METAL-FACH

“KRUK” CULTIVATOR AND SEED DRILL
U710, U710/1, U710/2, U710/50

INSTRUCTION MANUAL

TRANSLATION OF THE ORIGINAL INSTRUCTION MANUAL

REVISION 2

29.02.2024

UE

U710-02-167/2013

EC DECLARATION OF CONFORMITY

The undersigned,	Jacek Kucharewicz, President of the Board,	
hereby declares, with full responsibility, that the complete machine:		
“Kruk” cultivator and seed drill		
1.1.	Brand(s) (manufacturer's registered trademark):	Metal-Fach
1.2.	Type:	U710
1.2.1.	Variant:	U710, U710/1
1.2.2.	Version:	
1.2.3.	Vehicle trading name(s) (if any):	U710, U710/1
1.3.	Category, subcategory, and vehicle speed indicator	S2a
1.4.	Company name and manufacturer’s address:	Metal-Fach Sp. z o.o. ul. Kresowa 62 16-100 Sokółka, Poland
1.4.2.	Name and address of the manufacturer's authorised representative (if applicable)	N/A
1.5.1.	The location of the manufacturer's rating plate	On the left side of the main frame
1.5.2.	The method used to fix the rating plate of the manufacturer:	Bonded
1.6.1.	The location of the vehicle identification number on the chassis:	On the right side of the main frame
2.	Machine-identification number:	

Complies with all the appropriate regulations of Directive 2006/42/EC and the Regulation of the Minister of the Economy dated 21st October 2008 on the principal requirements for machines (Journal of Laws of 2008, No. 199, item 1228, as amended)

The following harmonised standards were applied to assess the compliance.

PN-EN ISO 4254-1: 2016-02, PN-EN ISO 13857: 2010, PN-EN ISO 12100: 2012, PN-EN ISO 4413: 2011

and standards: PN-ISO 3600:1998, PN-ISO 11684:1998, and Regulation of the Minister of Infrastructure dated 31st December 2002, on technical conditions of vehicles and the range of their necessary equipment (Journal of Laws of 2003, No. 32, item 262, as amended).

Safety Testing Report No.: LBC/07/14

This EC Declaration of Conformity shall become null and void if the machine is modified or reconstructed without the Manufacturer's consent.

Sokółka
(Place)

17/04/2014
(Date)

Jacek Kucharewicz
(Signature)

President of the Board,
(Position)

EC DECLARATION OF CONFORMITY

The undersigned,	Jacek Kucharewicz, President of the Board,	
hereby declares, with full responsibility, that the complete machine:		
“Kruk” cultivator and seed drill		
1.1.	Brand(s) (manufacturer's registered trademark):	Metal-Fach
1.2.	Type:	U710
1.2.1.	Variant:	U710/2
1.2.2.	Version:	
1.2.3.	Vehicle trading name(s) (if any):	U710/2
1.3.	Category, subcategory, and vehicle speed indicator	S2a
1.4.	Company name and manufacturer’s address:	Metal-Fach Sp. z o.o. ul. Kresowa 62 16-100 Sokółka, Poland
1.4.2.	Name and address of the manufacturer's authorised representative (if applicable)	N/A
1.5.1.	The location of the manufacturer's rating plate	On the left side of the main frame
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and the following standards: PN-ISO 3600:1998, PN-ISO 11684:1998, and Regulation of the Minister of Infrastructure dated 31st December 2002, on technical conditions of vehicles and the range of their necessary equipment (Journal of Laws of 2003, No. 32, item 262, as amended).

Safety Testing Report No.: LBC/01/20

This EC Declaration of Conformity shall become null and void if the machine is modified or reconstructed without the Manufacturer's consent.

Sokółka
(Place)

12/02/2020
(Date)

Jacek Kucharewicz
(Signature)

President of the Board,
(Position)

Machine data

Type of machine _____

Trade name _____

Serial number/ VIN [1] _____

Machine manufacturer:

METAL-FACH Sp. z o.o.
16-100 Sokółka
ul. Kresowa 62
Phone: (0-85) 711 98 40
Fax: (0-85) 711 90 65

Seller: _____

Address: _____

_____

Phone/Fax.: _____

_____

Delivery date: _____

Owner or user: Last Name: _____

Address: _____

_____

Phone/Fax.: _____

[1] The data is located on the machine's rating plate located on the front part of the machine's main frame

Table of Contents

INTRODUCTION

The information included in the Instruction Manual is valid as of the date of its drawing up. The manufacturer reserves its right to make design changes to machines, and due to this, some values or illustrations might not correspond to the actual state of the machine supplied to the user. The manufacturer reserves its right to make design changes without amending these instructions. The Instruction Manual is part of the basic equipment of the machine. Before using the machine, the User is obliged to read the contents of this Instruction Manual and to comply with its recommendations. It will ensure a safe operation and a trouble-free machine operation.

The machine has been built in compliance with the standards in force and the current legal provisions. The manual describes the basic safety and operation rules for the U710 cultivator and seed drill.

The main obligations of the manufacturer are presented in the guarantee card, which includes the complete and currently-in-force regulations on the guarantee coverage.

If the information included in the Instruction Manual proves to be incomprehensible, you should address the Seller from whom the machine was purchased, or the Manufacturer directly, for assistance.

The spare parts catalogue functions as a separate list and is attached in the form of a CD during the machine purchase and also is available at the Manufacturer's web site: www.metalfach.com.pl

The Warranty Card, including the terms and conditions of warranty, is attached to this Instruction Manual as a separate document.

Manufacturer's address:

Metal-Fach Sp. z o.o.

ul. Kresowa 62

16-100 Sokółka

Contact:

Phone: (0-85) 711 98 40

Fax: (0-85) 711 90 65

The symbols used in these Instructions:

DANGER!

Hazard-warning symbol. This indicates the occurrence of a serious hazard condition, which, if not avoided, can result in death or serious injury. This symbol warns against the most-dangerous situations.

CAUTION

This symbol highlights very important information and recommendations. Non-compliance with the described recommendations can lead to serious damage to the machine, resulting from its incorrect operation.

WARNING

This symbol indicates the possibility of the occurrence of a hazard, which, if not avoided, can result in death or serious injury. This symbol indicates a lower level of risk of injury than the symbol including the word “DANGER”.

This symbol indicates useful information.

1. General description

1.1. Introduction

THIS OPERATING MANUAL IS PART OF THE BASIC EQUIPMENT OF THE CULTIVATOR AND SEED DRILL AND MUST BE AVAILABLE, WHEN OPERATING THE MACHINE, AT ALL TIMES.

The machine can only be operated by persons, who have read this Instruction Manual, are familiar with the design and operation of the cultivator, and also with the operation of the tractor it works with.

Read and follow all the information provided in this Instruction Manual, in order to operate the machine in a safe manner. Abiding by the guidelines provided in the Instruction Manual ensures safe operation for the User, and also prolongs the machine's life.

1.2. Identification of the cultivator and seed drill

Identification data of the cultivator is located on the rating plate attached to the main frame, on the right-hand side. The machine's VIN number is stamped on the rating plate and next to it, on the right side of the main frame.

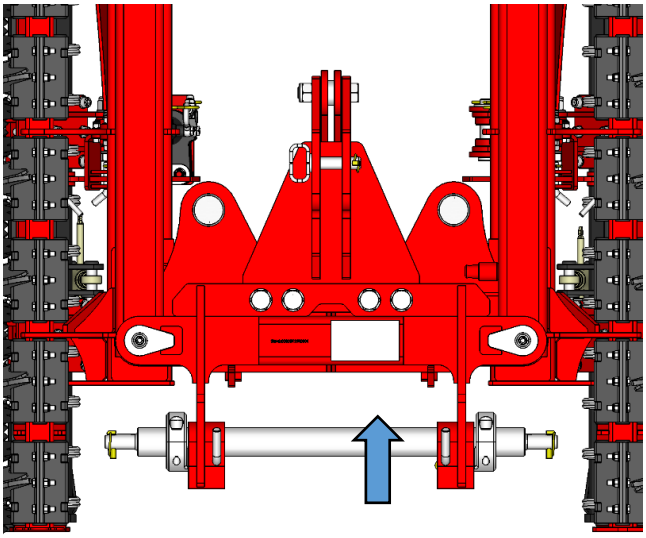


Fig. 1 Location of the rating plate and the VIN number on the machine

Please read the Instruction Manual carefully!

CAUTION

CAUTION!

It is prohibited to enter public roads without a rating plate or with an illegible rating plate.

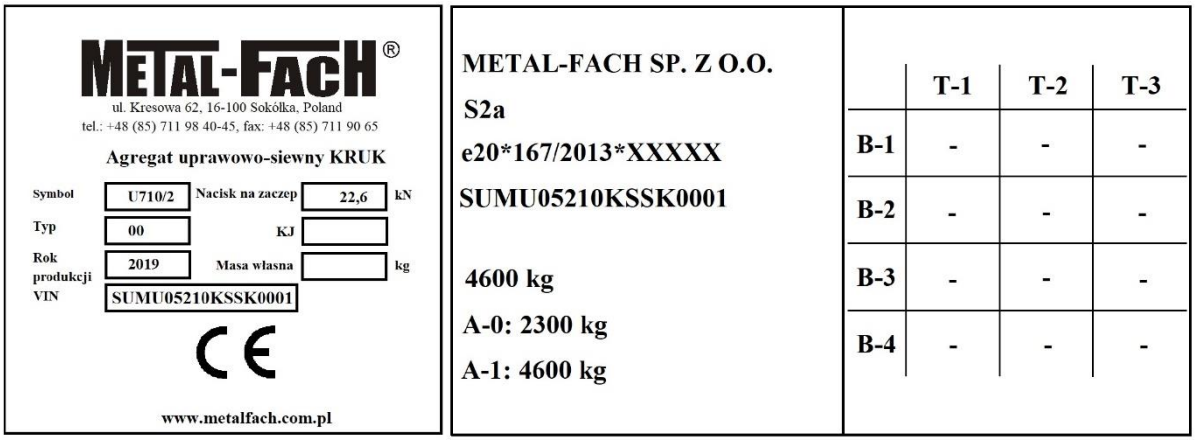


Fig. 2 Sample rating plate

Upon purchase, make sure that the VIN number printed on the machine's rating plate complies with the number specified in the Instruction Manual and on the Warranty Card.

It is often necessary to provide the cultivator's VIN number to identify the machine in an unambiguous manner, when ordering spare parts, or if any other problems arise. Therefore, it is advisable to write down the number provided below.

VIN number of the cultivator:

S	U	M								S	S	K				

Place 10 in the VIN number indicates the year of manufacture (according to the table below):

Table 1. Year of manufacture

Code	Year	Code	Year
P	2023	T	2026
R	2024	V	2027
S	2025	W	2028

CAUTION

CAUTION!

It is forbidden for the cultivator to be used by people, who have not read this Instruction Manual. The machine should only be operated by trained operators.

2. Intended use

The KRUK cultivator and seed drill is an all-purpose tool for cultivating the surface layer of soil, within the depth range of 5-15 cm. Its intended use is both post-harvest tillage, as well as pre-sowing after-harvest soil cultivation and after no-tillage cultivation, when vegetation residue are not covered, but mixed with the upper (surface) soil layer (the so-called mulching). It can be used on all the soil types, including also stony conditions, thanks to the overload protection of the discs (independent disc suspension). The harrow ensures that the soil is loosened and mixed, and also loaded and compacted, when working with the roller. Because of its high resistance to clogging, the harrow is excellent for the cultivation of high stubble after harvesting cereals and corn, and for cultivation of aftercrops for green manure.

The compact design of the cultivator and its working components ensures that its transport width does not exceed 3 m. The machine is equipped with a hydraulic or pneumatic braking system, which ensures a safe ride on public roads.

2.1. Proper use

The KRUK cultivator and seed drill can only be started, operated, and repaired by people, who are familiar with the operation of the machine and the tractor it is coupled with, as well as with the procedures concerning the safe operation of the cultivator.

The manufacturer shall not be liable for any unauthorised changes in the cultivator's design.

During operation use only factory-made parts produced by METAL-FACH.

CAUTION

CAUTION!

The cultivator and seed drill is intended for use in agriculture, exclusively. If used for purposes other than those specified in item 2, it will be considered as misuse. Failing to comply with the operating conditions recommended by the manufacturer, as well as with the service and maintenance requirements ensuring the proper technical condition of the machine, shall also be considered as misuse.

The manufacturer shall not be liable for any damage arising from improper use of the machine.

2.1.1. Incorrect and prohibited uses

The following uses are incorrect and prohibited:

- aggregation of the machine with tractors which do not meet the requirements specified in the manual (characteristics shown in Table 4);
- checking the technical condition and cleaning the machine while the tractor engine is running;
- using faulty hydraulic hoses;
- operation of the machine while under the influence of alcohol or drugs;
- working with a defective machine;
- leaving the machine unsecured on slopes;
- working on sloping terrain;
- entering the area between the tractor and the machine with the engine running;
- any other use of the machine not in compliance with its intended purpose.

3. Safety of use

3.1. Obligation to provide information

CAUTION

CAUTION!

If the cultivator is sold to other users, remember to attach the Instruction Manual, while the person receiving the machine must undergo training, according to the guidelines contained herein.

WARNING

WARNING!

Before starting to operate and use the machine, read this Instruction Manual, learn about the design of its assemblies, their functioning and adjustment ranges, paying special attention to the information regarding safety of operation.

It will be too late to do this during the operation!!!

3.2. General safety principles

The safety principles provided below refer to the cultivator. Notwithstanding, adhere to the general safety and accident prevention rules, as well as the road traffic rules.

When operating the cultivator and seed drill, follow all the recommended precautions, particularly the following:

- before each starting of the machine, make sure that the technical condition of the cultivator and seed drill and the tractor guarantee safe movement and operation;
- to ensure manoeuvrability, the cultivator must be connected with tractors fitted with a complete set of weights while the tractor's rear axle load cannot be too low, as it can lead to loss of stability and result in the tractor tipping over and, consequently, causing injury or death of the driver;
- follow the acceptable axle loads and transport dimensions;
- when connecting the machine with a tractor, extending and folding its working components, and when turning, make sure that there are no bystanders around, particularly children;
- never stand between the tractor and the machine, when the tractor engine is working;
- noise – equivalent A-weighted emission sound pressure level (LpA) is not above 70 dB;
- when connecting lines to the hydraulic system of the tractor, ensure proper connection of the sections, ensure that the hydraulic system is not under pressure, and check the position of the control lever of the tractor hydraulic system;
- start the devices controlled by the hydraulic system only when there are no persons within the range of their operation;
- inspect the hydraulic lines and tubes periodically, and replace with new ones if required;
- hydraulic lines must be changed every 5 years;
- pneumatic lines must be changed every 5 years;
- the actions of lifting, lowering, folding and extending, and starting the tractor to drive with the machine attached must be executed slowly and without any sudden jerks;

- never reverse the tractor or make turns, when the machine has been lowered to its working position;
- when turning, consider far-projecting components, do not apply independent brakes of the tractor;
- working on slopes exceeding 8.5% is not allowed;
- when operating the machine, there is a risk of a lightning strike;
- check tyre pressure in the tractor and in the cultivator;
- after the first hour of operation, check all connections, i.a. screw connections;
- standing and/or riding on the machine or loading it with additional weights is forbidden during transport and operation,
- carrying items on the machine that are not part of the machine is forbidden;
- perform all repairs, lubrication or possible cleaning of the working components during operation only when you have switched off the engine and unfolded the cultivator;
- detach the machine from the tractor, after you have positioned its working components on a level, hardened surface, unfolded the support foot and disconnected the engine;
- never leave the vehicle while its engine is running, before leaving the tractor cab, apply the manual brake, disable the engine and remove the ignition key;
- store the machine in the extended position;
- during stoppages, store the cultivator at sites without access for unauthorised persons or animals;
- persons under the influence of alcohol, drugs or medicines with narcotic effect are prohibited from operating the machine
- operation of the tractor with a coupled machine by persons who do not hold a relevant driving licence is prohibited;
- it is not allowed for unauthorised persons not familiar with this Instruction Manual to operate the machine;
- no bystanders are allowed during folding and extending the machine due to the hazard of being crushed by the machine components;
- during transport on public roads, follow the local traffic law provisions in force;
- when going on public roads, ensure you use the electrical lighting, check its good working order and visibility, keep it clean and mount a triangular board on the machine to indicate slow moving vehicles;
- adjust the transport speed to the surface condition and conditions on the road, do not exceed the speed of 30 km/h;
- do not leave the vehicle with the machine on a hillside or other sloping surfaces, without securing the vehicle from rolling down; apply the parking brake on the machine and place chocks under the wheels;
- prior to entering public roads, carry out visual inspection of the transported machine;
- during operation, use appropriate working clothes and footwear with non-slip soles;

WARNING

WARNING!

Failure to follow the rules defined above may be dangerous for the operator and bystanders and also cause damage to the cultivator and its working components.

The user is responsible for damage resulting from non-compliance with the above rules.

DANGER

DANGER!

It is strictly forbidden for any person to stay between the tractor and the cultivator, when the tractor's engine is operating.

WARNING

WARNING!

There is a risk of a lightning strike when working with the cultivator during a storm.

WARNING

WARNING!

There is a risk of the machine tipping over when driving on sloping or uneven ground.

WARNING

WARNING!

Always observe fire regulations and immediately eliminate any hazards occurring during machine operation or when stopped. There should be a fire extinguisher on the tractor.

3.3. Technical maintenance

Perform any technical service activities after you have lowered the cultivator to the ground. If the tractor is coupled with the machine, it must have the brakes enabled and the engine disabled.

To perform servicing, use tools and instruments that are in a good working condition, and only use original materials and parts.

The machine should only be operated by trained and properly qualified persons.

Use only common protections and cotter pins to secure pins that are components of the cultivator. Never use any substitute protections, such as bolts, rods or wires that may become a cause of damage to the tractor or the cultivator, resulting in hazardous situations during operation or transport.

3.4. Transport on public roads

Pursuant to the provisions regarding road traffic safety (Regulation of the Minister of Infrastructure, Journal of Laws, item 2022, dated 15th December 2016).

CAUTION

CAUTION!

The unit comprised of an agricultural tractor and an agricultural machine coupled with it must comply with the technical requirements regarding roadworthiness regulations.

WARNING

WARNING!

It is forbidden to drive the unit (tractor + machine) on public roads without suitable markings.

DANGER

DANGER!

Remember to connect the machine's braking system to the tractor's braking system. Before each new passage, check the condition of the braking system. A disconnected or defective braking system may prevent the tractor with the machine coupled to it from being slowed down sufficiently quickly. Consequently, an obstacle or other vehicle in front of the unit can be hit, which may result in injury or death of other road users.

Use only tractors that ensure sufficient braking force.

When driving the tractor coupled with the cultivator on public roads, follow all the provisions of the Highway Code in force for this type of vehicles, particularly the following:

- fold the cultivator to the transport position and secure it with a protective link - Fig. 4;
- when transporting the cultivator coupled to an agricultural tractor on public roads, the following is required:
  - marking with white-and-red-striped warning marker plates,
  - being fitted with lighting,
  - marking it with a triangular board indicating slowly moving vehicles,
- adhering to speed limits during transport, which are:
  - on smooth surface roads (asphalt), up to 30 km/h,
  - on farm or stone-paved roads, 6-10 km/h,
  - on potholed roads, up to 5 km/h.

  adjust the speed to the quality of the road and traffic conditions on the road.
- exercise special care during driving past and overtaking on bends (the long machine tail-swings on bends),
- do not exceed the maximum allowed terrain lateral inclination which is 8.5˚.

WARNING

WARNING!

Exceeding the maximum lateral inclination can cause the machine to tip over, which may lead to injury or death of the driver. When driving on uneven surfaces, reduce the driving speed.

CAUTION

CAUTION!

When driving on public roads, the accepted machine width is 3 m and the accepted height 4 m. Before driving on the road, fold the cultivator to its transport position. Remember to install all the transport protections.

CAUTION

CAUTION!

Before driving on public roads, the machine must be cleaned of soil and crop residues.

The U710/2 cultivator and seed drill requires folding of the disc end supports to the transport position (see item 9.4.2.) If the supports are not folded up, the cultivator will exceed the permissible transport height of 4 m. To fold the disc end support into its transport position, remove the pin, lift the support up, and secure it with the pin.

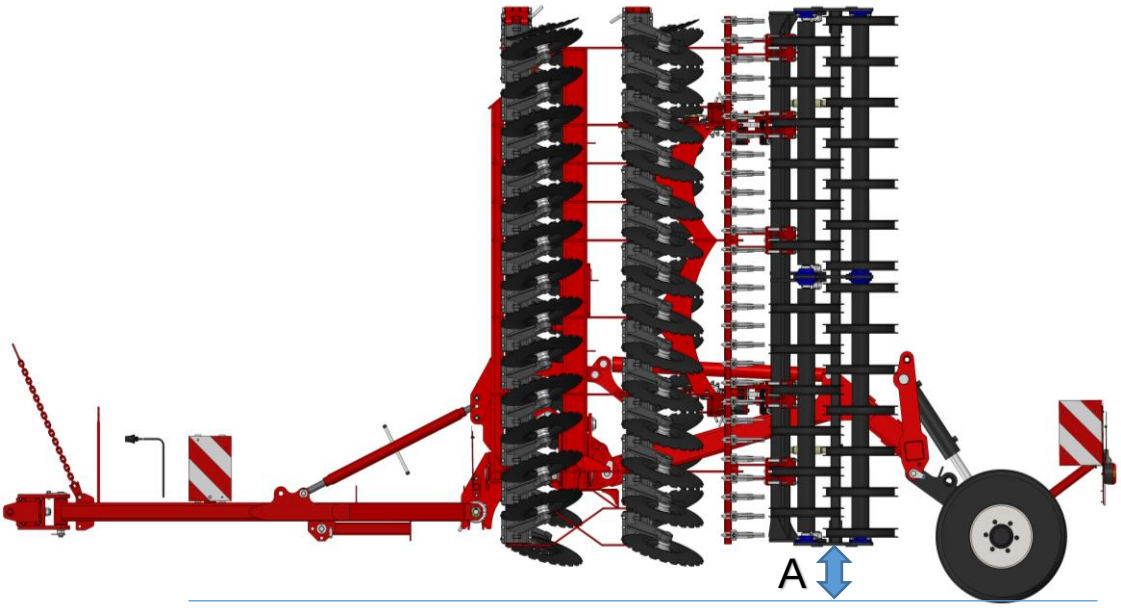


Fig. 3 Transport height

In the transport position, the distance [A] between the ground and the lower edge of the shaft frame must not exceed 350 mm (applies to the U710/2 cultivator - 7 m).

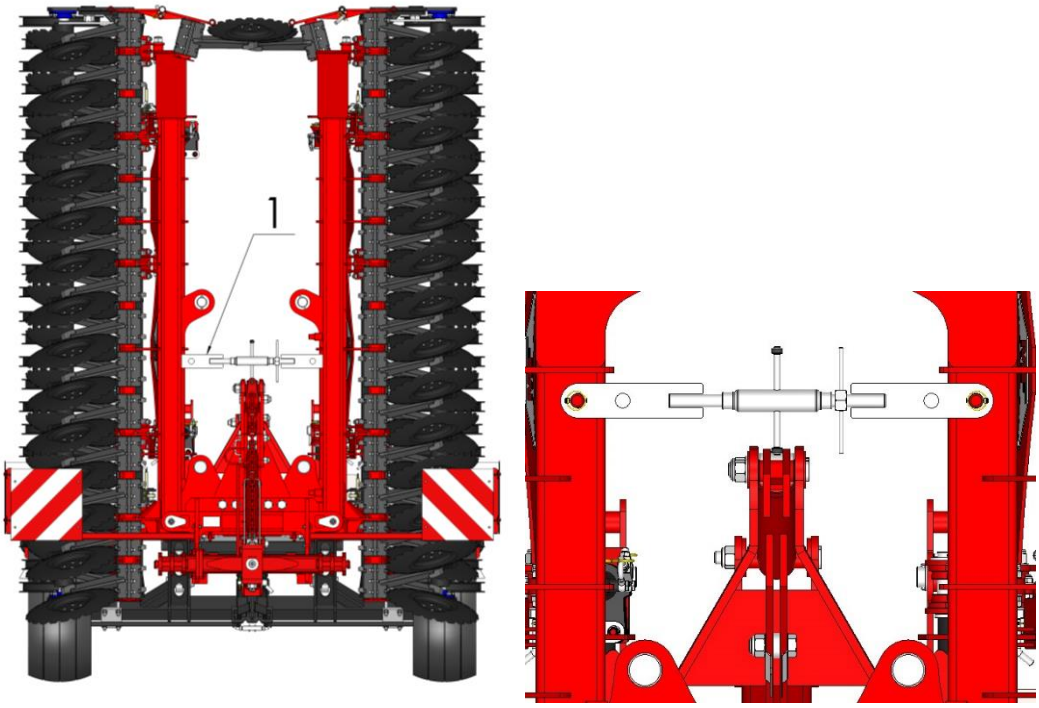


Fig. 4 Transport position with a connecting link

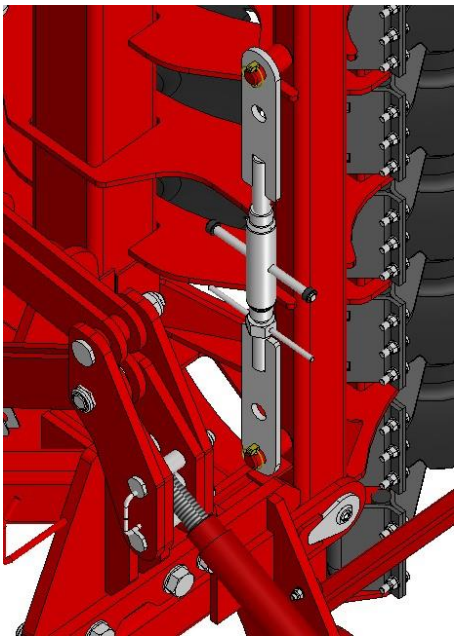


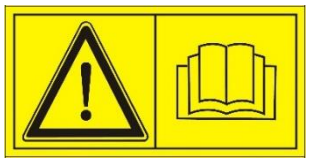
Fig. 5 Position of the connector during work.

3.5. Safety signs

Do not remove any warning signs or information located on the cultivator. They are intended for safe handling of the machine.

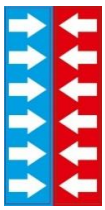
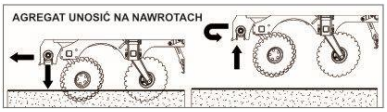
 CAUTION	CAUTION! The user of the machine must maintain the legibility of all warning information and symbols attached on the machine or its accessories, over the whole period of operation. If they are damaged or destroyed, replace them with new ones. New safety signs can be purchased from the machine manufacturer. The assemblies replaced during the repair works must be marked with safety signs recommended by the manufacturer.

Table 1. Safety symbols

No.	Safety symbol (sign)	Meaning of the symbol or content of the inscription	Location on the machine
1.	 1 pc. Size 100 x 50 Colour: yellow background, black symbols	Read the Instruction Manual.	On the front left section of the frame.

2.	 1 pc. Size 100 x 50 Colour: yellow background, black symbols	Switch off the engine and remove the key before maintenance and repairs.	On the front left section of the frame.
3.	 1 pc. Size 100 x 50 Colour: yellow background, black symbols	Keep a safe distance from the machine. Danger of crushing by the machine.	On the front left section of the frame.
4.	 pcs. 6 Size 100 x 50 Colour: yellow background, black symbols	Do not reach into the crushing area if the elements can move.	On the side arms of the cultivator.
5.	 3 pcs. Size 100 x 50 Colour: yellow background, black symbols	Keep a safe distance from the machine. Danger of crushing toes or a foot. – Force applied from the top.	On the front left section of the frame.
6.	 1 pc. Size 100 x 50 Colour: yellow background, black symbols	Keep a safe distance from power lines during operation.	On the front left section of the frame.

7.	 4 pcs Size 100 x 50 Colour: yellow background, black symbols	Crushing – side section of the cultivator.	On both sides of the cultivator, on the side arms.
8.	 1 pc. Size 100 x 50 Colour: yellow background, black symbols	Riding on the machine is forbidden, you may ride on the tractor passenger seat only.	On the front left section of the frame.
9.	 1 pc. Size 100 x 50 Colour: yellow background, black symbols	Stay clear of the area where the articulated coupling joints rotate, if the engine is running.	On the front left section of the frame.
10.	 4 pcs Dimensions: 50 x 50 Colour: white background, black signs	Pictogram marking the lifting points for loading the machine on transport means.	On the main frame, near the lifting eyes for transport.
11.	 38 pcs. Size: 35 x 25 Colour: white background, black signs	Lubrication point	At the main pivoting points and on the cylinders.

12.	 3 pcs. Size: 200 x 45 Colour: blue or red background, white arrows	Direction of oil flow.	On the hydraulic lines
13.	Maksymalne ciśnienie w układzie hydraulicznym - 16 MPa 1 pc. Size: 165 x 40 Colour: white background, black inscriptions	Maximum pressure in the hydraulic system.	On the front left section of the frame.
14.	 1 pc. Size: 260 x 70 Colour: white background, black signs	Lift the cultivator, when making turns.	On the front left section of the frame.
15.	 1 pc. Size: 260 x 70 Colour: white background, black signs	Working depth.	On the front left section of the frame.
16.	 2 pcs Size: 50 x 50 Colour: white background, black signs	Jacking points.	On the machine axis.
17.	 1 pc. Dimensions, dia. 150mm Colour: white background, black inscription, red rim	Speed limit.	At the rear of the machine.

18	 2 pcs. Dim. 300 × 50 Colour: yellow background, black lettering	Check tightness of disc hubs 300 Nm – SKF/350 Nm – NKE.	On the side wall of the unit frame, right and left side.
19	 pcs.1 Dim. 300 × 80 Colour: yellow background, black lettering	ATTENTION! Store the unit in the unfolded position.	On the front of the three-post frame.

4. Dismantling and Disposal

The cultivator and seed drill is made of materials that do not create any environmental hazards. After the end of its service life and further operation is not justified, the cultivator must be disassembled.

To disassemble the machine, use lifting devices, for example an overhead crane or a fork lift, since its components are heavy.

Send the metal parts to a scrap metal yard, and dispose of the rubber parts or send them to sites that are licensed to store such waste. Gather all the used oil from the hydraulic system in the leakproof containers and carry out the disposal.

CAUTION

CAUTION!

The disassembly of the machine must be carried out by those familiar with its design and operation. When disassembling (repairing), the general safety precautions for workshop work on agricultural equipment must be observed.

5. Signal lights

Prior to entering public roads, you should fit white-and-red-striped warning boards, which are fitted with marker lamps, and a holder for a board indicating slow-moving vehicles. Place a triangular board in the holder on the left side of the machine. Connect the power supply cable to the tractor's electric system and make sure that all lights operate properly.

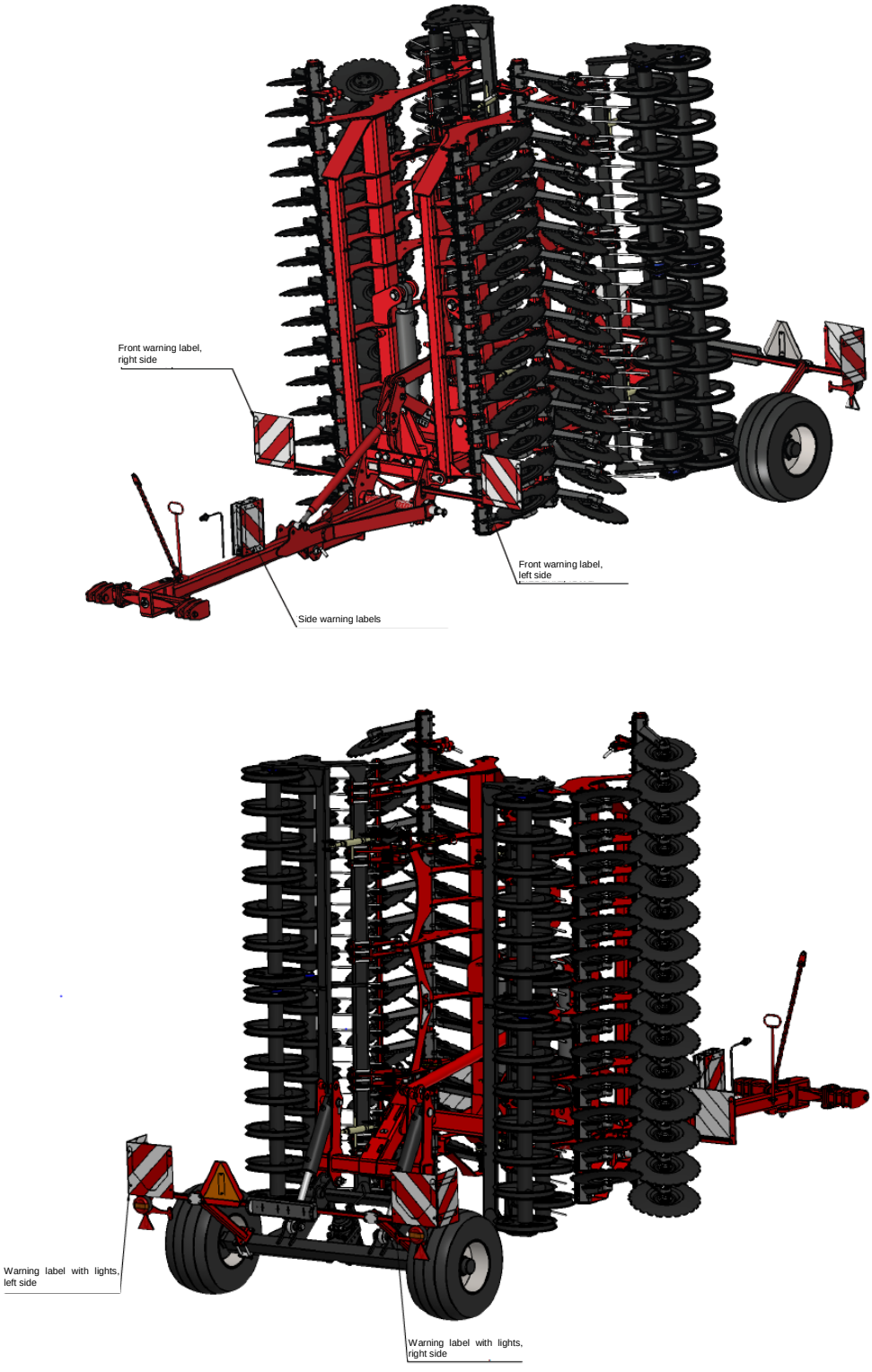


Fig. 6 Lights mounting on the cultivator

6. Design of the of the “Kruk” cultivator and seed drill

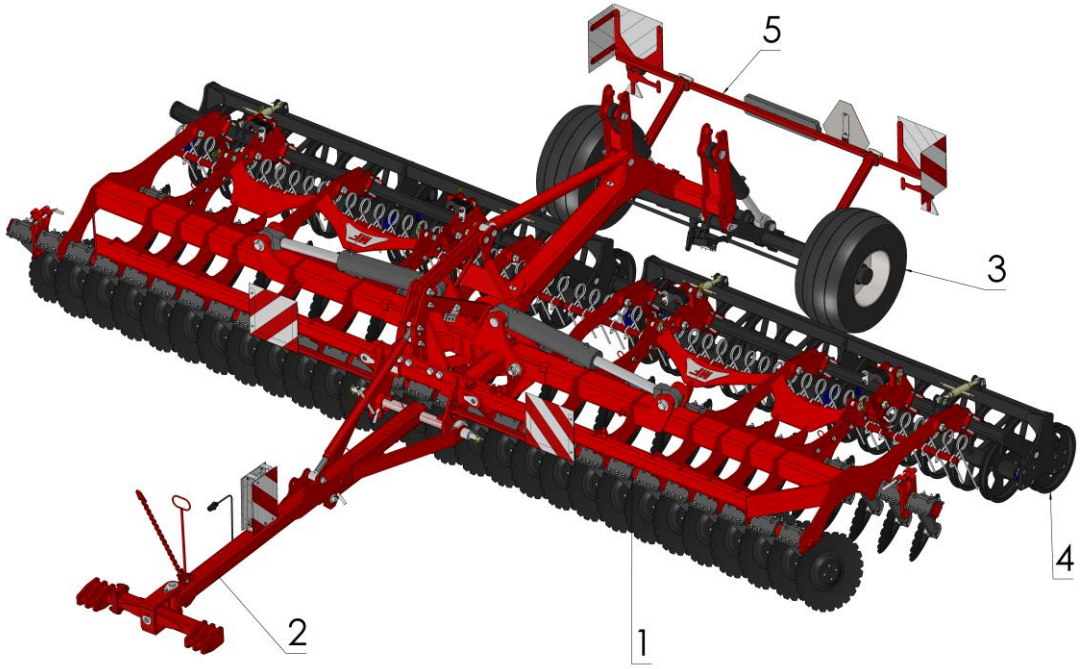


Fig. 7 Design of the “Kruk” cultivator and seed drill

1) Cultivator;
2) Hitch, complete;
3) Trolley, complete;
4) Shaft;
5) Lights;

6.1. Hydraulic system of the cultivator.

CAUTION

CAUTION!

The cultivator’s hydraulic system operates under high pressure. There is a risk of injuries from a high pressure oil stream or from burns caused by hot hydraulic oil. If injured due to high pressure or hot oil burn, seek medical help immediately.

CAUTION

CAUTION!

Before performing any work on the hydraulic system, disconnect the hydraulic hoses and deactivate the tractor's engine.

Carry out routine inspections of the hydraulic hoses and if any damage is found, replace them immediately with new ones that meet the technical requirements of the manufacturer.

This sign indicates the direction of oil flow (the piston rod slides into the cylinder)

This sign indicates the direction of oil flow (the piston rod slides out of the cylinder)

6.1.1. Diagram and design of the hydraulic system

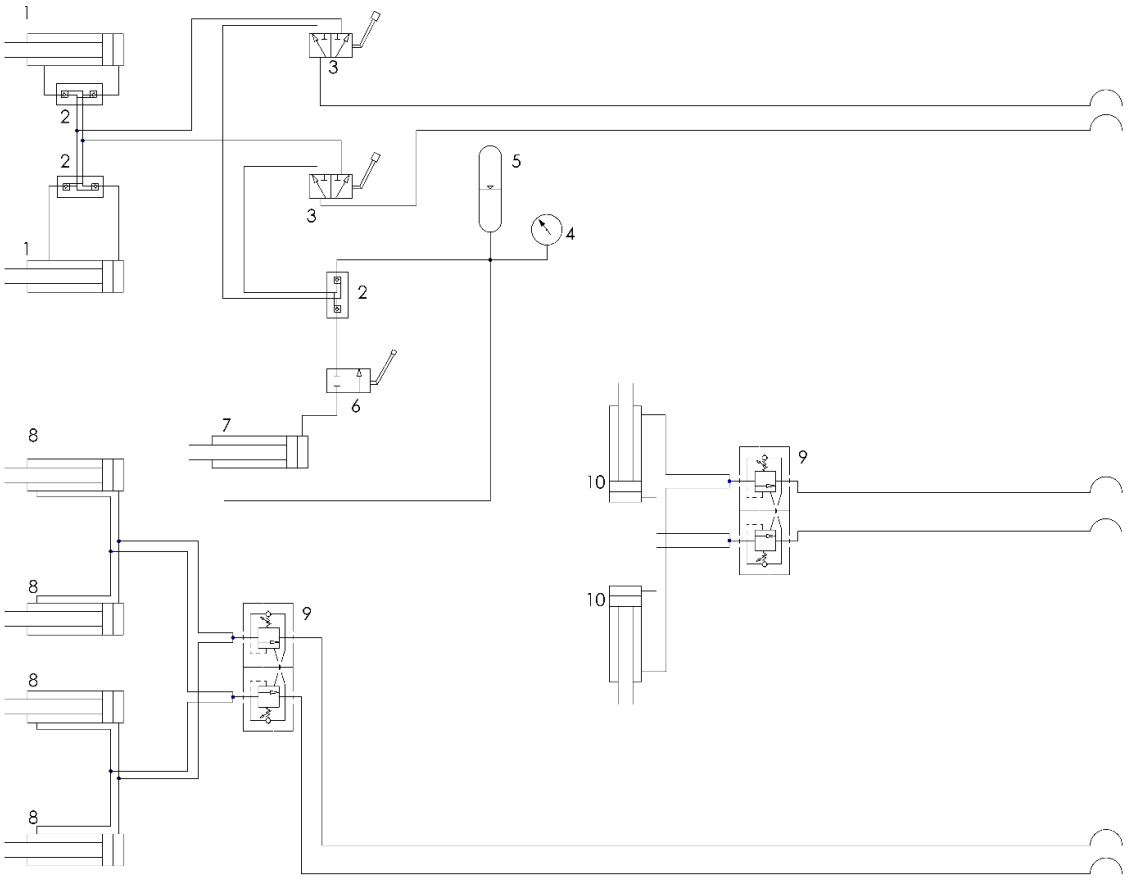


Fig. 8 Hydraulic system diagram

1) Trolley's lifting cylinder.
2) Controlled twin non-return valve .
3) Three-way ball valve.
4) Pressure gauge.
5) Hydraulic accumulator.
6) Two-way ball valve.
7) Connector's actuator.
8) Adjusting actuator for shafts.
9) Overload / block valve.
10) Arms' folding actuator.

6.1.2. Hydraulic system connection

- When connecting the hydraulic hoses, make sure you connect them to the tractor correctly.
- When connecting the hydraulic hoses, ensure that there is no pressure in the hydraulic system.
- Connect the hydraulic hoses in pairs to one control section; the pairs of hoses in one hydraulic section are marked with the same colour.

6.2. Braking system

The cultivator is equipped with a pneumatic braking system and a parking brake, due to the large kerb weight of the machine.

DANGER

DANGER!

It is forbidden to drive the cultivator on public roads with a defective or disconnected braking system!!! A defective or disconnected braking system can lead to a collision or accident. It may cause an injury or death of the driver or other road users.

CAUTION

CAUTION!

Remember to inspect the braking system before each starting of the machine. The braking system can only be repaired by a person trained for this purpose. Unauthorised repairing of the braking system is forbidden!!!

6.2.1. Description of the pneumatic braking system

The cultivator comes equipped with a two-line pneumatic braking system. The two-line braking system is compatible with the two-line pneumatic braking system in the tractor.

The braking system is started by the pneumatic braking system of the towing vehicle. Both brake lines, which link the towed vehicle with the towing vehicle. are equipped with filters. The red brake line supplies the cultivator's braking system with compressed air. The yellow brake line controls the braking force of the cultivator. The higher the pressure in the control line, the stronger the performance of the towed vehicle's brakes. The pressure in the control line increases along with the increasing pressure applied to the brake pedal in the towing vehicle. If the red brake line is disconnected from the towing vehicle, it activates the emergency brakes of the cultivator. Using the relief valve, you can relieve the locked brake. If the operating pressure falls below 3 bar, the relief valve button is automatically pushed upwards, and the brake is actuated.

6.2.2. Diagram and design of the pneumatic braking system

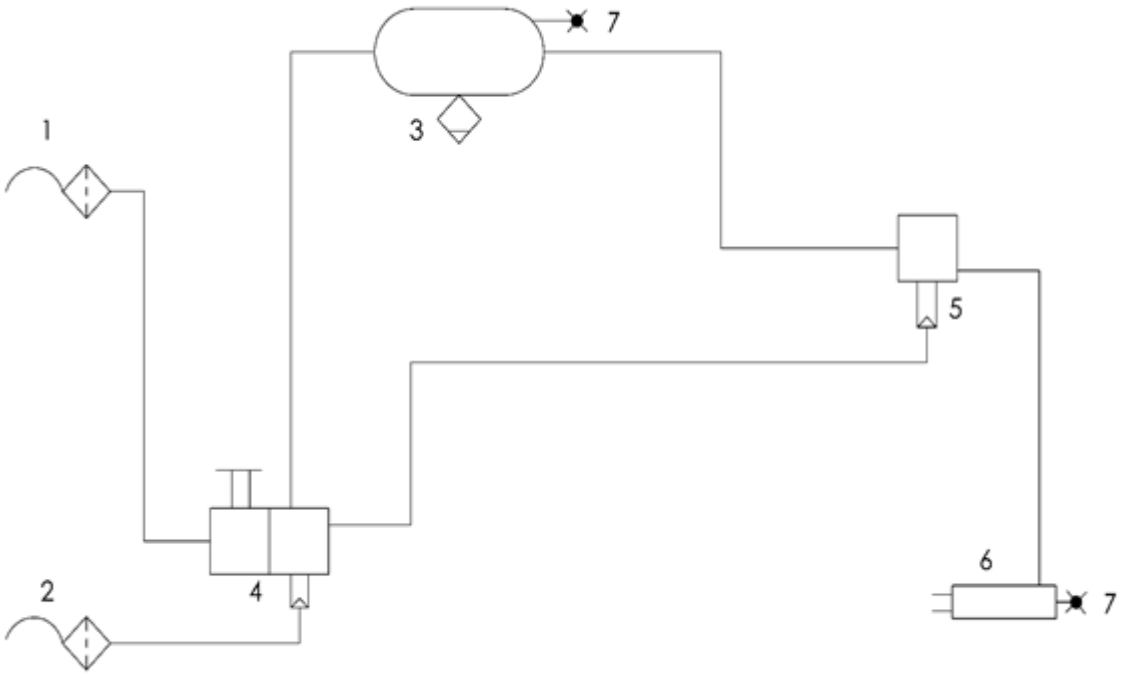


Fig. 9 Diagram of the pneumatic braking system

1) Hose coupling with filter, supply.
2) Hose coupling with filter, control.
3) Air tank with drainage.
4) Trailer brake valve with a brake release.
5) Relay valve.
6) Brake cylinder, membrane.
7) Inspection coupling.

6.2.3. Description of the hydraulic braking system

The machine's braking system is fitted with an automatic brake valve with an accumulator and a single-acting cylinder. The tractor connection is made by means of a double cord brake coupling and electrical connection that controls the valve function. The brake connector is connected with the automatic valve, by means of the main, auxiliary, and return lines. The accumulator is controlled by a hydraulic signal from the auxiliary line, and by the electro-hydraulic valve. If the signal from the auxiliary line or the electro-hydraulic valve is lost, the valve redirects the pressure from the accumulator to the brakes.

An electrical signal and presence of pressure in the auxiliary line of the tractor are required in order to apply brakes or release the parking brake. After disconnecting the machine from the tractor, it is possible to control the braking system with a handwheel on the automatic brake valve, and by means of the manual pump integrated with the valve. By pumping and setting the handlewheel in position 2, the pressure is released from the brake connector, which makes it possible to couple the machine (the machine's brake is still engaged). By pumping and setting the handlewheel in position 1, the pressure is released from the brakes, which enables the machine to move. Re-applying the brakes occurs when you set the hand wheel in

position 0. When driving coupled to a tractor fitted with a two-line braking system, set the handwheel to the valve in position 0. If the machine is coupled with a tractor fitted with a single-line braking system, the handwheel must be set in position 2 (by connecting the braking system to the tractor fitted with a single-line braking system, the braking system operates as both an emergency and service brake, but all other functions of the valve are lost). Position 1 is not used while driving.

6.2.4. Diagram and design of the hydraulic braking system

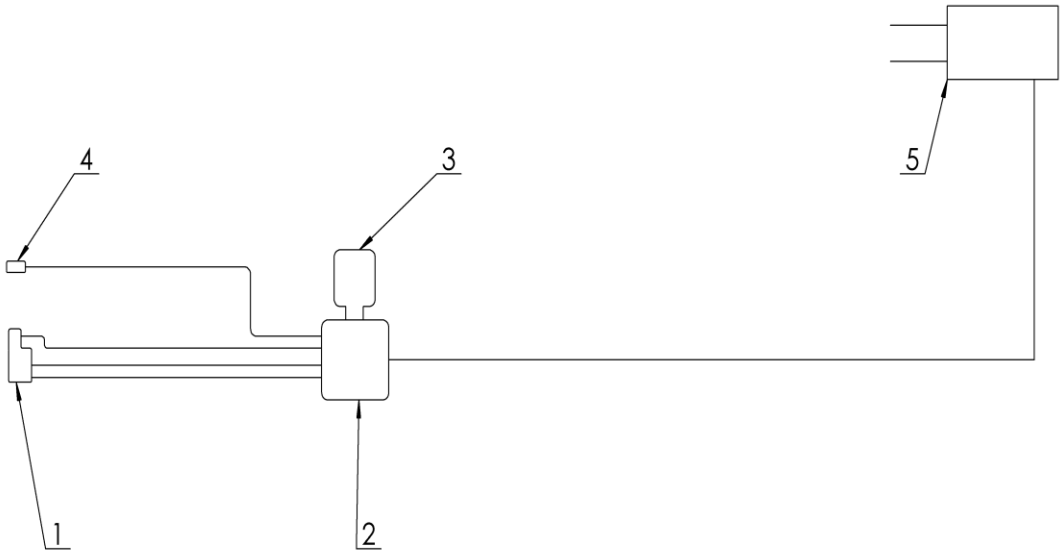


Fig. 10 Diagram of the hydraulic braking system

1) Connection of a two-line braking system.
2) Automatic brake valve with a manual brake release function.
3) Accumulator.
4) Electrical plug of the automatic brake valve.
5) Hydraulic brake cylinder.

6.2.5. Description of the parking brake

The disc cultivator comes equipped with a manually controlled parking brake.

The actuating component is a screwed slide connected with the brake levers. By turning the crank [1] counter-clockwise, the tensioning slide slides out [2]. By pulling out the tensioning slide, we can change the position of the brake levers [3] and actuate the parking brake. By changing the direction of turning the crank, the parking brake is released.

6.2.6. Design of the parking brake

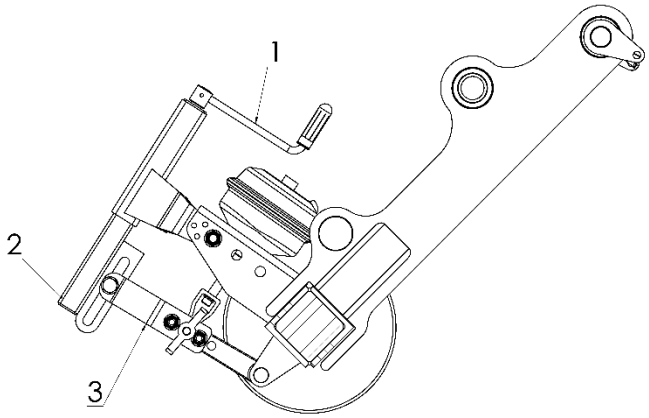


Fig. 11 Diagram of the parking brake assembly

1) Crank.
2) Tensioning slide.
3) Brake lever.

6.3. Electric system.

The cultivator comes equipped with a 12 V electric system. After connecting the power supply plug, make sure that all the lighting components operate correctly. The machine is fitted an electrical pin socket compliant with the ISO 1724 standard.

CAUTION

CAUTION!

No fuse repair is allowed. A short circuit in the electrical system may result in fire.

WARNING

WARNING!

Check the efficiency of the electric system and lights before each driving of the cultivator on public roads.

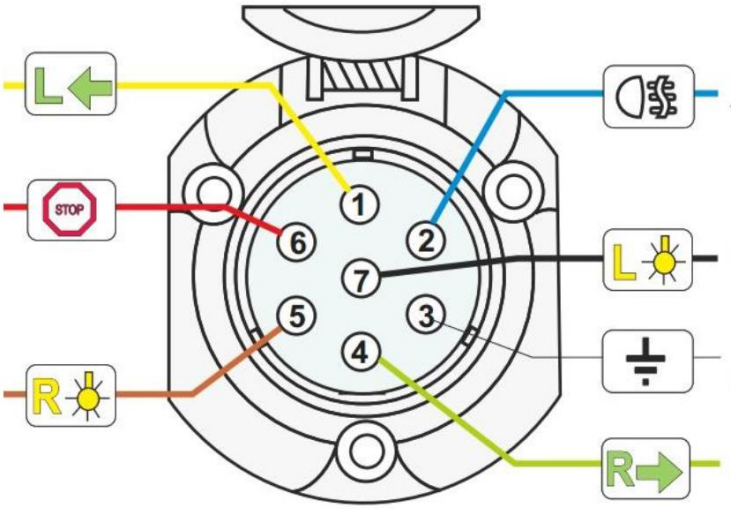


Fig. 12 Diagram of the electrical plug connection

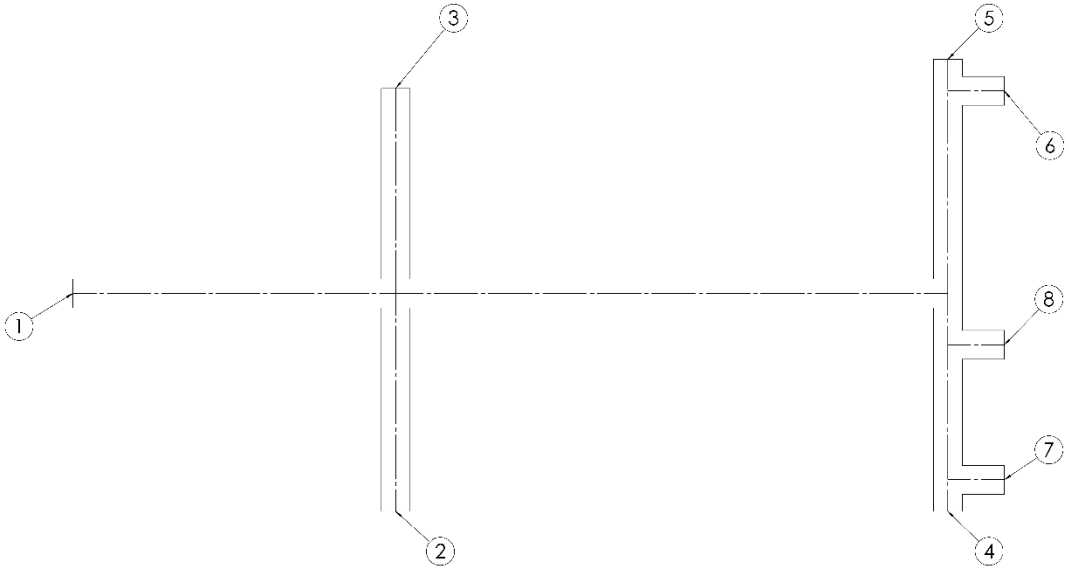


Fig. 13 Wiring Diagram

1) 7-Pin plug, according to PIN PN-ISO 1724,
2) Front marker lamp cluster, left side
3) Front marker lamp cluster, right side
4) Rear marker lamp, left side
5) Rear marker lamp, right side
6) Rear lamp cluster, right side
7) Rear lamp cluster, left side
8) Licence plate lights,

6.4. Tyres (ground wheels)

- When handling the tyres, make sure that the cultivator cannot move on its own.
- Any repair work on tyres and wheels should be carried out by skilled persons who are equipped with suitable tools.
- Check the air pressure regularly. Incorrect tyre pressure may result in faster tyre wear or tyre damage. (The maximum tyre pressure is shown on the outer flank of the tyre and in the “Tyre type” table).
- Tyres must be protected from sunlight over longer machine stoppages.
- Avoid driving on sharp edges.
  The tyres installed on the cultivator are shown in the table below.

Table 2. Tyre type of the cultivator

Tyre type / size:	**Maximum tyre pressure:**
Mitas 19.0/45-17	4.0 bar
Staco SG Flotation 480/45-17	3.2 bar

CAUTION

CAUTION!

It is not allowed to drive the cultivator if the tyre pressure is not correct or the tyres are damaged. Driving with damaged tyres may result in accidents. The maximum tyre pressure is given on the tyre external side. The value for tyre pressure may differ depending on the tyres used. Exceeding the recommended tyre pressure values may result in their damage.

CAUTION

CAUTION!

Inspect regularly the tightening of the wheel nuts.

Tighten the wheel nuts during weekly inspections, or after any play of the axle and rim connection is found. Wheel tightening torque 270 Nm

6.5. Anti-shock system

The anti-shock system is used to dampen vibrations of the cultivator during operation. Under certain soil conditions and at higher speeds, there is a risk that the cultivator will be subject to vibrations, which are transmitted to the tractor. Install an anti-shock system in place of the standard trolley connector, in order to dampen such vibrations. The hydraulic accumulator and properly adjusted oil pressure in the system ensure smooth operation of the cultivator, regardless of the conditions and speed of operation.

6.5.1. Design of the anti-shock system

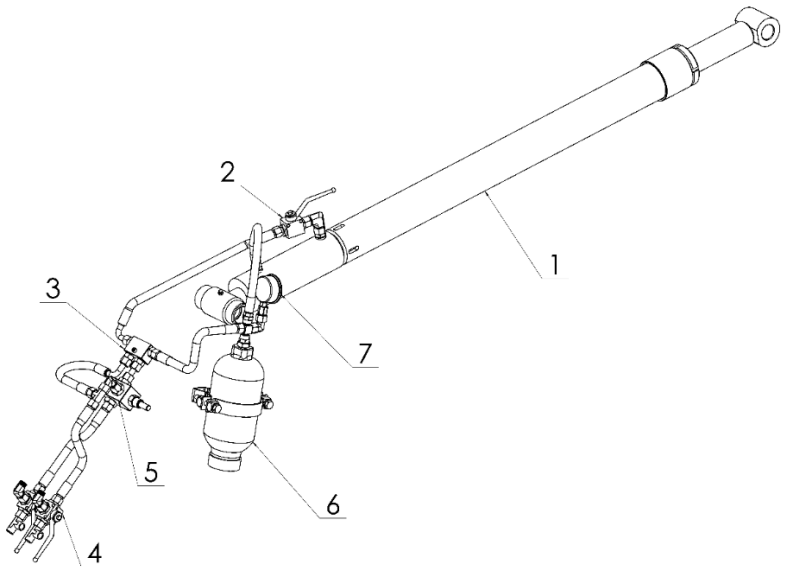


Fig. 14 Design of the anti-shock system

1) Connector to the actuator
2) Ball valve
3) Controlled twin non-return valve
4) Three-way ball valve
5) Overflow valve
6) Hydraulic accumulator
7) Pressure gauge

6.5.2. Anti-shock system adjustment

1. Tighten the screw in the cylinder's connector, so that the wheels do not roll on the ground, when the axle is raised to the working position.
2. Move the levers of the three-way valves to a position, in which it is possible to control the anti-shock system.
3. Push the piston rod out the cylinder by about 30 mm.
4. Close the ball valve on the cylinder.
5. Actuate the hydraulic section in the tractor and make the piston rod slide in, until the pressure gauge reads 120 bar.
6. If necessary, use the overflow valve to set the pressure to a pre-set value.
7. Move the lever of the three-way valves to the position, in which it is possible to control the lifting of the trolley's axle, by disconnecting the cylinder from the main hydraulic system.

7. Technical characteristics

Table 3. Technical specification of the tool carrier

No.	Parameters		Machine type			
			U710/1	U710/50	U710	U710/2
1	Machine type (configuration)		KRUK 4.5 m	KRUK 5 m	KRUK 6 m	KRUK 7 m
Dimensions and weights						
2	Dimensions in transport position L/W/H [mm] - suspended version - semi-suspended version, standard drawbar - semi-suspended version, LONG drawbar		2800/2650/3100 6150/2650/3070 7000/2650/3070	2800/2650/3350 6150/2650/3310 7000/2650/3310	2800/2650/3850 6150/2650/3810 7000/2650/3810	- 6150/2650/4000 7000/2650/4000
3	Dimensions in working position W/H/L [mm] - suspended version - semi-suspended version, standard drawbar - semi-suspended version, LONG drawbar		2800/5000/1550 6150/5000/1700 7000/5000/1700	2800/5500/1550 6150/5500/1700 7000/5500/1700	2800/6500/1550 6150/6500/1700 7000/6500/1700	- 6150/7500/1700 7000/7500/1700
4	Weight without roller [kg]		2620	2950	3060	3450
5	Wheels and tyres		480/45-17			
6	Wheel track [mm]		2300			
8	Load on the axle [kg]		3600	3750	4000	4600
9	Support load [kg]		1800	1870	2000	2300
10	Hitch category - suspended version - semi-suspended version		3 3 or 4N / fork version 3 or 3N			
11	Transport speed [km/h]		30			
Braking system						
12	**Service brake**					
	Type		mechanical, drum brake			
	Control		pneumatic or hydraulic (two-line)			
13	**Parking brake**					
	- type		mechanical, drum brake			
	- control system		manual, via crossed helical gear			
Electric system.						
14	Electric system.		12 V, from the coupled tractor			
Technical data depending on tool configurations						
15	Working width [m]		4.5	5	6	7
16	Number of working components [pcs]		36	40	48	58
17	Roller type [kg]	Tubular roller U-box roller Double U-box roller Packer roller DD-type heavy roller String roller V-ring roller FLEX type spring roller	2 x 300 2 x 360 2 x 470 2 x 420 2 x 470 2 x 350 2 x 320 2 x 410	2x340 - 2x520 - 2x540 2x400 2x350 -	2 x 380 2 x 460 2 x 610 2 x 530 2 x 600 2 x 430 2 x 400 2 x 520	2 x 450 2 x 600 2 x 750 - - - - -
18	Disc diameter [mm]		Ø560 / extreme Ø510			
19	Number of working component rows		2			
20	Number of scrapers [pcs]		34	40	48	56

21	Working depth range [cm]	from 5 cm to 15 cm			
22	Pitch between discs [mm]	250			
23	Working speed [km/h]	9-15	9-15	9-15	9-15
24	Effective capacity [ha/h]	4.0-6.5	4.5-7.5	5.4-9.0	6.0-10.0
25	Power requirement [kW] [HP]	 132-147 180-200	 140-162 190-220	 147-176 200-240	 206-250 280-340
26	Operation	Operator	Operator	Operator	Operator
27	Working depth adjustment	Hydraulic	Hydraulic	Hydraulic	Hydraulic
28	Clearance under the frame [mm]	575	575	575	575
29	Edge shields	Optional	Optional	Optional	Optional
30	Trolley weight - standard version [kg]	1400	1400	1400	1500
31	Trolley weight - LONG version [kg]	1500	1500	1500	1600
32	Lights - trolley version [kg]	110			
33	Lights - suspended version [kg]	90			

8. Delivery and loading on various means of transport

Depending on the means of transport used, the cultivator can be transported as a whole unit or partially dismantled. Use sections of the machine's frame marked with a relevant pictogram, as lifting points – see item 3.4. Use lifting equipment with sufficient lifting capacity for loading and unloading. The use of lifting equipment with insufficient lifting capacity can lead to an accident.

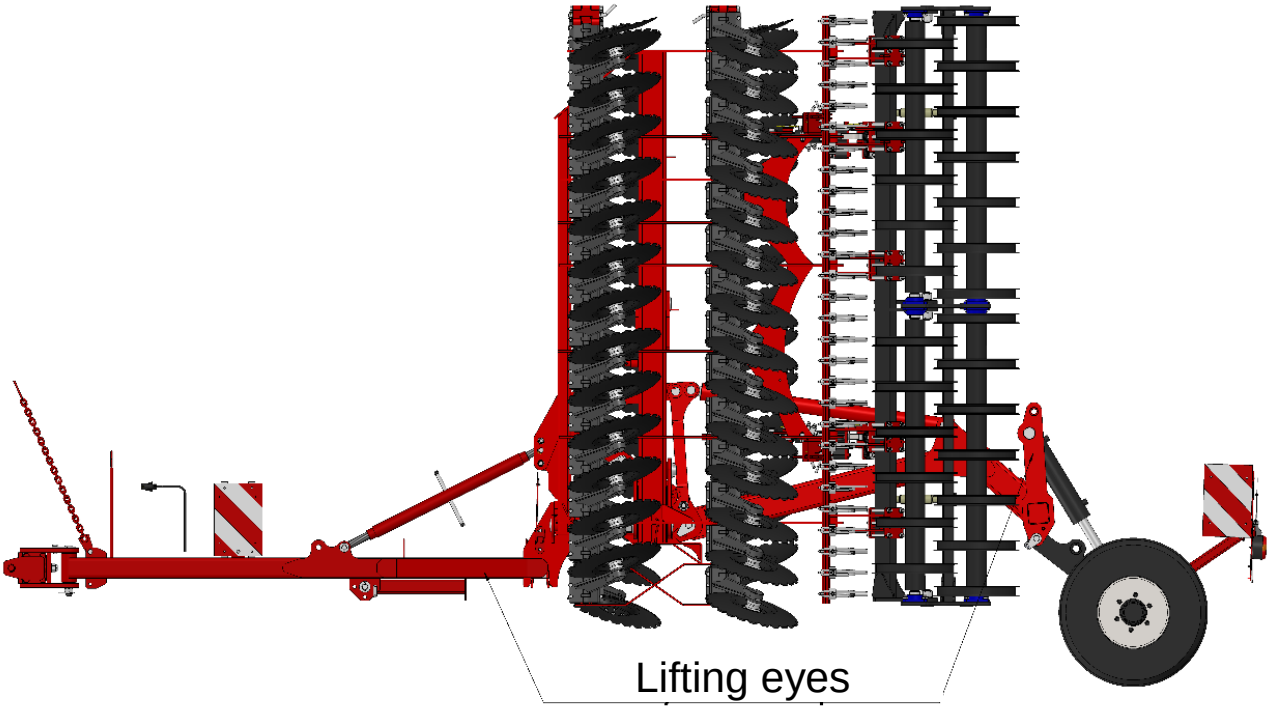


Fig. 15 Lifting eyes

9. Operation and use

9.1. Preparing the cultivator

When preparing the machine for operation, check its technical condition.

Additionally, do the following:

- Check the condition of the bolted joints – if loosened, tighten them, according to the table of torques (Table No. 8),
- Check the machine for completeness,
- Turn the discs and rollers manually to check if their rotation is free and uninterrupted,
- Lubricate relevant components, as per instructions given in item *Lubrication*,
- Check the condition of hydraulic lines,
- Check pressure in the cultivator's tyres,
- Check the condition of rotational component pins and their protections,
- Check the condition of the lighting system,
- Check the condition of the braking system,
- Check the condition of the coupling.

DANGER

DANGER!

When you prepare the machine for operation, follow the items above to check its technical condition. Operating a defective cultivator is a threat for the health and life of the operator and people in the vicinity of the machine.

Operation of a defective machine is forbidden!!!

The machine should only be operated by trained and properly qualified persons.

9.2. Requirements regarding the tractor

Mandatory components of the tractor:

- Two-line pneumatic or hydraulic braking system;
- Electric socket;
- Rear and front axle weights to ensure adequate stability;
- A hitch for coupling the machine;

Preparing the tractor:

- Check the pressure in the tractor’s tyres;
- Make sure that the tractor's suspension category is compatible with the suspension category of the machine;
- Set the tractor’s connecting links at an even height from the ground;
- Fit the front axle weights without exceeding the permissible tractor axle loads;

9.3. Coupling to the tractor

To ensure correct and safe coupling of the cultivator to the tractor, the latter must stand on solid and level ground.

CAUTION

CAUTION!
Each tractor must be equipped with a set of weights. 20% of the tractor's weight must be exerted on the front axle (see Item 13) for the tractor to maintain controllability.

CAUTION

CAUTION!
It is forbidden to stay between the machine and the tractor when coupling the tractor to the disc harrow.

9.3.1. The actions performed when coupling a semi-suspended machine to a tractor

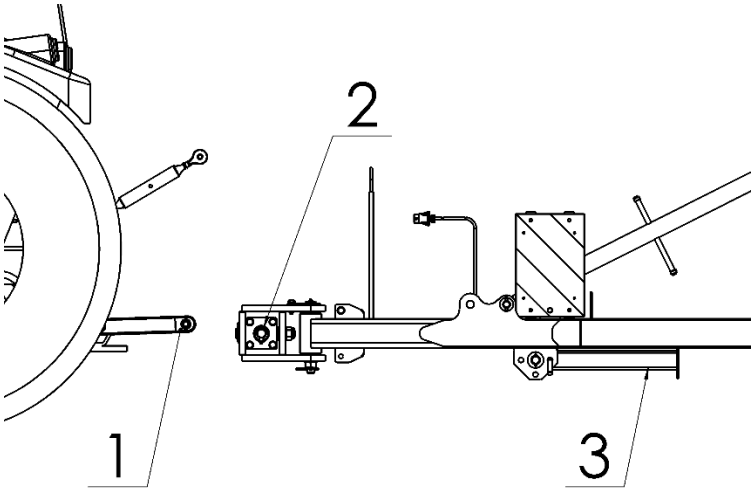


Fig. 16 Connecting the cultivator to the tractor (a semi-suspended version)

When connecting the cultivator to the tractor, perform the following actions:

- reverse the tractor to a distance that enables connecting the cultivator's hitch [2] to the lower connecting links of the tractor [1],
- connect the cultivator's hitch chain to the top mounting point of the connecting link on the tractor,
- connect the hydraulic lines of the cultivator to the tractor's external hydraulic system,
- lift the cultivator and fold up the support foot [3],
- check the hydraulic system of the cultivator for leaks; also, the hydraulic lines cannot be kinked or damaged,
- connect the cultivator's braking system and check it for proper operation,
- connect the cultivator's lights and check them for proper operation,

9.3.2. The actions performed, when coupling a suspended machine to a tractor

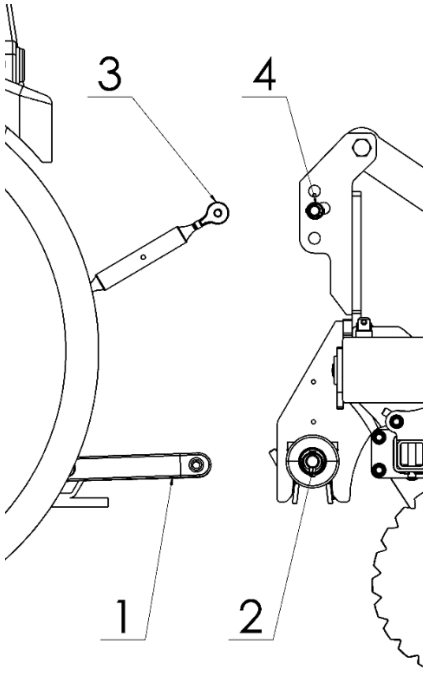


Fig. 17 Connecting the cultivator to the tractor (a suspended version)

When connecting the cultivator to the tractor, perform the following actions:

- reverse the tractor to a distance that enables connecting the cultivator's drawbar [2] to the lower connecting links of the tractor [1],
- use the pin [4]to connect the upper link [3] to one of the three holes in the machine,
- connect the hydraulic lines of the cultivator to the tractor's external hydraulic system,
- check the hydraulic system of the cultivator for leaks; also, the hydraulic lines cannot be kinked or damaged,
- connect the cultivator's lights and check them for proper operation.

9.4. Folding and unfolding the cultivator

WARNING

WARNING!

Before you unfold the machine, make sure that there is enough space for safe unfolding of the cultivator.

Carry out unfolding the cultivator to the working position only when the machine is coupled with a tractor.

CAUTION

CAUTION!

When folding and unfolding the cultivator, bystanders are not allowed near the machine.

CAUTION

CAUTION!

Carry out machine folding and extending on a solid, level and horizontal surface. Performing the above-mentioned activities with the cultivator on a slope may result in unfolding of only one working section, which may cause the machine to tip over.

CAUTION

CAUTION!

Remember to secure the arms with locking pins, each time you fold the cultivator – see Fig. 4. Failure to secure the cultivator in the transport position may cause the side arms of the machine to fold out. It may lead to accidents where other road users may die.

9.4.1. Hazard zones during folding and unfolding the cultivator

DANGER

DANGER!

Bystanders in the risk zones are not allowed during folding and unfolding of the cultivator, as there is a risk of crushing by the working sections. Standing in this zone is a hazard to health or life!!!

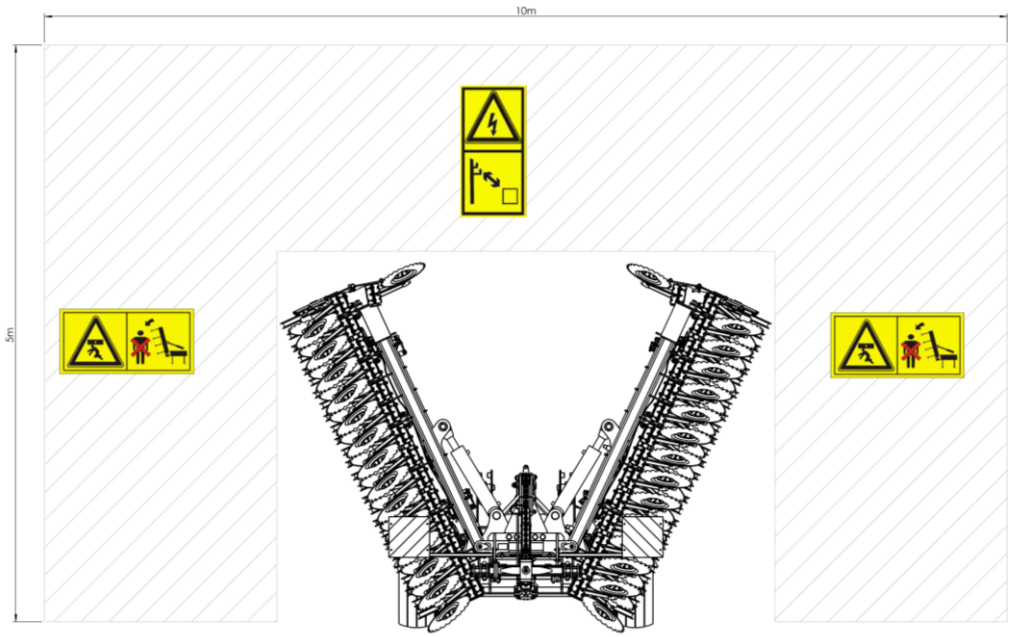


Fig. 18 Danger Zones

9.4.2. Folding the cultivator in the transport position

CAUTION

CAUTION!

Before starting to fold the cultivator up to the transport position, make sure that there is sufficient space to fold the machine safely.

The actions performed, when folding the cultivator:

1. Lift the cultivator on the transport trolley.
2. Lift the cultivator on a three-point linkage.
3. In the case of the U710/2 cultivator (7 m), fold the outer disc supports to their transport position.
4. Activate the folding section of the side arms and fold the cultivator to its transport position.
5. Use the connecting link to secure the cultivator against uncontrolled folding out – see Fig. 4.

9.4.3. Unfolding the cultivator to the working position

CAUTION

CAUTION!

Before starting to unfolding the cultivator to the transport position, make sure that there is sufficient space to fold the machine safely.

The actions performed when unfolding the cultivator:

1. Dismantle the protective link and put it on the side arm – see Fig. 5.
2. Activate the folding section of the side arms and unfold the cultivator to its transport position.
3. In the case of the U710/2 cultivator (7 m), unfold the extreme disc supports to their transport position.
4. Lower the cultivator on the transport trolley.
5. Lower the cultivator on a three-point linkage.

9.4.4. Folding and unfolding the disc extreme support

The extreme disc support of the U710/2 cultivator must be folded up to the transport position, otherwise the height of 4 m could be exceeded.

Folding the extreme support:

1. Remove the safety pin [1].
2. Lift the extreme disc support [2] and put it in the transport position.
3. Secure the disc support [2] against uncontrolled unfolding by inserting the pin [1] in the hole [3] and secure it with a cotter pin.

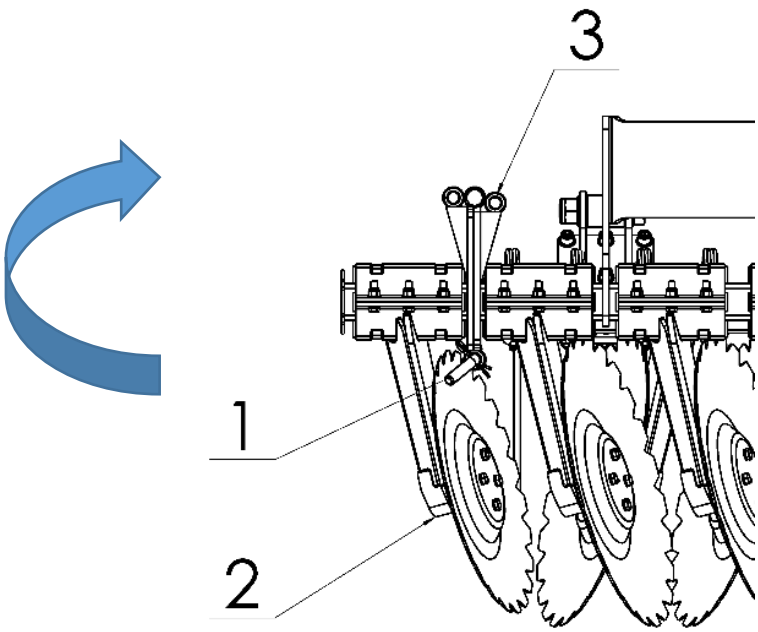


Fig. 19 Folding the extreme support

To achieve the full working width of the U710/2 cultivator, unfold the extreme disc support to the working position.

Unfolding the extreme support:

1. Remove the safety pin [1].
2. Lower the extreme disc support [2] and put it in the transport position.
3. Secure the disc support [2] in the working position. Insert the pin [1] into the hole [3] and secure it with a cotter pin.

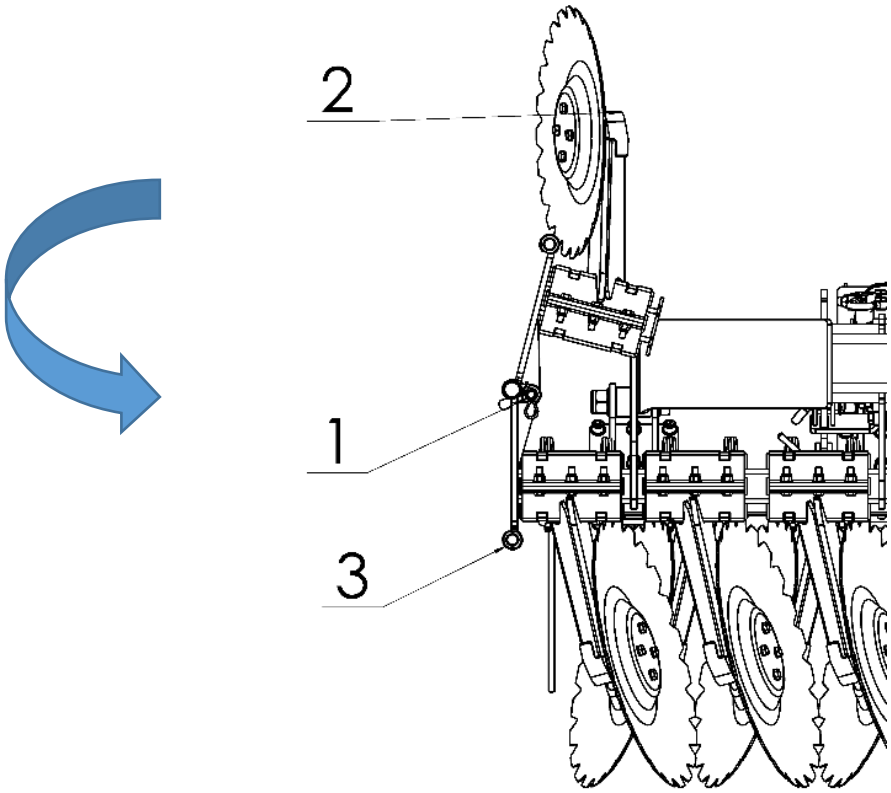


Fig. 20 Unfolding the extreme support

10. Operating the cultivator

10.1. Operating the cultivator in the field

Before starting to operate the cultivator in the field:

- remove the connecting link - Fig. 4-5,
- unfold the cultivator to the working position – see item 9.7,
- unfold the extreme disc supports (U710/2 cultivator),
- lower the tractor's jack,
- lift the chassis up as much as possible, so that the wheels do not come into contact with the ground.

During the first run, adjust the working depth and level the cultivator. The cultivator's frame is correctly levelled when it is parallel to the surface of the field.

If the cultivator gets clogged with excessive amount of vegetative residues, during operation, use the tractor's hydraulic lift to raise the cultivator, while driving, to clean it.

CAUTION

CAUTION!

Avoid sudden jerks during the cultivator's operation.

When driving on slopes, exercise caution and drive carefully – the cultivator must always be supported by the tractor's three-point linkage and wheels of the cultivator.

Do not reverse or make U-turn with the cultivator deep in the ground, as it could damage the machine.

10.2. Adjusting the working depth and position of the scrapers

Adjust the working depth of the scrapers by means of the pins [1] fixed in the proper holes of the plough standards, securing them with cotter pins. The angle can be adjusted with the lower pins [2] that fix the scrapers.

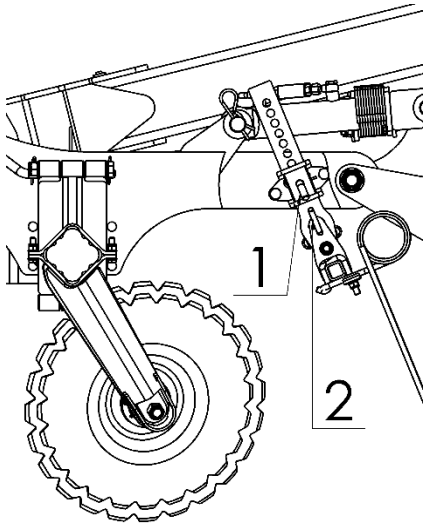


Fig. 21 Adjusting the position of the scrapers

Make adjustments after stopping the tractor's engine and follow all the safety rules. Use special care when working with components that could crush feet or hands.

10.3. Roller adjustment

The working depth is adjusted by configuring the compaction roller and the three-point linkage of the tractor. The position of the roller is adjusted by means of the hydraulic cylinders [A] and retaining pawls [B]. The retaining pawls allow you to set the same position for the hydraulic cylinders.

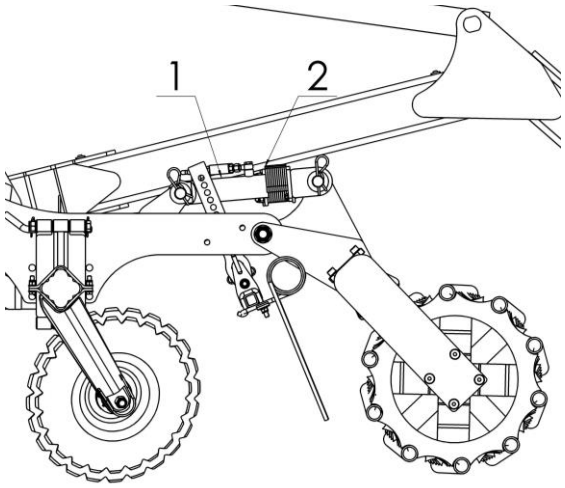


Fig. 22 Roller adjustment

10.4. Drawbar adjustment

The height of the machine's hitching points [2] must be adjusted, depending on the type of the tractor and the adjusted height of the pulling links [1]. Adjust the height of the hitching points [2], using the adjusting screw [3]. Shortening the screw lifts the drawbar, while it extending lowers the drawbar

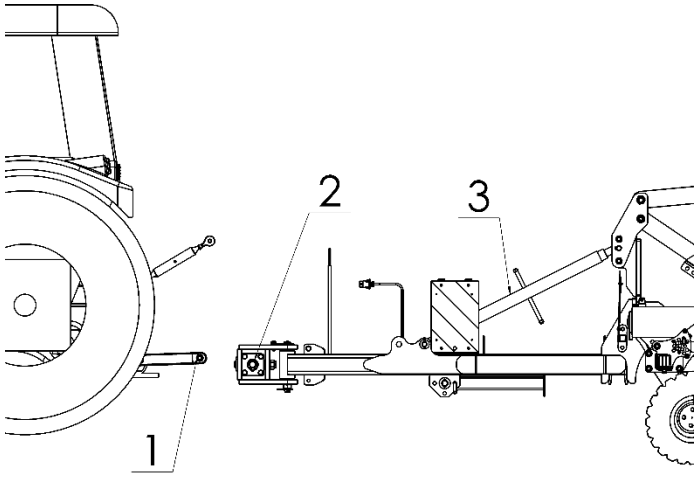


Fig. 23 Drawbar adjustment

11. Service activities

CAUTION

CAUTION!

Inspection activities regarding the cultivator. Use spare parts recommended by the manufacturer only.

The machine should only be operated by trained and properly qualified persons.

It is recommended that the machine is repaired by the technical service of the manufacturer or by a qualified service centre for agricultural machinery.

WARNING

WARNING!

Carry out the servicing activities when the machine is in the unfolded position. Carrying out the servicing activities in the transport position may lead to uncontrolled unfolding of the cultivator, and consequently, to bodily injury or death.

11.1. Servicing activities during start-up

The servicing activities during start-up are described in the table below.

Table 4. Servicing activities during start-up

Inspected assembly	**Activity**
Wheels and tyres	Check the tightening of the wheel nuts, according to the tightening torque table. Check the tyre pressure.
Thread connections	Check the tightness of bolts and nuts, according to the tightening torque table.
Transport protection components	Check the condition of the locks and pins securing the machine against uncontrolled unfolding.
Braking system	Check the braking system for proper operation and air-tightness.
Hydraulic system	Check the proper operation of the hydraulic system. If you find any leaks at the connections, tighten the nuts of hydraulic hoses.

11.2. Service activities during daily operation

The servicing activities during daily operation are described in the table below.

Table 5. Servicing activities during daily operation

Inspected assembly	Activity
Wheels and tyres	If the wheel nuts are loose, check the nut pins for damage. Tighten the wheel nuts with a torque wrench, to 270 Nm. Check the condition of tyres for damage. Check the tyre pressure. The correct values of the tyre pressure are provided in the Instruction Manual and on the side flanks of the tyres.
Threaded connections	Check the condition of the bolted joints and if any play is found, tighten them, according to the bolt torque table.
Braking system	Check the condition of brake hoses and couplers. If they are damaged, replace with new ones.
Hydraulic system	Check the condition of the hydraulic hoses and connections for damage and leaks. If they are damaged, replace with new ones.
Transport protection components	Check the condition of the locks and pins securing the machine against uncontrolled unfolding.
Working tools	Check the condition and completeness of the working tools. Replace worn or damaged working components with new ones.
Bearing units	Check the condition of bearing unit housings and replace as required.
Lighting	Check the technical condition and operation of lights.

11.3. Weekly service activities

Table 6. Service activities

Inspected assembly	Activity
Wheel nuts	Tighten the wheel nuts, according to the bolt torque table.
Threaded connections	Tighten the bolts and nuts, according to the bolt torque table.
Braking system	Check the condition of lines and of the working and control components of the braking system (pneumatic or hydraulic brake). Use the drain valve to drain water from the compressed air tank (pneumatic system). Check the technical condition of the parking brake system.
Bearing units	Check and lubricate all bearing units, cylinders, and upper connecting rods.

11.4. Lubrication

CAUTION

CAUTION!

Carry out lubrication according to the recommended lubrication frequency depending on the point of lubrication.

Durability and good working order of the cultivator depends primarily on systematic lubrication.

Use mineral greases for lubrication. Before applying the grease, clean the lubrication points. Carry out lubrication as per Fig. 24.

Use ŁT-4S-3 grease.

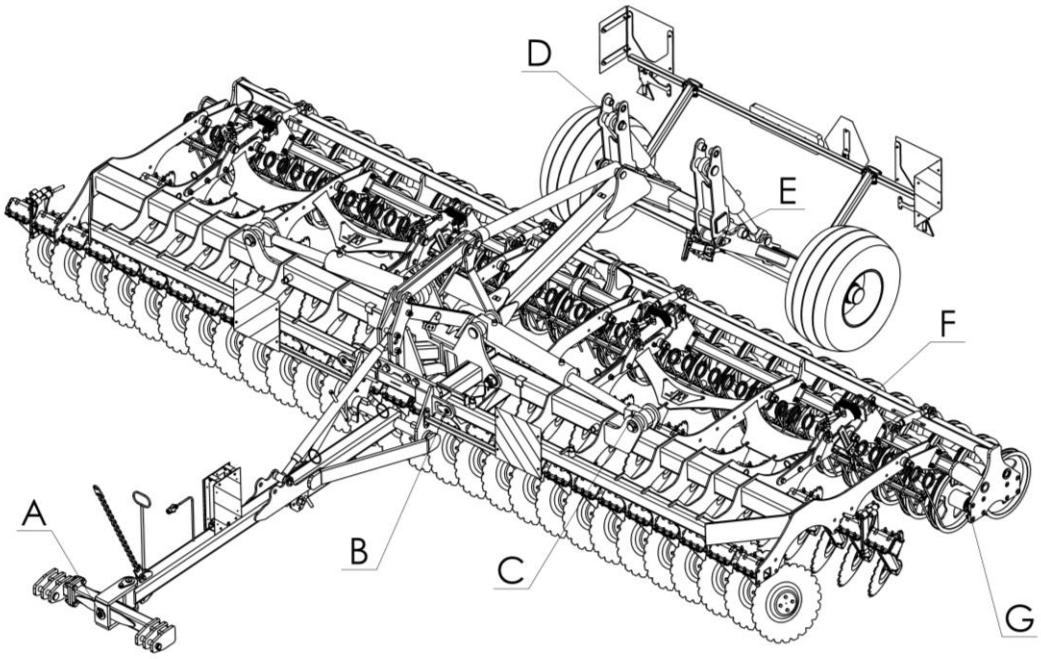


Fig. 24 Lubrication points on the cultivator

Table 7. Frequency of lubrication

Lubrication point	Number of lubricating points	Working time (h)				After the season	Before the season
		10	20	50	100		
A	2			x		x	x
B	4		x			x	x
C	4			x		x	x
D	4			x		x	x
E	2			x		x	x
F	8				x	x	x
G	4/8*/16**			x		x	x

** applies to a 3.5 m U-box roller

** applies to a 3.5 m double U-box roller

Before long-term storage, clean the cultivator and remove any faults found. Protect it from the adverse weather conditions. Store the cultivator in the extended setting on level compact ground.

11.5. Adjustment of the braking system

Adjust the brakes, when:

- excessive play forms between the brake lining and the drum, which reduces the brake performance, resulting from wearing out of the brake shoes;
- the brakes are applied non-uniformly.

You can adjust the play with the pusher rod of the brake cylinder or by shifting the lever of the brake expander. Carry out the adjustment for both wheels.

If the adjustment of friction components is carried out correctly, the wheel should rotate freely, without stoppage or evident resistance resulted from friction of the brake shoes against the drum. Slight friction of the shoes against the drum in a new machine or after brake replacement is a typical occurrence.

11.6. Wheel dismounting and mounting

CAUTION

CAUTION!

Carry out the dismounting and mounting on a solid and level surface. Lifting the machine on inclined terrain may cause the cultivator to tip over. Never place any items between the lift and the jacking point in the machine (Fig. 25). Never walk under the machine if it is lifted!!!

The lifting capacity of the lift must be adequate to the machine.

Before starting to lift the machine, disable the tractor's engine, apply the parking brake in both the tractor and the cultivator. Prop the wheels on the ground with chocks. Place the hydraulic lift at the places for lifting the machine, which are shown in Fig. 25. Loosen the wheel nuts counter-clockwise by half a turn. Lift the machine so that the wheel has no contact with the ground. Unscrew the nuts and dismount the wheel. When mounting the wheel, ensure that you embed the rim on the axle drum correctly. Tighten the wheel nuts with a torque wrench to a torque of 270 Nm. Lower the machine to the ground and re-check the tightness of the wheels. After driving for a few kilometres, check the wheel nuts for tightness, and if loose nuts are found, re-tighten them.

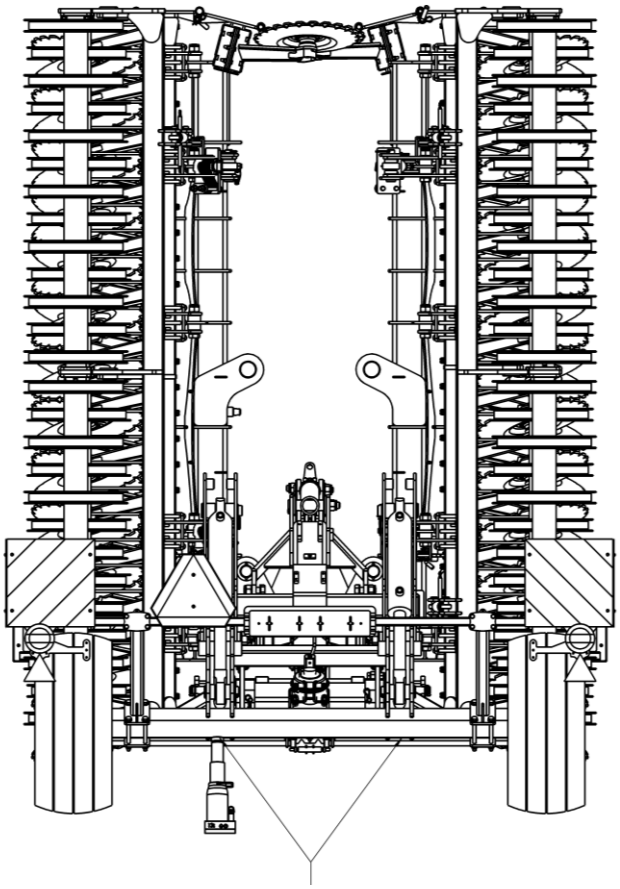


Fig. 25 Jacking point

11.7. Metric-bolt-tightening torques

Optimised torque values for bolts or screws and nuts [Nm] are shown in Table 8.

Table 8. Bolt tightening torques

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

12. Residual risk

12.1. Residual-risk description

Residual risk is most often a result of incorrect behaviour of the cultivator operators, resulting from their carelessness or lack of knowledge. The greatest hazard occurs in the following cases:

- operating the cultivator by persons under age or those who do not know the Instruction Manual,
- operating the cultivator by persons under the influence of alcohol or other intoxicating substances,
- using the cultivator for purposes other than those described in the Instruction Manual,
- standing between the tractor and the cultivator while the tractor's engine is running,
- bystanders, in particular children, standing close to the running cultivator,
- cleaning the cultivator during operation,
- handling the moving components of the cultivator during operation,
- checking the technical condition of the cultivator.

When specifying the residual risks, the cultivator is seen as a machine, which was designed and manufactured, in accordance with the state of art in the year of its manufacture, and meeting the basic OHS rules.

12.2. Evaluation of the residual risk

The occurrence of residual risk may be reduced if the guidelines presented below are satisfied:

- adhering to the safety rules described in the Instruction Manual,
- reading the Instruction Manual carefully,
- not reaching into dangerous and prohibited areas with your hands,
- not operating the cultivator in the presence of bystanders, children in particular,
- the cultivator is maintained and repaired only by properly trained persons,
- the cultivator is operated only by persons, who were trained and know the Instruction Manual,
- the cultivator is protected against children's access,
- the cultivator is operated by able-bodied persons, who are not under the influence of stimulants.

CAUTION

CAUTION!

Failure to comply with the instructions and guidance provided herein may result in residual risks!

13. Stability of the tractor coupled with the machine

The front section of the towing vehicle should be loaded with the relevant weight, in order to ensure the correct steering and braking actions. The load exerted on the front axle of the tractor with a suspended cultivator must be at least 20% of the tractor's weight (Fig. 26).

Remember that the road surface and the suspended machine affect the way of driving. The way of driving must be adjusted to the terrain conditions and type of soil.

When making a turn with a coupled or semi-suspended machine, take into account the wide outreach and buoyancy of the machine.

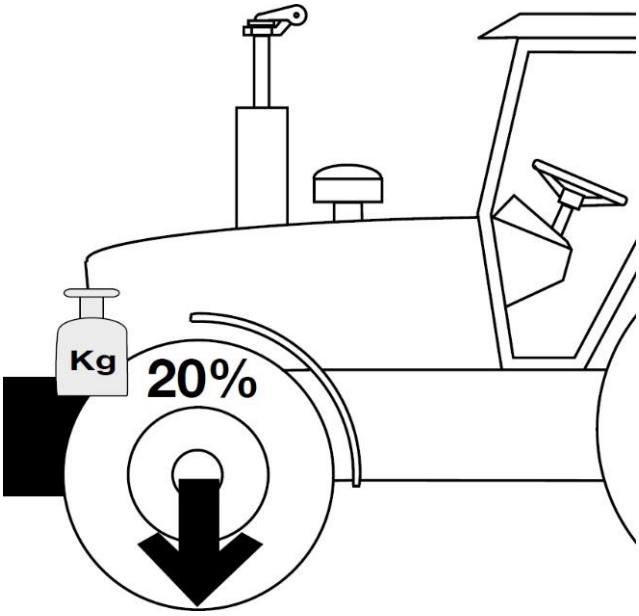


Fig. 26 . The minimum load on the front axle of the tractor.

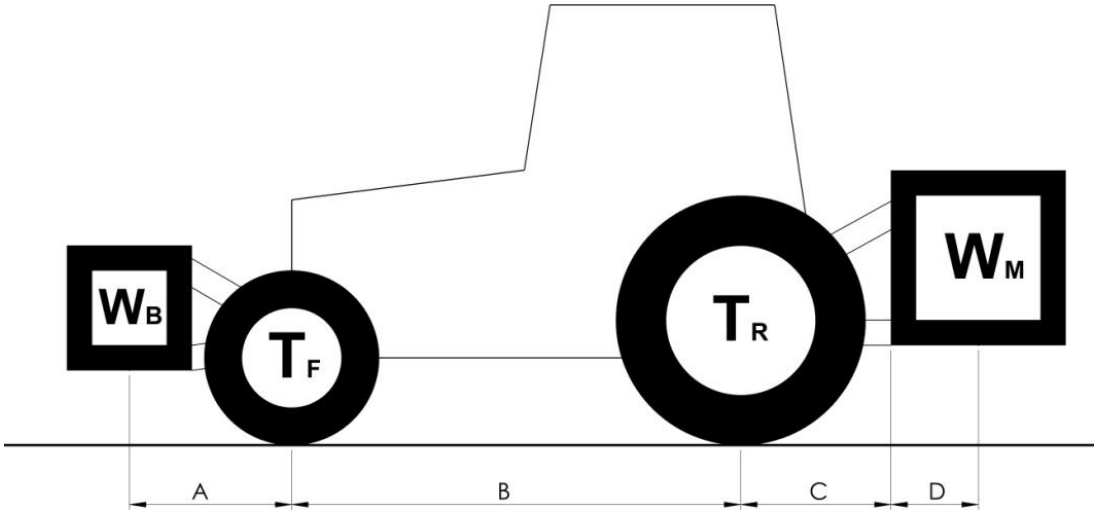


Fig. 27 Determining the static stability.

You need the following data for the calculation:

$$W_B = \frac{W_M * (C + D) - T_F * B + 0{,}2 * T_C * B}{A + B}$$

A [m] - the distance from the centre of gravity of the front ballast / machine mounted to the front and the centre of the front axle;

B [m] - the distance between the tractor's wheels;

C [m] - the distance between the centre of the rear axle and the centre of the lower link ball;

D [m] - the distance between the centre of the lower link ball and the centre of gravity of the machine mounted to the rear.

T_C [kg] - tractor's kerb weight;

T_F [kg] - the front axle load of an empty tractor;

T_R [kg] - the rear axle load of an empty tractor;

W_M [kg] - the total weight of the machine mounted to the rear;

W_B [kg] - the total weight of the front ballast / machine mounted to the front.

13.1. Position of the machine's centre of gravity

CAUTION

CAUTION!

Pay special attention, when making turns and driving on bumpy roads, since the cultivator's centre of gravity is located at a significant height. Failing to adjust the driving speed to the road conditions may result in the machine's tipping over.

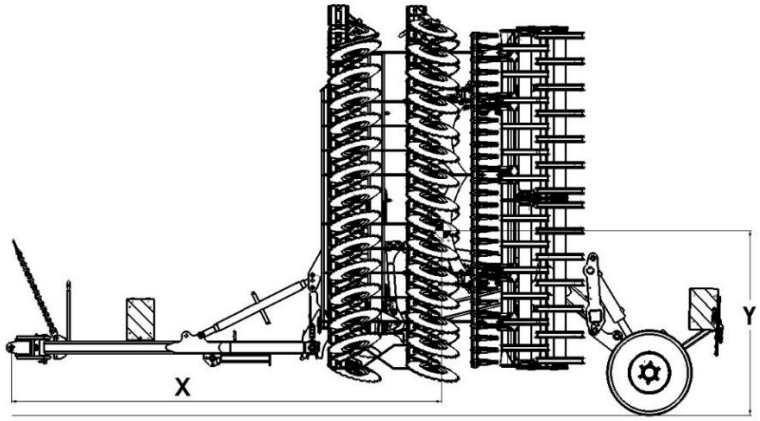


Fig. 28 Position of the centre of gravity (semi-suspended version)

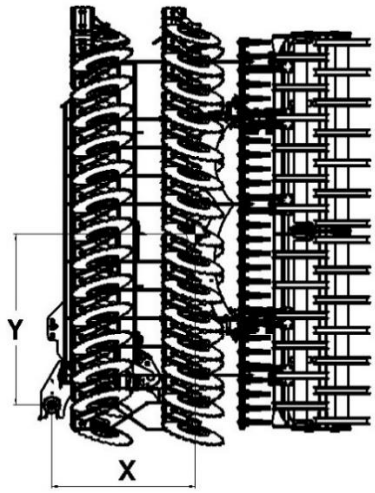


Fig. 29 Position of the centre of gravity (suspended version)

Table 9. Coordinates of the machine's centre of gravity

Coordinates of the centre of gravity				
	semi-suspended version		suspended version	
working width	X	Y	X	Y
4.5 m	4470	1280	1300	980
6 m	4470	1540	1300	1240
7 m	4470	1750	1300	1450

14. Defects and troubleshooting

The most frequent faults and problems that may occur during the machine operation are presented in the table below. If the suggested solutions fail to bring the required result, contact the distributor or service centre of Metal Fach.

Table 10. Possible faults

No.	Type of defect	Possible cause	Solution
1.	Clogging of the cultivator	Incorrectly adjusted cultivator.	Adjust the cultivator.
		The scraper beam is too low.	Lift the scraper beam and adjust the scraper's angle of inclination.
2.	The hydraulic system does not work.	No power supply to the hydraulic outputs.	Activate the hydraulic outputs from the tractor.
		Damaged hydraulic lines.	Change the hydraulic lines.
		Incorrectly adjusted brake and pressure relief valve.	Adjust the brake and pressure relief valve.
		Oil leak in cylinders (oil goes past the piston).	Replace the seals at the cylinders.
		The hydraulic hoses are not connected correctly to the external sockets of the tractor hydraulic circuit.	Check and, if necessary, carefully tighten the quick-release coupling in the external sockets of the tractor's hydraulic circuit.
3.	The electric system does not work.	The 7-pin plug is dirty.	Clean the pins in the plug.
		Burnt bulbs in the lamps.	Replace the bulbs.
		The wire harness is damaged.	Repair or replace the wire harness.
4.	The braking system does not work properly.	Worn out brake shoes.	Replace the brake shoes.
		Leakage in the braking system.	Replace the brake lines or connections.
5.	The roller does not rotate or rotates with difficulty.	The roller is contaminated with soil and vegetative residues.	Clean the roller.
		Damaged bearing unit of the roller.	Change and lubricate the roller's bearings.
6.	The disc cutter does not rotate or rotates with difficulty.	The disc assembly is contaminated with soil and plant debris.	Clean the space between the disc cutters.
		The disc cutter's hub is damaged.	Replace the hub.
		The hub was tightened incorrectly.	Tighten the disc cutter's hub to 300 Nm.

7.	Loose disc cutter.	The hub was tightened incorrectly.	Tighten the disc cutter's hub to 300 Nm.
		Incorrectly tightened cutting disc.	Tighten the cutting disc.

15. Spare parts catalogue

15.1. How to use the spare parts catalogue

The Catalogue should be used as follows:

1) Determine in which unit of the machine the part to be exchanged is located.
2) Find respective drawing of the unit, and the corresponding number of the part to be found.
3) Use this number as a reference and go the descriptions provided in the table to find a corresponding drawing number or a catalogue number, and a quantity.

15.2. How to order spare parts

Order spare parts on the telephone or send an e-mail including the following:

1) The exact address of the customer,
2) Name, code and serial number of the machine, manufacture year,
3) Exact name of the part,
4) No. of the drawing or standard in the spare parts catalogue,
5) Number of pieces,
6) Terms of payment.

The parts will be delivered by a courier company, or the customer can collect them on their own, from the manufacturer or from a local Metal-Fach distributor.

INDEX OF NAMES AND ABBREVIATIONS

daN – dekanewton, power unit;

BHP - occupational safety and health;

dB (A) - decibel A, sound pressure unit;

kg – kilogram, weight unit

km/h – kilometre per hour, linear speed unit

HP – horse power, power unit;

kN – kilonewton, power unit;

kW – kilowatt, power unit

mm – millimetre - auxiliary length unit equal to 0.001 m

Nm – newton metre, a unit of torque and moment of force;

Pictogram – an information plate

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

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

V - Volt, voltage unit;

ALPHABETICAL INDEX

NOTES

Metal-Fach Sp. z o.o. is constantly improving its products and adjusting its package to the needs of its customers, so it reserves the right to make changes to its product range without notice. Therefore, before making your purchase decision, please contact an authorised dealer or sales representative of Metal-Fach Sp. z o.o. Metal-Fach Sp. z o.o. will not accept any complaints regarding the data and pictures contained in the catalogue, as the presented range of products does not constitute an offer within the meaning of the provisions of the Civil Code.

The pictures do not necessarily show standard accessories.

Original spare parts are available from authorised dealers, both in Poland and abroad, and also at the Metal-Fach retail outlet.

METAL-FACH Sp. z o.o.

16-100 Sokółka, ul. Kresowa 62
phone: +48 85 711 98 40; fax: +48 85 711 90 65
biuro@metalfach.com.pl

TECHNICAL SERVICE

16-100 Sokółka, ul. Kresowa 62
phone: +48 85 711 07 80; fax: +48 85 711 07 93
serwis@metalfach.com.pl

SPARE PARTS WHOLESALE STORE

16-100 Sokółka, ul. Kresowa 62

Wholesale:
phone: +48 85 711 07 81; fax: +48 85 711 07 93
serwis@metalfach.com.pl

Retail
24/7 PHONE: +48 533 111 477
phone: +48 85 711 07 90

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