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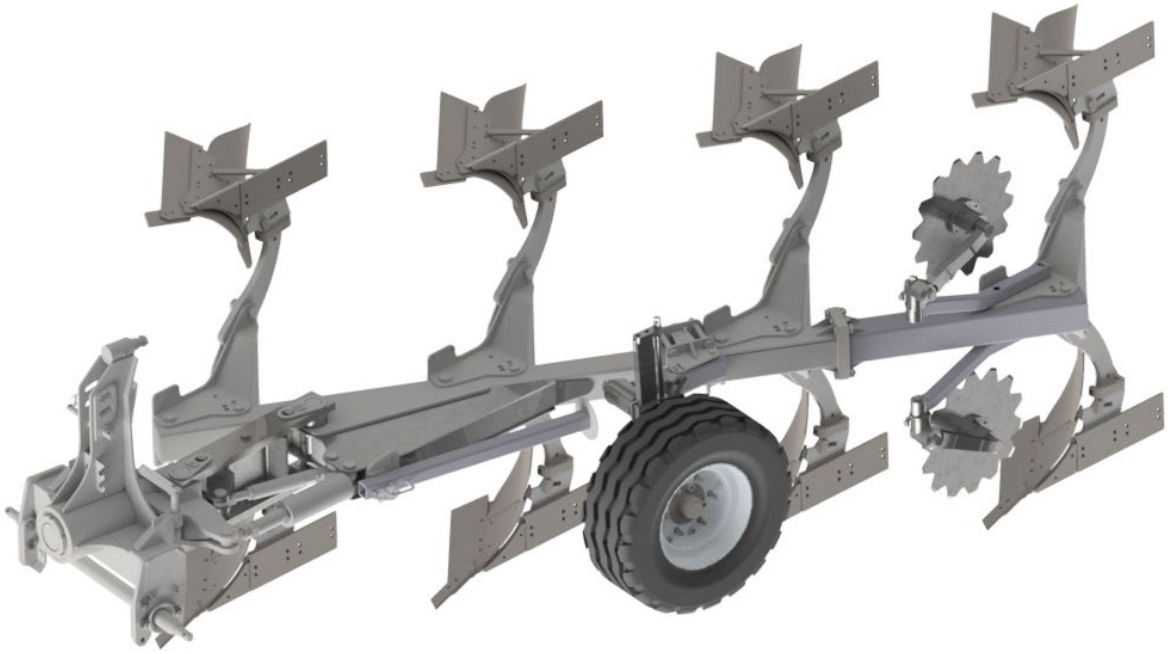
INSTRUCTION MANUAL

ORKAN, ORKAN VARIO, ORKAN RESOR PLOUGH



Issue II
Gliwice 2022

DECLARATION OF CONFORMITY

FOR A MACHINE

In accordance with the Ordinance of the Minister of the Economy dated 21 October 2008 (Journal of Laws No. 199, item 1228)
and the Directive of the European Union no. 2006/42/EC of 17 May 2006

MANDAM Sp. z o.o.
ul. Toruńska 14
44-100 Gliwice

hereby declares at its sole responsibility that the following machine:

ORKAN / ORKAN VARIO / ORKAN RESOR PLOUGH
type/model: .....
year of manufacture: .....
serial number: .....

under this declaration, complies with:

the **Ordinance** of the Ministry of Economy of 21 October 2008 on fundamental requirements for machinery (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 for the machine: Jarosław Kudlek, Łukasz Jakus
ul. Toruńska 14, 44-100 Gliwice, Poland

For assessment of compliance the following standards have been applied:

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 shall be cancelled
if the machine is modified or redesigned without consent of the manufacturer.

Prezes Zarządu
Dyrektor
inż. Bronisław Jakus

V-ce Prezes Zarządu
Dyrektor ds. Techniczno-Organizacyjnych
mgr inż. Józef Seidel

.....
Place and date of issue

.....
First and last name, position held and signature of the person authorized

1 Introduction

Congratulations on your purchase of the ORKAN VARIO plough. This instruction manual provides information on the hazards that may occur during use, plough operation, technical data and the most important indications and recommendations the knowledge and use of which is a prerequisite for proper operation. Keep this manual for future reference. Should you have any problems with understanding any statement in the instruction manual, please contact the manufacturer.
The following mark indicates the guidelines that are important due to safety reasons:

Machine identification

Identification data of the plough, including basic information on the manufacturer and the machine and CE marking, can be found on the rating plates placed on the load-bearing frame.

The warranty for the plough is valid for 12 months from the date of sale.

The warranty card constitutes an integral part of the machine.

Whenever you request any information on spare parts, provide the serial number.

For more information on spare parts:

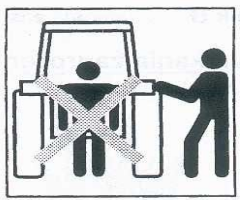
- please visit our website at: http://mandam.com.pl/parts/
- call us at +48 668 662 289
- e-mail us at: czesci@mandam.com

1.1. Safety symbols and inscriptions

CAUTION! Special care must be taken when using the implement in case of areas marked with special information and warning signs (yellow stickers).

The following symbols and inscriptions can be found on the implement. Secure the symbols, signs and inscriptions against loss and make sure they are legible at all times. If lost and illegible, replace the symbols, signs and inscriptions with new ones.

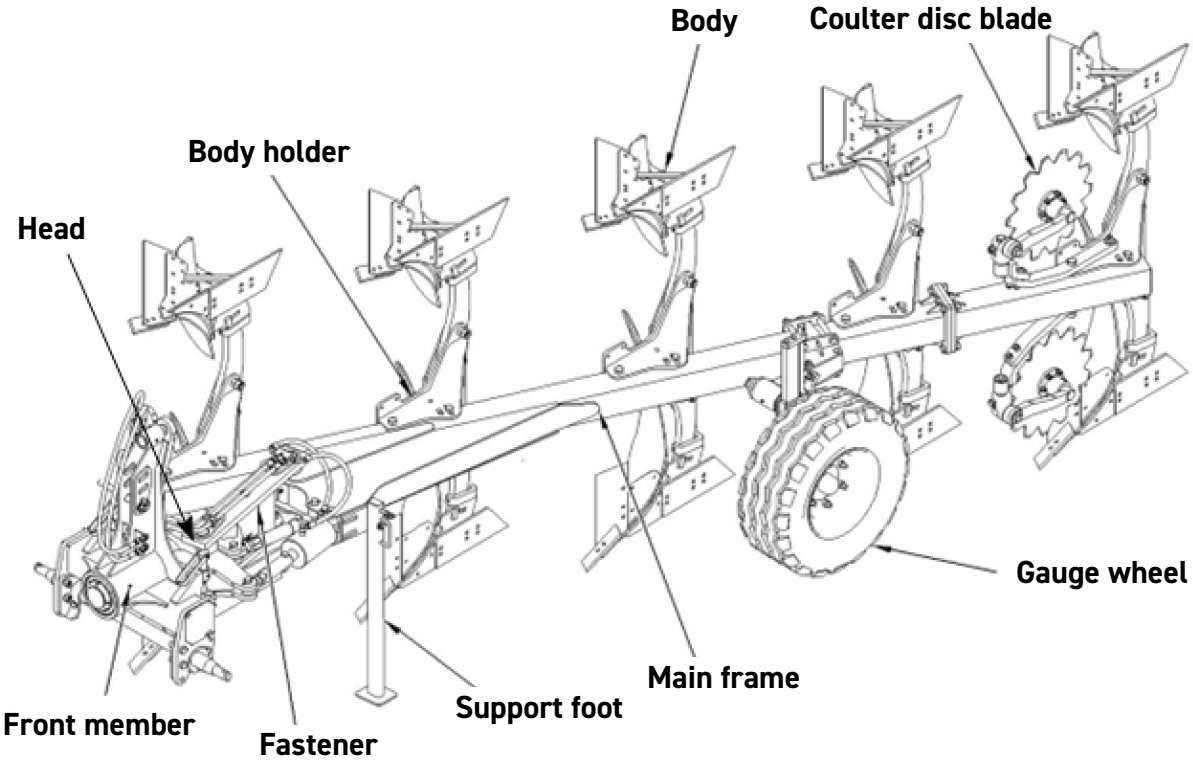
Table 1. Information and warning signs

Safety sign	*Meaning of the safety sign*	*Location on the implement*
	Read the instruction manual prior to operating the implement	Frame adjacent to the mounting place of the upper fastener
	Danger of toe or foot crush	Frame adjacent to the mounting place of the upper fastener
	Keep clear from lift bars while controlling the lift	Frame adjacent to the mounting place of the upper fastener
	Keep clear from foldable and moving parts of the implement	Rear part of the frame

Safety sign	*Meaning of the safety sign*	*Location on the implement*
	Liquid jet under pressure – hazard of bodily injury	Cylinders
	Fixing point for transport belts	Upper part of the drawbar (upper fastener pin) Rear part of the plough frame

2 General information

2.1. Design of the ORKAN / ORKAN VARIO / ORKAN RESOR PLOUGH.



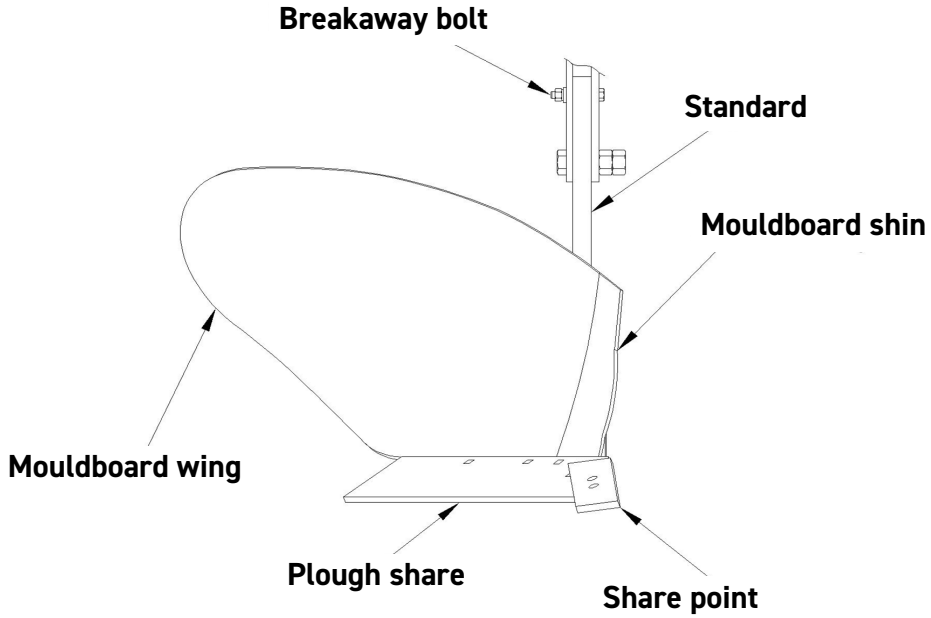


Fig. 1. Design of the ORKAN plough and the work tool.

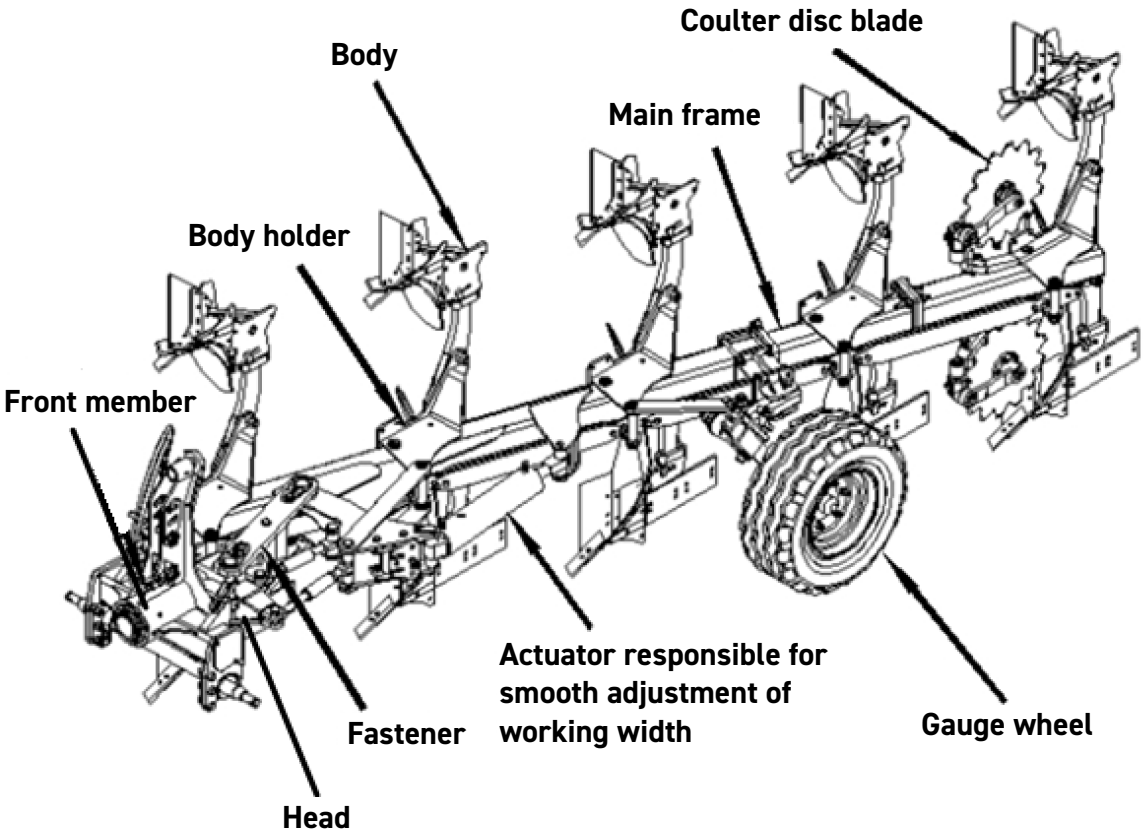


Fig. 2. Design of the ORKAN VARIO plough.

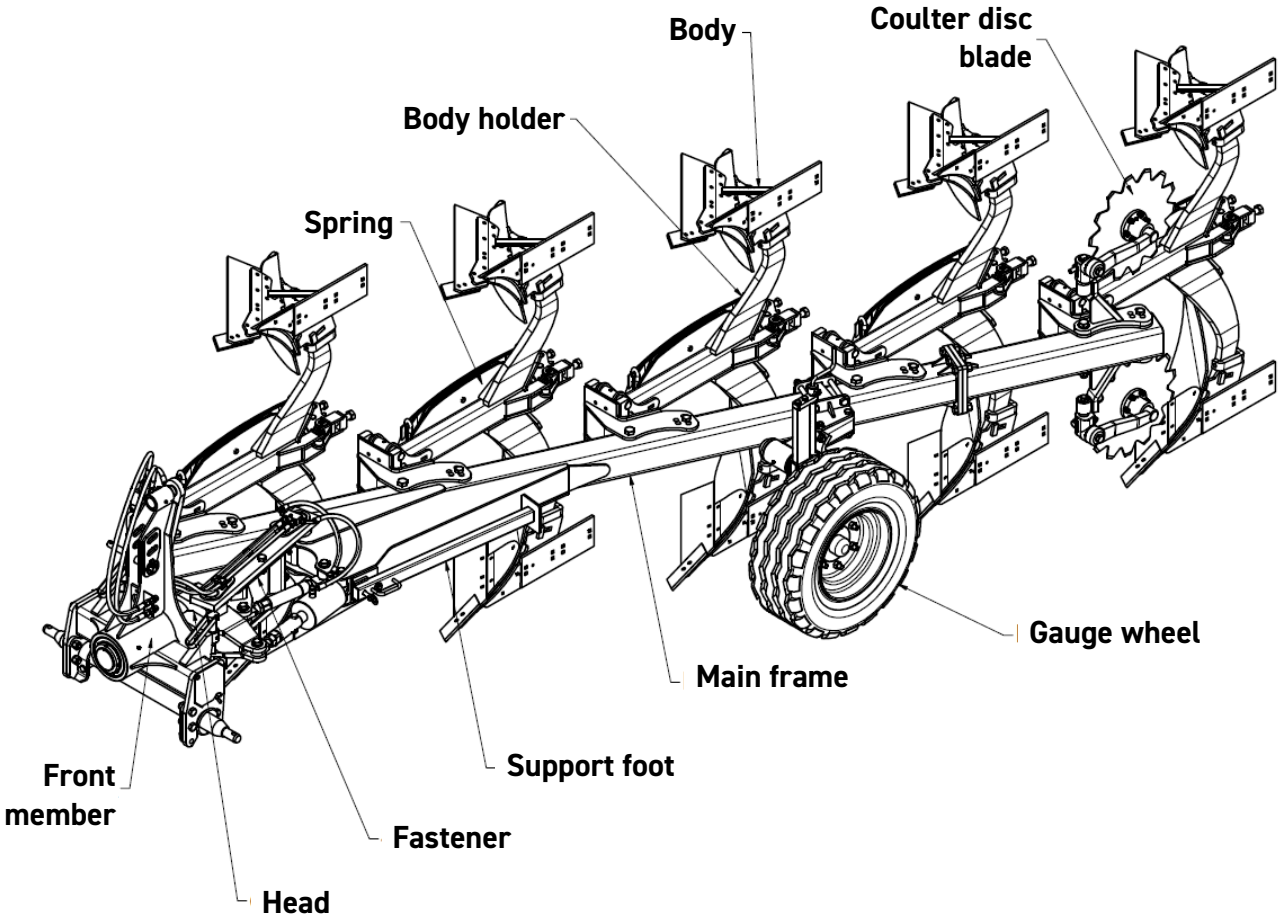


Fig. 3. Design of the ORKAN RESOR plough and the work tool.

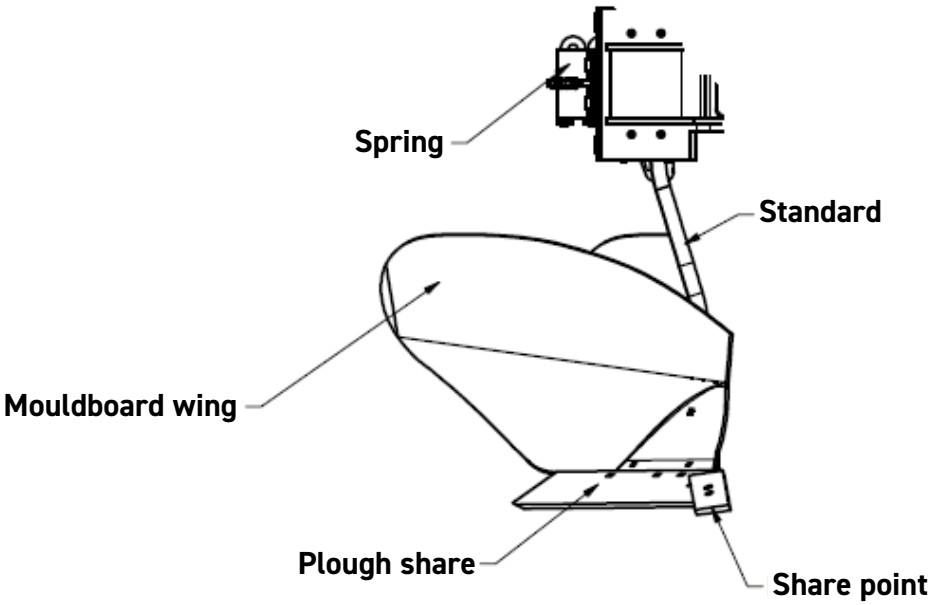


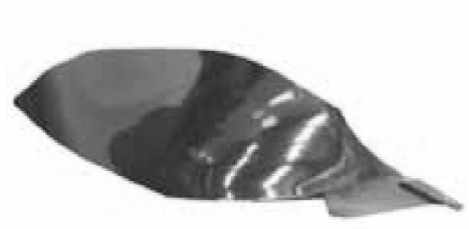
Fig. 4. Design of the ORKAN RESOR work tool.

2.2. Intended use of the ORKAN / ORKAN VARIO / ORKAN RESOR plough

The plough is intended for tillage on poorly stoned soils. Its purpose is to cut off field's earth from undisturbed soil, shift and turn it over in order to cover over crop residue and to loosen the soil.

The working components are right- and left-hand plough bodies equipped with 18" plough shares, reversible share points, and full semihelical or openwork cylindrical mouldboards.

Full semihelical mouldboard



Recommended for medium and light soils. Ideal for covering over crop residues and characterized by a low soil loosening intensity. It creates a wide furrow, allowing for cooperation with tractors with tractors with wide tyres.

Openwork cylindrical mouldboard

Recommended for heavy (compacted) soils. Ideally loosens the soil and thanks to the mouldboard being of an openwork structure, ploughing resistance is reduced.

Plough share (trash board)

Provides good coverage of crop residues and organic fertilizers. Allows for a large space to be maintained between the plough bodies.

Skimmer

Recommended for efficient deep ploughing on soils with a large amount of crop residues and stubble (especially corn for medium to shallow ploughing) and organic fertilizers.

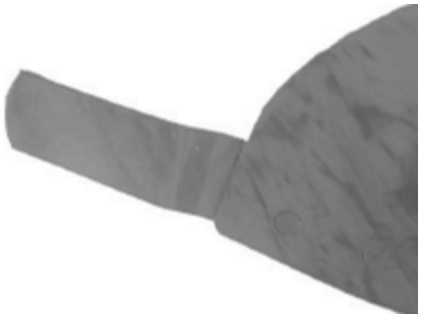
Coulter disc blade

The coulter disc blade installed on the last pair of bodies ensures a proper shape of the furrow. It creates a lower working draft and operating resistance while compared to a knife coulter.

Gauge wheel

It ensures the maintenance of the working depth and copying, providing a uniform working depth irrespective of the unevenness of the surface.

Mouldboard extension



It ensures correct arrangement of the furrow especially during the ploughing of stubble and areas covered by sod.

Coulter knife blade

Alternative to the coulter discs when reduction of mass is necessary. It is also recommended for large quantities of crop residues, organic fertilizers or stony soils when a coulter disc blade would be blocked.

CAUTION! This plough is exclusively intended for agricultural work – soil cultivation. Using the implement for tasks that differ from the intended use shall be regarded as misuse, resulting in loss of warranty.

CAUTION! The manufacturer shall not be liable for any damage arising out of misuse. Failure to follow the guidelines included in this instruction manual shall also be regarded as misuse.

3 General safety information

The plough can only be started, used and repaired by persons familiar with its operation and that of the tractor being used and the rules for its safe use and operation. The manufacturer shall not be liable for any unauthorised alternation of the plough. Only genuine original MANDAM spare parts shall be used during the warranty period.
The plough must be operated with all precautionary measures, in particular:

- each time before starting operation check the plough and the tractor whether their condition guarantees safety during operation and travel,
- minors, disabled or intoxicated persons (under the influence of alcohol or drugs) must not operate the implement,
- wear work clothes, shoes and gloves during maintenance,
- do not exceed the maximum axle loads, tyre pressure and transport dimensions,
- use only original cotter pins and pins,
- do not approach the plough when it is being lifted or lowered,
- do not stay between the plough and the tractor when the engine is running,

- move forward, lift and lower the roller slowly and smoothly without sudden jerks, making sure that nobody stays in the vicinity,
- do not reverse and make U-turns when the implement is lowered to the working position,
- when making U-turns do not use independent tractor brakes,
- do not stand on the implement or apply additional loads during operation and transport,
- while making U-turns, pay due caution if anyone is in the vicinity,
- do not operate the plough on slopes with the inclination exceeding 12°,
- any repairs, lubrication or cleaning of working components may be performed as long as the engine is not running and the plough is lowered,
- there is a hazard of head injury when you perform maintenance or replacement of parts under the implement without adequate protection – wear a hardhat,
- during a break in the work, always lower the implement to the ground and stop the tractor engine,
- the plough is equipped with a mechanical lock to prevent uncontrolled rotation during transport,
- driving and parking the implement on an unstable slope may cause soil slipping and machine sliding,
- store the implement in a manner preventing injury to people and animals.

3.1. Hitching and unhitching from the tractor

- Make sure that the plough is hitched to the tractor in accordance with the instructions, remembering to secure the bolts and that the bolts are secured with cotter pins.
- While hitching the tractor with the plough, do not stay between the implement and the tractor.
- The tractor used together with the plough must be fully functional and in good working order. Do not attach the implement to a tractor with a malfunctioning or defective hydraulic system.
- Remember to observe the following: balance of the tractor and the plough, tractor steerability and braking performance – the front axle load must not drop below 20% of the total tractor load – a kit of front weights.
- When in resting position and disconnected from the tractor, the machine must be stable all the time.
- Place the supporting foot on a stable ground. Do not use pads under the foot as this may cause instability.

3.2. Tyres

- The tyre pressure must not exceed the tyre manufacturer’s recommended tyre pressure rating (as indicated on the tyre wall).
- Badly damaged tyres (especially damage to the tyre profile) must be replaced immediately.
- The repair works on wheels or tyres must be performed by persons trained and authorised for this purpose. Such works must be performed with properly selected tools.

3.3. Hydraulic system

The hydraulic system operates under high pressure. Take all precautionary measures, in particular:

- do not connect and disconnect hydraulic hoses when the tractor hydraulic system is pressurised (hydraulics set to neutral position),
- check regularly the conditions of connections and hydraulic hoses,
- do not use the implement until the hydraulic system is repaired.

3.4. Transport safety on public roads

For transport, the plough must be turned to the centre position (the frame should be in the tractor's axis) and then locked with a pin. Before turning, raise the plough to a point where it does not interfere with the ground. During transport, the clearance under the lowest part of the plough should prevent collision with the ground during transport on uneven ground. When driving with the plough on public roads, it is mandatory to use driving lights, a distinctive warning sign and side reflectors.
Do not exceed the speed limits during transportation, which are:

- up to 20 km/h on smooth-surface (asphalt) roads,
- 6-10 km/h on country roads or cobblestones,
- up to 5 km/h on bumpy roads.

Adapt the driving speed to the road conditions to prevent the plough jumping on the three-point hitch and to prevent excessive loads on the implement frame and the three-point hitch.
Maintain particular caution when passing and overtaking and on bends. The permissible width of the implement travelling on public roads is 3.0 m.
Do not drive with the implement if the slope is inclined crosswise to the implement by more than 7°.
Be aware of the length of the plough. In sharp turns, the plough leans against the direction of the turn. This may result in a collision with obstacles or other road users.

During transport the plough is to be secured with the lock that keeps the plough on the same axis as the tractor, reducing its transport width and increasing the stability of the vehicle during transport. For locking, use the lever that you need to turn so that it jumps out of its slot and so that the pin holds the tow bar head in the locked position. Once locked, the plough cannot be turned because damage to it may occur. To unlock, turn the lock lever so that it falls back into its slot.

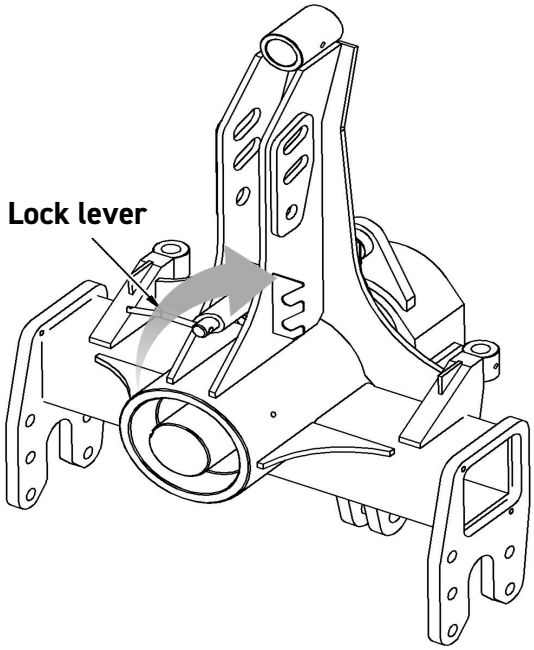


Fig. 5 Diagram of the plough lock lever.

While not working, the plough should be protected from tipping over by its support foot. To this end, pull the protective pin towards you, then hold the foot's handle and pull it towards you. Turn the foot to its supporting position (by 90º) and release the handle.

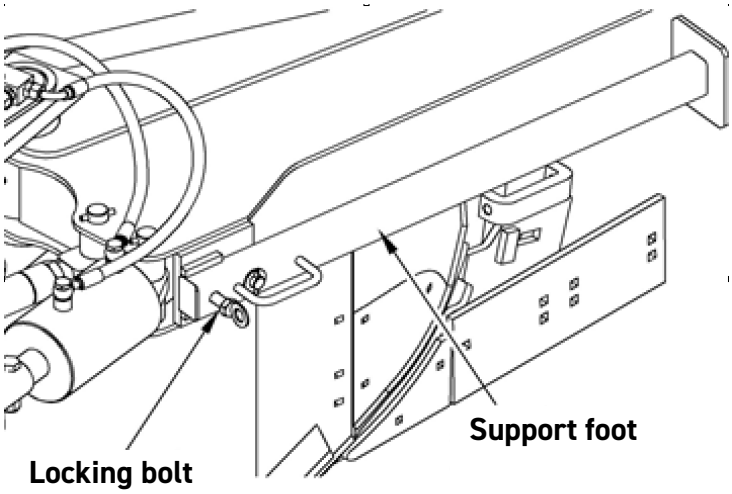


Fig. 6 Plough support foot.

Warning! Failure to observe the above rules may pose hazard to the operator and other people and can lead to the implement damage. The user shall be liable for any damage caused by failure to observe the rules.

3.5. Residual risk description

Mandam Sp. z o.o. makes every effort to eliminate the risk of accidents. However,

there is some residual risk that may cause an accident. The biggest hazard occurs when/during:

- using the implement for purposes other than described in the manual,
- operating the implement by people who are underage and do not have licences, are ill or intoxicated,
- presence of people and animals within the implement operating range,
- precautionary measures are not taken during transport and maneouvering with the tractor,
- anyone gets between the implement and the tractor while the tractor's engine is running,
- maintenance and when the service recommendations are not observed,
- driving on public roads.

3.6. Residual risk assessment

The residual risk can be minimised by applying the following recommendations:

- operate the implement carefully and without undue haste,
- read the instruction manual carefully,
- keep a safe distance from hazard zones,
- do not stay on the implement and within the implement operating range when the engine is running,
- perform the maintenance in accordance with safety rules,
- wear safety clothes and a safety helmet while working under the implement,
- prevent the access of unauthorized personnel and especially children to the implement.

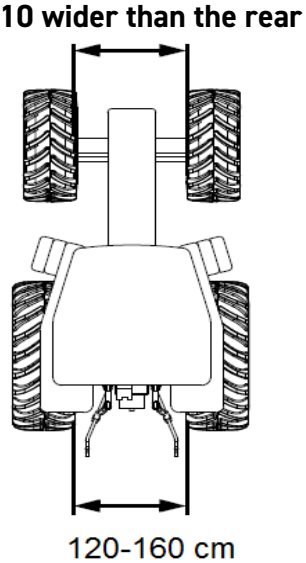
4 Plough and tractor settings

The tractor selected for use with the plough should have the characteristics described in the following paragraphs. The hydraulic system must be operational and efficient and have two pairs of hydraulic couplings in accordance with ISO 7241-1 A, controlled by a twin distributor. Pressure in both rear tyres should be the same in order to avoid formation of uneven furrow-slices.

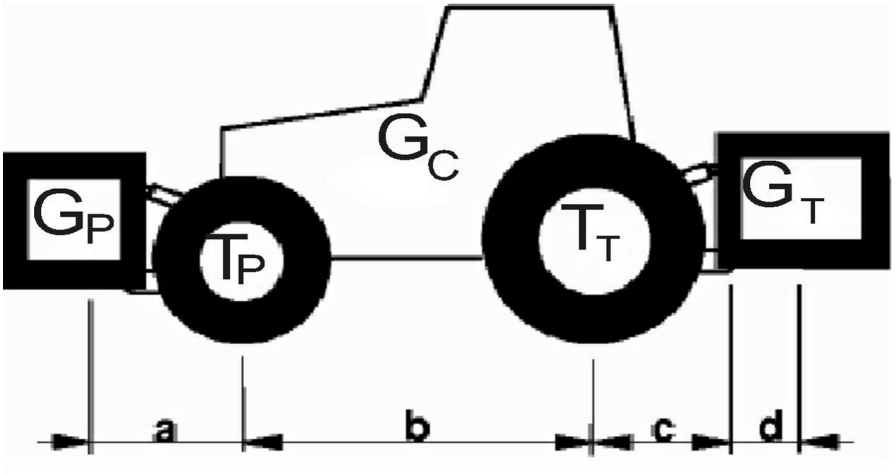
Tractor wheelbase – track

- The recommended tractor internal wheelbase – track width (without the use of a furrow widener) should be 120 – 160 cm.

- The front track should be 0 – 10 cm wider than that of the rear wheels.



CAUTION! The permissible loads on the axles and tyre load capacities must not be exceeded. The front axle load may not be less than 20%.



Axle load calculations
Key:
GC – the tractor weight,
TP – front axle load for the unhitched tractor,
TT – rear axle load for the unhitched tractor,
GT – total weight of the rear-mounted implement,
GP – total weight of the front-mounted implement,
a – distance between the centre of gravity of the front-mounted implement and the axle centre,
b – tractor wheelbase,
c – distance between the rear axle centre and the centre point of the hitching pin of the rear-mounted implement,
d – distance of the centre of gravity of the agricultural implement from the hitching pins of the tractor,
x – distance of the centre of gravity from the rear axle (assume 0.45 if the manufacturer does not provide this parameter).

Minimum load at the front in case of a rear-mounted implement:

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

Actual load on the front axle:

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

Actual total weight:

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

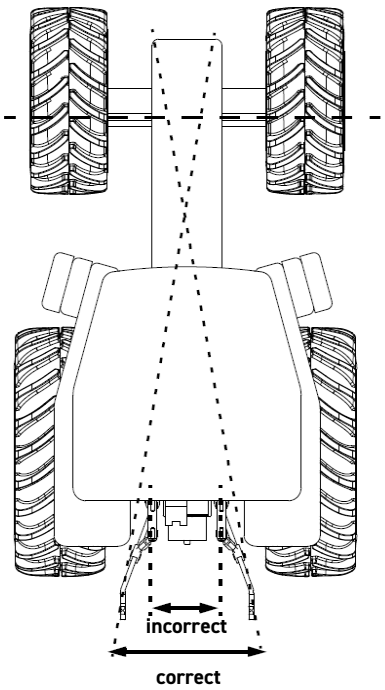
Actual load on the rear axle:

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

4.1. Preparing the plough

The plough is usually delivered for sale in a ready-to-operate condition. Due to the limitations of the means of transport, it is also possible to deliver it in a partially disassembled condition. Prior to operation check the technical condition of the plough, in particular that of the working parts and screw connections.

4.2. Selection of the hitching bar



In order to obtain a stable width of the first furrow-slice, the theoretical intersection line of the lower bars of the tractor's hitch should be located in a distance equal to 1/3 of the tractor's axle base, behind the front axle. Failure to do this may cause the plough to "slew". In such a case, a hitching bar of a different length must be used.

4.3. Hitching the plough to the tractor

The lower bars of the three-point hitch should be at the same height, spaced correspondingly to the spacing of the lower hitches of the plough. When hitching the plough to the tractor, the implements should be placed on a hard and level surface. When hitching the two pieces of machinery together, complete the following steps:

- suspend the hitching bar on the lower bars of the three-point hitch and secure with cotter pins,
- switch the tractor hydraulic system into adjustment position,
- reverse carefully, suspend the implement on the bar and secure with pins,
- connect the tractor upper fastener (during operation of the implement, the hitch point of the upper fastener on the implement must be located higher than the attachment point of this fastener on the tractor),
- check the operation of plough lifting, lowering and the hydraulic system.

Connection of the upper fastener

- Oval (longitudinal) holes allow for better longitudinal ploughing of the terrain. Use

for 4-5 furrow plough, in extreme cases 3-furrow plough.

- A fixed hole prevents the plough from rising up on heavy and stony soils. Use for 2-3 furrow ploughs.

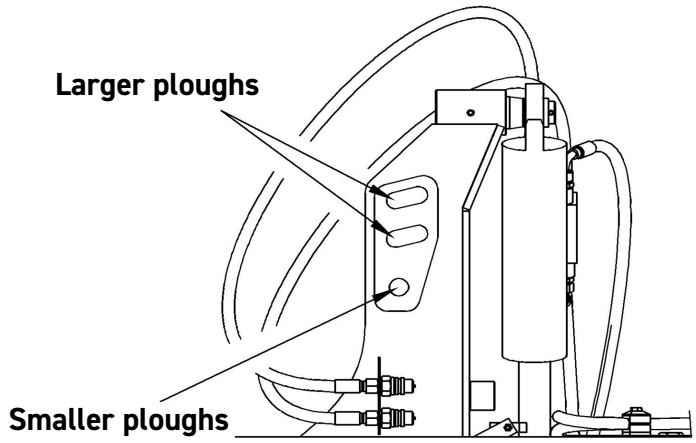


Fig. 7 Using a suitable connection to the plough upper fastener.

4.4. Adjustment of the hitching bar height

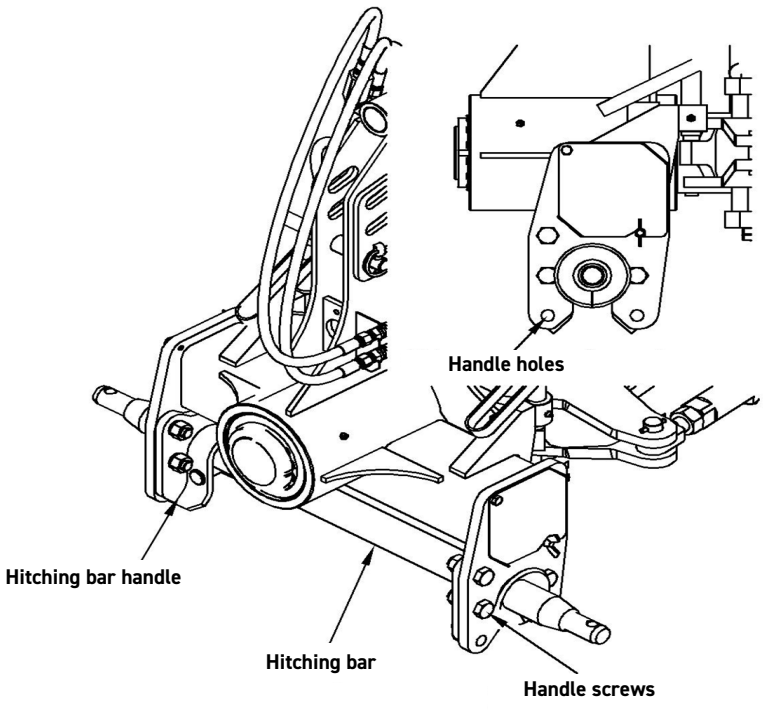


Fig. 8 Schematic drawing of the hitching bar height adjustment.

The hitching bar can be set at the height of 64.5 cm and 57 cm from the ground depending on the type of tractor operating the plough. In order to change the position of the hitching bar, first remove the hitching bar from the plough hitch. Then turn the hitching bar handle to the appropriate holes.

4.5. Adjustment of the ploughing width

4.5.1 ORKAN and ORKAN RESOR plough

To change the working width of the ORKAN plough, first, change the angle of the bodies to the frame bar. To this end:

- unscrew the M20 and remove the bolt from the hole,
- adjust the body so that the corresponding holes overlap,
- insert the bolt into the hole and tighten the nuts with a torque of 468 Nm.

Five working widths are available: 30 cm, 35 cm, 40 cm, 45 cm, 50 cm.

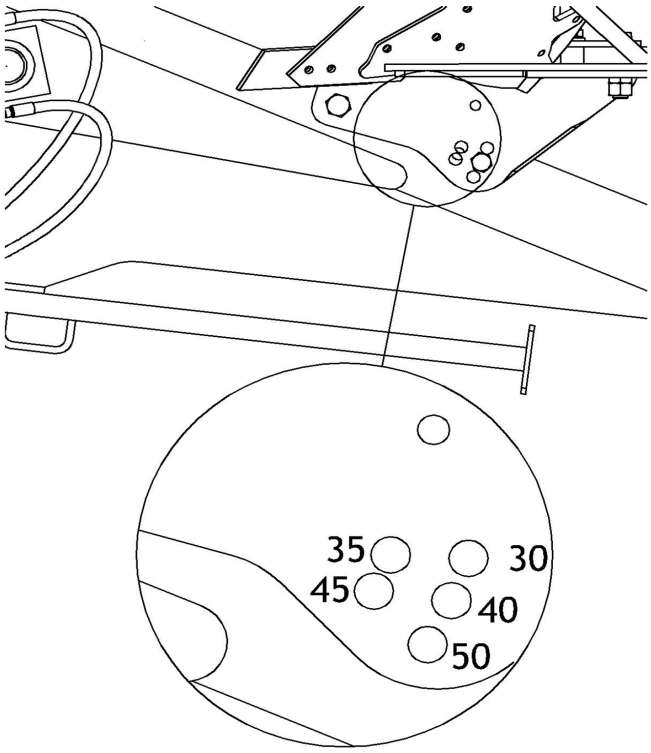


Fig. 9 Holes regulating the width of the implement.

Then, adjust the angle of the frame bar to the suspension so as to the body landsides are parallel to the direction of travel. This is done with the external fastener screw between the head and the frame beam. To this end:

- loosen the lock nut with a 46 wrench,
- then use a 46 wrench to set the appropriate angle of the frame,
- counter with a nut.

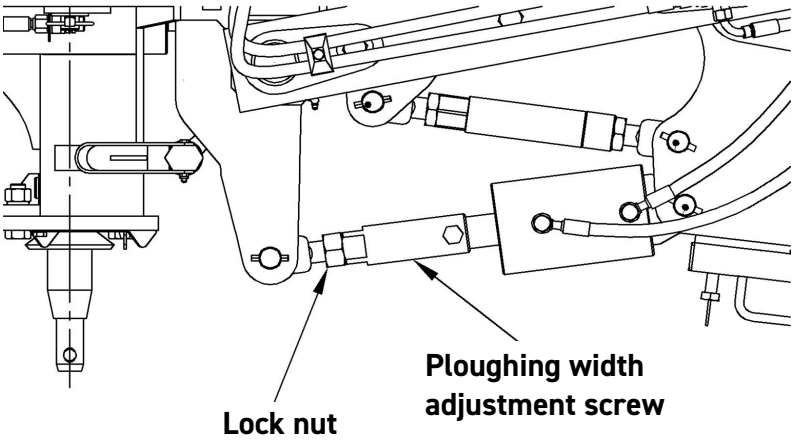


Fig. 10 Adjustment of the ORKAN plough ploughing width.

4.5.2 ORKAN VARIO plough

The ORKAN VARIO plough is equipped for an infinitely adjustable ploughing width. Changing the ploughing width is possible thanks to the use of a hydraulic actuator. The ploughing width can be infinitely adjusted from 30 to 50 cm. The arrow in the photo below shows the position of the ploughing width adjustment actuator and its view as seen from above.

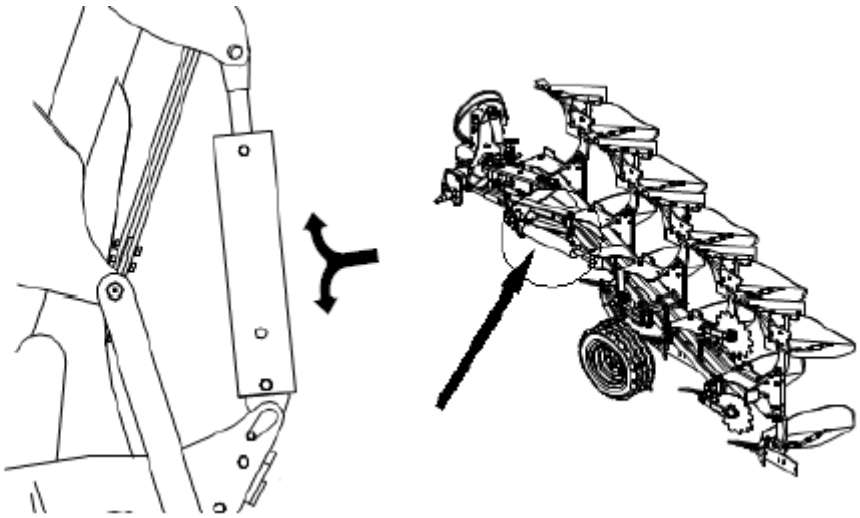
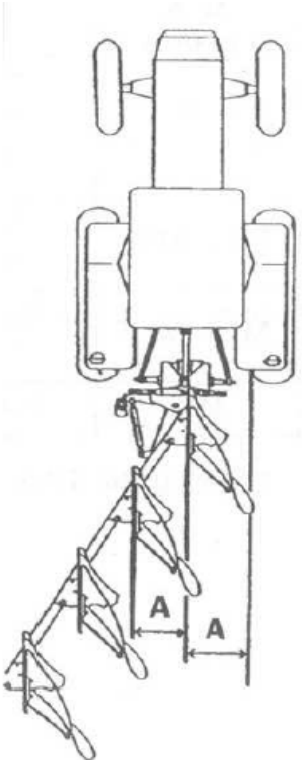


Fig. 11 Adjustment of the ORKAN VARIO plough ploughing width.

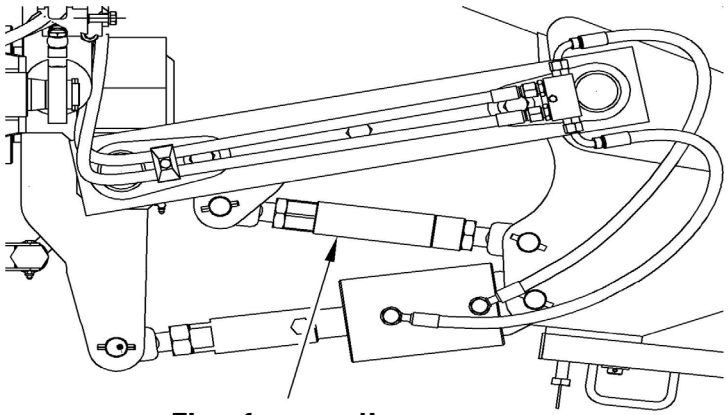
Determining the optimum ploughing width is particularly important for reducing the implement's operating resistance and minimising the degree of soil clumping after plouging. The working width of the body should be adjusted according to weather conditions, terrain and the capabilities of the agricultural tractor. Indicated above is the position of the actuator within the implement and the direction of its movement. Extension of the actuator reduces the ploughing width, while the maximum position of the actuator corresponds to the maximum ploughing width.

4.6. First furrow-slice adjustment



The width of the first furrow-slice should correspond to the width of the other furrow-slices, however the following should be taken into account too:

- resultant compensation of the plough's operating resistance,
- while using broad tractor tyres, the width of the first furrow-slice should be reduced to ensure proper fitting to the front furrow-slices,
- while using a plough equipped with a furrow widener, the width of the first furrow-slice should be reduced in relation to the width of the other furrow-slices.



First furrow-slice adjustment screw

After altering the first furrow-slice width, an adjustment of the ploughing width may be required.

4.7. Levelling

The plough is longitudinally levelled by means of the upper fastener. The plough frame should always be parallel to the ground. The upper fastener bolt should be in the middle of the longitudinal hole.

The plough is adjusted transversely using the bolts with handles. The adjustments for the left and right sides are done separately. Looking from the rear of the plough, the plough beams should be positioned perpendicularly to the ground. As the working depth changes, a correction of the transverse levelling must be made.

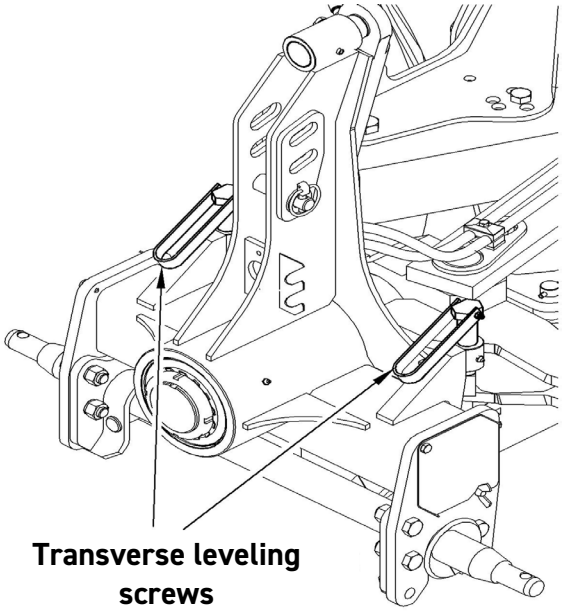
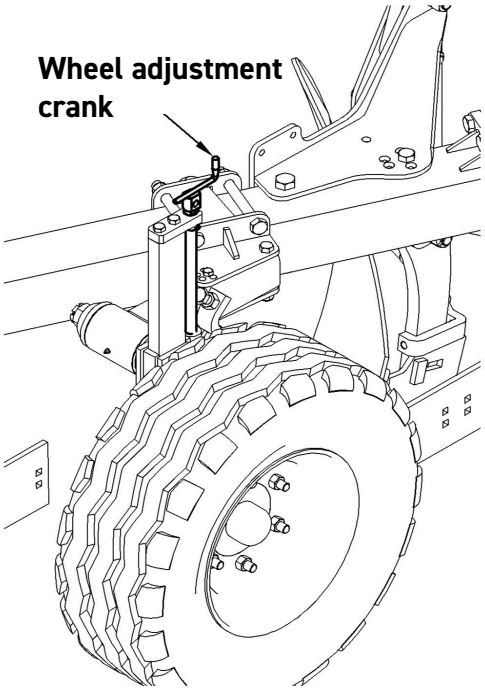


Fig. 12 Screws used for transverse levelling of the plough.

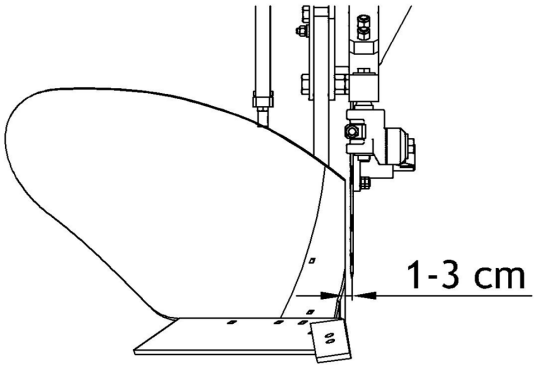
4.8. Working depth adjustment.



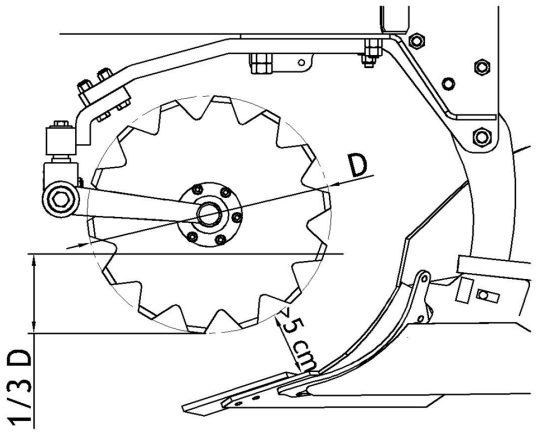
When attaching the upper fastener to the longitudinal holes, it is necessary to set the furrow depth by means of the tractor's hydraulic adjustment (force/positional)

Setting the working depth of the plough on the gauge wheel is done using the screw crank. The setting is the same on the left and right sides. Bumpers (screws with a lock nut) allow the angle of the gauge wheel arm to be changed relative to the ground. It enables to change the distribution of forces acting on the wheel moving in a hash terrain. A change of the wheel arm angle leads also to the change of the working depth.

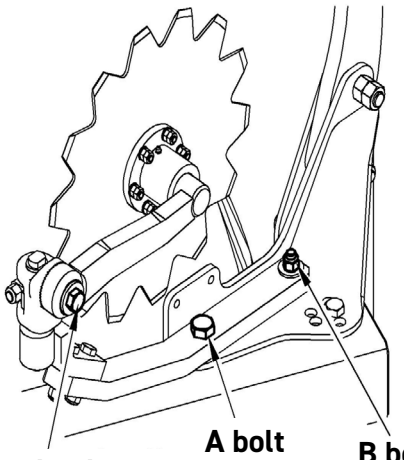
4.9. Coulter disc blade



A properly set coulter disc blade should work:
- maximum at half the working depth of the body,
- at the distance of 1 - 3 cm from the landside,
- at 1/3 of its diameter at maximum,
- at the minimum distance of 5 cm before the mouldboard shin and the plough share edge,
- not colliding with the gauge wheel.



All coulter discs should be set identically.

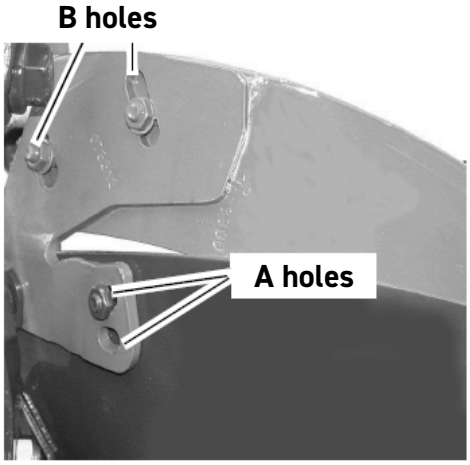


Working depth adjustment screw

To change the working depth of the coulter disc:
- support the coulter disc's arm to protect it from falling down,
- loosen the working depth adjustment screw,
- turn the arm on the ratchet to the desired setting,
- tighten the screw.

The distance from the landside is set as follows:
- loosening A and B bolts,
- turning A bolt on it axis in the longitudinal hole of B bolt to the desired position,
- tightening A and B bolts.

4.10. Plough share



The plough share is bolted to a bracket that is mounted on the mouldboard. This bracket has two holes (A) – for shallow and deep ploughing. There are two longitudinal holes in the bracket to be adjusted according to conditions.
The front edge of the optimally set plough share should be positioned at the mouldboard, and the rear edge should be adjusted according to the ploughing depth.

4.11. ORKAN and ORKAN VARIO skimmer

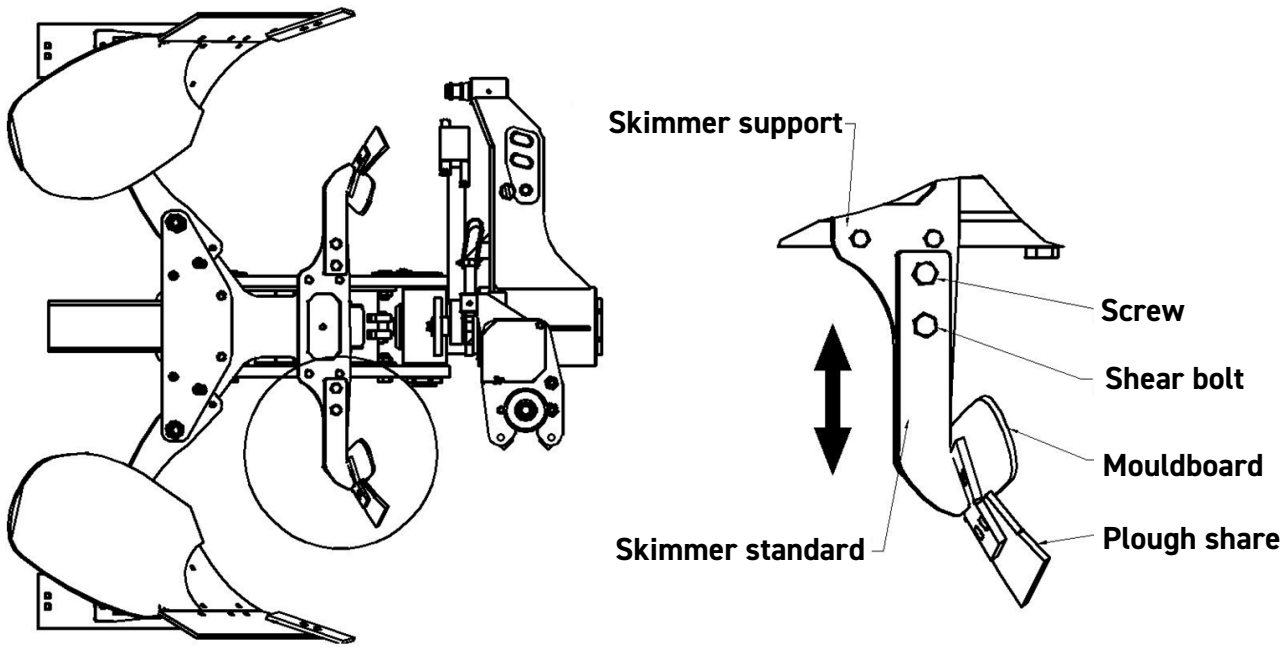


Fig. 13 Construction of the skimmer.

The skimmer set consists of a support bolted to the plough body holder. It supports the skimmer standard to which the working components are bolted – the plough share and mouldboard. The working depth of the skimmer is set using the holes of the bracket by turning the bolts holding the standard. The lower bolt securing the components against overload has a circumferential groove that allows the bolt to be shorn. The shear bolt should always be mounted as shown in the figure above. The distance of the plough share from the share point is set in two positions: 0 mm and 70 mm. This is set by turning the skimmer support 180°.

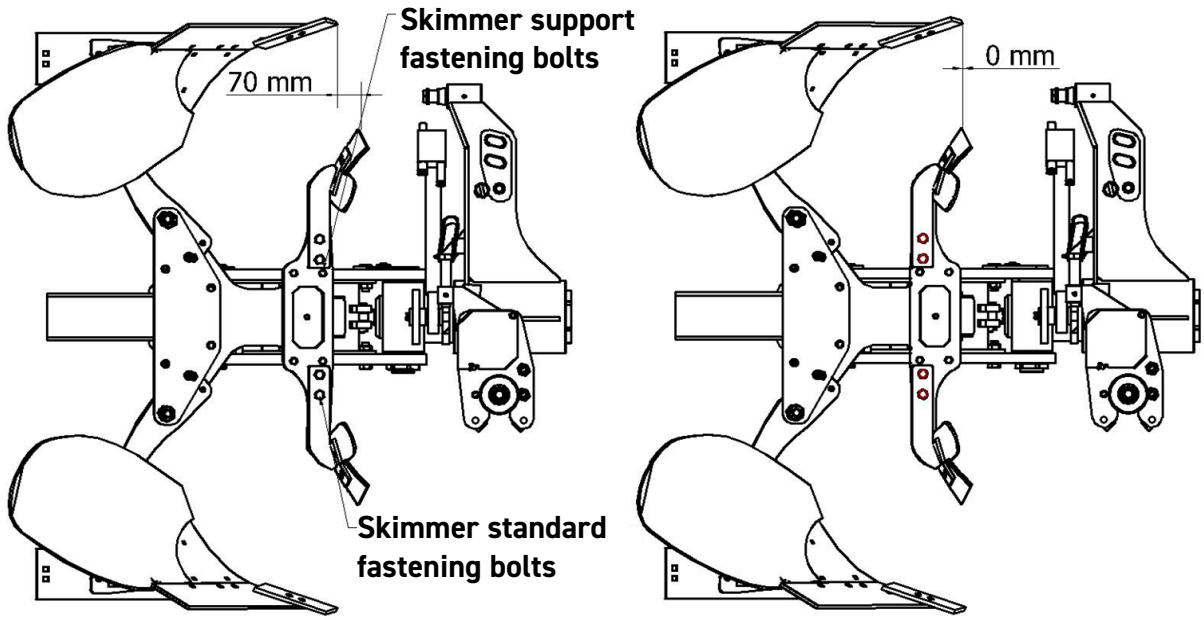


Fig. 14 Schematic diagram of the a skimmer attachment.

4.12. ORKAN RESOR skimmer

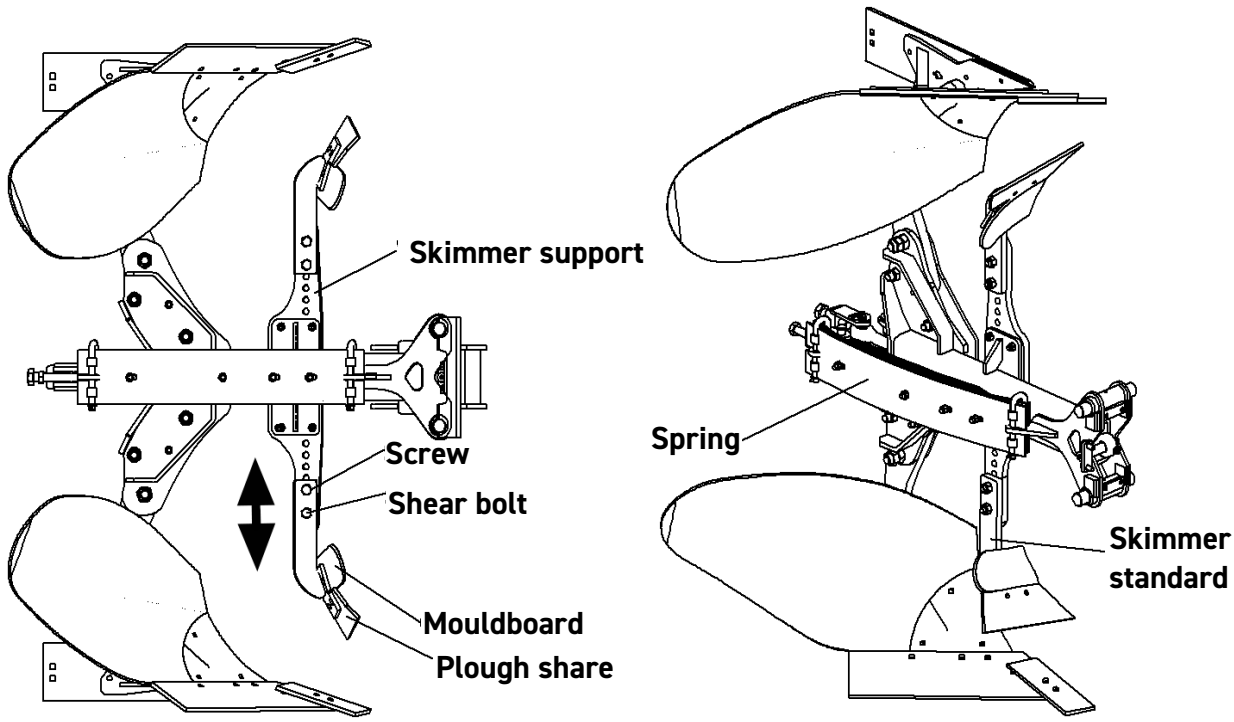
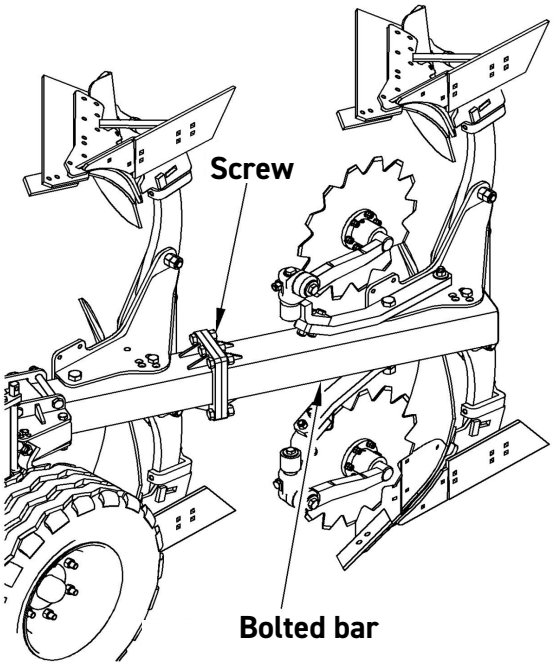


Fig. 15 Skimmer design.

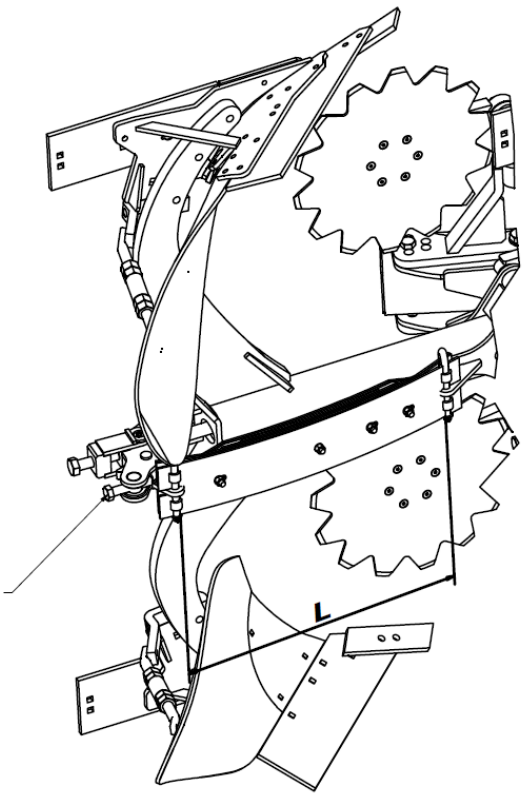
The skimmer set consists of a support bolted to the plough body holder. It supports the skimmer standard to which the working components are bolted – the plough share and mouldboard. The working depth of the skimmer is set using the holes of the support by turning the bolts holding the standard. The lower bolt securing the components against overload has a circumferential groove that allows the bolt to be shorn. The shear bolt should always be mounted as shown in the figure above.

4.13. Assembly and disassembly of the last pair of bodies



Ploughs marked with the 3+ and 4+ symbol can be fitted with a bar with a pair of plough bodies. Before commencing assembly or disassembly, place the plough stably on an even/firm surface. Use lifting and transport means for work. The weight of the complete unit ranges from 210 - 265 kg depending on the equipment bolted to it. Before starting the assembly, remove the plastic cap. The bars are bolted together using six M20x65 screws. The complete set should include M20 nuts and Z 20.5 spring washers.

4.14. Spring protection



A spring protection is available on ORKAN RESOR implements which, compared to ORKAN and ORKAN VARIO machines, allows the body to rise automatically when it hits an obstacle, and then return to the working position on its own. ORKAN RESOR ploughs are equipped with a 7 leaf spring.

The length of the spring which should be measured between the pins should be about 700 mm. Length changes can be made using the screw shown in the figure opposite.

CAUTION! Changing the length of the spring does not change the trigger force, this can only be achieved by adding or removing spring leaves.

5 Operation of ORKAN / ORKAN VARIO / ORKAN RESOR plough

Daily maintenance

At the end of the each working session, clean the plough thoroughly off soil and plant residues. Inspect the screw, bolt and pin connections and the condition of the working components and other parts. Replace any damaged or worn parts. Tighten any loose screw connections and replace damaged plugs and pins. Before commencing work and after every cleaning with water, lubricate the grease points (chapter 5.1). Never direct a liquid jet at bearings.

Post-season maintenance

At the end of the working season, clean the plough thoroughly and repair the spots of damaged paint coating. Also, the abraded working surfaces of the bodies should be cleaned thoroughly and preserved. In addition, perform complete lubrication. During idle periods, storage under a roof is recommended. However, if this is not possible, check the condition of the protection from time to time and supplement the grease washed away by the rain, if necessary.

5.1. Lubrication

- Clean the plough from soil after each use and inspect the parts and assemblies.
- After the first 4 hours of operation, re-tighten all bolts and periodically check them for tightness. **Failure to do so will exacerbate play and backlash and result in damage to the implement.**
- Use thread adhesive and only original screws and nuts when replacing worn parts.
- Always remember to tighten the screwed joints properly.

CAUTION! Periodic lubrication guarantees the long service life of the machine.

The long service life and efficiency of a machine depends to a large extent on regular lubrication. Use mineral greases for lubrication. Clean the lubrication points thoroughly before pressing or applying grease.

Before lubrication, grease nipples should be thoroughly cleaned. The following lubrication points should be lubricated depending on the intensity of use:

- plough rotation axles (2 pieces) - 10 hours,
- actuator pins (2 pieces) - 10 hours,
- connector pin at the head (1 piece) - 10 hours,
- connector pin at the frame beam (1 piece) - 50 hours or once a week,
- gauge wheel rotation axle (rotation depending on the operation side), (1 piece) - 10 hours,
- coulter disc bearings.

Lubricate all lubrication points until bearings or friction surfaces are filled with grease. Remove any grease residues. Excessive grease causes dust and soil particles to coat.

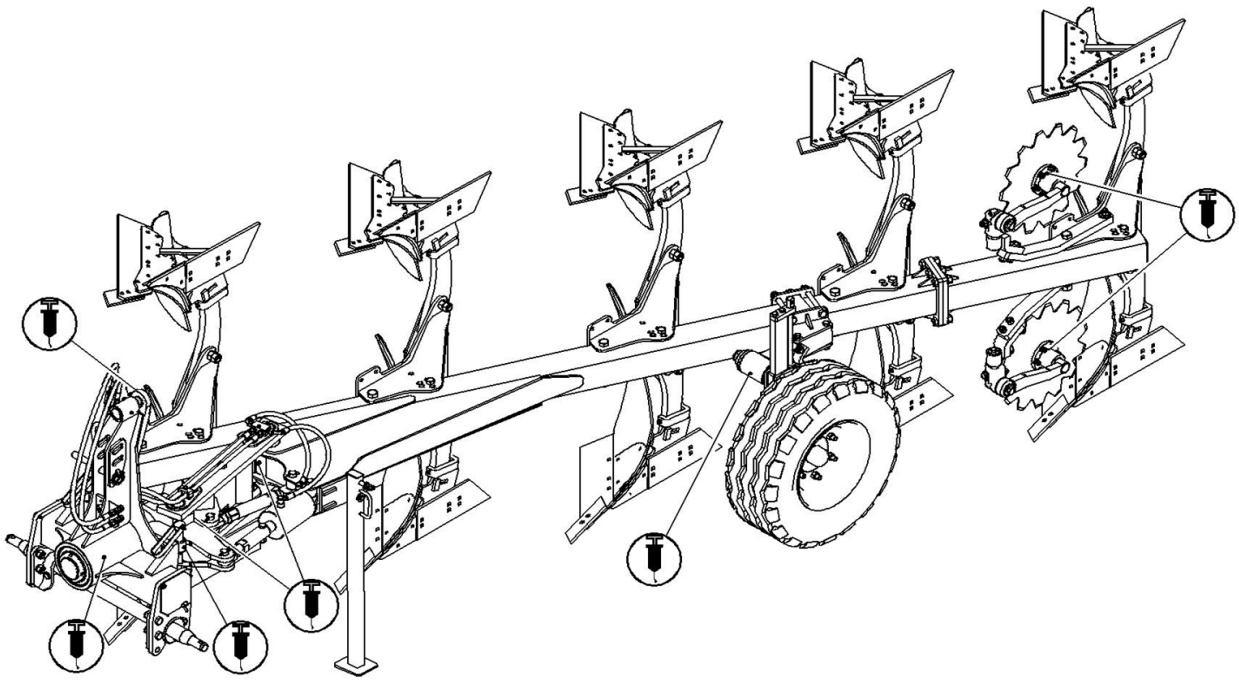
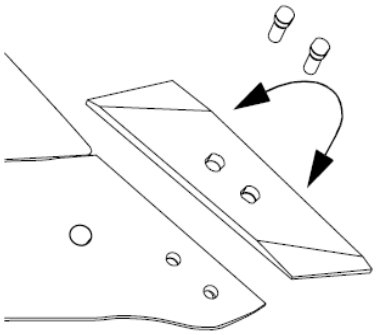


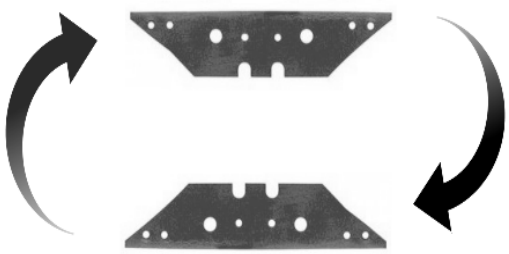
Fig. 13 Lubrication points of the ORKAN plough.

5.2. Worn out components

Cutting working parts (share point, plough share, mouldboard shin) should be used only till the cutting element is levelled with the supporting element (plough standard shoe). In practice, these components should be replaced early on due to the quality of the work done. The working parts which wear off (mouldboard, mouldboard extension, landside) should be used only when their thickness is larger than 5 mm.



Share points are rotating parts. When their one is worn out, the screws are unscrewed and the share point is rotated by 180º.



The landsides used up to 5 mm at their ends may be rotated in order to extend their service life. To this end, rotate the unscrewed landsides by 180°. Then transfer the landsides from the left-hand plough bodies to the right-hand plough bodies and from the right-hand plough bodies to the left-hand plough bodies as shown in Fig.

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

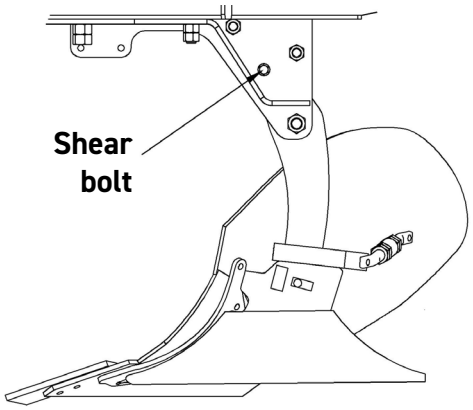
5.3. Screw tightening torque

Screws, bolts and nuts should be tightened in the machine with the appropriate torque depending on the strength class of the bolt and its thread size and pitch. The corresponding torque values for tightening them are shown in Table 2.

Table 2. Screw tightening torque

Screw, bolt and nut tightening torques [Nm]						
			Bolt strength class			
		Thread pitch	6.8	8.8	10.9	12.9
Size	M4	0,7	2,4	3,2	4,5	5,2
	M5	0,8	4,5	6	8,4	10
	M6	1,0	8	11	15	17
	M8	1,3	18	27	34	40
		1,0	16	21	30	35
	M10	1,5	35	46	65	76
		1,3	31	41	75	67
		1,0	27	36	50	59
	M12	1,8	59	79	111	129
		1,3	49	65	91	107
	M14	2,0	92	124	174	203
		1,5	76	104	143	167
	M16	2,0	127	170	237	277
		1,5	104	139	196	228
	M18	2,0	194	258	363	422
		1,5	135	180	254	296
	M20	2,5	250	332	469	546
		1,5	172	229	322	375
	M22	2,5	307	415	584	682
		1,5	212	282	397	463
	M24	3,0	432	576	809	942
		2,0	322	430	603	706
	M27	3,0	640	740	1050	1250
		2,0	480	552	783	933
	M30	3,5	755	1000	1450	1700
		2,0	650	745	1080	1270
	M36	4,0	980	1290	1790	2020
		2,0	731	960	1340	1500

5.4. Securing bolts



If the plough body meets an obstacle, the securing bolt is shorn. After the plough is lifted for the screw replacement, the body will not return to its original position automatically. Rotate and position it accordingly. The tightening torque of the breakaway bolts should be in the range of 70–79 Nm.

5.5. Gauge wheel

Check the pressure in the wheel regularly. In case of significant air loss, check the air valve tightness. Next, have the wheel inspected by a specialised company to locate and repair the damage. Badly damaged tyres (especially damage to the tyre profile) must be replaced immediately.

Setting the bearing axial play.
Inspection and adjustment should be carried out every 2 years. It is recommended that this operation be performed by a specialised workshop. The recommended play is 0.12 - 0.15 mm. Procedure:

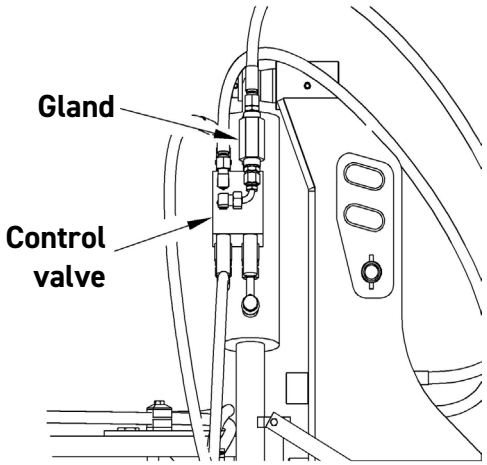
- Dismount the hub cover and the spring pin securing the castle nut.
- While rotating the hub, press and tighten the castle nut.
- Stop tightening when with a vigorous manual push there is no more than a half-turn of the hub.
- Loosen the nut partially until the hub can rotate freely and repeat the tightening step.
- After the repeated locking of the hub, loosen the nut a maximum 30° until the closest possibility to secure the nut with a cotter pin is found. Mark the position with a line.
- From the marked position unscrew the nut a half turn, and slightly tapping on the hub press the hub onto the nut as far as possible.
- Keep tightening the nut until it reaches the position marked with the line.
- Mount the hub cover.

CAUTION! During maintenance works the plough should rest firmly on the ground and be protected against tipping over.

5.6. Hydraulic system

Maintenance of the hydraulic system consists in visual inspections to prove leak tightness. Remember to insert pins into quick-fit connectors. If there is an oil leakage from connections of hydraulic hoses, the connector must be tightened. If the oil leakage is not remedied, replace the component or the hose with a new one. Mechanical damage also requires replacement of the component. It is recommended that the hydraulic hoses be replaced every 5 years.
If oil appears on the piston rod of the hydraulic cylinder, check for the nature of the

leakage. Check the sealing once the piston rod is fully moved out. Small leakage which results in covering the piston rod with an oil film is acceptable (damaged wiper seal). If the amount of oil is greater or there are oil drops, shut down the unit for the period required to repair the malfunction (damaged sealing).



The hydraulic system controlling the rotation is equipped with a gland controlling the rotation speed depending on the efficiency of the tractor's hydraulic system. During the first startup, turn the gland to a degree which precludes rotation almost completely. Then, gradually undo the gland until a satisfactory rotation speed is obtained. The control valve is factory set for proper rotation. Do not tamper with or disassemble the valve. In case of malfunction please contact the service agents.

If the components of the machine are disassembled several times, it is necessary to inspect and replace (if required) connecting components such as bolts, washers or nuts, excessive wear of which can lead to uncontrolled loosening of the connected components, and consequent damage to the same.

Work with extremely worn work tools can cause damage e.g. to other machine assemblies. Tools should be replaced when their wear and tear exceeds the limits allowed by the manual. Otherwise damage may occur, for which the manufacturer SHALL NOT BE HELD RESPONSIBLE!

6 Storage of ORKAN / ORKAN VARIO / ORKAN RESOR plough

The plough should be stored under a roofing. If there is no roofed space, external storage is permitted. **The plough should be stored in a location where it is not hazardous to people and the environment.** If the implement is stored outdoors for a long time, repeat the maintenance activities on the workpieces as soon as the preservative layer disappears. When unhitched from the tractor, the implement must be supported on a firm, level surface with a stable balance. All working units should rest on the ground. Lower the implement gently so that it does not come into contact with hard surfaces. When lowering the implement, unhitch the suspension system and drive away the tractor.

Store the machine firmly supported on a hardened firm surface so that no injury is caused to persons or animals.

7 Disassembly and withdrawal from service and scrapping

When operated in accordance with the guidelines in the instruction manual, the implement will have a long life; however, worn or damaged parts must be replaced. In the event of emergency damage (cracks and deformation of the frames) impairing the quality of the machine operation and posing a risk to its further operation, the machine must be withdrawn from service. Disassembly of the implement should be carried out by persons

who are familiar with its construction. These operations must be performed when the machine is placed on level, firm ground. Disassembled metal parts should be scrapped and plastic parts should be handed over to a disposal plant. Oil must be drained into a tight container and disposed of at a disposal plant.

CAUTION Take all precautions during the disassembly: use appropriate tools and personal protective equipment. Dispose of the disassembled parts in accordance with the environmental protection requirements.

8 Technical characteristics

Table 3. Technical specifications of the ORKAN and ORKAN VARIO plough

Type	Operating width	Frame bar	Ground clearance under frame	Distance between plough bodies	Number of plough bodies	Min. power demand	Weight
	cm	mm	cm	cm	pcs.	HP	kg
ORKAN 3+	90 - 150	120x120x8	82	102	3	90	850
ORKAN 3+1	120 - 200				4	110	1040
ORKAN 4+	120 - 200	140x140x10			4	110	1060
ORKAN 4+1	150 - 250				5	130	1300
ORKAN 3+ VARIO	90 - 150	120x120x8	82	102	3	90	1470
ORKAN 3+1 VARIO	120 - 200				4	110	1670
ORKAN 4+ VARIO	120 - 200	140x140x10			4	110	1770
ORKAN 4+1 VARIO	150 - 250				5	130	1968

Table 4. Technical specifications of the ORKAN RESOR plough

Type	Operating width	Frame bar	Ground clearance under frame	Distance between plough bodies	Number of plough bodies	Min. power demand	Weight
	cm	mm	cm	cm	pcs.	HP	kg
ORKAN 3+ R	90 - 150	120x120x8	82	102	3	90	1270
ORKAN 3+1 R	120 - 200				4	110	1520
ORKAN 4+ R	120 - 200	140x140x10			4	110	2070
ORKAN 4+1 R	150 - 250				5	130	2272

9 ORKAN, ORKAN VARIO, ORKAN RESOR ploughspare parts

In order to search, find prices and order original spare parts visit our website at www.mandam.com.pl, “parts” tab.

There you can find catalogues and spare part sheets in PDF format, containing current part drawings and diagrams for each machine or implement, together with part numbers and prices.

Purchase orders for parts can be placed or enquiries related to the same can be sent directly from this website (tab: “contact/order”), or sent to the following e-mail address: czesci@mandam.com.pl

A purchase order should contain part numbers and quantities, as well as details of the ordering party/payer together with a contact phone number.

The parts are sent directly to the specified address on the COD basis.

If in doubt, please contact Mandam Spare Parts Department at: +48 32-232-2660 extension 39 or 45 or at + 48 668-66-22-89 (mobile).

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