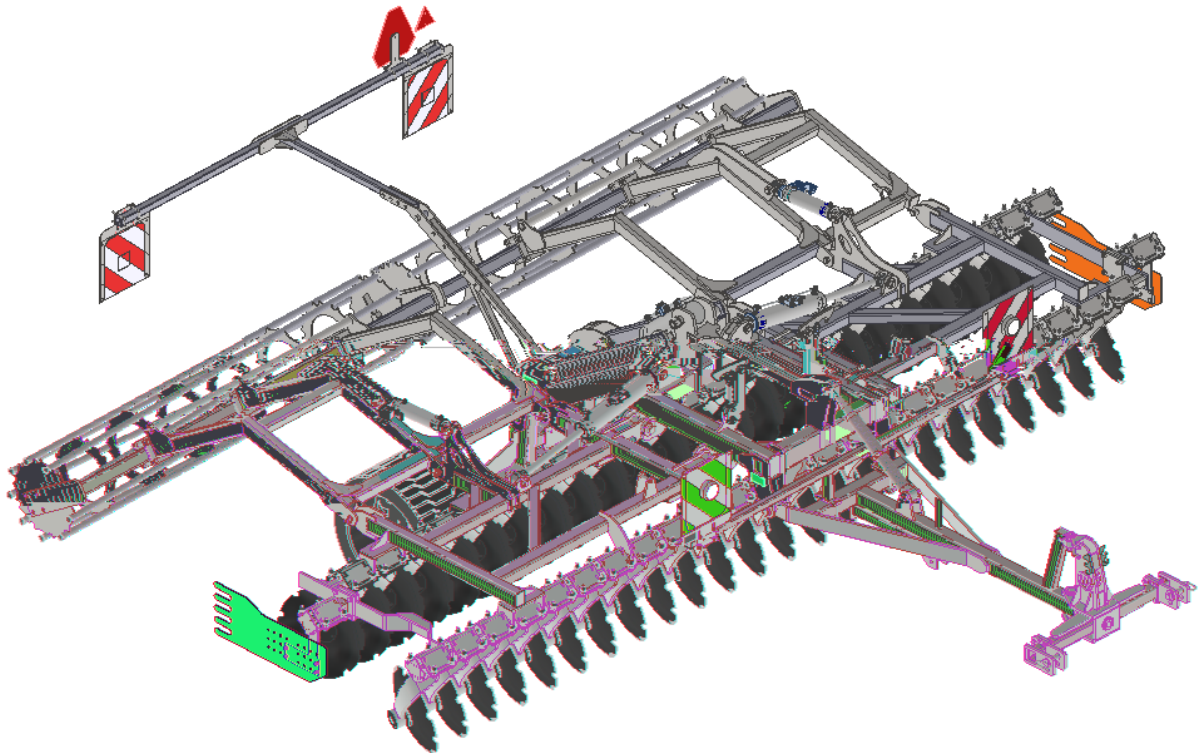




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OPERATION MANUAL

Disc harrow GAL-K, GAL-K HD



Revision V
Gliwice 2023



**EC DECLARATION OF CONFORMITY
FOR THE MACHINE**



Pursuant to the Ordinance of the Minister of Economy of 21 October 2008 (Journal of Laws No. 199) and the Directive of the European Union 2006/42/EC of 17 May 2006

MANDAM Sp. z o.o.

ul. Toruńska 14

44 -100 Gliwice

declares with full responsibility that the machine:

DISC HARROW GAL-K, GAL-K HD

type/model

year of production:

Serial No.:

under this declaration, complies with:

Ordinance of the Ministry of Economy of October 21, 2008 on the essential requirements for machines (Journal of Laws No. 199, item 1228) and the Directive of the European Union 2006/42/EC of 17 May 2006

Persons responsible for the technical documentation of the machine: Jarosław Kudlek, Łukasz

Jakus

ul. Toruńska 14, 44-100 Gliwice

The following standards were also used to assess compliance:

PN-EN ISO 13857:2010,

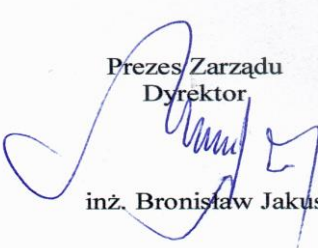
PN-EN ISO 4254-1:2016-02,

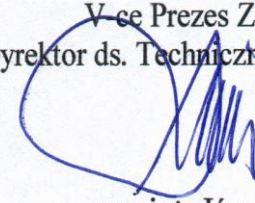
PN-EN ISO 12100-1:2005/A1:2012

PN-EN ISO 12100-2:2005/A1:2012

PN-EN 982+A1:2008

This EC Declaration of Conformity loses its validity, if the machine is modified or converted without the manufacturer's consent.

Prezes Zarządu
Dyrektor

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V-ce Prezes Zarządu
Dyrektor ds. Techniczno-Organizacyjnych

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Place and date of issue

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Surname, first name, position and signature of the authorized person

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1 Introduction

Congratulations on your purchase of the GAL-K disc harrow.

These instructions provide information on the hazards that may occur during use, harrow operation, technical data and the most important indications and recommendations, the knowledge and application of which are prerequisites for correct operation. Keep this manual for future use. If you do not understand any of the provisions of this manual, please contact the manufacturer.

Notes that are important for safety reasons are marked with the sign:



Machine identification

The identification data of the GAL-K harrow can be found on the rating plate on the support frame, which contains the CE mark, basic information about the manufacturer and the machine:



The guarantee on the harrow is valid for 12 months from the date of sale.

The warranty card is an integral part of the machine.

Please always quote the serial number when making enquiries about spare parts.

Information on spare parts can be found:

- on the web site: <http://mandam.com.pl/parts/>
- phone +48 668 662 289
- E-mail: parts@mandam.com

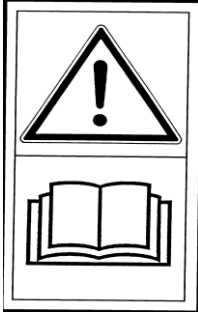



1.1. Safety signs



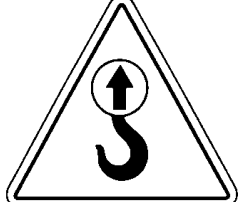


NOTE! When using the machine, special care must be taken in areas marked with special information and warning signs (yellow stickers).

The signs and inscriptions on the machine are detailed below. Safety signs and inscriptions should be protected against loss and loss of legibility. Signs and inscriptions that are lost or illegible should be replaced with new ones.

Table 1. Information and warning signs

<i>Safety signs</i>	<i>Meaning of the safety sign</i>	<i>Miejsce umieszczenia na maszynie</i>
	Read the operating instructions before use.	Frame near mounting of the upper fastener.
	Crushing of the toes or foot.	Frame near mounting of the upper fastener.
	Keep clear of the lift bars while controlling the lift.	Frame near mounting of the upper fastener.
	Keep a safe distance from foldable and moving parts of the machine	Front part of the mid frame near the side frames

<i>Safety signs</i>	<i>Meaning of the safety sign</i>	<i>Miejsce umieszczenia na maszynie</i>
	<p>Do not reach into the crushing area if parts may move</p>	<p>Mid frame near side frames</p>
	<p>Pressurised liquid jet - bodily harm</p>	<p>Cylinders</p>
	<p>Fixing point for transport belts</p>	<p>Upper part of the drawbar (upper fastener bolt) Rear frame part:</p> <ul style="list-style-type: none"> • rigid frame (adjacent to the roller depth adjustment) • foldable frame (adjacent to the upper fastener bolt on the mid frame)

2 General information

2.1. Construction of the GAL-K disc harrow

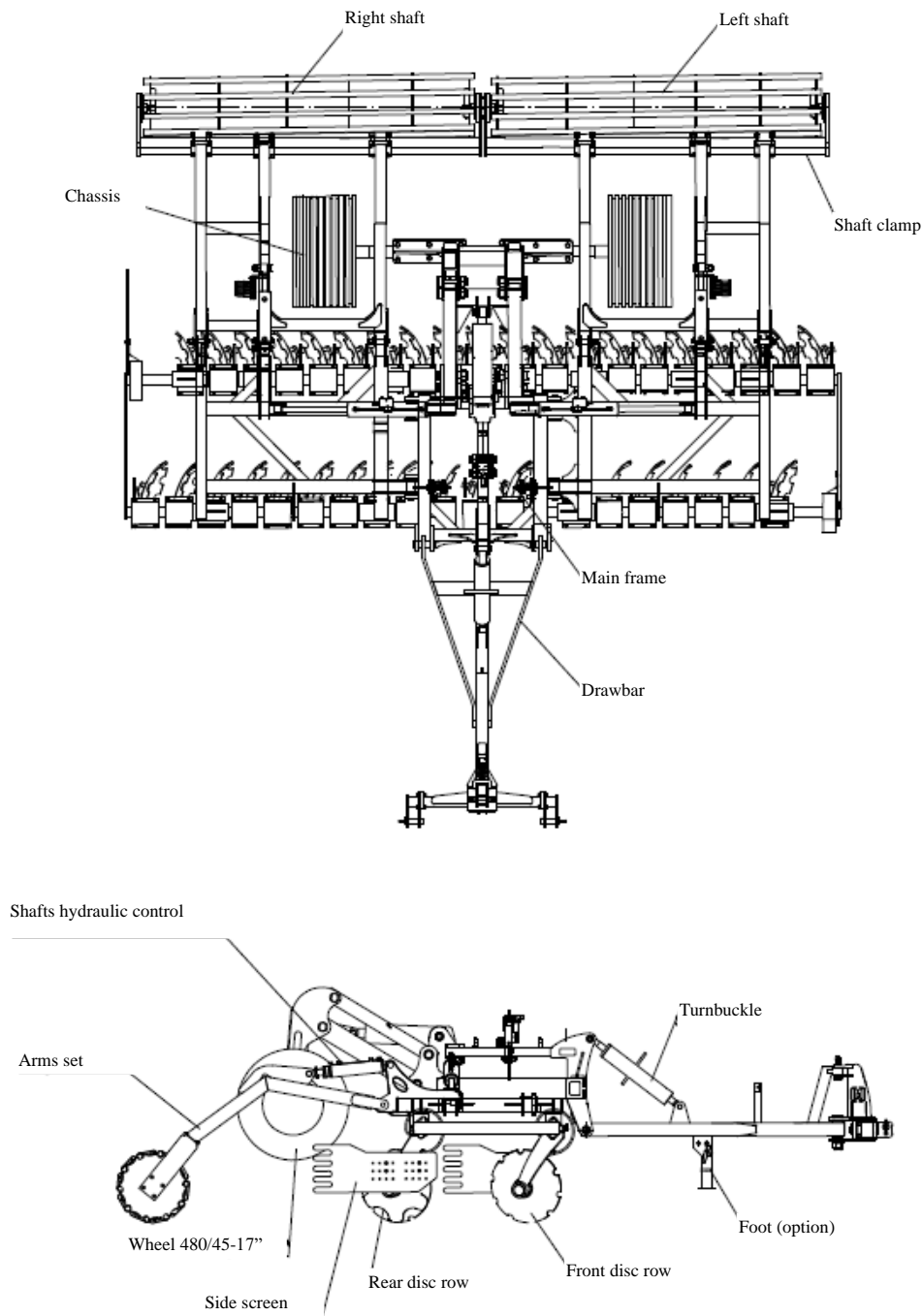


Fig.1 Disc harrow GAL-K.

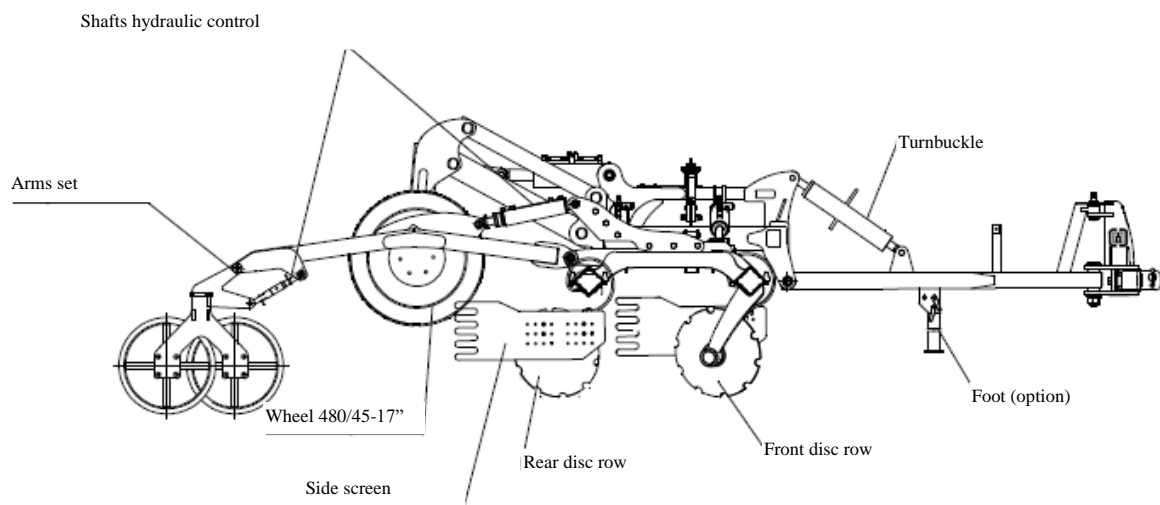
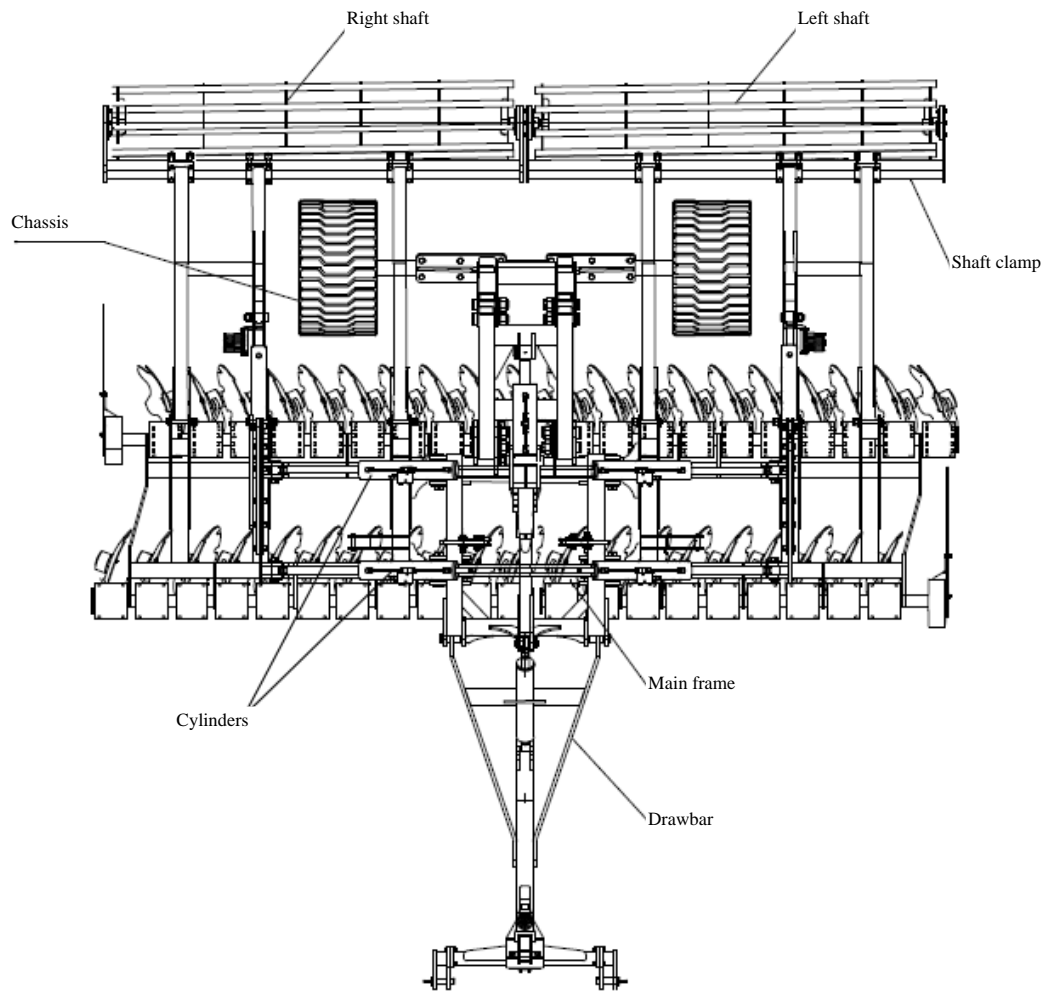


Fig. 1 Disc harrow GAL-K HD.

Table 2. Types of disc harrow GAL-K

Type of harrow	Working width [m]	Diameter of toothed discs [mm]	Number of discs [pcs.]	Min. tractor power [HP]	Wheel sizes	Weight [kg]
GAL-K 4.0H	4	560	32	150	480/45-17"	3448
GAL-K 5.0H	5	560	40	180	480/45-17"	3852
GAL-K 6.0H	6	560	48	200	480/45-17"	4314
GAL-K 8.0H	8	560	64	220	620/40-22.5"	5576
GAL-K 10.0H	10	560	80	400	620/40-22.5"	8683
GAL-K 12.0H	12	560	96	450	620/40-22.5"	9200

Table 3. Types of disc harrow GAL-K HD

Type of harrow	Working width [m]	Diameter of toothed discs [mm]	Number of discs [pcs.]	Min. tractor power [HP]	Wheel sizes	Weight [kg]
GAL-K 4.0H HD	4	560	32	160	480/45-17"	3699
GAL-K 5.0H HD	5	560	40	190	480/45-17"	4195
GAL-K 6.0H HD	6	560	48	210	480/45-17"	4574

2.2. Intended use of the GAL-K and GAL-K HD disc harrows

The disc harrow is designed for post-harvest cultivation (with chopped straw) and pre-sowing in both ploughing and ploughless technology. The unit can also be used to mix catch crops into the soil.

The working elements are toothed discs of diameter Ø560 mm in two staggered rows mounted on maintenance-free bearings. Equipping each disc with its own bearing allows the disc to be optimally inclined to the direction of travel and the ground. This allows the stubble to be thoroughly undercut, and harvest residues to be evenly mixed and broken up. As a result, soil evaporation is interrupted, plant residues decompose more quickly and there is a reduction in the intensity of phenolic compounds negatively affecting the development of succeeding plants. The tothing of the discs aids penetration. The shaft located at the rear of the machine compacts the soil, resulting in faster emergence of weeds and volunteer seeds. The use of a disc harrow before sowing ensures thorough mixing of fertiliser into the soil, levelling of the surface and proper soil structure.

The GAL-K HD version of the disc harrow has a double hydraulic cylinder system for folding the machine wings as standard.

An optional drawbar-mounted support foot is available to ensure horizontal positioning of the harrow during storage or maintenance work.

In addition, the harrow can also be fitted with a coupling to the seed drill, known as a hydropack.

The GAL-K units are equipped with their own chassis with a braked axle. A pneumatic system is used for this purpose.



NOTE! MANDAM provides a 5-year guarantee on maintenance-free hubs under the following conditions:

- comply with the rule of replacing the working discs in the event of wear, which must not exceed 490mm in diameter for discs Ø560mm and 550mm

- for discs Ø610mm,
- use the original MANDAM plates,
 - not to exceed the permitted working depth, which is 12cm for Ø560mm discs and 15cm for Ø610mm discs,
 - observe the rule prohibiting the turning manoeuvre with the harrow when it is in the working position (working discs buried in the soil).



NOTE! The disc harrow is designed exclusively for agricultural use. Use for any other purpose will be construed as misuse and will void the warranty. Failure to comply with the recommendations in these operating instructions will also be construed as misuse.



NOTE! The manufacturer is not liable for damage resulting from the operation of the machine not in accordance with its intended use.

3 General safety rules

The disc harrow may only be started up, used and repaired by persons who are familiar with its operation and the associated tractor and with the rules of conduct for the safe operation and handling of the disc harrow.

The manufacturer is not responsible for arbitrary changes to the harrow design. During the warranty period, only factory-made "MANDAM" parts must be used.

The disc harrow should be operated with all precautions in mind, in particular:

- before each start-up, check that the disc harrow and the tractor are in safe working order,
- use of the machine by minors, persons who are ill or under the influence of alcohol or other intoxicants is prohibited,
- use work clothes, footwear and gloves when carrying out maintenance work,
- permissible axle loads and transport dimensions must not be exceeded,
- use only original safety and split pins,
- do not approach the disc harrow while it is being raised or lowered,
- it is not permitted to stay between the tractor and the disc harrow when the engine is running,
- when moving the disc harrow, lift and lower it slowly and gently without sudden jerks, taking care not to allow any bystanders to be in the vicinity,
- it is forbidden to reverse the tractor or make a U-turn with the machine lowered into the working position,
- the tractor's independent brakes must not be applied during turning,
- do not stand on the machine or put any additional weight on it during operation or transport,
- during u-turns, special care should be taken if there are bystanders in the vicinity,
- disc harrows must not be operated on gradients greater than 12° ,
- carry out any repairs, lubrication or cleaning of working parts only with the engine switched off and the machine lowered and unfolded,
- during maintenance and when replacing parts, going inside or underneath the machine without adequate protection can cause head injuries - a helmet should be used in this case.
- when not in use, lower the machine to the ground and stop the tractor engine,
- harrows with a working width greater than 3.00 m are fitted with a mechanical lock to prevent the wings from opening uncontrolled when stationary and during road transport,

- driving and parking the unit next to a slope with unstable ground may cause a landslide.

machinery must be stored in such a way as to prevent injury to people and animals.

3.1. Proper coupling and uncoupling with the tractor

- The attachment of the machine to the tractor must be made as specified, remembering to secure the pins and to secure the suspension pins with split pins.
- When coupling the tractor to the disc harrow, it is forbidden for people to stay between the machine and the tractor during this time.
- The tractor working with the disc harrow must be fully operational. It is forbidden to couple the harrow with a tractor with defective pneumatic (if the machine has a braked axle) and hydraulic systems.
- Make sure that the tractor with the attached unit is stable, and the tractor steerability and stopping power can be maintained. The load on the front axle cannot drop below 20% of the total load on the tractor axle - set of front-mounted weights.
- In the resting position, the machine, when uncoupled from the tractor, should maintain a stable equilibrium.
- The support foot should be rested on a stable surface. It is forbidden to use foot pads that may cause instability of the support.

3.2. Tyres

- Tyre pressures must not exceed those recommended by the manufacturer and it is forbidden to transport the machine at too low a pressure. This may damage the machine and cause an accident on large uneven surfaces and when driving too fast.
- Significantly damaged tyres (particularly profile damage) must be replaced immediately.
- When replacing tyres, the machine must be secured against rolling.
- Repair work on wheels or tyres should be carried out by persons trained and authorised for this purpose. This work should be carried out with appropriately selected tools.

Each time the wheels are fitted, the tightness of the nuts should be checked after 50km.

3.3. Hydraulic and pneumatic system

The hydraulic and pneumatic system is under high pressure. All precautions should be taken, in particular:

- do not connect or disconnect the hydraulic lines when the tractor's hydraulic system is under pressure (hydraulics set to neutral),
- regularly check the condition of the connections and the hydraulic and pneumatic hoses.
- the unit must be taken out of service while the hydraulic or pneumatic failure is being rectified.

3.4. Safety regarding transport on public roads

For transport, the side sections of the disc harrow must be folded into the transport position using the hydraulic system. Before folding, the machine must be raised to the extent that the side sections do not interfere with the ground during folding.

The side frames of the disc harrow should be secured against unfolding with a automatic

HBS wings lock.

The wheels should be lowered to the point where the side sections do not collide with the ground when folded.

During transport, the clearance under the machine should be at least 30 cm

When transporting the unit on public roads, the use of a luminous device, a distinguishing sign and side reflectors is mandatory.

The travelling speed during transport must not be exceeded:

- on roads with a smooth surface (asphalt) up to 20 km/h,
- on dirt or paved roads 6-10 km/h,
- on bumpy roads not more than 5 km/h.

Once the machine is assembled, slide the shafts together and secure with pins in the ladders for a smaller transport width.

The travelling speed must be adapted to the condition of the road and the conditions on the road so that the disc harrow does not jump up on the tractor's suspension and there are no excessive loads on the machine frame and the tractor's suspension.

Particular care should be taken when passing and overtaking and on bends. The permissible width of the machine running on public roads is 3.0 m.

It is forbidden to transport the unit where the slope transverse to the unit exceeds 7°.



WARNING! Failure to comply with the above rules may create hazards for the operator and bystanders as well as damage to the machine. Damage resulting from non-compliance with these rules is the responsibility of the user.

3.5. Description of residual risk

MANDAM Sp. z o.o. makes every effort to eliminate the risk of accidents. There is a residual risk that could result in an unfortunate accident. The greatest danger occurs when:

- using the machine for purposes other than those described in the instructions,
- using the machine by minors, persons who are not authorised, who are ill or who are under influence of alcohol or other drugs,
- persons and animals are within the operating range of the machine are present,
- no caution is paid when transporting and manoeuvring the tractor,
- staying on the machine or between the machine and the tractor while the engine is running,
- during operation and failure to comply with operating instructions,
- driving on public roads.

3.6. Assessment of residual risk

Residual risk can be minimised by applying the following recommendations:

- prudent and unhurried operation of the machine,
- careful reading of operating instructions,
- keeping a safe distance from danger zones,
- prohibition on being on the machine and in the operating area of the machine while the tractor engine is running,
- carrying out maintenance work in accordance with safety rules,
- use of protective clothing and, if working under machinery, a helmet,
- prevention of unauthorised access to the machines, especially by children.

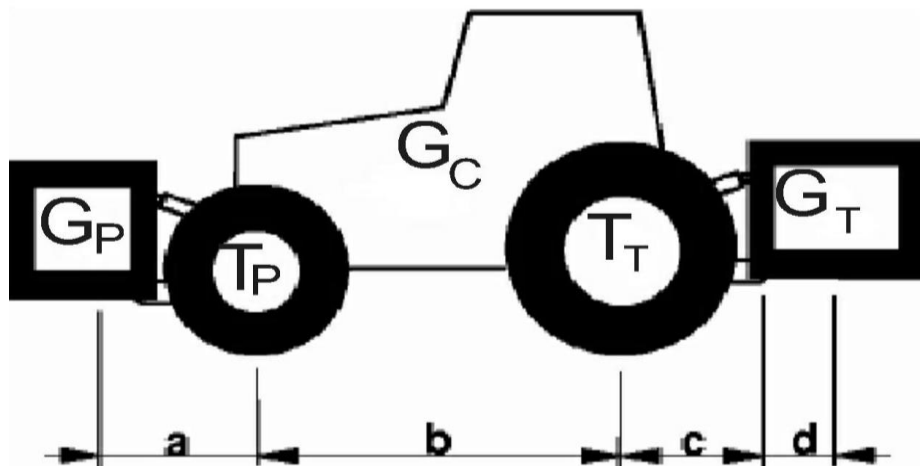
4 Information on handling and use

Before starting the machine for the first time:

- refer to the operating instructions,
- make sure the machine is in good working order,
- check the condition of the hydraulic and pneumatic systems (replace components if damaged, e.g. pressure lines),
- make sure that the machine's pressure hose couplings fit into the sockets on the tractor,
- check the tightness of the individual bolts and nuts,
- check the air pressure in the wheels in accordance with the manufacturer's recommendations,
- ensure that all components requiring lubrication are lubricated,
- ensure that the pressure in the tractor wheels is the same on each axle to ensure even operation.



NOTE! The permissible axle loads and tyre load capacities must not be exceeded. The front axle load must not be less than 20%.



Axle load calculations

Designations:

G_C - empty tractor weight,

T_P - front axle load of the empty tractor,

T_T - rear axle load of the empty tractor,

G_T - total weight of rear-mounted device,

G_P - total weight of front-mounted device,

a - distance between the centre of gravity of the front-mounted device and the centre of the axle,

b - tractor wheel track,
 c - distance between the centre of the rear axle and the centre of the hitch pin of the rear device,
 d - distance of the centre of gravity of the machine from the towing pins of the tractor
 x - distance of the centre of gravity from the rear axle (if the manufacturer does not specify this parameter, enter 0.45).

Minimum front load when hitching the machine to the rear:

$$G_{Pmin} = \frac{G_T \cdot (c+d) - T_P \cdot b + 0,2 \cdot G_C \cdot b}{a+b}$$

Actual front axle load:

$$T_{Pcal} = \frac{G_P \cdot (a+b) + T_P \cdot b - G_T \cdot (c+d)}{b}$$

Actual total weight:

$$G_{cal} = G_P + G_C + G_T$$

Actual rear axle load:

$$T_{Tcal} = G_{cal} - T_{Pcal}$$

4.1. Preparing the disc harrow

The disc harrow is usually supplied ready for sale. Due to the limitations of transport facilities, it is also possible to deliver it in a partially dismantled state - this usually involves disconnecting the shaft.

When the unit is first prepared for operation, its components (shaft) must be assembled. To do this, place the disc harrow on flat paved ground in a position that allows the shaft to manoeuvre. A lifting device with a lifting capacity of at least 500 kg w (700 kg in the case of a rubber shaft) must be used to transport the shaft for reasons of stability during transport. Position the arms in the harrow brackets and connect the arms to the shaft bracket with screws (fig 3).

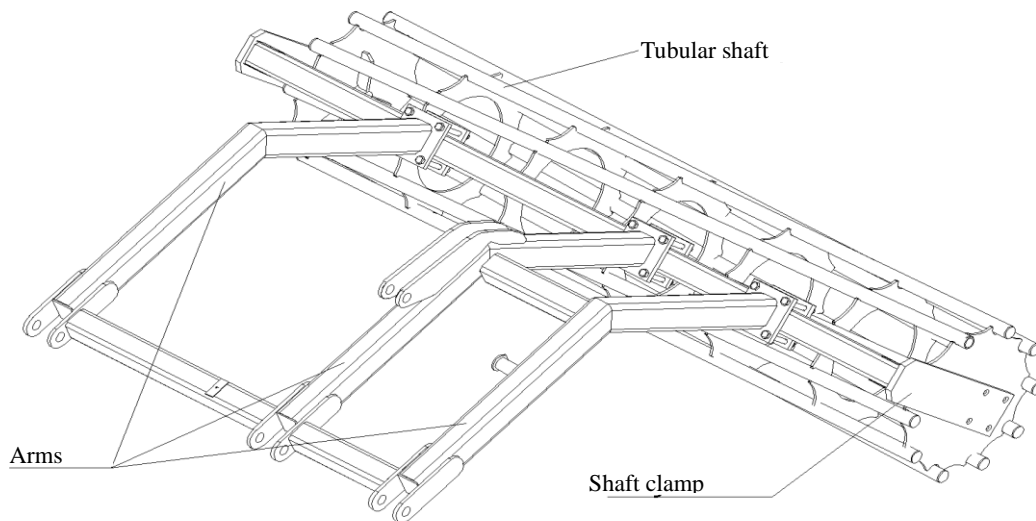


Fig. 3 Connection of the arms with shaft bracket.

Before starting the work, check the condition of the disc harrow, especially the condition of the working parts and bolted connections.



NOTE! The correct procedure for mounting the shafts in the arm holders requires that the bolts be evenly tightened diagonally, so that the entire plane of the arm holders is adjacent to the plane of the shaft clamp profile. This provides the most secure way of connecting the shaft arms to the machine!

4.2. Coupling the harrow to the tractor

The tractor wheel tyre pressure should be in accordance with the manufacturer's recommendations. The lower links of the three-point hitch should be at an equal height, at a spacing corresponding to the spacing of the lower suspension points. When connecting the disc harrow to the tractor, the harrow should stand on firm and level ground.

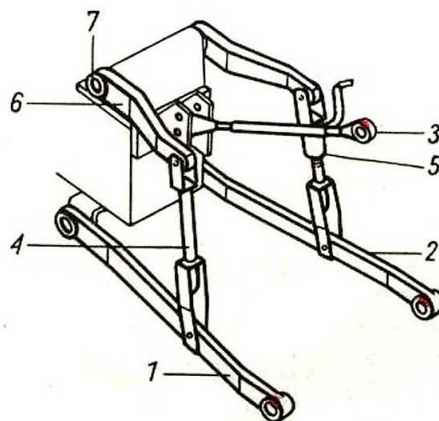


Fig. 4 Three-point suspension system of the tractor's three-point hitch: 1,2 - lower links, 3 - upper fastener, 4 - left suspension, 5 - right suspension with adjustable length, 6 - lift arm, 7 - lift shaft

When attaching the disc harrow to the tractor, perform the following steps:

- switch the tractor's hydraulic system to position control,

- disconnect the suspension axle from the unit and place it on the lower links of the tractor,
- back the tractor up to a distance that allows the suspension axle to be connected to the frame plates and the tractor's top link to the harrow hanger,
- secure the suspension axle in the frame plates with clamps and pins,
- connect the top link on the tractor. When the unit is in operation, the attachment point of the upper link on the unit should be higher than the connection point of this link on the tractor,
- check the raising and lowering of the unit.

Any tractor that is used with the machine must be equipped with a set of weights and must remain steerable during transport, i.e. a minimum of 20% of the tractor's weight must be on the front axle.

4.3. Coupling the seed drill to the disc harrow

Before suspending the seed drill, familiarise yourself with the weight of the drill including the seed. The load capacity of the hydropack is 1,300 kg. When coupling the seed drill to the disc harrow, do the following:

- match the spacing of the towing hooks to the spacing of the seed drill pins by placing a hook on the appropriate side of the arm and shimming the spacer plate accordingly,
- lower the lower links of the hitch below the hitching pins of the seed drill (in the case of a trolley hitch, insert a pin into the appropriate hole in the hangers of the hitch, then adjust the position with a cylinder),
- reverse the set so that the seed drill pins are in the hooks,
- insert the safety device into the pins, hole in the hooks and secure with a safety pin,
- connect the top link to the seed drill.



NOTE! Before raising the disc harrow, the seed drill must be raised for the stability of the unit.

4.4. Operation and adjustment

4.4.1 Automatic machine wing lock

On machines with folding sections, automatic wing locking is available, requiring no additional operation. The lock uses a mechanism consisting of an cylinder and a hook (Figure 5).

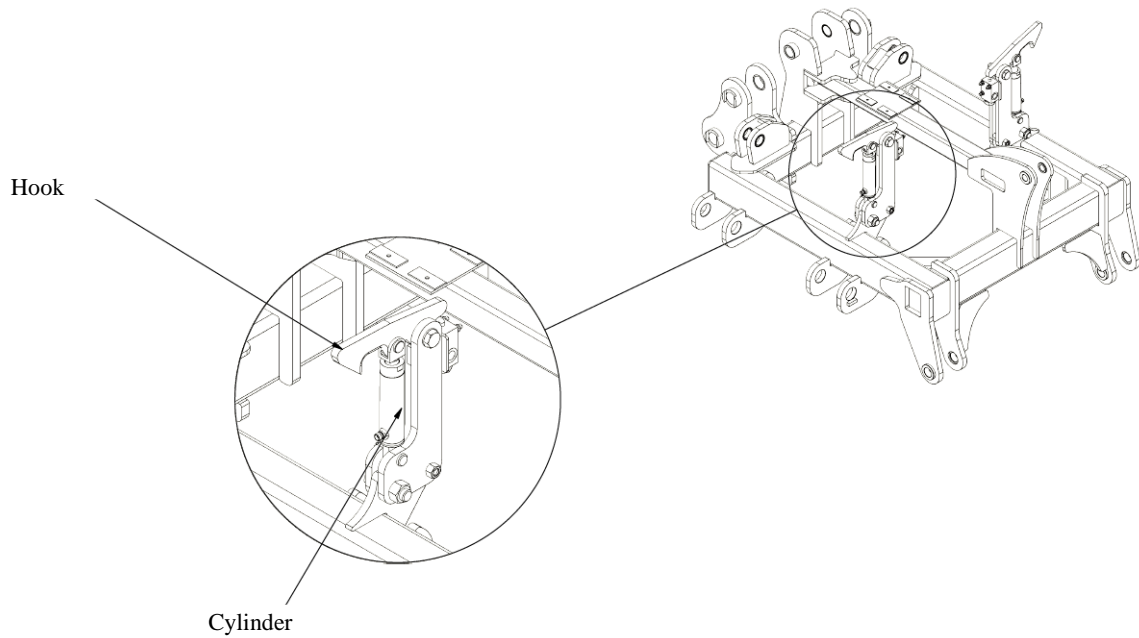


Fig. 5 Main frame with automatic wing locking mechanism.

4.4.2 Opening sequence for machines without chassis

Before unfolding the folding wings of the machine, it is important to familiarise yourself with the opening sequence that allows you to do this correctly.

1. The machine must be raised as much as possible to enable it to be folded correctly, avoiding the risk of the folding arms catching on the ground during movement (fig.6).
2. The next step is to hydraulically fold the wings of the machine into the 'closed' position, the purpose of which is to ensure that the wing lock mechanism unlocks and allows the machine arms to be opened at a later stage. This operation is necessary every time the arms of the unit are opened (fig. 6).

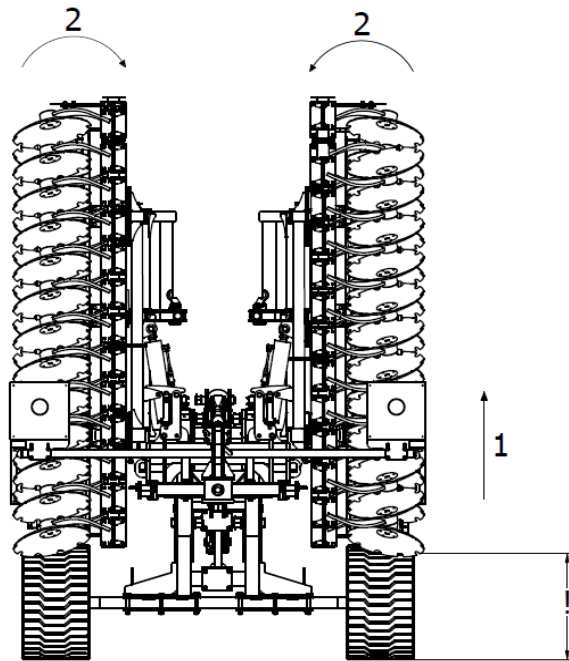


Fig. 6 Machine opening sequence: 1- lift the machine up to its maximum, 2- fold the machine wings into the "closed" position.

3. Once you have ensured that the hook of the hydraulic wing lock mechanism will allow the machine wings to be unlocked, you can proceed to open them fully (fig.7).

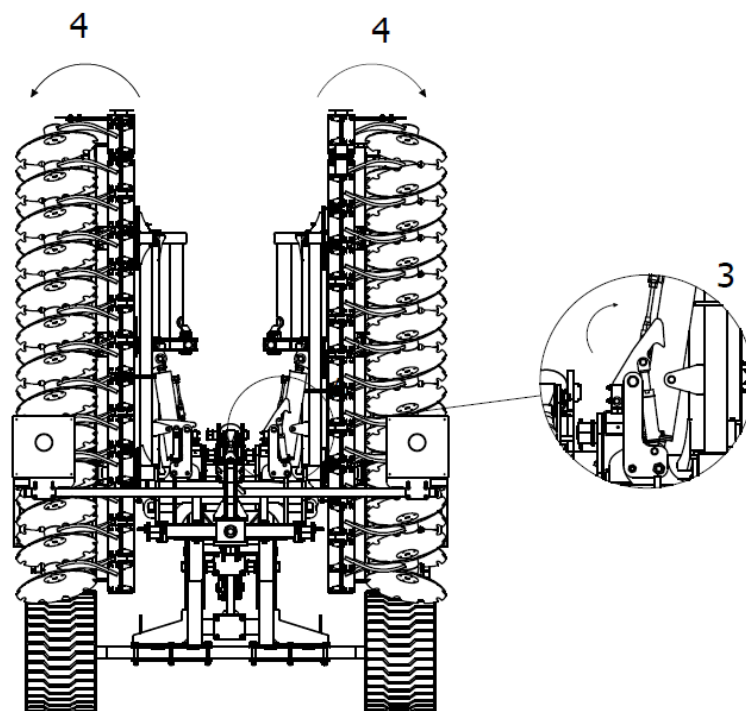


Fig. 7 Machine opening sequence: 3- release the hook of the hydraulic wing lock mechanism 4- open the wings of the machine.

4. When opening the machine's wing arms, ensure that the ends of the arms are at a sufficient height to prevent them from catching the ground (fig. 9).

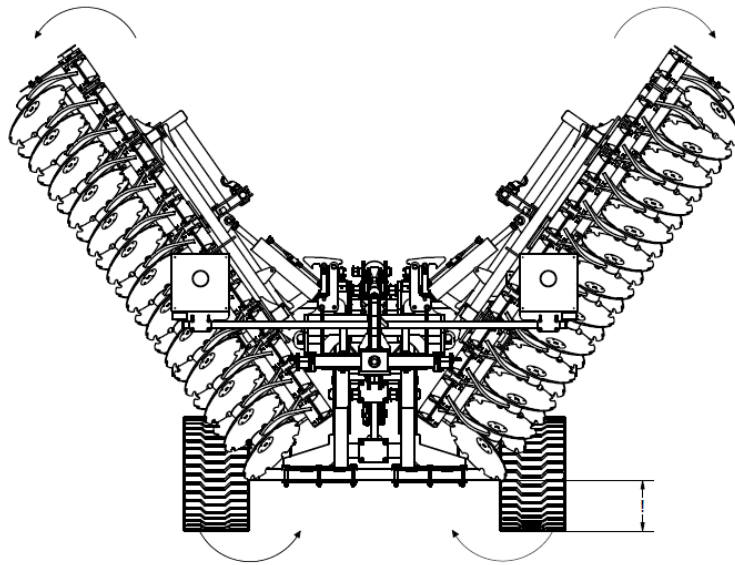


Fig. 8 Machine opening sequence: opening the machine with special attention to the height of the arm ends from the ground.

5. To complete the opening sequence of the machine wings, wait until the hydraulic mechanism opens the arms to their final position. Do not interrupt the process of opening the arm wings without ensuring that they are fully open

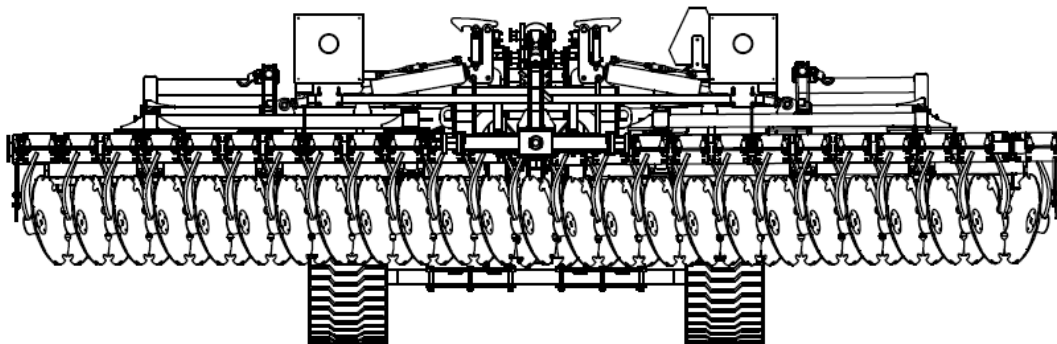


Fig. 9 View of the machine at the end of the wing opening sequence. The arms of the machine are fully open.



NOTE! On machines with folding wings, clean the machine thoroughly after use so that excessive soil residues do not put additional strain on the machine wings and thus on the cylinders!

4.4.3 Setting up work units

On the GAL disc harrow, the position of the individual working units must be preadjusted before starting work in the field. It is also necessary to level the machine longitudinally with the tractor's top link or drawbar turnbuckle and transversely with the right lower link hanger. The first working run should then be made to set the optimum working speed and correct the adjustment based on an assessment of the correct operation of the individual units.

Setting up the machine correctly for operation

Position the machine parallel to the ground (see fig. 10). The front drawbar must be aligned horizontally. It is forbidden to operate the machine with the drawbar at an angle!

Setting up the machine correctly for operation:

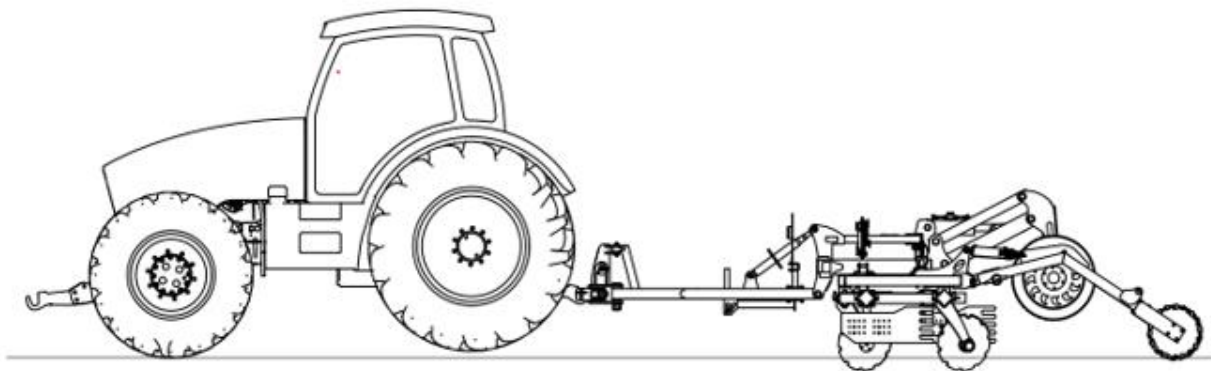


Fig. 10 Properly positioned machine parallel to the ground.

Incorrect machine settings:

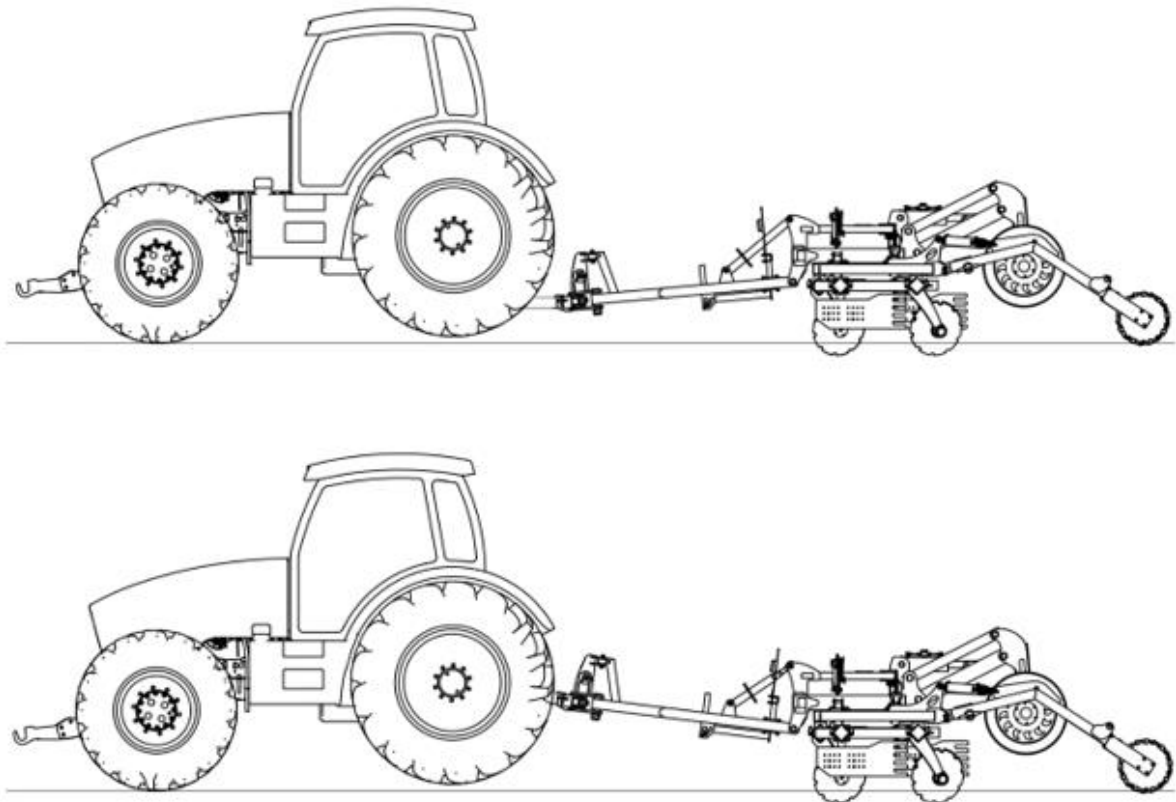


Fig. 11 Incorrect machine settings.

Turning at field ends is only permitted with the machine raised on the chassis.

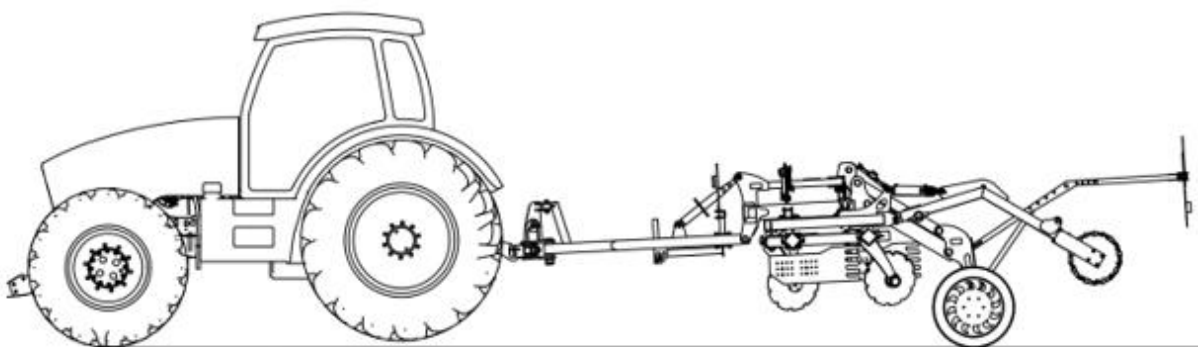


Fig. 12 Turning the machine correctly.

Turning with the machine buried in the spoil in or turning on shafts is not permitted:

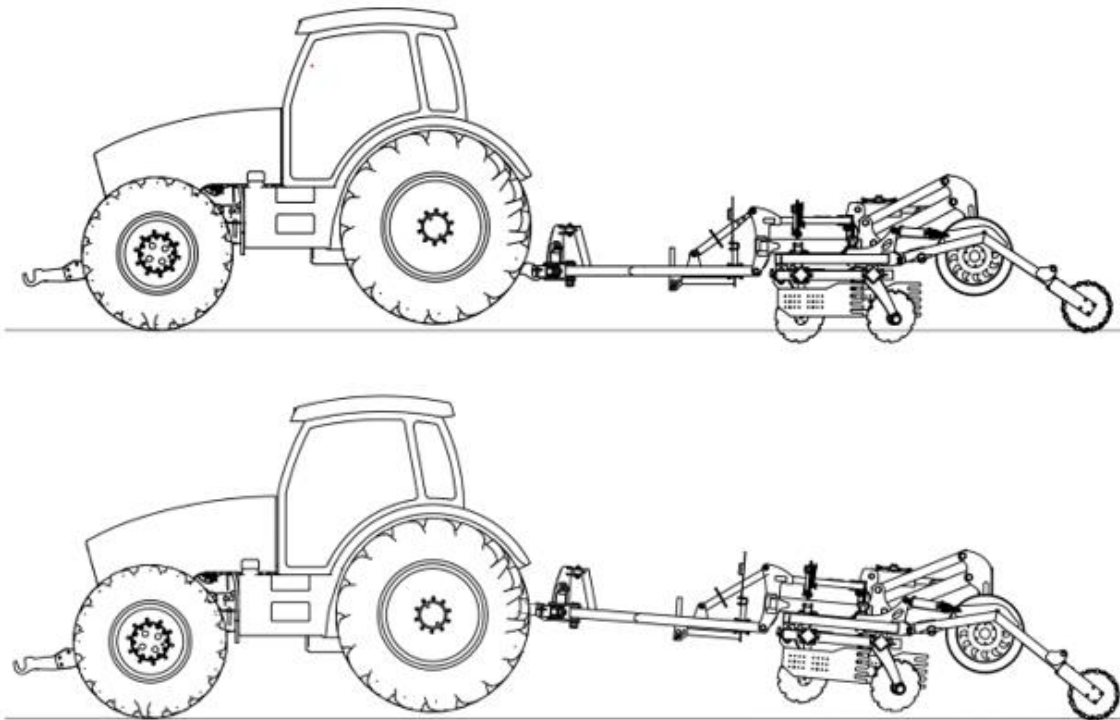
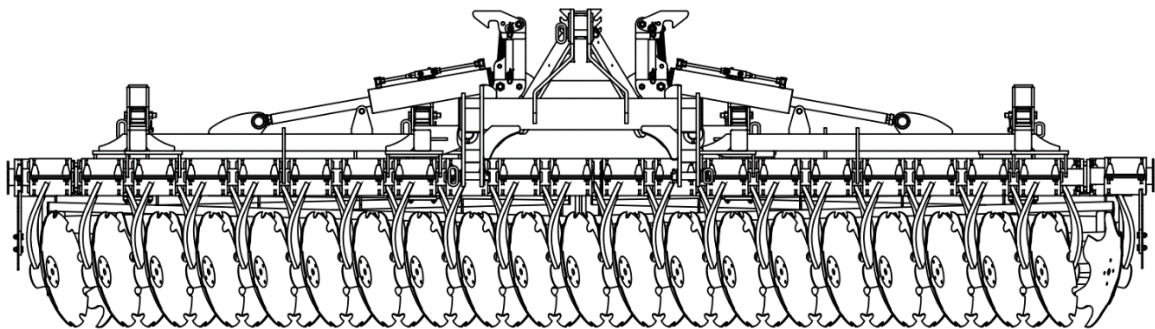


Fig. 13 Turning the machine incorrectly.

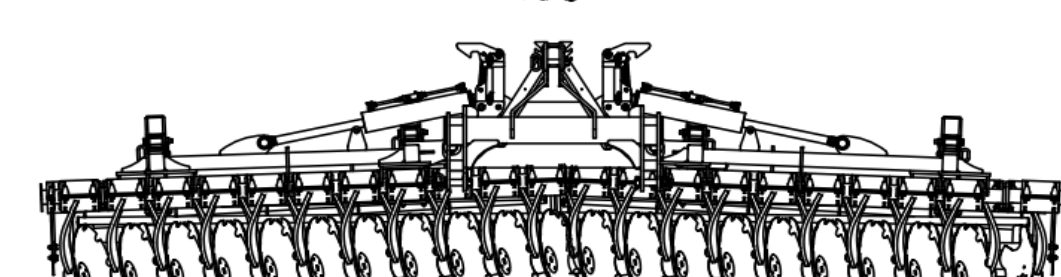
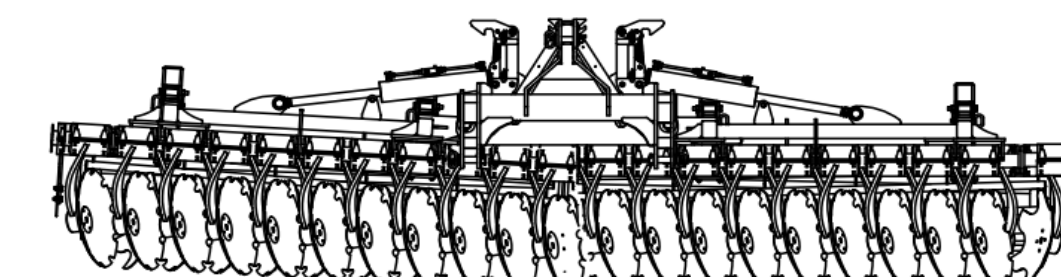
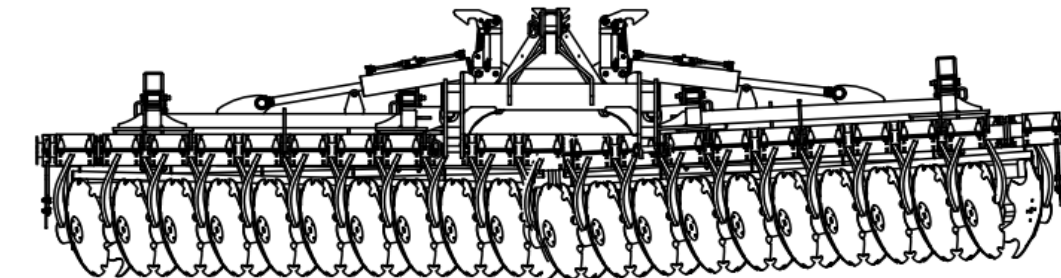
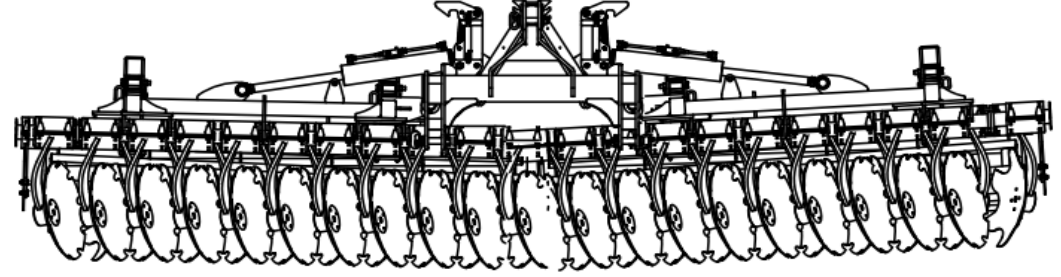
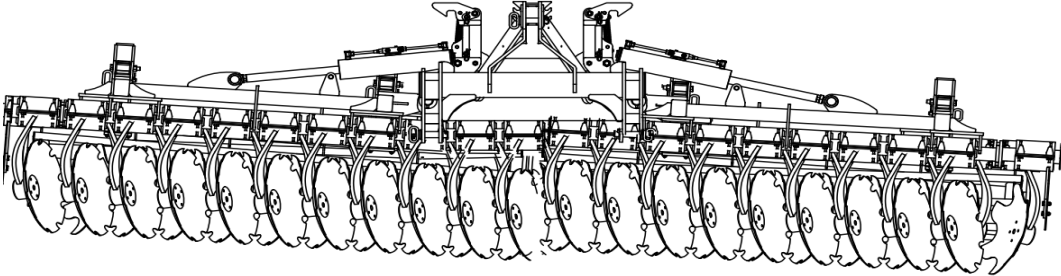
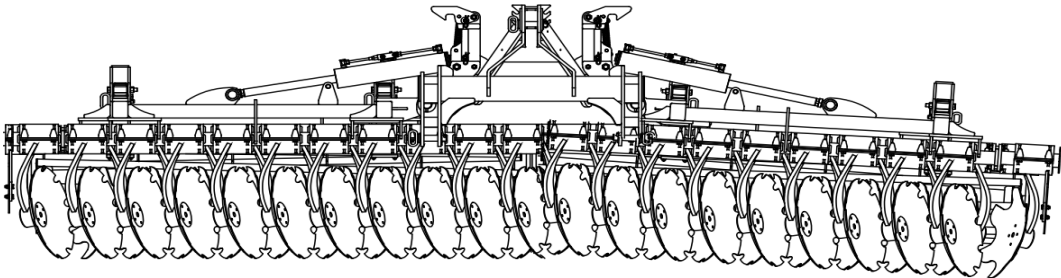
When working with the machine, it is also advisable to use an additional weight on the front of the tractor to enable more stable and comfortable working.

Levelling the machine.

Machine levelled correctly:



Machine levelled incorrectly:



Levelling:

If you notice an abnormality in the machine's level, screw or unscrew the end of the cylinder. Firstly, the lock nut is loosened with a size "50" spanner and then the cylinder end is adjusted with a size "41" spanner by placing the spanner on the end of the cylinder piston rod. If the side frame of the machine is "dropping" the tip should be screwed, while if the side frame is facing "up" the cylinder should be unscrewed.

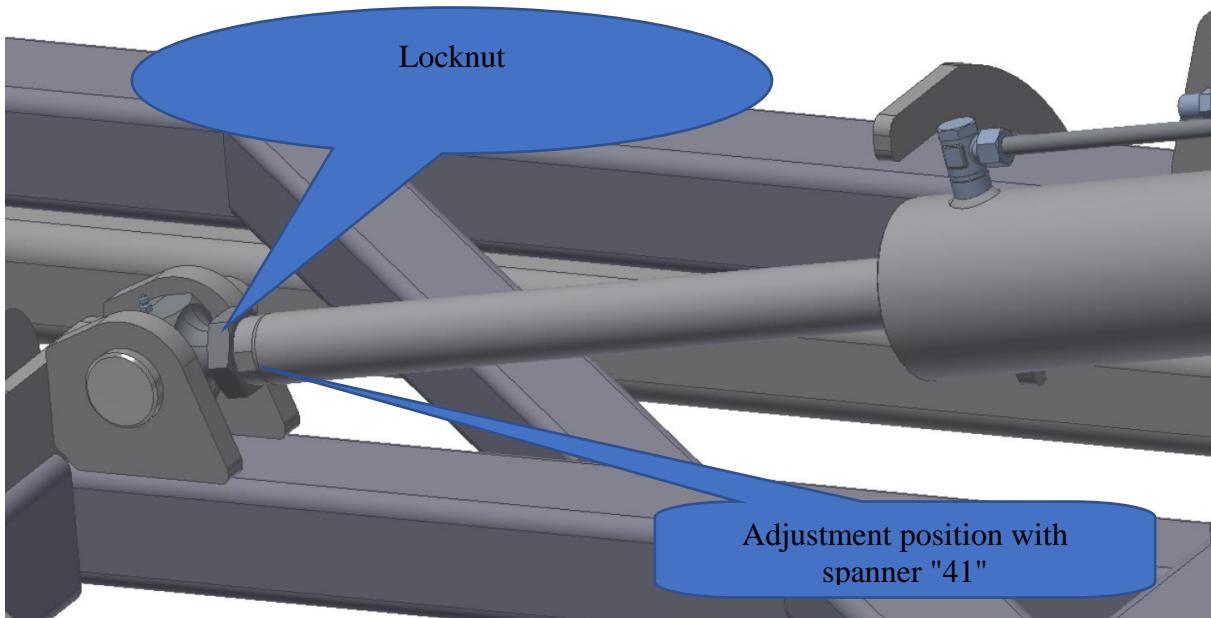
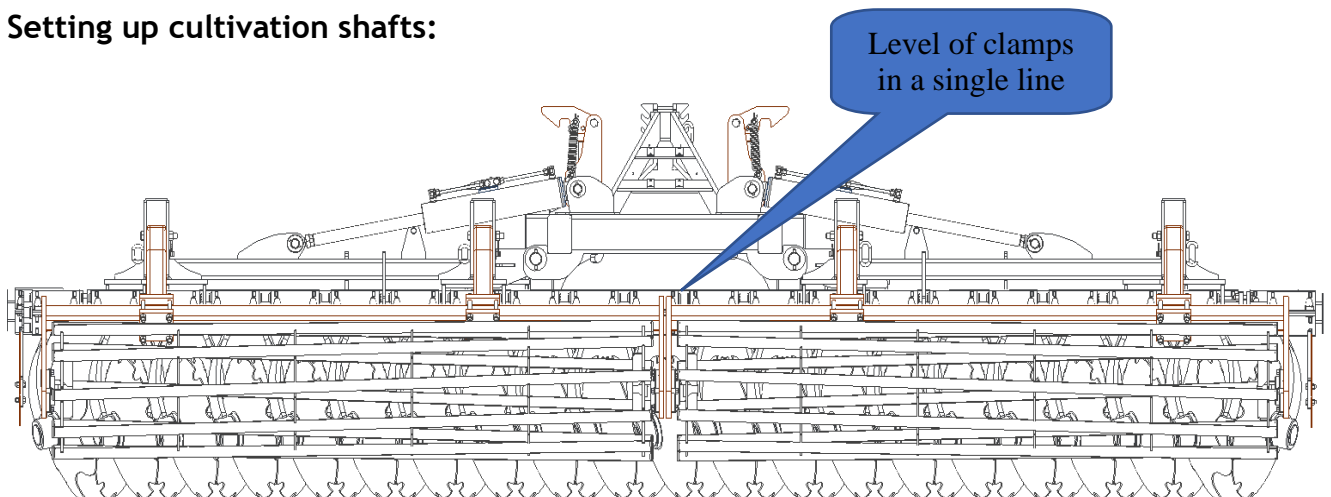


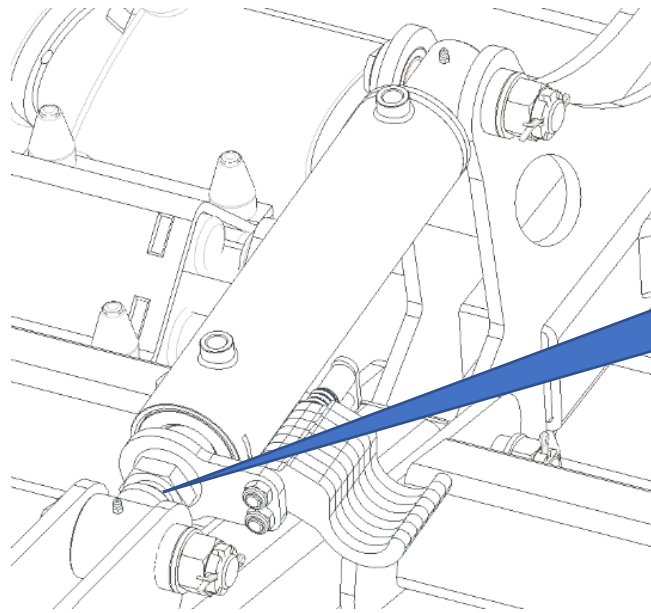
Fig. 14 View of cylinder with nut for levelling the machine.

Setting up cultivation shafts:

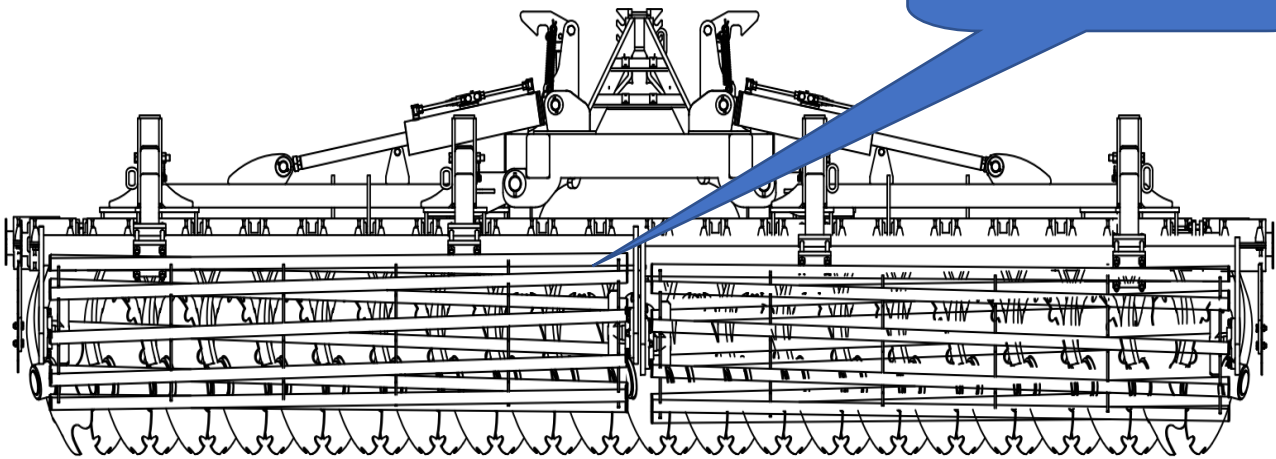


Shafts levelling:

Levelling of the shafts is carried out on the depth control cylinder in the same way as for adjusting the side frame cylinders. Unscrewing the cylinder end lowers the shaft, screwing in the cylinder end raises the shaft.

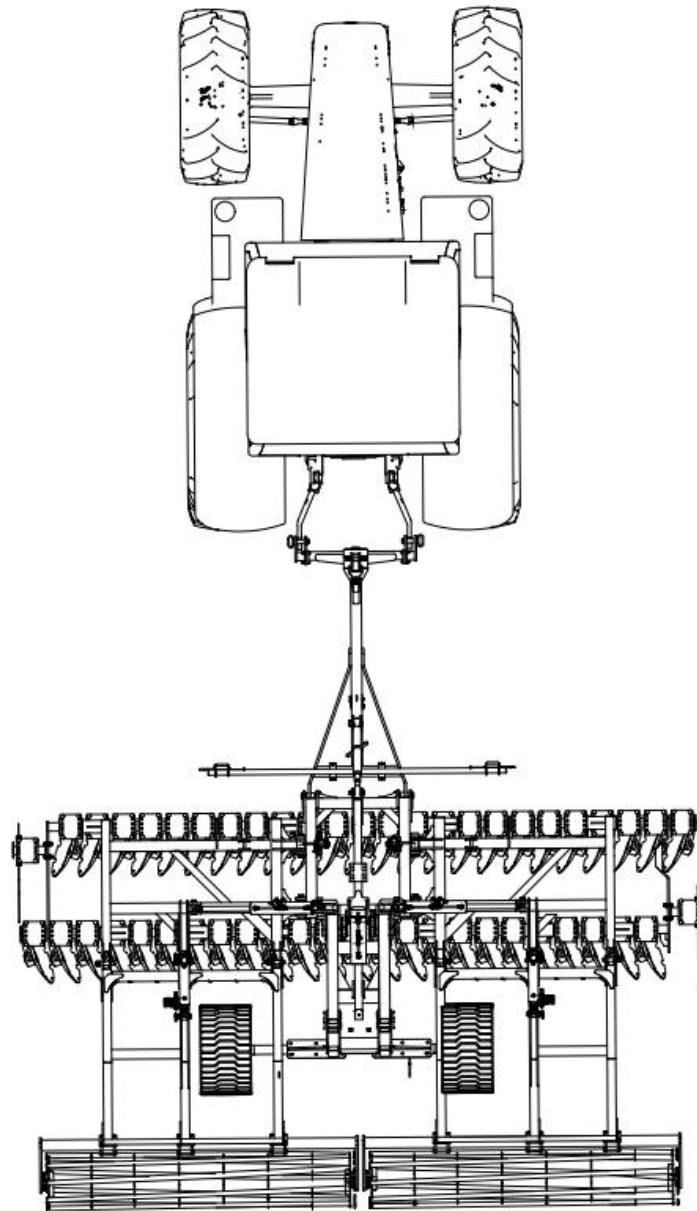


Misalignment of shafts:



Irregularities during operation - pulling off the machine

Machine operating correctly:

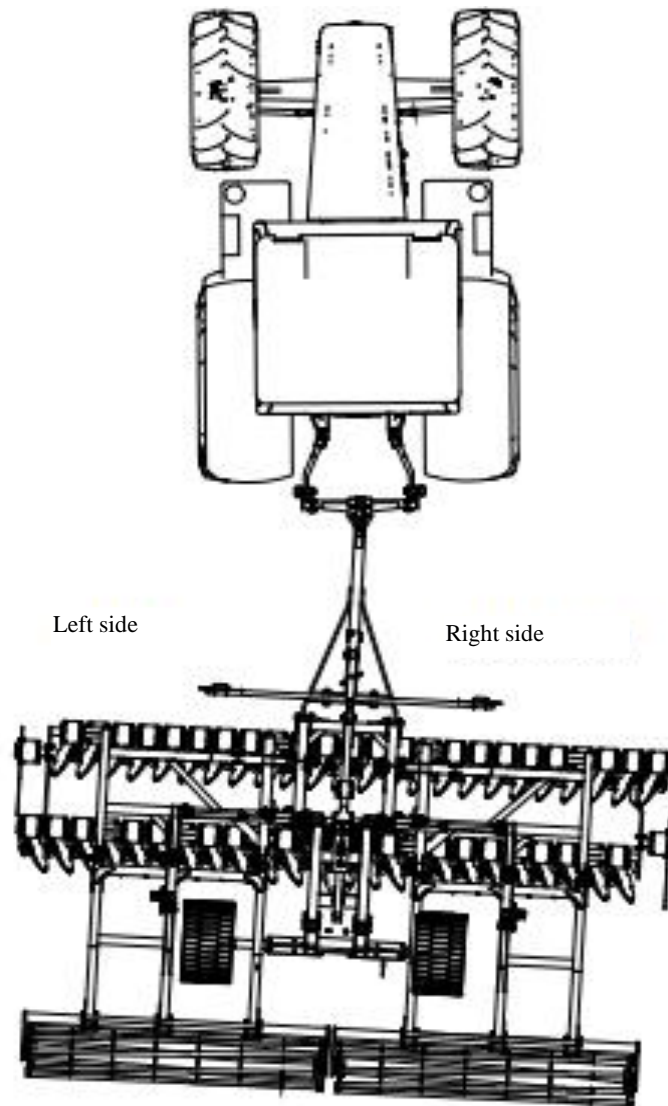


Pulling the machine to the right side:

If there is a situation of the machine pulling to the right side, the level of the machine should be checked first. If the machine is not levelled correctly, this can occur when the left side is horizontal and the right side is facing upwards, the cylinder on the right side should be rotated.

It is also important to check that the front and back rows of discs are evenly aligned. If the front row is set too deep, the high soil resistance causes the machine to pull. The machine should then be raised on the lifting arms and the front row of discs slightly lifted.

Check the setting up cultivation shafts: Cultivation shafts should be horizontally aligned. If the right side runs deeper and the left side runs shallower there is a pulling down of the machine.

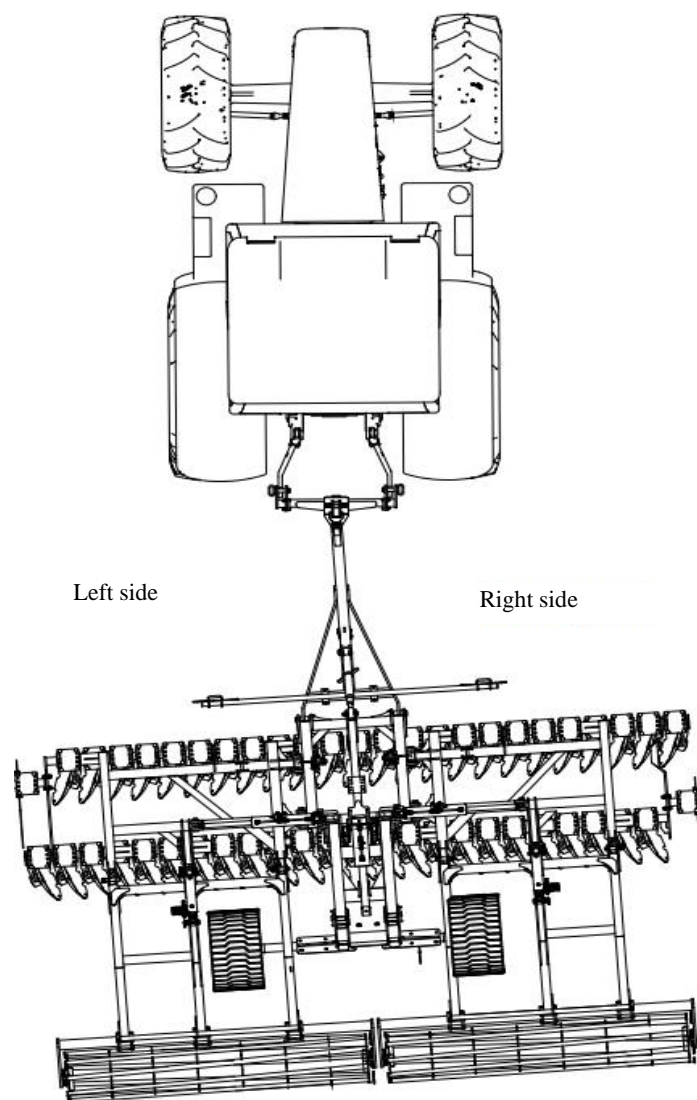


Pulling the machine to the left side:

If there is a situation of the machine pulling to the left side, the level of the machine should be checked first. If the machine is not levelled correctly, this can occur when the right side is horizontal and the left side is facing upwards, the cylinder on the left side should be rotated.

It is also important to check that the front and back rows of discs are evenly aligned. If the front row is set too deep, the high soil resistance causes the machine to pull. The machine should then be raised on the lifting arms and the front row of discs slightly lifted.

Check the setting up cultivation shafts: Cultivation shafts should be horizontally aligned. If the left side runs deeper and the right side runs shallower there is a pulling down of the machine.



The working speed should be 10 - 15 km/h. In a well-adjusted machine, the frame must be parallel to the ground and all working units should penetrate the soil equally across the entire working width.

The **side screen** should be set and locked with a screw at such a height that it is above the soil surface and not exposed to the impact of stones and the hanging of crop residues. If required, it should also be moved forwards or backwards (remounting on the holes) so that it retains the soil rejected by the outermost front disc and rakes the furrow behind the outermost rear disc.

4.4.4 Working depth of the GAL-K disc harrow

The working depth is determined by the position of the shaft, whose arms are adjustable by cylinders. To maintain a constant shaft position (working depth) during operation, clamps are fitted to the cylinder piston rods (fig. 15). Initially, the shaft and wheels should be set above the lower edge of the discs at a height that roughly corresponds to the anticipated working depth, and the setting should be adjusted during the work once the shaft's settlement has been taken into account. The maximum permissible working depth is 12cm for discs Ø560mm.

Once the required working depth has been established, the appropriate number of clamps must be taken from the holder on the shaft arm and then fitted to the piston rod of the cylinders. This ensures a constant working depth during operation. The number of clamps on both cylinders must always be equal.

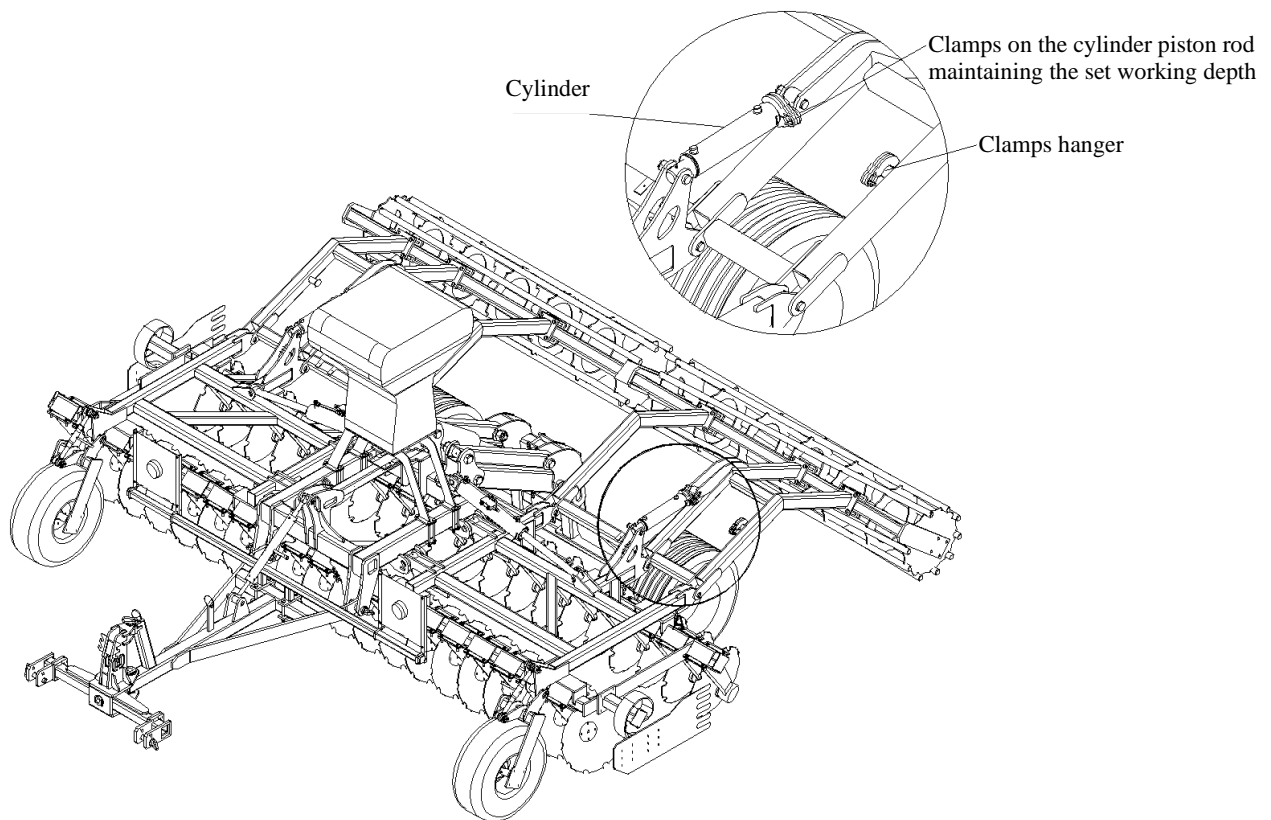


Fig. 15 Hydraulic shaft depth control

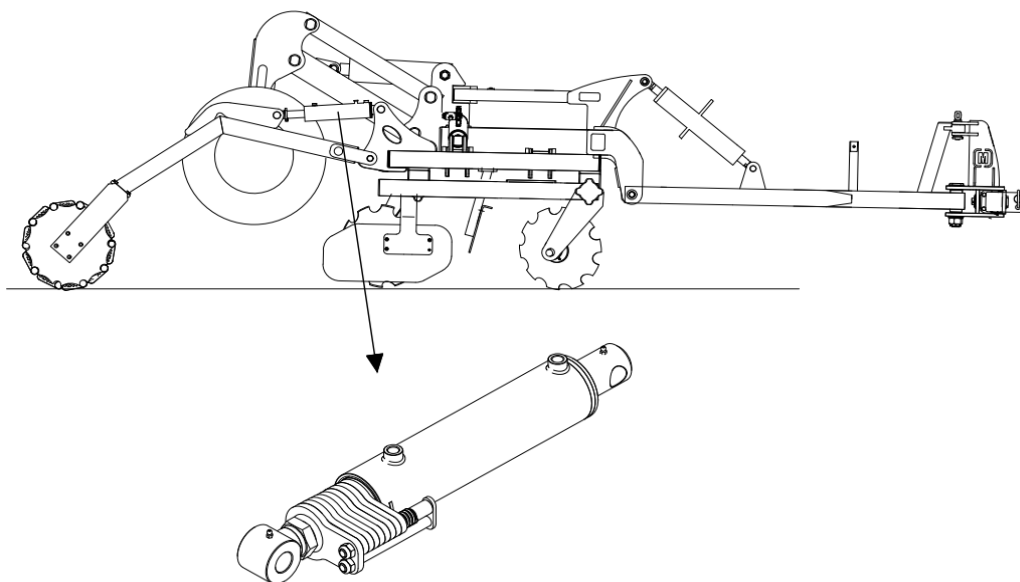


Fig. 16 Cylinder with pawls attached to the piston rod to adjust the working depth.

The working depth of the machine is set using pawls located at the piston rod of the cylinder. As more pawls are folded, the operation of the machine becomes shallower. In a configuration where none of the pawls are installed, the machine is in its greatest working depth configuration. In fig. 17 and fig. 18, the correct way of installing the subsequent pawl plates on the cylinder and the incorrect way of installing them are shown.

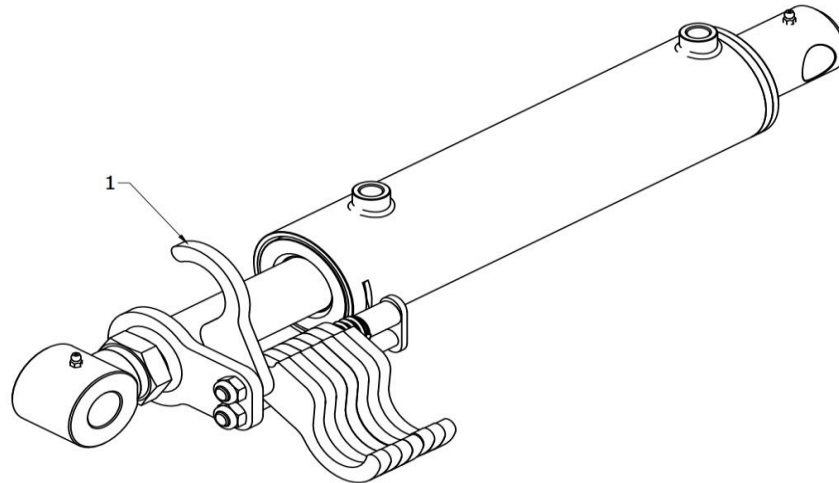


Fig. 17 Correct way to put the first (1) pawl on the piston rod of the cylinder to adjust the working depth of the machine.

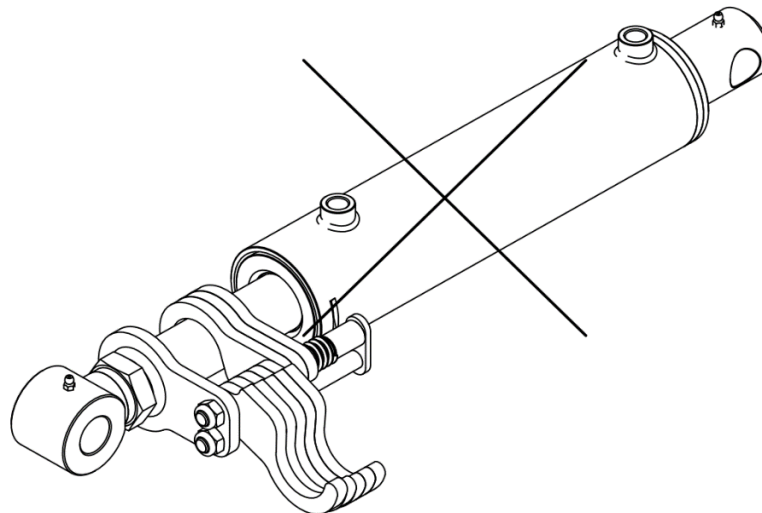


Fig. 18 Incorrect installation of pawls on cylinder piston rod. Partial omission of the attachment of the pawls to the cylinder results in uneven distribution of the forces acting on the piston rod and can lead to piston rod buckling resulting in damage to the entire cylinder assembly. This kind of adjustment is unacceptable!

4.4.5 Opening sequence of the machine on the chassis

Before unfolding the machine on the chassis, it is important to familiarise yourself with the opening sequence to allow you to do this correctly.

1. Position the machine on a flat surface in a place that provides free space to allow the machine to unfold correctly avoiding the risk of the folding wings of the machine catching on other obstacles during movement.
2. Pull out the pins securing the machine wings against self-extension from the buffers (fig.19).

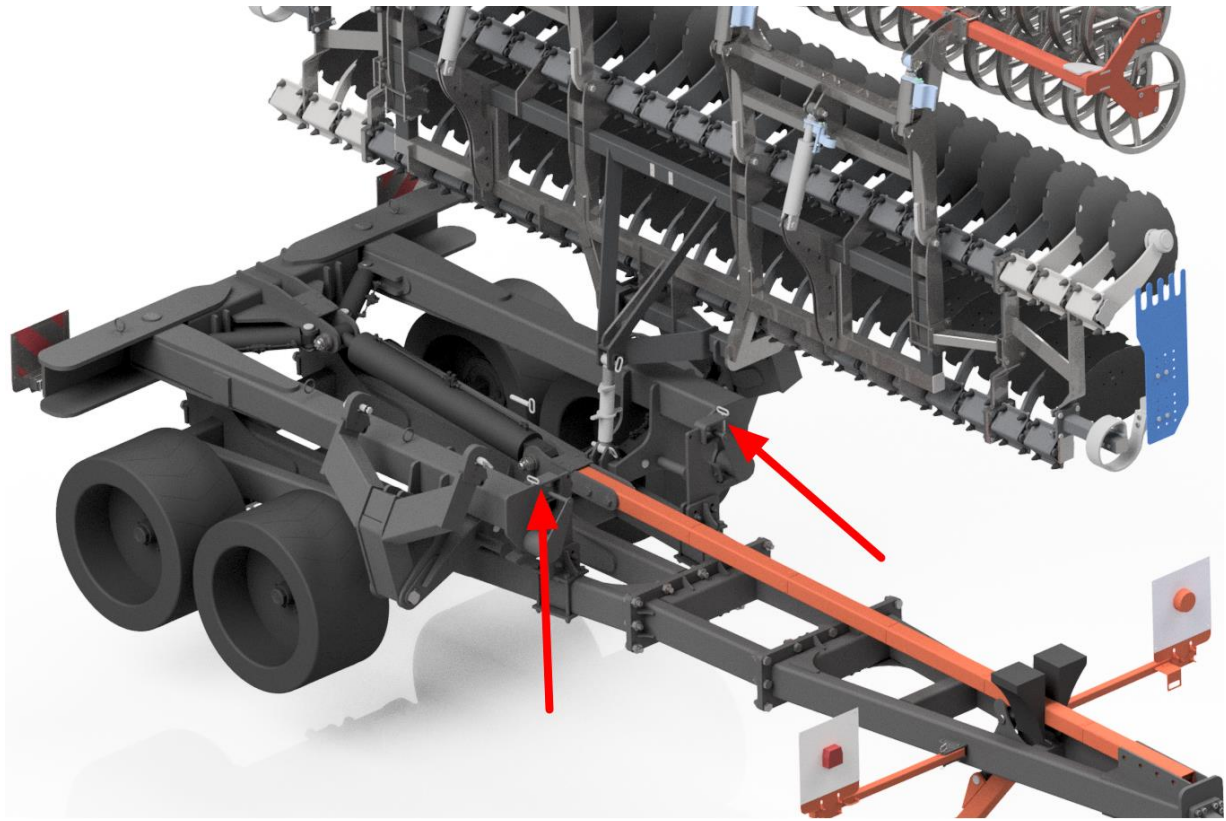


Fig. 19 Location of pins preventing the machine wings from unfolding.

NOTE! Remember to secure the machine wings against self-opening by means of safety pins each time the unit is folded.

3. Using the hydraulics, spread the arms of the machine horizontally until they are fully extended (fig. 20).

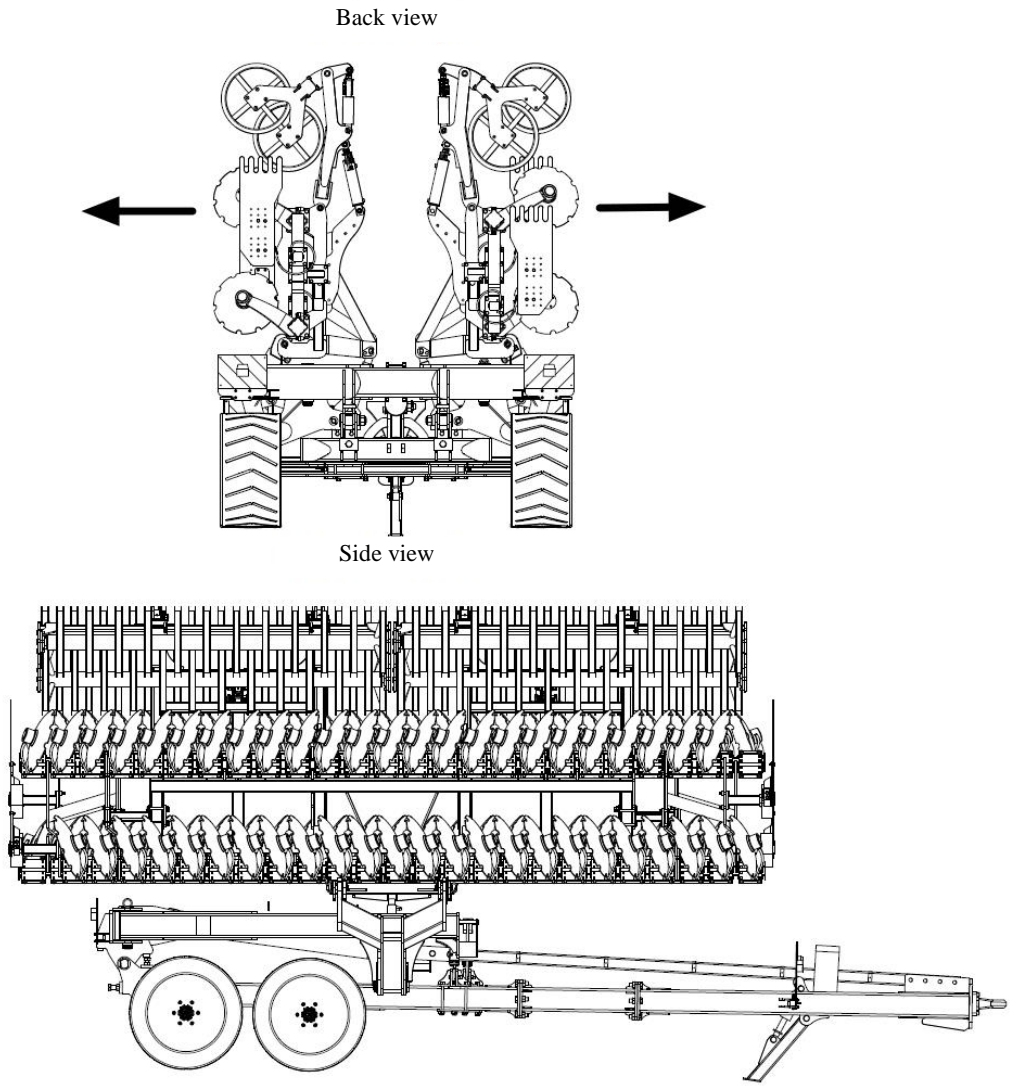
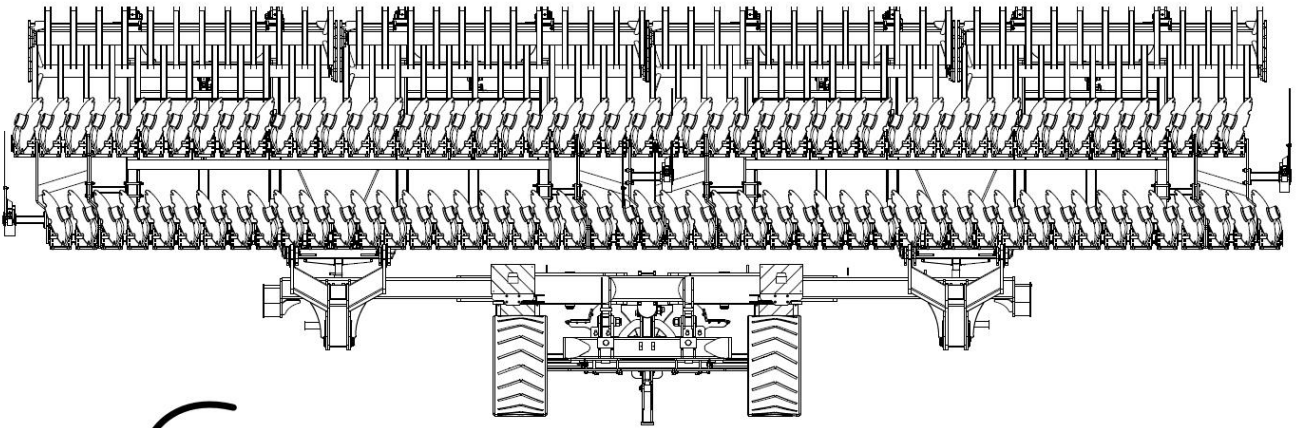


Fig. 20 Unfolding the wings of the machine.

Back view



Side view

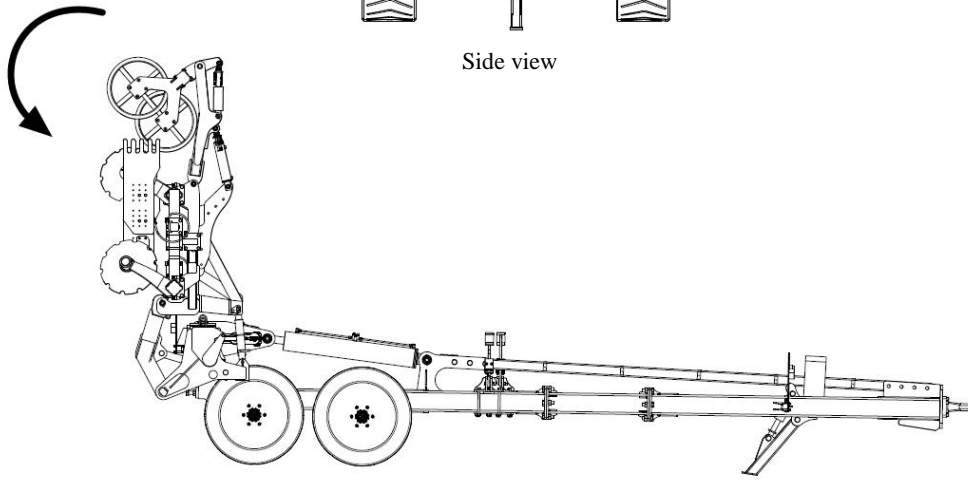
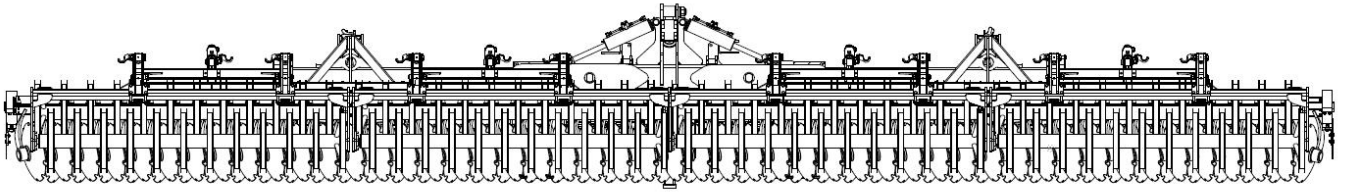


Fig. 21 Unfolding the wings of the machine to horizontal position.

4. The next step is to hydraulically unfold the open arms of the machine to a horizontal position (fig. 21, 22).

Back view



Side view

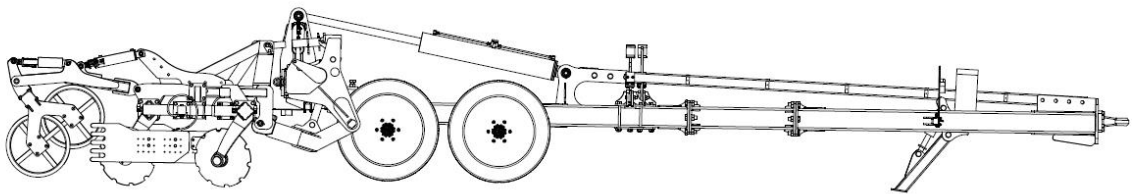
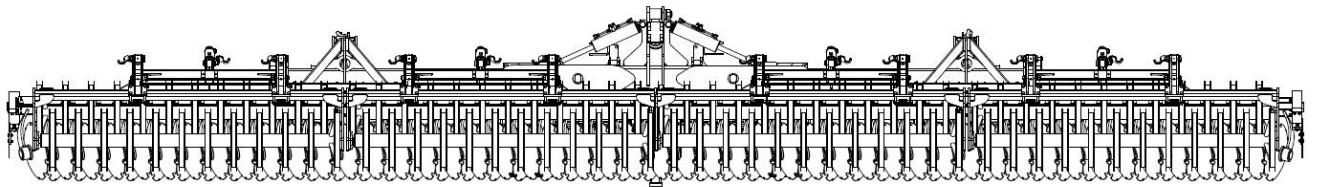


Fig. 22 View of the machine after unfolding.

5. Once the machine has been unfolded on the chassis, the alignment of the working shafts with respect to the machine must be carried out using hydraulic cylinders. The entire process is carried out using hydraulic cylinders that determine the height of the shafts and their angle of attack relative to the ground, and turnbuckles fitted to the machine's wing drawbars (fig. 23).

Back view



Side view

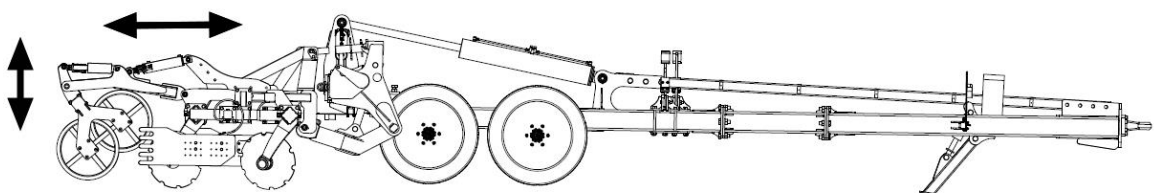


Fig. 23 Adjusting the height and angle of attack of the working shafts.

4.4.6 Adjusting the working depth and setting the correct position for machines with chassis

Once the machine has been unfolded, proceed with setting the working depth and levelling.

First of all, the appropriate working depth must be determined using the hydraulic cylinders of the three-point linkage on which the disc harrows are suspended (item 1, fig. 24). There are special clips on the three-point frame designed to be fitted to the piston rod of the cylinder to maintain the desired extension (item 2, fig. 24). As the cylinder's extension is increased, its working depth is increased, and a decrease in extension results in a decrease in working depth. Clips (item 2, fig. 24), which are fitted to the piston rod of the cylinder, are used to maintain the preset cylinder extension.

NOTE! Make sure the machine is standing on level ground before carrying out the levelling operation.

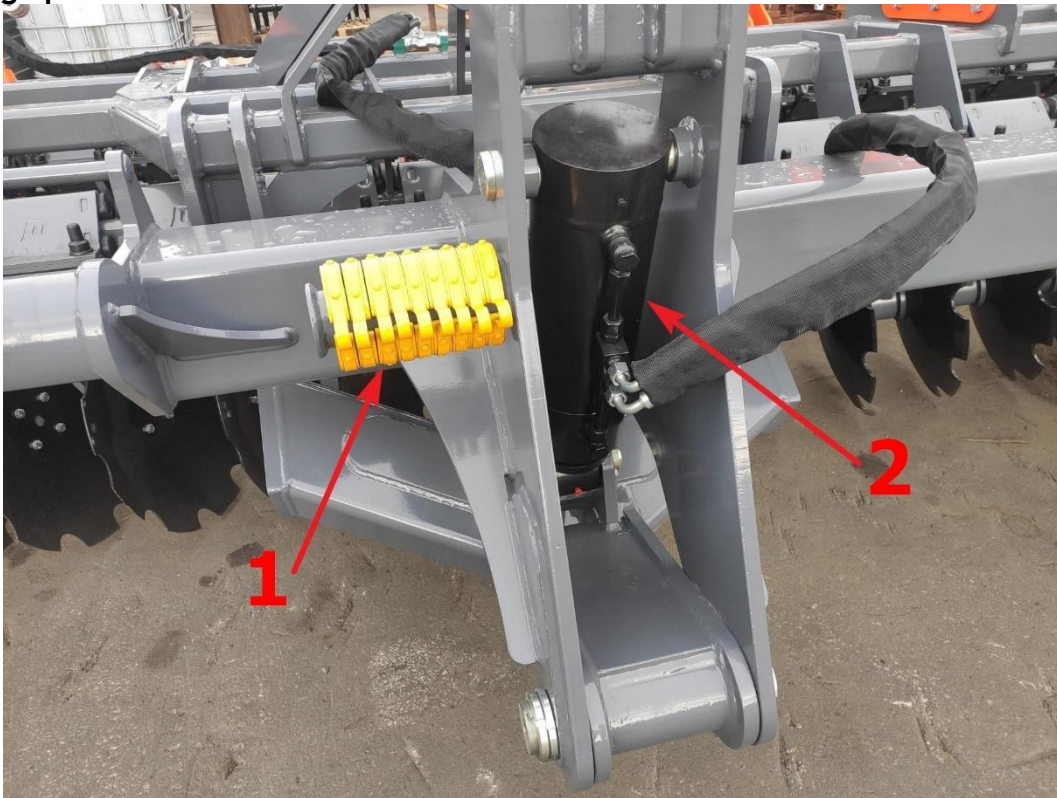


Fig. 24 View of the machine wing hydraulic assembly; 1-safety clips, 2-cylinder.

Once the working depth of the machine has been established, it is necessary to level the machine by adjusting the turnbuckle on which the disc harrow is mounted on the three-point linkage arms (fig.25).



Fig. 25 Placement of turnbuckle on drawbar assembly; 1- turnbuckle.

Levelling the machine is also possible thanks to the adjustment screws at the rear of the chassis. The vertical bolts (item 1, fig. 26) adjust the position of the disc harrow when the machine is folded. The horizontal screws (item 2, fig. 26) adjust the level of the disc harrow when the machine is unfolded.

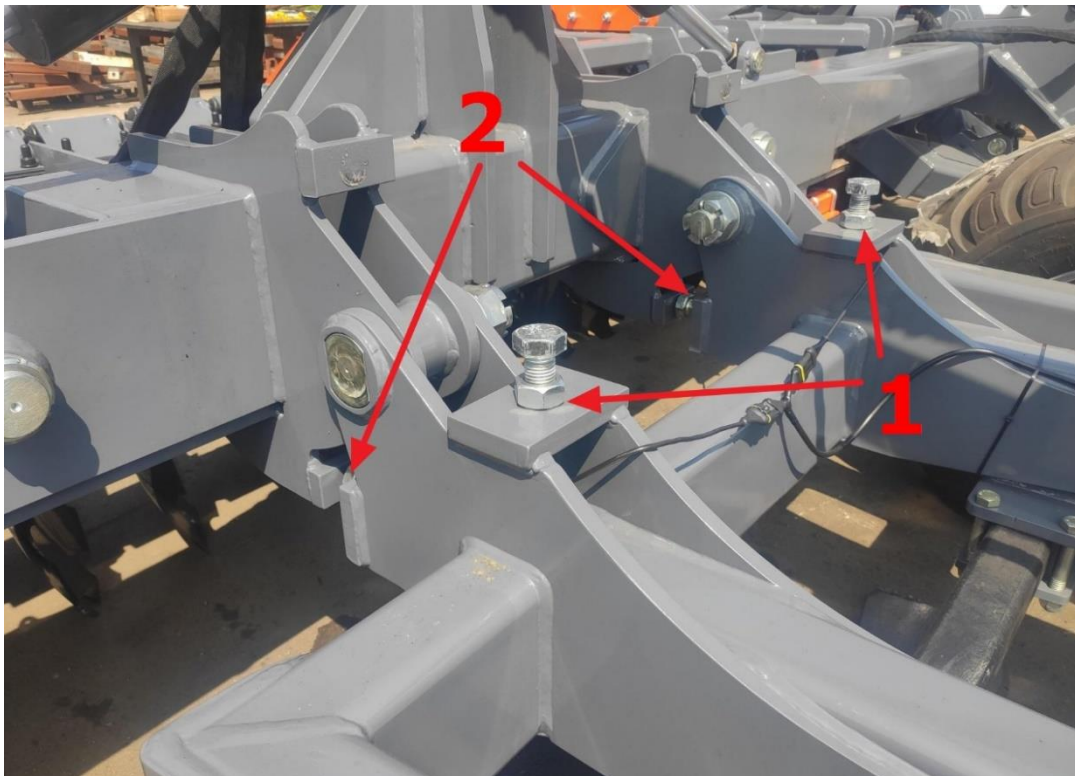


Fig. 26 Placing the machine wing adjustment screws in position when: 1-Machine wings are folded, 2- Machine wings are unfolded.

After levelling and adjusting the working depth, adjust the working depth of the machine on the rollers at the rear of the machine. Height adjustment of the rollers is carried out by hydraulic cylinders connecting the roller arms to the disc harrow frame. To maintain a constant shaft position (working depth) during operation, clamps are

fitted to the cylinder piston rods. The maximum permissible working depth is 12cm for discs Ø560mm.

Once the required working depth has been established, the appropriate number of clamps must be taken from the holder on the shaft arm and then fitted to the piston rod of the cylinders. This ensures a constant working depth during operation. The number of clamps on both cylinders must always be equal.

In fig. 27 and fig. 28, the correct way of installing the subsequent pawl plates on the cylinder and the incorrect way of installing them are shown.

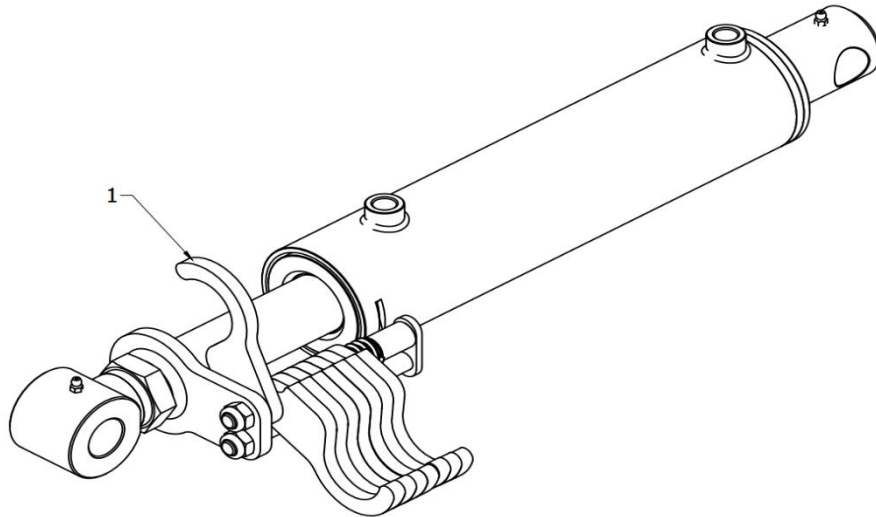


Fig. 27 Correct way to put the first (1) pawl on the piston rod of the cylinder to adjust the working depth of the machine.

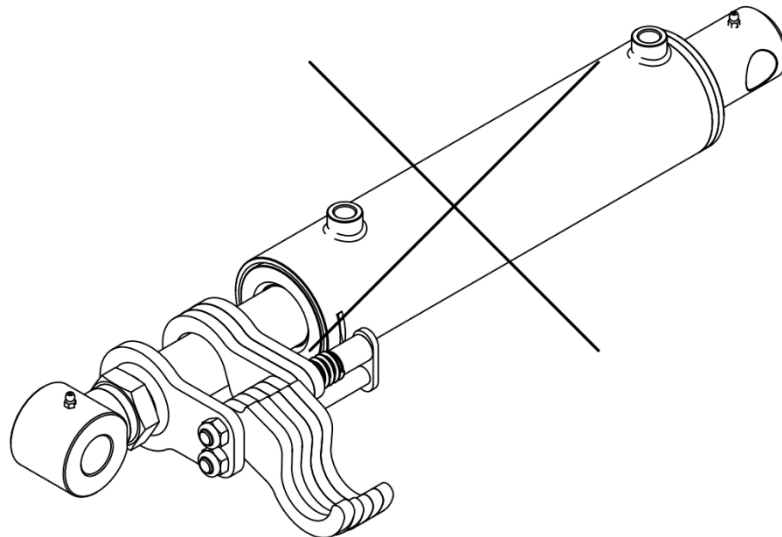


Fig. 28 Incorrect installation of pawls on cylinder piston rod. Partial omission of the attachment of the pawls to the cylinder results in uneven distribution of the forces acting on the piston rod and can lead to piston rod buckling resulting in damage to the entire cylinder assembly. This kind of adjustment is unacceptable!

NOTE! Before turning with the machine unfolded, retract the chassis cylinder (approx. 100mm) so as to raise the front row of discs by at least 15cm in order to avoid undesirable hitting of the machine on the ground (fig. 29). After the manoeuvre, lower the machine back to the operating position.

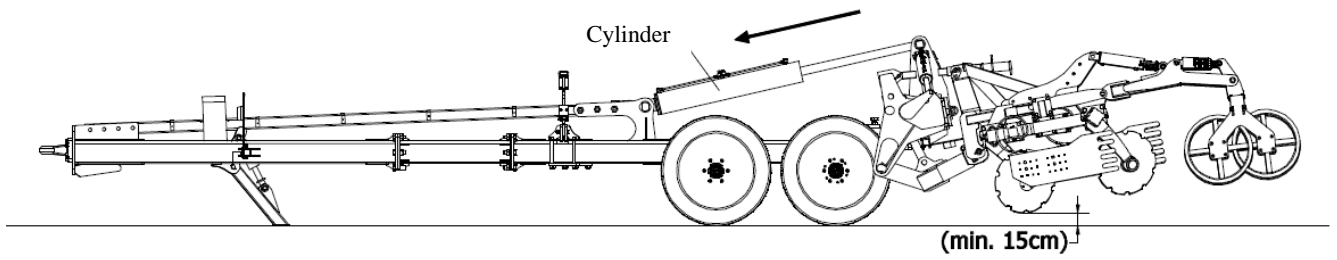


Fig. 29 The correct way to lift the machine when carrying out a turning manoeuvre.

For machines with chassis, an option is available to purchase a valve block with electric control, which allows all the hydraulic sections (except the section responsible for folding/unfolding the machine wings) to be connected directly to the joystick control panel, which allows more convenient control of the machine's hydraulics and requires only two, free pairs of hydraulic connections on the tractor for its connection (fig. 30).

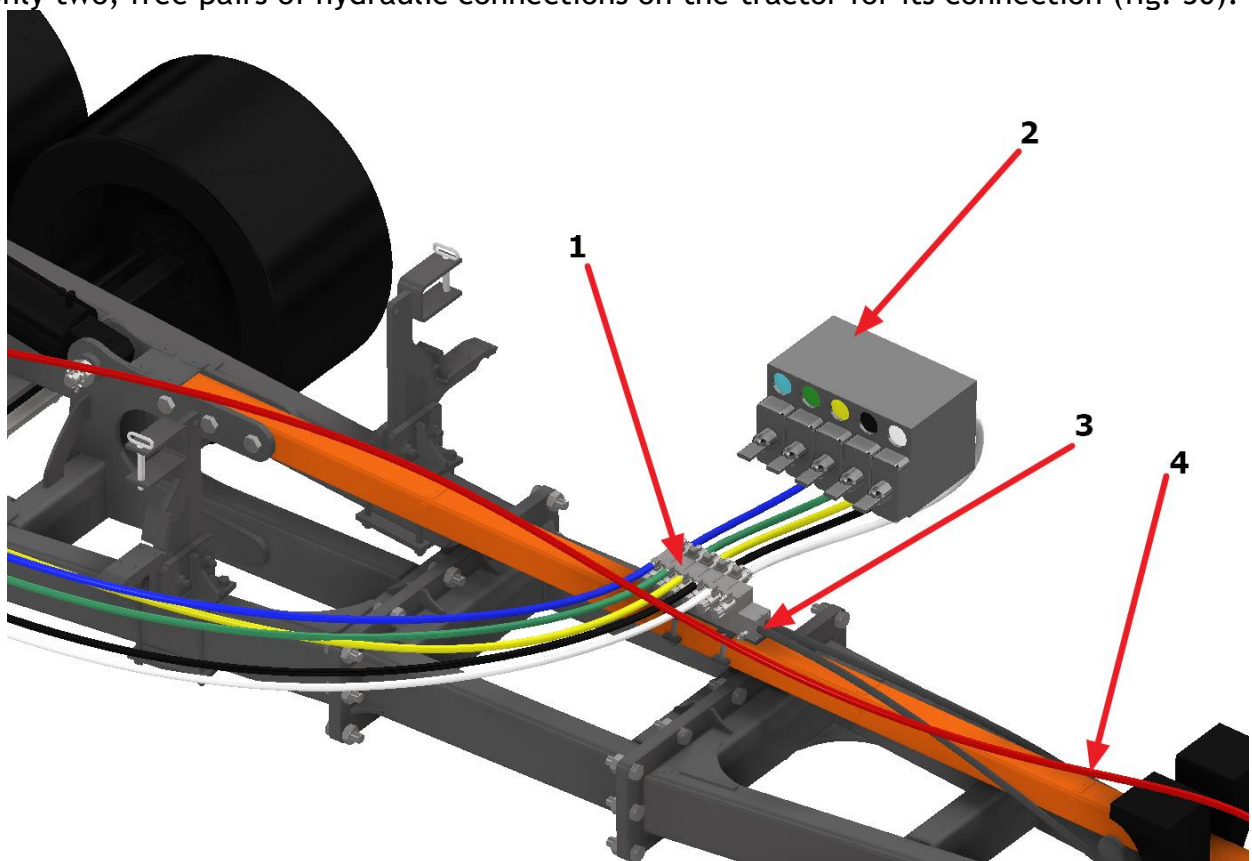


Fig. 30 Machine chassis with valve block installed; 1-valve block with electric control, 2-control panel with joystick, 3-valve block power supply outlet, 4-power supply outlet for machine wing folding/unfolding hydraulics.

Figure 31 shows a diagram of the machine's hydraulics using a valve block with electric control.

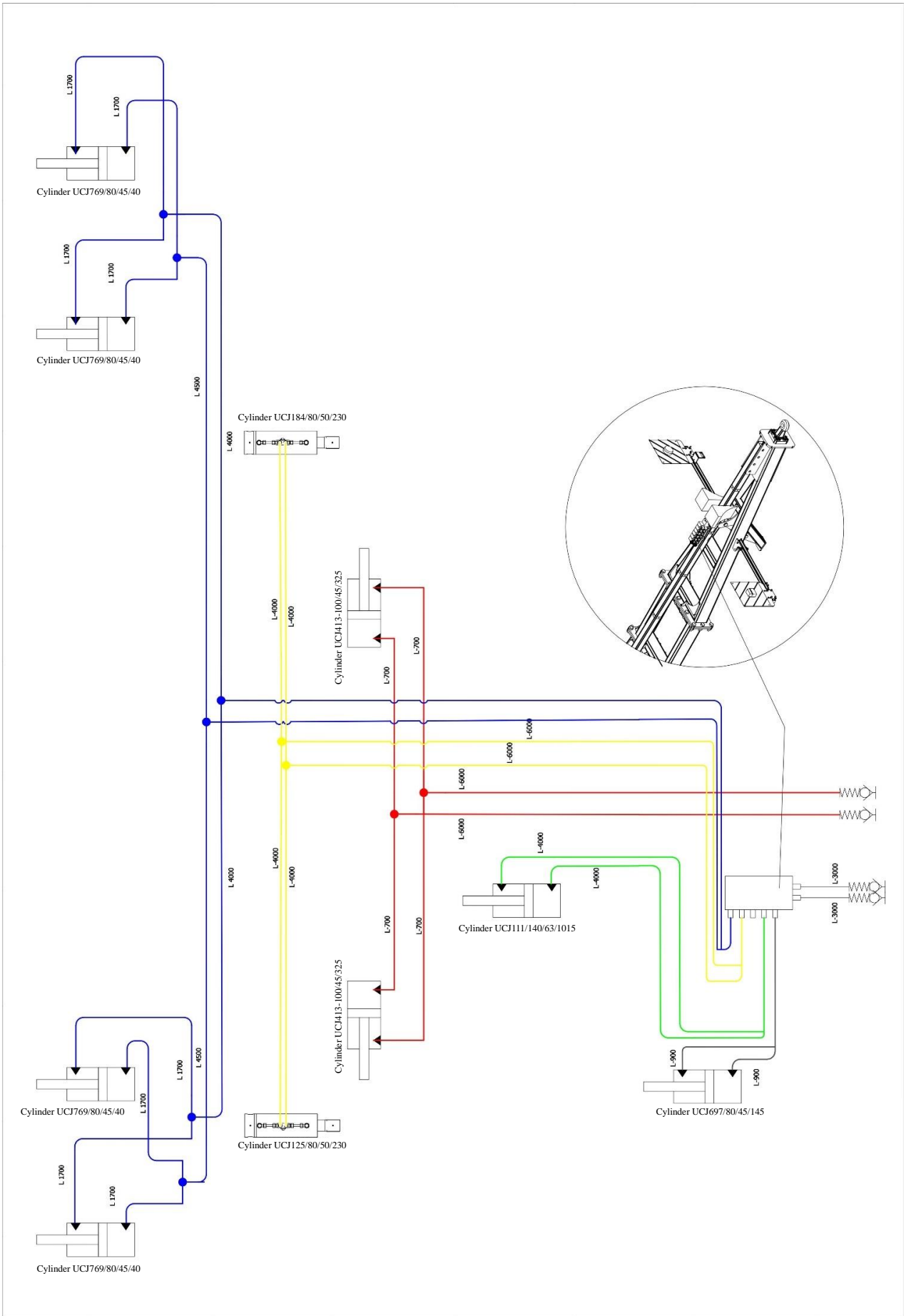


Fig. 31 Diagram of the machine's hydraulic system with valve block fitted.

4.5. Braking system

Chassis-mounted machines can be equipped with three types of braking systems - single-circuit hydraulic brake, dual-circuit hydraulic brake or air brake (standard on 8.0m; 10.0m; 12.0m machines), a diagram of which, along with the principle of operation, is shown below.

4.5.1 Air brake

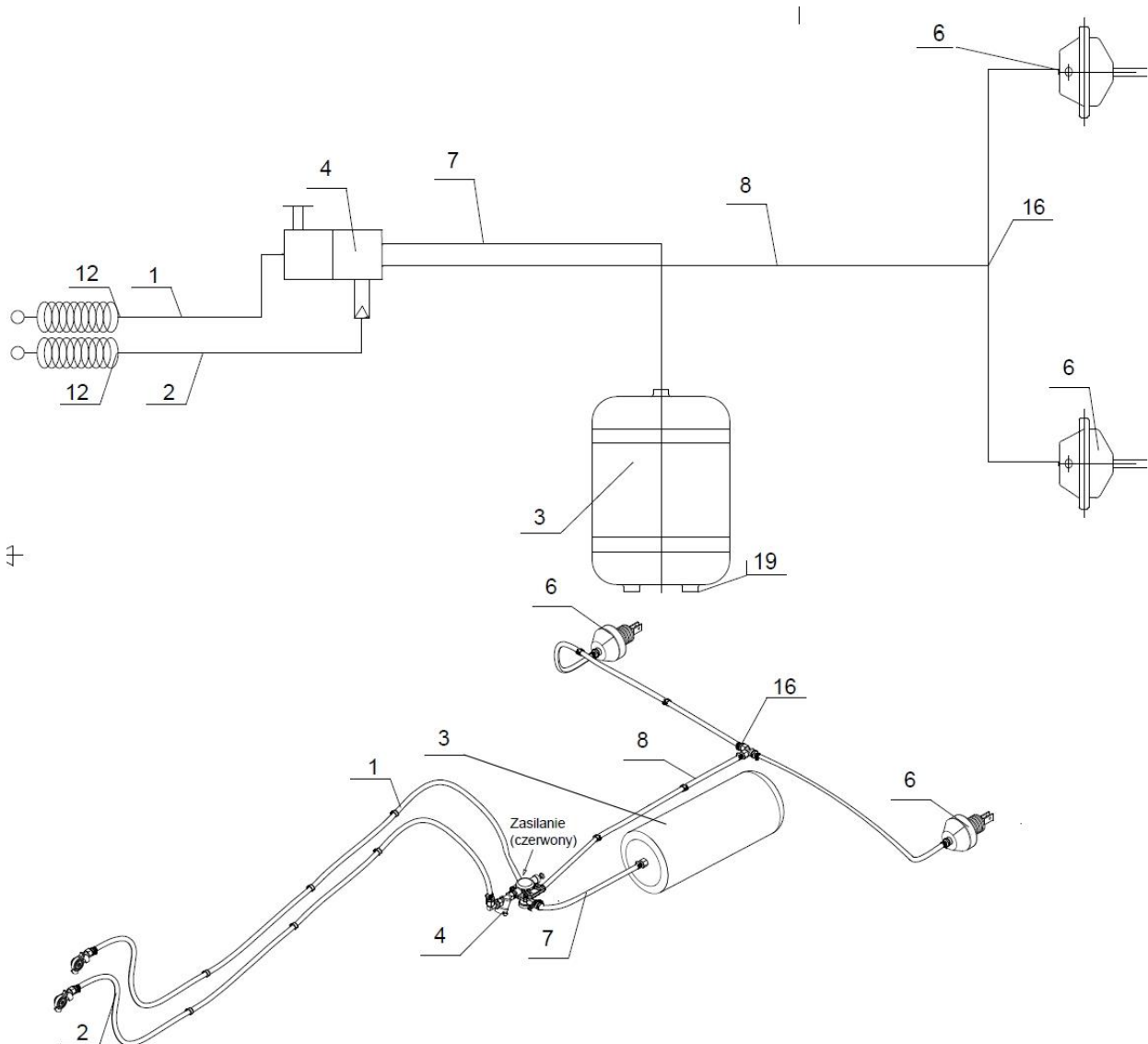


Fig.32 Diagram of an air brake: 1 - spiral hose coupling (red), 2 - spiral hose coupling (yellow), 3 - 40L air tank, 4 - trailer control valve, 6 - 24" diaphragm cylinder, 7-8 - rubber air line, 12- reduction, 16 - M22 T-piece, 19 - tank plug.

4.5.2 Hydraulic single-circuit brake

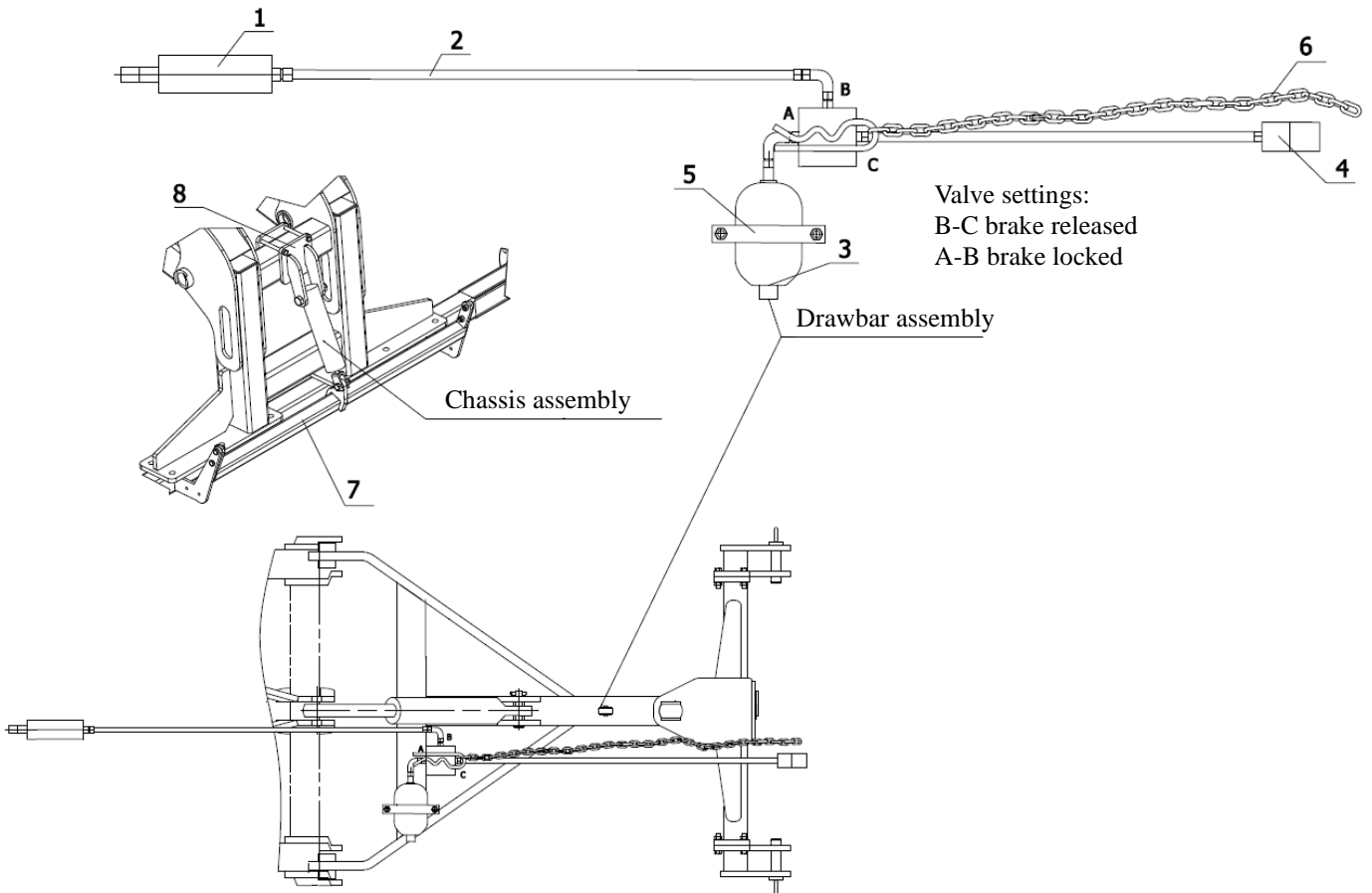


Fig. 33 Diagram of a single-circuit hydraulic brake with the most important operating components: 1 - 301349/P2 cylinder, 2 - hydraulic hose, 3 - 0.75l 100 bar(SIAP WA) accumulator, 4 - SAFIM quick-release coupling, 5 - accumulator bracket, 6 - safety valve actuating chain, 7 - brake beam, 8 - brake cylinder holder.

4.5.3 Hydraulic double-circuit brake

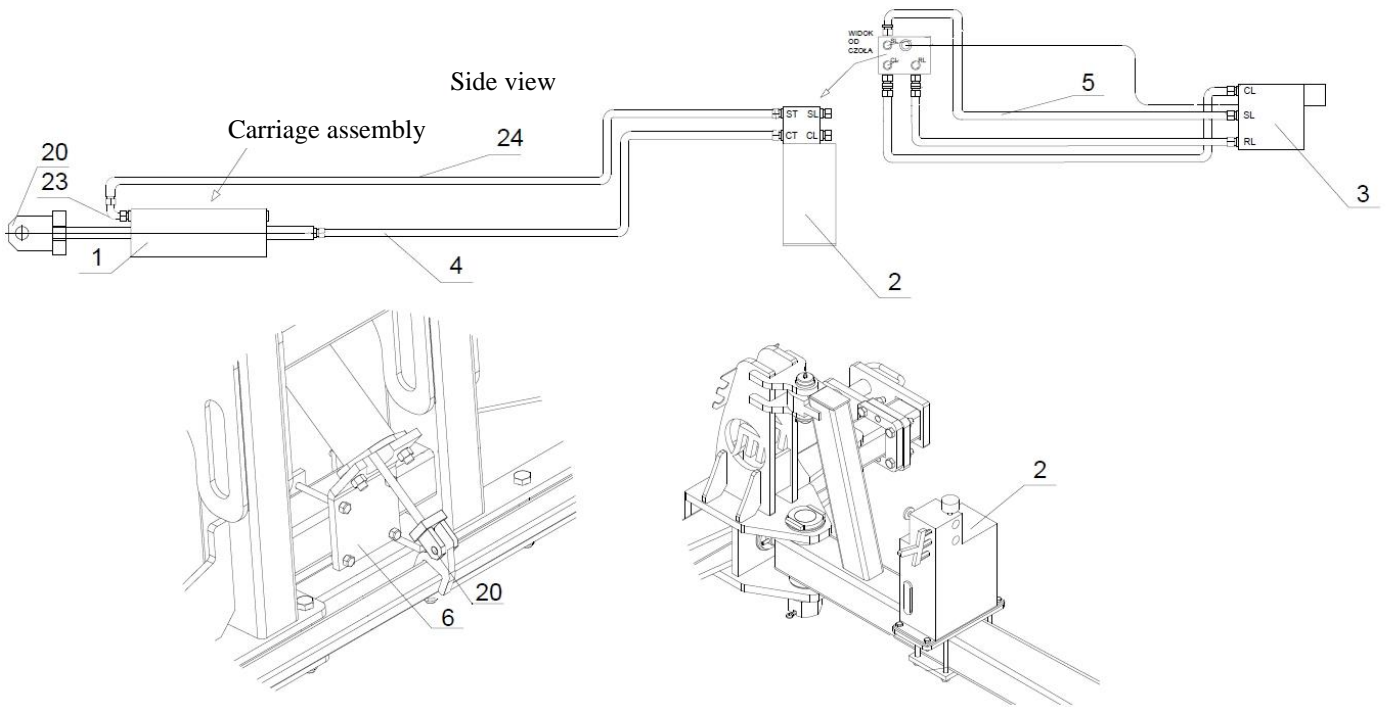


Fig. 34 Diagram of a double-circuit hydraulic brake with the most important operating components: 1 - combination brake cylinder, 2 - valve with pump reservoir, 3 - DLC- double-circuit coupling with cable, 4-5 - hydraulic line, 6 - hydraulic cylinder mounting plate, 20 - beam bracket, 23 - elbow connector, 24 - hydraulic line.

4.5.4 Automatic brake valve with spring brake - 206613

The SAFIM valve on the machine is designed to manage the service and emergency braking functions of the two-circuit hydraulic braking system. If the trailer is disconnected from the tractor, the automatic brake valve activates the emergency braking function. This function is achieved by using the energy previously stored on the compressed spring of the SAHR cylinders, which become active when the oil of the spring brake section is discharged into the reservoir.

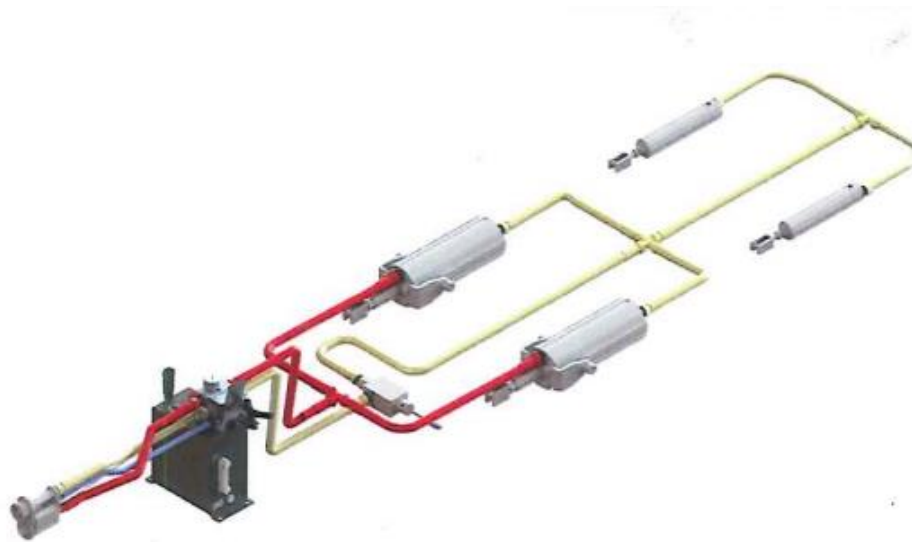


Fig. 35 Overview of the two-circuit hydraulic braking system.

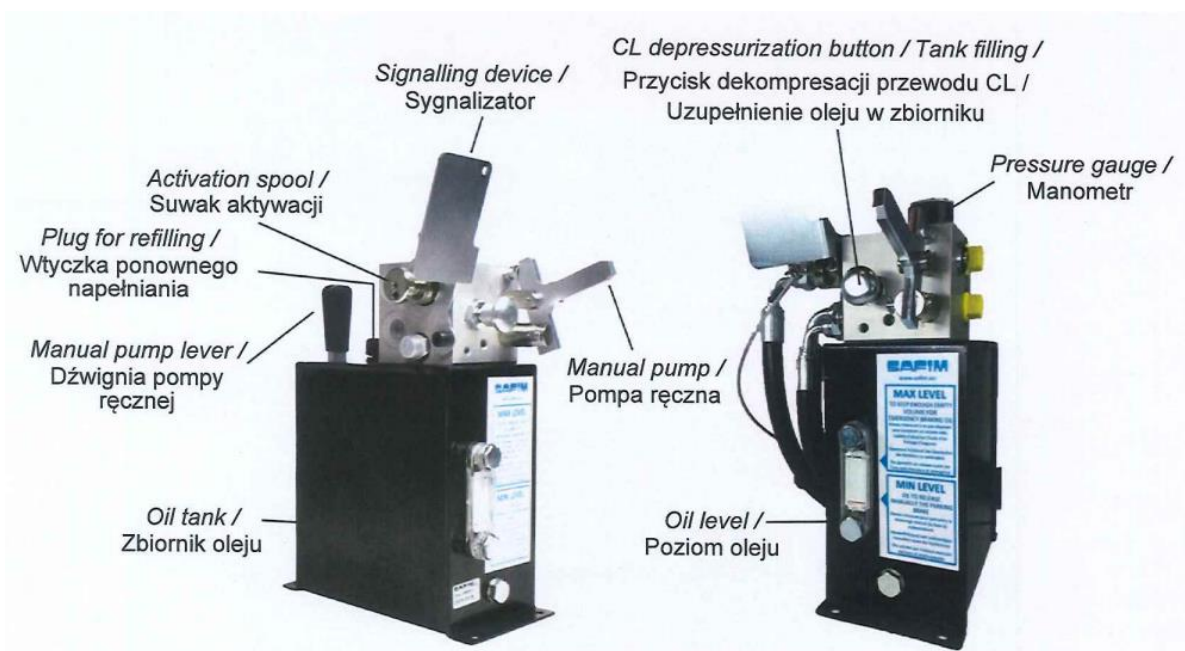


Fig. 36 Valve with marked components.

Figures 7 and 8 show the respective valve plans with the designations of the most important wires and connectors, where they denote in sequence:

- CL - control line (from coupling joint),
- SL - auxiliary line (from the coupling joint),
- RL - return line (from the coupling joint);

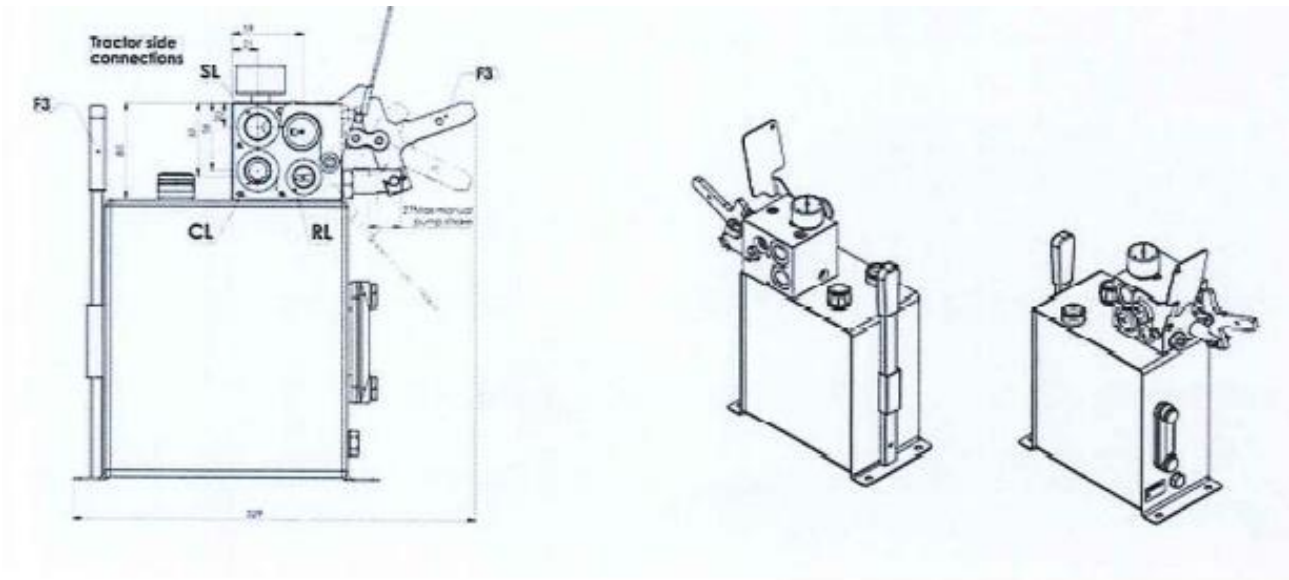


Fig. 37 View showing the couplings from the tractor side.

- CT - output port (of brake cylinders or load sensing valve, if fitted),
- ST - output port (spring brake sections of the combined SAHR actuators - SL port),
- SL-A - return line from the automatic load sensing valve, if fitted.
-

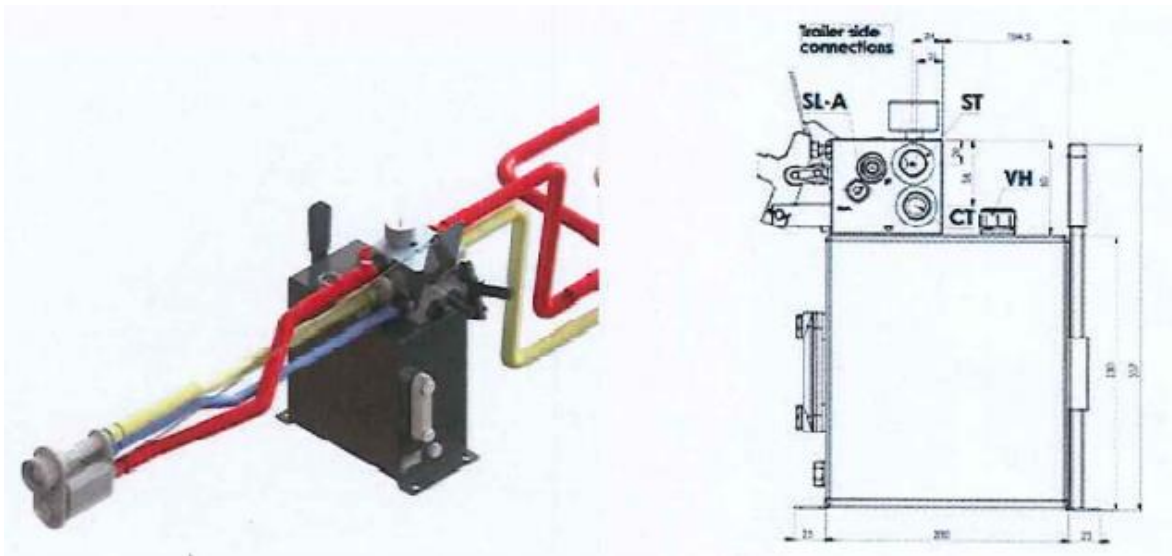


Fig. 38 View showing the joints from the side of the disc harrow.

It is important to note that during installation, the metal cable (pre-mounted on the coupling joint) must be connected to its dedicated housing on the valve. Also ensure that the length of the cables is 20-30 cm shorter than the length of the hydraulic lines.

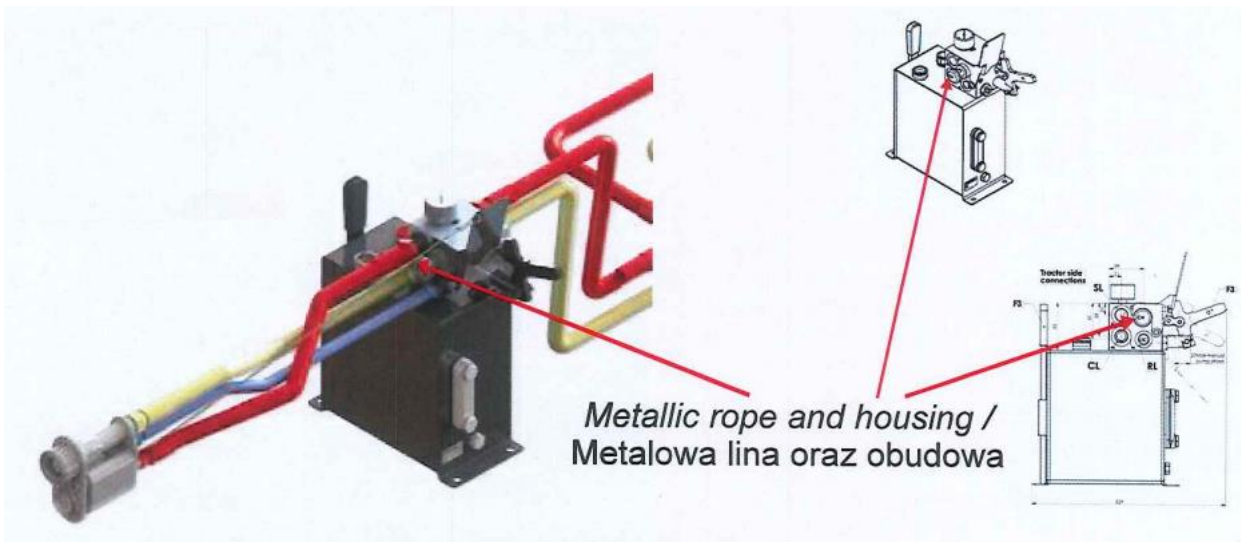


Fig. 39 Marking the point of connection of the metal cable to its dedicated housing.

If the braking system contains an automatic load detection valve of type 206104/xx, connect the SL-A port of the automatic brake valve to the SL port of the load detection valve.

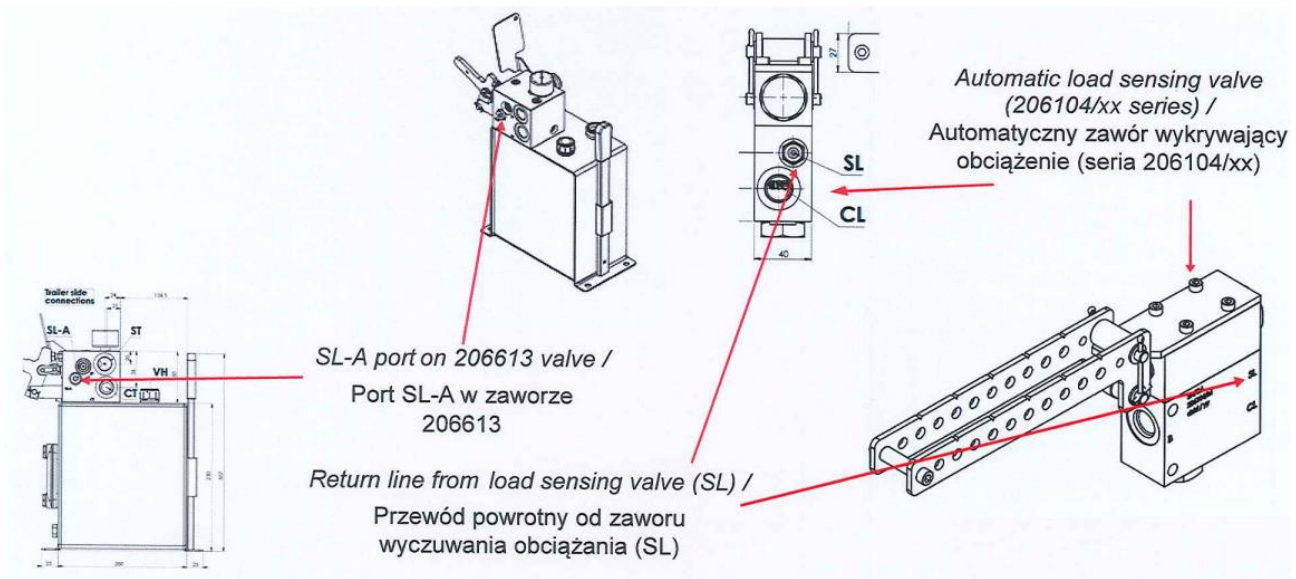


Fig. 40 Marking of the connection point when using automatic load sensing valve type 206104/xx.

The brake valve has several modes of operation. All modes are listed in sequence below with their descriptions:

Mode 1 - Drive mode:

- Two-line connector: connection to the tractor
- Tractor engine: on
- Parking brake: released

The activation spool automatically returns to the drive mode position when the pressure in the secondary line (SL) increases to its normal value.

The valve's normal function mode is engaged each time the operator connects the two-line connector, starts the tractor engine and releases the parking brake.

The device provides all standard trailer braking functions when the driver brakes. If the

trailer is disconnected from the tractor, the automatic brake valve activates the automatic emergency braking function.

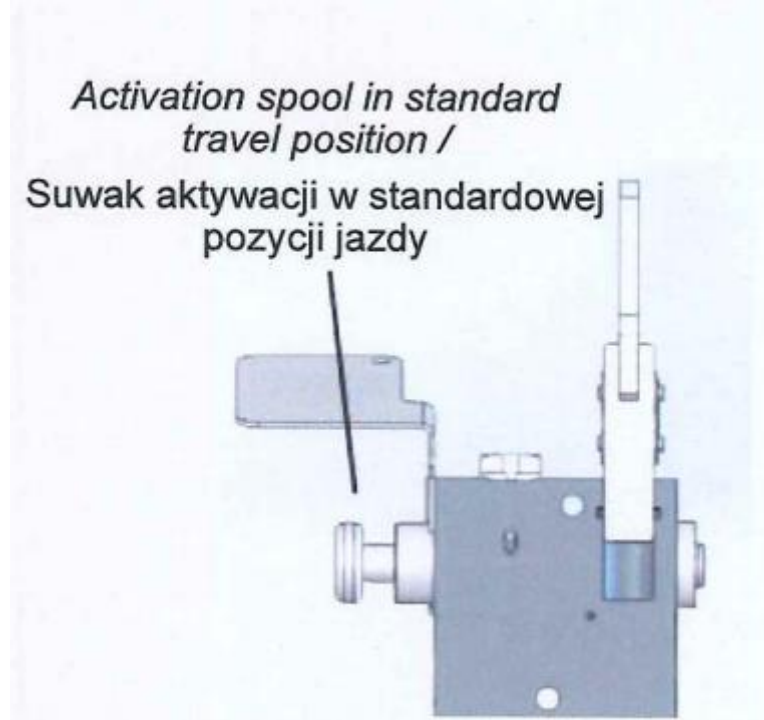


Fig. 41 Standard position of the activation spool in the driving position.

Mode 2 - Emergency mode:

When the trailer is disconnected from the tractor, an automatic brake valve connects the spring brake section of the SAHR cylinders to the reservoir. The oil holding the springs under tension is discharged into the reservoir, the spring action activates the emergency brake function.

The automatic emergency brake function is activated even if the pressure in the auxiliary line (SL) drops while the DLC connector is still connected to the tractor. The activation spool remains in its normal function position when the automatic brake function is activated.

Mode 2a - Parking mode:

In a spring brake trailer braking system, the application of the automatic emergency braking function overlaps with that of the parking brake, as spring brakes generate both functions. Therefore, disconnecting the DLC connector ensures that the vehicle is parked correctly.

If the operator disconnects the two-line joint from the tractor, it is recommended to connect it to the dummy connection of the valve housing to avoid contamination.

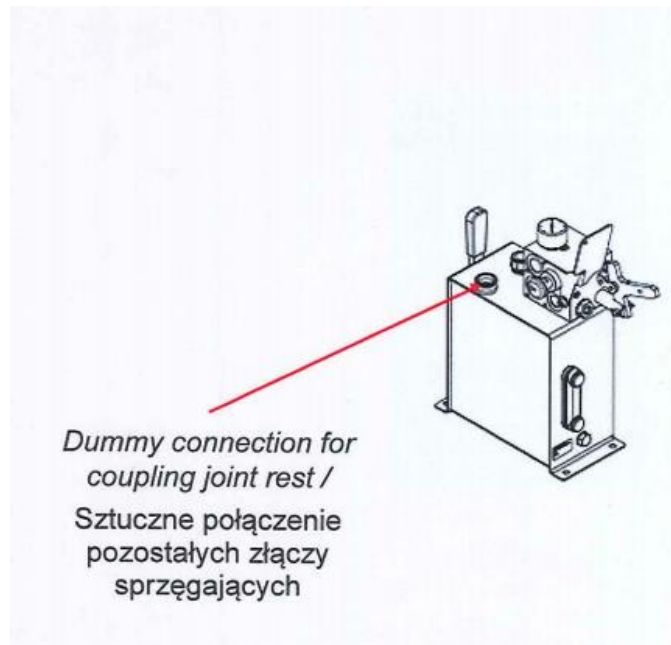


Fig. 42 Dummy connection port for the remaining coupling joints.

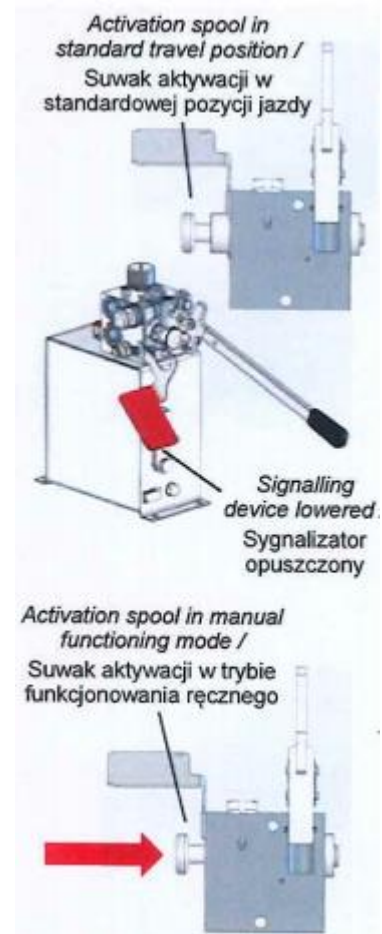
Mode 3 - Deactivation of automatic brake function:

To deactivate the automatic brake function (if towing a trailer by a non-two-wheel tractor or other type of vehicle):

- Press the activation spool (as in the image on the right) until it is fully extended. The signalling device will move downwards generating a switch on manual mode operation;
- Pump oil from the reservoir into the spring brakes using a hand pump. The automatic/parking brake function will be deactivated.

NOTE: the brakes will be released when the pressure in SL towards the spring section of the SAHR cylinders is over 15 bar. When pumping, check the pressure gauge to ensure that it indicates the correct pressure not exceeding 35 bar.

NOTE: Whenever the activation spool is in "manual operation mode", automatic application of the parking brake is not ensured. If the vehicle has to park again, check that the activation spool is in the "standard driving position".



Mode 4 - Reconnecting to the tractor:

The activation spool automatically returns to its normal function position every time the pressure in the secondary line (SL) increases to its normal value.

The valve's normal function mode is engaged each time the operator connects the two-line joint, starts the tractor engine and releases the parking brake. In this situation, all emergency functions are switched on.

Place the signal box back into its running position before switching on the tractor engine and before releasing the tractor parking brake. If the spool is already in the driving position, it will be impossible to reset the signalling device.

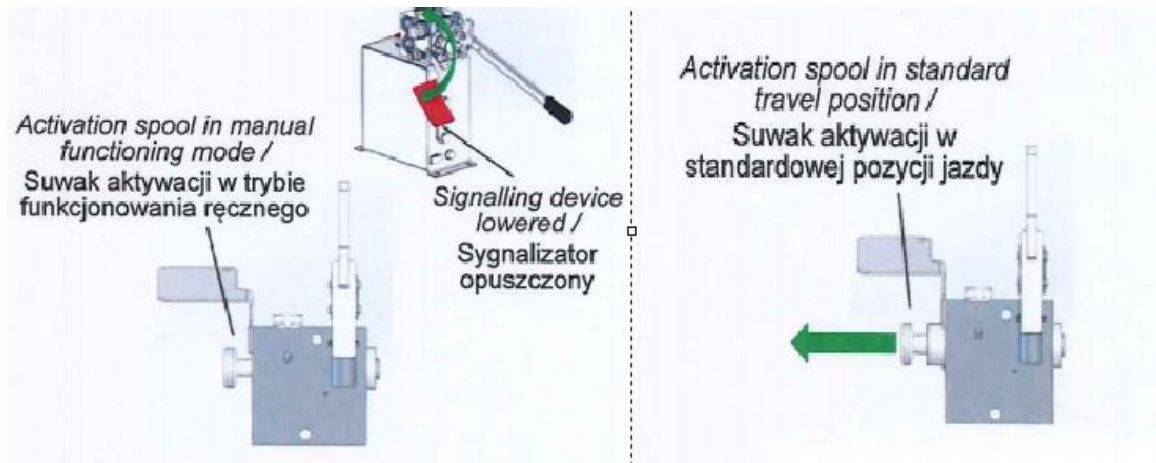


Fig. 43 Positions of the activation spool in manual operation and standard driving position.

Two alternative procedures are allowed for filling the installation's oil tank after installation. To do that:

- Unscrew the oil plug from the top and fill the tank with the correct amount of oil*;
- Press the "**decompression/reservoir fill**" button on the front side of the valve and, keeping it in the same position, slightly depress the tractor brake pedal (this procedure requires two operators, one to operate the tractor and one to operate the valve). The oil coming from the tractor via the control line (CL) will be directed to the tank. When the oil has reached the correct level, let go of the „**decompression/tank fill**” button.

*Use oil complying with SAE 10W30 standard or that used to fill the tractor's oil tank.

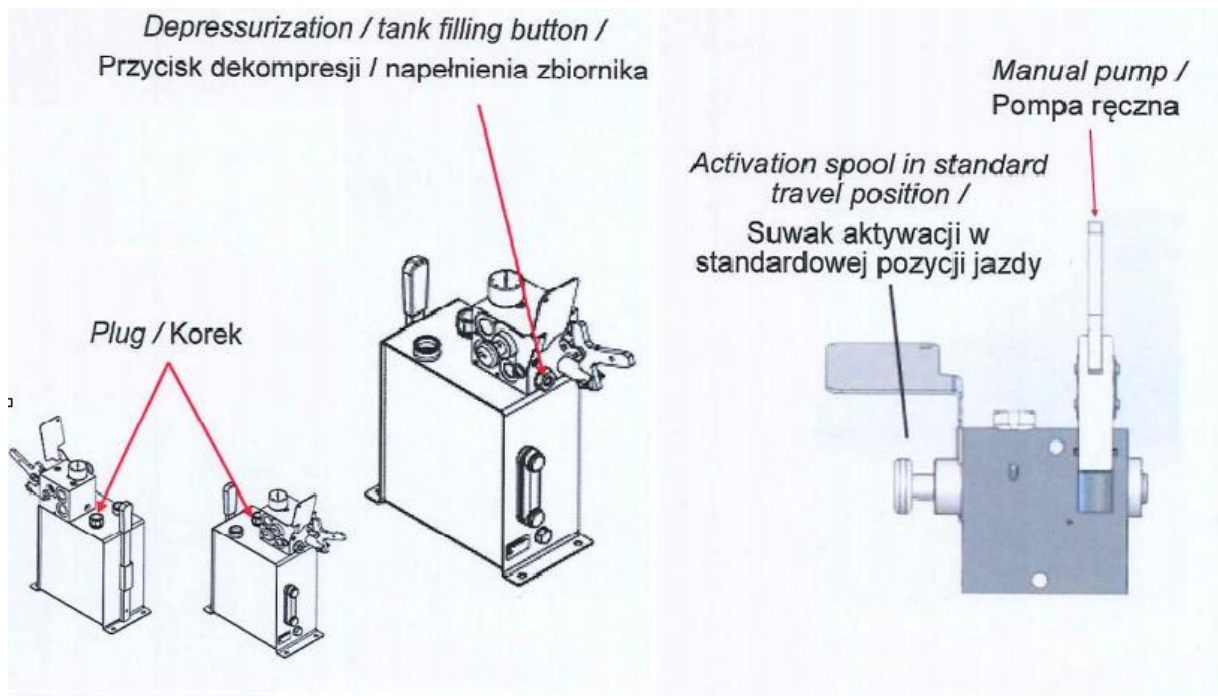


Fig. 44 Location of tank cap, decompression button and hand pump.

Check the oil level in the tank regularly: the level must always be between the „max” and „min” positions on the oil level indicator.

If the oil level is below the minimum, follow one of the previously described procedures to refill the tank.

If the oil level is above the maximum, use the hand pump when the trailer is connected to the tractor (the activation slide is in the „normal function position”). The oil will flow from the tank to the tractor tank via an additional line (SL).

If it is difficult to reconnect the tractor's two-line joint due to residual pressure inside the lines, it is possible to relieve the pressure by pressing the decompression button for a few seconds. This can happen if the vehicle is left parked in the sun for some time. Excess oil will be drained into the reservoir and the DLC connector can be reconnected.

You can push the decompression button with tools such as a screwdriver, spanner or lever to the hand pump supplied with the valve assembly kit.

4.6. Hydraulic system quick couplings

The machine's hydraulic system has quick couplings for quick and easy connection of the hoses and other hydraulic installation. Each quick coupling has its own designation (fig. 45):







Quick couplings:		
-Red		-Folding/unfolding machine wings
-Blue		-Machine working depth adjustment
-Green		-Central cylinder
-Yellow		-Three-point hitch – machine levelling
-Black		-Foot
-White		-Shaft angle adjustment

Fig. 45. Designation and purpose of individual quick couplings on the machine.

4.7. Rules for transporting the harrow on public roads and lighting

In accordance with the road safety regulations (Regulation of the Minister of Infrastructure of 31.12.2002. Journal of Laws No. 32 of 2002 item 262) - unit consisting of an agricultural tractor and the agricultural machine coupled with it must meet the same requirements as the tractor itself.

The units should be equipped with:

- triangular plate to distinguish slow-moving vehicles,
- two forward-facing plates having a white position light and a white retro-reflector,
- two rear-facing plates having a combination light and a red reflector. The plates should be painted with diagonal white and red stripes.

Once the plates have been fixed, the electrical wires of the warning-light device should be connected to the socket of the tractor's electrical installation.

For the GAL-K 4.0H; 5.0H and 6.0H machines, the manufacturer does not supply warning signs as standard equipment. Warning signs for these units are available commercially. Other machines are equipped with warning signs as standard.

Driving style should always be adapted to the road conditions - this will help avoid accidents and damage to the chassis. Consider your own skills and the intensity of the movement, the prevailing visibility and the weather.

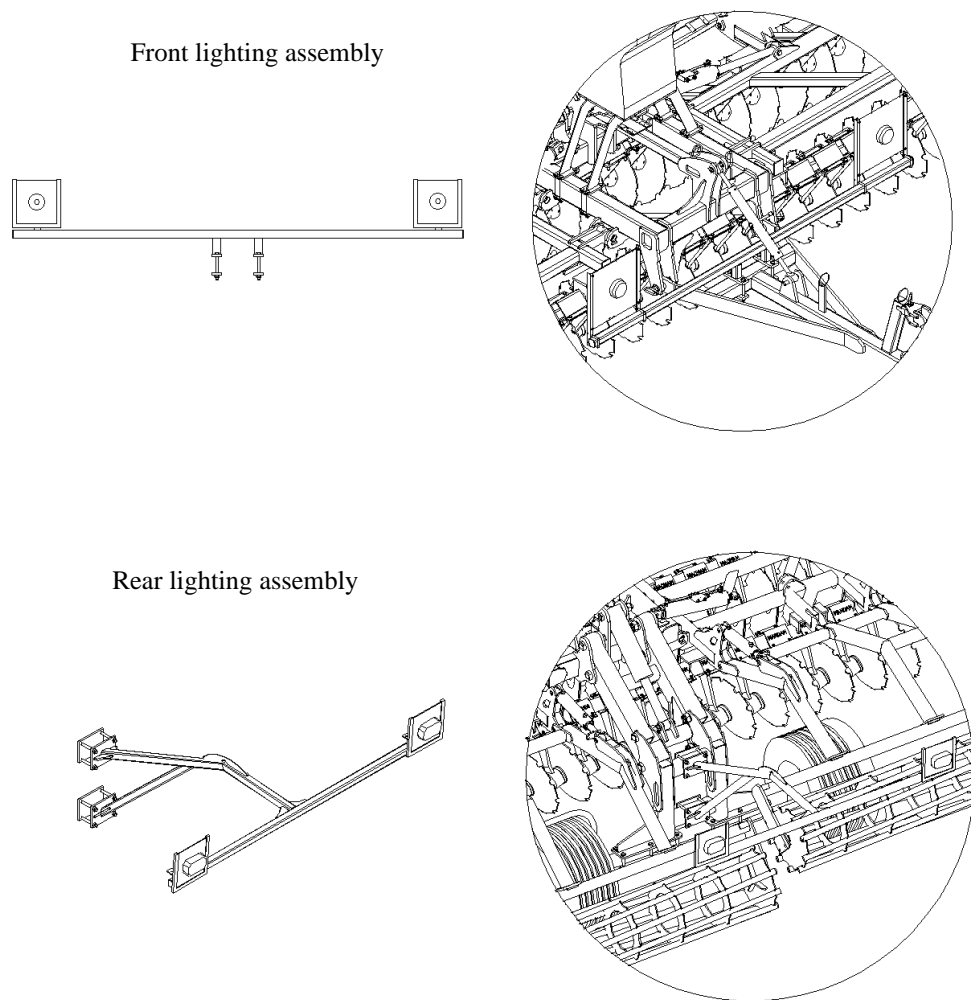


Fig. 46 Front and rear lighting assemblies and their location

Before transporting, the machine should be cleaned from the soil and the operation of the lights checked. After lifting the machine, check the clearance under the lowest working elements, which should be at least 30 cm. The permissible transport speed of the tractor with the machine is 15 km/h. It should be reduced to 10 km/h on roads with poorer surfaces and 5 km/h on dirt roads. Extreme caution should be exercised when passing and overtaking other vehicles, avoiding obstacles and crossing large irregularities in fields and dirt roads.

4.8. Maintenance and lubrication

- The disc harrow must be cleaned of soil after each operation, followed by an inspection of the parts and assemblies. **Otherwise, there may be a problem with the folding of the machine if the shafts are clogged with soil and there is an additional load!**
- Re-tighten all screws after the first 4 hours of operation and periodically check the tightness. **Failure to do so will exacerbate backlash and result in damage to the machine.**
- Lubricate the grease points on the hinge pins daily during the life of the machine. Lubricate the bearings of the tubular shaft and the levelling discs every 25 operating hours (this does not apply to the maintenance-free bearings of the discs - these bearings do not require maintenance and lubrication).

- When replacing worn components, use thread glue, original bolts and nuts.
- Always ensure that screw connections are properly tightened.

NOTE! Periodic lubrication is a guarantee of the durability of the machine.

The service life and efficiency of the machine depend to a large extent on regular lubrication. Mineral lubricants should be used for lubrication. Lubrication points must be thoroughly cleaned before pressing in or applying grease.



NOTE! It is forbidden to work on a damaged machine caused by any event resulting in a broken, or deformed frame, shaft or other assembly of the machine!

4.9. Screw tightening torque

Bolts and nuts should be tightened in the machine with the correct torque depending on the strength class of the bolt and its thread size and pitch. Their respective tightening torque values are shown in Table 3.

Table 3. Tightening torque values for nuts and bolts.

Bolts and nuts torques [Nm]					
		Thread pitch	Screw strength class		
			8.8	10.9	12.9
Dimensions	M4	0,7	3,2	4,5	5,2
	M5	0,8	6	8,4	10
	M6	1,0	11	15	17
	M8	1,3	27	34	40
		1,0	21	30	35
	M10	1,5	46	65	76
		1,3	41	75	67
		1,0	36	50	59
	M12	1,8	79	111	129
		1,3	65	91	107
	M14	2,0	124	174	203
		1,5	104	143	167
	M16	2,0	170	237	277
		1,5	139	196	228
	M18	2,0	258	363	422
		1,5	180	254	296
	M20	2,5	332	469	546
		1,5	229	322	375
	M22	2,5	415	584	682
		1,5	282	397	463
	M24	3,0	576	809	942
		2,0	430	603	706
	M27	3,0	740	1050	1250
		2,0	552	783	933
	M30	3,5	1000	1450	1700
		2,0	745	1080	1270
	M36	4,0	1290	1790	2020
		2,0	960	1340	1500



NOTE! It is forbidden to work on a damaged machine caused by any event resulting in a broken, or deformed frame, shaft or other assembly of the machine!

5 Operation of the GAL-K disc harrow

Everyday service

Each time after work, the harrow should be thoroughly cleaned of soil and plant debris and the condition of the bolt and pin connections and the condition of the working elements and other parts should be inspected. When cleaning, plant debris and strings winding up at the bearing points of the discs and shaft should be removed. If parts are found to be damaged or worn, they should be replaced. All loose screw connections must be tightened and damaged cotter pins and pins must be replaced.

NOTE! When the machine equipped with a chassis is stationary, secure it by placing locking wedges under the wheels of the chassis to prevent unwanted rolling down. The safety wedges with which these machines are equipped as standard are located on the front of the chassis.

Post-season service

After the working season, the disc harrow must be thoroughly cleaned, any damage to the paintwork repaired and the worn working surfaces of the teeth, discs, strings and roller rings, as well as the threads of the adjusting screws, washed with "Antykor" paraffin and protected against corrosion with "Antykor 1" grease, in addition to a full lubrication. It is advisable to store the machine under a canopy when not in use. However, if this is not possible, the condition of the protection should be checked from time to time and, if necessary, the rain-washed grease should be replenished.

Operation of the GAL-K chassis

Regular control of wheel pressure. If there is a significant loss of air from the tyres, check the air valve for leaks. Next, take the wheel to a specialised workshop to locate and repair the damage. Significantly damaged tyres (particularly profile damage) must be replaced immediately.

Setting of wheel bearing axial clearance.

It is recommended that this operation is carried out by a specialised company. Performed by tightening the nut on the wheel hub after the wheels have been removed. Recommended play is 0.12-0.15 mm. Inspection and adjustment should take place every 2 years.

Procedure :

- Removal of the hub cover and the spring pin securing the spring nut.
- At the same time, while turning the hub, press down and tighten the crown nut.
- Tightening is complete when no more than half a turn of the hub is caused by vigorous hand rotation.
- Partially loosen the nut until the hub rotates freely and repeat the tightening.
- After repeated rotation locking, loosen the nut by 30° max. until the immediate nut locking with the pin is possible. Mark the position with a line.
- From the marked position, unscrew the nut by half a turn and, with a gentle tap, press the hub against the nut as far as it will go.
- Tighten the nut to the position marked with the line.
- Fit the hub cover.



NOTE! During maintenance work, the unit should be secured against rolling (it should be connected to the tractor with the parking brake on) and unfolded.

Operation of the hydraulic system

Maintenance of the hydraulic system consists of a visual inspection for leaks. Remember to put plugs on the quick-release couplings. Oil leakage at the connections of the hydraulic lines should be tightened. If this does not rectify the fault, the component or hose must be replaced with a new one. Leakage occurring outside the connector - the leaking hose must be replaced with a new one. Mechanical damage also requires replacement of the component. It is recommended to replace the hydraulic hoses every

5 years.

Appearance of oil on the piston rod of the hydraulic cylinder - check the nature of the leak. When the piston rod is fully extended, check the sealing points. Minor leaks characterised by wetting of the piston rod with an "oil film" are permissible (defective sealing ring). In the event of heavier sweating or the appearance of drops, the unit should be switched off while the fault is being rectified (defective seal).

Operation of the pneumatic system

The three-range brake force regulator is not adjustable under normal use. It should be in a central position. If the braking force deviates from that of the tractor, the regulator can be adjusted to avoid incorrect road behaviour. When making any change, be sure not to cause an accident or damage to the machine.

The removal of condensed water in the tank is carried out by means of a valve located underneath the tank. The stem must be pressed, which will cause the compressed air to displace the water. Releasing the stem will automatically close the valve. Once a year (before winter) the drainage valve should be unscrewed and cleaned.

Checking the pneumatic system involves visually inspecting for leaks, especially at the connection points (when checking the system, the pressure should not be less than 6 atmospheres). If hoses, seals and other system components are damaged, this will manifest itself as hissing. Bubbles will appear at small leaks (check by applying wash liquid). **Damaged components should be replaced with new ones.**

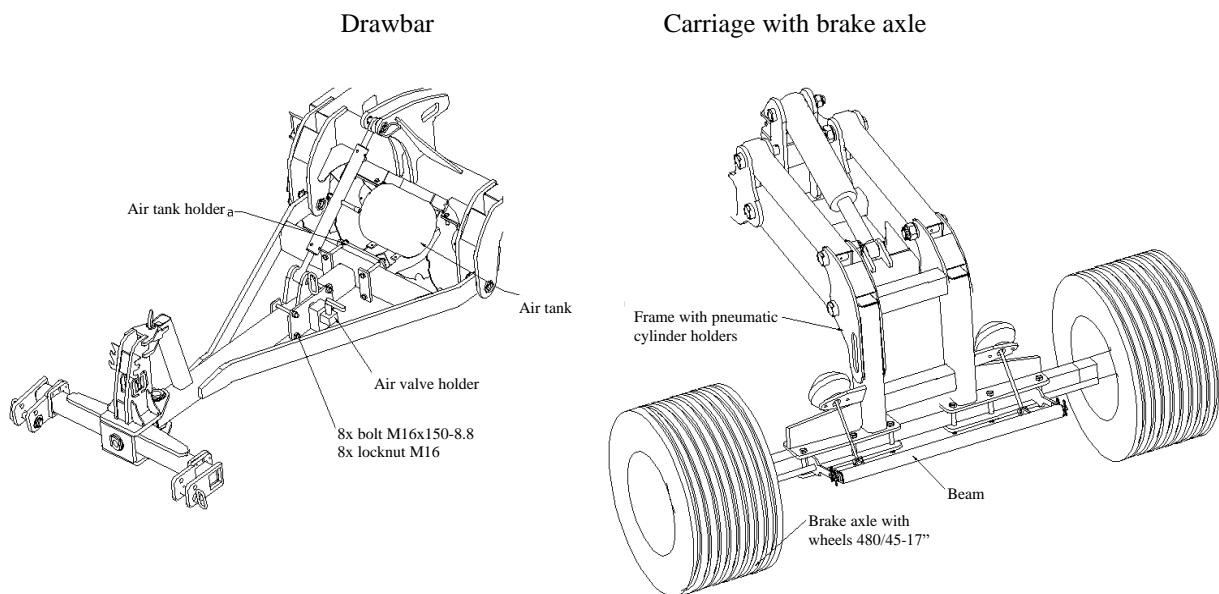


Fig. 47 Pneumatic system of brake axle

Braking adjustment - braking deceleration levelling, should be carried out when:

- As the lining jaws wear during use and as a result of the resulting clearance, the braking force decreases,
- the wheel brakes brake unevenly and inconsistently.

To do this, it is necessary to change the position of the spreader arm on which the piston rod of the pneumatic cylinder acts by changing the starting angle of the spreader shaft at the end of the multi-shaft and to correct the length of the linkage on the bolt. Adjustments should be carried out for each wheel separately.

5.1. Operation of the vibration compensation system of the chassis suspension system

On the GAL-K and GAL-K HD disc harrows, a vibration compensation system can be fitted as an option. The vibration compensation system consists of: double-acting cylinder, hydro-pneumatic accumulator, pressure gauge, shut-off valve, hose assembly and fittings.

The system is designed to compensate for vibrations passing from the tractor to the machine, which introduce vibrations into the unit. As a result of the resonance created during operation, there is a 'jumping' between the machine and the tractor, which makes work more difficult, leaves bumps on the field surface and, in extreme cases, can damage the machine. By absorbing vibrations and drawbar oscillations caused by the tractor hitting a bump, the hydro-accumulator reduces the machine's resonance.

5.1.1 Installation

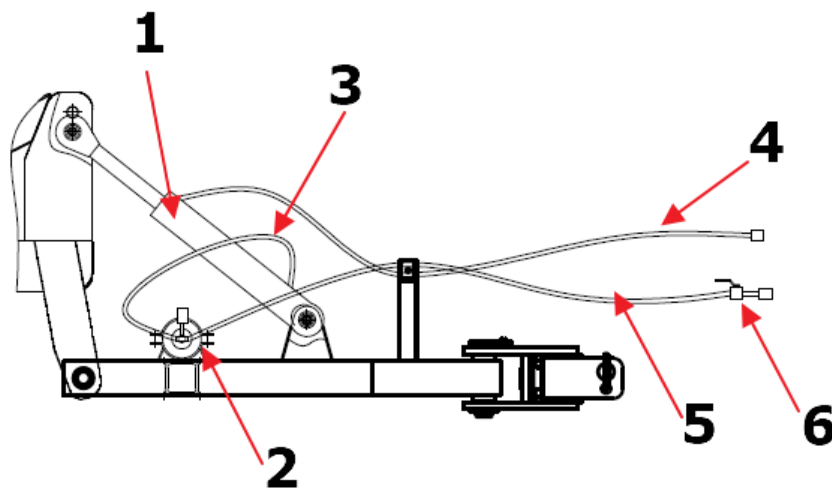


Fig. 48. 1-Hydraulic cylinder, 2-Hydraulic accumulator system, 3-Strait hose - elbow 0.9 m, 4-Straight hose - elbow 2 m, 5-Straight hose - elbow 2 m, 6-M18 ball valve.

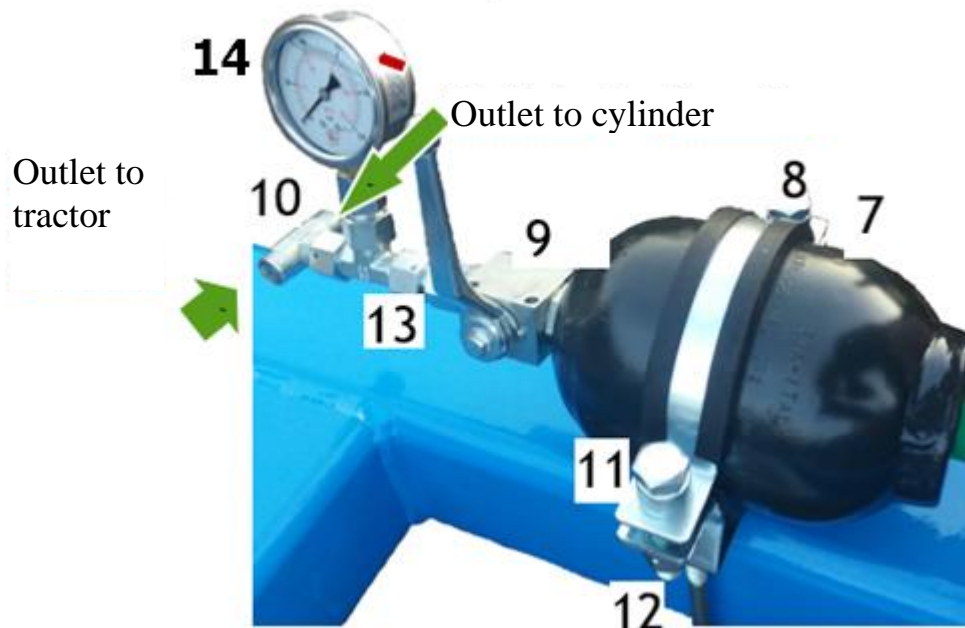


Fig. 49. 7-Hydro-pneumatic accumulator, 8-Accumulator clamp, 9-Ball valve+copper/steel-rubber washer, 10-Tee, 11-Bolt M12x70+nut M12, 12-Plate+bolt M8x130+locknut M8, 13-Adapter, 14-Pressure gauge.



NOTE! Partially assembled components do not provide a connection that enables operation. Before commissioning, check all connections and tighten them!

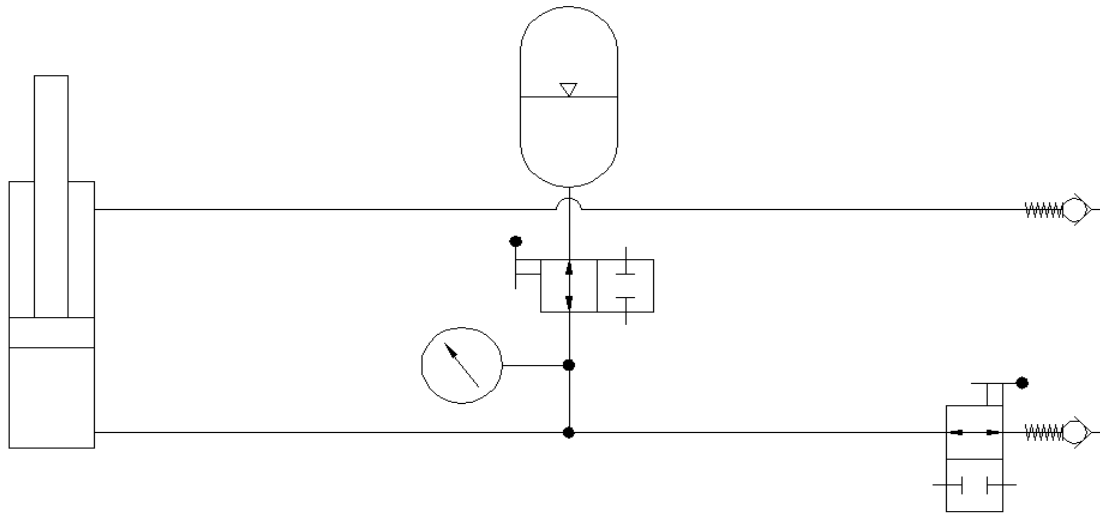


Fig. 50. Hydraulic diagram of the vibration compensation system.

5.1.2 Operation

The vibration compensation system is switched on and off using a ball valve (No. 9, fig. 49). When transporting over large unevenness, the hydraulic system should be open - ball valve open (position of lever parallel to oil flow direction). The flow of oil to the accumulator is then allowed, allowing the centre frame to be cushioned when the machine is moving on public roads. Once the system has been pressurised, it is possible to close the hydraulic system using a ball valve (No. 6, fig. 48), but allowing the unit to continue operating.



NOTE! The tractor linkages should be raised to such a height that, in the event of a cylinder failure, the machine will not hit the ground when falling.

Initial system start-up

- Once the machine has been unfolded and lowered into the working position (trolley raised as far as possible), the machine must be levelled on the cylinder and the tractor's suspension system.
- The lever of the pair of tractor hydraulic outputs operating the vibration compensation system should be in a position that prevents the free flow of oil.
- The pressure on the pressure gauge should be around 90 bar to ensure that the system works properly.
- Then raise the machine on the three-point hitch and check the cylinder stroke. The stroke value should vary between 30-60 mm depending on the operating conditions of the machine. The amount of pressure in the system will vary depending on the type of machine and cylinder.
- If the factory settings prevent adequate stroke, the gas pressure in the hydro-pneumatic accumulator should be reduced. To do this, unscrew the nut on the back of the accumulator, press the flathead screwdriver against the valve and then reduce the pressure in the accumulator by hitting it with a pulse. Check the cylinder stroke after each reduction.

- If the cylinder stroke is selected appropriately, work can begin.



NOTE! The accumulator is charged with nitrogen (N₂) at 90 bar. The depressurisation must take place in the open air. Pressurisation must be carried out with specialised tools by a trained worker.

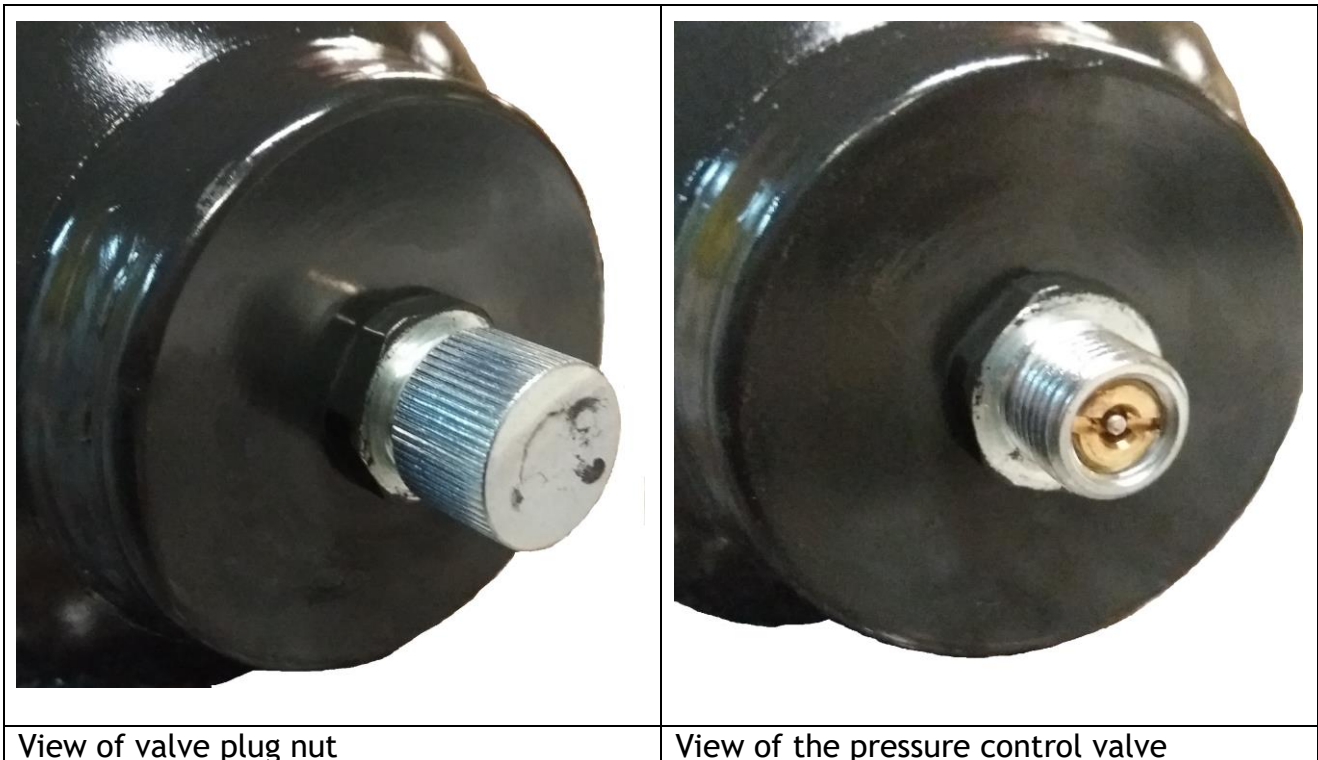


Fig. 51. Accumulator nitrogen pressure control valve.

Daily operation

- Once the machine has been unfolded and lowered into the working position (trolley raised as far as possible), the machine must be levelled on the cylinder and the tractor's suspension system.
- Then adjust the pressure in the shock absorber system to 90bar.
- The lever of the pair of tractor hydraulic outputs operating the vibration compensation system should be in a position that prevents the free flow of oil.
- The hydro-accumulator valve should be in the open position (lever parallel with the direction of oil flow).
- Start operation.
- After finishing work, it is advisable to drive with the drawbar suspension engaged when driving over large bumps (e.g. gravel roads).
- The drawbar damping valve must only be closed when driving with the machine on level asphalt roads.

5.2. Chassis suspension system

A suspension system for the chassis is fitted as standard on the GAL-K HD and optional on the GAL-K disc harrow. The vibration compensation system consists of: cylinder system, hydro-pneumatic accumulator, pressure gauge, shut-off valve, hose assembly and fittings.

The system is designed to compensate for vibrations passing from the roadway to the machine, which subject the machine to additional stress during transport. By absorbing the vibrations caused by the machine hitting a bump, the hydro-accumulator reduces the stress to which the machine is subjected during transport on the road.

Side view:

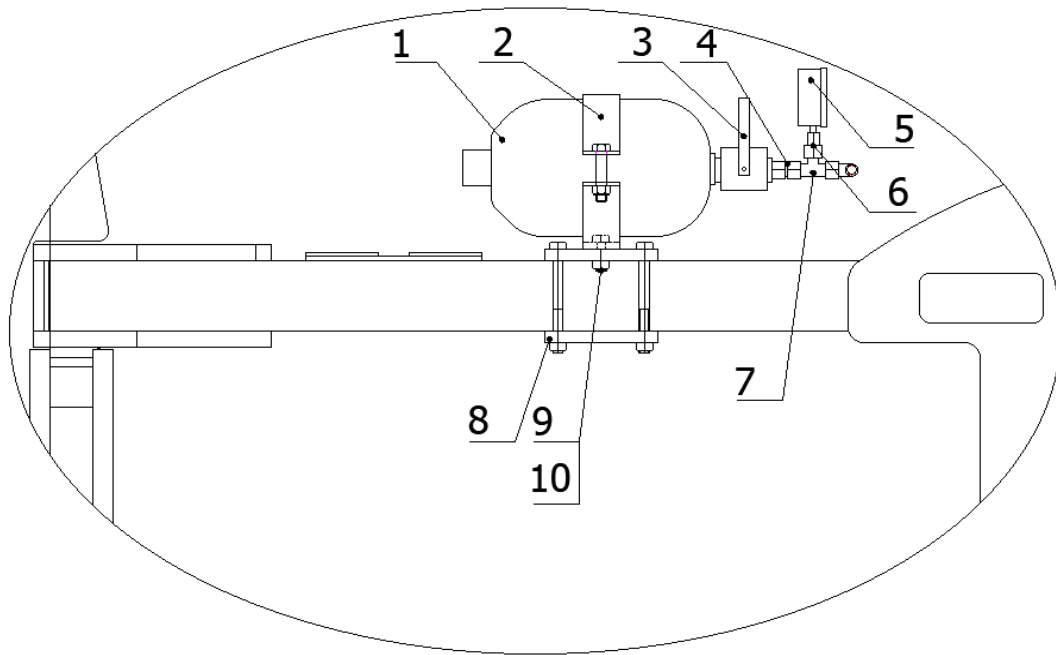
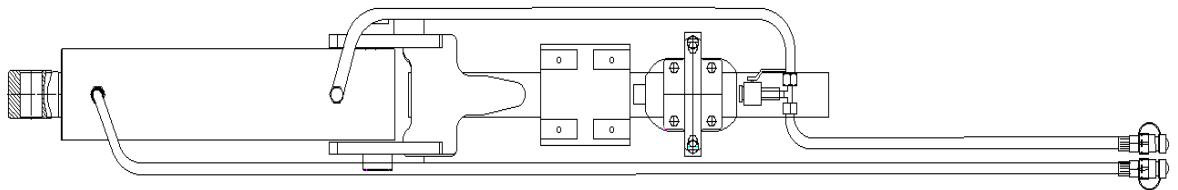


Fig. 52. Diagram of the chassis suspension system.

The system is assembled on the centre frame of the machine and comprises the following components: 1. Hydro-accumulator, 2. Clamp, 3. Ball valve, 4. Adapter M18 th. W-w, 5. Pressure gauge, 6. Adapter M18 th. W-w, 7. Tee, 8. Accumulator clamp bracket, 9. Bolt M10x30, 10. Lock nut M10

Top view:



Note! Partially assembled components do not provide a connection that enables operation. Before commissioning, check all connections and tighten them!

Diagram of the vibration compensation system

The suspension system is switched on and off using a ball valve (No. 3, fig. 52). When transporting the machine over large unevenness, the hydraulic system should be open - ball valve open (position of lever parallel to oil flow direction). The flow of oil to the accumulator is then allowed, allowing the machine to be cushioned when the machine is moving on public roads.

Initial system start-up and operation

- Lift the machine as far as possible on the chassis, only then fold it into the transport position.
- The arm cylinders (hydraulic working depth) must be extended so that when the machine is lowered, the arms are not damaged by colliding with the chassis.
- Once the machine has been lifted onto the chassis, the pressure in the system should be stabilised so that it is 90 bar. During lifting, the pressure gauge can indicate up to 160 bar. To lower the pressure in the system, the chassis should be lowered slightly, which will improve the handling characteristics as the machine's centre of gravity will also be lowered.
- If the pressure gauge reads 90 bar, the machine can be transported with confidence.
- When driving, monitor the behaviour of the machine on the road and always adapt your speed to the road conditions (potholes, surface condition, traffic volume, road width).
- Before starting work in the field, lift the machine as high as possible on the chassis and only then start to unfold the machine.
- During operation, the damper valve may be in the open position.



Note! The accumulator is charged with nitrogen (N₂) at 90 bar. The depressurisation must take place in the open air. Pressurisation must be carried out with specialised tools by a trained worker.

6 Replacement procedures

Replacement of tube shaft bearings

If the bearings are damaged, they must be replaced as follows:

- place the machine on a horizontal surface,
- unscrew the four screws holding the ball bearings on each side,
- move the tubular shaft away,
- loosen the two headless screws on each bearing and pull off the bearings using an extractor,
- fit the new bearings loosely onto the shaft,
- roll the shaft between the bearing plates and screw the bearings to them. Screw in headless screws using adhesive to prevent loosening.
- do not replace the ball bearings on the disc holders,
- In the event of damage, replace the entire disc holder.

Replacement of working components

Excessively worn working element make it difficult for tools to penetrate and cause an increase in working resistance. The discs should be replaced with new ones when their diameter reduces to 510 mm.

The working components must be changed on the machine lowered to the ground after the tractor engine has been switched off. To ensure that the elements to be replaced do not come into contact with the ground, sturdy shims (e.g. wooden blocks approx. 20 cm thick underneath adjacent elements or the shaft) must be provided. In the case of a trolley, the maximum lowered wheels can also be used as supports. After lowering the harrow, switching off the tractor engine and applying the handbrake, check

the stability of the tractor-machine combination. Only typical screws should be used to fix new components.

If machine components are disassembled several times, it is necessary to inspect and possibly replace connecting elements such as bolts, washers or nuts, excessive wear of which may lead to uncontrolled loosening of the connecting elements and subsequent damage.

When working on extremely worn work tools, such work can cause, for example, bearing damage in the case of a small disc diameter. Tools should be replaced when their wear and tear exceeds the limits allowed by the manual. If the recommendations are not followed, damage may occur for which the manufacturer is **NOT RESPONSIBLE!**

Replacement of cylinders

A malfunctioning cylinder, leakage, etc. must be replaced by dismantling and returning it to a specialist workshop. Replacement of the cylinder must be carried out on an unfolded machine. Connect the cylinder to the system and, mounted on one side, it should cycle a few times to fill the cylinder completely with oil. Failure to do so may result in a sudden fall of the drop section.



NOTE! When carrying out repairs and maintenance, the machine should be lowered to the ground and supported on supports to ensure full stability and the tractor engine switched off. Use proper spanners and protective gloves during maintenance and repairs.

Table 4. Causes and remedies for faults and malfunctions of the GAL-K disc harrow.

Fault, malfunction	Reason	Repair method
- uneven penetration of working elements	- poor levelling of the machine	- level the machine longitudinally and transversely
- poor penetration of the discs	- discs excessively worn - shaft too low - disc pressure too low on compacted soil	- replace the discs - lift the shaft
- lack of complete stubble undercutting	- disc working depth too shallow	- increase the working depth of the discs
- deep furrow at the junction of the working passages	- misaligned side screen	- improve the positioning of the side screen
- spreading the soil over the shaft	- no rear screen - shaft too close to the discs	- mount the rear screen - move the shaft away from the discs
- clogging the discs	- working depth too deep - too much humidity	- reduce the depth
- clogging up the side screen	- too much crop residue	- remove the side screen
- poor soil compression by the shaft	- wrongly levelled harrow - shaft too high	- lengthen the top link - lower the shaft

7 Storage of the disc harrow

The disc harrow should be stored under cover.. In the absence of a covered area, outdoor storage of the machine is permitted.

The disc harrow should be stored in a place that does not pose a danger to people or the environment. If the machine is stored outdoors for a long period of time, the maintenance of the working parts should be repeated when the preservative layer is rinsed off. The machine, when uncoupled from the tractor, should support itself on firm and level ground, maintaining a firm balance. All work units should rest on the ground. The machine should be lowered gently so as not to expose the working parts to impact on hard ground. Once the machine is down, disconnect the suspension system and drive the tractor away. Also, components dismantled from the machine must be stored securely supported on the ground, excluding the possibility of uncontrolled movement. It is advisable to store the machine in a paved and covered area that is inaccessible to bystanders and animals.



Store the machine securely supported on a hard surface to prevent injury to people or animals.

8 Disassembly and disposal

A machine used in accordance with the rules in the operating instructions will last for many years, but worn or damaged components must be replaced with new ones. In the event of emergency damage (cracks and deformation of the frames) impairing the quality of the machine's work and posing a danger to further operation, the machine must be scrapped.

The disassembly of the machine should be carried out by persons previously familiar with its construction. These operations should be carried out after the machine has been set up on a level and stable surface. Disassembled metal parts should be scrapped and rubber parts should be taken to a recycling facility. The oil should be poured into a sealed container and taken to a recycling facility.



NOTE Take all precautions when dismantling the machine by using operable tools and personal protective equipment. Disassembled parts must be disposed of in accordance with environmental protection requirements.

9 Spare parts for the disc harrow GAL-K

To search, price and order genuine spare parts for MANDAM machines, please visit our website at: www.mandam.com.pl, tab "parts".

On this page, we provide catalogues and spare parts sheets in PDF format, containing up-to-date parts diagrams for each machine, together with their numbers and prices. Parts orders, or enquiries regarding them, can be made directly from this page (tab: "contact/order") or via e-mail: parts@mandam.com.pl

The order should include the part numbers and quantities, as well as the purchaser/payer's details including a contact telephone number.

Parts are shipped directly to the address provided and payment is made on delivery.

If you are not sure, please contact the Mandam spare parts department on the following telephone numbers : 32-232-2660 ext. 39 or 45 or on the mobile number +48 668-66-22-89.

Original MANDAM spare parts are also available from all authorised MANDAM machine distributors.