middle dual wheels. Lifting will cause the bolt to collide with the suspension cylinder as shown in the figure below:

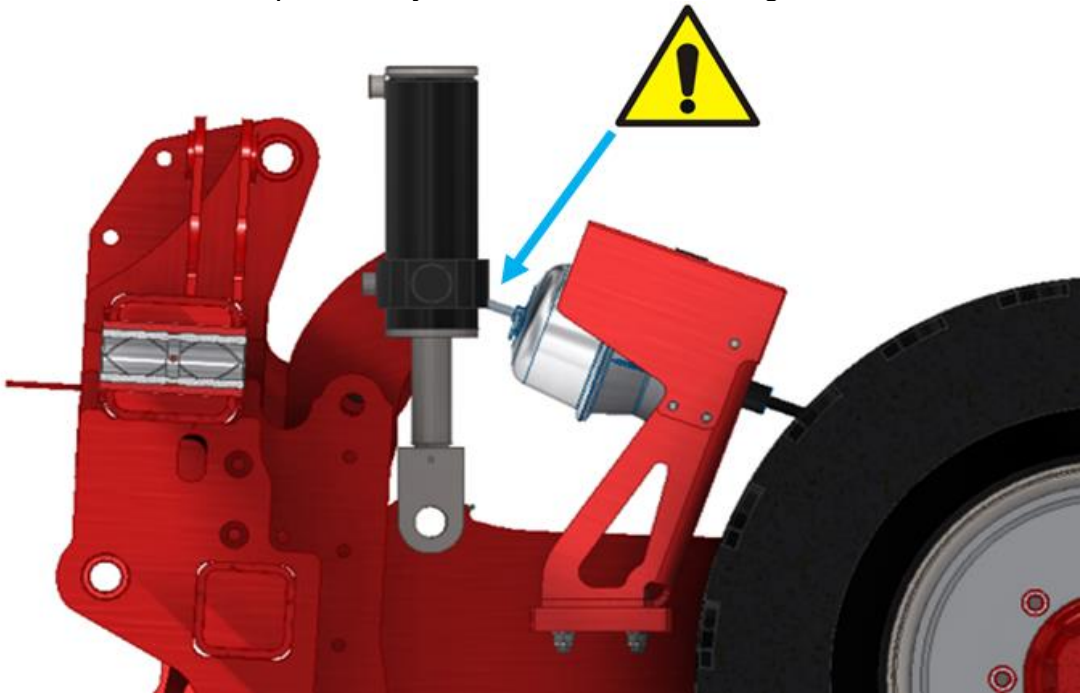
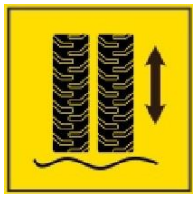


Fig. 63. Unlocking bolt collision with shock absorber cylinder

33. Function describing pictograms

N017 – Working pressure of hydraulic protection

N018 – Pressure of the rear wheel copying system



34. Handling

34.1. Preparation of the machine

Before starting work, check the technical condition of the machine, in particular the condition of the working elements. Once the working elements are worn out, replace them with new ones.
Furthermore:

- Check the screw connections and pins of the rear three-point linkage hitch, working sections; tighten loose connections, secure pins.
- Check the unfolding, folding, lifting and lowering of the machine.
- Check the condition of the hydraulic and pneumatic hoses of the machine, whether there are no leaks and pressure losses, damage. Replace damaged hoses with new ones.
- Check whether the quick connectors of the hydraulic hoses of the machine correspond to the hydraulic sockets of the tractor, adjust if necessary (in particular the free flow).
- Check the cable (extension cord) between the agricultural tractor and the precision seeder.
- Check whether the drive (chain transmission, chain tension) and sowing devices rotate freely.
- Check whether the spacing of the working sections corresponds to the planned sowing, adjust if necessary.
- Set the hydraulic distributor section in the tractor used to operate the Seeding Attachment to the open position - free flow.

34.2. Operator position

The machine operator's position is located in the tractor cabin. The machine is operated by one person.

34.3. Operating the fan

The hydraulic fan is powered directly by the tractor's hydraulic system or by an optional external system powered by the tractor's PTO. The air flow generated by the fan moves the seed from the sowing unit through the seed distributor heads to the coulters. The amount of air required for correct seeding depends on the weight and type of seed, the sowing speed and the working width, which is why determining the correct speed must be specified during field tests. The air flow must be set as precisely as possible; if the air flow speed is set too low, the seed may remain in the hoses and cause them to clog. Too low air speed may also result in incorrect distribution of the seed material. Therefore, it is recommended to set the fan speed as high as possible. The seed should be placed correctly on all sections immediately after sowing begins. When sowing large areas, it is recommended to check the correctness of the sowing process. Special attention should be paid to eliminating contamination on the protective grid and fan blades, as this contamination can lead to air loss, hose clogging, unbalance of rotating elements, which can damage the bearing. The fan speed is regulated by the amount of oil (see photo below). The hydraulic pump must deliver sufficient amount of oil so that the fan speed does not decrease even when the tractor speed drops or another hydraulic function is switched on.

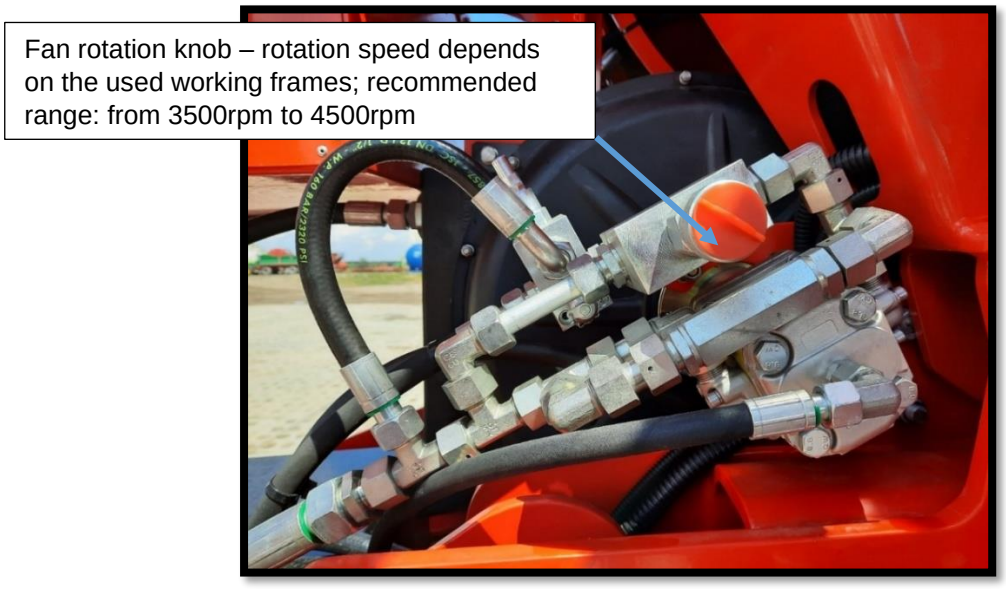


Fig. 64. Front adjustment system

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34.4. Changing the number of rows

The hose system is always ready for complete equipment. If only half of the frames are used (75 cm spacing ST600 8 frames ST400/ST450 6 frames), two hoses lead to one distributor in the frame. In the case of other frame spacings, the hoses must be attached individually to the distributors.

Fig. 65. Connecting the fertilizer hoses to the distributor of the working section

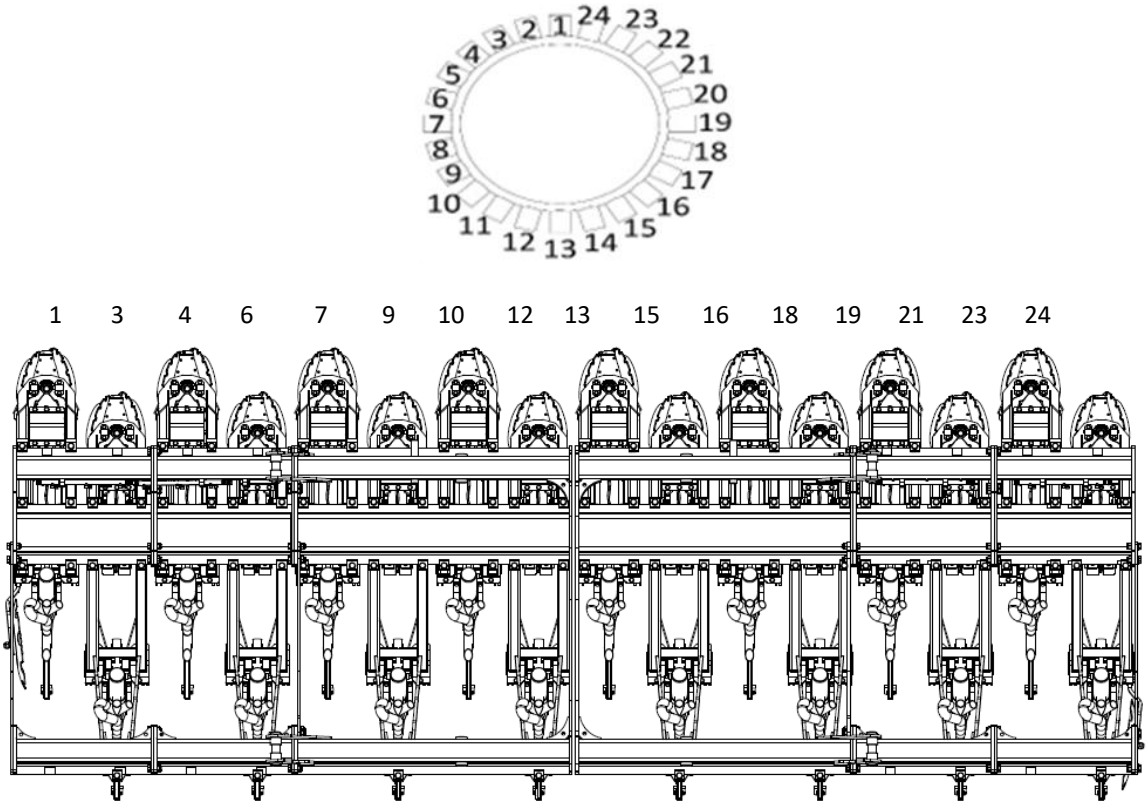

Fig. 66. Hoses of ST600, 16 frames

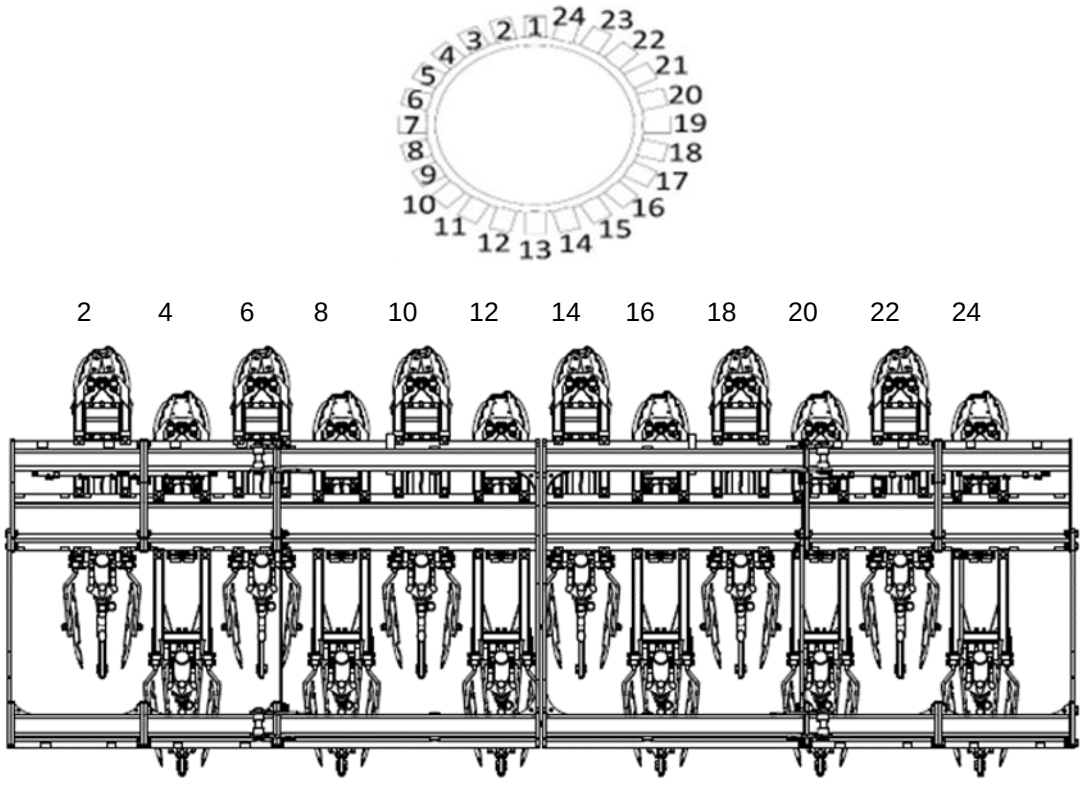

Fig. 67. Hoses of ST600, 12 frames

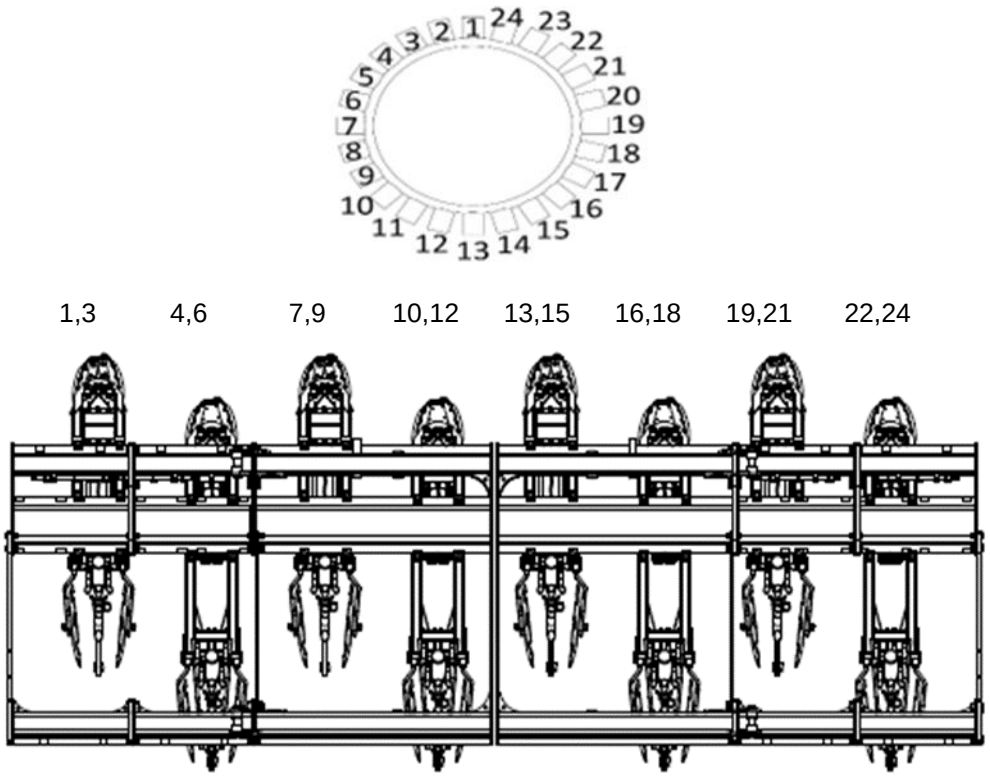

Fig. 68. Hoses of ST600, 8 frames

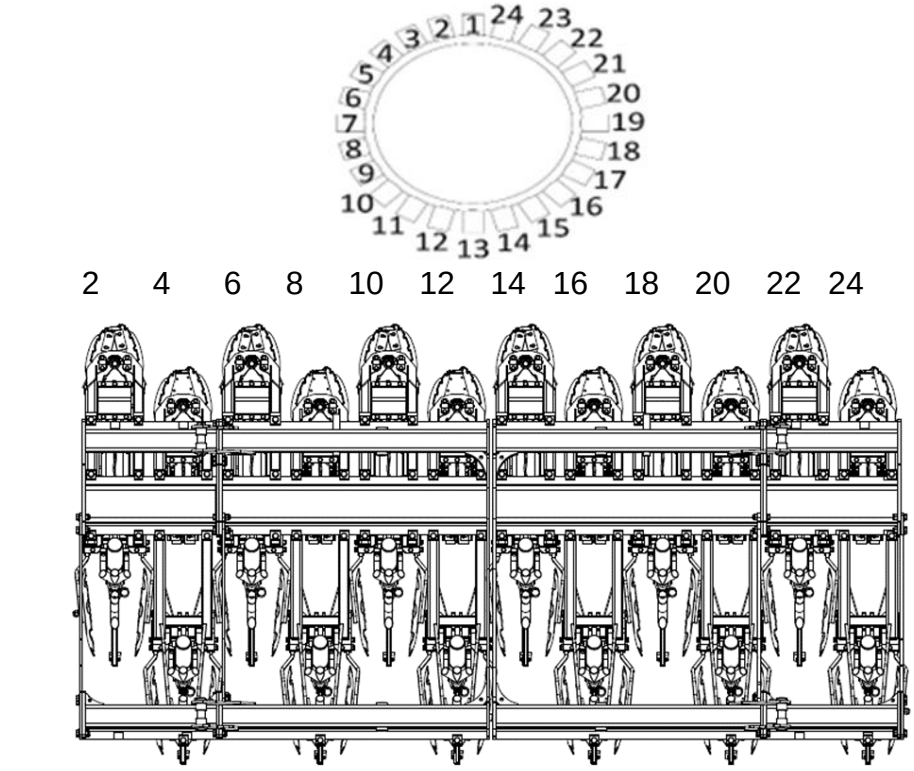

Fig. 69. Hoses of ST450 and ST400, 12 frames

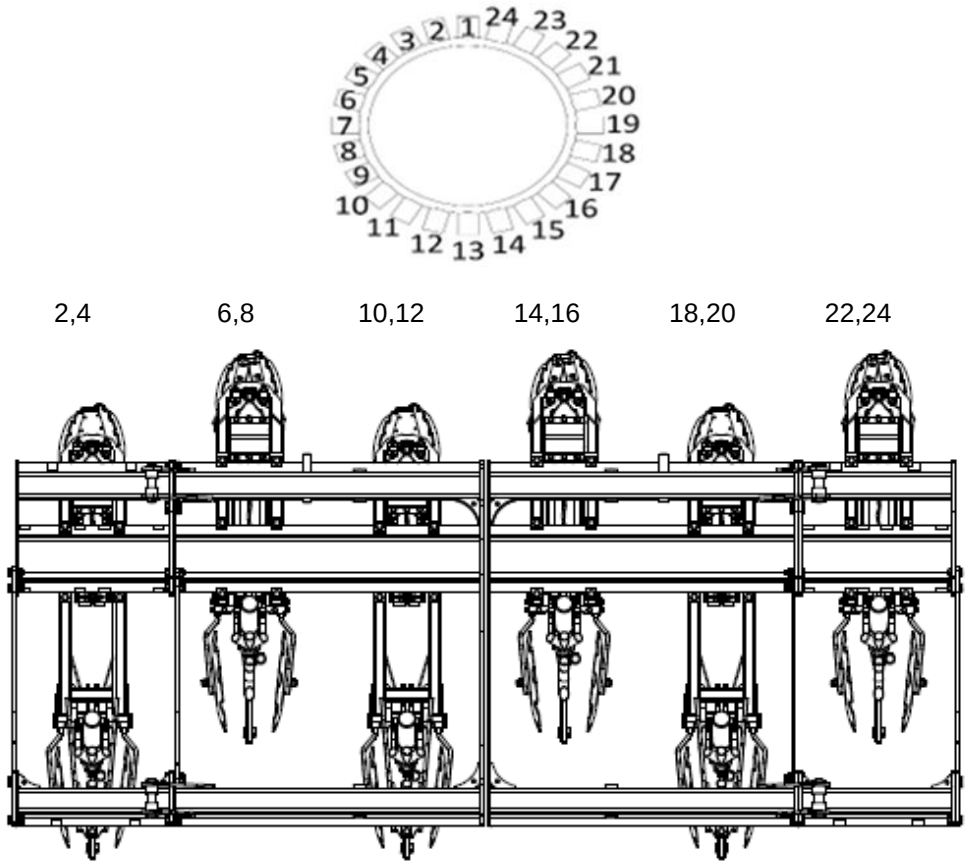

Fig. 70. Hoses of ST400/ST450, 6 frames

34.5. Hydraulic system

The hydraulic system is under high pressure. Escaping fluid can penetrate the skin and cause serious injury. If you are injured, seek medical attention immediately. The hydraulic system of the machine can pose a risk to people and the machine itself in the event of incorrect operation.

It is important to pay attention to the following aspects:

- The system is under high pressure;
- Hydraulic hoses may only be connected to the tractor when the hydraulic systems of the tractor and the implement are depressurized.
- Leaking oil can cause fires and endanger health.
- All hydraulic lines (hoses, fittings) should be regularly checked for visible damage or leaks. If any exist, they should be removed immediately.
- Plugs and sockets for hydraulic connections must be marked to prevent operating errors.
- Hydraulic hoses should be replaced at least every 6 years.
- There are pressure accumulators installed in the hydraulic system.
  It is forbidden to modify pressure accumulators. Before maintenance, it is necessary to reduce the pressure in the hydraulic system. After emptying, the gas pressure is present in the tank.

34.6. Connecting the hydraulic hoses to the tractor

ATTENTION ⚠ To ensure that the machine works correctly, please follow the diagrams below, which show the correct connections of the hydraulic hoses!

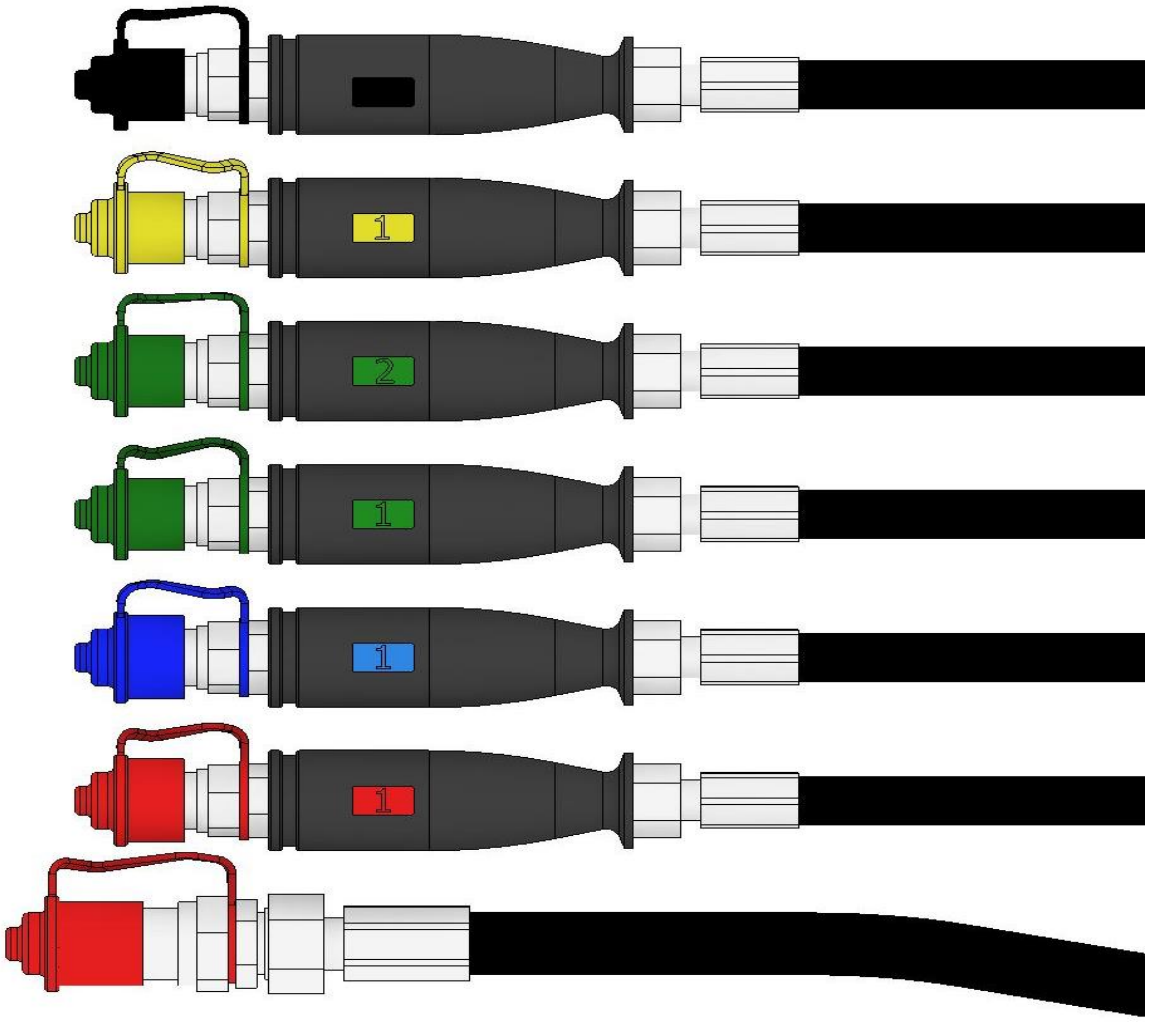

Fig. 71. Hoses connections to the tractor

Colours of hydraulic hoses (plugs) connected to the tractor

- Black – Wheel suspension system
- Yellow – Rear 3-point linkage
- Green (1 & 2) – Hydraulic bank power supply (lifting the machine and folding side frames and working parts)
- Blue – Front fan
- Red – Rear fan
- Red (without plastic handle) – Free flow (overflow)

If an external hydraulic system is used, the blue hydraulic hose is not used.

34.7. Connecting the hydraulic hoses to the ST

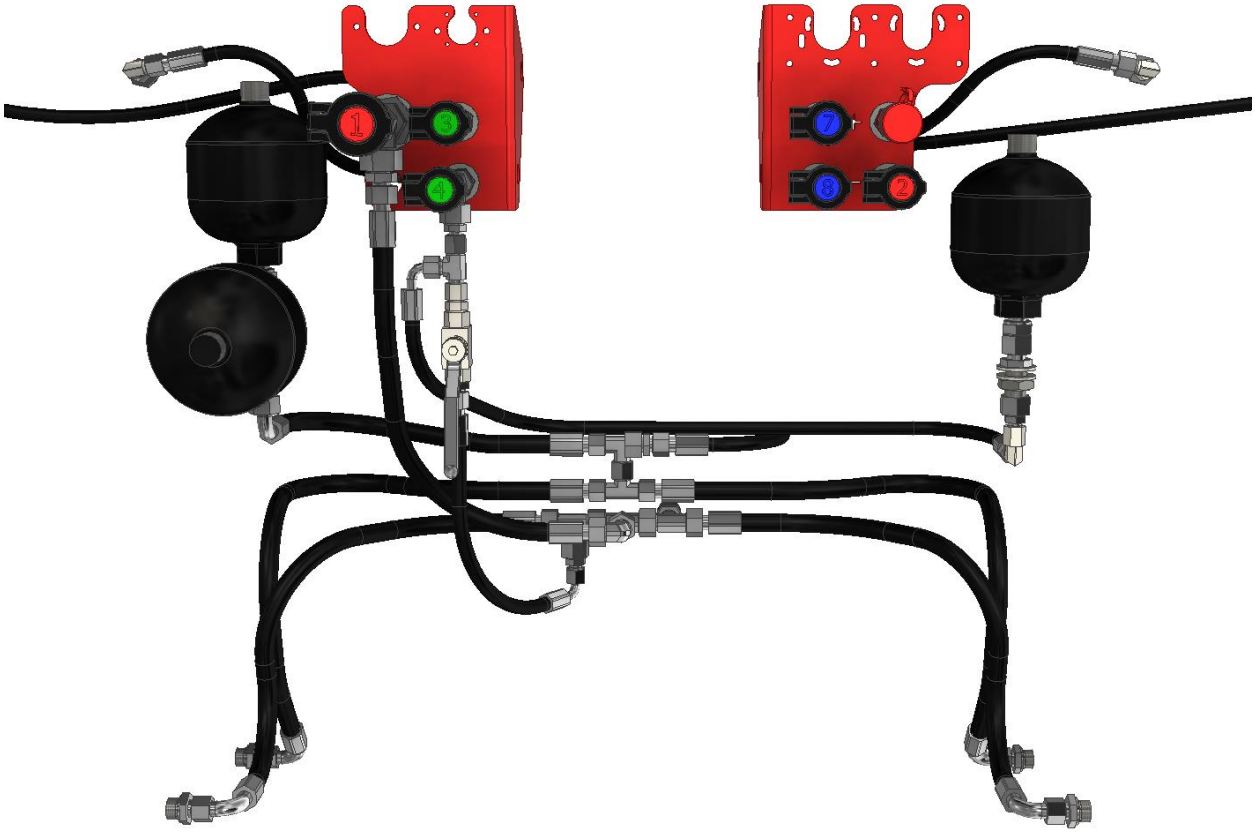

Fig. 72. Rear view of the CZAJKOWSKI ST machine

1. Green – unfolding of the PS attachment or the precision seeder
2. Red (2 sockets, small and large) – drive of the air blower or the seeder air vent
3. Blue – folding and unfolding of markers (if applicable)

34.8. Reducing pressure of working parts

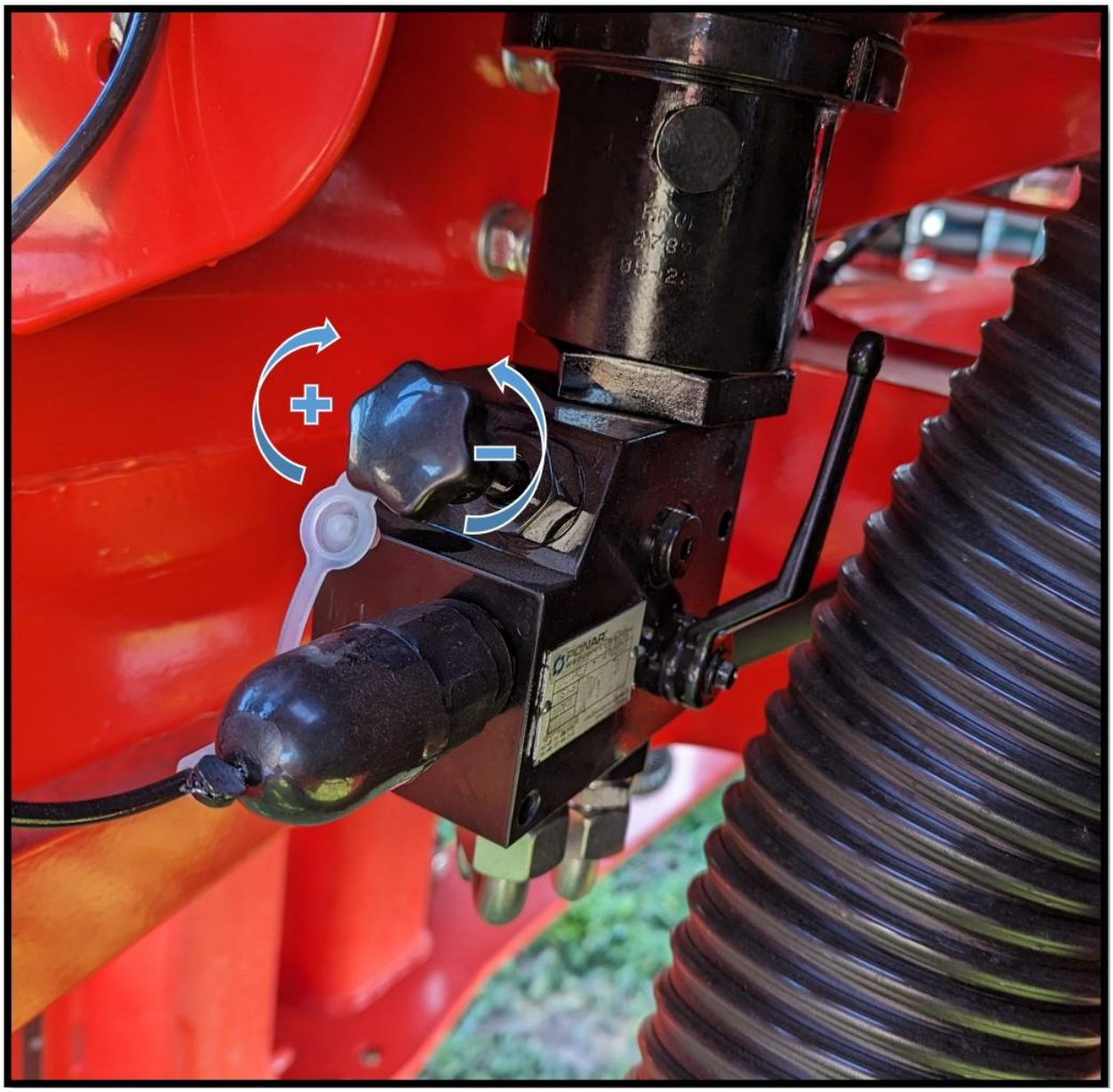

Fig. 73. Adjustment method

Drain valve with knob. If we unscrew the knob (-), the hydraulic accumulator will be emptied of the loaded hydraulic oil (overpressure). This operation must be performed before detaching or attaching the working frames.

ATTENTION ⚠ Free flow must be connected to the tractor before depressurization!

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34.9. Emergency mode for electronic controls

If machine electronics fail, the machine individual elements can be folded and unfolded in emergency mode. To start the emergency operation mode, screw the knob all the way into one of the three places that control the given components:

1. folding and unfolding of working elements,
2. folding, unfolding side frames,
3. lifting, lowering the main frame,

Mechanically activated coil in the valve bank will enable free flow of oil.
As standard, the knob is partially screwed into coil no.2. This knob is adapted to all three coils, so we can also control coils number 1 and 3 by removing the plastic covers.

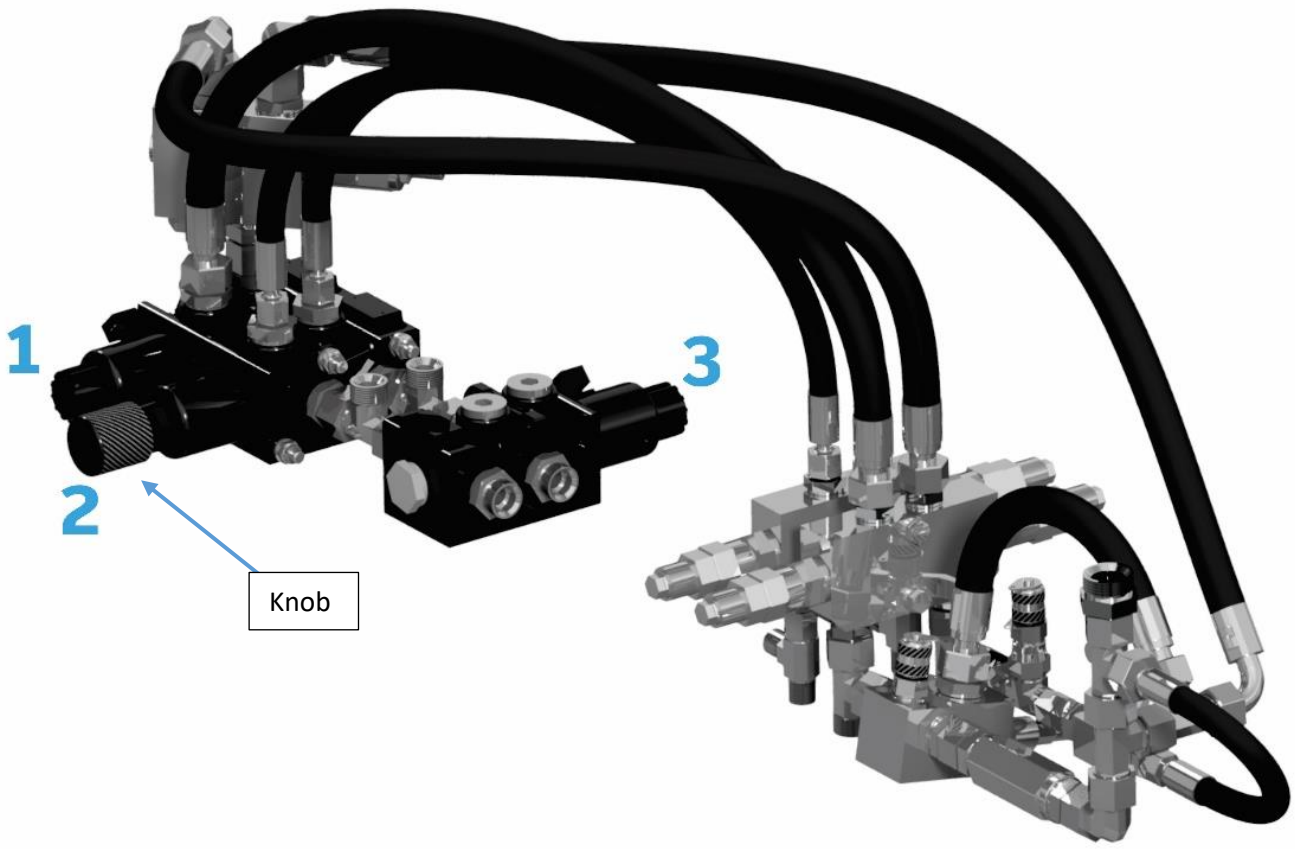


Fig. 74. Hydraulic bank

ATTENTION Secure the system by closing the oil flow when transporting the folded machine in emergency mode.

35. Maintenance

1. Before performing any maintenance, cleaning or repair work on the machine, turn off the PTO relay, the tractor engine and remove the key from the ignition.
2. You should regularly check the tightness of screws and nuts and tighten them if necessary (including wheels, mounting of working frames). These activities should be performed before each machine start-up.
3. Tighten the clamps securing the working sections after the first 50 ha of work and each time after 50 ha from the moment of changing the width of working sections.
4. Before starting maintenance work on the lifted machine, it is recommended to use appropriate supports or clips on the cylinders to prevent the machine from lowering itself.

Fig. 75. Securing clips on hydraulic cylinders

5. Always wear protective gloves and use proper tool when replacing working parts of the machine.
6. Always disconnect the machine's power supply before working on the electrical installation.

ATTENTION The electrical box may only be opened by Czajkowski Service or authorized persons!

7. Spare parts must meet the technical requirements of the machine manufacturer. This is ensured only by original spare parts.
8. Before starting any welding work, disconnect the clamps from the alternator and tractor battery. The manufacturer recommends disconnecting the machine from the tractor.
9. Protective devices exposed to damage should be checked regularly, and damaged ones should be replaced immediately.

10. Don’t exceed the temperature of 60°C when washing the machine. In addition, it is recommended to:
    - empty the tank and dosing devices,
    - unfold and lower the machine,
    - use recommended and certified cleaning agents,
    - avoid places exposed to damage caused by a strong water stream, such as: the fan, electrical system, lamps, diodes, solenoid valves, electrical and electronic boxes, machine controller, transmitter, electrical sensors, various types of warning stickers, logo and wrapping.
11. The stroke limiter of the coulter beam cylinder should be cleaned every 200 ha or 100 hours of operation.
12. Coulter beam should be protected against corrosion between seasons to avoid problems with folding/unfolding.
13. Regularly check protective devices prone to damage, damaged ones must be replaced immediately.
14. The axle manufacturer recommends checking every 500h of work the tightness of the wheel nuts, brake linings, brake lever stroke and its eventual possible regulation. Then every 1500h, check the bearing play and its possible regulation.

35.1. Maintenance of the hydraulic system

Maintenance of the hydraulic system may only be performed by trained persons. Read and follow the contents of the "Safety" chapter.

Before each start-up of the machine, you should:

- visually check the tightness of the entire hydraulic system,
- check the hydraulic lines for visible damage to the hoses (abrasions, cracks, thickening, fractures, crushing),
- check the tightness of the screws and nuts,
- check the condition of the joints and mountings of the hydraulic cylinders.

ATTENTION ⚠ Hydraulic hoses should be replaced at least every 6 years.

35.2. Maintenance and adjustment of the distributor head

Cleaning must be performed in the following way:

- pull the parking brake of the tractor, turn off the engine and remove the key from the ignition,
- unscrew the wing nuts and remove the cover of the distributor head,
- remove deposits and dirt first with a brush and then compressed air,
- fix the cover of the head and close the wing nuts.

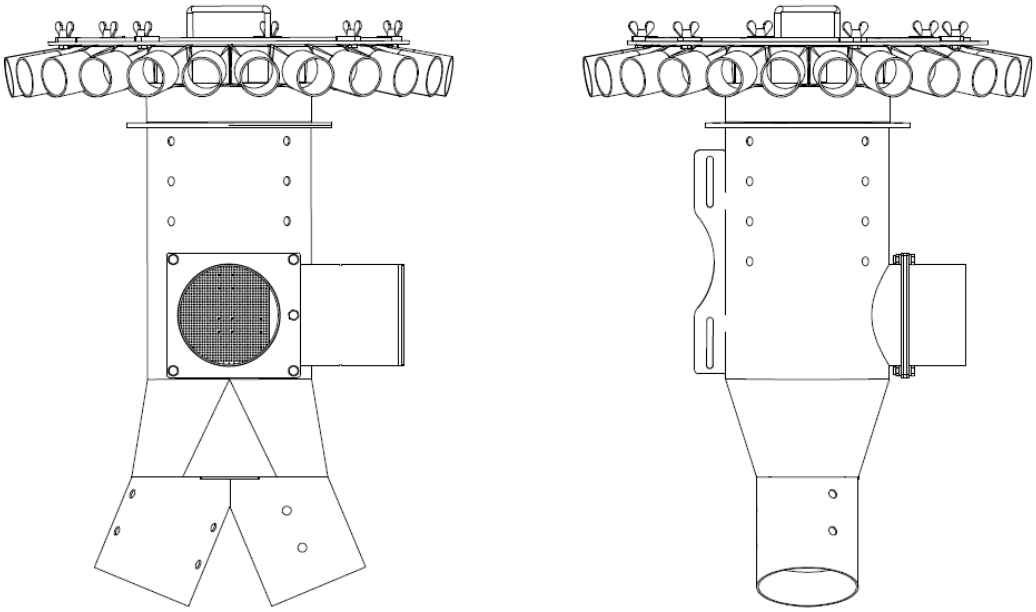


Fig. 76. Head of the seed distributor

35.3. Maintenance of the seeder

The sowing device does not require any special maintenance procedures, however, the device body should be emptied of any remaining seed material and cleaned thoroughly after work is finished, and its correct operation should be checked. If the machine will not be used for a long time, it is also recommended to dismantle the sowing shaft and set the device scraper in the inner, lower part of the body to the open position.

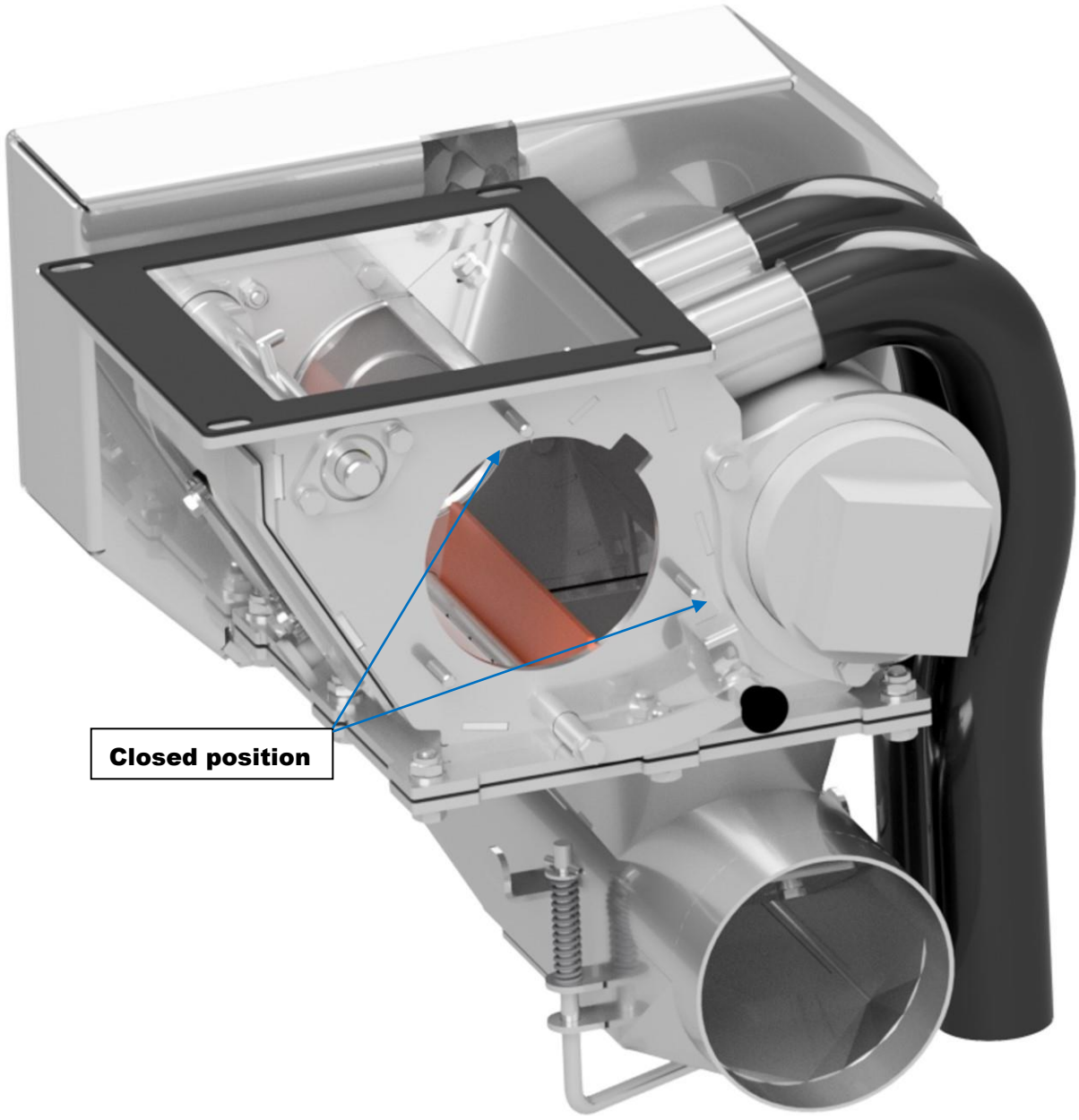


Fig. 77. Closed position of the scraper inside the seeder.

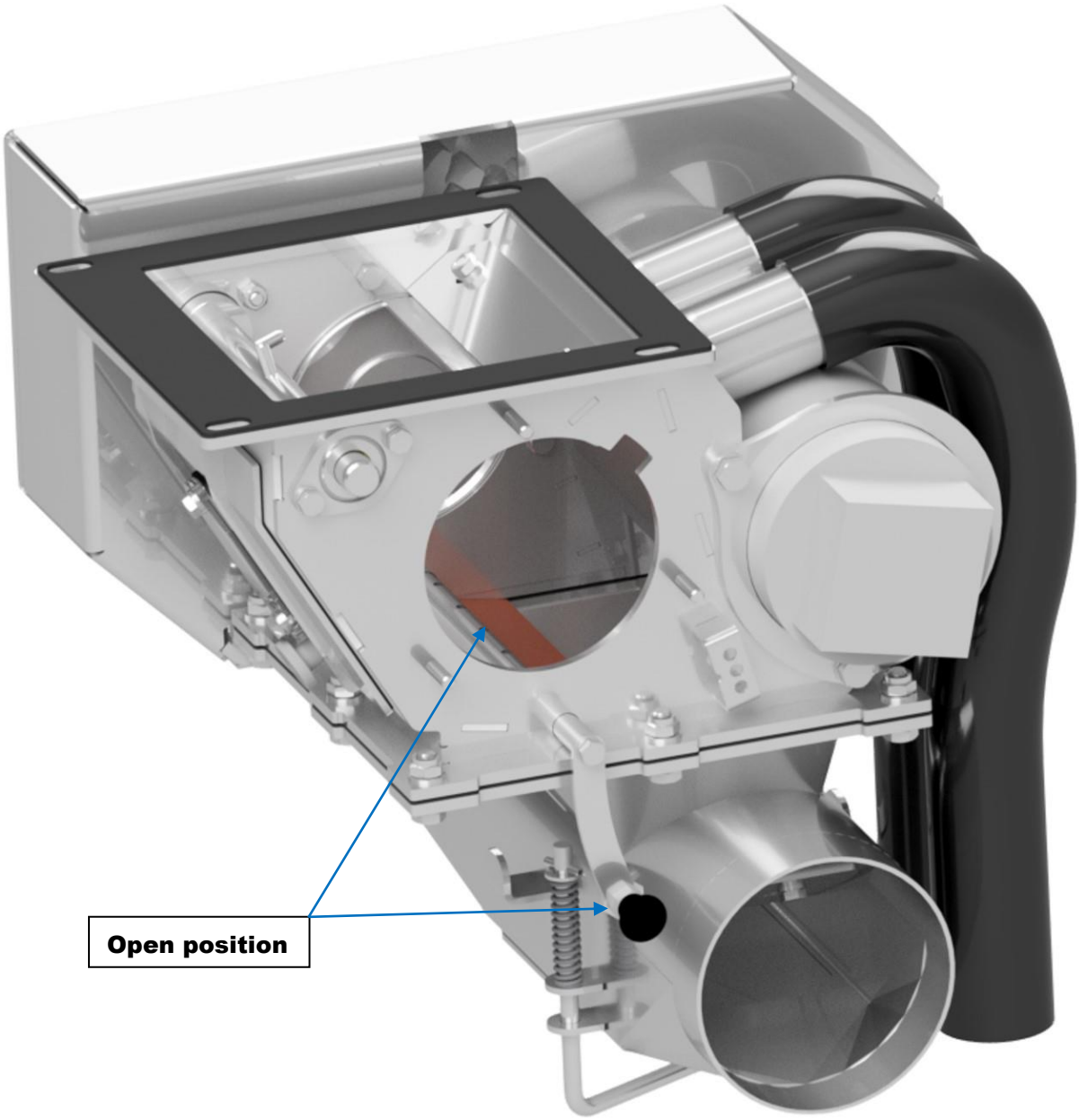


Fig. 78. Open position of the scraper inside the seeder.

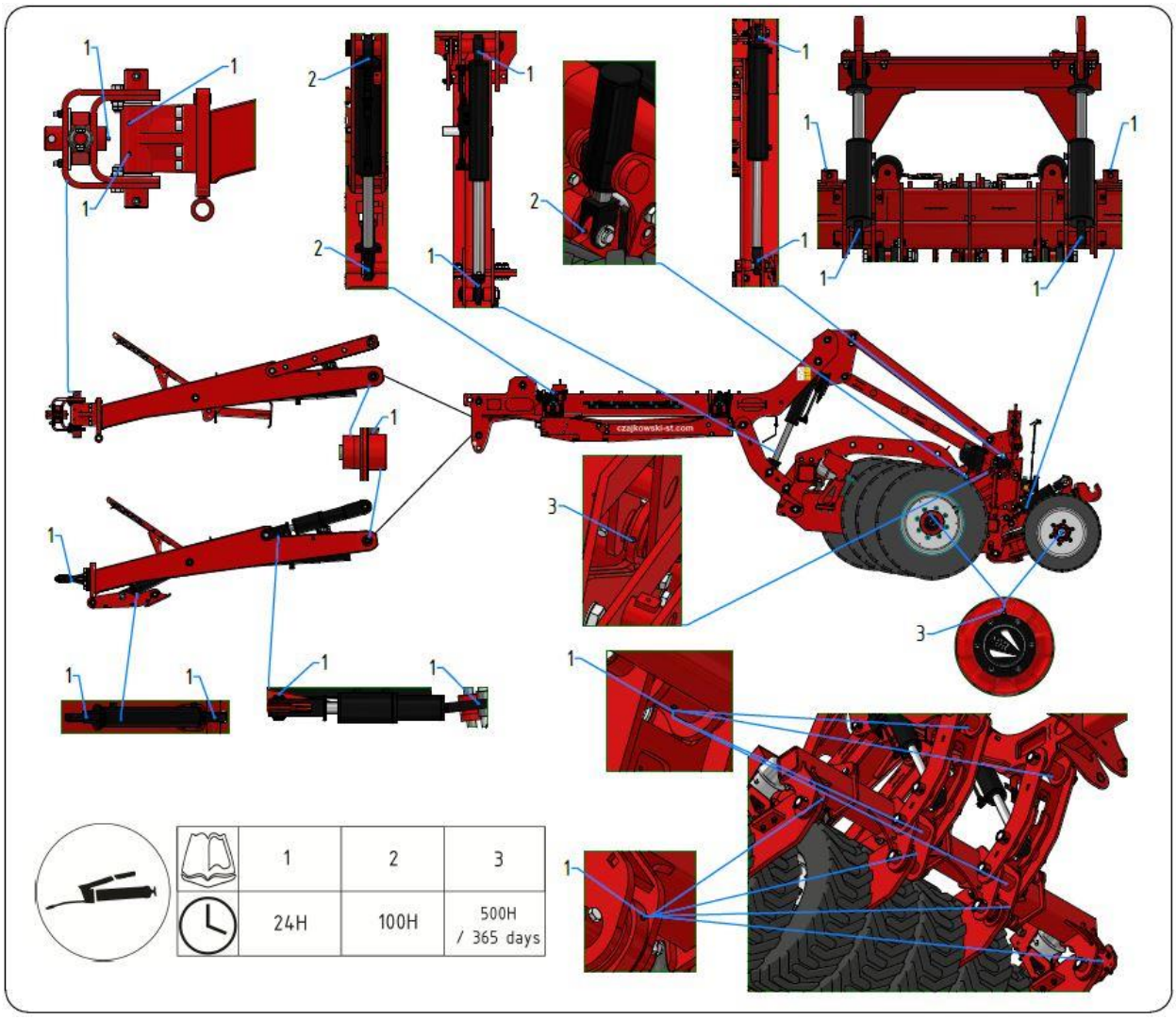
Frequency of cleaning the device depends on many factors, which include working conditions such as the type of used material, working speed, weather conditions etc. To ensure trouble-free operation, it is important to follow inspection and maintenance work.

36. Greasing points

The lubrication points on the machine and their lubrication frequencies are shown in the figure below. This drawing is also placed on the machine as a sticker. Before lubrication, clean the lubricator tip and the lubrication nipples. Lubrication of individual machine elements should be completed when fresh, clean grease appears on the given element. Replaced oils, greases and filters should be returned to special disposal points.

Oils and grease used by the manufacturer when the machine was first started up are:

- Hydraulic system – Dynatrans MPV
- External hydraulic system – Hydrol L-HV 46
- Multiplicator – 80W/90 GL-4
- Grease – L2-EP



Rys. 79. STK greasing points

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37. Seeding device

The seeding device is designed for an equal distribution of seeds and fertilizer in a pneumatic seeding system. **The seeding device is not suitable for precision seeding (e.g. maize, beetroot), the seeding system does not allow for maintaining equal distances between seeds in a row as required in precision seeding.**

Seeding device consists of the following parts:

1. Apparatus body,
2. Drive motor,
3. Sowing shaft,
4. Side cover,
5. Mixer,
6. Gears
7. Gust attachment.

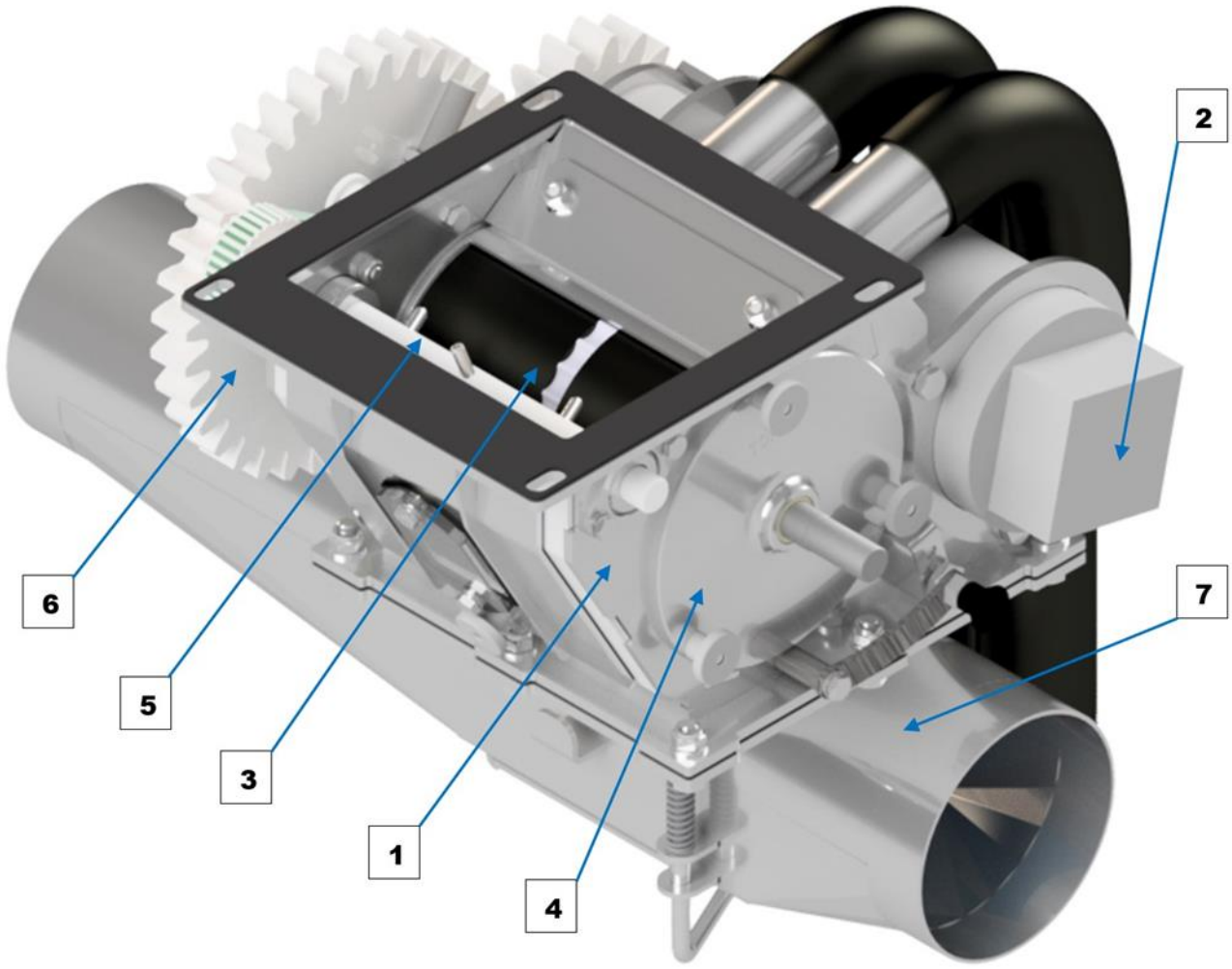


Fig. 80. Seeding device.

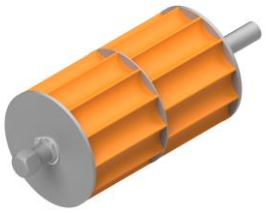
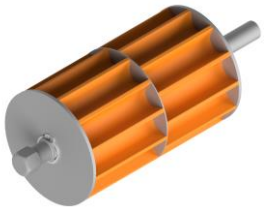
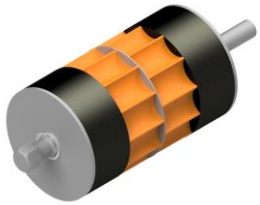
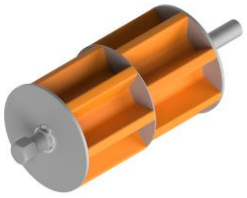
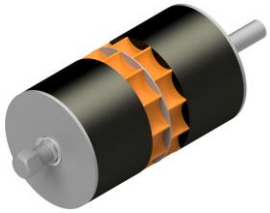
Parts necessary to operate the seeding device can be removed without tools. The device's flap enables verification of the correct functioning of the seeding device. It is also used to empty the tank of remaining seed material and makes it easier to clean the device. The mixer is used to crush the seed material and ensure that the seeder shafts are completely filled. At the top, there's a hatch that separates the seeds from the seeding device. A gust attachment is mounted at the bottom. The gear is protected by a cover that allows easy access to the gears and selection of the appropriate ratio.

When assembling the device, the edges of the contact must be sealed. Leaks may lead to changes in seed rates.

37.1. Sowing shafts (Rotors)

Dedicated sowing shafts have been made for the seeder device, which differ in relation to profiles of seeders. The table below shows the seeding shafts with their numbers from 1 to 7 and the exact values of dosed volumes. The use of several types of seeding shafts allows for a wide range of sown doses and different sizes of seed material. During the operation of the sowing shaft 1 and 2, only the sowing disc rotates, the other elements are blocked by a limiter against the body of the device.

Table 3. Sowing shafts

Name	Picture	
Sowing shaft 1		Rotor rapeseed - working width to 3 m
Sowing shaft 2		Rotor rapeseed - working width from 4 to 6 m
Sowing shaft 3		Rotor 100-200 kg
Sowing shaft 4		Rotor 200-280 kg
Sowing shaft 5		Rotor 50-100kg
Sowing shaft 6		Rotor 280-400 kg
Sowing shaft 7		Rotor 25-50 kg

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37.2. Replacing the sowing shaft

To replace the sowing shaft, close the hatch and empty the body of the device from the seed material. Then perform the following steps in the correct order:

1. Open 3x star knobs [1],
2. Remove the side cover [2],
3. Take out the sowing shaft [3],
4. Put in a suitable shaft [3] and check the limiter settings [4],
5. Put back the side cover and tighten it [2]

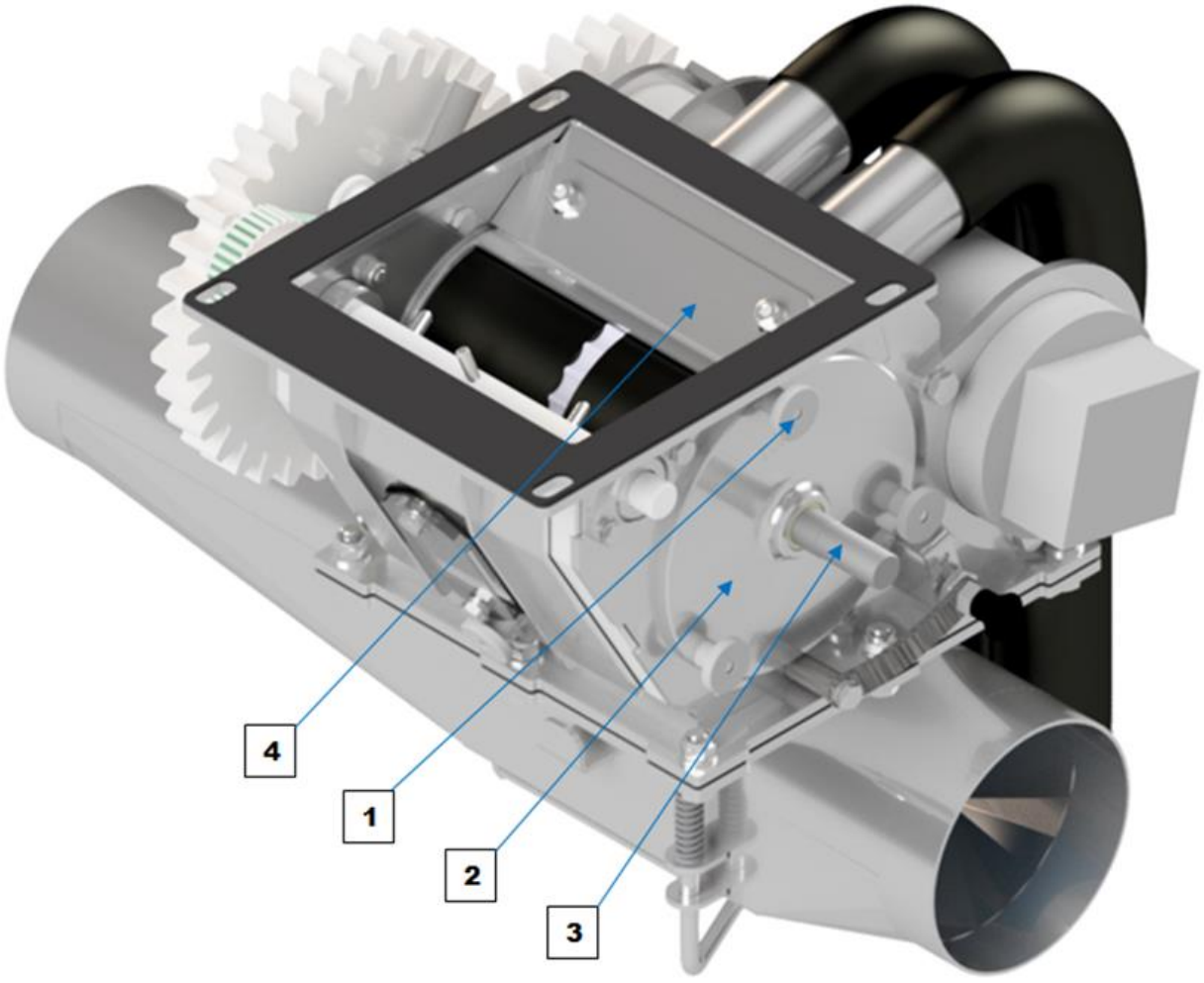

Fig. 81. Replacing the sowing shaft.

You must check the position of the limiter [4] and the guide seal [5] each time after replacing the sowing shaft.

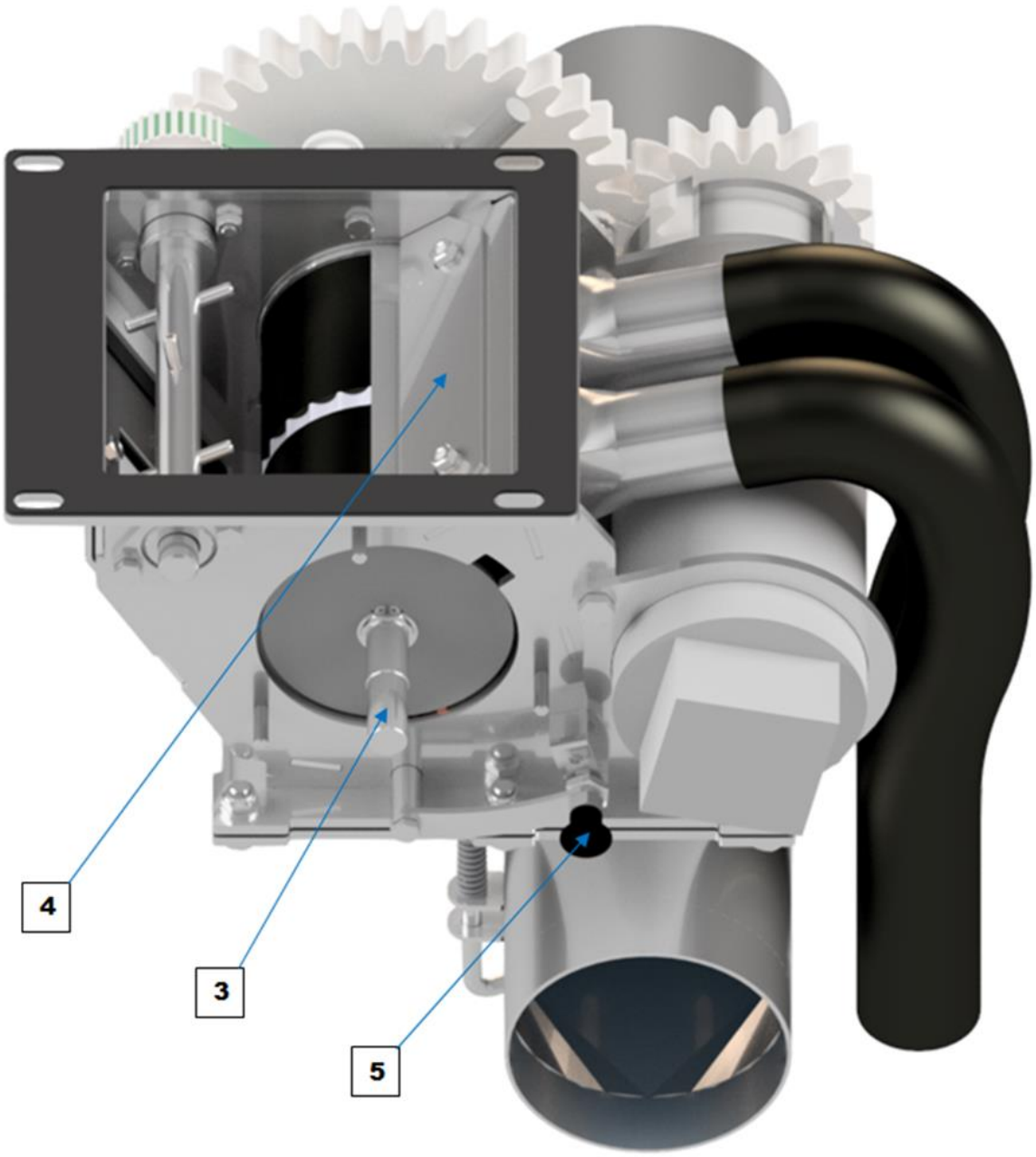

Fig. 82. Placement of the sowing shaft.

37.3. Gears

The seeding device has a set of gears to drive the sowing shafts. The available gears have the ratio of 1:2 and 1:1. Gears can be installed interchangeably, the device must be checked for correct functioning after gears are replaced.

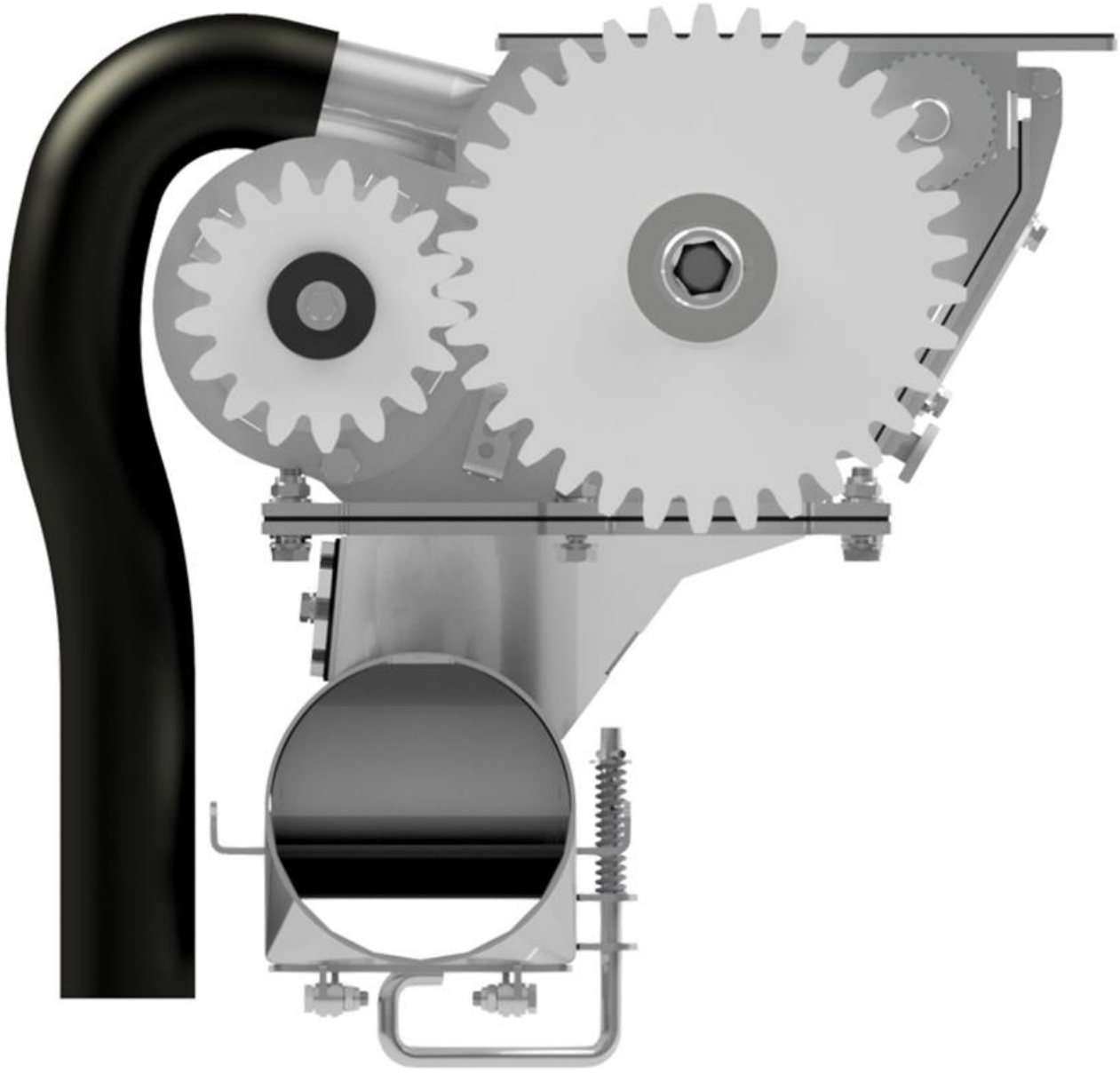

Fig. 83. Gears of the seeder.

37.4. Gear wheels cover of the seeding device

The seeding device is equipped with a gear wheel cover. For safety reasons, the cover must always be present on the device. After each removal of the cover, e.g. during maintenance, remember to mount the cover back on.

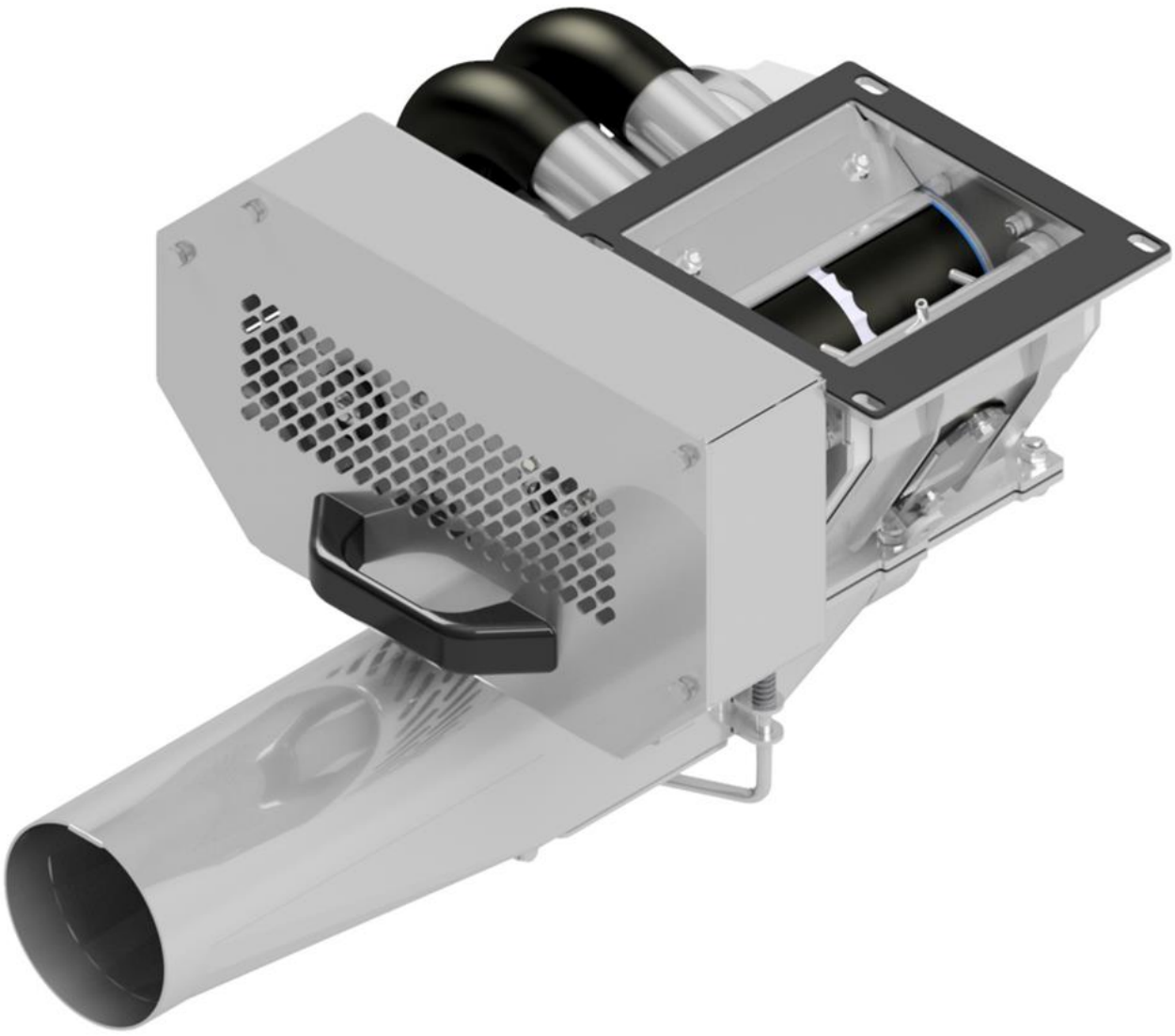

Fig. 84. Gear wheels cover

37.5. Adjusting the scraper

The Scraper [5] adhering to the sowing shaft can be adjusted in 3 positions. Check the position of the scraper and its condition before starting the machine, any damage may lead to inaccurate sowing doses. When sowing small seeds, set the scraper to the highest adjustment position, and for sowing large seeds, set it to the lowest position.

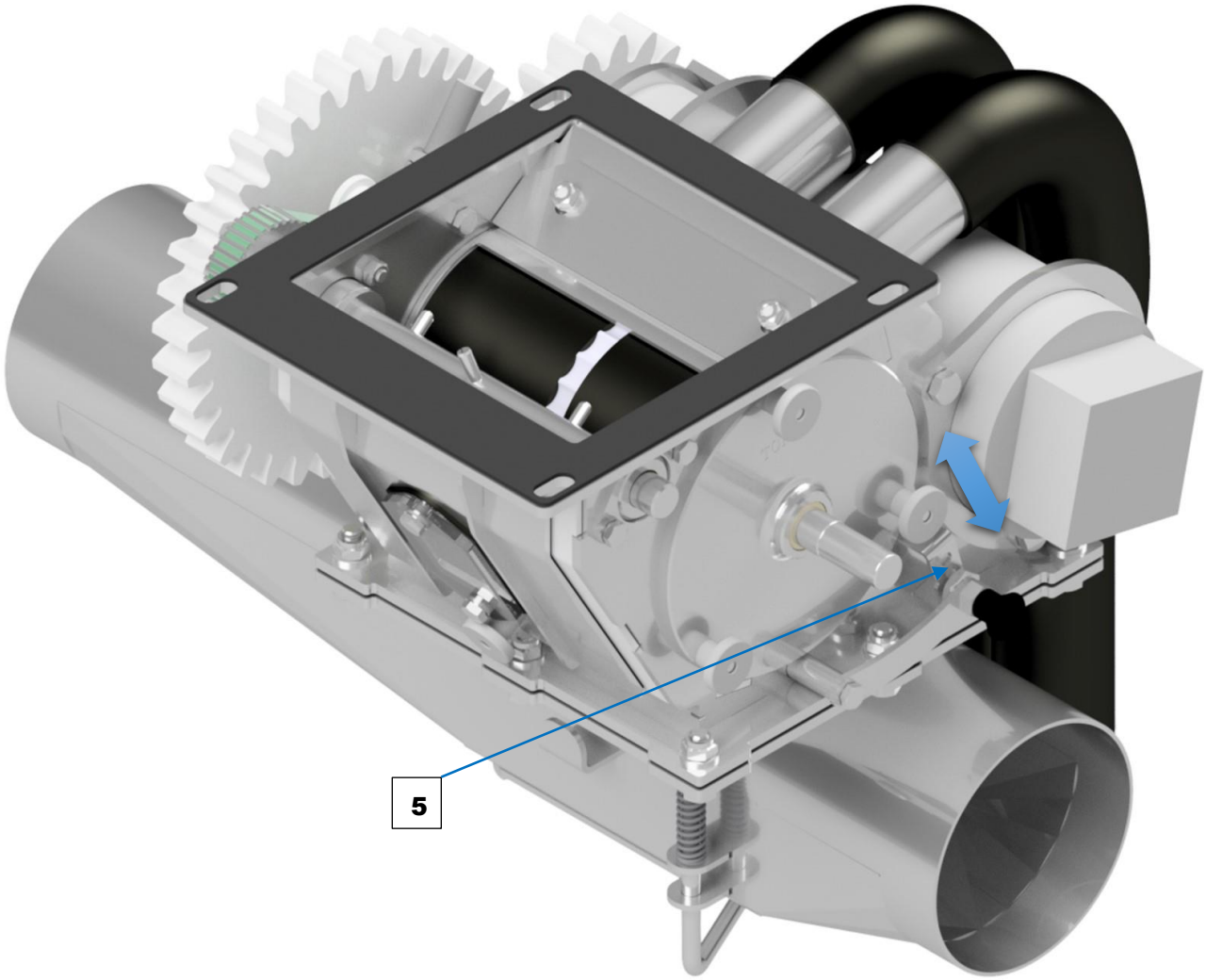

Fig. 85. Adjusting the scraper

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37.6. Adjusting the limiter

The limiter affects the tightness of the seeding device. It should be set relative to the sowing shaft; it is recommended to select the smallest gap possible. In addition, the adjustment plate should be set in the appropriate position depending on the type of material being sown; for small seeds, it is recommended to set the adjustment plate as close to the sowing shaft as possible. After the above-mentioned adjustments are done, check if the sowing shaft can move freely. Incorrect adjustment may damage the device.

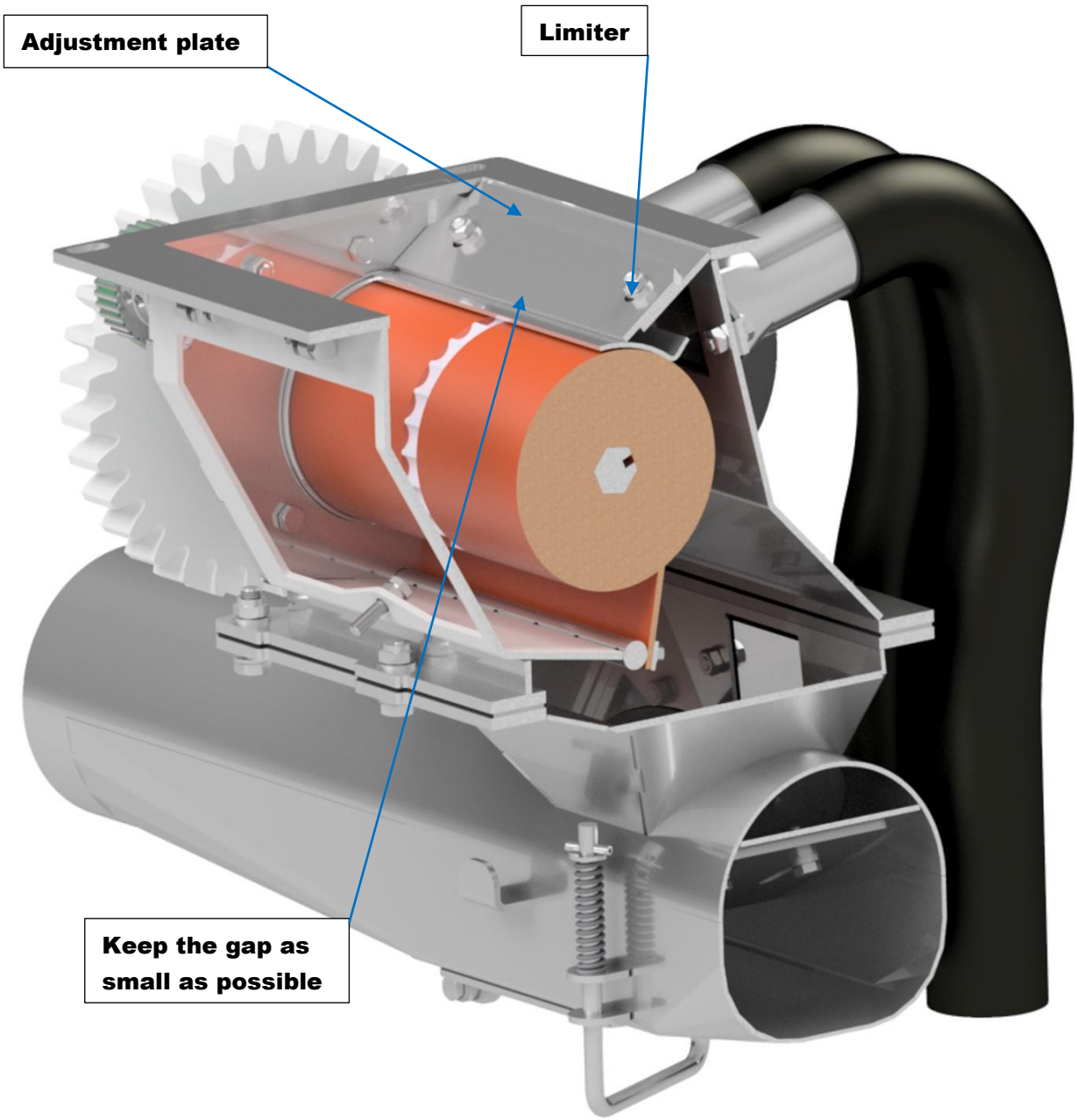

Fig. 86. Adjusting the limiter.

37.7. Tensioner

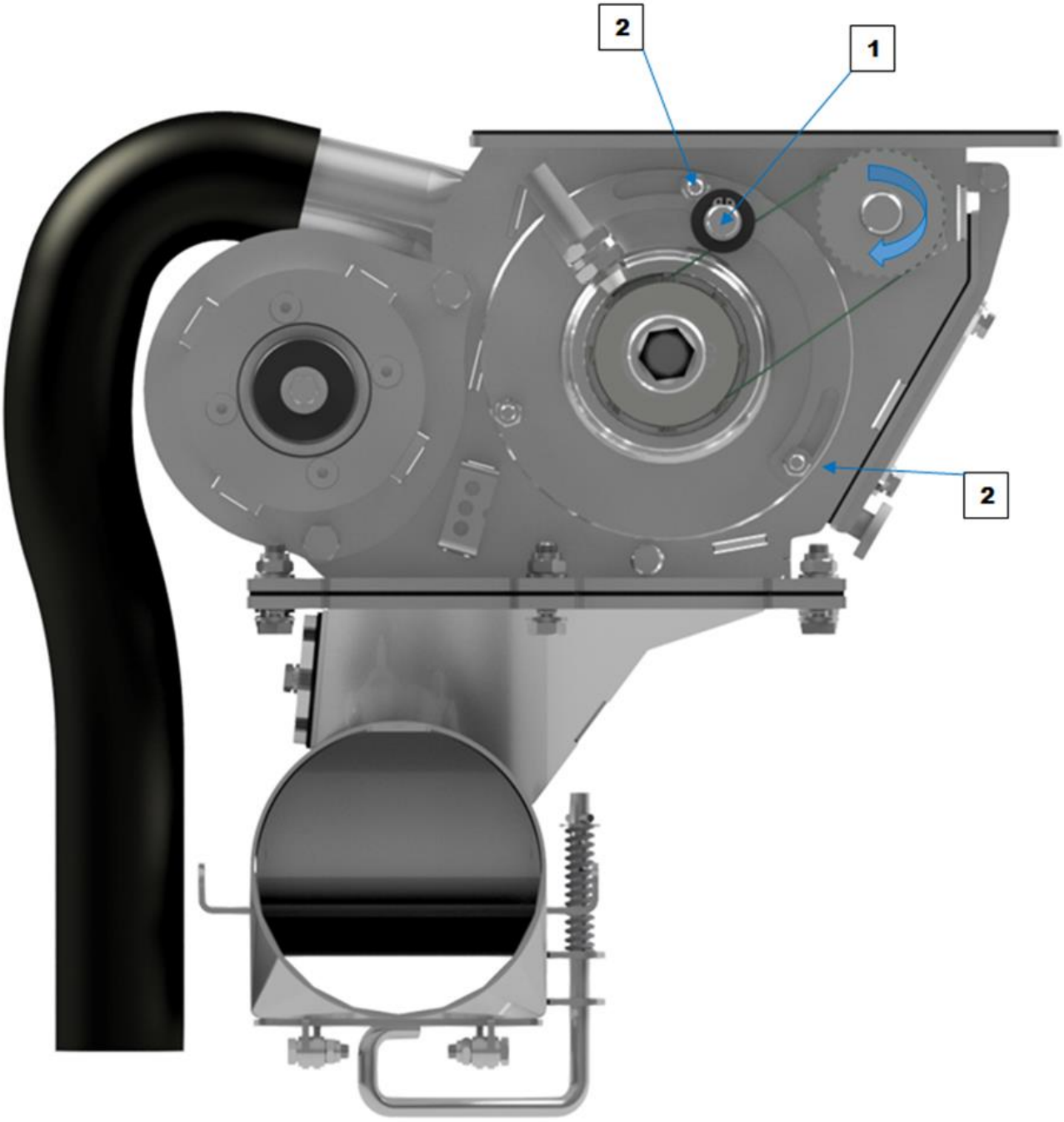

Fig. 87. Tensioner.

The tensioner (item 1) is for adjusting the tension of the mixer drive belt. You must check its condition before starting work. In order to adjust the position of the tensioner, unscrew the two m6 bolts (item 2).

37.8. Gust attachment

The gust attachment is equipped with a flap, which allows for taking the material from the calibration test. After the test the flap must be tightly closed.

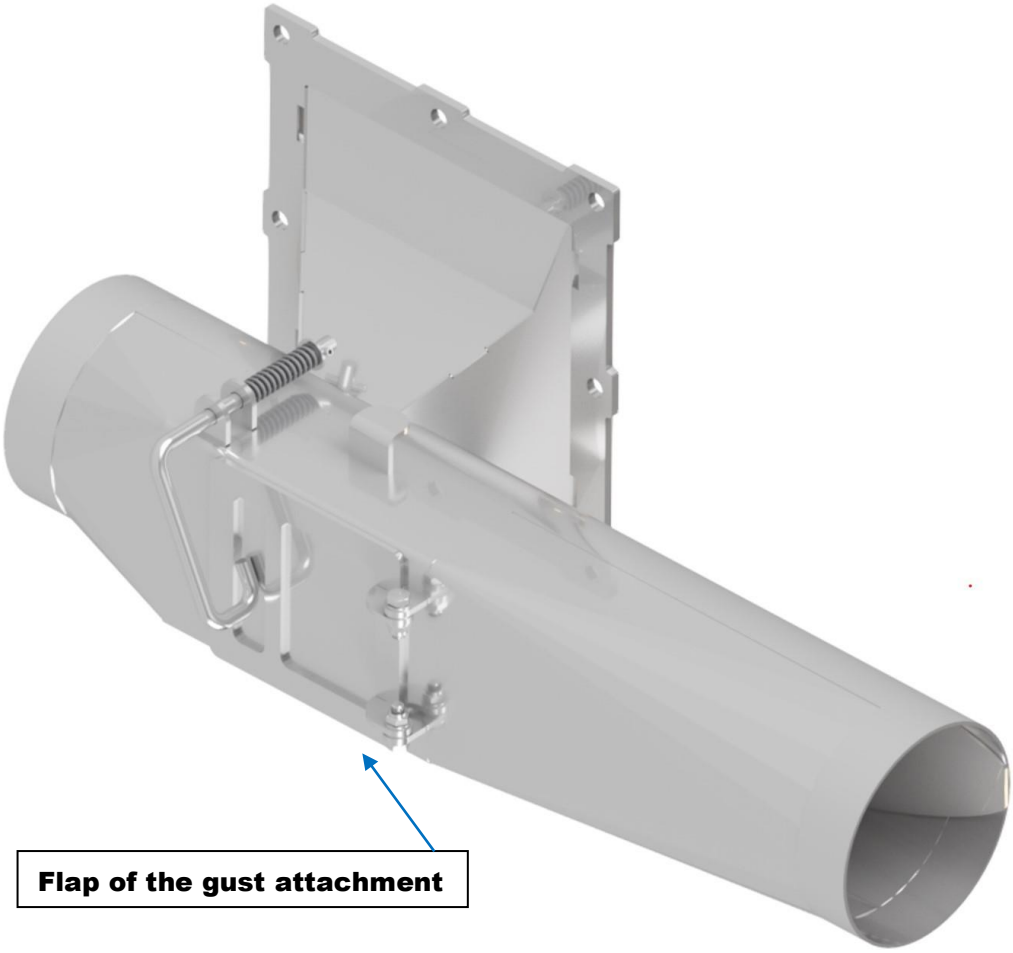

Fig. 88. Flap of the gust attachment

The gust attachment allows for adjusting the air inlet, which must be properly set in relation to the sowed dose.

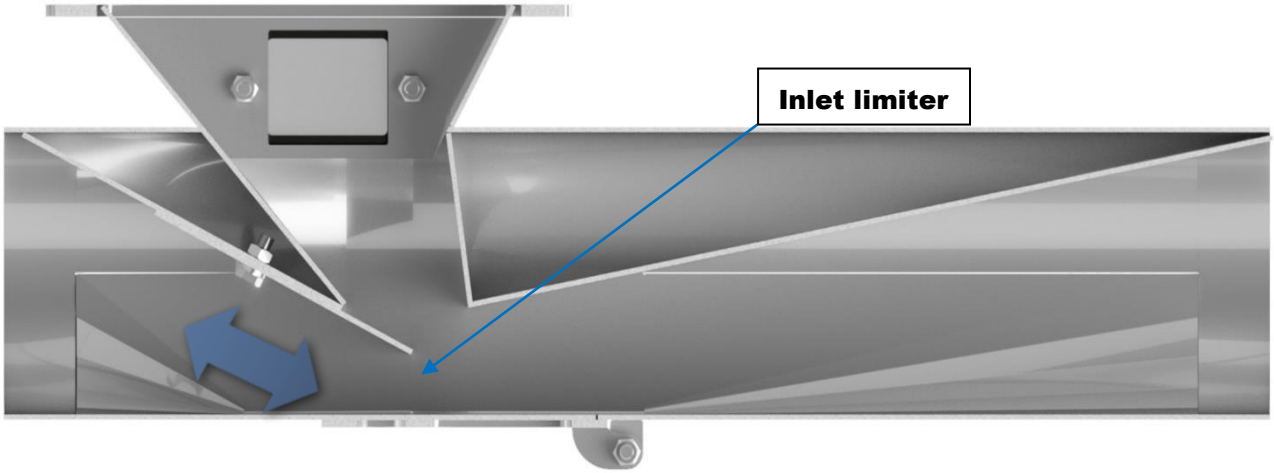

Fig. 89. Inlet limiter.

38. Attaching the machine to the tractor

When attaching a tractor with a Czajkowski STK unit and/or a seed drill and/or a precision seeder, it is prohibited to stand between these devices.

Fig. 90. Pictogram NP002

When attaching the machine to the tractor make sure that it stands on hard and even ground. Bottom linkage points of the tractor must be at the same height. The 3-point linkage must be parallel to the ground during work.

The machine must be attached to the tractor in the following way:

- reverse the tractor until the axis of linkage holes overlaps the fixing points,
- stop the tractor and pull the brake,
- attach the tractor linkage hooks to the fixing points on the machine and secure them from loosening using the original pin,
- slightly lift the machine using the rear three-point linkage and fold the support foot of the machine located at the front linkage,
- turn off the tractor engine,
- clean the hydraulic sockets on the tractor and connect the hydraulic system connectors to the tractor output sockets,
- connect the plug of the machine's electrical system to the tractor's electrical socket,
- start the tractor engine,
- turn on the tablet to operate the machine,
- check the lifting, lowering, folding and unfolding of the machine,
- check the tightness of the hydraulic system,
- connect a seeding attachment or a precision precision seeder to a functioning machine connected to the tractor.

ATTENTION Please remember that the machine with a filled tank must always be coupled to the tractor. You can disconnect the machine from the tractor only when the tank is empty.

39. Technical support

Checking the technical condition of the machine by the operator before each use increases the operator's confidence and comfort of working with the device, and also reduces the risk of accidents. Typical activities included in daily maintenance and checking the technical condition that directly affect work safety include checking:

- cleanliness of the machine;
- condition of tires and air pressure in them;
- operation of brakes;
- external and internal lighting;
- proper oil level.

Seasonal maintenance is related to the seasonality of use of machines or changes in climatic conditions. Such maintenance should consist of:

- checking the state of technical readiness;
- renewing damaged elements and protective covers;
- replenishing and changing lubricants.

40. Detaching the machine from the tractor

The machine should be disconnected from the tractor on a firm and level surface, which will ensure safe disconnection.

The following steps should be taken:

- fold the machine into the transport position,
- unfold the support foot and lower the machine to a stable support,
- use support chocks under the wheels to prevent the machine from rolling away,
- disconnect hydraulic and electrical cables between tractor and machine,
- secure the quick release couplings against dirt, fixing to a intended clip,
- lower the arms of the three-point linkage to detach the machine.

41. Attaching the ST unit to the PS attachment or a precision seeder

When connecting the seeder/attachment, perform the following steps:

- reverse the machine to a seeder or a precision seeder so the linkage openings overlap the fixing points,
- stop the tractor and pull the brake – set the P position (parking),
- attach the machine linkage hooks to the fixing points of the seeder or the precision seeder and secure them against loosening using the original pin,
- attach the machine using the central bottle screw,
- connect the hydraulic system connectors to the machine sockets,
- connect the plug of the electrical system of the PS attachment or the precision seeder to the electrical socket of the machine,
- check lifting, lowering, folding, unfolding operations of the PS/precision seeder,
- check tightness of the hydraulic system,
- level the seeder (attachment) by shortening or lengthening the central connecting screw.

Detach in opposite order

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42. Configurations

42.1. Transport position

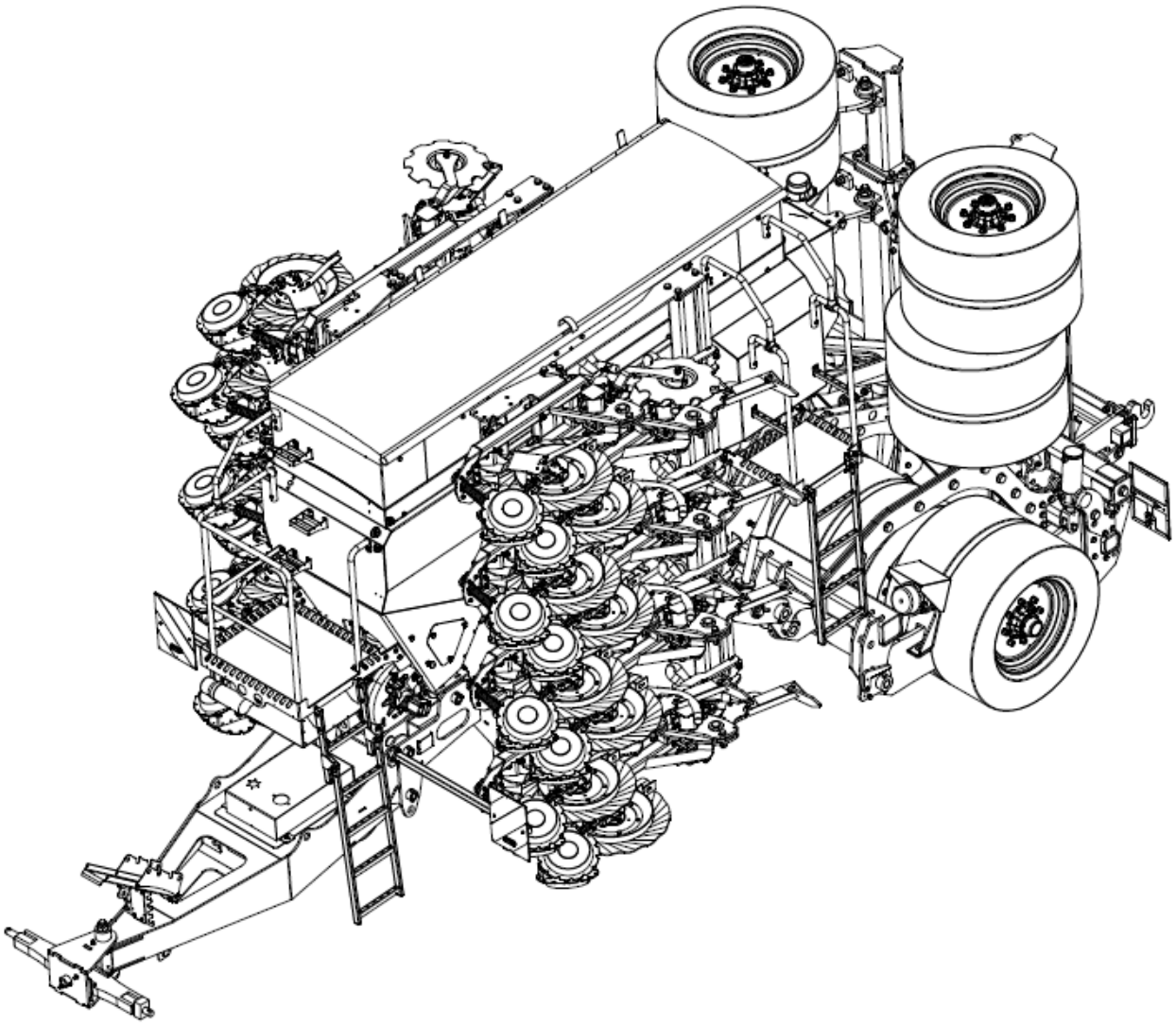

Fig. 91. Transport position of the ST600 unit

Setting the tractor-machine-seeding attachment or precision seeder assembly in the transport position should be performed as follows:

- attach the tractor to the unit,
- attach the unit to the seeding attachment or precision seeder,
- by controlling the tractor hydraulic system, lift the seeding attachment / precision seeder to the transport position using the 3-point linkage of the machine,
- using the tractor hydraulics, raise the machine to the transport position,
- using the tablet function and then controlling the tractor hydraulics, raise the machine's intermediate frames and then the wheel arms to the transport position,
- set the axle suspension to the transport position using the axle suspension switch – follow the instructions on the switch:

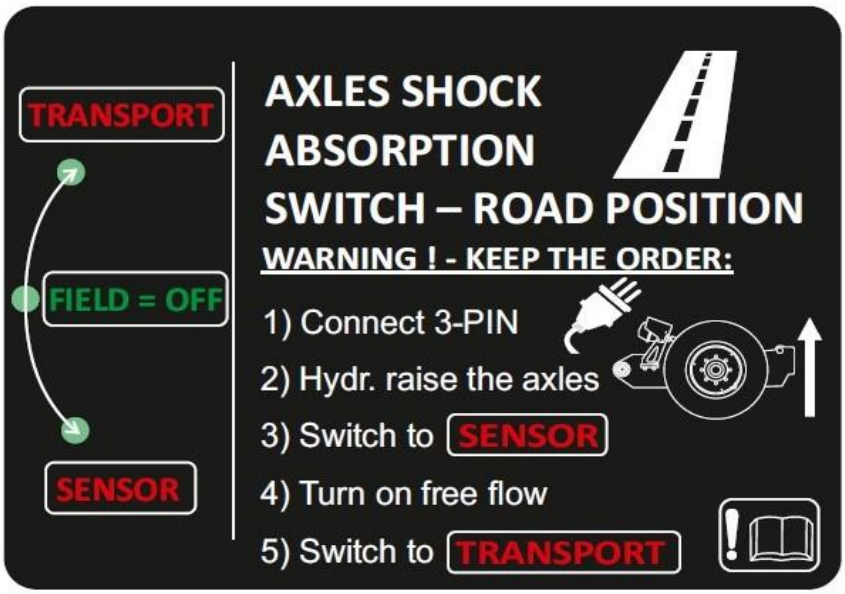

Fig. 92. Shock absorption system switch instruction – Road Position

- level the machine in transport position by using the 3-point linkage of the tractor,
- using the tablet function and then controlling the tractor hydraulics, set the furrow openers to the transport position (folded),
- check the tightness of the hydraulic system, for leaks and damage,
- turn on the high beam lights,
- secure the tire roller against unfolding with a lock,

After performing the above activities, the machine is ready for transport on public roads. The permissible transport speed is 25 km/h.

ATTENTION ⚠ When transporting on public roads, it is necessary to drive with an empty tank. Driving on roads with a filled tank is prohibited.

42.2. Working position

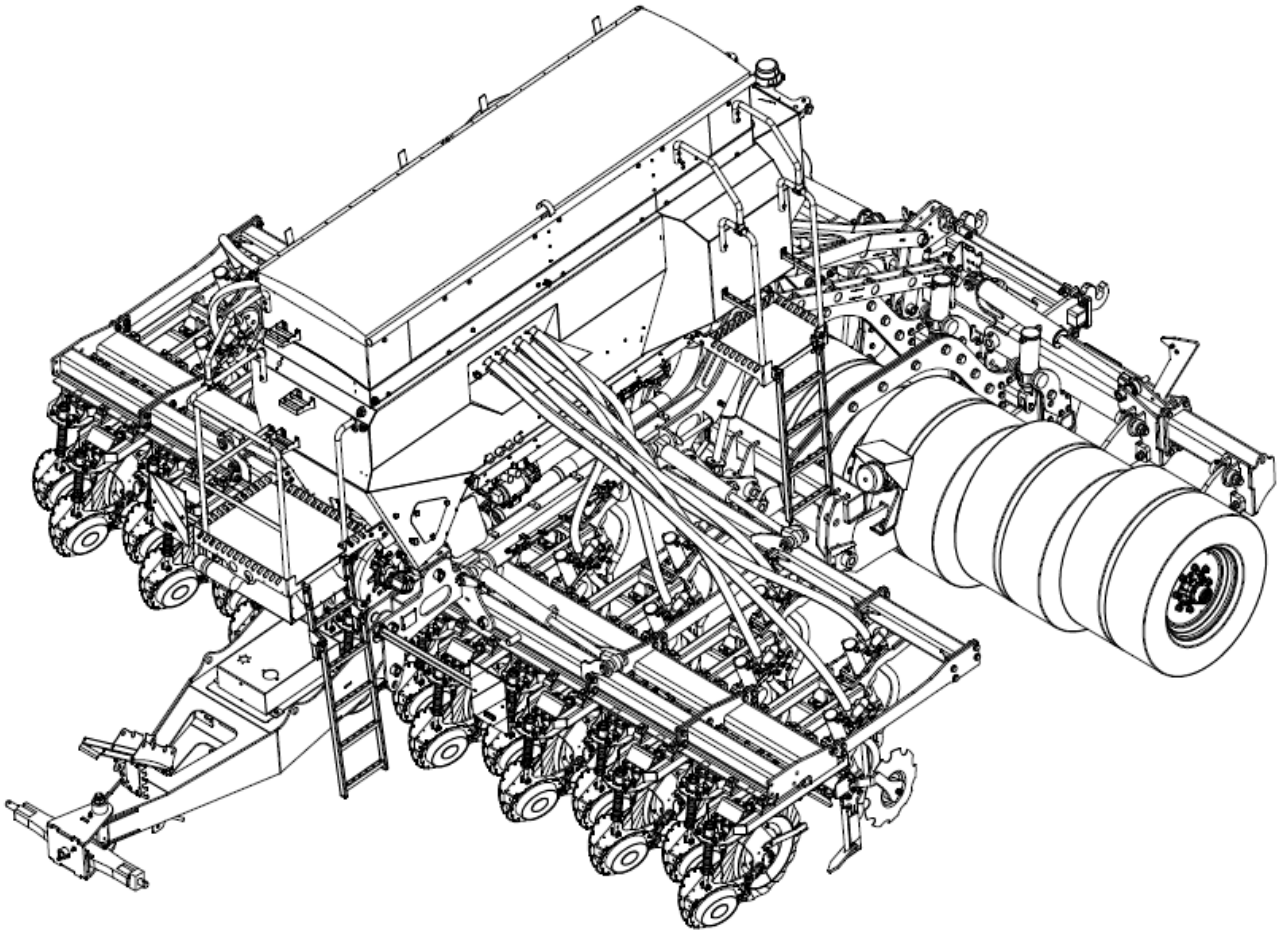

Fig. 93. Working position of the ST600 unit

After transporting the folded machine, the following steps must be performed to unfold it to the field position:

- unlock the wheel arm lock and remove transport/mechanical securing devices such as belts, chains, etc.,
- turn off the high beams,
- using the tablet function and then controlling the tractor hydraulics, lower the machine's intermediate frames and then the rear side beams of the wheels to the working position,
- using the tablet function and then controlling the tractor hydraulics, set the loosening paws to the working position (open, unfolded),
- using the tablet function and then controlling the tractor hydraulics, lower the machine to the working position,
- set the suspension to the field position using the axle suspension switch – follow the instructions on the switch:

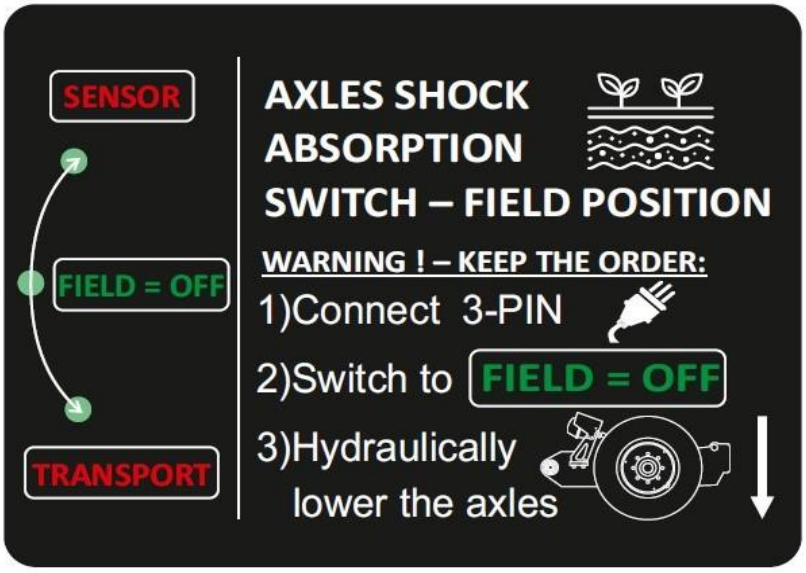

Fig. 94. Shock absorption system switch instruction – Field Position

- by controlling the tractor hydraulic system (the tablet is not required), lower the seeding attachment or a precision seeder on the 3-point linkage to work position,
- level the unit to work position by using the 3-point linkage of the tractor.

After performing the above-listed actions, the unit is ready to work in the field

43. Adjustments

43.1. Adjusting the working depth

To adjust the working depth, increase or decrease the number of stroke limiters, which are mounted on the two main hydraulic cylinders. They are responsible for raising and lowering the machine.

43.2. Adjusting fertilizer application depth

Fertilizer dosing can be adjusted in 2 ranges:
- from 0 cm neutral position [1]
- from - 2.5 cm position in case of smaller working depth [2]
Adjustment is made by unscrewing the nut and pulling out the screw, then selecting the appropriate adjustment level, inserting the screw and tightening the nut.

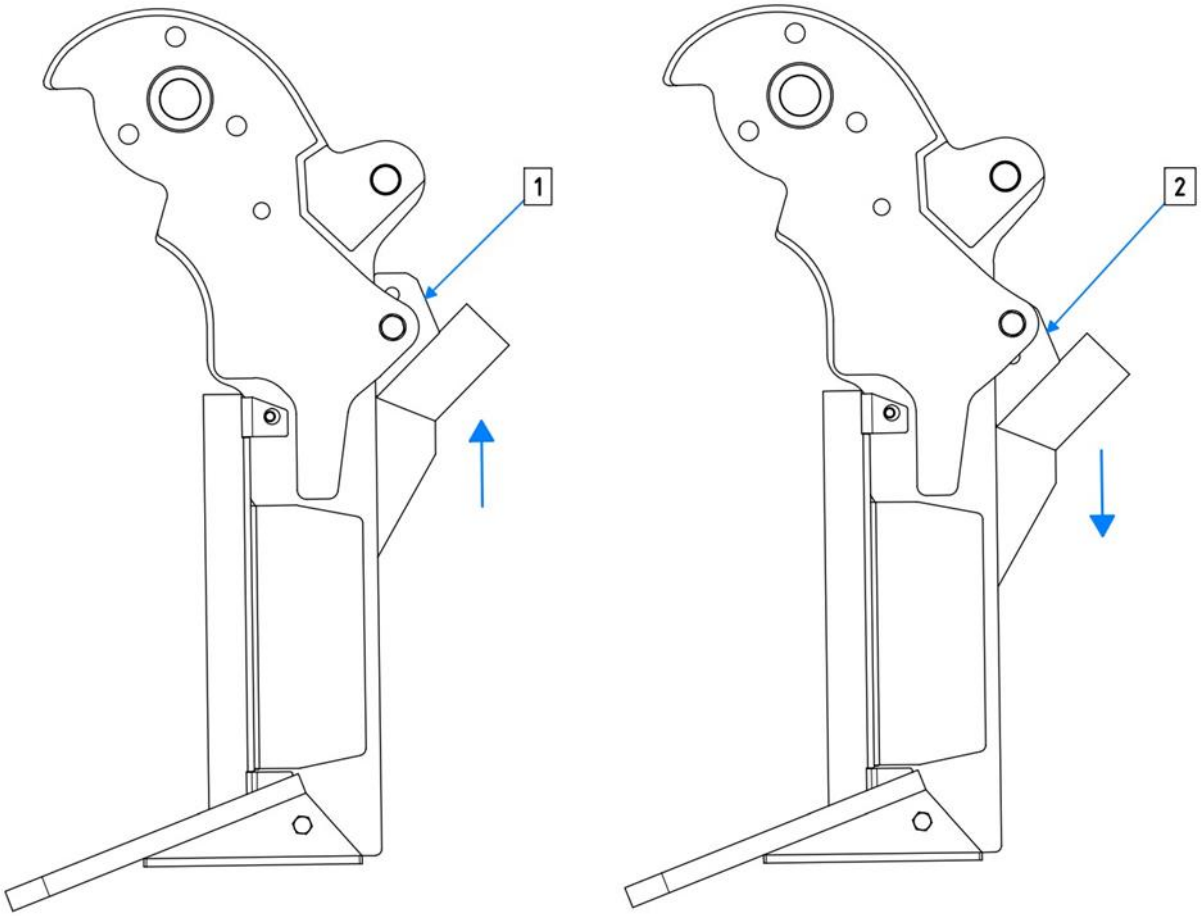

Fig. 95. Adjusting fertilizer application depth

43.3. Adjusting the spreading and breaking discs

The working position of the spreading and breaking discs is adjusted using adjustment holes by changing the length of the shock absorber [2]. When changing the working position of the discs, you should:

- release and remove the pin [1]
- set the correct length of the shock absorber [2]
- insert the pin [1]

By shortening the length of the shock absorber [2] we reduce the aggressiveness of the plates. By shortening the shock absorber length as much as possible [2] the plates become inactive.

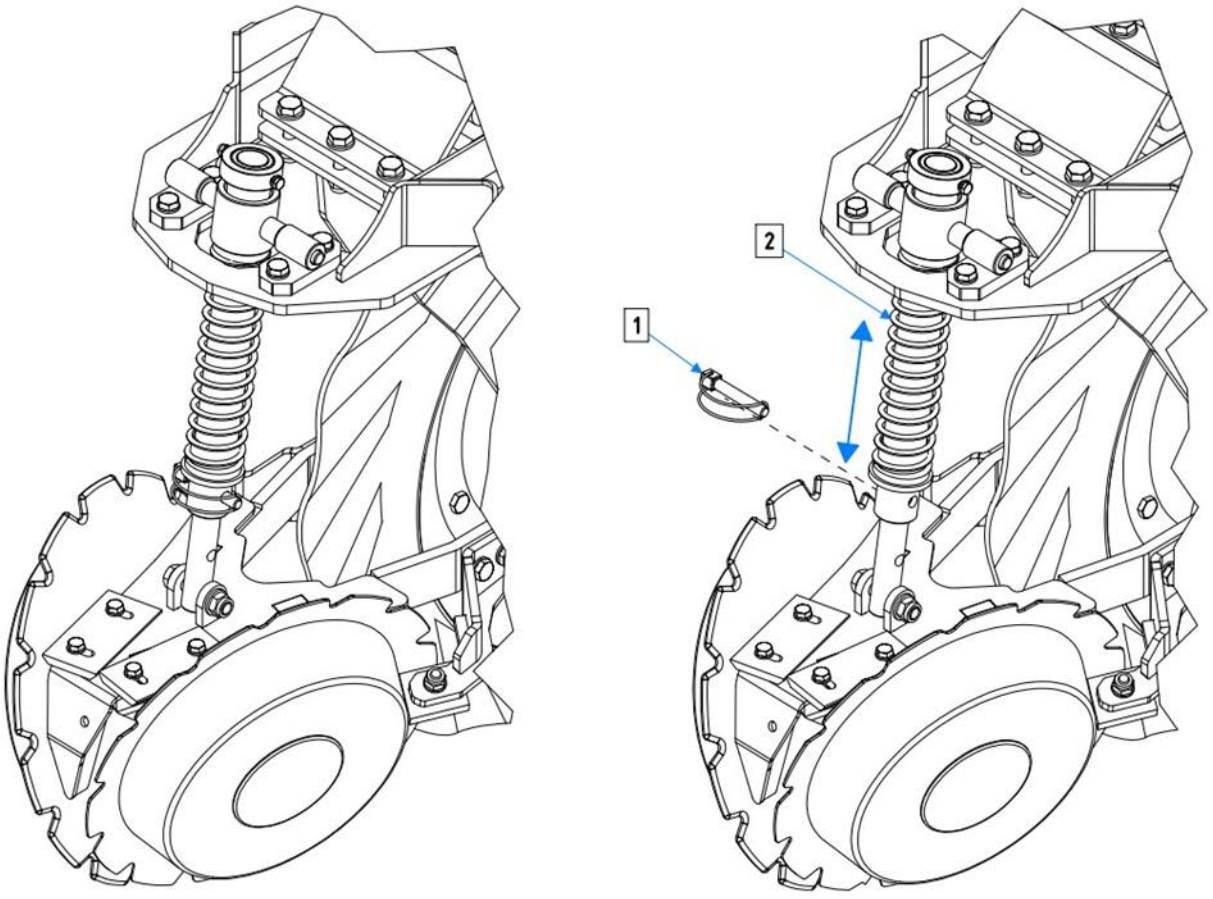

Fig. 96. Adjusting the pressing strength

43.4. Adjusting the cutting disc

The cutting disc is adjusted using a 3-point suspension system (the machine must be level).

ATTENTION ⚠ Perforated discs are intended for cutting the soil (up to 12cm), but they cannot be used as support wheels of the unit!

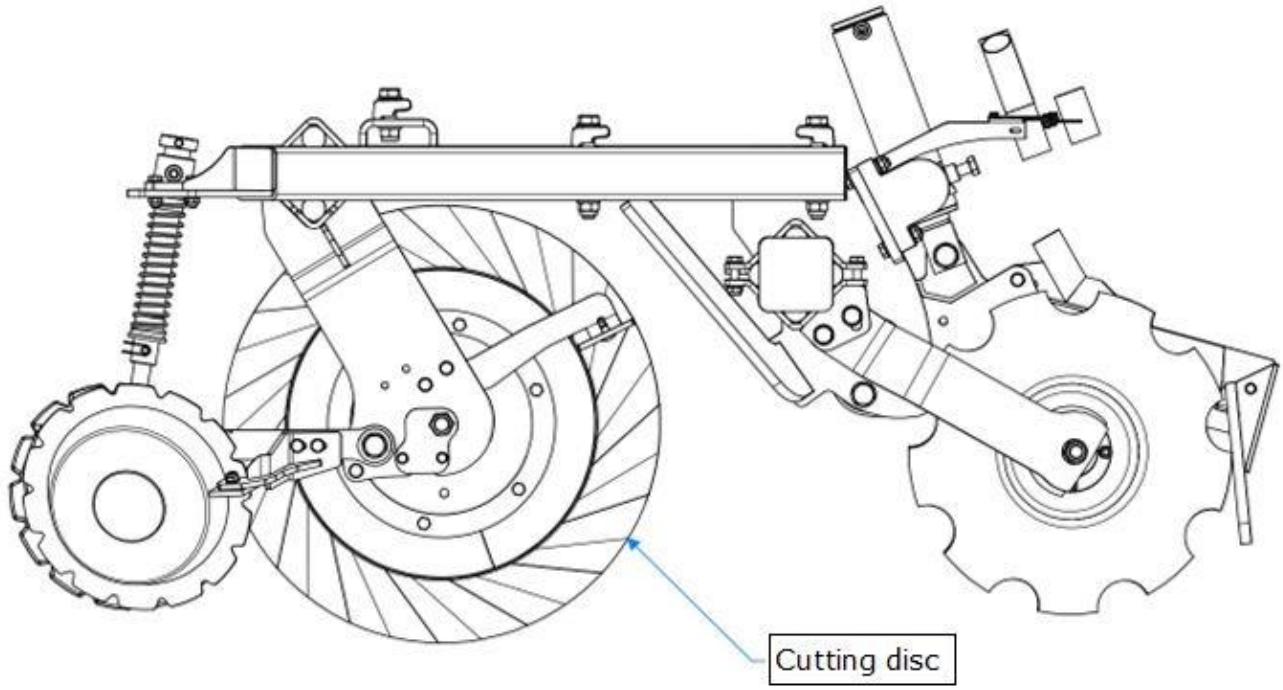

Fig. 97. Side view of the working section

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43.5. Adjusting the toothed closing discs

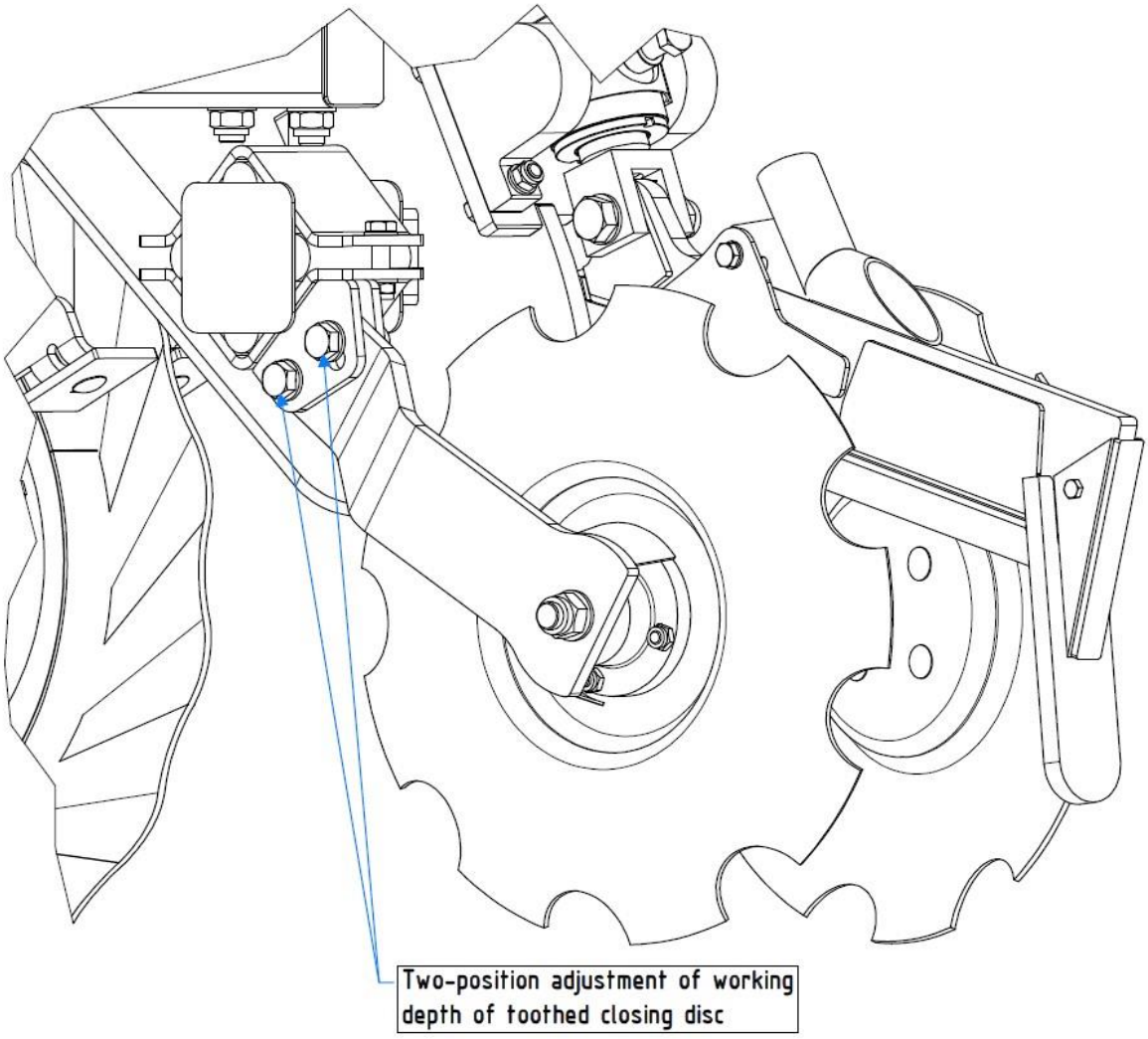

Fig. 98. Adjusting the toothed closing discs

Adjustment of the working depth of the toothed closing disc. To adjust it, loosen the nut, pull out the screw, carry out the adjustment, put in the screw, tighten the nut.

43.6. Adjusting the working depth of the closing and gathering discs

The closing and gathering discs can be adjusted in 3 ranges:

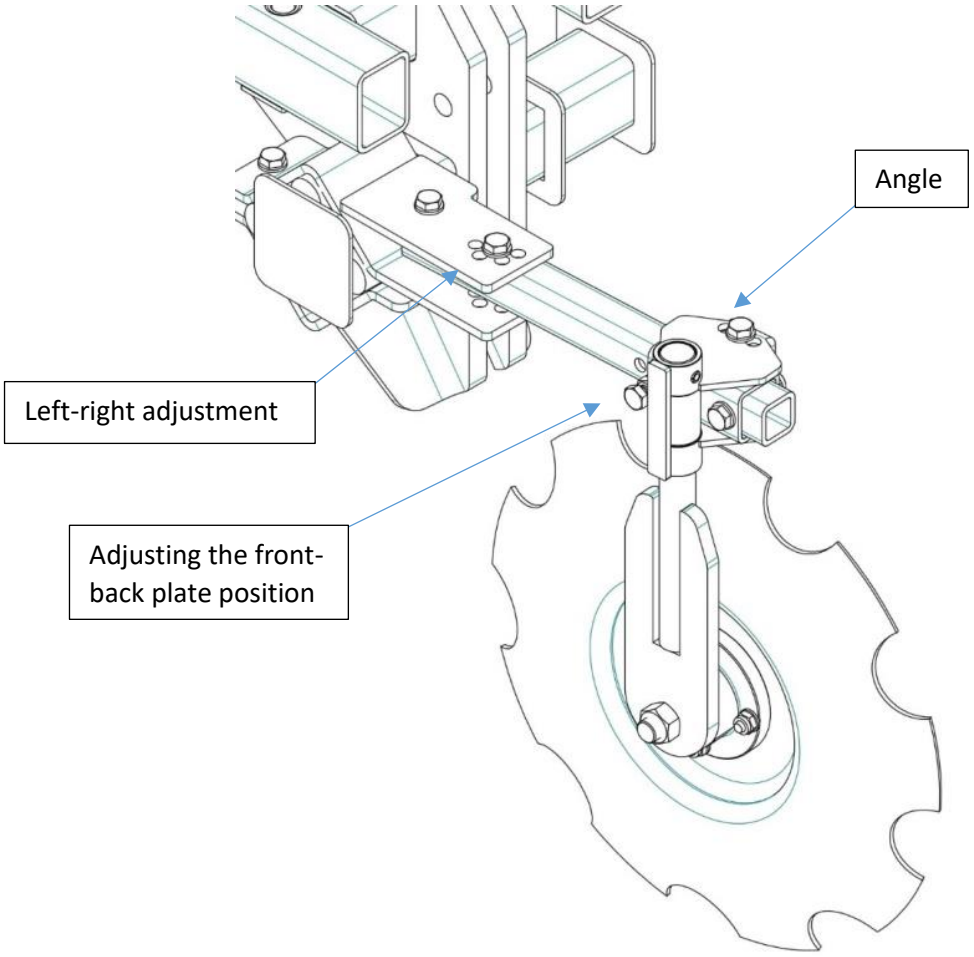

Fig. 99. Method of adjusting

1. Front-back adjustment. To perform the above adjustment, you must re-tighten the bolt located on the so-called basket, unscrew the nut, pull out the bolt, perform the adjustment, insert the bolt, bolt on the nut and counter the bolt.
2. Left-right adjustment. The above adjustment is made by unscrewing the nut, pulling out the bolt, making the adjustment, inserting the bolt, screwing on the nut.
3. Changing the angle of attack of the plate. To make the above adjustment, unscrew the nut, pull out the bolt, make the adjustment, insert the bolt, bolt on the nut.

ATTENTION ⚠ These plates are used only on the outer working sections.

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43.7. Adjusting the spacing, attaching/detaching working frames

The work frames can be adjusted in many ranges.

Example of the adjustments:

- 37,5 cm;
- 40,0 cm;
- 45,0 cm;
- 50,0 cm;
- 70,0 cm;
- 75,0 cm;

To change the spacing or adapt the machine to the appropriate working frame spacing, you should:

- unfold the machine to the working position (intermediate side frames),
- set the main frame in horizontal position (using main hydraulic cylinders and the 3-point linkage of the tractor),

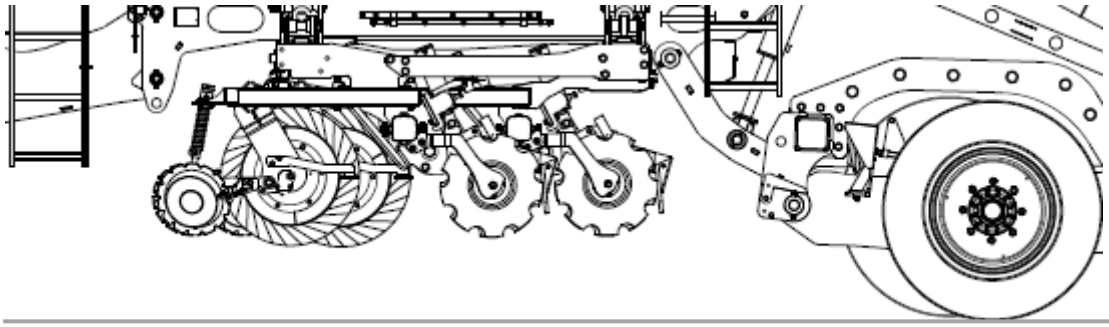

Fig. 100. Adjusting the pressing strength of discs

- engage the parking brake,
- lift the furrow openers to the transport position, if they are not already in it (fold them),
- immobilize and turn off the tractor engine, remove the key from the ignition,
- disconnect or connect hydraulic hoses from detached or attached working frames,
- unscrew the frame support screw (short frame – screw at the front, long frame – screw at the back),
- unscrew the ST section holder, which attaches the working frame to the main side frames,
  pull out or move the working frame.

Depending on whether the work section is being moved, added or put away, these activities are used in reverse order.

43.8. Pneumatic bleed valve – main tank

The machine is equipped with 1 main vent for overpressure, which is created in the pipes mounted inside the tank before the pneumatic fertilizer or seed distributor.
To bleed the system (overpressure), the bleeder valve must be set to the appropriate position.

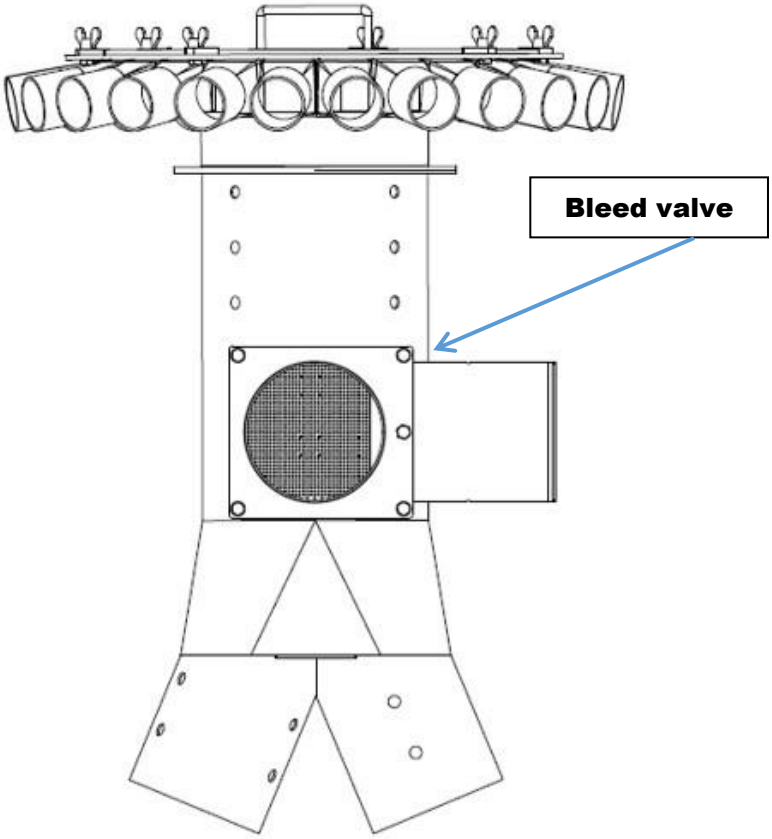

Fig. 101. Pneumatic bleed valve

43.9. Adjusting the airstream

The air flow is regulated by means of the air flow guide. To change the direction of the air flow, change the position of the flap in the appropriate direction using the lever, placing it in the appropriate hole on the adjustment comb.

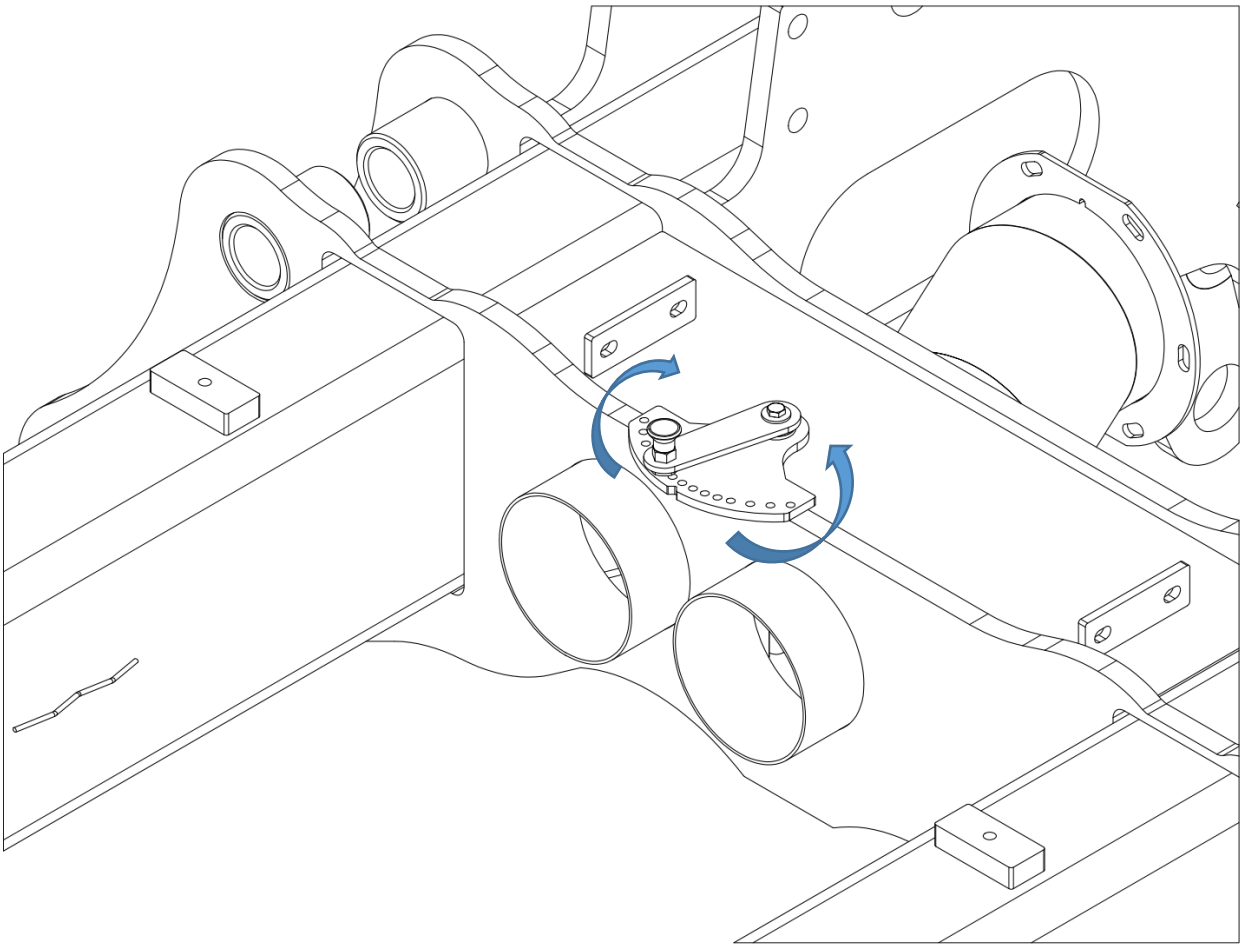

Fig. 102. Airstream regulator

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43.10. Adjusting the fan and sowing equipment of the ST with the PS

ATTENTION ⚠ Please note that these values are indicative only. These settings and the efficiency of the sowing system are influenced by phenomena such as weather conditions, soil conditions or grain size.

1. **Initial fan speed**
   First, set the initial fan speed values.
   Start with high fan speed.

Table 4. Initial fan speed values

MODEL	INITIAL FAN SPEED [rpm]
ST 600	3500-4500
ST 450	3500-4400
ST 400	3500-4200
ST 300	3400-4200

2. **Adjusting the airstream regulator**
   Next, you need to adjust the air guide located behind the fan.

Table 5. Examples of air guide settings

CROP	SEED DOSES [kg/ha]	FERTILIZER DOSES [kg/ha]	AIR STREAM REGULATOR SETTINGS
Rapeseed	2	100	2nd hole towards fertilizer
Rapeseed	2	150	3rd hole towards fertilizer
Wheat	100	100	Middle hole 0 (center)
Wheat	100	150	1st hole towards fertilizer

3. **Adjusting the PS seed attachment vent**

The next step is to regulate the pressure in the PS using the vent.

Table 6. PS vent adjustment values for rapeseed

INITIAL SETTING	SEED STATUS AT OUTLET	ADJUSTMENT
3/10	They fly freely	None
	They fly out with force and hit the pressing wheel.	Increase PS vent opening (decrease pressure)
	No seeds or they fly irregularly	Reduce PS vent opening (increase pressure)
	They fly freely, but are blown out of the ground	Increase PS vent opening (decrease pressure)

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4. Adjusting the fan speed

The final step is to adjust the fan speed.

Table 7. Example fan speed values

MODEL	SEED DOSE [kg/ha]	FERTILIZER DOSES [kg/ha]	FAN SPEED SETTINGS
ST	> 100	> 120	Upper parts rev range
	< 10	< 100	Lower parts rev range

The speed should be reduced after the initial adjustment of the air stream regulator and vent. Otherwise, too low speed may cause blockage of the fertilizer hoses.

Table 8. Approximate fan speeds

MODEL	FAN SPEED [rpm]	HOSES BLOCKAGE RISK
ST 600, ST 450	4500	Low
	4200	Medium
	< 4200	High
ST 400, ST 300	4200	Low
	3800	Medium
	< 3800	High

5. Readjusting the PS attachment

If the fan speed changes, it is necessary to readjust the air stream regulator from point 3.

There are no identical settings for the fan operating parameters for sowing grains and other plants.

The machine should be set according to the procedure, correcting the parameters with possible adjustments, in order to obtain the optimal fan force for the working conditions.

Fan adjustments should be made after entering the operating parameters (doses, etc.) on the machine computer.

Please note that these values are indicative only. The above-mentioned settings and efficiency of the sowing system are influenced by phenomena such as weather conditions, soil conditions and grain size.

44. Wheel replacement

Wheel changes should be performed on a hardened and level surface to ensure the task can be performed safely. To replace a damaged wheel/tyre, follow these steps:

1. Secure the machine wheels on both sides with wedges on the opposite side of the wheels that we intend to dismantle,
2. Raise the machine as high as possible on the lifting cylinders,
3. Lower the machine on the shock absorption all the way down (field position),
4. Do not unfold the machine, only open the furrow openers to avoid injury while working on the tire roller,
5. Place a jack (minimum 20t) under the rear frame and lift until the frame rests completely on the jack, allowing the wheel assembly to be unscrewed from the machine frames,
6. Disconnect the pneumatic hose from the brake cylinder,
7. Knock out the pin from the pin located in the piston rod of the shock absorption cylinder and remove the pin,
8. Remove the two screws securing the pin at the front of the wheel assembly and remove the pin,
9. Unscrew the brake cylinder and lift it,
10. Lower the front of the dual wheel assembly down and pull it out of the slides,
11. While moving dual wheel assembly to the right and left take it to the outside of the machine,
12. Secure the entire machine with supports where the jack is located,
13. Unscrew the individual single wheels from the wheel assembly,

In order to assemble the wheels, the above steps are performed in the reverse order.

Bolt tightening torque - **450 Nm**.
Tire pressure - **7 bar.**
Tire size - **315/70-22.5.**

45. Lock against unwanted use of the machine

The Czajkowski ST aggregate is equipped with a device that prevents the coupling with tractor in order to transport the machine by unwanted third parties. After field work is completed, the properly parked machine, unhitched from the tractor, should be blocked against possible use. To do this, use the lock on the drawbeam arm. First, slide the lock onto the beam's hitch ball and then put the padlock shackle through the lock holes in such a way that it is between the ball and the hitch beam. Then close the padlock and pull it to make sure that the lock is properly installed.

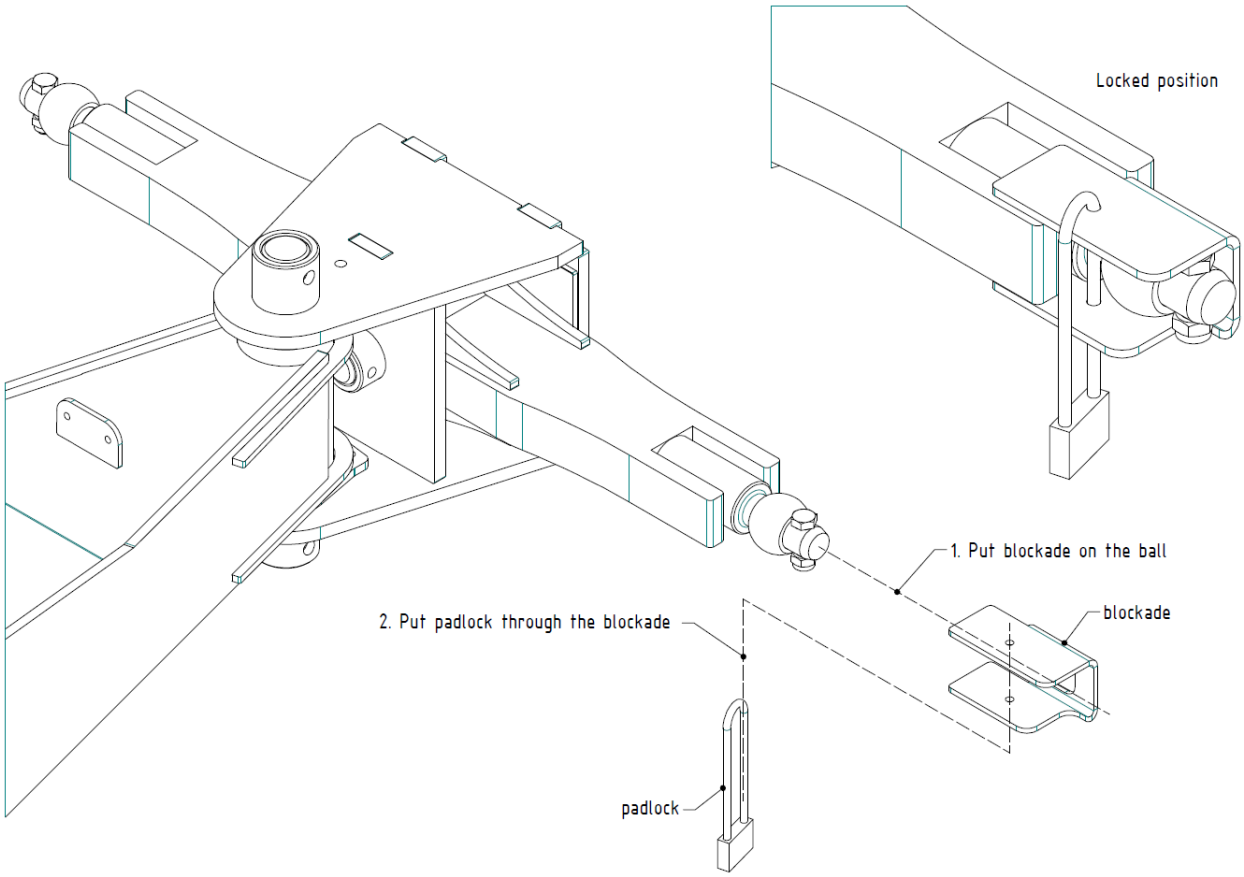

Fig. 103. Drawbar blockade

46.Long-term storage of the machine

- Before storage, the machine should be thoroughly cleaned,
- The machine must be stored in closed, roofed space.
- Working parts must be secured using an anti-corrosion agent.
- The machine should be stored with the tractor and seeder disconnected
- Lubricate necessary parts and add oil.
- Do not lubricate any parts of the seeding device.

Long-term storage of the machine should take place under a roof due to the presence of electronic components. Despite the very good quality of these components, this criterion should be met. It should be remembered that the machine's control tablet should be stored at positive temperatures and in a dry room when not in use. During long-term downtime, the tank should be emptied, the machine should be cleaned and washed. The cylinder piston rods, working elements and other glossy parts should be protected with an anti-corrosion agent. The manufacturer recommends that the cylinder piston rods be hidden. The machine should be rested on the support and folded into the transport position: - side frames folded, tire roller folded;

- arms lifted, in transport position;
- machine lowered – main piston rods retracted;
- 3-point linkage lowered;
- the machine is placed on a support foot on a hard and even surface.

During long-term machine downtime, disconnect the machine's electrical power supply (disconnect the plug from the 3 PIN socket), reduce the pressure in the roller, secure it with anti-roll chocks.

47. Maximum widths of dual wheels of the tractor

If we use a tractor with twin wheels, remember not to exceed the maximum width of 4 m to avoid collision with the profile on which the warning board is located.

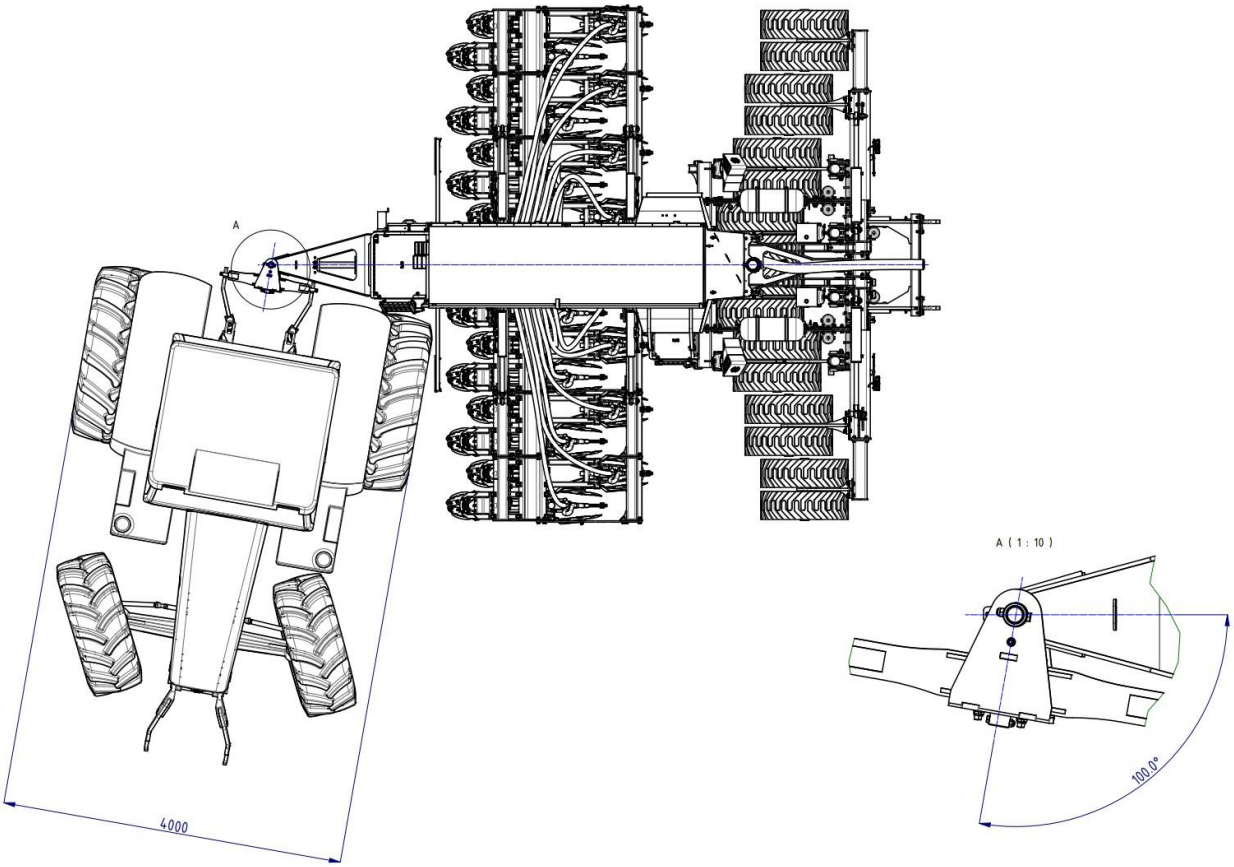

Fig. 104. Maximum width of dual wheels of the tractor

It is also possible to use a tractor with twin wheels with a maximum width of 4.2 m if you previously remove the front warning board profile.

ATTENTION ⚠ The warning board is necessary for the legal use of public roads. If you decide to dismantle the contour board, you should do so only after transporting the machine, just before using it in the field.

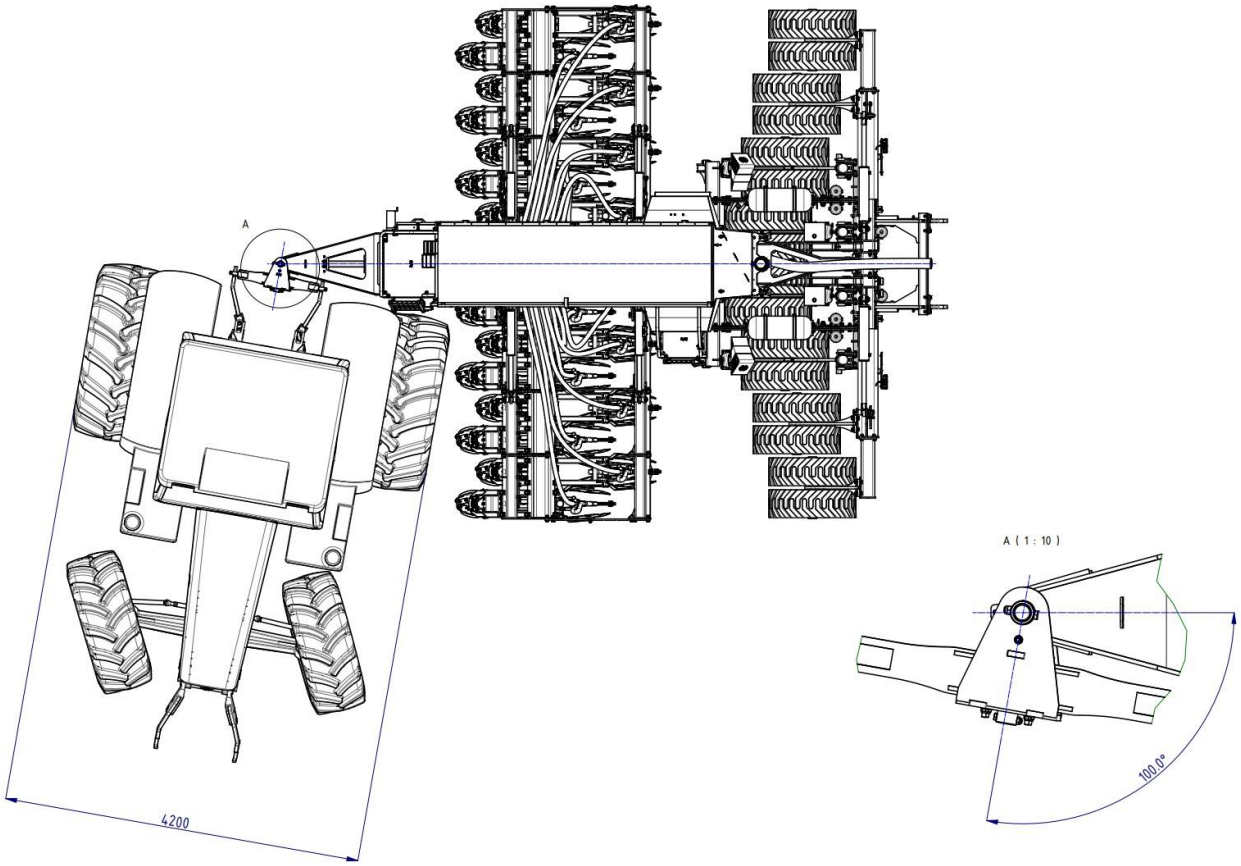

Fig. 105. Maximum width of dual wheels
of the tractor with dismantled warning board

48. Transportation

If it is necessary to transport the machine on a trailer or other means of transport, the following cables must be connected before loading:

- free flow (red cap),
- machine lifting and lowering (green cap),
- three-point linkage, if the machine is coupled to a seeding attachment or a precision seeder (yellow cap),
- brake lines.

For safety reasons and for road traffic regulations, the manufacturer recommends transportation on a low-bed trailer with a "full" floor.

Loading on this type of means of transport should be carried out in the following way:

- before driving on, raise the seeding attachment or precision seeder (if present) as high as possible,
- place the machine centrally so that it does not exceed 3 m in width and 4 m in transport height,
- slowly lower the machine onto the working section plates on the ground,
- lower the seeding attachment or precision seeder using the three-point linkage (if present),
- immobilize and secure all moving and protruding parts of the machine so they don’t pose a threat to other road users during transport,
- to improve stability, it is recommended to place a support of appropriate height and strength under the hitch,
- place support chocks under the tire roller,
- after loading, switch all connected sections to "free flow",
- disconnect all cables.

49. Disassembly and disposal

Oils, lubricants and parts for disposal covered in them pose serious threat to the environment and should be disposed according to the law and in an eco-friendly manner that's also safe for people. If necessary, consult with local authorities. While using and maintaining the machine different substances are created, which must be properly disposed of. In the case of excipients, consumable substances and other chemical agents, always follow instructions of the safety data sheets of those substances.

Decommissioning.

If the machine can no longer be used and should be utilized, it must be decommissioned. Machine parts should be segregated according to materials, and then handed over for eco-friendly disposal or recycling. While doing that you must obey the applicable regulations. Contact a disposal company if necessary.

50. Responsibility of the producer

The manufacturer does not bear responsibility for using the machine in a manner inconsistent with the provisions of the law, safety regulations or instructions of this user manual. Due to the fact that events unforeseen in this manual may occur, it's crucial to always follow general safety regulations. Responsibility of the manufacturer is excluded when the user willingly uses spare parts other than original ones or parts approved by the manufacturer, or if elements of the machine have been modified. The manufacturer is not responsible for indirect damages, including damages to other machines or devices. The manufacturer is not responsible for the wrong choice of seeds, their type and quantity. If the experience of the user is not sufficient, it's recommended to ask for help of specialists or contact the Czajkowski Maszyny company**.** Responsibility of the manufacturer does not cover incorrect (or deviating from the expected) results of work. In every case, the user must control and supervise seeding and make sure that the dosage is correct for the given conditions. The user should also constantly monitor the correctness of sowing the seeds. Responsibility for use and maintenance lies in the hands of the owner. The owner of the machine is responsible for making sure that operators have proper qualifications and know how to use the machine. You must remember that incorrect use of the machine poses danger to people, animals, bodies of water and cultivation fields. Always follow the instructions provided by manufacturers of machinery and equipment, seeds, plant protection products and fertilizers contained in specialist instructions.

51. Warranty

The warranty period is 12 months and is counted from the day of the first start-up of the machine at the customer's by the Czajkowski Maszyny sp. z o.o. service. However, the warranty is also limited to a maximum of 400 ha worked per meter of the machine's working width. An additional condition for the warranty to be valid is the use of the machine with a tractor whose power does not exceed 100 HP (horsepower) per meter of the machine's working width.

The warranty covers defects and irregularities inherent in the machine at the time of its issue, resulting from material or manufacturing defects.
Artificial elements such as rubber or plastic are covered by the warranty only in the event of obvious material defects.

The warranty does not cover wear and tear of the machine's working elements that wear out during normal use, such as:

- Elements of the furrow opener (chisel, sword, beam cover, sleeves),
- Spreading and breaking disc,
- Wavey cutting disc,
- Toothed closing discs,
- Pre-emergence marker discs,
- Bearings in discs and road/field wheels,
- Rubber compaction tires,
- Cage compaction wheels,
- Fasteners (bolts, nuts, washers etc.),

ATTENTION The manufacturer will not accept a complaint under the warranty when:

- Non-original spare parts were used,
- The machine, its individual components and accessories were not used, stored or maintained properly,
- Any repairs or technical changes were made without the manufacturer's consent,
- The contents of this instruction manual were not followed,
- The warranty card was not completed or was completed incompletely,
- The defects or faults that occurred are not related to a material or manufacturing defect,
- The defects or faults were caused by damage to the machine during transport,
- The defects or faults were caused by force majeure, the action of the elements or third parties.

52. Useful tools

While working with the cultivation unit for strip till Czajkowski ST, you should have the following tools in your toolbox. They might come in handy when operating the unit.

- hammer,
- striker (7 mm),
- wrench set: 1x7mm, 2x10mm, 2x13mm, 2x17mm, 2x19mm, 2x22mm, 2x24mm, 2x27mm, 2x30mm, 1x36mm, 1x46mm, 1x55mm,
- hex key set: 2,5mm, 4mm, 6mm, 8mm.

The above-mentioned tools are not included when buying Czajkowski machines.

53. Bolts tightening torque values

Table 9. Bolts tightening torque values

Tightening torque values in **Nm**		
Diameter	**8.8**	**10.9**
M4	3.3	4.8
M5	6.5	9.5
M6	10	15
M8	25	35
M10	50	75
M12	90	130
M14	150	210
M16	220	330
M18	330	470
M20	460	660
M22	630	900
M24	800	1200
M27	1100	1700
M30	1600	2300
M33	2100	3100
M36	2800	4000
M39	3600	5100
M42	4400	6200

- The above-mentioned bolt tightening torques are approximate values,

- When tightening wheel bolts, the values given in the section on changing wheels should be used.

54. Troubleshooting

Table 10. Troubleshooting

1.Equipment 2.Action 3.Issue	Main issue	Failure	Failure cause	Failure removal
Attaching the machine	Tractor	**The tractor should be equipped with quick release connector for free oil flow**	oil should return to the tractor freely	Fix the quick release connector for free oil flow directly to the oil tank
Attaching the machine	Tractor	**The cabin should have at least two 3-pin 12v sockets**	Power supply for the camera display and extension cord for the seeder	Install the sockets
Attaching the machine	External hydraulic system	**Pump of the external hydraulic system should be installed in a way that does not allow it to move freely**	Incorrect installation of the pump may lead to damaging the spline	Correct installation of the pump on the PTO shaft axis
Attaching the machine	Connecting hydraulic hoses	**Machine works incorrectly**	Connecting hydraulic hoses incorrectly will cause failure	Connect hoses according to colours and pairs.
Attaching the seeder	Connecting hydraulic hoses	**Machine works incorrectly**	Connecting hydraulic hoses incorrectly will cause failure	Connect hoses according to colours and pairs.
Attaching the seeder	Seeder	**Signal cable is too short**	Use a 10m extension cord between the tractor and the seeder	Use dedicated seeder extension cord
Attaching the PS attachment	Attachment	**Connect:** **-pneumatic hose** **-hydraulic system (blue hoses)** **-electrical cable**	- hose for transporting seeds between the device and the seeder -blue hydraulic outlets for marker control -electronics for controlling seeding and paths	Connect according to the user manual
ST unit	Notched discs	**Don’t break up harvest remains**	Not enough depth	Slide out
ST unit	Furrow opener	**Too shallow**	Too many clips on hydraulic cylinders	Remove excessive clips
ST unit	Furrow opener	**Chisels don't work efficiently, lose their track**	Used opener, working parts replaced too late	Replace the coulter beam
ST unit	Furrow opener	**No pressure in working parts**	There’s a release valve on the hydraulic accumulator	Close the valve

ST unit	Furrow opener	**Deposits remain on the coulter beam**	Not enough depth of the cutting disc	Lower on the three-point linkage of the tractor

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ST unit	Fertilizer distributing tubes	**Fertilizer must be applied deeper**	Tubes have 2 depth adjustments	Put on lower holes
ST unit	Fertilizer distributing tubes	**No flow**	Clogged system or wrong connection of hoses	Check hose connections and clean the system
Seed distribution	Flow sensors	**No flow is indicated**	Seeds stay in the flow sensor or the coulter of the applicator	Clean the blocked system
Seed distribution	tank	**Seeds stay in the tank**	Leaking apparatus	Check the tightening rubber under the rotor
Hydraulic system	Pressing roller	**Pressing strength of the roller is too weak**	Pressure is too low	Correct the pressing pressure. Recommended: 160 - 200 bar
Hydraulic system	Rear three-point linkage	**Uncovered seeds on elevations**	The three-point linkage is not copying the ground	The rear three-point linkage should work in „free float" mode. Set the mode on the tractor.
Hydraulic system	Air blower	**Oil is flowing out due to tightened engine**	Oil is not flowing back to the tractor freely	Check the free flow connection
Hydraulic system	Unfolding	**The machine is folding and unfolding very slowly**	There's a pressure reduction valve at the rear section of the machine	Close the valve
Hydraulic system	Folding, unfolding, working parts, rear three-point linkage	**All functions aren't working correctly**	Hydraulic hoses have colour marking	Check the connection of hydraulic hoses to the tractor
Seed distribution	Flow sensors	**No flow is indicated**	Seeds stay in the flow sensor or the coulter of the applicator	Clean the blocked system
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Hydraulic system	Folding, unfolding, working parts, rear three-point linkage	**All functions aren't working correctly**	Hydraulic hoses have colour marking	Check the connection of hydraulic hoses to the tractor
Electrical system	Display screen	**Displays screen isn't turning on**	No power	Check the power cord between the tractor and the machine
Electrical system	Seeds	**The device is not distributing the specified amount of seeds**	Incorrect settings	Check settings for working width of the unit
Electrical system	Seeds	**Rotor is rotating at maximum speed**	Incorrect rotor size	Replace the rotor with a bigger one

55. Index

56. Notes

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