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## OPERATION MANUAL

# SAL DISC HARROW



Revision II  
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, item 1228) 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:

SAL DISC HARROW

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.

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Place and date of issue

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## 1. Introduction

Congratulations on your purchase of the SAL 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

Identification data for the SAL harrow can be found on nameplates located on the support frame (Fig.1), which includes 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](mailto:parts@mandam.com)

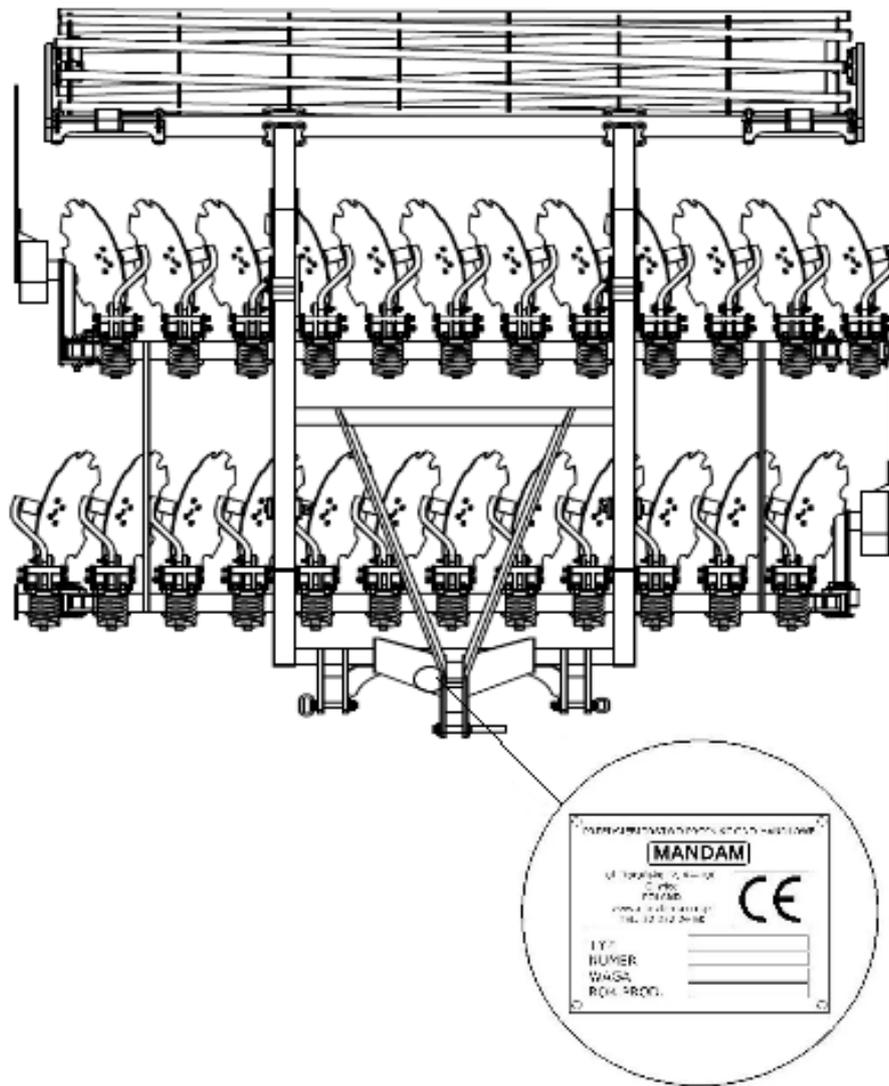


Fig. 1 View of the SAL harrow with the location of the nameplate.

## 1.1 Safety signs



**Remember! When using the disc harrow, special care should 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 and 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.

<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"> <li>• rigid frame (adjacent to the roller depth adjustment)</li> <li>• foldable frame (adjacent to the upper fastener bolt on the mid frame)</li> </ul>

## 2. Construction of SAL disc harrow

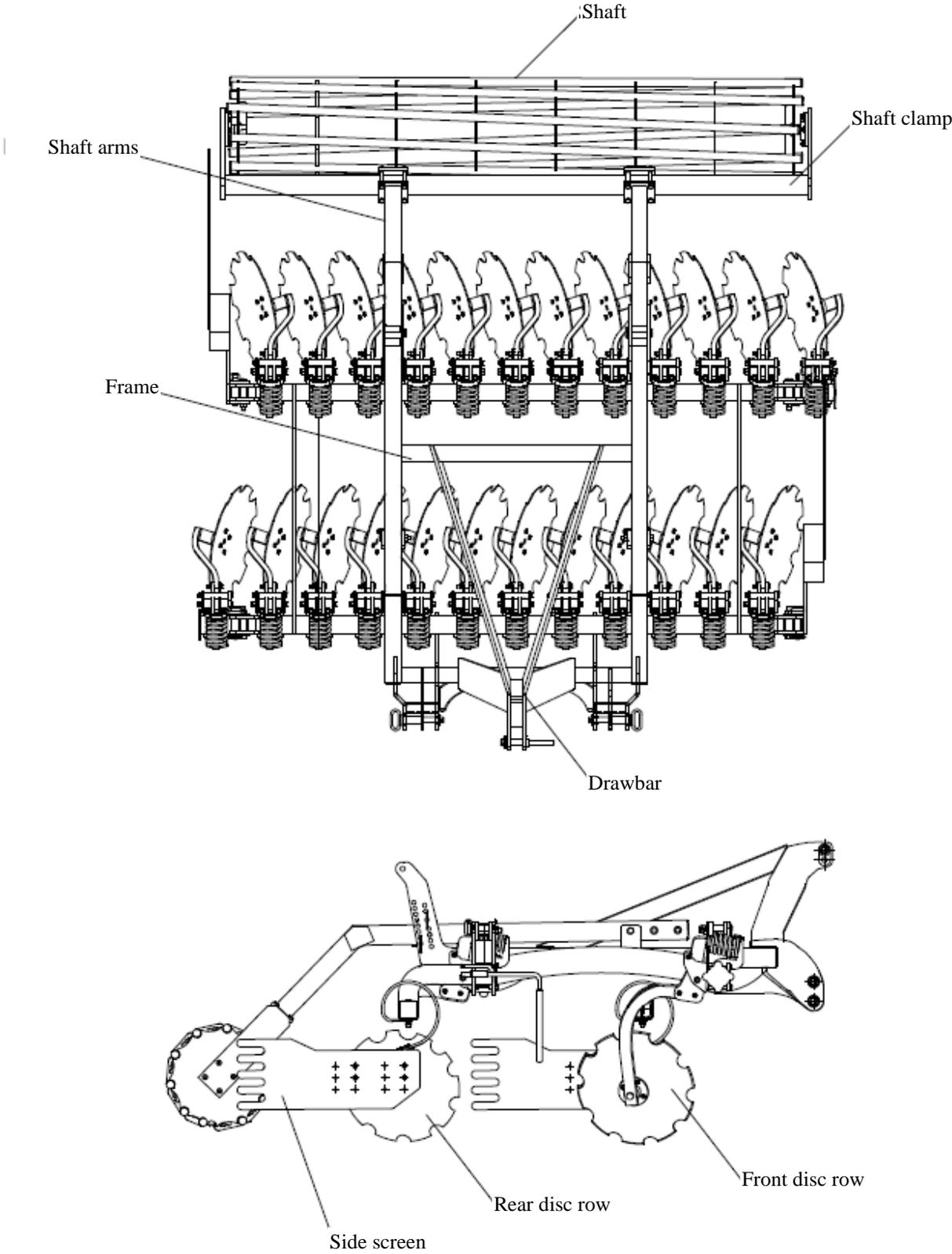


Fig. 2 SAL disc harrow.

Table 2 Type of SAL disc harrow.

Type of harrow	Working width [m]	Number of discs [pcs.]	Spacing of disc rows [mm]	Diameter of toothed discs [mm]	Min. tractor power [HP]	Weight (kg)
SAL 3.0	3,00	24	1190	610	130	1840

## 2.1 Purpose of the SAL disc harrow

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 for mixing catch crops into the soil or cultivating wasteland overgrown with tall volunteer seeds.

The working elements are toothed discs with a diameter of 620 mm in two staggered rows, mounted on posts secured by springs. Equipping each disc with its own maintenance-free 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.



**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!** MANDAM provides a guarantee for maintenance-free hubs under the following conditions:

- comply with the principle of replacing the working discs in the event of wear, which must not exceed 520mm in diameter for discs Ø620mm,
- use the original MANDAM plates,
- not to exceed the permitted working depth, which is 11cm,
- 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 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 systems

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 shaft must be folded into the transport position and secured with pins on a ladder.

**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 25 km/h,
- on dirt or paved roads 6-10 km/h,
- on bumpy roads not more than 5 km/h.

The driving speed must be adapted to the condition of the road and the conditions on the road so that the unit does not jump up on the tractor's suspension system. Take extra care when passing, overtaking and on bends. The permissible operating width of the machine when travelling on public roads is 3.0 m. It is forbidden to transport the unit where the slope preceding the aggregate 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.**



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) - a unit consisting of an agricultural tractor and the agricultural machinery that is coupled with it must meet the same requirements as the tractor.



**NOTE! The unit as a part of the vehicle protruding beyond the rear side contour of the tractor obscuring the rear lights of the tractor poses a danger to other vehicles on the road. It is forbidden to travel on public roads without appropriate markings.**

The manufacturer does not supply warning signs as standard equipment on the machine. Warning signs are available commercially. The warning boards must be securely mounted in the brackets and the plug connected to the socket of the tractor's electrical system. Check the operation of the lights before starting the transport. After lifting the machine, check the clearance under the lowest working elements, which should be at least 25 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.

### 3.5 Description of residual risk

Mandam Sp. z o.o. makes every effort to eliminate the risk of accidents. There is, however, 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 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,
- operating 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.

#### 4.1 Preparing the disc harrow

The disc harrow is usually delivered to the customer ready for use. However, 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. Use a lifting device to transport the shaft. Position the arms in the harrow brackets and bolt together at the desired extension (Fig. 4 - No. 1), then secure the arms with the pins in the ladders while adjusting the desired height (Fig. 4 - No. 2).



**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!

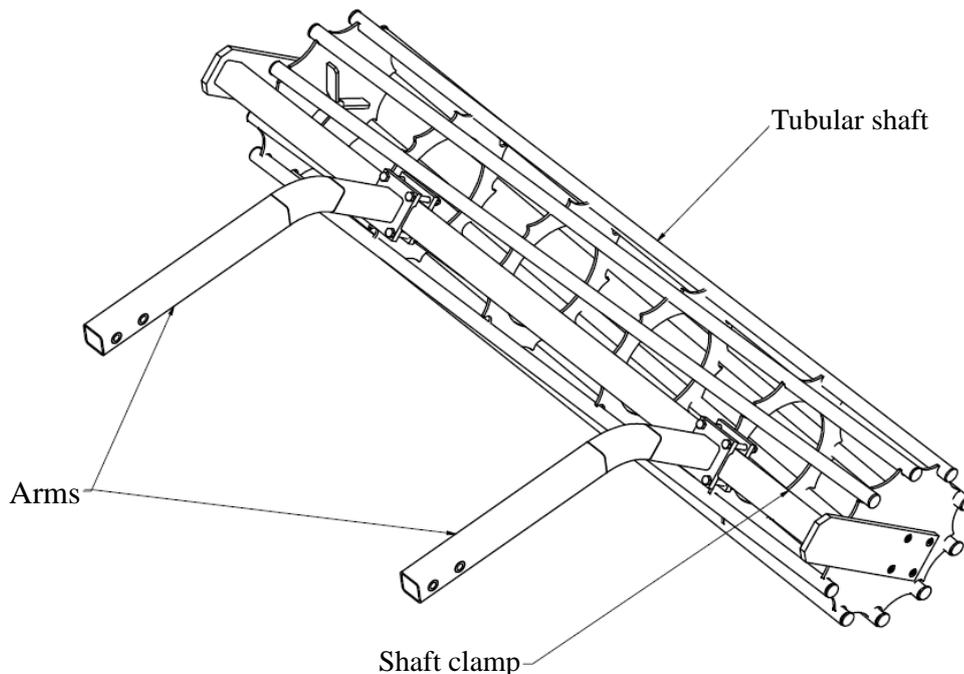


Fig. 3 Connection of the arms with shaft bracket.

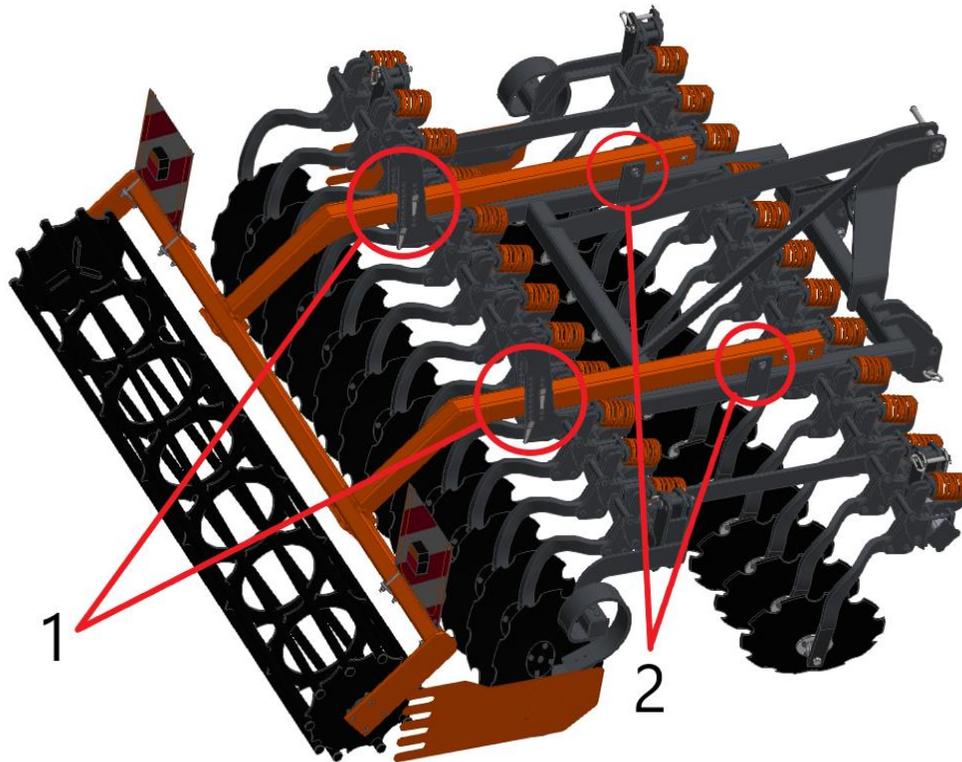


Fig. 4 View of the SAL disc harrow with the fixing points of the roller arms, 1 - pin fixing, 2- bolt + nut fixing.

Before starting work, check the technical condition of the unit, especially the condition of the working parts and screw connections.



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

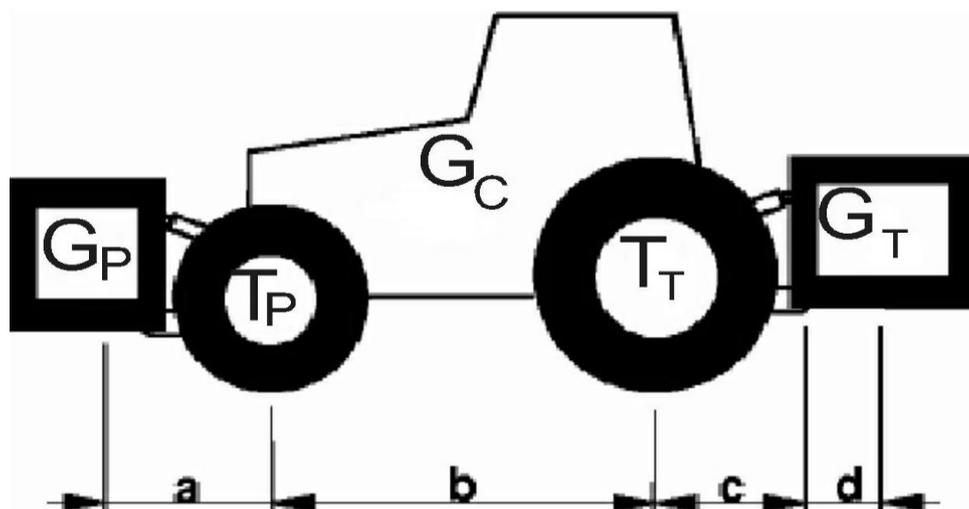


Fig. 5 Diagram of tractor load designations.

## Axle load calculations

Designations:

$G_C$  - tractor weight,

$T_P$  - front axle load of the empty tractor,

$T_T$  - rear axle load of the empty tractor,

$G_P$  - total weight of rear-mounted device,

$G_T$  - 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 bolt of the rear device,

$d$  - distance of the machine's centre of gravity from the tractor's hitching pins (for suspended machines assume 1.4 m, for machines with a seed drill assume 3 m),

$x$  - distance of the centre of gravity from the rear axle (if the manufacturer does not specify this parameter, enter 0.45).

Minimum load at the front for rear-mounted machine:

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

Actual front axle load

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

Actual total weight

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

Actual rear axle load

$$T_{T\ cal} = G_{cal} - T_{P\ cal}$$

## 4.2 Coupling the disc 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.

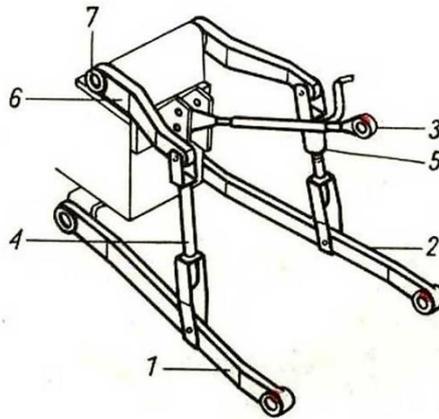


Fig. 6 Three-point suspension system of the tractor's three-point hitch: 1,2 - lower links, 3 - upper fastener, 4 - left suspension, 5 - right suspension with adjustable length, 6 - lift arm, 7 - lift shaft

When attaching the SAL disc harrow to the tractor, do the following:

- switch the tractor's hydraulic system to position control,
- remove the lower link pins if the tractor's three-point hitch is not equipped with hitching hooks,
- carefully back up, suspend the machine from the lower links, then secure,
- connect the upper link on the tractor (on units not equipped with a trolley) - when the unit is running, the attachment point of the upper link on the machine should be higher than the attachment point of this link on the tractor,
- check the lifting and lowering of the pre-seed unit and the operation of the hydraulic system.

**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

On the SAL 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 and transversely with the 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. **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.

### 4.4.1 Adjusting the shaft position

The position of the shaft can be adjusted in 2 ways, changing its offset from the discs and the working depth, these are described below:

The **working depth** is determined by locking the shaft arms using locating pins with locating plates on the ladder at the desired height. Particular care must be taken to ensure that the pins are fitted equally on both sides.

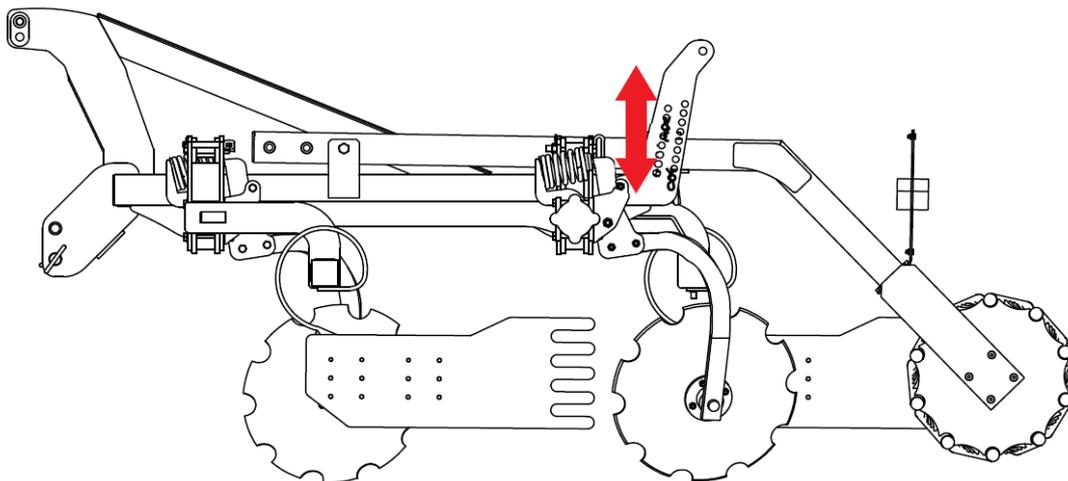


Fig. 7 Adjusting the working depth of the shaft.



**Caution !** When setting the working depth, take into account the sinking of the shaft into the ground depending on the condition of the surface and the type of crop.

**Distance of the shaft from the discs** - extend the unlocked arms to the desired distance and then secure with screws on the handle. However, it must be remembered that moving the shaft backwards causes the machine to lengthen and worsens the longitudinal balance of the tractor.

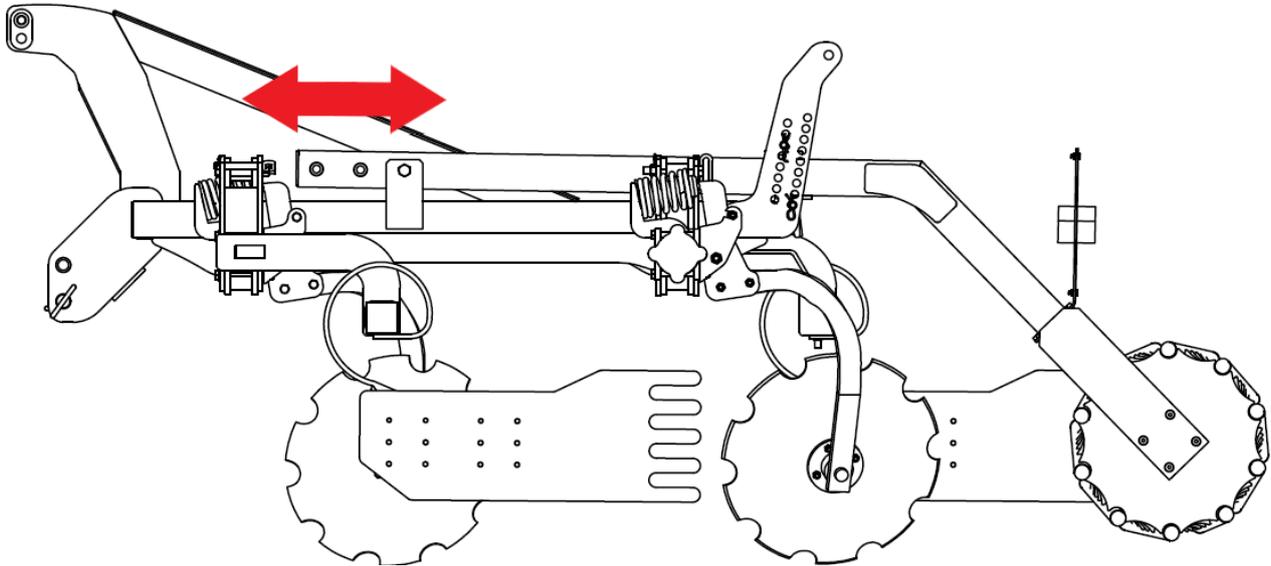


Fig. 8 Adjusting the shaft offset from the discs.

#### 4.4.2 Setting up side screens

The **side screen** should be positioned and locked with screws at such a height that the screen 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.

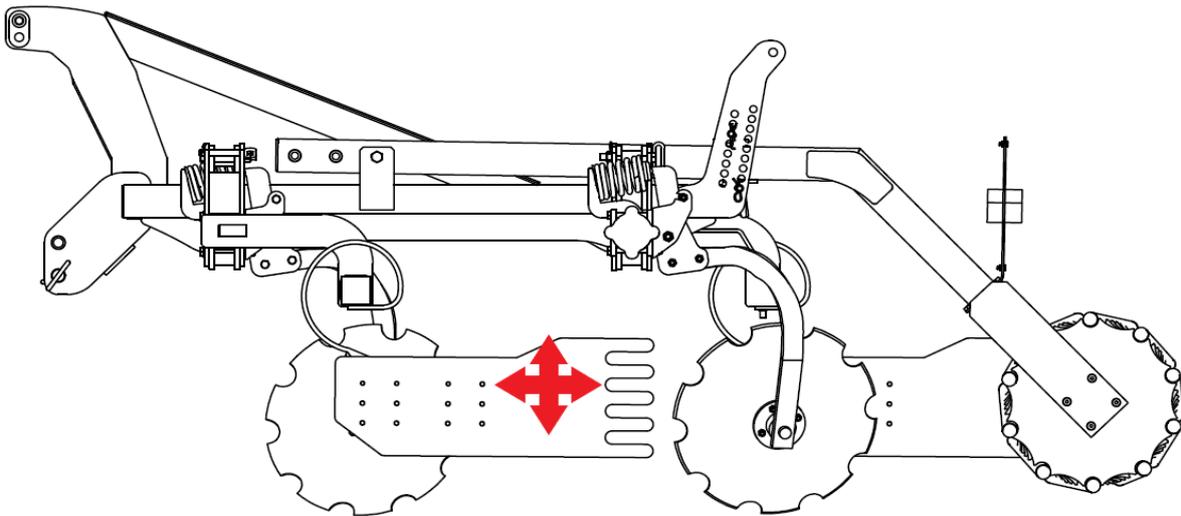


Fig.9 Setting up side screens

#### 4.4.3 Setting up the work units

##### Setting up the machine correctly for operation

The machine must be set up parallel to the ground for operation (see Fig.10). The front drawbar should be aligned horizontally. It is forbidden to operate the machine with the drawbar at an angle!

Setting up the machine correctly for operation:

Correct operation

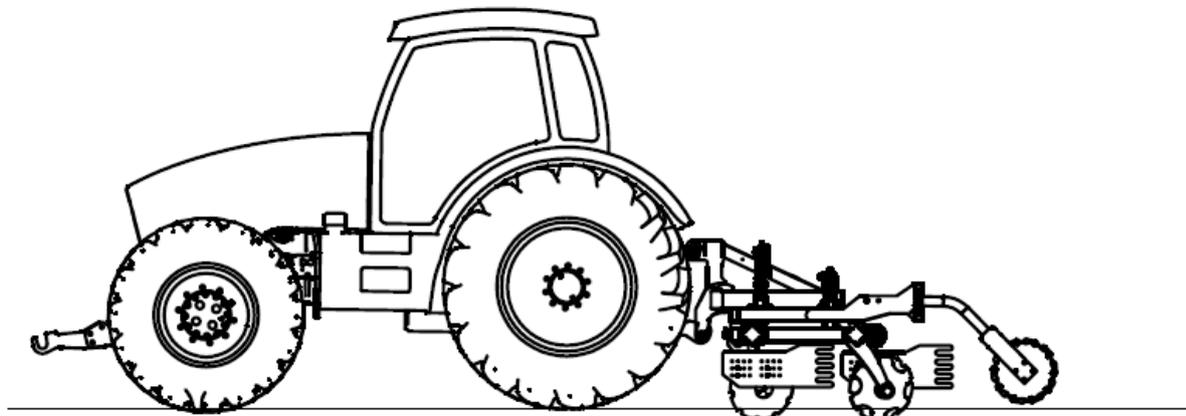


Fig. 10 Properly positioned machine parallel to the ground.

Incorrect machine settings:

Incorrect operation

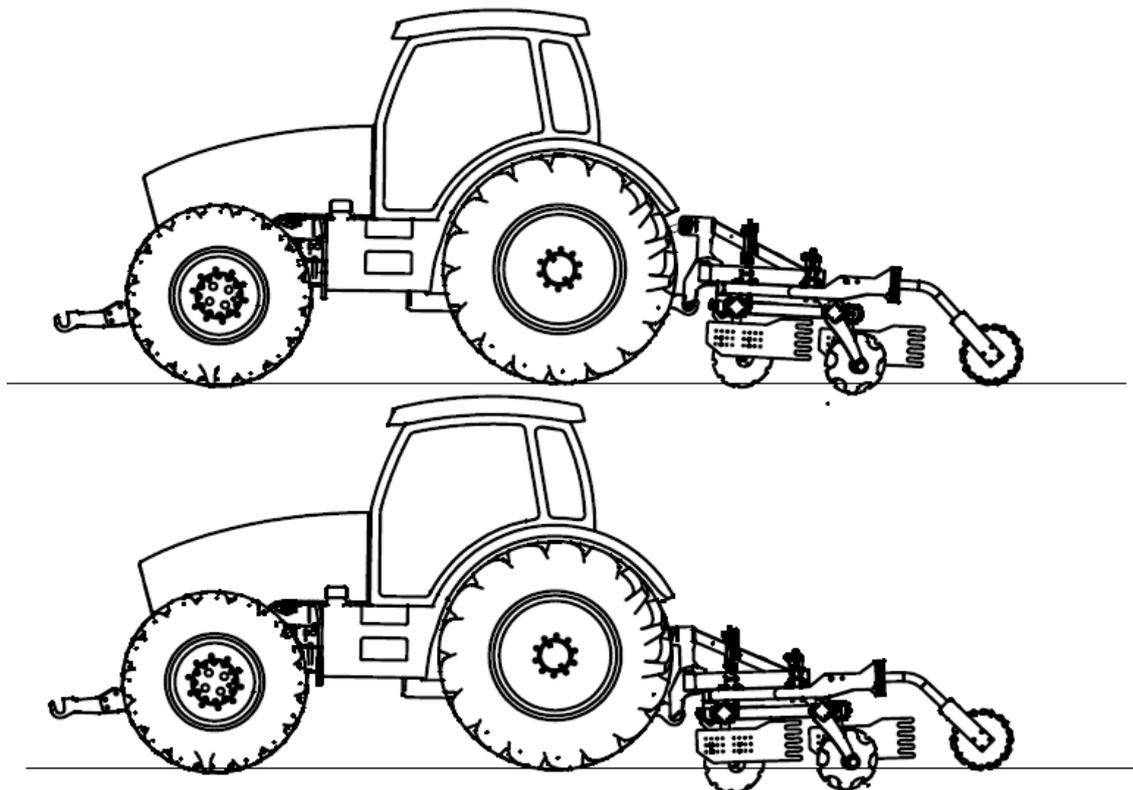


Fig. 11 Incorrect machine settings.

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

Turning the machine correctly:

Correct turning

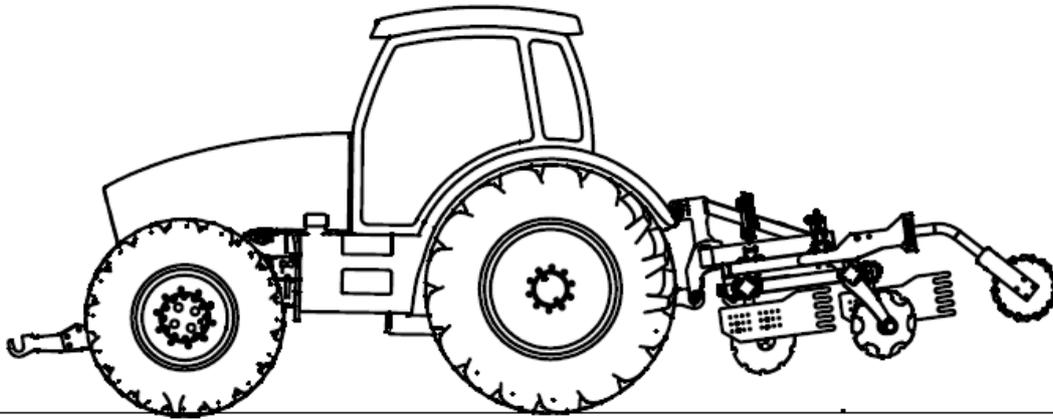


Fig. 12 Turning the machine correctly.

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

Incorrect turning

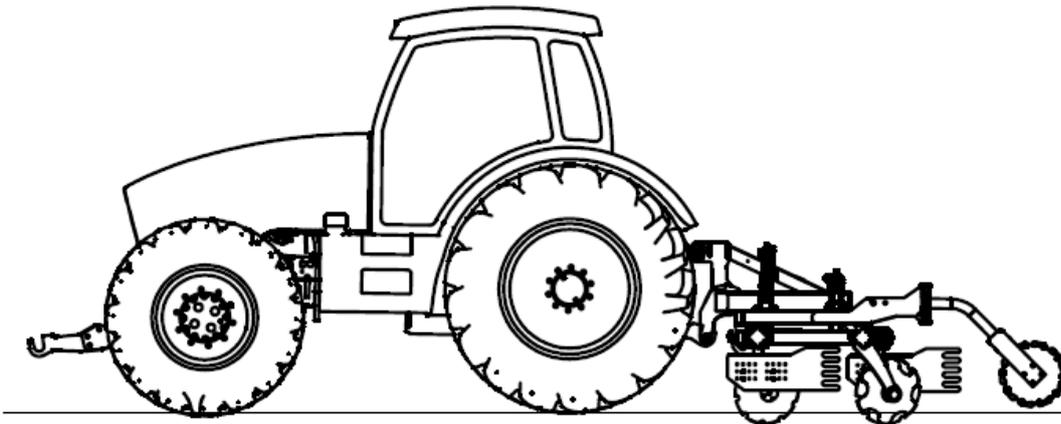


Fig. 13 Turning the machine incorrectly.

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.

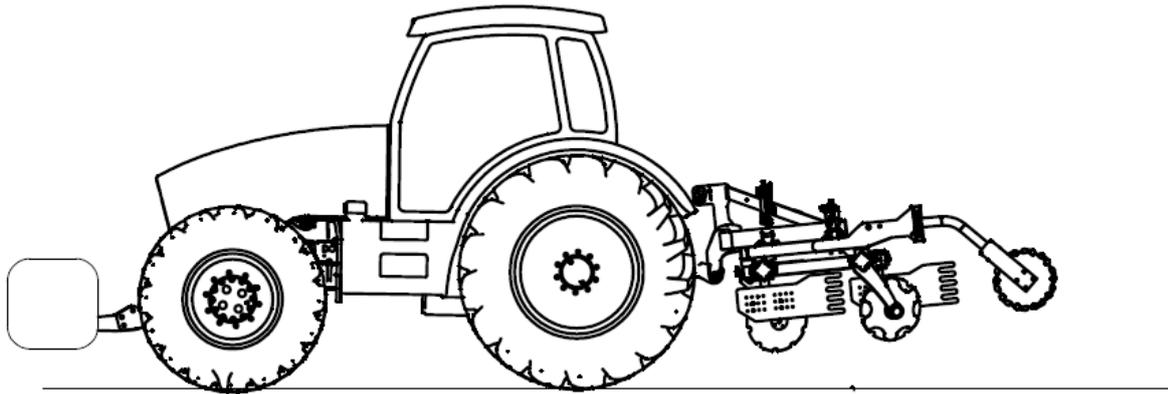


Fig. 14 Operation with additional load applied to the front of the tractor.

#### 4.5 Rules for transporting the harrow on public roads and lighting the machine

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) - the unit consisting of the agricultural tractor and the agricultural machine coupled with it must meet requirements identical to those imposed on the tractor itself.



**NOTE!** The unit as a part of the vehicle projecting beyond the rear side contour of the tractor obstructing the tractor's rear lights poses a danger to other vehicles on the road. Be sure to observe the transport recommendations given in section 3 "General safety rules". It is forbidden to travel on public roads without proper signage.

The units should be equipped with:

- triangular plaque distinguishing slow-moving vehicles,
- two forward-facing plates having a white running lights and a white retro-reflector,
- two rear-facing plates having a combination light and a red reflector. The boards should be painted in slanted red and white 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.

The manufacturer does not supply warning signs as standard equipment on the machine. Warning signs are available commercially.

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.

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 25 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.

#### 4.6 Maintenance and lubrication

- The disc harrow must be cleaned of soil after each operation, followed by an inspection of the parts and assemblies.
- Re-tighten all screws after the first 4 hours of operation and periodically check the tightness.
- 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.

#### 4.7 Torques for tightening screws

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.

<b>Nuts &amp; bolts torque [Nm]</b>					
			<b>Nuts &amp; bolts strenght grade</b>		
		Thread pitch	8.8	10.9	12.9
<b>Size</b>	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

### Everyday service

- Every time the BEST pre-sowing unit is finished working, the soil must be cleaned and the parts and components inspected. During cleaning, plant debris and strings winding up at the bearing points of the shafts must be removed.
- Re-tighten all screws after the first 4 hours of operation and periodically check the tightness.
- Lubricate the shaft bearings every 25 operating hours during the life of the machine.
- 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.

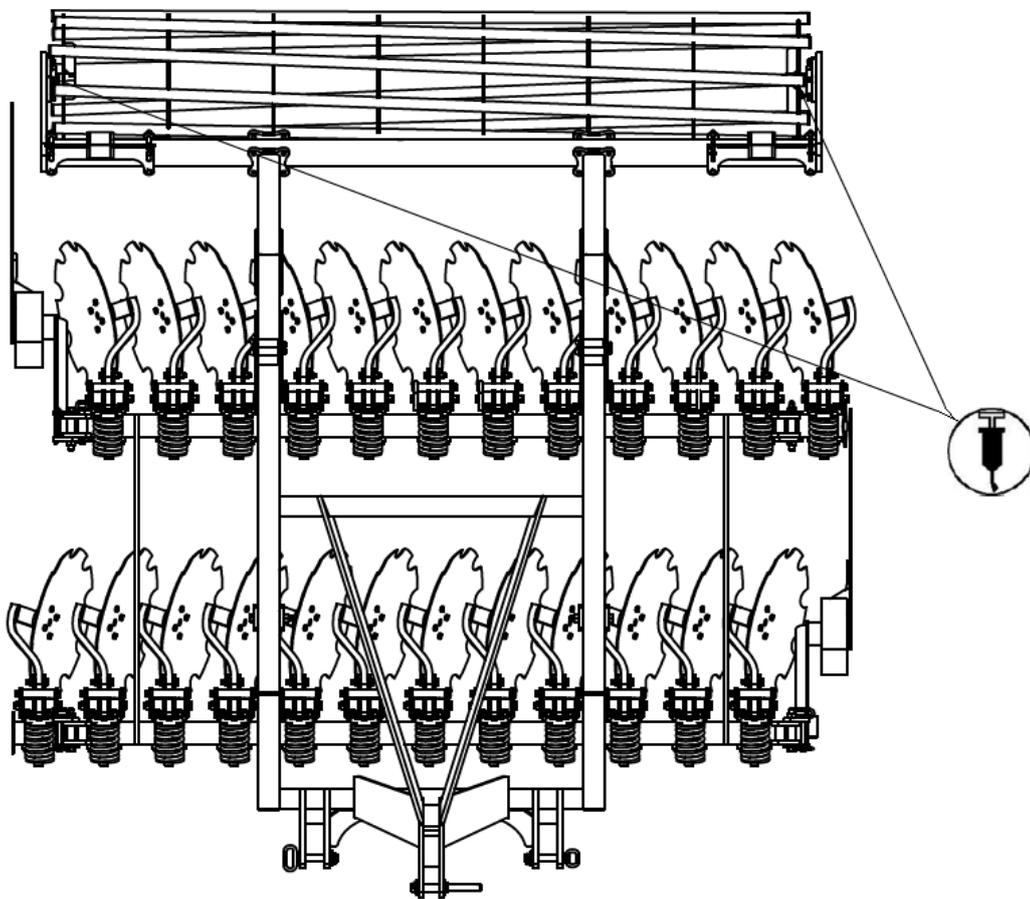


Fig. 15 Lubrication points of the SAL harrow.

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.

### 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 discs, roller rings and

the threads of the adjusting screws cleaned 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.



**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.

## 6. Replacement procedures

### Bearing replacement

If the bearings are damaged, they must be replaced:

- 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 in each bearing, and pull the bearings off with 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 elements make it difficult for tools to penetrate, increase operating resistance and can damage the machine. The discs should be replaced with new ones when their diameter reduces to 520 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!**



**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 clothing during maintenance and repairs.

Table 4 Causes and remedies for faults and malfunctions of the SAL 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	- 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	- lengthen the top link
	- shaft too high	- 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.

Parts and assemblies should be inspected after the working season. If damage or significant wear is found, replace the relevant parts with new ones. Clean areas of paint damage from dirt, rust and touch up with anti-corrosion paint, then top coat. Protect the working surfaces of the disc harrow and roller from corrosion. 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 the maintenance of the working elements should be repeated when the preservative layer is rinsed away by rain.

**Clean the piston rods of the hydraulic cylinders during winter and when the machine is not in use for a long period of time, and protect them with vaseline or acid-free grease to protect them from corrosion.**

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 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.



**NOTE!** The disc harrow should be stored in a place that does not pose a danger to people or the environment.



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 SAL disc harrow

To search for, price and order genuine spare parts for MANDAM machines, please visit our website at: [www.mandam.com.pl](http://www.mandam.com.pl), under the "parts" tab.

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](mailto: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 : +48 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.