AGRO MASZ

Instruction manual

Warranty certificate
Parts catalogue

ROTARY PLOUGH

POV, POVR, POVH

CE

AGRO-MASZ
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Dear Customers!

Taking the opportunity to thank you for your interest in our offer and for the purchase made, we would like to ensure that the trust placed in us becomes the motivation for the whole team for further and more intensive work to improve the machines belonging to the ever increasing range of products offered by AGRO-MASZ.

In order to ensure the fullest presentation of the capabilities of our product, we created an instruction manual, which will clearly guide you step-by-step through the essential aspects of the technical construction of the machine and protect against adverse effects caused by incorrect operation.

Detailed knowledge of the provisions set forth in this instruction manual, which remains the basic piece of equipment of every machine, is necessary for its safe use for many years.
The instruction manual should be kept in a safe place and used properly throughout the entire period of the operation of the machine.
In case of its loss or damage, a new copy must be purchased.
The new instruction manual can be ordered from the dealer of AGRO-MASZ-brand the machines or directly from the manufacture.
It is also important to note that the instruction manual should be made available to the other user in case of sale or lending of the machine.

Every machine manufactured by AGRO-MASZ is also provided with a warranty certificate and parts catalogue, in which all elements of equipment of the machine are presented.
It should be kept in mind that the use of original spare parts only will ensure the proper functionality and long service lifetime of our product. The use of non-original and duplicated parts adversely affects its parameters.
We have put every effort to present you an easy-to-operate, solid and reliable product, with the belief that our cooperation with you will also be lasting and, as a result, it will allow us to develop together new solutions in order to facilitate and increase the level of productivity in agriculture.

Thank you for choosing our product and wish all joy in your work.

I. EC DECLARATION OF CONFORMITY FOR THE MACHINE

Manufacturer

AGRO-MASZ Paweł Nowak
Strzelce Małe 78
97-515 Masłowice

Machine

Name: Rotary plough

Type / Model: .....

Factory number: .....

Year of manufacture: .....

Application: bed free ploughing of medium and large depth.

The manufacturer hereby declares that the machine, to which the declaration relates, meets:
- all relevant provisions and regulations of Directive **2006/42/EC of the EUROPEAN PARLIAMENT and of the COUNCIL of 17 May 2006 on the machinery, and amending Directive 95/16/EC (Official Journal of the European Union L157 of 09.06.2006, page 24)** and **Ordinance of the Minister of Economy of 21 October 2008 on essential requirements for the machinery (Dz.U. No 199, item 1228)**;
- requirements of harmonized standards:
- PN-EN ISO 4254-1:2016;
- PN-EN ISO 12100: 2012;
- PN-EN ISO 13857: 2010;
- other standards:
- PN-ISO 3600: 1998;
- PN-ISO 11684: 1998;
- Regulation of the Minister of Economy of 31 December 2002 on technical conditions applicable to vehicles and scope of the necessary equipment.

This Declaration shall become invalid if the machine is changed or redesigned without the written consent of the manufacturer.

Full name, signature of person authorised
to prepare the technical documentation:
Mirosław Nowak, Strzelce Małe 78, 97-515 Masłowice

Paweł Nowak – owner
(full name, signature of person authorised to prepare the declaration)

Strzelce Małe, 05.01.2015

II. THE MACHINE IDENTIFICATION

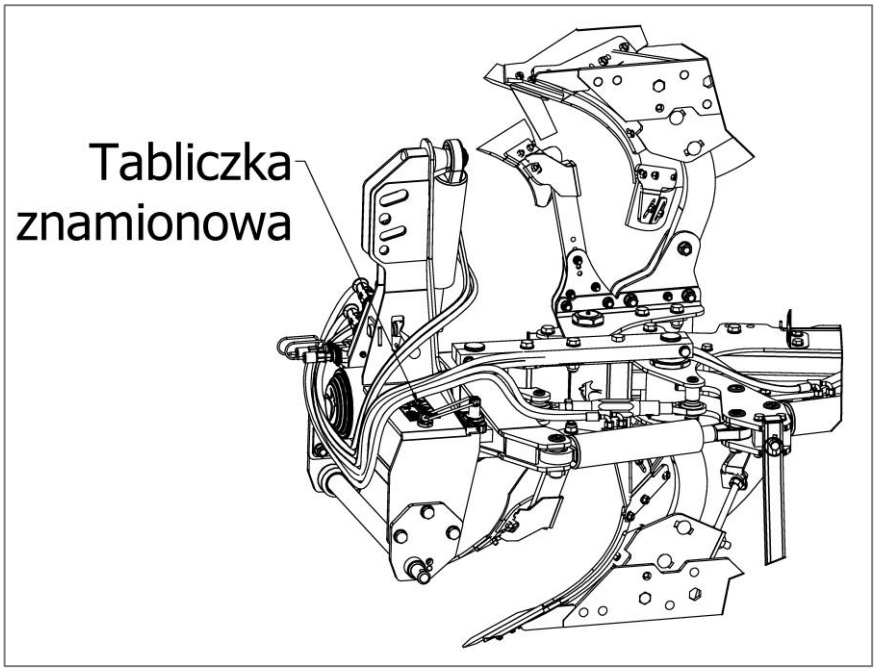
2.1. Name

Mounted rotary plough.

2.2. Model symbol

POV3 – Rotary plough, 3-furrow
POV4 – Rotary plough, 4-furrow
POV5 – Rotary plough, 5-furrow

Identification data can be found on data plate attached to the machine's frame by the three-point linkage.



2.3. Data plate

The purchaser (the user) of the machine should confirm to have acquainted with warranty terms and information included in the Instruction Manual with his/her signature.

When the machine is being sold, the seller (dealer) should enter below the machine's symbol, factory number and year of manufacture in accordance with the data plate and include own data.

Machine symbol .....

Factory number .....

Year of manufacture
.....

Date of sale .....

Seller Address ……..

Tel./Fax……..

Purchaser (User) Address .....

Tel./Fax……..

NOTE! Remember the name and symbol of your machine. Always use this name and symbol in contact with the seller or the manufacturer.

2.4. Manufacturer data

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III. TABLE OF CONTENTS

IV. INITIAL EXPLANATIONS

When you receive the machine, please make sure that there are no transport damages, and the machine is complete! To avoid any misunderstanding, a complaint should be filed immediately.
This instruction manual is delivered to the user of the machine at the point of sale. Getting familiar with its provisions and guidelines gives the operator an opportunity to conduct the safe and trouble-free operation of the machine. Failure to observe the provisions of the instruction manual can lead to an accident or the machine breakdown. This may result in the loss of the guarantee and warranty rights.
The instruction manual is provided with the parts catalogue, which is to enable the user to identify the parts and to purchase them in case of possible damage to the machine.

Before any use, check the machine and tractor, with which it is coupled, for work and transport safety.

The operator is responsible for his/her safety and the safety of persons that come into contact with the plough throughout the period of use, operation and storage.
Before using the plough, get acquainted with the instruction manual.
Special attention should be paid to the danger warning signs and safety marks placed on the plough. They indicate important information relating to the risk specified in the instruction manual.

4.1. Directions in the instruction manual

The terms: “the left side" or “the right side" used in the instruction manual mean the sides on the left and right hand of the observer facing the direction of the machine travel, respectively.

REMEMBER! AGRO-MASZ assumes no responsibility for damage caused by any failure to observe the instruction manual.

In case of any concern or doubt about maintenance and operation, consult the authorised seller or manufacturer’s sales department.
The seller is obliged to enter the address of the contractor of the warranty service in the warranty certificate.
The company continually develops its products and therefore reserves its right to introduce constructional and technological changes and modifications in equipment.

4.2. User feedback

AGRO-MASZ will be grateful for sending any comments on the use and operation of the machine and on this instruction manual. Instruction manuals are regularly updated, but it is your feedback that enables us to jointly create a user-friendly instruction manual.

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4.3. Recommendations and descriptions

The recommendations, referred to as: WARNING, NOTE, REMEMBER, are used in order to underline the importance of information.

WARNING! This indicates the possibility of danger, which if not avoided, can lead to cutting or heavier injuries to the personnel operating the machine.
NOTE! This is used when there is the risk of damage to the machine.
REMEMBER! This is used with complementary information.


This symbol warns about the risk. Information included in the instruction manual and marked by this symbol is particularly important for the machine's user.

Descriptions to figures and diagrams are given next to or near them.

Procedures to be carried out by the machine's operator are given as enumeration:

- Operation 1
- Operation 2 …


Service operations included herein, marked with this symbol should be carried out by a specialized service.

4.4. Intended use

Mounted rotary ploughs with PO are designed for bed free ploughing of medium and large depth on flat fields and fields with maximum inclination of 8,5°, using left and right bodies alternatively. POV3, POV4, POV5 ploughs are suitable for cooperation with tractors of 90 to 180HP. The plough is fitted with safety devices of bodies by means of shear bolts and is intended only for works in agriculture for cultivation of non-stony fields.
Plough should be used, operated and repaired only by personnel familiar with its construction, operation and safety procedures.

The scope of the use compliant with its purpose also includes:

- Observance of provisions of the instruction manual (widely understood regulations related to operation, maintenance, service, settings, repairs and performance),
- Observance of safety regulations, in particular, the warning pictograms located on the machine and the law of the country where the machine is operated,
- Use of original spare parts only,
- Observance of maximum permissible loads of the machine (also the recommendations of the manufacturer of the tractor, with which the machine is aggregated).

Any use of the machine other than the above, as recommended by the manufacturer, shall be considered as a misuse.

REMEMBER! Any arbitrary modifications introduced to the machine without consent of the manufacturer shall exempt the manufacturer from the responsibility for machine damages, personal injuries and other material losses.

V. SAFETY NOTES

REMEMBER! Before operation and use of the (tractor + plough) assembly, get acquainted with this instruction manual, the construction of the plough and its sub-assemblies, their functions, ranges and adjustment method, paying special attention to information on the work safety. During work it is too late for that!

The mentioned safety regulations refer to the plough. Notwithstanding, observe the general safety and accident prevention rules as well as road traffic regulations.

WARNING! Observance of the safety rules related to the use included in this instruction manual will allow avoiding personal accidents, damage or premature wear of the machine.

5.1. General safety principles

The below-mentioned safety regulations refer to the plough aggregated with the tractor. Notwithstanding, always observe general occupational health and safety rules and road traffic regulations.

- In addition to the recommendations included in this instruction manual, follow general occupational health and safety rules as well!
- Observe the warning symbols placed on the machine. Their observance is for your own safety!
- The machine can be used only by adults who hold adequate qualifications to drive tractors, are familiar with instruction manuals of both the plough, and the tractor.
- Use of the machine by minors, and children in particular, is forbidden.
- Before any start, check if the condition of the plough and tractor ensures traffic and work safety.
- The tractor cooperating with the plough must be equipped with ballast weights of the front axle. Balance of the tractor with the machine mounted, its manoeuvrability and braking capacity must be maintained. Observe the maximum permissible load per axle and transport dimensions.
- Stay of any personnel on the machine during work and transport is forbidden. Before operation, make sure that nearby the machine there are no bystanders. Pay special attention to children.
- Lever for the tractor's hydraulic sections should be operated only from the driver's seat.
- Exercise particular caution when the machine is being connected to and disconnected from the tractor. Turn the tractor's engine off, remove the ignition key, and engage the hand brake.
- When the plough is aggregated with the tractor, raised or lowered on the tractor's hydraulic lift and turned on the headlands, check if there are no bystanders, children in particular, nearby the the tractor + plough assembly.
- It is forbidden to approach the plough while it is being lifted and lowered, and turned.

- Do not stand between the tractor and the plough while the engine is working.
- When connecting hoses to tractor's hydraulic system make sure the hydraulic system is depressurized. Check position of control levers for the tractor's hydraulic system.
- Appliances controlled by the hydraulic sections can be activated only when there are no personnel within the operation area of the machine. There are crushing and cutting places on the parts activated with the use of the other force than their own (e.g. hydraulic system).
- Rotate the plough once the plough is lifted on the tractor's three-point linkage
- Raise, lower, tune and start the assembly slowly, without sharp jerks.
- It is forbidden to reverse the tractor and make turns with the lowered plough in the working position.
- While making turns, take the far protruding elements into account, do not use the brakes independent of the tractor.
- Check air pressure in the tractor's tyres.
- Connect the machine to the tractor as described herein.
- The machine can be connected only to tractors of adequate power and equipped with category 3 rear three-point linkage (in accordance with PN-ISO 730-1:1996). Also remember to choose the tractor's class properly to ensure its manoeuvrability.
- In order to maintain proper tractor's manoeuvrability, the machine should be connected to the tractor equipped with a set of front axle ballast weights. Pressure of the tractor's front axle with the mounted plough must be at least 20% of the tractor's weight.
- Balance of the tractor with the machine mounted, its manoeuvrability and braking capacity must be maintained. Observe the maximum permissible load per axle and transport dimensions.
- Do not operate the plough on slopes greater than 8.5°.
- Use special, dedicated pins and cotter pins to secure connections between the machine and the tractor. It is forbidden to use the substitute means, such as bolts, rods, wires etc., as these can be sheared or fall out during work or transport, and thus cause an accident or damage to the machine. Diameter of the pins must be compliant with the machine's three-point linkage category.
- All maintenance, repair and adjustment works should be carried out only when the machine is lowered and the tractor's engine is turned off. Remove the ignition key! It is forbidden to remain under the raised plough due to risk of being crushed by machine elements.
- It is forbidden to replace working elements of the machine without proper protection against shifting of the tractor-machine assembly and falling of the machine.
- During repairs requiring the machine to be lifted use stable and strong supports protecting the machine against falling. Do not use supports made of materials that can be easily damaged (e.g. hollow tiles, bricks).
- If working units are clogged during operation, clean the machine by lifting / lowering it few times on the tractor's linkage.
- Never leave the tractor with the machine mounted on slopes or other sloping areas without protecting it against uncontrolled rolling. Take special care while working on the slopes.
- For operation and wear working clothes and protective gloves.
- Never leave the tractor with the engine operating. Before leaving the driver's seat, lower the machine, turn the tractor's engine off, remove the ignition key, and engage the hand brake.
- It is forbidden to work with the machine which is defective or incomplete. Also inspect the hydraulic system. The actuator, hydraulic hoses and connections must be tight. Replace worn or defective parts immediately.

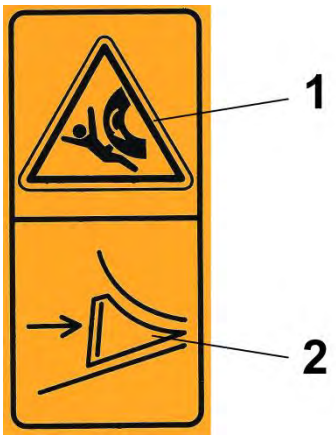
- Due to material wear and tear, flexible hydraulic hoses should be replaced

periodically, every 4 years from the date of their manufacture. The date of manufacture, i.e. year and week number, is indicated on hydraulic hoses.

- Exercise particular care when driving on public roads, observe the relevant road traffic rules and regulations. For the time of transport on the public roads, install the following on the plough: warning signs painted in white and red stripes, with lamps: front – white position, rear – red position and red round reflective (warning signs can be ordered at the machine's manufacturer on additional charge or purchased at a point of sale of agricultural machinery) and a warning triangle for slow moving vehicles.
- For transport on public roads protect the plough against rotation by means of a mechanical lock.
- Speed during machine transport should be adjusted to the condition of the road surface.
- During transport, drive the tractor as close to the right side of the road as possible.
- During manoeuvres on roads pay attention to the space around the machine. Exercise particular caution when passing and overtaking, and on curves (the machine is firmly connected to the tractor).
- During transport and work it is forbidden to stand on the plough or load it with additional ballast weights.
- Detach the plough from the tractor when the plough is supported on right bodies on a firm and level ground, and protected with a lock, with the engine turned off.
- During breaks in operation, the plough should be stored on a in a place that is inaccessible to unauthorised personnel and animals.
- Pay particular attention when dismantling and use drawings provided in the spare parts catalogue.
- When loading, the lifting devices (e.g. forklift truck, overhead crane) can be operated only by the personnel with proper qualifications. Elements of the frame (marked on the machine) should be used as fixing points.

5.2. Warning pictograms placed on the plough

The warning labels informing of permanent or periodical hazards are placed by the manufacturer on the machine in easily visible locations. Do not remove them from the machine. These labels should be replaced if worn, damaged or illegible for other reasons.
Warning pictograms can be ordered at the manufacturer of the machine.



Each warning sign consists of two vertically arranged fields (black figures on a yellow background).
1 – figure on a warning triangle background presents a risk (e.g. 1 – risk of rolling of the machine and crushing of the body),
2 – figure presents a way of behaviour to avoid the risk (e.g. 2 – to avoid the risk, secure the wheels of the machine with wedges).

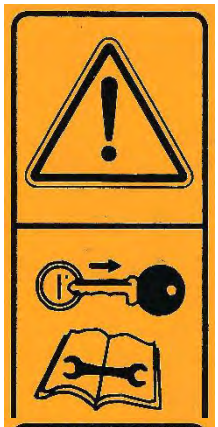
The below section presents graphically warning signs, shows their location on the machine, explains what type of risk they indicate and the way to keep safety and avoid hazard.

Additionally, each sign bears a number, which refers to the number of a warning pictogram included in the parts catalogue, which facilitates identification of a label if damaged.

A. Risk due to non-observance of the provisions of the instruction manual!

This risk can result in serious injuries of the operator and bystanders.

Before using the machine, get acquainted with the instruction manual and safety regulations included there.



B. Risk due to uncontrolled rolling of the machine and tractor!

This danger can result in serious injuries, even fatal, to operator of the machine.

Before maintenance or repair works, turn off the tractor's engine and remove the ignition key!

C. Risk of crushing of the limbs by working elements of the machine or cutting by sharp edges!

This risk can result in serious injuries leading to loss of a limb, in extreme cases.

Keep a safe distance from the machine! Exercise particular caution when replacing the working elements!

D. Risk of crushing of the body within the three-point linkage operating area!

This risk can result in crushing of chest or other part of the body, or even the death of the operator.

It is forbidden to stand between the machine and tractor when fixing the machine and starting the lifting device!

E. Risk of crushing of the hand or fingers by the moving parts of the machine!

This risk can result in serious injuries leading to the loss of fingers, a hand, or even the whole arm.

Never reach into the area of moving elements of machine (e.g. cylinders, plough rotation points, release area of plough bodies), especially during work of the machine or when the tractor's engine is turned on, or the hydraulic installation is being started!

F. Risk of crushing of the whole body due to the machine swing while turning!

This risk can result in serious bodily injuries, including fatal injuries.

Do not stay within the swing area of the machine during work and transport! Keep a safe distance from the plough when it is being swung!

G. Risk of crushing of the whole body due to movement of an unprotected subassembly of the machine!

This risk may cause serious injuries.

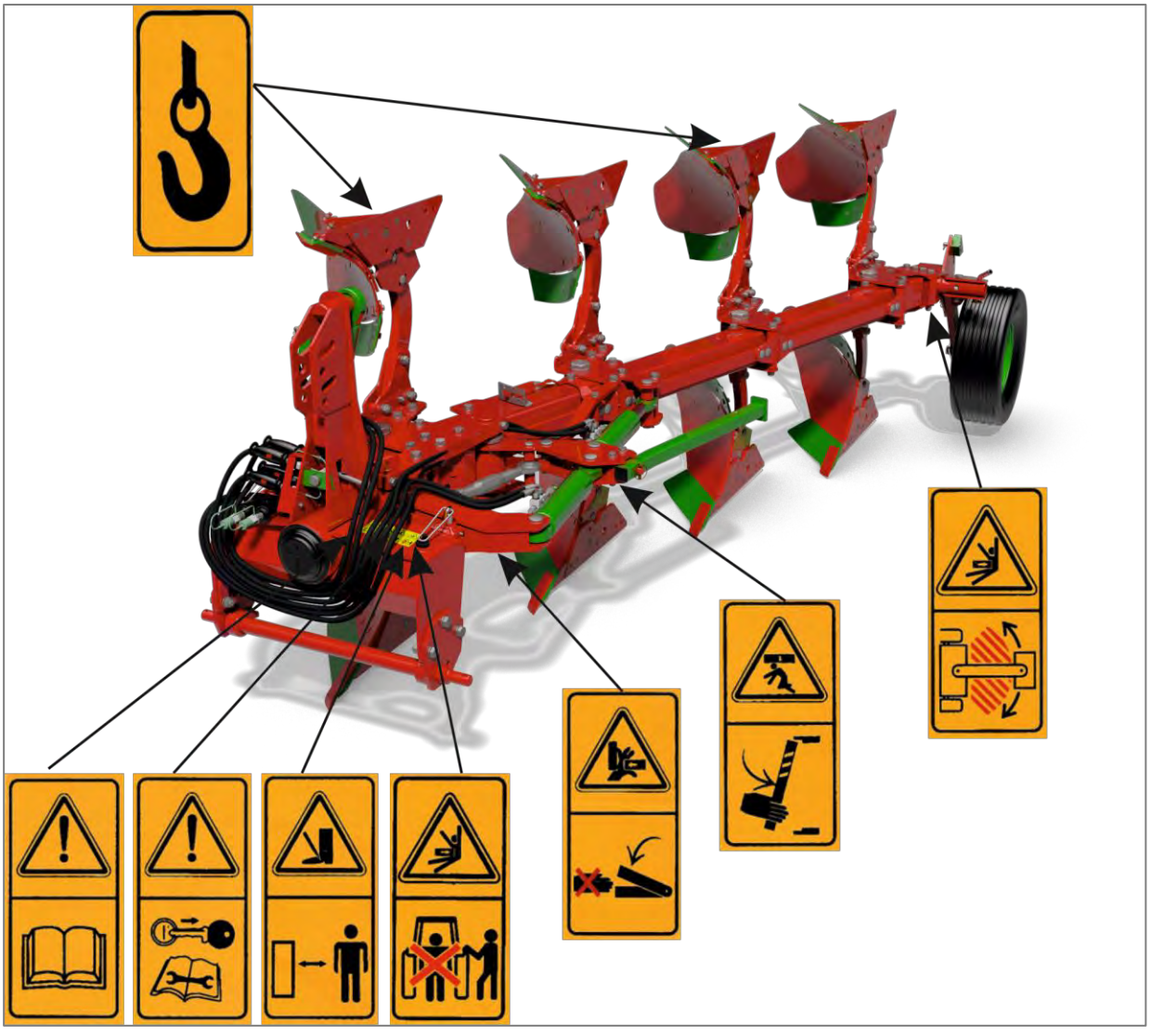
When detaching the plough from the tractor, remember to unfold the support foot and secure it with cotter!

H. Marking of a place to fasten loading slings!

These are suggested places to maintain the safe loading / unloading of the machine and its balance while it is hanging on ropes, belts or chains.

Always take the weight of the lifted machine into account!

5.3. Location of warning pictograms on the machine



5.4. Other risks

In addition to the risks defined in the section 5.2. and presented in the form of warning pictograms placed on the machine, the other risks described by manufacturer in this section can also appear during operation.

5.4.1. Wiring system

- Electrical devices, such as lighting system, are powered by 12V current.
- Too high or too low voltage can cause malfunction of an electronic device or cause its damage!
- Use of non-original elements of electrical and electronic devices and improper fuses can result in a breakdown!
- Take special care when installing electrically operated devices. Improper connection to the tractor's battery, in extreme cases, can result in a fire or explosion of the battery!!
- When removing the electrical and electronic devices from the machine, protect their elements (plugs, cables, etc.) properly against moisture and atmospheric agents.

5.4.2. Hydraulic system

- Hydraulic system is under high pressure!
- Hydraulic hoses of the machine can be connected to the tractor only when hydraulic systems, of both the machine mounted and the tractor, are under pressure-free conditions.
- Hydraulic hoses of the machine should be connected to the hydraulic sockets of the tractor, paying attention to their correct arrangement! Improper connection can result in a breakdown of the mounted machine or the tractor!
- Hoses of the hydraulic system should be controlled regularly for tightness and damages.
- Damaged hoses should be replaced immediately only with original hoses, as recommended by the machine's manufacturer!
- Period of use (as intended) of hydraulic hoses should not be longer than 4 years.
- Do not work with the machine, where hydraulic system is not tight! There is a risk of a serious breakdown!
- There is a risk of being cut by the machine elements, which are moved by means of the hydraulic system.
- There is a risk that during work and operation of the machine a cut of skin, of face and hand in particular, eyes cause by oil splashing!
- It is forbidden to seal hydraulic hoses manually!
- In case of skin burns or oil penetration into the body, seek medical attention immediately!
- When checking the condition of the hydraulic hoses, use appropriate equipment and protective clothing. It is recommended to control the condition of the hydraulic hoses by a specialized service on a yearly basis.

- It is forbidden to lock hydraulic system controls in the tractor.
- Before any works on the hydraulic system:
    - Lower the mounted machine,
    - Depressurise the hydraulic system,
    - Turn the tractor's engine off and engage the parking brake,
    - Remove the ignition key.

5.4.3. Residual energy

WARNING! During operation of the machine keep in mind that there is residual electric, pneumatic and mechanical energy on the machine!

Electric current for powering road lights, high-pressure oil in the hydraulic system intended to power such sub-assemblies as rotation cylinder, ruling cylinder and mechanical energy accumulated in the elastic parts constitute a hazard to an inattentive operator and unauthorised personnel!

The machine's operator must be careful during work and all service and maintenance actions carried out on the machine!

5.4.4. Foreign bodies

During operation of the machine there is a risk that the personnel remaining nearby will be injured by stones, lumps of the soil or other foreign bodies unexpectedly thrown by the machine and its sub-assemblies.

WARNING! During work no person is allowed to remain within the danger zone or move near the machine, until the tractor's engine is turned on!

5.4.5. Other obstacles

During field works there is a risk of burning or electric shock after contact with overhead power lines or as a result of getting too near to high voltage lines.

WARNING! Observe national regulations regarding a safe distance, within which the live overhead power lines can be approached to!

5.5. Operator's obligations and training

5.5.1. Operator's obligations

The operator must:

- get acquainted with the instruction manual attached to the machine, in particular become familiar with the safety regulations related to work, repair and maintenance,
- take care that the instruction manual is always stored in a place ensuring its maintenance in good condition and to make sure it is always available during work,
- be equipped with proper protective clothes, in accordance with the description included in 5.5.3.,
- get acquainted with the legal regulations, applicable in a specific country, relating to the occupational safety, accident prevention and environmental protection,
- operate the machine according to the manufacturer's recommendations,
- use only original spare parts and not make any modifications of the machine without a written consent of the manufacturer.

The machine should be always stored and transported protected in order to avoid accidents caused by contact of the children or bystanders with the machine, untrained in their use!

5.5.2. Personnel training

The machine can be operated, to the same extent as the operator (owner), only by personnel who are authorized and trained by the owner. The authorized personnel (e.g. engaged workers) must.:

- hold a driving licence compliant with requirements of regulations applicable in a specific country,
- get acquainted with the instruction manual attached to the machine,
- observe general occupational health and safety rules,
- undergo training provided by the owner in regulations relating to work safety (machine installation, operation and maintenance),
- get acquainted with construction and function of the machine.

The afore-mentioned provisions are also applicable to any further owner of the machine, when it is sold on the secondary market.

5.5.3. Personal Protective Equipment

Before any service works the machine's operator machine must be equipped with:

- protective gloves protecting against sharp edges of the machine's elements and against a direct contact with oils and lubricants,

- clothing which do not constrain movements but, a the same time, are tight to such extent not to be caught by any of the machine's sub-assembly,
- protective goggles, hearing protectors and breathing protection mask, if necessary (when strong wind is encountered during operation or the tractor is not provided with a cab).

5.6. Risk zones

According to a general definition, a danger zone includes surroundings of the machine, within which people can be caught. Places of risk are as follows:

- an area between the tractor and mounted machine,
- immediate vicinity of the machine's moving elements (rotation cylinders, ruling cylinders, springs),
- flat surfaces, such as frame,
- places within plough raising / lowering and rotating areas.

In such surroundings a person can come in contact with:

- foreign bodies ejected by the machine,
- the mounted machine due to its unexpected lowering,
- the tractor-plough assembly due to its rolling or shifting when operating and changes in its while turning or reversing, rotating,
- the mounted machine by its working elements, changing their position, driven by mechanical, electric or hydraulic power.

When operating the machine there is a risk that parts of the body of people present nearby will be injured! This risk can be permanent or periodically variable. Pay attention to lumps of soil, stones and other foreign bodies ejected by working elements of the machine in motion, and keep a safe distance!
During operation no person is allowed to remain within reach of the tractor-machine assembly, i.e. no person can be present neither directly in front of, behind nor by the machine! It is also forbidden to move nearby and stand on the machine during work.

People cannot stay within the risk area until:

- the tractor's engine and control units for the plough's working elements are off (hydraulic system for rotation control, etc.),
- both the tractor and machine mounted, and its sub-assemblies are protected against rolling and unintended motion.

 **WARNING!** Keep a safe distance!
The risk area varies during work when the machine is running!

5.7. Residual risk

Residual risk mainly results from incorrect behaviour of the operator of the plough mounted on the tractor. Reasons for such behaviour of a person operating the machine are ignorance and inattention.

5.7.1. Description of residual risk

Despite the fact, that the **AGRO-MASZ** company – the manufacturer of the PO plough takes the responsibility for the design and manufacture, in order to eliminate hazard, certain risk when operating the machine is unavoidable. Major source of risk follows these forbidden operations:

- stay of personnel on the plough during work and transport,
- stay of personnel between the tractor and the plough when the tractor's engine is working,
- stay of personnel nearby the plough when it is being lifted, lowered or rotated,
- operation of the machine when the tractor's engine is working,
- operation of the machine lifted on the linkage and unprotected against falling down,
- stay of unauthorised personnel nearby the plough while operating,
- operation of the plough and the tractor in poor technical condition.

When describing residual risk, the plough shall be considered a machine, which until the production start has been designed and manufactured in accordance with the state of the art current as for the date of manufacture.

5.7.2. Residual risk assessment

Apply the following recommendations:

- carefully read and follow rules herein,
- do not put hands into restricted areas,
- stay of personnel on the machine during work and transport is prohibited,
- stay of personnel between the tractor and the machine with the tractor's engine working is prohibited,
- stay of personnel nearby the machine when it is being lifted, lowered and rotated is prohibited,
- stay of unauthorised personnel nearby the plough while operating is prohibited,
- operation of the plough is allowed only by the personnel who are trained and acquainted with this instruction manual,
- performance of repair and maintenance works only by personnel who are properly trained,
- protection of the plough against access by children, unauthorised personnel and animals,

- elimination of all accident hazards to ensure safe use of the POV rotary plough.

The AGRO-MASZ company, the manufacturer the POV plough declares that in the current state of the art it is not possible to eliminate the existing residual risk. This risk can be reduced by using POV plough in accordance with the recommendations specified in this instruction manual.

NOTE! Accident hazards resulting from the existing residual risk appear in case of failure to observe the specified recommendations and guidelines.

5.8. Stability of tractor - plough assembly

The tractor-plough assembly can lose its stability due to weight of the mounted machine.
To calculate the required minimum front ballast, and also determine by how many kilograms should the load of the tractor's rear axle be increased, in order to ensure stability of the whole assembly, the user should know parameters of the tractor and the plough applicable to the below calculations.
Mounting of machines to the tractor cannot result in exceeding the maximum permissible values, i.e. total mass of the whole tractor-plough assembly, load of the front and rear axles, and tyre carrying capacity.

Below are the most useful formulas to calculate maximum permissible loads.

To calculate increase in load of the tractor's rear axle:

$$I_R + \frac{I_R \cdot (a+b)}{b}$$

In order to verify the total stability, to calculate minimum mass of front ballast weights $I_{F,min}$ [kg], allowing to achieve load of the front axle equal to *20%* of the the tractor overall weight, the below formula can be used:

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

Formula to calculate the actual load of the front axle:

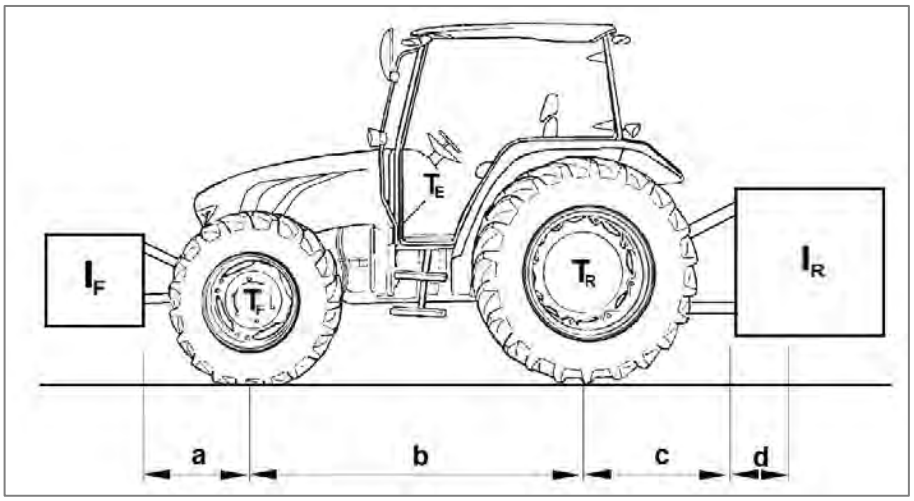
$$T_{F\,S} = \frac{I_F \cdot (a+b) + T_F \cdot b - T_R \cdot (c+d)}{b}$$

Formula to calculate the actual total weight:

$$C_{R\,C} = I_F + T_E + I_R$$

Formula to calculate the actual load of the rear axle:

$$T_{R\,S} = C_{R\,C} - T_{F\,S}$$



T_E – tractor's overall weight [kg]
T_F – front axle load of unloaded tractor [kg]
T_R – rear axle load of unloaded tractor [kg]
I_F – weight of front ballast weights [kg]
I_R – weight of machine mounted at rear [kg]
a – distance between centre of gravity of front ballast weights and centre of front axle [m]
b – tractor wheelbase [m]
c – distance between centre of rear axle and centre of ball joints of rear linkage [m]
d – distance between centre of ball joints of rear linkage and centre of gravity of mounted machine [m]

Enter calculations from formulas in the below table to compare them with values specified by the tractor's manufacturer.

Calculated values cannot exceed the maximum permissible limits.

	CALCULATED REAL VALUE	VALUE ACCEPTABLE BY THE TRACTOR'S MANUFACTURER	UNIT OF MEASURE
Minimum load of tractor front			kg
Total weight of the tractor-plough assembly			kg
Tractor's front axle load			kg
Tractor's rear axle load			kg

VI. GENERAL INFORMATION

The plough, intended for sale, is delivered assembled by the manufacturer. Plough bodies are equipped with sectional mouldboards, ploughshares with bolted chisel, strips and landsides and skimmers to be mounted above mouldboards for better coverage of plant residues. Mounting of plough body core (frog) to plough beam enables plough body tilt angle adjustment. Before the last body, a disk cutter is mounted for better slicing of furrow from undisturbed soil.

6.1. Technical data for POV ploughs

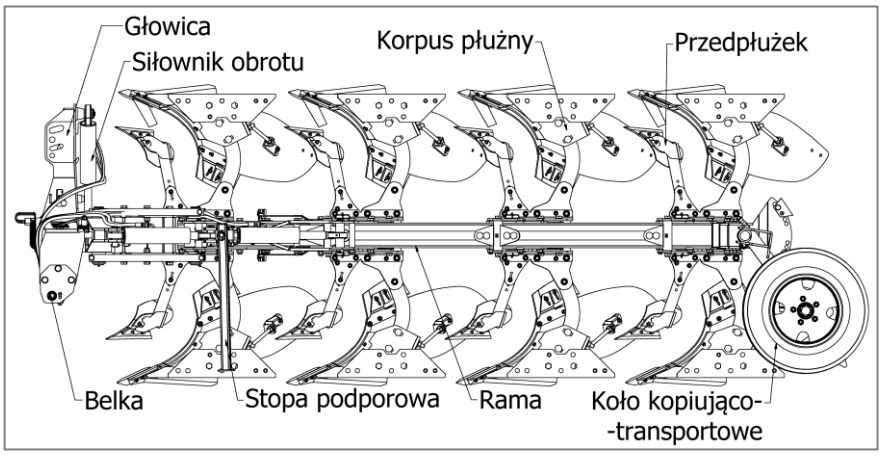
Information given in the table below is for reference only. Machine's ultimate parameters depend on both the additional equipment and configuration.

PARAMETER	UNIT OF MEASURE	PLOUGH POV3	PLOUGH POV4	PLOUGH POV5
Type		mounted	mounted	mounted
Number of bodies	pcs	3	4	5
- distance between bodies on frame, - height under frame, - mouldboard type, - ploughshare type, - cutter - support wheel	mm mm	1000 760 semihelicoidal zone tempered handle 10.0/80-12	1000 760 semihelicoidal zone tempered handle 10.0/80-12	1000 760 semihelicoidal zone tempered handle 10.0/80-12
Width of cut	m	0.60–1.50	0.80–2.00	1.00–2.50
Depth of cut (max)	cm	30	30	30
Dimensions: - length - width - height - frame profile	 mm mm mm mm	 3100 1600 1750 140x140	 3600 1800 1750 140x140	 4100 2000 1750 140x140
Weight	kg	1100	1350	1600
Working speed	km/h	5-10	5-10	5-10
Performance	ha/h	0.8-1.3	1.0-1.7	1.2-2.0
Power demand	HP	90-120	120-140	140-180
Nominal pressure in hydraulic system	MPa	18	18	18
Acoustic pressure - acoustic pressure level	dB L_{pA}	below 70	below 70	below 70
Skim coulter set		option	option	option
Disk cutter for last body		option	option	option
Openwork mouldboards		option	option	option
Wheel shock absorber		option	option	option
Rotation cylinder with memory module		option	option	option
Ruling cylinder		option	option	option

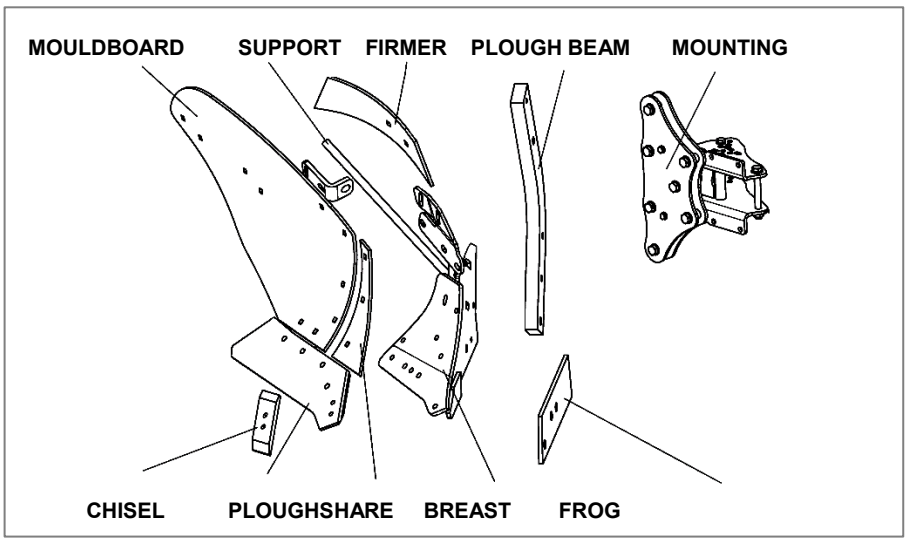
PARAMETER	UNIT OF MEASURE	PLOUGH POVR3	PLOUGH POVR4	PLOUGH POVR5
Type		mounted	mounted	mounted
Number of bodies	pcs	3	4	5
- distance between bodies on frame, - height under frame, - mouldboard type, - ploughshare type, - cutter - support wheel	mm mm	1000 760 semihelicoidal zone tempered handle 10.0/80-12	1000 760 semihelicoidal zone tempered handle 10.0/80-12	1000 760 semihelicoidal zone tempered handle 10.0/80-12
Width of cut	m	0.75–1.50	1.00–2.00	1.25–2.50
Depth of cut (max)	cm	30	30	30
Dimensions: - length - width - height - frame profile	 mm mm mm mm	 3100 1600 1750 140x140	 3600 1800 1750 140x140	 4100 2000 1750 140x140
Weight	kg	1300	1550	1800
Working speed	km/h	5-10	5-10	5-10
Performance	ha/h	0.8-1.3	1.0-1.7	1.2-2.0
Power demand	HP	90-120	120-140	140-180
Nominal pressure in hydraulic system	MPa	18	18	18
Acoustic pressure - acoustic pressure level	dB L_{pA}	below 70	below 70	below 70
Skim coulter set		option	option	option
Disk cutter for last body		option	option	option
Openwork mouldboards		option	option	option
Wheel shock absorber		option	option	option
Rotation cylinder with memory module		option	option	option
Ruling cylinder		option	option	option

PARAMETER	UNIT OF MEASURE	PLOUGH POVH3	PLOUGH POVH4	PLOUGH POVH5
Type		mounted	mounted	mounted
Number of bodies	pcs	3	4	5
- distance between bodies on frame, - height under frame, - mouldboard type, - ploughshare type, - cutter - support wheel	mm mm	1000 760 semihelicoidal zone tempered handle 10.0/80-12	1000 760 semihelicoidal zone tempered handle 10.0/80-12	1000 760 semihelicoidal zone tempered handle 10.0/80-12
Width of cut	m	0.75–1.50	1.00–2.00	1.25–2.50
Depth of cut (max)	cm	30	30	30
Dimensions: - length - width - height - frame profile	 mm mm mm mm	 3100 1600 1750 140x140	 3600 1800 1750 140x140	 4100 2000 1750 140x140
Weight	kg	1300	1550	1800
Working speed	km/h	5-10	5-10	5-10
Performance	ha/h	0.8-1.3	1.0-1.7	1.2-2.0
Power demand	HP	90-120	120-140	140-180
Nominal pressure in hydraulic system	MPa	18	18	18
Acoustic pressure - acoustic pressure level	dB L_{pA}	below 70	below 70	below 70
Skim coulter set		option	option	option
Disk cutter for last body		option	option	option
Openwork mouldboards		option	option	option
Wheel shock absorber		option	option	option
Rotation cylinder with memory module		option	option	option
Ruling cylinder		option	option	option

6.2. Construction of plough



Overview of POV plough in version with skim coulters.



Construction of a single body.

6.3. Constructional changes

Equipment of your machine can slightly differ from equipment provided in figures or in descriptions included in this instruction manual.

The manufacturer reserves the right to make further technical modifications of the machine, relating to both its basic construction and additional equipment, due to the adaptation to the ever developing technical level.

REMEMBER! All modifications and alterations of the plough made without a written consent of the manufacturer are forbidden, for they can result in a decrease of the machine's parameters.

VII. MAINTENANCE AND SERVICE

Before working, it is necessary to carefully get acquainted with the function and construction of the tractor's and plough's parts.

7.1. Preparation of the tractor to work with the plough

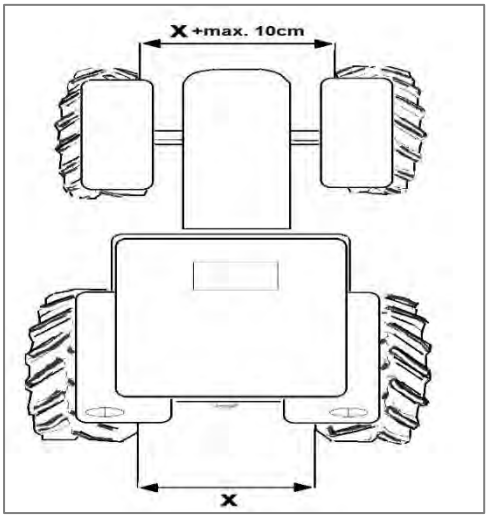
REMEMBER! In order to make proper adjustments of the below-described sub-assemblies of the tractor, observe the provisions specified in the instruction manual provided by the tractor's manufacturer.

7.1.1. Tyres

In order to maintain proper service lifetime of the tyres and achieve optimum driving properties, check and correct tyre pressure, if necessary. In particular, it is essential to maintain the same pressure level in the tractor's rear tyres. In difficult conditions, while observing the provisions of the instruction manual of the tractor, it is recommended to add further ballast weights to wheels or to fill up the tyres with a liquid. Air pressure in the tyres must be accordingly not too high to ensure the optimum tractive force and not too low so that the rims do not damage the tyres at the same time.

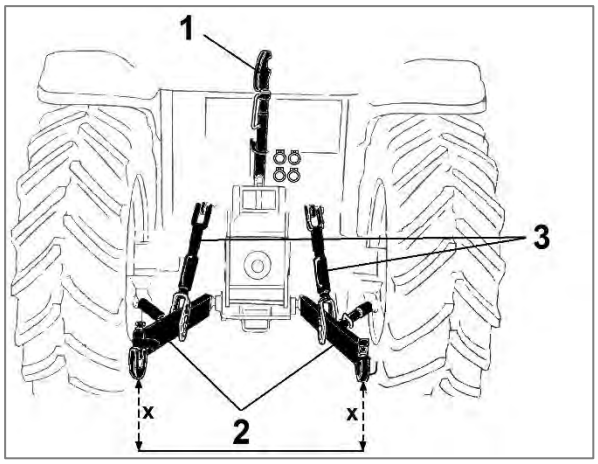
REMEMBER! In order to ensure equal working depth for the plough, take care that pressure in the tractor's tyres is the same in right and left tyres.

7.1.2. Wheel track



For ploughing, the wheel track is measured as a space between the internal surfaces of the tractor's tyres. The distance between the external edges of front wheels should be equal to, or slightly greater than, the distance between rear wheels.

7.1.3. Three-point linkage



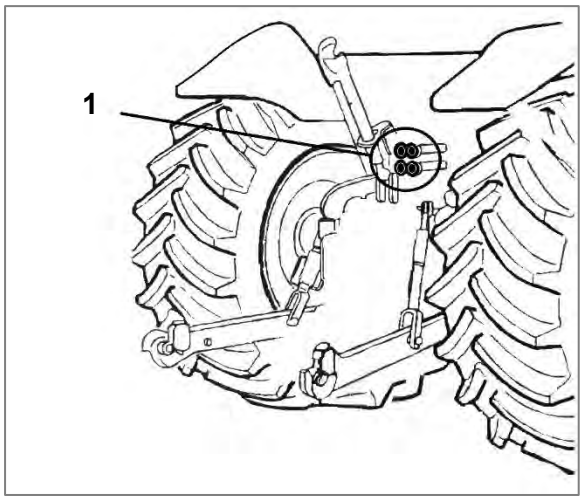
The construction of the three-point linkage is based on the principle that the tractor and the mounted machine are intended to operate as an integral assembly. The functionality of such assembly depends on a setting of **the upper link (1)** and **lower links (2)** adjusted **hangers (3)**.

In order to facilitate the optimum arrangement of the plough, if the tractor has several points for the attachment of the upper link, the said link should be fixed at the top-most point.

Lower links should be set on the same height **(x)** by means of adjustment on hangers. Hangers should be set so as to enable lowering of lower link to approx. 30 cm below the plough's linkage axis and lifting of the plough onto an adequate height for the plough's rotation and safe transport.

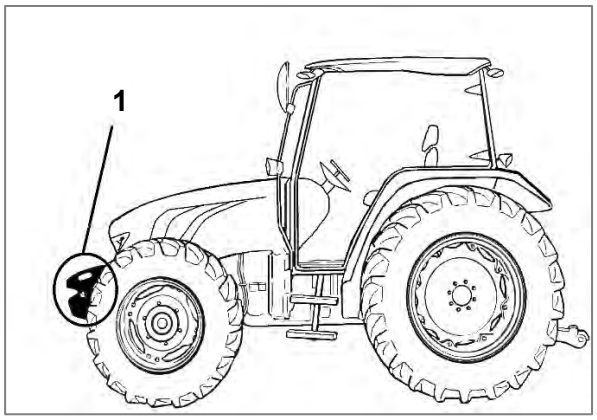
Regardless of whether the lower links are equipped with chains, telescopic struts, or other side movement stabilisation system, the system should be adjusted so that the mounted plough can move slightly sideways during work and it does not tilt too much during transport.

7.1.4. Hydraulic system



The tractor should have 2 independent external hydraulic sections – **2 pairs of push-in fittings (1)**, i.e. two hydraulic outputs of two-side action to ensure plough's rotation and two hydraulic outputs of two-side action for ruling cylinder (option).

7.1.5. Front axle load



The tractor must be equipped with **front weights (1)** to ensure the optimum driving properties, proper mass distribution and equal working depth of ploughing.

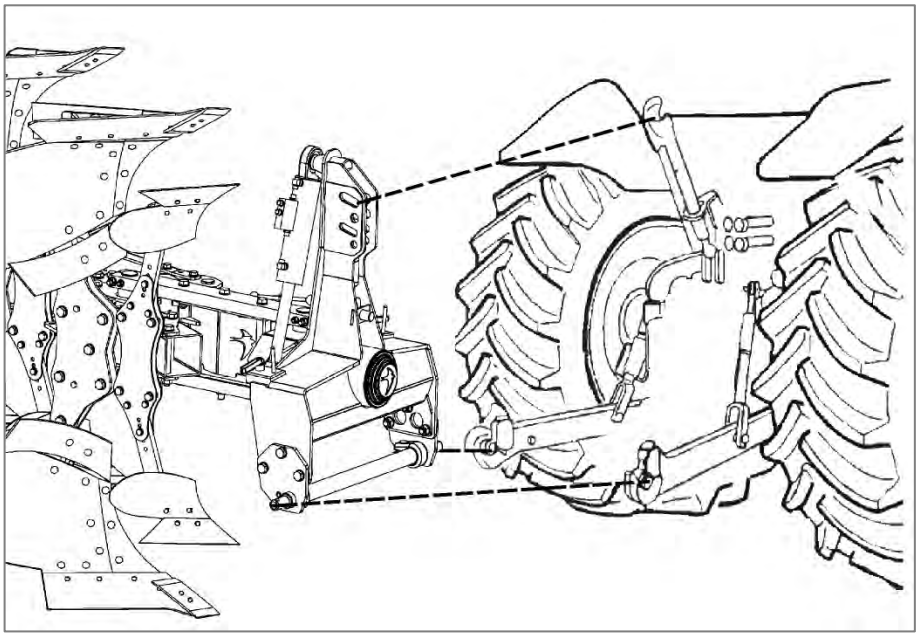
The calculation procedure of the counterweight mass for the plough as the ballast weights mounted in front of the tractor is discussed in the “Stability of the tractor-plough assembly” sub-section, page 23.

NOTE! Attachment of the cultivating machine on the tractor's three-point linkage must not cause the maximum load parameters specified by the tractor's manufacturer to be exceeded.

7.2. Preparation of the plough

- Before work, check technical condition of the plough, and working parts and hydraulic system in particular. Replace any damaged or worn parts causing the plough's work quality to decrease.
- Check bolting connections, and tighten nuts, if any plays are found. After about 3 hours of ploughing, tighten all bolts and nuts.
- Lubricate the plough in accordance with recommendations specified in the lubrication table.
- Check the arrangement of plough bodies, and if there are no significant differences between each particular body.
- Check whether adjustment screws turn without jamming.
- Check whether push-in fittings on the plough's hydraulic hoses match the sockets on the tractor.
- Check the condition of hydraulic hoses (cannot be damaged) and cleanliness of push-in fittings.
- Check the pressure in tyres of the transport wheel, which should be 350-425 kPa.

7.2.1. Mounting the plough on the tractor



In order to mount the plough correctly and safely, the tractor should stand on a firm and level ground.

While mounting the plough on the tractor proceed as follows:

- switch the tractor's hydraulic system into position adjustment,
- set the plough's latch bar in one of four positions and attach it on tractor's lower links (possibly on ends of latch bar, attached on the plough, mount ball-and-socket joints – depending what type of ends of three-point linkage links the tractor is equipped with) and secure,
- reverse the tractor at a distance allowing connection of the latch bar to forepart plates and and the tractor's upper link to the plough's upper hanger,
- secure the suspension axle in forepart plates using **pins (2)** with cotters,
- attach the tractor's upper link and secure its pin. When ploughing the attachment point for the plough's upper link should be higher than the attachment point for the tractor's link,
- adjust the anti-roll bars of the tractor's lower links,
- connect the plough's hydraulic hoses to the tractor's external hydraulic sections,
- unlock transport support,
- check the plough for lifting and lowering,
- perform a trial rotation of the plough to check whether during this operation neither the support wheel nor the machine touches the ground.

WARNING! When mounting the plough on the tractor, in the three-point linkage area, there is a risk of crushing!

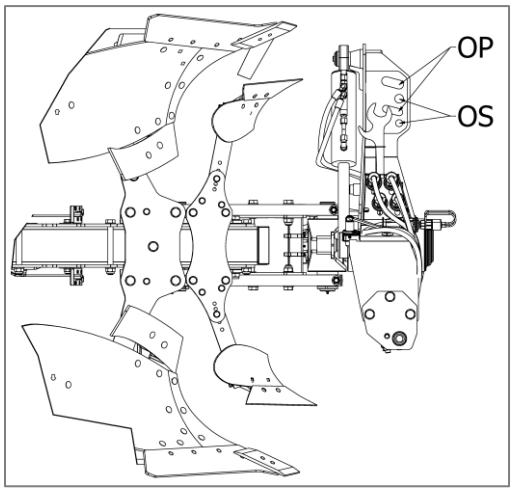
Do not stand between the tractor and the machine!

Protect the tractor against rolling!

7.3. Start of ploughing

The arrangements indicated below are essential, particularly if the plough is operated for the very first time.

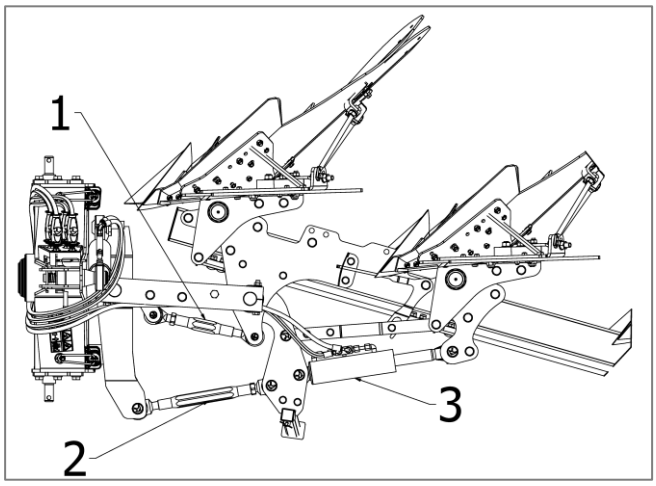
7.3.1. Upper attachment point



The plough can be connected to the end of the tractor's upper link **by means of permanent holes (OS)** or **floating holes (OP)**, which additionally enable the plough to lift slightly whenever a significant resistance is encountered. Apart from that, it is recommended to use floating holes for mounting, if the plough has 4 furrows or more.

If the upper link is to be connected to a floating hole (length-wise) on the hanger, loosen the link so that when the plough is lowered, pin for the link is relieved adjoining the hole's front end.

7.3.2. Spindles (bottle screws)



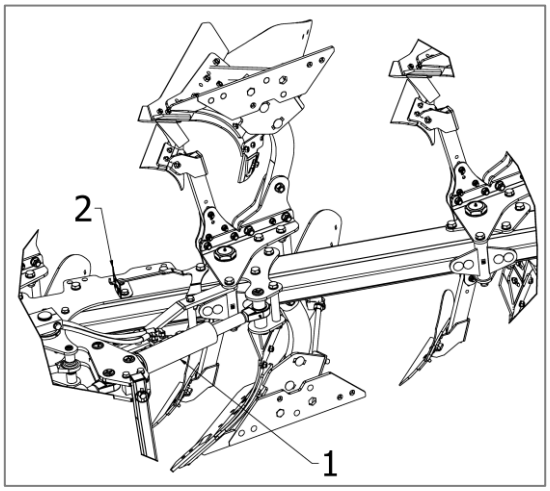
The **internal spindle** (**1**) is used for setting the tractor-plough hauling rope. If set correctly, prevents the plough's sliding, and in turn provides reduction in sliding of the whole tractor-plough assembly, and fuel consumption.

When starting ploughing, in order to properly set the plough, note which direction the tractor tends to veer to. If it turns towards the ploughed soil, loosen the internal spindle, and if it turns towards unploughed field tighten the internal spindle.

While **external spindle** (**2**) is used for changing of the furrow width. For transport to the customer, it is often tightened to save space. Adjust them to an approximate length of the hinge (about 55cm).

Work range actuator (**3**) used to change spacing between bodies.

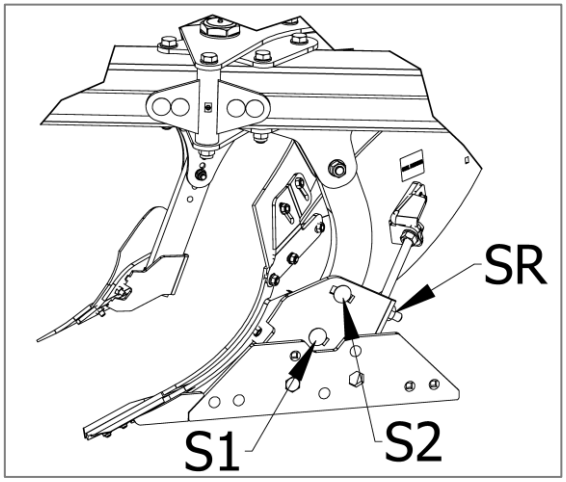
7.3.3. Bodies



Working width is adjusted by using actuator **1**. Gauge **2** shows the currently set working width for a body.

WARNING! Do not change working width of the plough whilst operating.

WARNING! In POVR and POVH ploughs the minimum working width for a body is 25cm. Setting a lower working width for a body can cause damage to the plough.

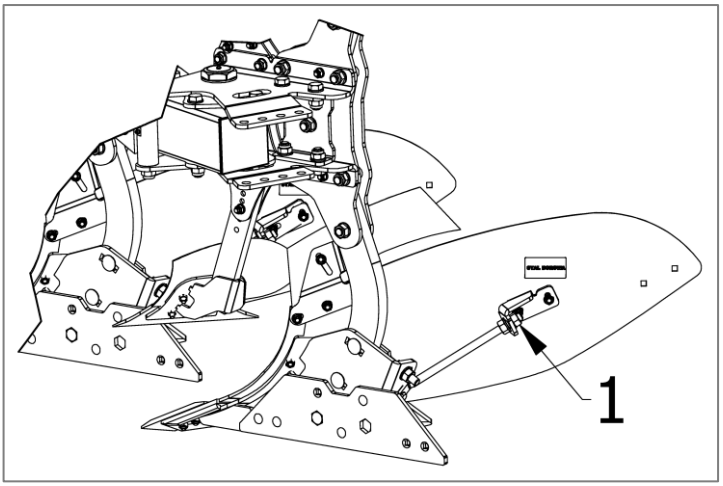


Each body has the approach angle adjustment. To align all bodies and set the same angle, use **adjustment screw (SR)** at the back of each body. To start the adjustment, loosen **fastening bolts (S1 and S2)**. It is important that the distance **(x)** from the ploughshare chisel end to the frame for all bodies should be the same. Once the adjustment is completed, re-tighten fastening bolts **(S1** and **S2)**.

However, if value of the angle of approach is too high, this can result in undesired resistance and problems maintaining the same ploughing depth, and finally, significant increase in fuel consumption.

When adjusting the body, do not loosen fastening bolts completely to prevent detachment of elements of the body!

7.3.4. Mouldboards

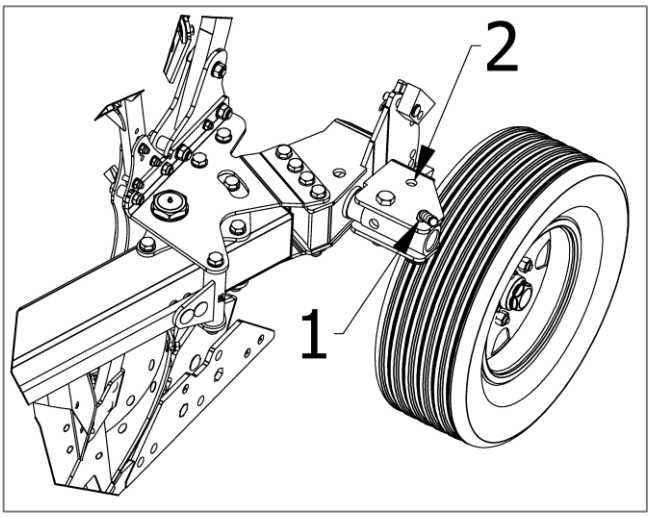


Mouldboards are made of tempered steel, as they are exposed to fast wearing due to contact with soil.

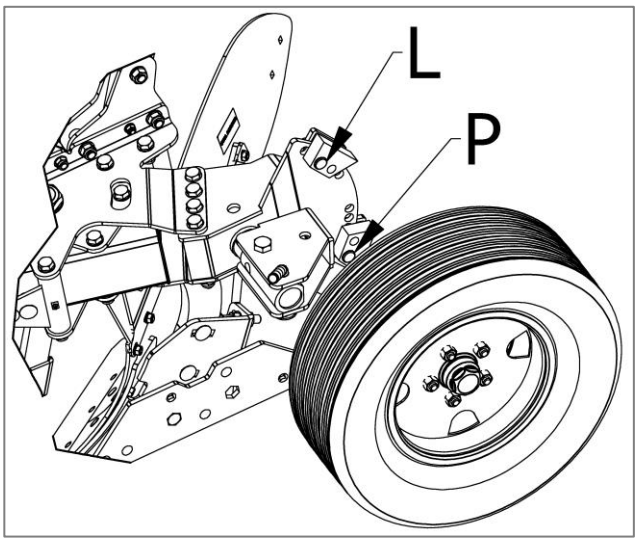
In order to produce even furrows at each passage, set the approach angle for all mouldboards by means of **mouldboard support screw (1)**.

In order to achieve optimum quality of the ploughing on the first use of the plough, paint on the mouldboard, at the side which remains in contact with soil when tilling, can be removed.

7.3.5. Support wheel



The plough is equipped with a standard universal support wheel – transportation wheel. In “working” position (safety pin is put through **hole (1)**) it is used as a gauge wheel.

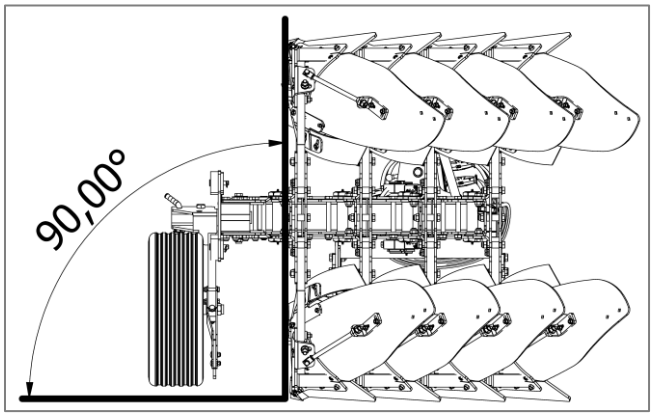


Wheel support has a few-step vertical adjustment, separately for the plough's right and left side (**protections L** and **P**). In connection with the tractor's hydraulic system, used for lifting and lowering of the plough, the adjustable support wheel can be used for ploughing depth adjustment. The wheel, if properly adjusted, bears partial weight of the plough, and thus prevents excess and uneven penetration of the plough into soil. However, it should be noted that the plough's general weight should, as far as possible, be borne on the tractor, so as not to cause too much of sliding. Despite proper setting of the support wheel, the operator should monitor the machine's working depth by means of the tractor's hydraulic system, and take notice of variable conditions (operation on light or difficult grounds.

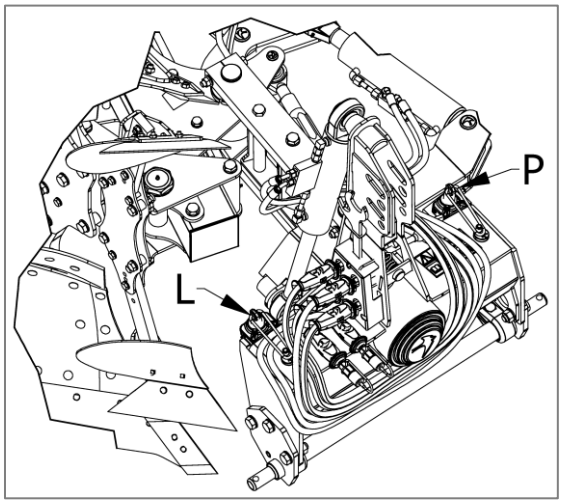
NOTE! Around the support wheel, areas of cutting and crushing risk are present! Exercise particular caution when removing the wheel in “transport / work” positions, and when setting the wheel working position!

Check pressure in the plough's wheels regularly. Too high or too low pressure during work or transport, can result in damage of the tyre, and even the whole machine or cause an accident!

7.3.6. Adjustment of vertical tilt



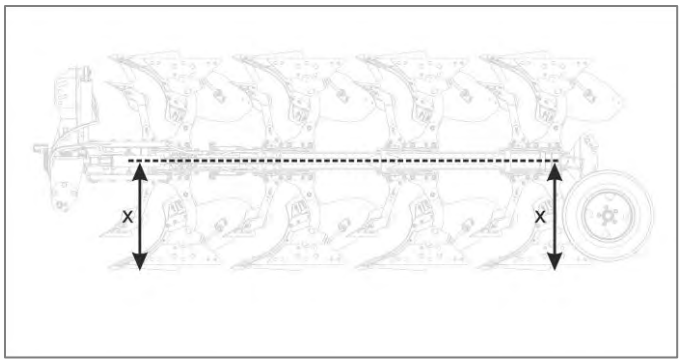
After setting of a desired ploughing depth and setting of the tractor so that right or left wheels are level on a furrow, adjust proper working angle for the whole machine (vertical adjustment). It is desirable that in ploughing position, between the ground and plough beams on the bodies an angle of 90° (the setting can be checked by looking at the plough from its behind).



For vertical adjustment use two **adjustment screws (L, P)**, located on the plough's hanger arms. They are used for separate adjustment of right and left bodies.

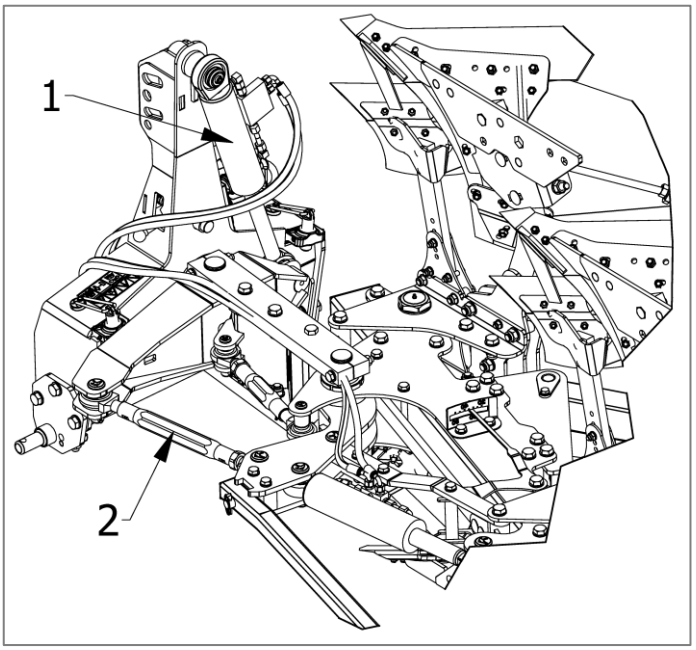
In order to change the setting of the screw for one side of the plough, lift the plough and rotate it, and then adjustment the screw, rotate the plough again to starting point to continue the operation.

7.3.7. Adjustment of horizontal tilt



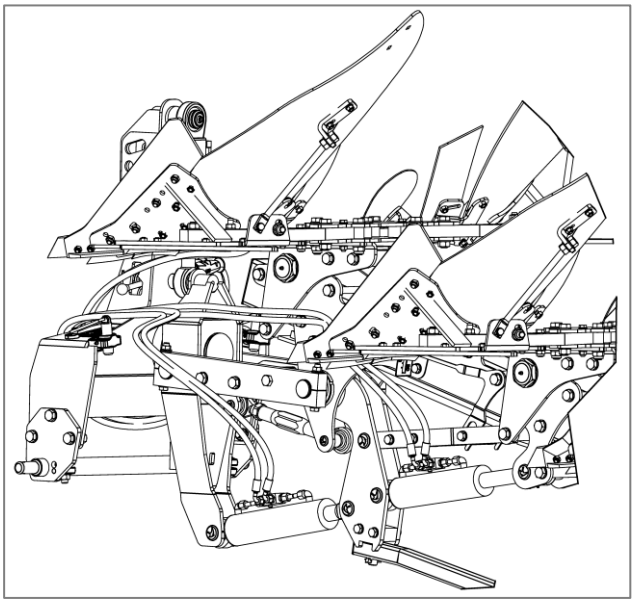
Once the first furrow is completed, correct the upper link length, tilt, furrow width, the plough's working depth and pressure of the support wheel. During work, the plough's frame always should be parallel to the ground.

7.4. Plough rotation



The plough's rotary mechanism is based on **rotation cylinder** (**1**) of two-side action. The cylinder is mounted at the back of hanger's turret which enables smooth and safe rotation.

External spindle (**2**) should be adjusted so that when the plough is lifted, the machine has a sufficient clearance from the ground to ensure a collision-free full rotation, taking into account also a change in the support wheel's position during this procedure. If necessary, when adjustment of the spindle cannot provide a sufficient amount of space for the plough's rotation, additionally change the upper link's position on the hanger for higher.

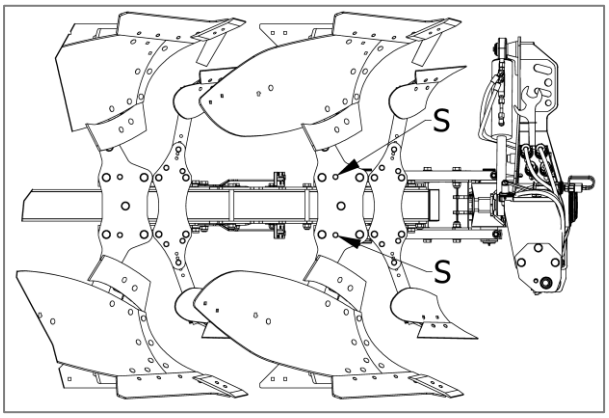


Once the plough's rotation is started from the position on right bodies, the two-side action cylinder will push the plough to its intermediate position, and then oil flow in the cylinder is automatically changed, while the plough is pushed to ploughing position on left bodies or the other way round.

Plough in half-rotation position.

Before the plough's rotation is started, make sure within the machine's range there are no personnel!

7.5. Shear bolts POV

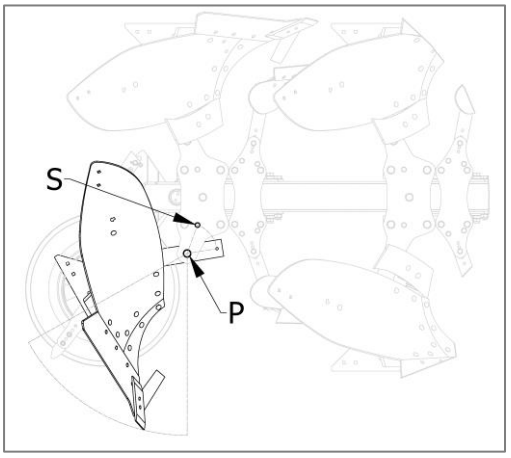


The simplest in use and the most effective stone protection device. Each plough body is protected with **shear bolts (S)** of adequate hardness. These bolts are mounted in upper holes on the plough beam and holder mounting the whole body on the frame. In lower holes bolts of greater hardness are provided, therefore once a stone is hit, an adequate bolt is sheared, and the whole body is lifted up as on hinges.

Remember to use special bolts of adequate hardness. The manufacturer uses shear bolts with hardness of 8.8.

Application of bolts of lower hardness, can lead to the need of replacing them frequently, or deformation of the bolts which may damage of the plough.

Also, use of bolts of too much hardness, can damage the machine. When the body hits a stone, it is also possible that the bolt is not sheared, and e.g. a ploughshare or other plough element can be subject to a damage.



Once the shear bolt is sheared, at an adequate point, the plough body passes the obstacle by, being lifted up, and then the body gets back to the working position.

To replace a sheared bolt:

- Carefully set the body in its working position, bearing in mind that it hangs on **joint bolt (P)**, and protect it against shifting,
- Remove remainders of the damaged bolt,
- Loosen bolt **(P)**,
- Place and tighten new **shear bolt (S)**,
- Tighten bolt **(P)**.

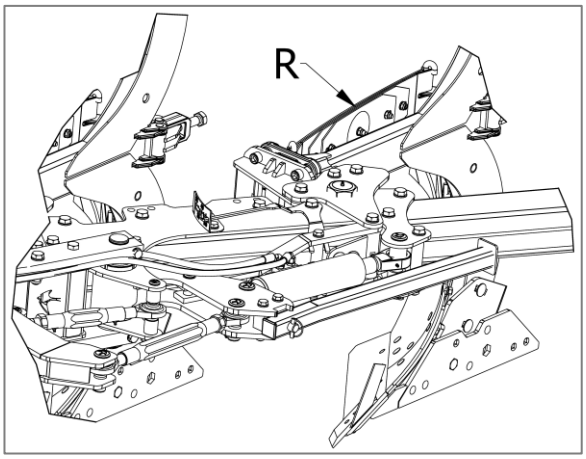
During ploughing never remain within area of plough body release! Keep a safe distance!

WARNING! Exercise particular caution when replacing shear bolt. Within the area of protection of the plough body with shear bolt, there are cutting and crushing risk points!

NOTE! Do not make the plough rotation with released body! This may cause damage to the machine!

7.6. Spring protection POVR

7.6.1. Construction of spring

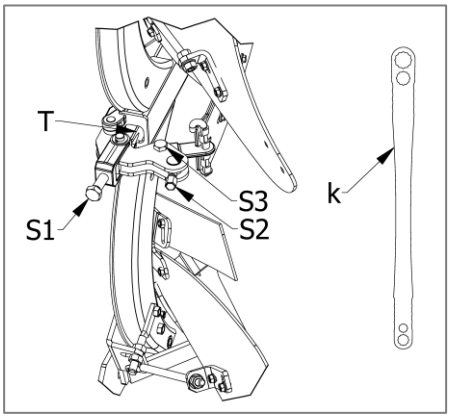


Plough bodies are protected with springs in case stones or other solid objects found in the soils are hit. Such solution enables tilting of a plough body slightly to either side and upwards in case of an obstacle, and thus protects the machine against damage. Once an obstacle is passed, the spring returns the whole body to its original position.
Spring (R) includes a set of 5 leaves enabling release of plough body with an approximate force of 7kN.
A properly tightened spring is 70cm long, measured between pins fixing it to the frame and the plough body.
Tightening of springs may vary over time, under working loads.

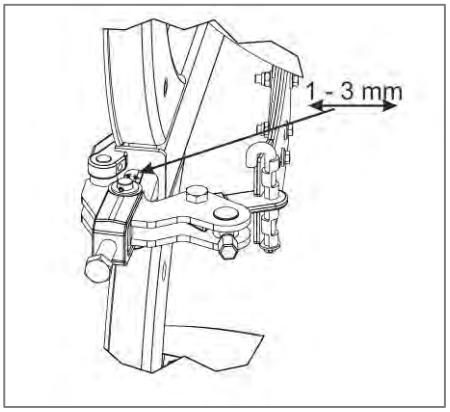
REMEMBER! Check adjustment of spring tightening after each working day, before and after the season.

7.6.2. Spring adjustment

To change (increase / decrease) the spring tightening and correct the working line for all bodies, adjust two screws located on each body.



To change (increase / decrease) the spring tightening:
- Lower the plough so it is supported on a level ground,
- Support a beam of a plough body to be adjusted,
- Loosen **screw (S3)**,

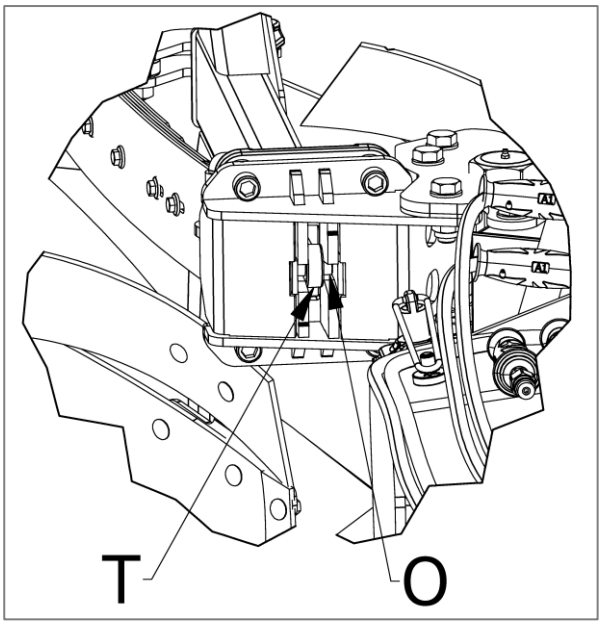


- Tighten **screw (S),** so that **pin (T)** is within 1-3mm from the left wall of the plough beam,
- Screw / unscrew **screw (S2)**, to achieve the desired length of the spring (approx. 70cm),
- Screw the **screw (S3)**.

To adjust plough's settings use a **wrench (K)** delivered with the plough by the manufacturer (the wrench is mounted by the plough's support foot).

NOTE! Exercise particular caution when adjusting! Within the area of the plough body mounting and spring adjustment, there are cutting and crushing risk points!

7.6.3. Disassembling of body

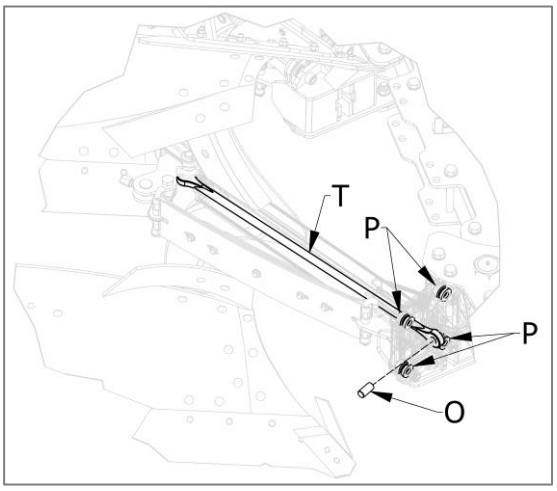


During operation it is possible that a body on hitting a sizeable obstacle is shifted. Due to this, it will require to be re-set in working position. When it seems the tractor cannot operate efficiently due to extremely difficult field conditions (weather, soil type) it can be necessary to disassemble one of the bodies.

To disassemble a body:

- Lower the plough and secure the body,
  - Reduce maximum spring tension (according to description given in 7.6.2. Spring adjustment),
  - Push out **pin (T)** mounting the body on frame holder (e.g. by pushing it forward from the adjustment side),
  - Remove **axis (O)** protecting the pin of the body.

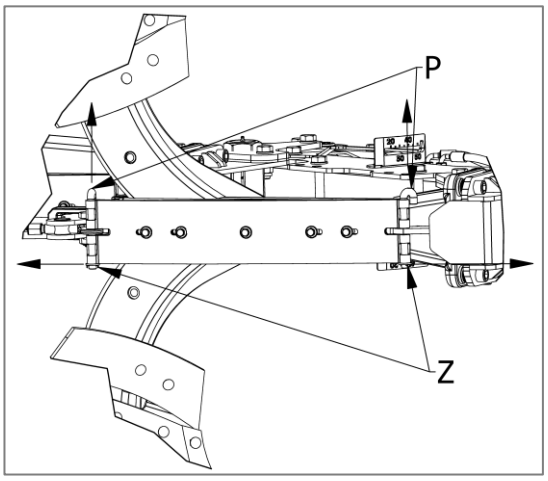
NOTE! Secure the body against falling properly, Failure to secure the disassembled elements may cause serious injuries!



To remount the body properly:

• Lean the body on **support points (P)** for mounting on the frame and protect against falling,
• **Pin (T)** for body mounting should be pushed forward so it is locked in the mounting,
• Slide protective **axis (O)** into pin opening,
• Tighten the spring properly (in accordance with instructions in Chapter 7.6.2. Spring adjustment).

7.6.4. Removing spring



To remove the spring for replacement or maintenance:

• Lower the plough on a level ground and protect the body against falling,
• Release the spring tensioning (in accordance with instructions in Chapter 7.6.2.),
• Remove **cotters (Z)** protecting pins for spring mounting,
• Carefully remove **pins (P)** for spring mounting on the body, while holding the spring itself (after making sure it is not tightened),
• Remove the spring.

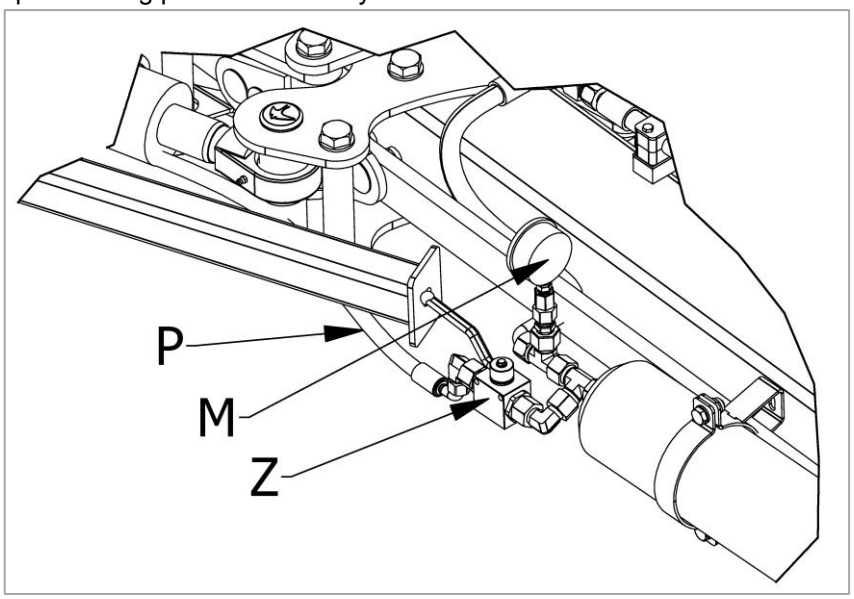
In order to mount the spring correctly, follow the below instructions (reverse the order of the final three steps).

NOTE! Before removing the spring, make sure it is protected properly! Make sure the given element is not tensioned as releasing of the force accumulated in a tensioned body may cause a serious risk!

7.7. Hydraulic protection POVH

7.7.1. Construction and adjustment

Plough bodies are protected in case stones or other solid objects found in the soils are hit. The protection is a hydraulic cylinder system with adjustable pressure, coupled with **hydraulic accumulator (H)** (gas and oil). The hydraulic accumulator together with the whole hose and cylinder system is under pressure which is indicated on pressure gauge. During operation gas compressed within the hydraulic accumulator acts as a spring, providing automatic cushioning. Such solution enables tilting of a plough body in either direction. Once an obstacle is passed, the whole body is automatically pushed to its starting point.
Proper working pressure in the system is between 40 and 120 bar.



Working pressure should not be raised significantly above the level when bodies are able to keep their working position, not being released automatically on the soil's resistance.
To adjust pressure in the system:

- Connect **plough's hydraulic hose (P)** to the tractor's hydraulic section,
- Open **valve (Z)**,
- Increase/reduce pressure in the system by means of tractor's hydraulic system, while controlling the pressure level in the system on **pressure gauge (M)**,
- Close valve **(Z)**.

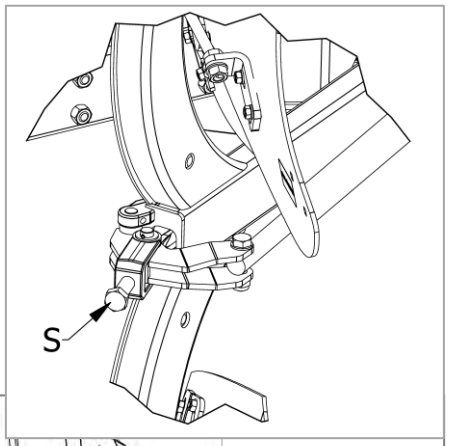
REMEMBER! Control working pressure in the hydraulic protection system during operation, after daily work, before and after the season. Never disconnect the plough's hydraulic system, if it is not protected by valve closure and is under pressure!

Never reduce pressure in the hydraulic protection system below 10bar! If the pressure is lower than recommended, plough bodies will be lowered automatically, what in turn may result in the machine damage or an accident!

To align all bodies, adjust the screw on each body.

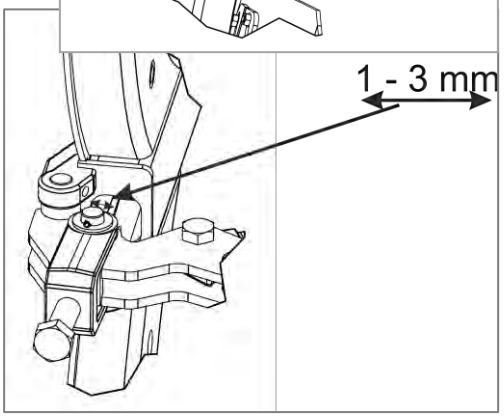
To adjust a body:

- Lower the plough so it is supported on a level ground,
- Support a beam of a plough body to be adjusted,
- Loosen **bolt (S)**,



Each body should be aligned. To align them correctly:

- Tighten **bolt (S),** so that **pin** is within 1-3mm from the left wall of the plough beam,

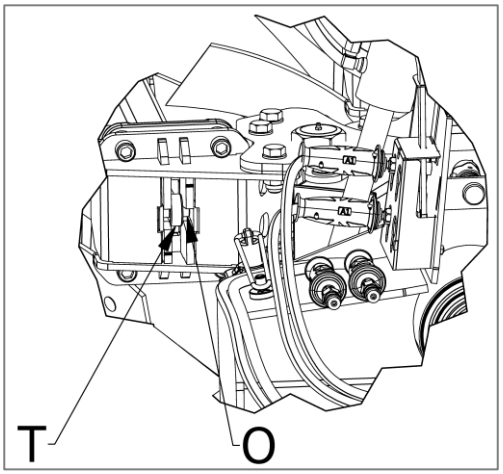


To adjust plough's settings use a **wrench** delivered with the plough by the manufacturer (the wrench is mounted by the plough's support foot).

NOTE! Exercise particular caution when adjusting! Within the area of the plough body mounting and adjustment, there are cutting and crushing risk points!

7.7.2. Disassembling of body

During operation it is possible that a body on hitting a sizeable obstacle is shifted. Due to this, it will require to be re-set in working position. When it seems the tractor cannot operate efficiently due to extremely difficult field conditions (weather, soil type) it can be necessary to disassemble one of the bodies.



To disassemble a body:

- Lower the plough and secure the body,
- Reduce maximum working pressure,
- Push out **pin (T)** mounting the body on frame holder (e.g. by pushing it forward from the adjustment side),
- Remove **axis (O)** protecting the pin of the body.

NOTE! Before disassembling secure the body and the cylinder accordingly! Make sure the given element is not tensioned as releasing of the force accumulated in a tensioned body may cause a serious risk!

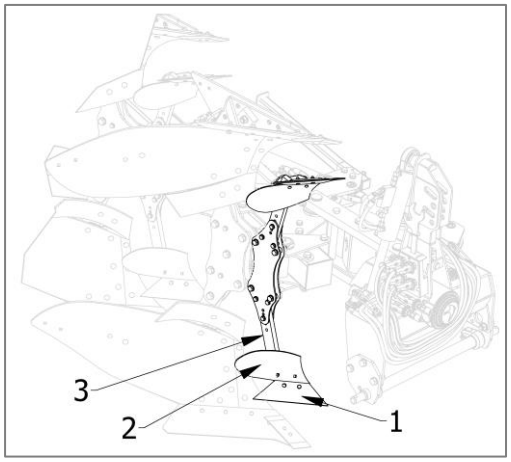
NOTE! Appropriately secure the body against falling, preferably using a lifting device, to which the body will be attached using certified straps, ropes or chains! Failure to secure the disassembled elements may cause serious injuries!

Such disassembly must be carried out using an adequate lifting device and certified straps, ropes or chains! This can be carried out by a specialized service only!

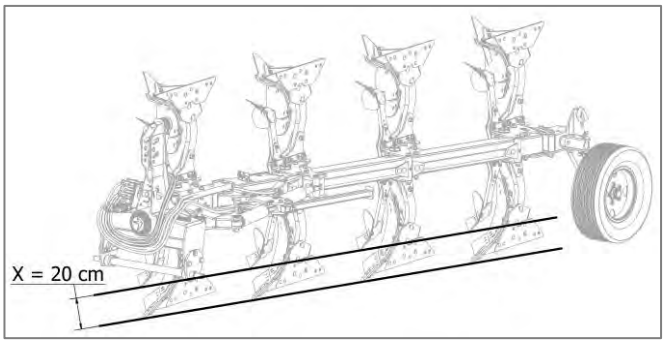
7.8. Optional equipment

7.8.1. Skim coulter

On a customer's request, the plough can be fitted with skim coulters. Generally, their function is to turn over a cut soil for better coverage of plant residues. If properly adjusted, they are suitable for weed removal as well.

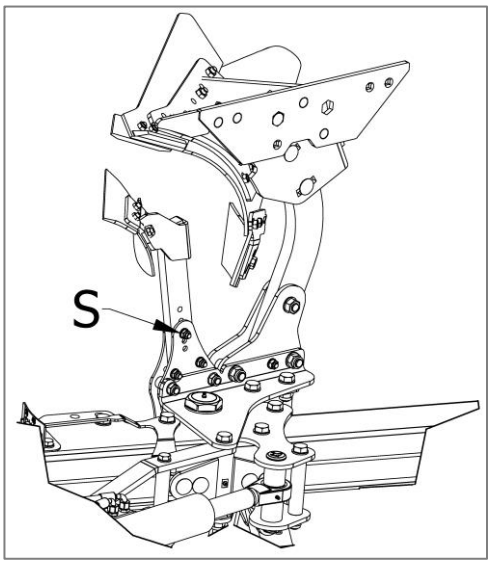


A skim coulter consists of **ploughshare (1)**, **mouldboard (2)** and **plough beam (3)** with **mounting**.



Skim coulters should operate at a depth of 5-10cm. For deep ploughing adjust skim coulters so that ends of their ploughshares are approx. 20cm from ends of ploughshare chisels on plough bodies.

REMEMBER! All skim coulters should be set at an equal height related to the ground **(x)**.



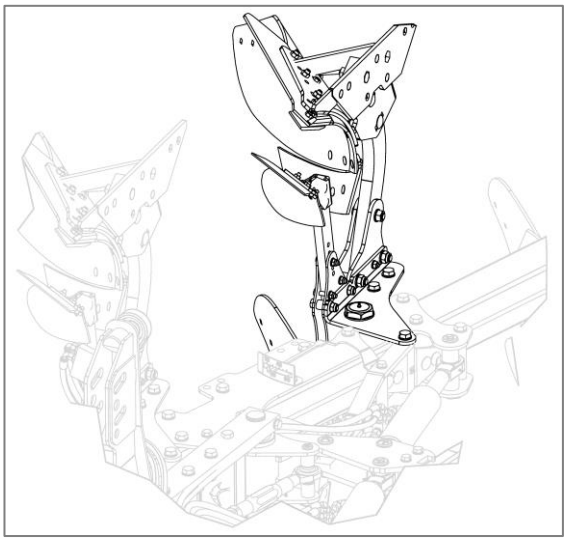
Plough beam of each skim coulter features a few-step vertical adjustment.

To change working depth of skim coulters:

- support skim coulter to prevent its falling,
- loosen nut and remove bolt (**S)**,
- lift / lower skim coulter accordingly to adjustment scale,
- pass bolt (**S)** through and tighten nut.

NOTE! Exercise particular caution when adjusting skim coulters! There is a risk of injuries!

Be careful when setting skim coulter on first plough body, so that after the skim coulter fixing bolt is sheared the skim coulter would not collide with the rotation cylinder!

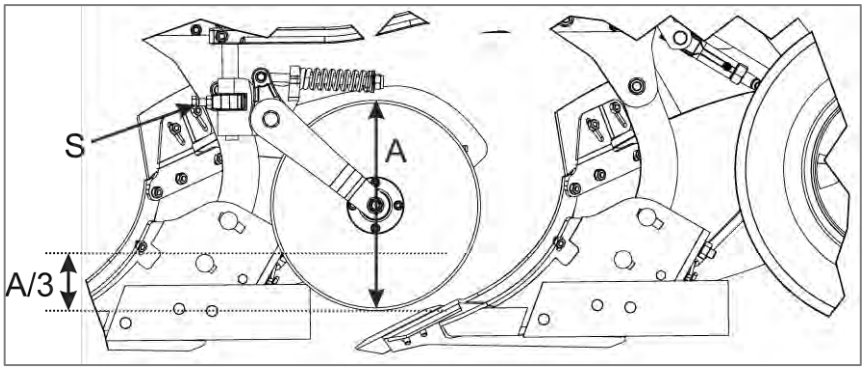


Width and angle at which skim coulters work depends of the setting on plough body mounting (skim coulters are mounted to the frame by means of the same holder as plough bodies).

7.8.2. Disk cutter

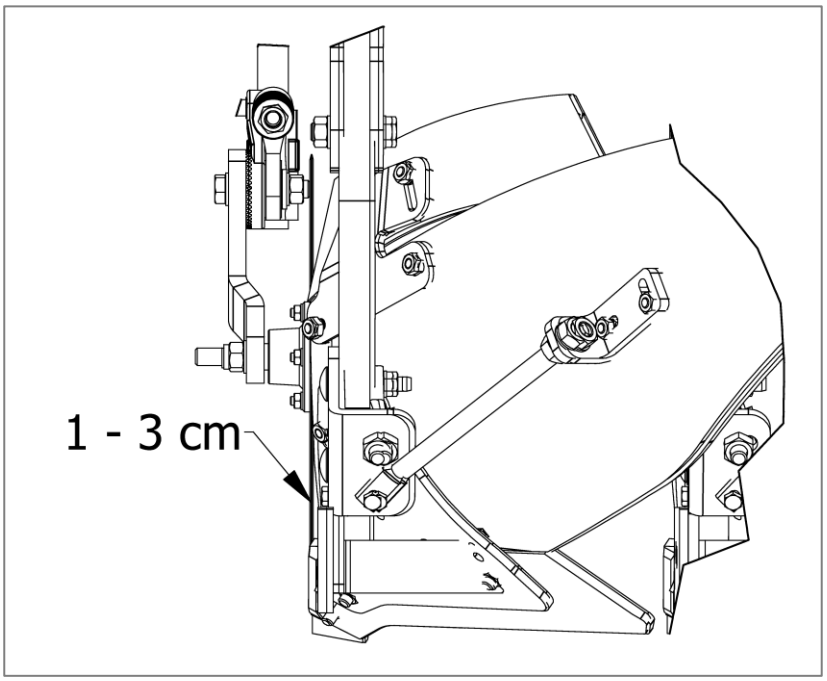
Disk cutters, which the plough can be equipped with, are used for vertical cutting of a furrow produced by a ploughshare.

In order to ensure proper operation, disk cutters should be set so that they penetrate into the soil by no more than 1/3 of their diameter.



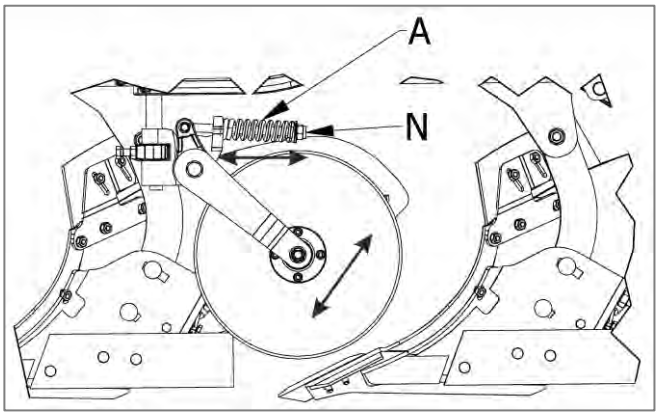
To adjust position of disk cutters:

- support disk cutter arm,
- hold the cutter,
- loosen **bolt (S)**,
- move cutter arm up or down,
- tighten **bolt (S)**.



The cutting line should go 1 to 3 cm from the inner edge of plough body breast.

NOTE! Within the area of disk cutters, there are points of cutting and crushing risks! Exercise particular caution!

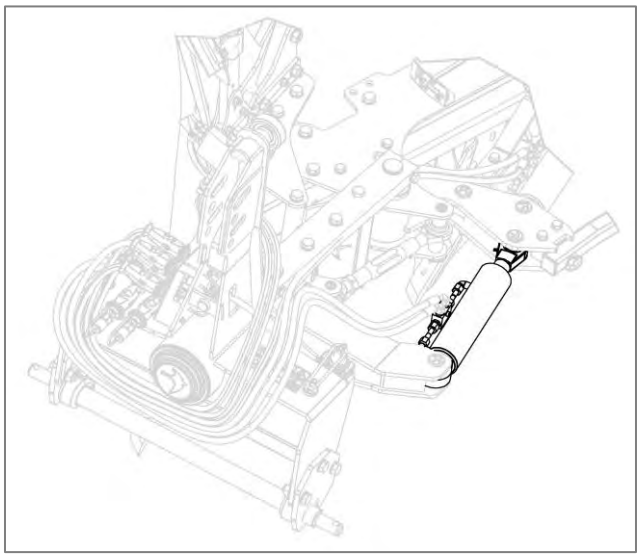


Cutters are provided protection, in case of hitting a solid obstacle, as a **spring (A)** on the cutter supporting arm. Use of cutters mounted on a spring is a particularly important solution for work on difficult and stony grounds. The spring is intended to protect the cutter against damage and at the same time ensure that cutters do not operate as a wheel, on which the plough would be supported during operation, in turn leading to deterioration in the ploughing quality. The spring offers adjustment of pressing force for the cutter by means of a **nut (N).**

NOTE! Exercise caution when adjusting cutters! There is a risk of injuries! Never undo fastening bolts completely, as otherwise the machine's unit can detach freely!

REMEMBER! All disk cutters always should be set at the same depth and mounted in the same distance from furrows.

7.8.3. Ruling cylinder



Ruling cylinder is used for step-less hydraulic adjustment of the tractor-plough hauling rope setting. The operator can adjust the plough's setting without the need to get out of the tractor's cabin using lever for control of hydraulic sections. The ruling cylinder is set based on instructions given in 7.3.2.

VIII. TRANSPORT

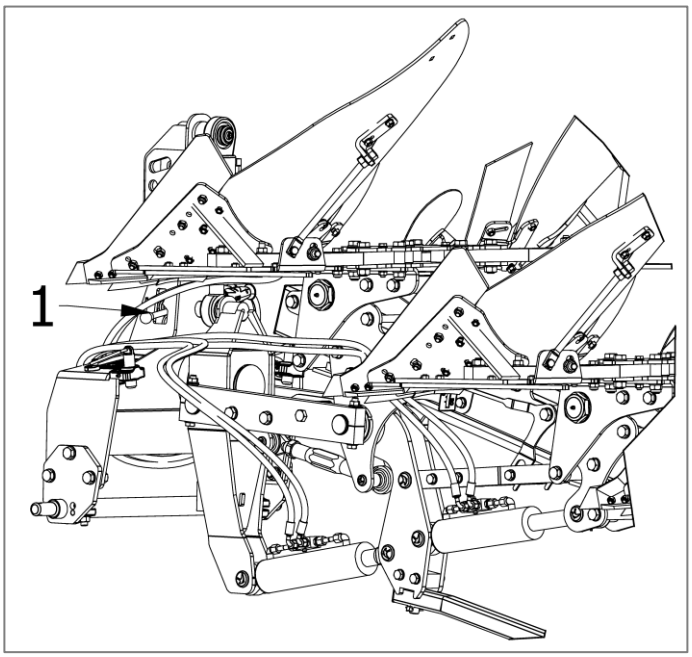
8.1. Delivery and unloading

If the machine is purchased directly from the manufacturer, the transport conditions are determined by AGRO-MASZ, if no other arrangements are made with the customer. The delivery time-limit is settled by the manufacturer in consultation with the customer. The seller (manufacturer) is responsible for the proper packaging and protection of the machine for the time of transport. The manufacturer is also responsible for loading of the machine for the needs of transport to the customer. However, the carrier is responsible for the machine for the time of transport.

The POV plough is delivered assembled to the customer. Some sub-assemblies can be set in a transport position or disassembled. In this case the sub-assemblies are installed by the authorised AGRO-MASZ or trading partner's employee at the customer's site.

Conditions for unloading machine safely:
1. Depending on structure of a transport trailer, the POV plough can be driven down once it's aggregated with a tractor or can be lifted by means of a hoisting device (crane, fork-lift truck, etc.)
2. Loading and unloading of the machine and its assemblies should be performed with a crane by personnel holding adequate qualifications.
3. The machine can be hoisted only by marked points (fixation points are marked with decals) considering proper distribution of load and stability of the lifted machine.
4. Check whether the hoisting device has adequate capacity and there is no risk of the machine's falling.
5. Use only certified ropes, chains or belts of relevant strength.
6. Do not mount the machine directly onto the crane's hook and rather use ropes, chains or belts.
7. When lifting the machine, keep ropes, chains or belts tensioned, so as to prevent it from swinging which may cause an accident.
8. When lifting the machine with a crane, always pay attention to hoist trajectory and remove any obstacles.
9. The whole area, where any machine's manoeuvring is to take place and vehicle's setting location should be previously checked for any possible "danger areas" and particularly for conductors, gas pipelines or liquid hoses. If such "danger areas" are present, choose other areas for manoeuvring.
10. All employees should keep proper safety distance, so in case of an accidental falling of the machine, no person is injured.

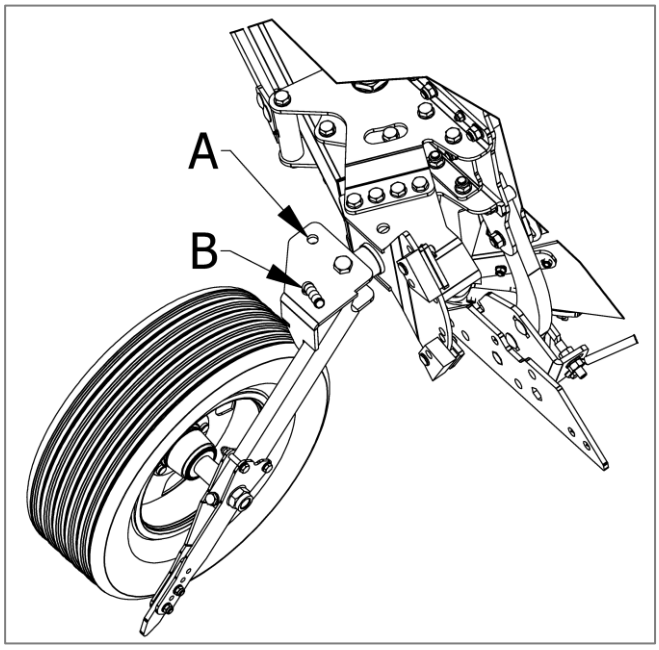
8.2. Transport – driving on public roads



The plough's head is fitted with **frame transport lock** (**1**) for transporting in half-rotation position.

To move the plough to transport position:

- Lift and rotate the plough using right bodies down (so that the wheel is at the left of the plough's frame),
- Remove pin protecting the wheel and put it through the other hole **(B)** after the wheel changed its position by 90° (picture below),
- Turn transport lock **(1)** 90° clockwise,
- Start the plough rotation mechanism, so that the machine is locked in transport position,
- Lower the plough so it is supported on the wheel,
- Detach upper link from plough head

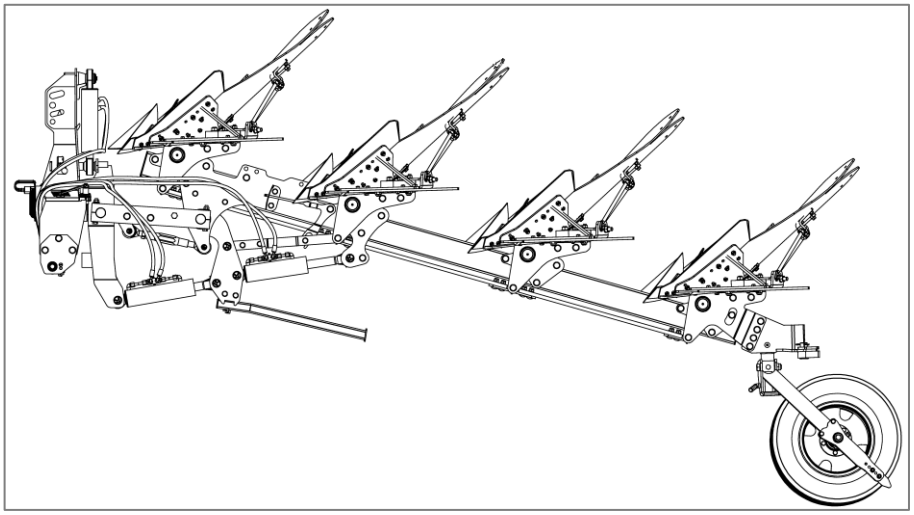


Wheel transport position.

Take care as the machine can swing beyond the outline of the tractor at the corners!

Before transport, fix supports of the tractor's lower links to limit the sideways movements of the machine!

For driving on public roads, according to valid regulations, the machine should be equipped with lighting and warning plates.



Machine transport position.

After leaving the field, and before driving onto roads, clean the machine of the soil.

Always keep in mind that the tractor's rear axle is significantly loaded and its front section must be additionally loaded to keep proper manoeuvrability of the assembly.

It is required that for transport the wheel is mounted on the last section of the frame (between last bodies). When driving on roads the wheel is subject to high loads, and mounting it at the frame's end allows to reduce this load and avoid tearing of wheel mounting bolts.

REMEMBER! Before work in the field, remember to remove lighting and warning plates to prevent their damage.

8.2.1. Speed

Always adjust the speed to the road conditions and observe road traffic regulations. The maximum permissible speed during transport of the plough equipped with a universal support wheel on the roads in all conditions is 25 km/h.

IX. MAINTENANCE

The machine can be repaired and serviced only by personnel with proper knowledge and being familiar with the possible risk and instruction manual!

To keep the plough in the best technical condition and its optimum service lifetime, maintain its elements in accordance with the below-mentioned schedule.

Apart from elements subject to regular lubrication, to keep the machine's functionality, it is necessary to inspect:

- tightening of bolts and nuts connecting elements of the plough,
- technical condition of hydraulic hoses which, if apparent mechanical damages or rubber porosity is found, should be replaced,

NOTE! It is forbidden to work under the raised plough without its additional protection!

9.1. Lubrication

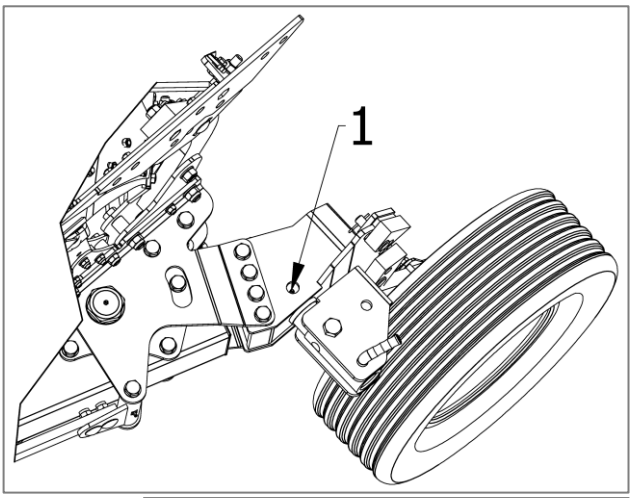
Proper care of the lubricated elements of the plough will prevent the penetration of dirt or water into places between movable parts of the machine, and as a consequence, will protect against its premature wear.

Lubricate until grease gets out from the lubrication point. Remove the excess with a cloth to prevent accumulation of dirt on the grease.

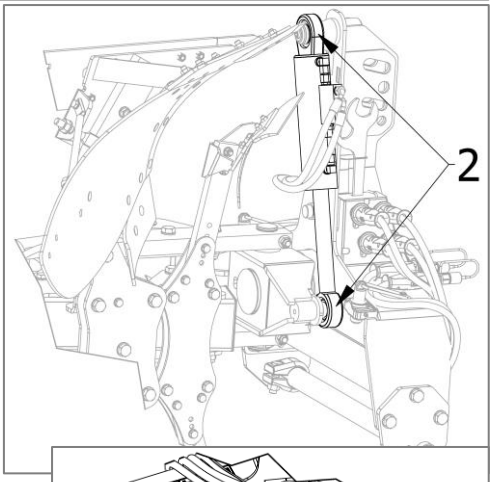
REMEMBER! Make sure that before the first use the rotation bearing is greased abundantly (approx. 3L).

LUBRICATION PLAN

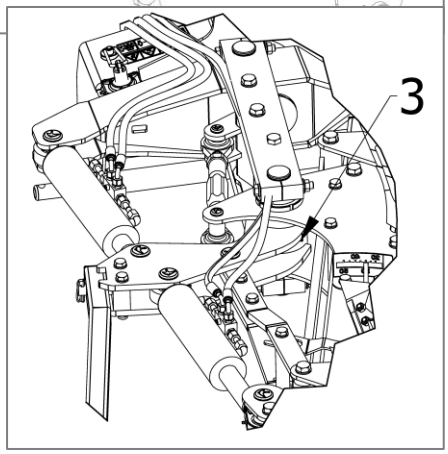
	DESIGNATION OF SUBASSEMBLY	NUMBER OF LUBRICATION POINTS	TYPE OF GREASE	LUBRICATION FREQUENCY
1	Mounting of ground following wheel bracket	1	ŁT-41	20h of operation
2	Tilt cylinder joints	2	ŁT-41	50h of operation
3	Pins of frame-hanger joint	2	ŁT-41	20h of operation
4	Rotation bearing	1	ŁT-41	20h of operation
5	Bottle screws	2	ŁT-41	Once a year



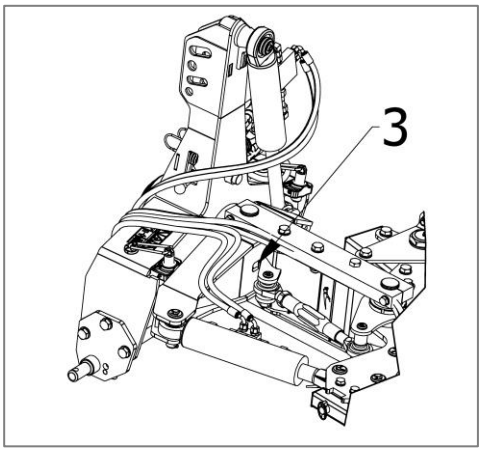
Mounting of wheel bracket.



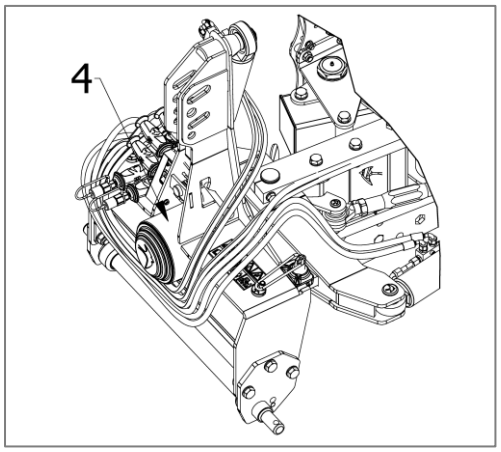
Tilt cylinder joints.



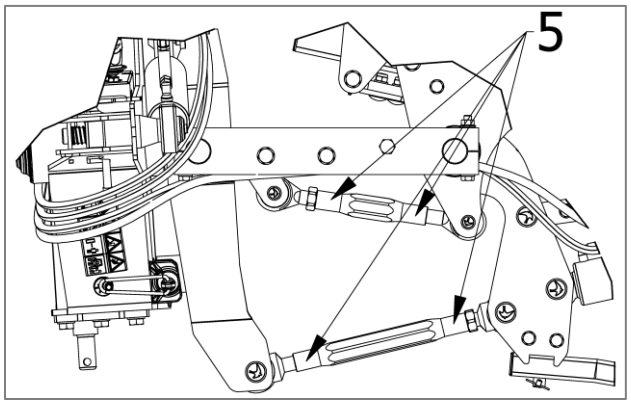
Pin of frame-hanger joint.



Pin of frame-hanger joint.



Rotation mechanism bearing.



Bottle screws.

REMEMBER! For maintenance, use adequate enriched grease! Use of a grease of inadequate parameters can result in the faster wear of the plough parts or their breakdown!

9.2. Bolt tightening

The machine is provided with bolts with hardness grade of 8.8, 10.9 and 12.9. The below table is intended to indicate the torque measured in [Nm] that should be applied to bolts of particular sizes and hardness grades for different sub-assemblies of the machine in order to ensure its proper operation and protect against part loosening and breakdown. The table includes most types of the bolts used in the machine.

REMEMBER! Suggested values provided in the table are given for reference only.

Bolts and nuts can be oiled so as to provide their easier tightening (applying less torque).

REMEMBER! Damaged bolts should be replaced with new ones of the same quality.

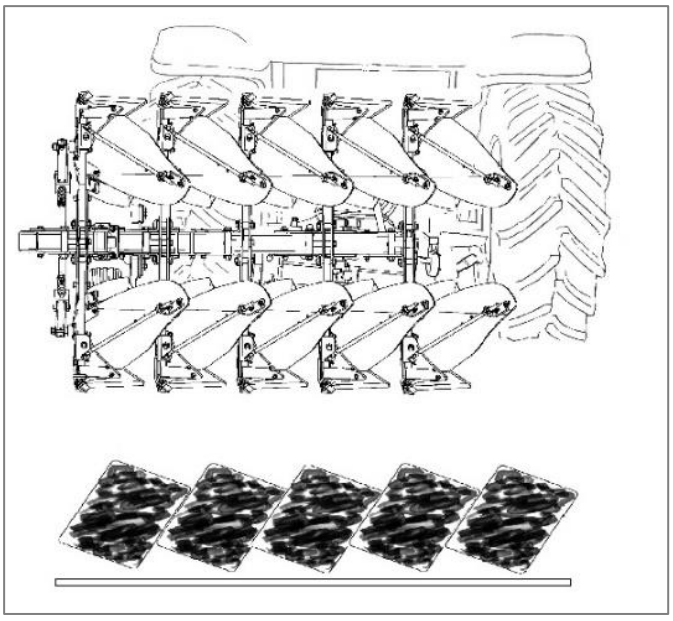
Control the tightening torque of bolts during operation!

Tighten all bolts and nuts after the first day of operation! Tighten all bolts and nuts after the end of the working season!

NOTE! It is forbidden to use bolts with the parameters other than applied by the manufacturer!

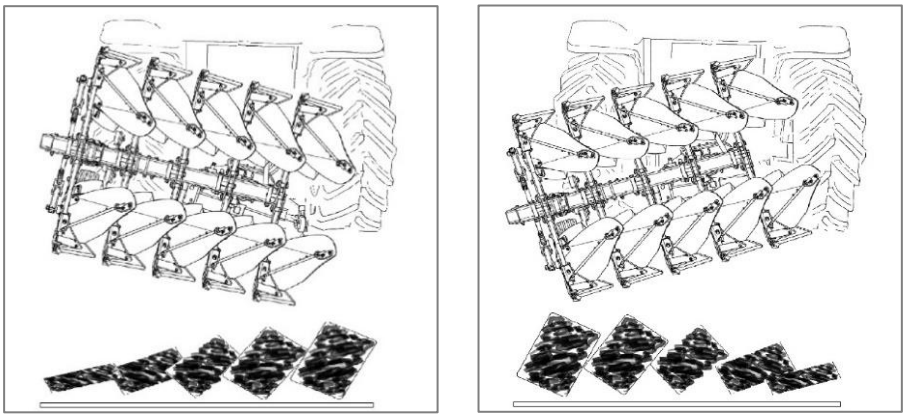
SIZE	HARDNESS	TIGHTENING TORQUE [Nm]
M12	8.8	80-85
M14	8.8	137-145
M16	8.8	195-207
M20	8.8	380-410
M24	8.8	658-672
M30	8.8	1290-1332
M12	10.9	102-120
M14	10.9	178-198
M16	10.9	276-300
M20	10.9	542-590
M24	10.9	933-1005
M30	10.9	1820-1910
M12	12.9	135-145
M16	12.9	332-360
M20	12.9	648-712
M24	12.9	1105-1240

9.3. Instructions for proper operation



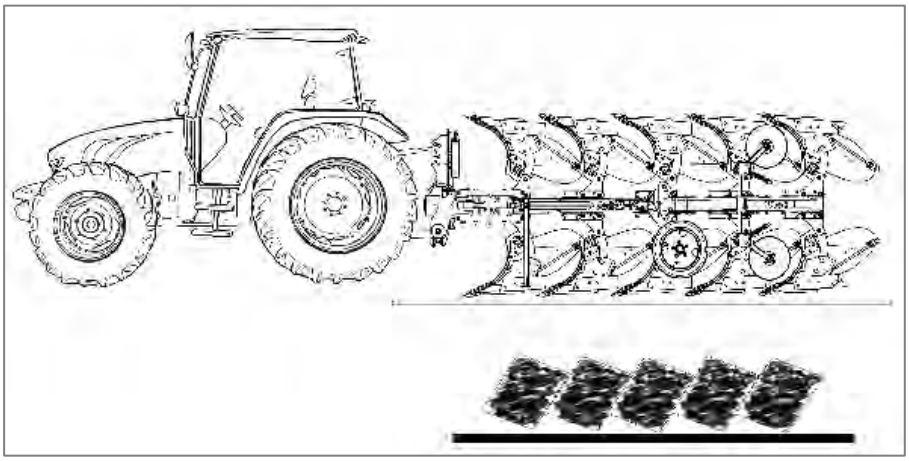
Correct vertical setting of the plough.

Even if settings of each particular element of the plough are correct, this will not ensure a high quality of ploughing unless the whole machine is checked for vertical and horizontal setting.

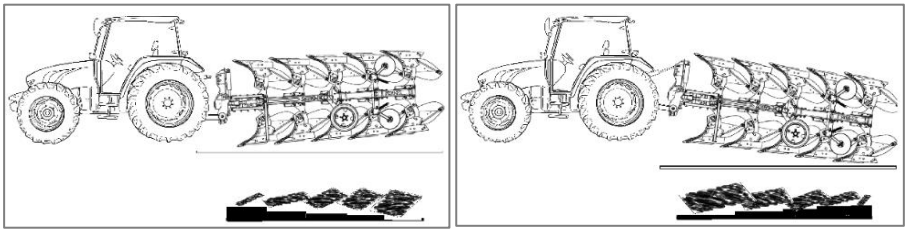


Incorrect vertical settings of the plough.

As far as the quality of work is concerned, it is important to have the depth correctly set. Maximum working depth should not be greater than 2/3 of the furrow width, which in normal soil conditions will allow to produce furrows which are properly turned over and balanced.



Correct horizontal setting of the plough.



Incorrect horizontal settings of the machine.

Ploughing quality is significantly influenced by an apparently obvious matter of turning on headlands. It is recommended to take turns using either of two methods:

- Turn by 360° – when approaching the edge of the field, start the plough lifting function at the same time turning maximally to the ploughed part of the field, and shortly after that smoothly turn the steering wheel maximally to the opposite direction, and then approach the unploughed part again, turn and lower the plough.
- Three-point turn – lift the plough on headland, turning accordingly towards the ploughed field, drive the tractor back to the unploughed part and turn smoothly to get near and lower the plough.

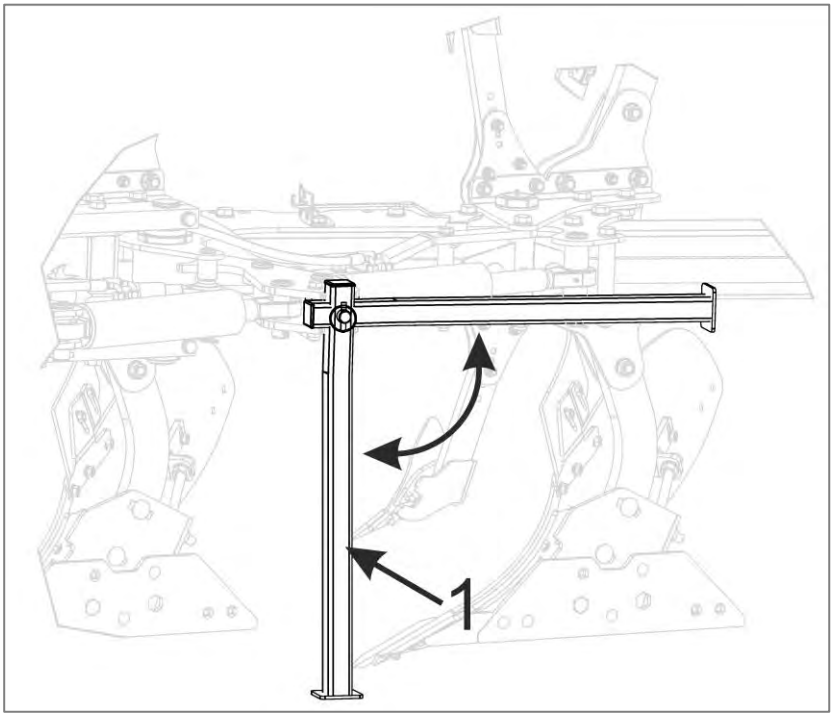
Adjust working speed according to soil conditions, stony fields in particular, cultivation of which, with too high working speed, may result in a major damage to the machine.

Always try to drive as straight as possible. Careless driving (uneven furrows), apart from deterioration in quality of ploughing, as consequence will result in sudden load of the tractor and progressive increase in fuel consumption.

It is not possible to carry out ploughing using only right or left bodies. Always use left and right bodies alternatively. Bodies at both sides should wear evenly, which in turn will produce a uniform furrow at both sides.

Always mark headlands (across the field, in particular), while using the last plough body which will facilitate loosening of the tractor's upper link. A headland should be of an adequate width, including length of the tractor-plough assembly.

9.4. Detachment of plough



The plough always should be parked on a firm and level ground.

To safely detach the plough from the tractor:

- turn the plough to working position and lower it so it is supported with right bodies on the ground,
- turn the tractor's engine off and remove the ignition key,
- set lever for hydraulic connector control valve in neutral position (to depressurize the hoses) and disconnect the plough's hydraulic hoses,
- detach the upper link of the three-point linkage from the plough's hanger,
- unlock and lower **support foot** (**1**) of the plough,
- remove lower links from the plough's latch bar.

9.5. Storage

The machine should be cleaned on regular basis, taking particular care after the end of the working season for a storing period between the working seasons, which will affect its service lifetime. The plough can be cleaned by means of compressed air or a pressure washer. However, the water jet should not be directly pointed to the lubrication places and bearings.

The elements of the machine indicated in the lubrication table also should be lubricated before every working season, after its end, as well as after every washing of the machine (in particular after the use of pressure washer).

The preserved machine should be parked and stored on a firm and level ground, with unfolded and secured support foot (the plough should not be supported on the wheel), shielded from direct impact of weather conditions (sun, rain, snow) which will protect metal elements without paint against rust, and rubber elements against damage.

NOTE! Make sure children and animals have no access to the machine.

Additionally, surfaces which lose paint coating due to work in contact with soil, should be preserved with oil.

9.6. Replacement of parts

Parts, technical condition of which shows wear, should be replaced immediately, so as to prevent other sub-assemblies against wear, which in turn could cause deterioration in quality of work performed by the machine. To maintain functions of the plough, it is essential to use original spare parts only. Before replacement of any parts, the plough should be set in transport position and protected against falling down by means of an adequately strong and stable support (e.g. a thick metal support or a wooden beam). It is also necessary to turn the tractor's engine off, engage the parking brake and protect the tractor wheels with the additional supports. It is recommended to clean the area of the machine, maintenance of which is to be performed. Only after it is certain that the plough is stable, replacement of worn or damaged parts can be performed.

Elements of the plough, working in a direct contact with the soil, i.e. ploughshares, ploughshare chisels, mouldboards, and other parts of plough bodies and shear bolts, are exposed to the fastest wear.

Chisels (ploughshare blades) are elements the construction of which enables reversing them, if one end is worn significantly.

Ploughshares should be replaced in good time before section where the chisel is bolted is affected by wear. However a ploughshare can be recovered, if its wear allows for this.

Mouldboards should be replaced together with supports, if there is a deterioration in dumping of a produced furrow, or eventually, if the element starts to get deformed.

 It is forbidden to perform maintenance works of the plough without providing an additional protection against falling down, shifting or releasing of its parts!

Use protective clothing (gloves, goggles, etc.) in order to protect against sharp parts of the machine. Working elements in contact with the soil can be particularly sharp. Their improper operation can result in personal injury!

Protect skin against direct contact with greases and oils!

Prevent penetration of lubricants and oils into the soil!

Use only tools in proper technical condition!

9.7. Defects and their elimination

The below table presents the possible defects during operation and most often incorrect arrangements of the machine, causing unintended faster wear of the plough and the tractor.

MALFUNCTION	POSSIBLE CAUSE	REPAIR ACTION
Oil leaks from hydraulic hose fitting	Soiling of seal area	Thoroughly clean internal and external side of the plough's and the tractor's fittings
	Damaged push-in fitting seal	Replace push-in fitting end
	Loose nut connecting push-in fitting to hydraulic hose	Tighten push-in fitting nut
Tractor tends to turn in one side	Uneven setting of protective means to stabilise tractor's lower links	Adjust setting of link stabilisers
	Incorrectly adjusted plough	Correct settings of particular elements of plough (refer to “Maintenance and service”)

MALFUNCTION	POSSIBLE CAUSE	REPAIR ACTION
Tractor front section is lifted	Improper additional loading of tractor front section in relation to plough's weight	Mount more front axis weights on tractor
		Fill front tyres with liquid (if provided by tractor's manufacturer)
Plough does not penetrate into soil	Upper link on tractor's three-point linkage is too loose	Tighten upper link to shorten
	Link is mounted to high on plough's turret	Re-attach upper link on plough's lower attachment hole
Plough “jumps” causing uneven passage	Plough's weight is distributed in excess on support wheel	Adjust support wheel setting to distribute part of plough's weight onto tractor
Plough body protecting bolt (peg) is sheared too often	Use of bolt with inadequate diameter or hardness	Mount original bolts with adequate hardness
Uneven ploughing on the right and on the left	Improper vertical setting of the plough	Adjust setting screws (see “Adjustment of vertical tilt”)
	Different settings of approach angle for right and left mouldboards	Adjust mouldboards position
	Uneven pressure in tractor's rear tyres	Adjust pressure according to the tractor manufacturer's instructions
Furrows are not turned over completely	Set furrow width is too narrow related to ploughing depth	Increase furrow width (refer to “Plough bodies – Fig. Change of furrow width”)
Furrows are uneven on the same passage	Mouldboards are not set parallel	Adjust mouldboards to be parallel
	Skim coulters are set for various depths (plough optional version)	Adjust skim coulters higher / lower, all at equal height
	Improperly adjusted disk cutters (plough optional version)	Adjust furrow width and cutter setting

9.8. Environmental protection

When the machine is significantly worn, as a result of the expiry of its service lifetime, it should be utilised by a specialist company, in accordance with the applicable environmental protection regulations.

Worn and damaged parts of the machine, replaced with the new ones, should be dealt in a special way, as well. Such parts should be stored on the farm in a specially isolated place, protected against access of people and animals, and periodically delivered to the collection points (metal scrap points).

Plastic parts (hydraulic hoses, tyres) should be delivered to separate collection points for recycling purposes.

9.9. Noise and vibrations

The machine does not pose a health risk to the operator, because the noise level / level of emitted acoustic pressure at the workplace, corrected by the characteristics A, does not exceed 70dB (A).

There is no vibration hazard while using the plough, either. The operator's workplace is the tractor's cabin, appropriately and ergonomically shaped and cushioned.

NOTES

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X. WARRANTY CERTIFICATE

Any defects under warranty should be notified directly to the manufacturer by phone: +48 661 076 457.
For proper warranty service, in addition to the afore-mentioned notification, the machine's user should submit photographs of the machine showing the defect at: serwis@agro-masz.eu.

10.1. Warranty terms

1) The “user”, as referred herein, means any natural or legal person purchasing agricultural equipment; the “seller” – a trade unit delivering equipment to the user, the manufacturer – a maker of agricultural equipment.
2) Before work, the user should carefully get acquainted with this instruction manual in order to avoid unnecessary breakdowns, as failure to observe rules for proper operation results in reduction of the machine's efficiency and loss of warranty rights.
3) The manufacturer guarantees its products against faults in materials or production.
4) Faults or damages to the plough found within 12 months from the date of purchase shall be removed free of charge at the Purchaser.
5) Faults or damages should be submitted personally, in writing or by telephone. Warranty repairs are performed by the manufacturer.
6) If it is necessary to perform 4 warranty repairs within the warranty period, and the product still fails to function properly, the purchaser is entitled to have the product replaced with a new defect-free one or have the money returned.
7) Upon completion of the repair, the manufacturer must submit a warranty claim within 14 days.
8) The purchaser bears costs of technical evaluation – when the manufacturer finds that the claimed product is defect-free and it is confirmed by an expert opinion.
9) The manufacturer has the right to cancel the warranty, if within the warranty period the machine was used not as intended, and any unauthorised technical modifications or repairs were carried out.
10) The warranty does not cover the removal of damages caused by the user,

- removal of damages due to modifications or alterations of the product not agreed with the manufacturer (design modifications),
- removal of damages caused by random or other events, for which the manufacturer shall not be held responsible,
- removal of damages caused due to the use of the machine not as intended or against provisions of the instruction manual,
- replacement of ploughshares, ploughshare chisels, breasts and mouldboards, shear bolts, landsides, and other parts, wear and tear of which can occur before the end of warranty period.

The above warranty terms are valid in Poland and apply to the purchase of the machine by the user residing in Poland.

10.2. Warranty table

MACHINE INFORMATION	
Plough symbol	
Factory number	
Date of sale	
Manufacturer's signature and stamp	
Seller's signature and stamp	

NOTE! When the product is purchased, request the seller to fill in exactly the warranty certificate, specifying the date and place of sale and have the data confirmed with the seller's stamp and signature. Otherwise the purchaser may lose his / her warranty rights. The warranty certificate, if not filled in, filled in illegibly or corrected, is invalid.

10.3. List of service works

	SCOPE OF REPAIRS	DATE, REPAIR CONTRACTOR'S SIGNATURE STAMP

	SCOPE OF REPAIRS	DATE, REPAIR CONTRACTOR'S SIGNATURE STAMP

XI. PARTS CATALOGUE

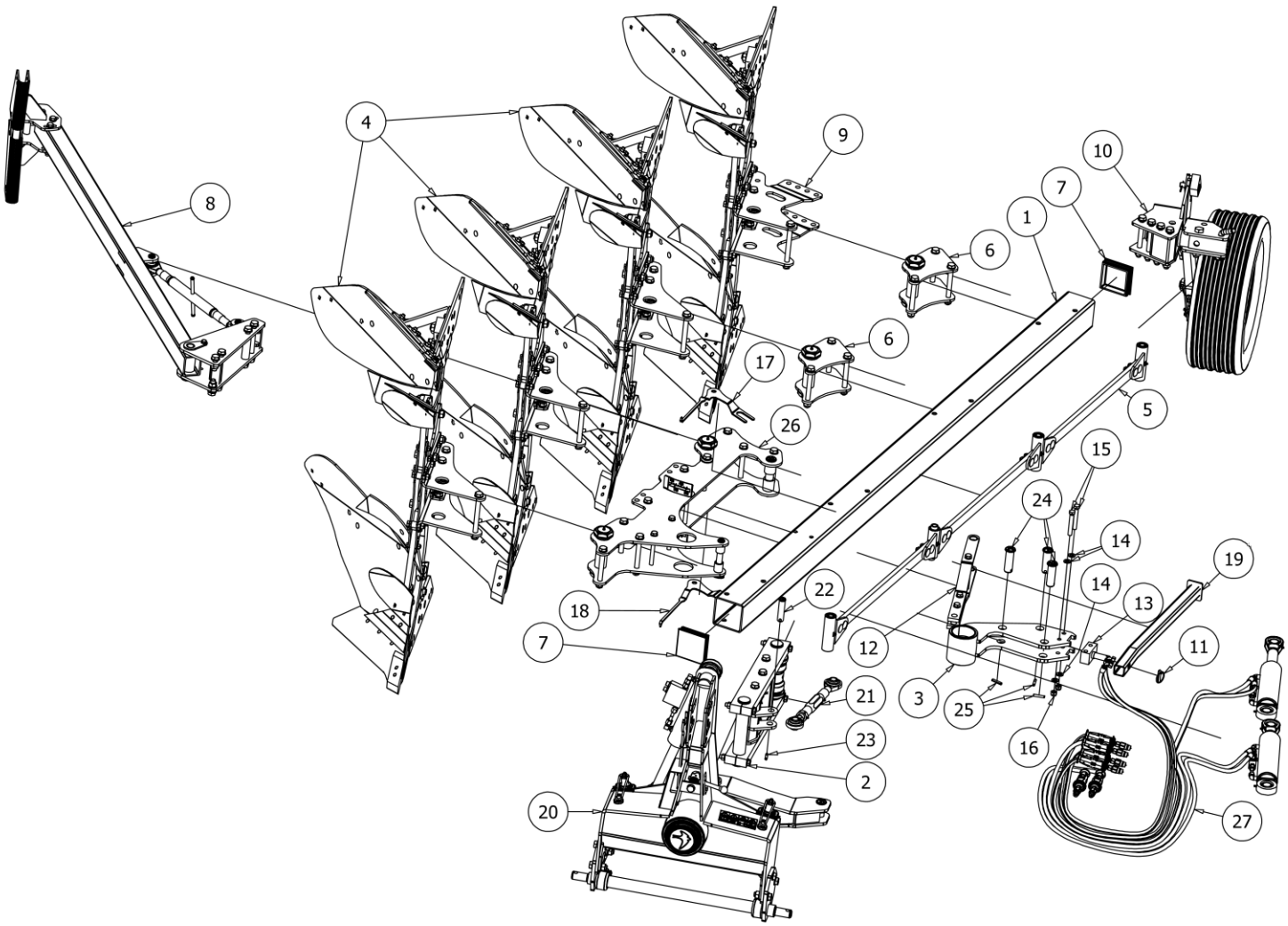
Spare parts can be purchased at the point where the machine was sold, or at the machine's manufacturer.

When ordering spare parts include the following data:

- machine symbol, year of manufacture, factory number (see data plate),
- catalogue part designation,
- reference number,
- quantity,
- exact address and phone number of orderer.

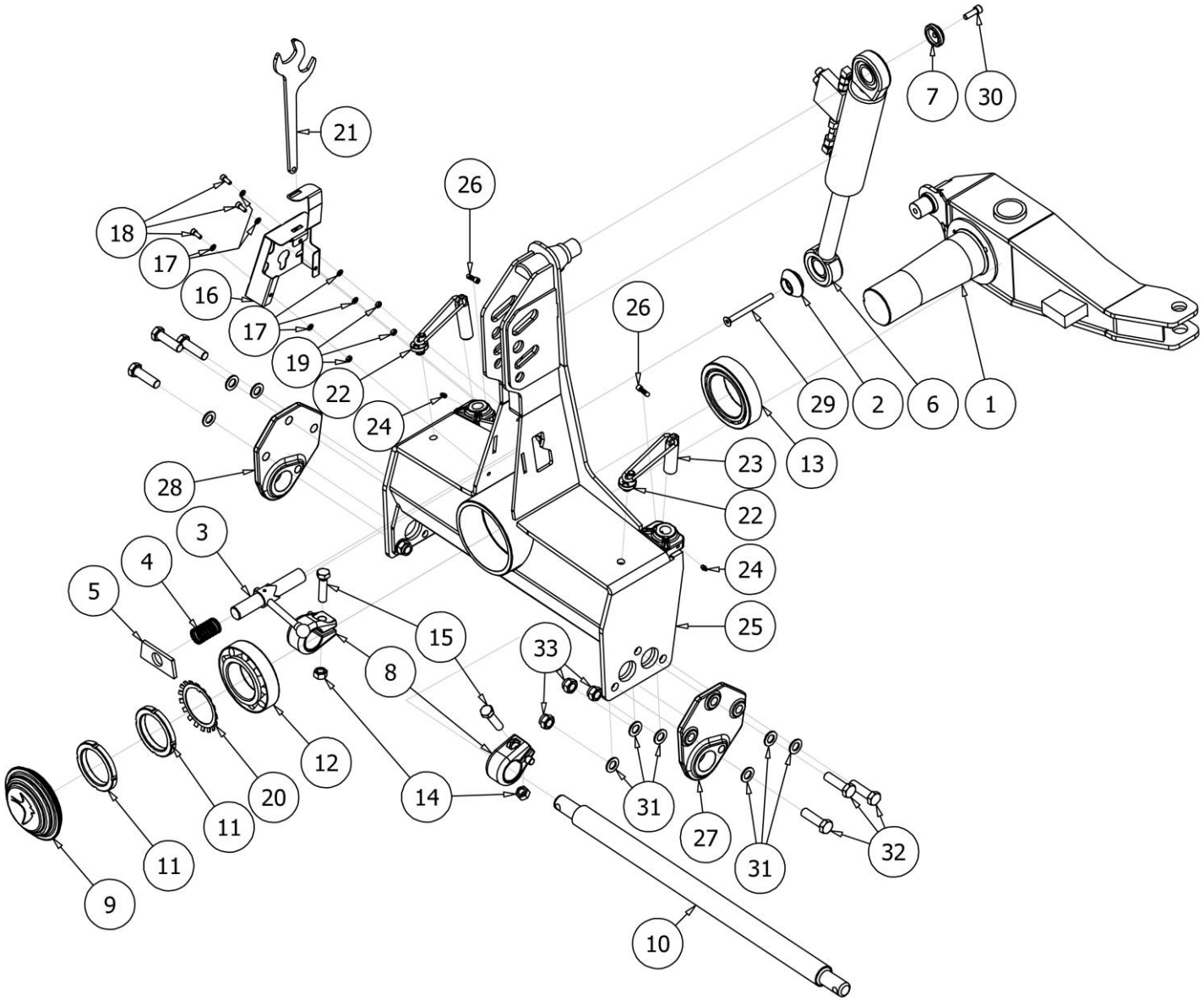
Using the catalogue, find the machine's part to be ordered in the figure and determine its designation and catalogue number specified in the table of contents and corresponding reference number.

Figure R1	PLM0018 Rotary plough VARIO 4-furrow shear bolt protection frame 140x140 100cm spacing full mouldboards



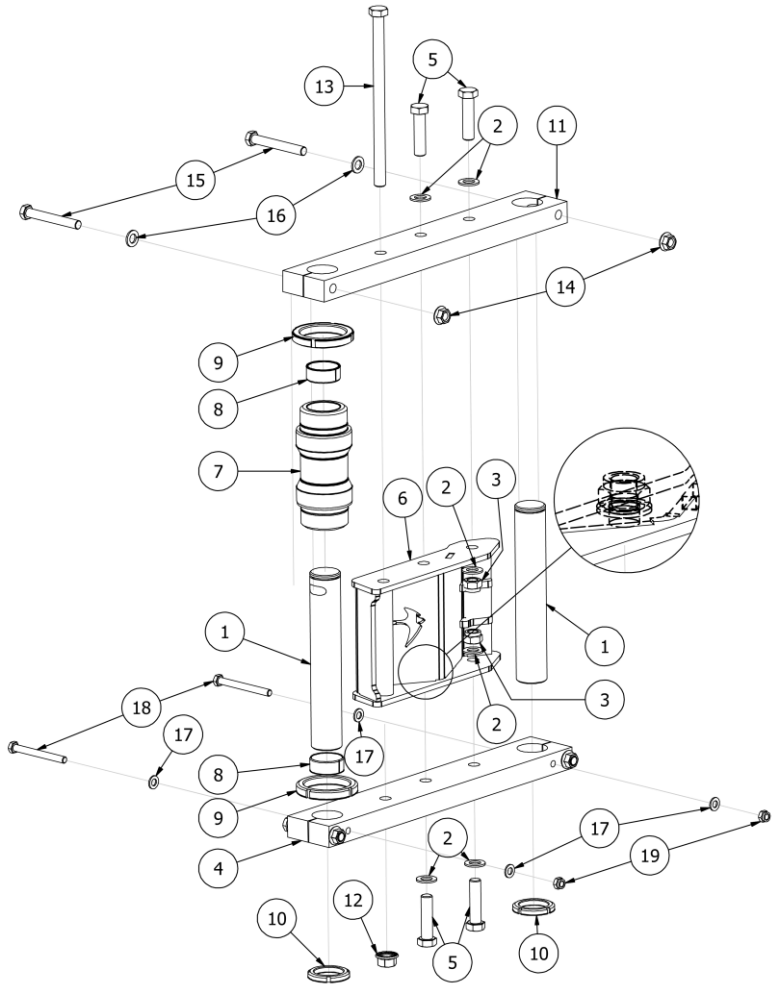
LIST OF PARTS			
NO.	QUANTITY	REFERENCE NUMBER	DESCRIPTION
1	1	PL01580	Frame POV 4
2	1	PL01586	Upper hinge POV complete
3	1	PL01615	Connector
4	3	PL01644	Body POV with skim coulter
5	1	PL01656	Tension POV
6	2	PL01663	Pocket mounting POV
7	2	EW00397	Rubber plug 140x140
8	1	PLM0010	Tillage roller arm complete
9	1	PL01669	Body POV with wheel mechanism mounting
10	1	PL00297	Ground following and transport wheel mechanism rear
11	1	EW00004	Cotter with clip dia10
12	1	PL01675	Body tension
13	1	PL00040	Foot holder
14	4	P16/O	Flat washer M16 zinc plated
15	2	S16x110/8.8/O	Bolt M16x110 8.8 zinc-plated
16	2	NS16/O	Locknut M16 8 zinc plated
17	1	PL01683	Indicator upper
18	1	PL01706	Indicator lower
19	1	PL00527	Foot
20	1	PL01717	Hitch and turntable POV
21	1	PL01723	Link POV M30x360x480
22	1	PL00794	Link pin dia25.5xL105
23	1	EL00044	Spring peg dia10xL45
24	4	PL00124	Ruling cylinder pin dia34.9xL107
25	4	EL00025	Spring peg dia10xL50
26	1	PL02420	Frame main holder POV
27	1	HY00152	Hydraulic system POV

Figure R2	PL01717 Hitch and turntable POV



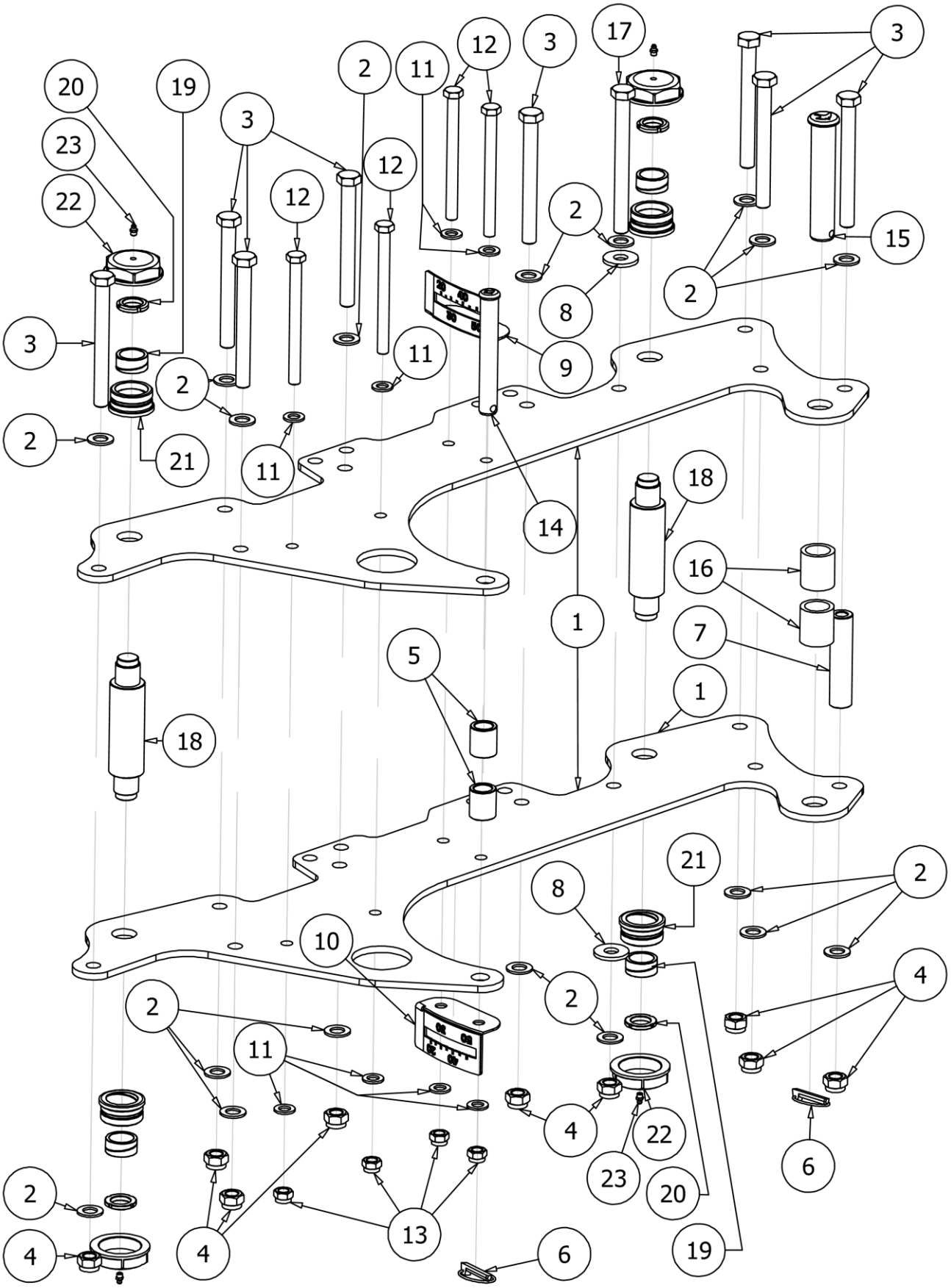
LIST OF PARTS			
NO.	QUANTITY	REFERENCE NUMBER	DESCRIPTION
1	1	PL01667	Turntable PO 110
2	1	PL00048	Lock - socket
3	1	PL00049	Lock
4	1	PL00076	Compression spring
5	1	PL00066	Lock guide
6	1	PL00202	Actuator PO II (80.45.236 +valve)
7	1	PL00226	Cylinder protection upper
8	2	PL00025	Spindle lock dia52
9	1	PL00442	Turntable plug
10	1	PL00702	Spindle 52 dia36 for PO(100)
11	2	EL00052	Bearing nut KM19
12	1	EL00045	Tapered roller bearing 32219
13	1	EL00050	Tapered roller bearing 32022
14	2	NS18/O	Locknut M18 zinc plated
15	2	S18x70/8.8/O	Bolt zinc plated M18x70 grade 8.8
16	1	PL01728	Mounting for push-in fittings 4 pcs. POV
17	6	PO8/O	Flat washer M08 zinc plated
18	3	SI8x20/8.8/O	Hexagon socket bolt M8x20 8.8 zinc plated
19	3	N8/O	Nut M8 zinc plated
20	1	EL00051	Bearing washer MB19
21	1	PL02289	Wrench M46-M40
22	2	PL01267	Spring lock
23	2	PL02416	Rotation adjustment with knob
24	2	EL00020	Grease nipple Type A DIN 71412 - AM8 x 1 conical short
25	1	PL00062	Hitch PO 2014
26	2	PL01760	Rotation angle adjustment lock
27	1	PL01240	Hitch adapter cast
28	1	PL01242	Hitch adapter cast
29	1	SW12x140/8.8/O	Countersunk bolt with hexagonal socket M12x140 10.9
30	1	SI12x35/8.8/O	Hexagon socket bolt M12x35 8.8 zinc plated
31	12	P20/O	Flat washer M20 zinc plated
32	6	S20x1.5x70/10.9/O	Bolt M20x1.5x70 10.9 zinc plated
33	6	NS20/1.5/O	Locknut M20 1.5 zinc plated

Figure R3	PL01586 Upper hinge POV complete



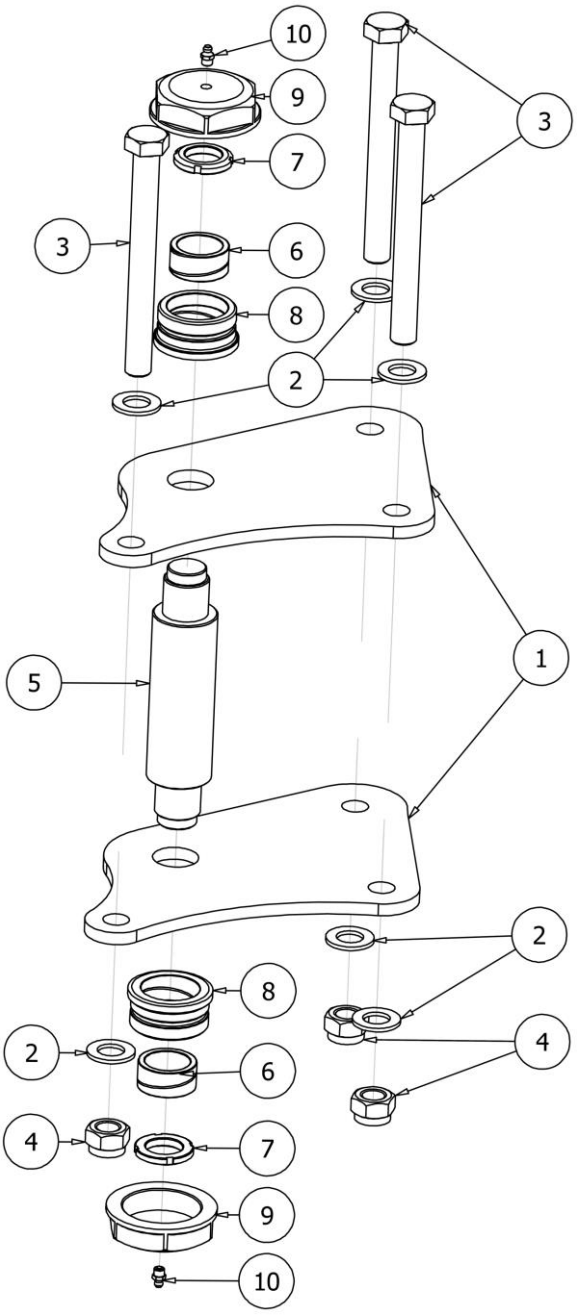
LIST OF PARTS			
NO.	QUANTITY	REFERENCE NUMBER	DESCRIPTION
1	2	PL01591	Pin dia55
2	8	P20/O	Flat washer M20 zinc plated
3	4	NS20/O	Locknut M20 zinc plated
4	1	PL01587	Flat 100x40 hinge
5	4	S20x80/8.8/O	Bolt M20x80 8.8 zinc-plated
6	1	PL01595	POV hinge reinforcement
7	1	PL01607	Hinge sleeve POV 40 HRC
8	2	PL01610	Hinge sleeve POV
9	2	EL00080	Bearing nut KM17
10	2	EL00081	Bearing nut KM11
11	1	PL01855	Flat 100x40 hinge
12	1	NK20x1.5/10/O	Flange nut M20x1.5 10 zinc plated
13	1	S20x320/12.9/O	Bolt M20x320 12.9 zinc-plated
14	4	NK16/10/O	Flange nut M16 10 zinc plated
15	4	S16x1.5x120x/10.9/O	Bolt M16x1.5x120 10.9 zinc plated
16	4	P16/O	Flat washer M16 zinc plated
17	4	P12/O	Flat washer M12 zinc plated
18	2	S12x120/8.8/O	Bolt M12x120 8.8 zinc-plated
19	2	NS12/O	Locknut M12 zinc plated

Figure R4	PL02420 Frame main holder POV



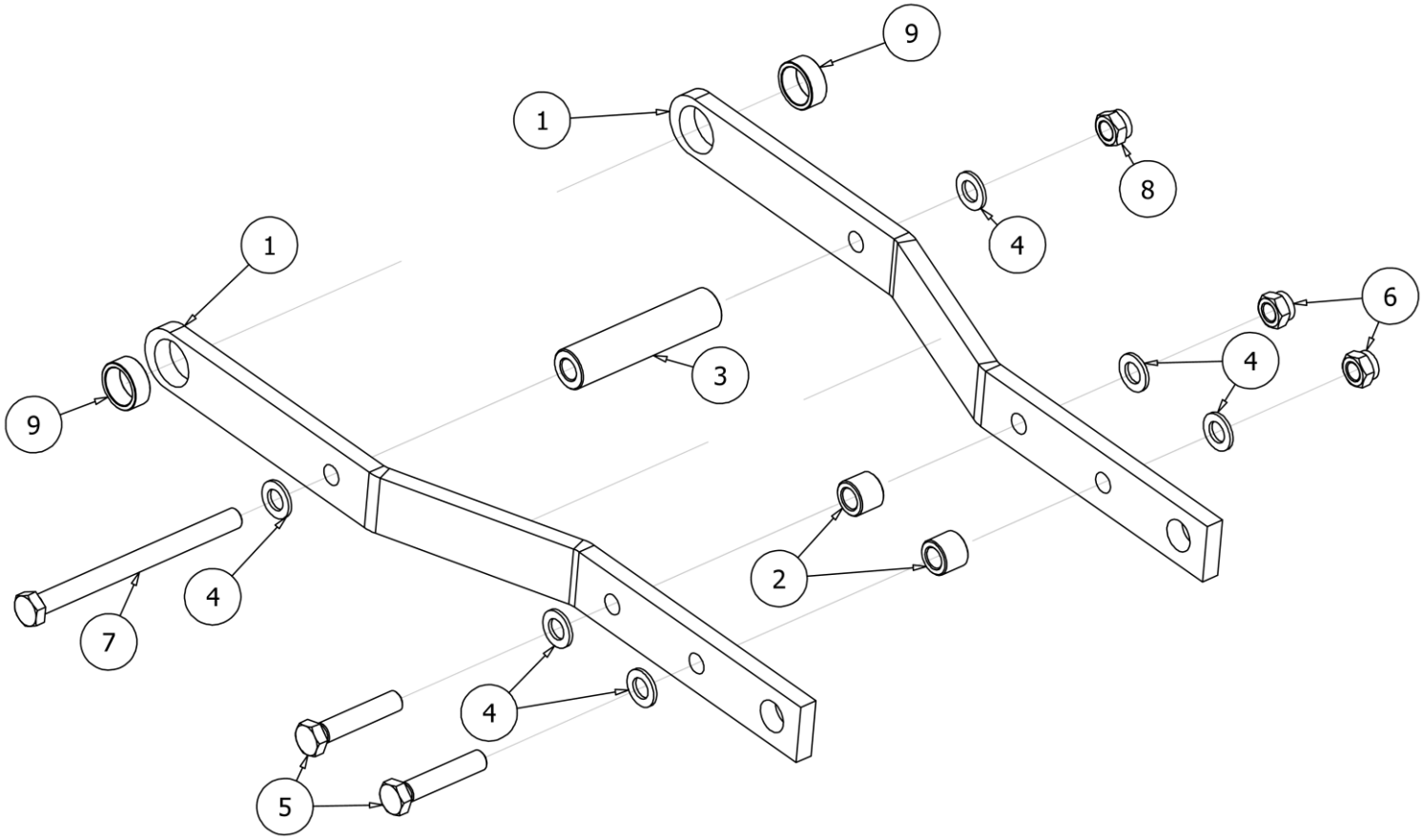
LIST OF PARTS			
NO.	QUANTITY	REFERENCE NUMBER	DESCRIPTION
1	2	PL01618	Frame main plate
2	18	P20/O	Flat washer M20 zinc plated
3	8	S20x1.5x190/10.9/O	Bolt M20x1.5x190 10.9 zinc plated
4	9	NS20x1.5/O	Locknut M20x1.5 zinc plated
5	2	PL01666	Sleeve 26x38x43
6	2	EW00004	Cotter with clip dia10
7	1	PL01674	Sleeve 16.5x32x140
8	2	PL01705	Teflon washer M20x50x5
9	1	PL01711	Upper gauge
10	1	PL01712	Lower gauge
11	8	P16/O	Flat washer M16 zinc plated
12	4	S16x1.5x190/10.9/O	Bolt M16x1.5x190 10.9 zinc plated
13	4	NS16x1.5/O	Locknut M16x1.5 zinc plated
14	1	PL01729	Link pin
15	1	PL01730	Actuator pin
16	2	PL01731	Spacer - actuator
17	1	S20x1.5x210/10.9/O	Bolt M20x1.5x210 10.9 zinc plated
18	2	PL01620	Pocket axle POV
19	4	PL01624	Pocket rotation sleeve 60 HRC
20	4	EL00019	Bearing nut KM6
21	4	PL01629	Pocket rotation sleeve POV 50 HRC
22	4	PL01630	Axle cover POV
23	4	EL00020	Grease nipple Type A DIN 71412 - AM8 x 1 conical short

Figure R5	PL01663 Pocket mounting POV



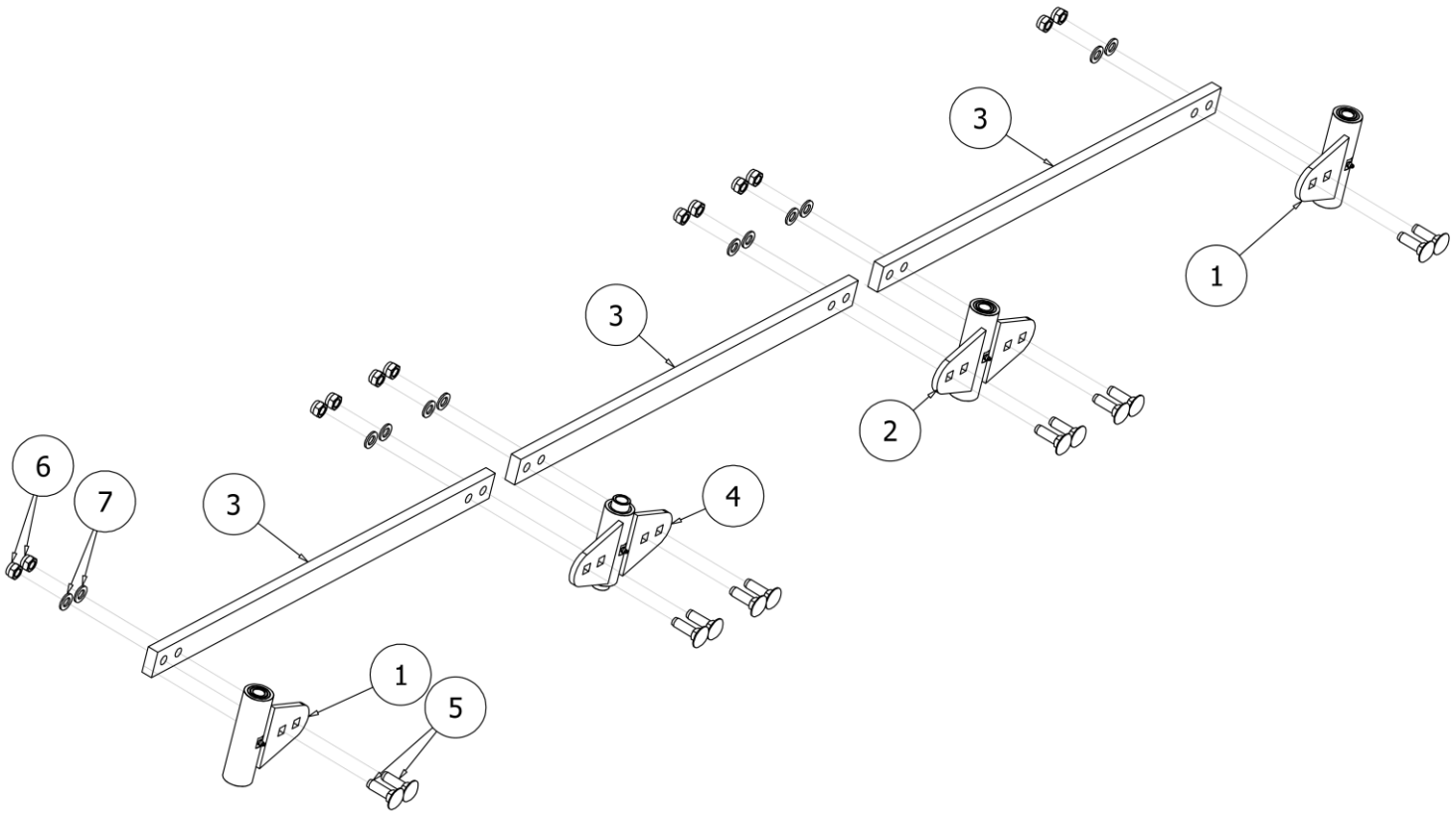
LIST OF PARTS			
NO.	QUANTITY	REFERENCE NUMBER	DESCRIPTION
1	2	PL01662	Pocket holder plate POV
2	6	P20/O	Flat washer M20 zinc plated
3	3	S20x1.5x190/10.9/O	Bolt M20x1.5x190 10.9 zinc plated
4	3	NS20x1.5/O	Locknut M20x1.5 zinc plated
5	1	PL01620	Pocket axle POV
6	2	PL01624	Pocket rotation sleeve 60 HRC
7	2	EL00019	Bearing nut KM6
8	2	PL01629	Pocket rotation sleeve POV 50 HRC
9	2	PL01630	Nut
10	2	EL00020	Grease nipple Type A DIN 71412 - AM8 x 1 conical short

Figure R6	PL01675 Body tension



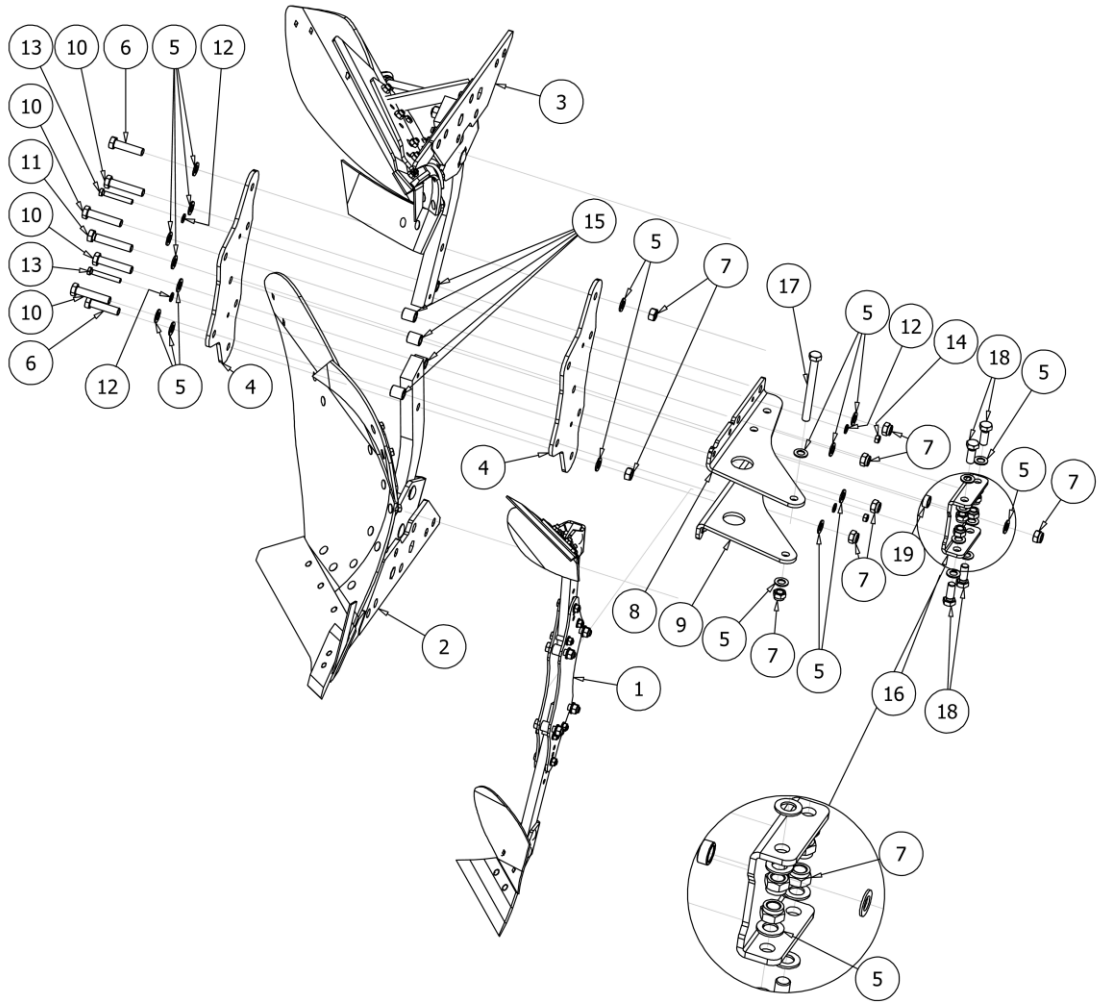
LIST OF PARTS			
NO.	QUANTITY	REFERENCE NUMBER	DESCRIPTION
1	2	PL01672	Body tension
2	2	PL01673	Sleeve M16.5x28x23
3	1	PL01674	Sleeve 16.5x32x140
4	6	P16/O	Flat washer M16 zinc plated
5	2	S16x80/8.8/O	Bolt M16x80 8.8 zinc-plated
6	2	NS16/O	Locknut M16 8 zinc plated
7	1	S16x200/8.8/O	Bolt M16x200 8.8 zinc-plated
8	1	NS16x1.5/O	Locknut M16x1.5 zinc plated
9	2	PL01679	Sleeve 30x38x15

Figure R7	PL01656 Tension POV



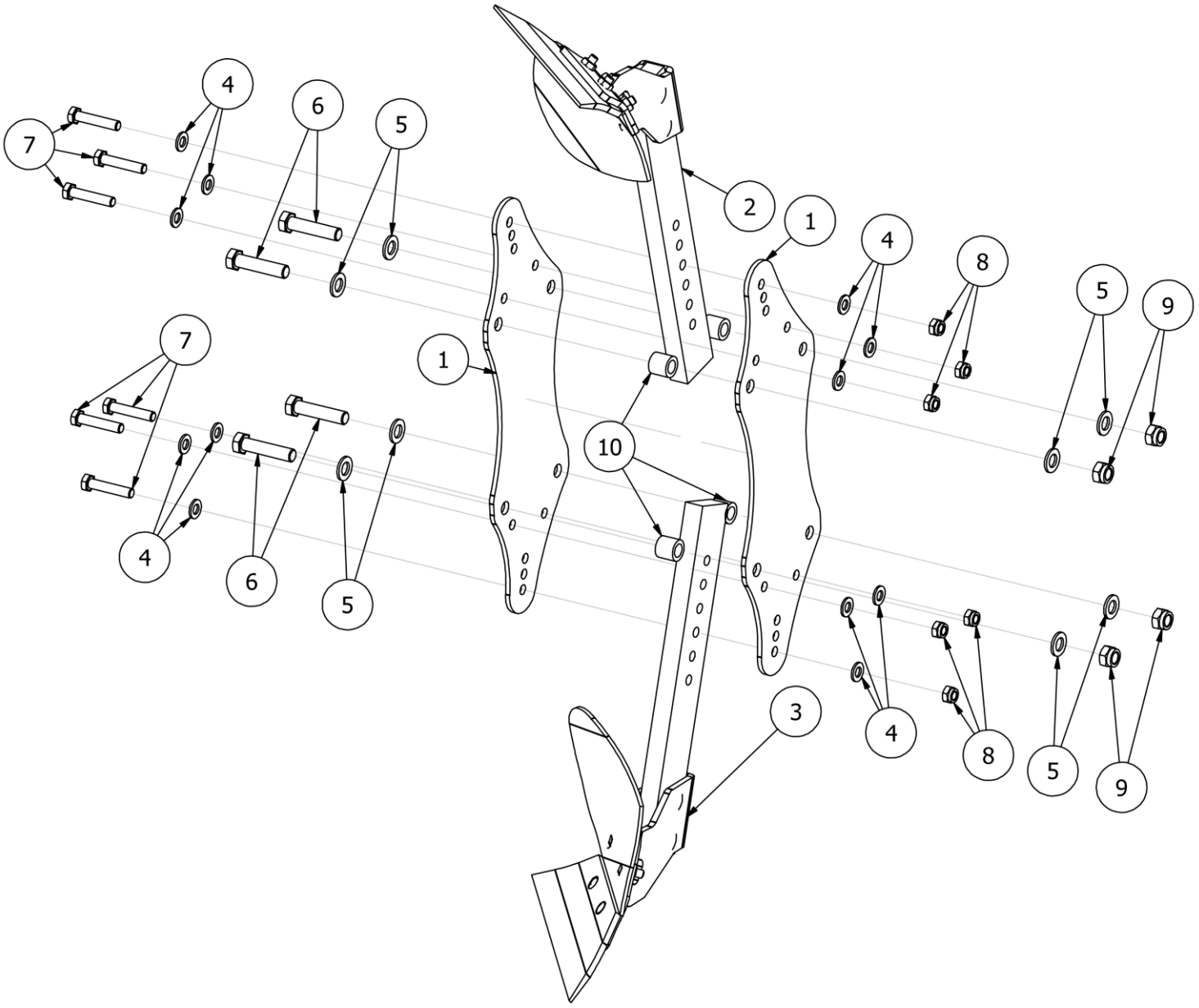
LIST OF PARTS			
NO.	QUANTITY	REFERENCE NUMBER	DESCRIPTION
1	2	PL01653	Tension system coupler single
2	1	PL01654	Tension system coupler double with short sleeve
3	3	PL01655	Tension system flat
4	1	PL01680	Tension system coupler double with long sleeve
5	12	SZ16x50/8.8/O	Coach bolt M16x50 8.8 zinc plated
6	12	NS16/O	Locknut M16 8 zinc plated
7	12	P16/O	Flat washer M16 zinc plated

Figure R8	PL01644 Pocket POV



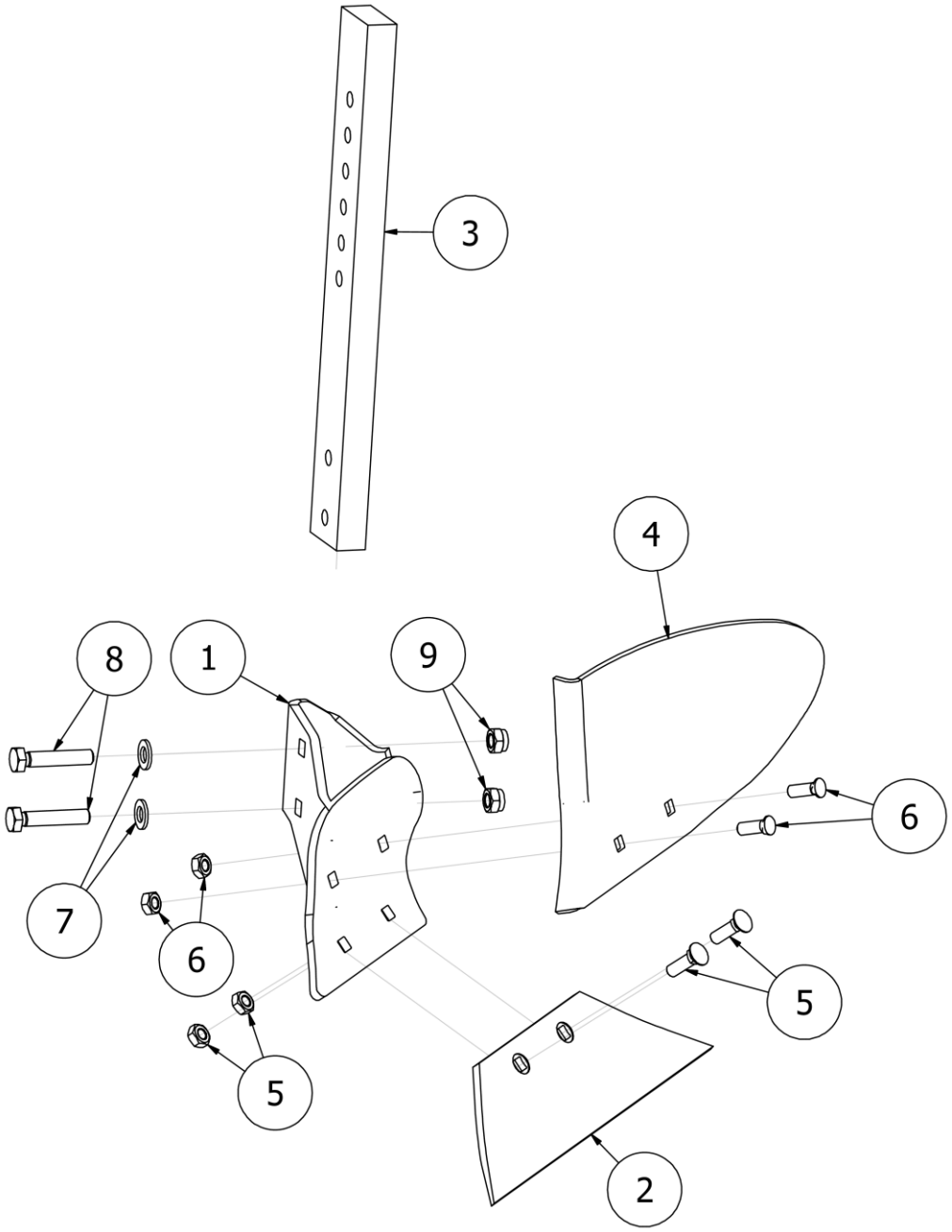
LIST OF PARTS			
NO.	QUANTITY	REFERENCE NUMBER	DESCRIPTION
1	1	PL00200	Skim coulter frame 140x140
2	1	PL00346	Body 2015 right with plough beam
3	1	PL01245	Body 2015 left with plough beam
4	2	PL01641	Pocket plate vertical POV
5	24	P20/O	Flat washer M20 zinc plated
6	2	S20x80/8.8/O	Bolt M20x80 8.8 zinc-plated
7	12	NS20x1.5/O	Locknut M20x1.5 zinc plated
8	1	PL01642	Pocket horizontal POV
9	1	PL01643	Plate pocket 2
10	4	S20x1.5x90/10.9/O	Bolt M20x1.5x90 10.9 zinc plated
11	1	S20x110/8.8/O	Bolt M20x110 8.8 zinc-plated
12	4	P12/O	Flat washer M12 zinc plated
13	2	S12x85/8.8/O	Bolt M12x85 8.8 zinc-plated
14	2	N12/8.8/O	Flat washer M12 8.8 zinc plated
15	5	PL01664	Sleeve 22x30x35
16	1	PL01776	POV pocket reinforcement
17	1	S20x1.5x200/10.9/O	Bolt M20x1.5x200 10.9 zinc plated
18	4	S20x50/8.8/O	Bolt M20x50 8.8 zinc-plated
19	1	PL01777	Sleeve 22x32x14.5

Figure R9	PL00200 Skim coulter frame 140x140



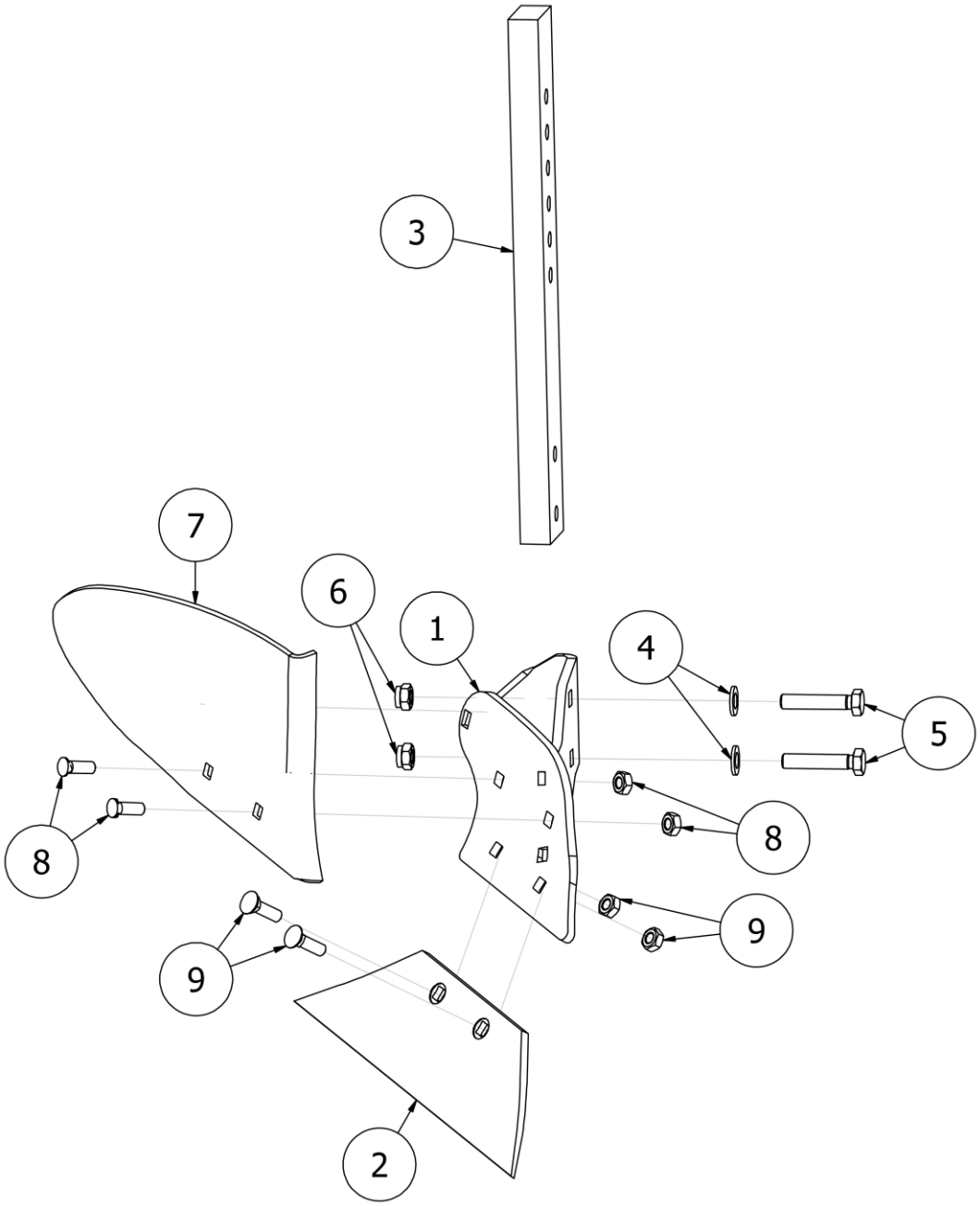
LIST OF PARTS			
NO.	QUANTITY	REFERENCE NUMBER	DESCRIPTION
1	2	PL00201	Skim coulter holder for pocket
2	1	PL00185	Skim coulter left with plough beam
3	1	PL00182	Skim coulter right with plough beam
4	12	P12/O	Flat washer M12 zinc plated
5	8	P16/O	Flat washer M16 zinc plated
6	4	S16x70/8.8/O	Bolt M16x70 8.8 zinc-plated
7	6	S12x60/8.8/O	Bolt M12x60 8.8 zinc-plated
8	6	NS12/O	Locknut M12 zinc plated
9	4	NS16/O	Locknut M16 8 zinc plated
10	4	PL00198	Spacer

Figure R10	PL00185 Skim coulter left with plough beam



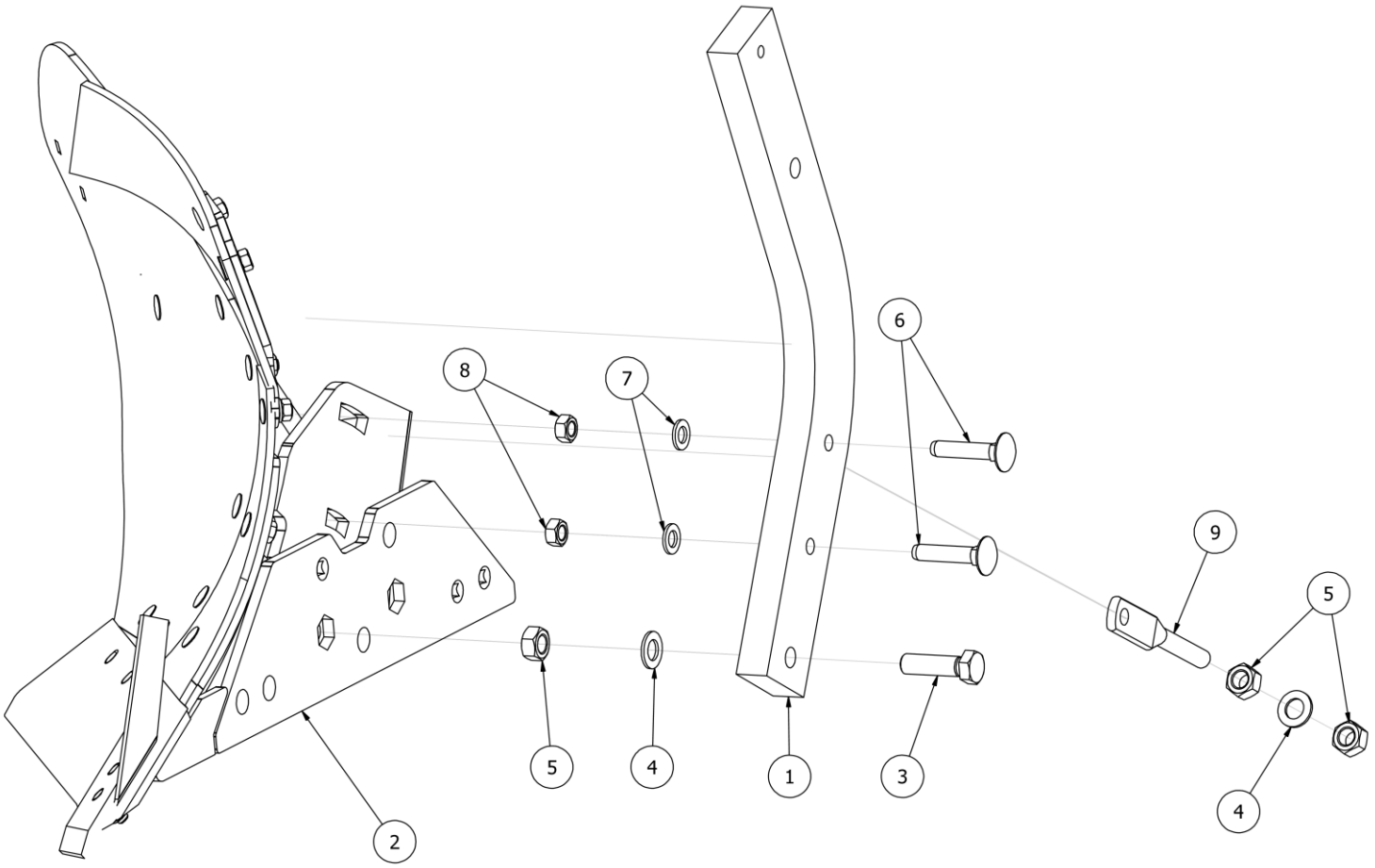
LIST OF PARTS			
NO.	QUANTITY	REFERENCE NUMBER	DESCRIPTION
1	1	PL00191	Skim coulter frog left
2	1	PL00188	Ploughshare skim coulter left
3	1	PL00186	Skim coulter plough beam
4	1	PL01119	Skim ploughshare “corn” left
5	2	PL01761	Plough bolt square with square neck M10x35 10.10 with nut
6	2	PL01305	Double nose bolt M10x30 for skim coulters
7	2	P12/O	Flat washer M12 zinc plated
8	2	S12x60/8.8/O	Bolt M12x60 8.8 zinc-plated
9	2	NS12/O	Locknut M12 zinc plated

Figure R11	PL00182 Skim coulter right with plough beam



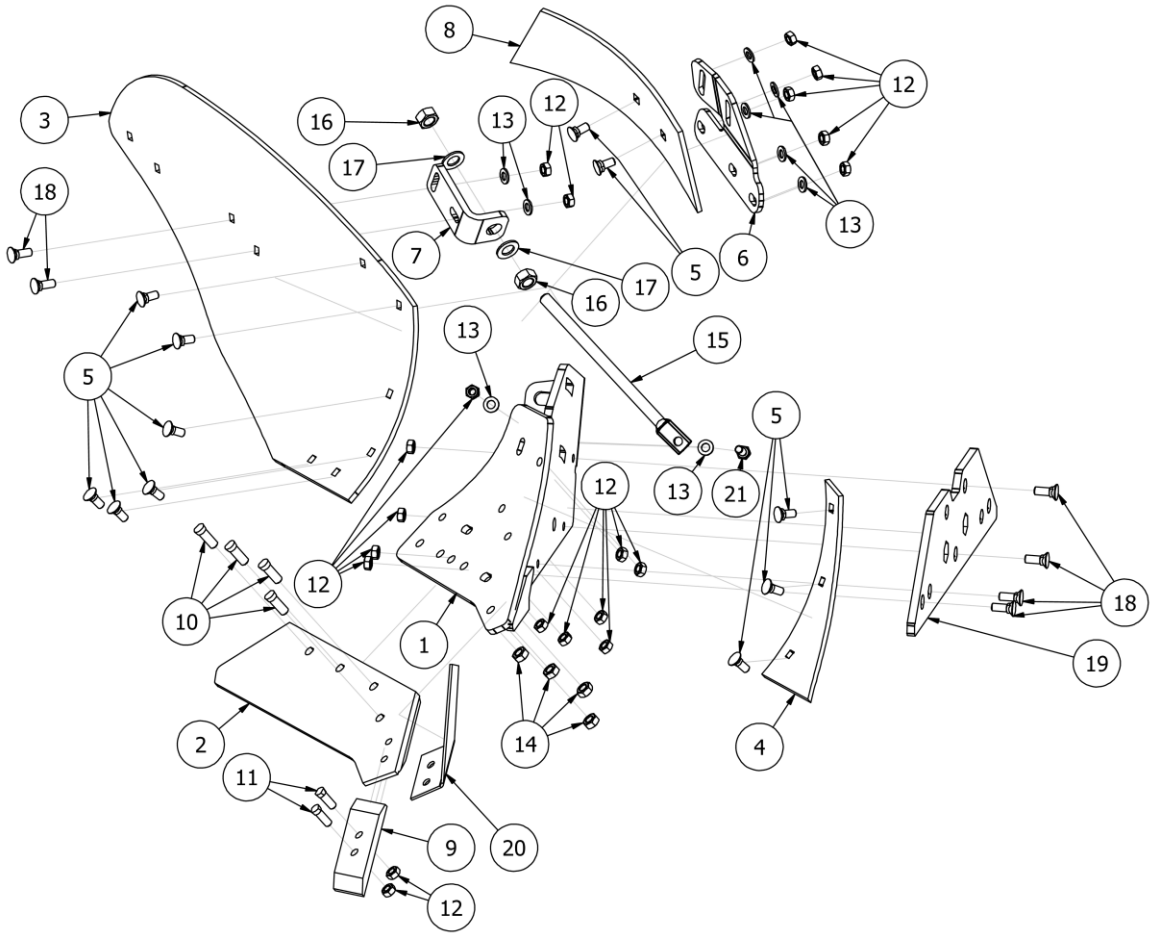
LIST OF PARTS			
NO.	QUANTITY	REFERENCE NUMBER	DESCRIPTION
1	1	PL00183	Skim coulter frog
2	1	PL00187	Ploughshare skim coulter right
3	1	PL00186	Skim coulter plough beam
4	2	P12/O	Flat washer M12 zinc plated
5	2	S12x60/8.8/O	Bolt M12x60 8.8 zinc-plated
6	2	NS12/O	Locknut M12 zinc plated
7	1	PL01118	Skim ploughshare “corn” right
8	2	PL01305	Double nose bolt M10x30 for skim coulters
9	2	PL01761	Plough bolt square with square neck M10x35 10.10 with nut

Figure R12	PL00346 Body right with plough beam



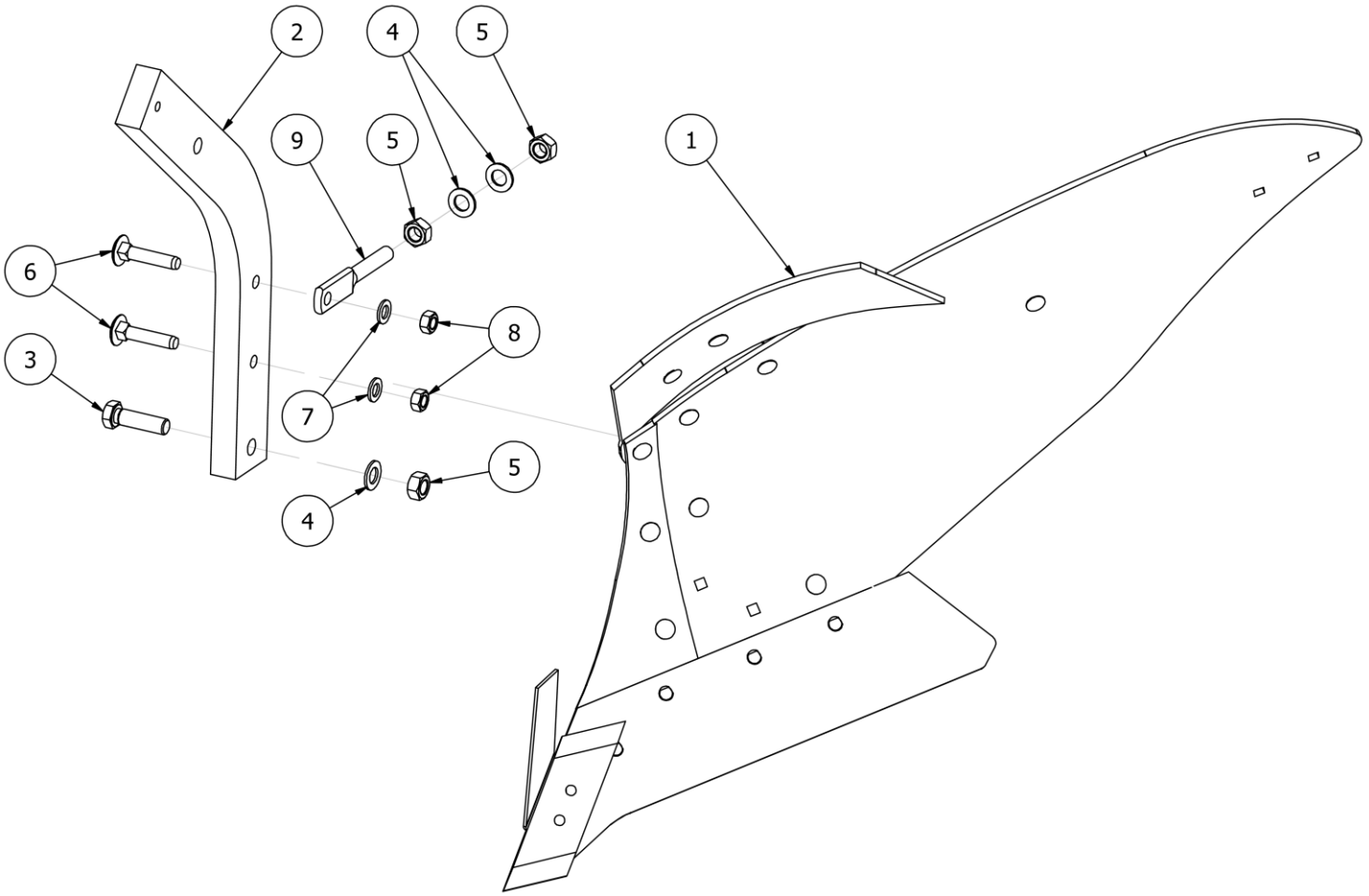
LIST OF PARTS			
NO.	QUANTITY	REFERENCE NUMBER	DESCRIPTION
1	1	PL00321	Plough beam
2	1	PL00329	Right frog complete
3	1	S20x70/8.8/O	Bolt M20x70 8.8 zinc-plated
4	3	P20/O	Flat washer M20 zinc plated
5	3	N20/O	Flat washer M20 zinc plated
6	2	SZ16x80/8.8/O	Coach bolt M16x80 8.8 zinc plated
7	2	P16/O	Flat washer M16 zinc plated
8	2	N16/10/0	Flat washer M16 10 zinc plated
9	1	PO.ET.00021	Angle adjustment screw

Figure R13	PL00329 Right frog complete



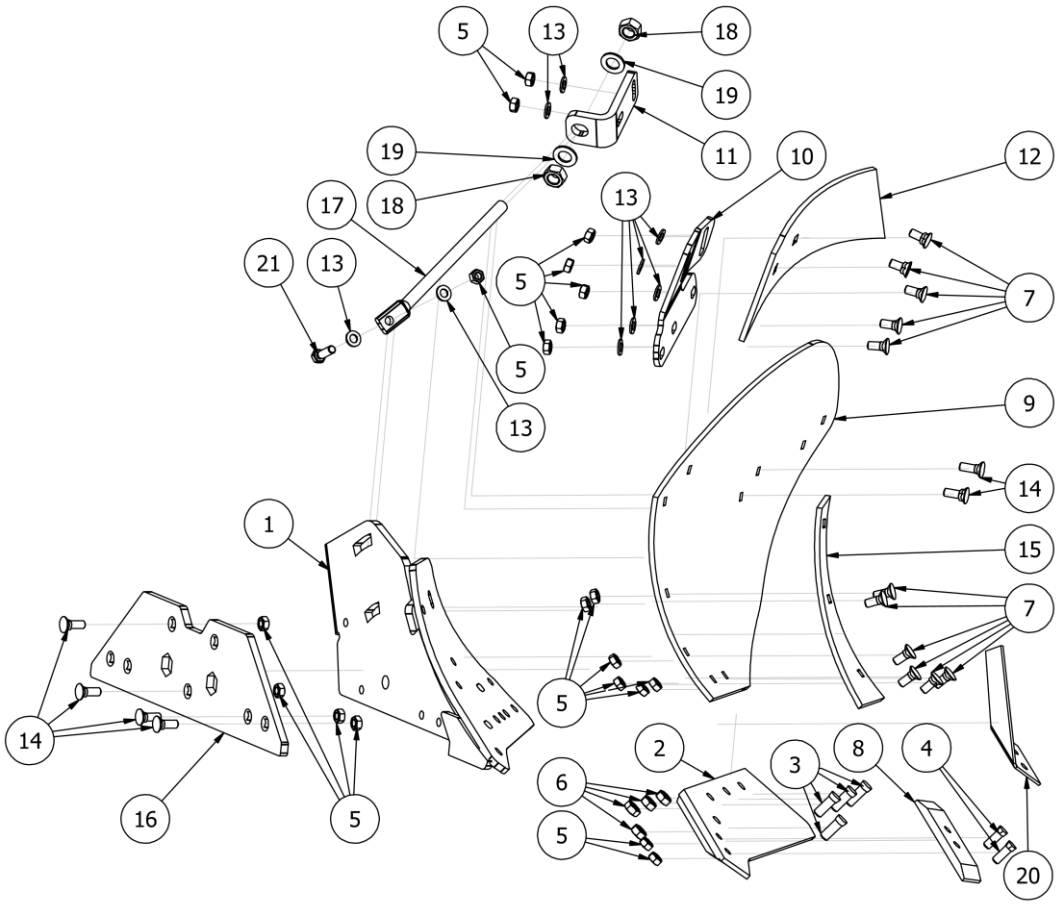
LIST OF PARTS			
NO.	QUANTITY	REFERENCE NUMBER	DESCRIPTION
1	1	PL00330	Frog right 18" PO
2	1	PL00340	Ploughshare 18" right
3	1	PL00251	Mouldboard right 18" PO
4	1	PL00249	Breast right 18" PO
5	11	SP12x35/8.8/C	Plough bolt M12x35 8.8 black
6	1	PL02091	Chisel holder right PO
7	1	PO.WG.00029	Support mounting
8	1	PL02081	Trash board right PO
9	1	PL00342	Chisel right
10	4	PL00784	Ploughshare bolt M14x34
11	2	PL00785	Chisel bolt M12x40
12	20	N12/5.8/O	Flat washer M12 5.8 zinc plated
13	9	P12/O	Flat washer M12 zinc plated
14	4	N14/8.8/O	Flat washer M14 8.8 zinc plated
15	1	PO.WG.00030	Board support
16	2	NS20/O	Locknut M20 zinc plated
17	2	P20/O	Flat washer M20 zinc plated
18	6	SP12x35/8.8/O	Plough bolt M12x35 8.8 zinc plated
19	1	PL00327	Landslide 2015 PO(85) PO(100)
20	1	PL01116	Ploughshare cutting knife right
21	1	S12x35/8.8/O	Bolt M12x35 8.8 zinc-plated

Figure R14	PL01245 Body left with plough beam



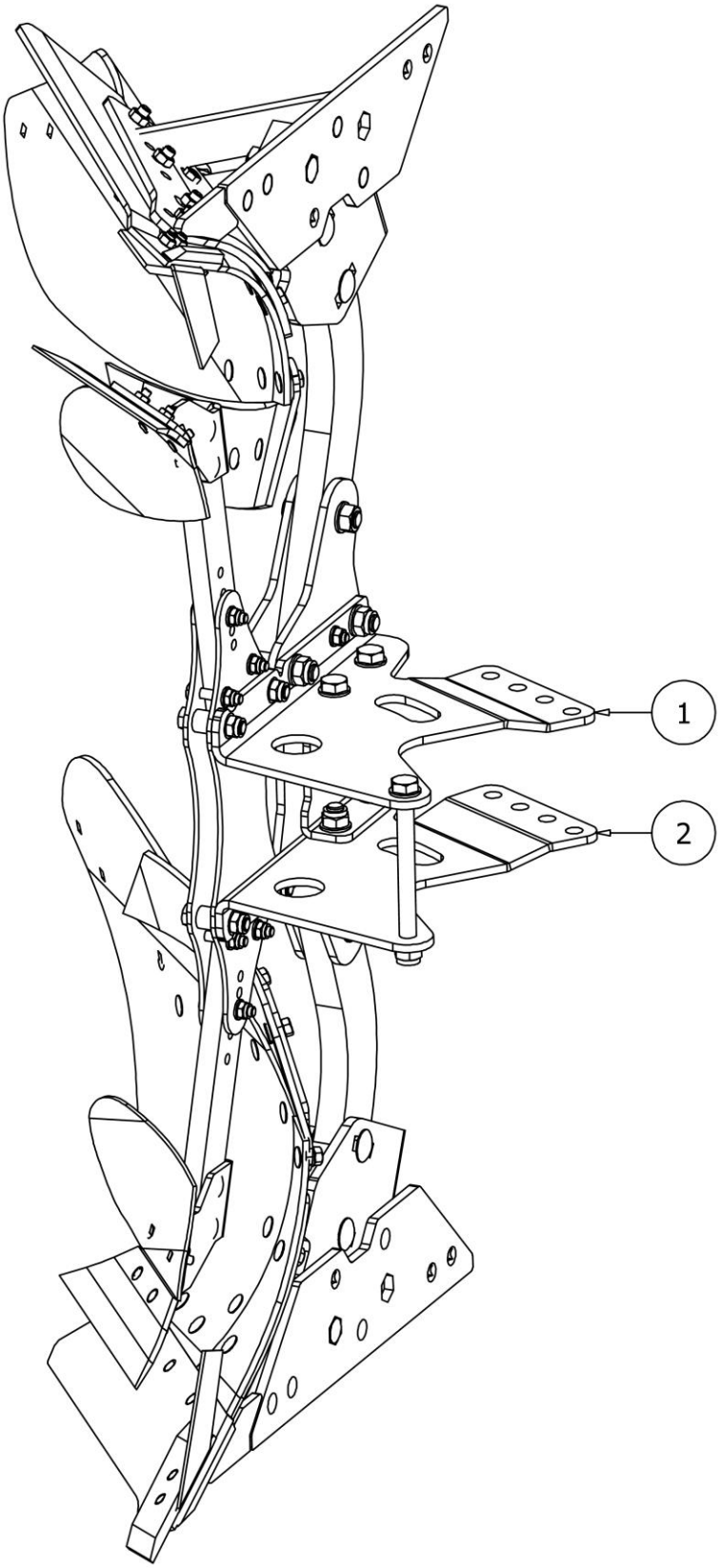
LIST OF PARTS			
NO.	QUANTITY	REFERENCE NUMBER	DESCRIPTION
1	1	PL00921	Frog left complete
2	1	PL00321	Plough beam
3	1	S20x70/8.8/O	Bolt M20x70 8.8 zinc-plated
4	3	P20/O	Flat washer M20 zinc plated
5	3	N20/O	Flat washer M20 zinc plated
6	2	SZ16x80/8.8/O	Coach bolt M16x80 8.8 zinc plated
7	2	P16/O	Flat washer M16 zinc plated
8	2	N16/10/0	Flat washer M16 10 zinc plated
9	1	PO.ET.00021	Angle adjustment screw

Figure R15	PL00921 Left frog complete



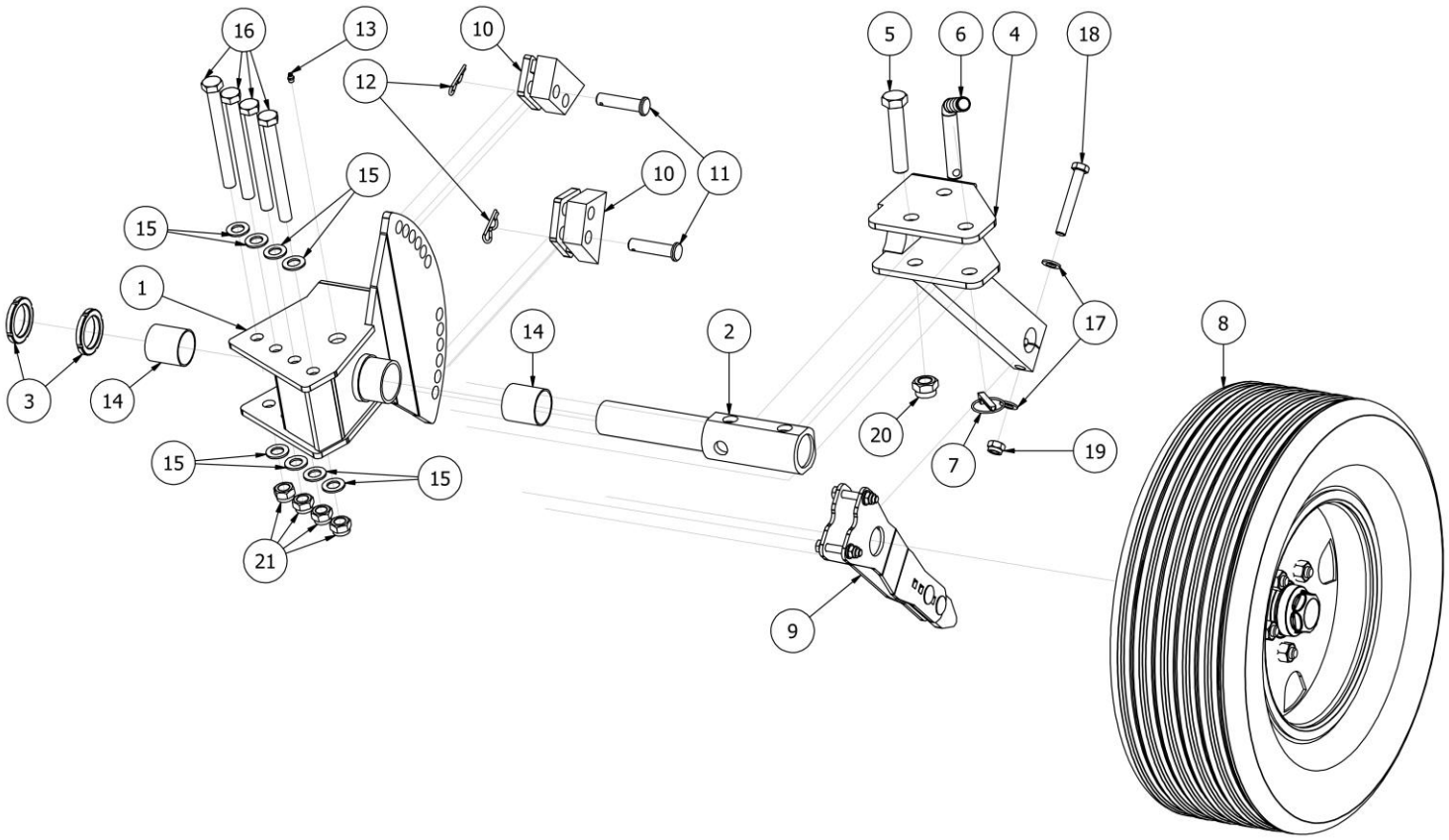
LIST OF PARTS			
NO.	QUANTITY	REFERENCE NUMBER	DESCRIPTION
1	1	PL00924	Frog left 18" PO
2	1	PL00341	Ploughshare left 18" PO
3	4	PL00784	Ploughshare bolt M14x34
4	2	PL02710	Chisel bolt 12x50
5	20	N12/5.8/O	Flat washer M12 5.8 zinc plated
6	4	N14/8.8/O	Flat washer M14 8.8 zinc plated
7	11	SP12x35/8.8/C	Plough bolt M12x35 8,8 black
8	1	PL00343	Chisel left
9	1	PL00250	Mouldboard left 18" PO
10	1	PO.WG.00033	Trash board holder left PO
11	1	PO.WG.00029	Support mounting
12	1	PO.EK.00021	Trash board left PO
13	9	P12/O	Flat washer M12 zinc plated
14	6	SP12x35/8.8/O	Plough bolt M12x35 8.8 zinc plated
15	1	PL00248	Breast left 18" PO
16	1	PL00327	Landslide 2015 PO(85) PO(100)
17	1	PO.WG.00030	Board support
18	2	NS20/O	Locknut M20 zinc plated
19	2	P20/O	Flat washer M20 zinc plated
20	1	PL01117	Ploughshare cutting knife left
21	1	S12x35/8.8/O	Bolt M12x35 8.8 zinc-plated

Figure R16	PL01669 Body wheel holder



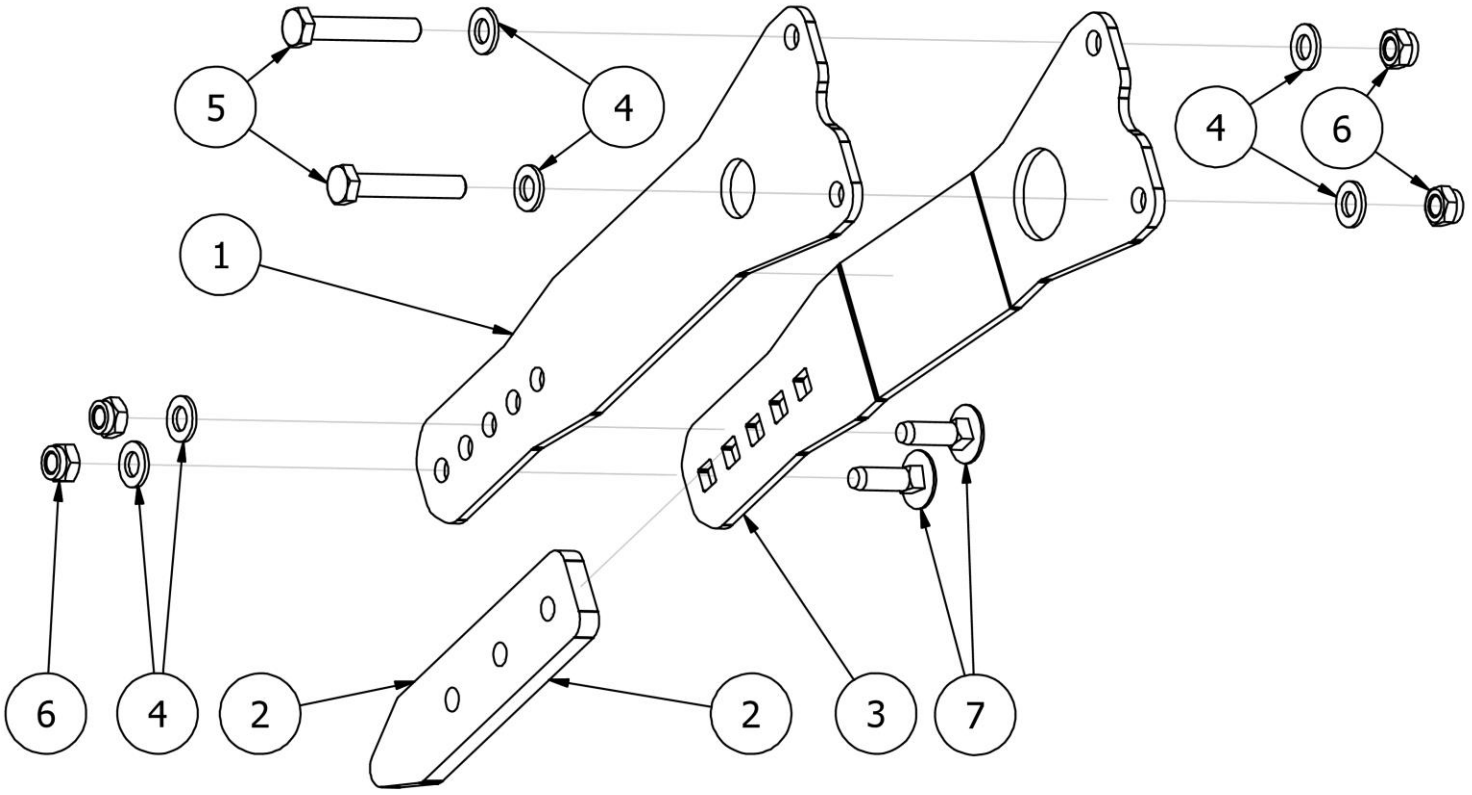
LIST OF PARTS			
NO.	QUANTITY	REFERENCE NUMBER	DESCRIPTION
1	1	PL01670	Pocket and wheel holder upper
2	1	PL01671	Pocket and wheel holder lower

Figure R17	PL00297 Ground following and transport wheel mechanism rear



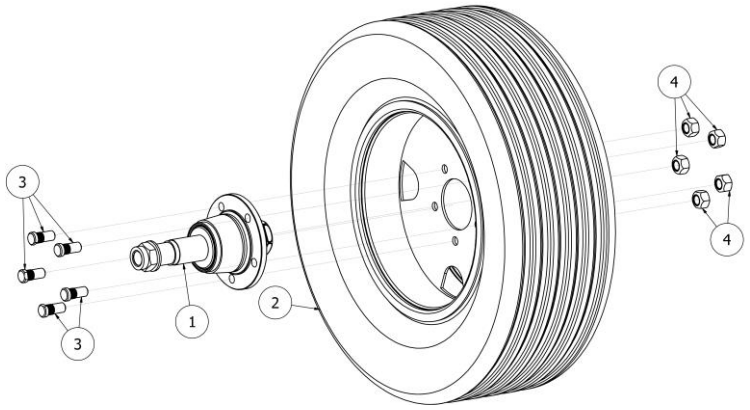
LIST OF PARTS			
NO.	QUANTITY	REFERENCE NUMBER	DESCRIPTION
1	1	PL00114	Ground following wheel adjustment
2	1	PO.ES.00003	Adjustment shaft complete
3	2	EL00081	Bearing nut KM11
4	1	PO.ES.00001	Ground following wheel arm
5	1	S24x120/8.8/O	Bolt M24x120 8.8 zinc-plated
6	1	EW.SW.00007	Depth adjustment pin
7	1	EW00004	Cotter with clip dia10
8	1	PL00456	Wheel with hub
9	1	PL00460	Ground following wheel stabilizer – complete
10	2	PO.ES.00004	Adjustment bumper
11	2	PL00470	Depth adjustment pin PO
12	2	AP00032	Bendable cotter dia4
13	1	EL00020	Grease nipple Type A DIN 71412 - AM8 x 1 conical short
14	2	PL00467	Sliding sleeve 55x50
15	8	P20/O	Flat washer M20 zinc plated
16	4	S20x190x1.5/10.9/O	Bolt M20x190x1.5 10.9 zinc-plated
17	2	P16/O	Flat washer M16 zinc plated
18	1	S16x110/8.8/O	Bolt M16x110 8.8 zinc plated
19	1	NS16/O	Locknut M16 8 zinc plated
20	1	NS24/O	Locknut M24 zinc plated
21	4	NS20/1.5/O	Locknut M20 1.5 zinc plated

Figure R18	PL00460 Ground following wheel stabilizer – complete



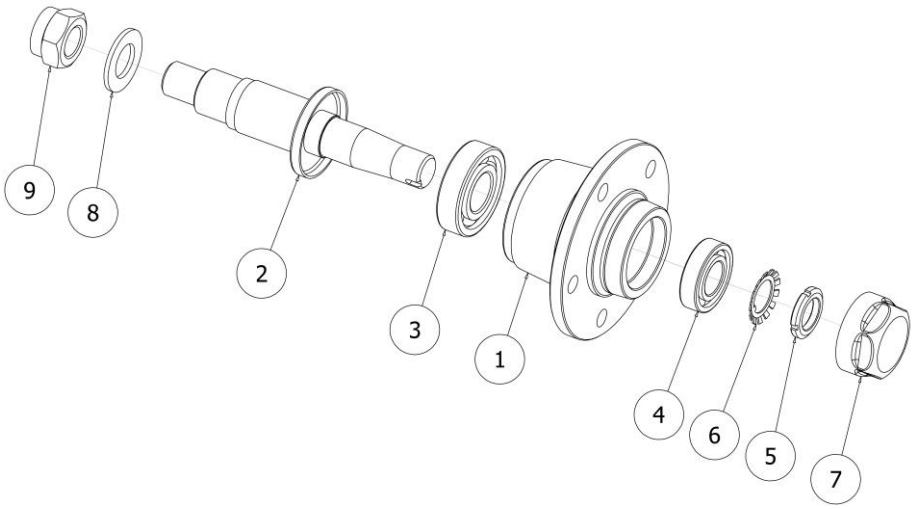
LIST OF PARTS			
NO.	QUANTITY	REFERENCE NUMBER	DESCRIPTION
1	1	PL00284	Ground following wheel landslide holder
2	1	PL00286	Ground following wheel landslide
3	1	PL00285	Landslide bent holder
4	6	P12/O	Flat washer M12 zinc plated
5	2	S12x60/8.8/O	Bolt M12x60 8.8 zinc-plated
6	4	NS12/O	Locknut M12 zinc plated
7	2	SZ12x35/8.8/O	Coach bolt M12x35 8.8 zinc plated

Figure R19	PL00456 Wheel complete



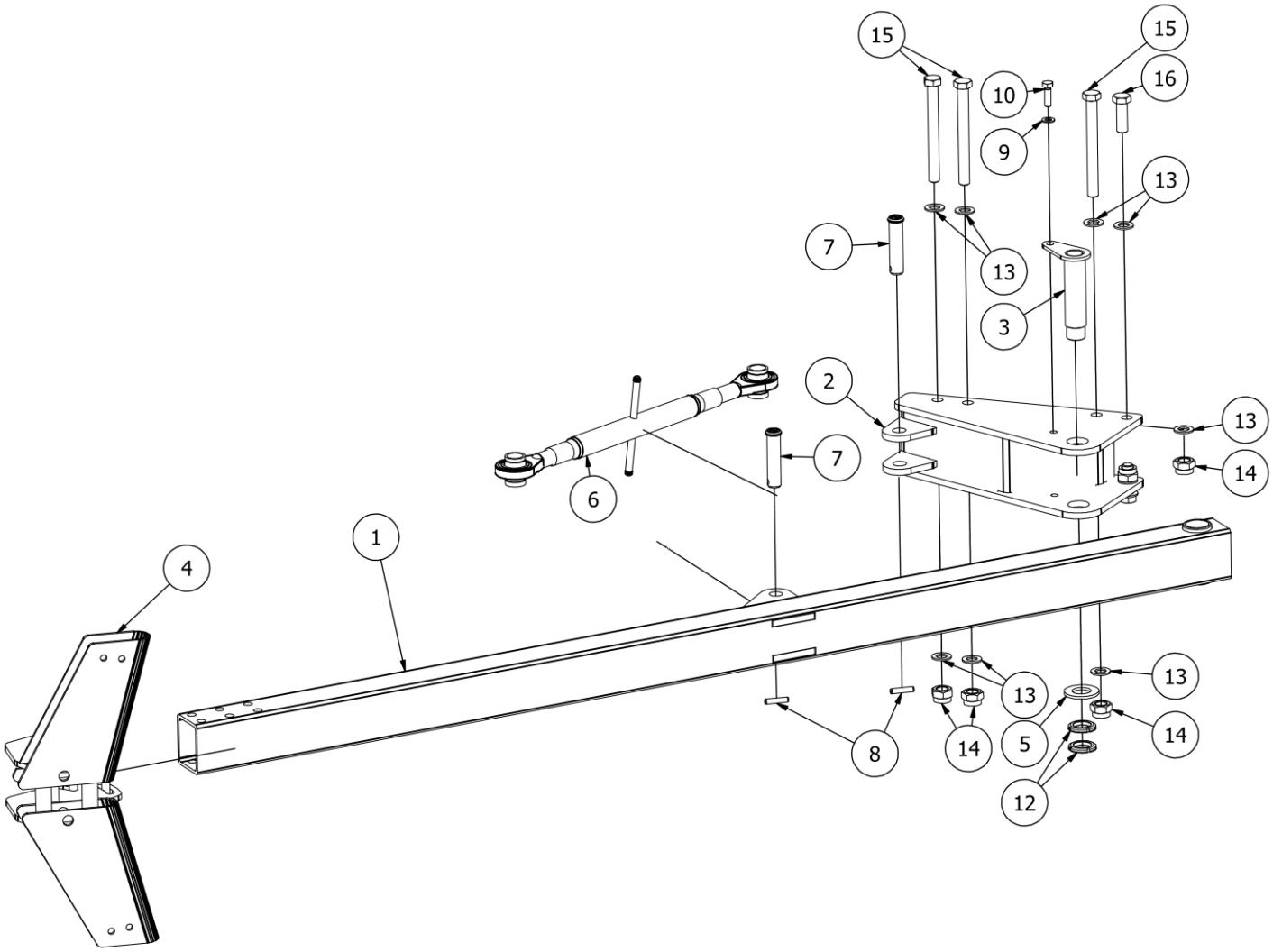
LIST OF PARTS			
NO.	QUANTITY	REFERENCE NUMBER	DESCRIPTION
1	1	PO.EM.00002	Hub complete PO
2	1	PL00450	Wheel 10.0/80-12
3	5	EW00385	Wheel pin M14x1.5
4	5	EW00387	Wheel nut M14x1.5

Figure R20	PO.EM.00002 Hub complete PO



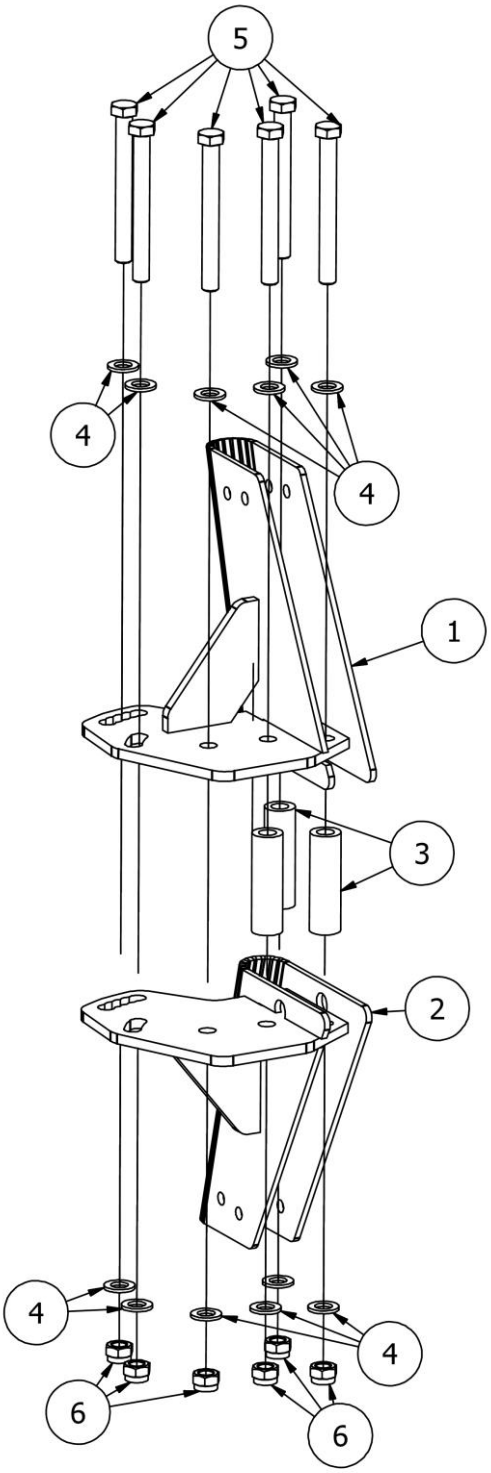
LIST OF PARTS			
NO.	QUANTITY	REFERENCE NUMBER	DESCRIPTION
1	1	PL00453	Hub PO housing
2	1	PO.ES.00006	Wheel hub axle PO
3	1	EL00023	Ball bearing 6307-2RS (PO)
4	1	EL00024	Ball bearings 6206-2RS (SR and AP)
5	1	EL00019	Bearing nut KM6
6	1	EL00018	Bearing washer MB6
7	1	PL00454	Hub dust nut
8	1	P30/O	Flat washer M30 zinc plated
9	1	NS30/O	Locknut M30 zinc plated

Figure R21	PLM0010 Tillage roller arm complete



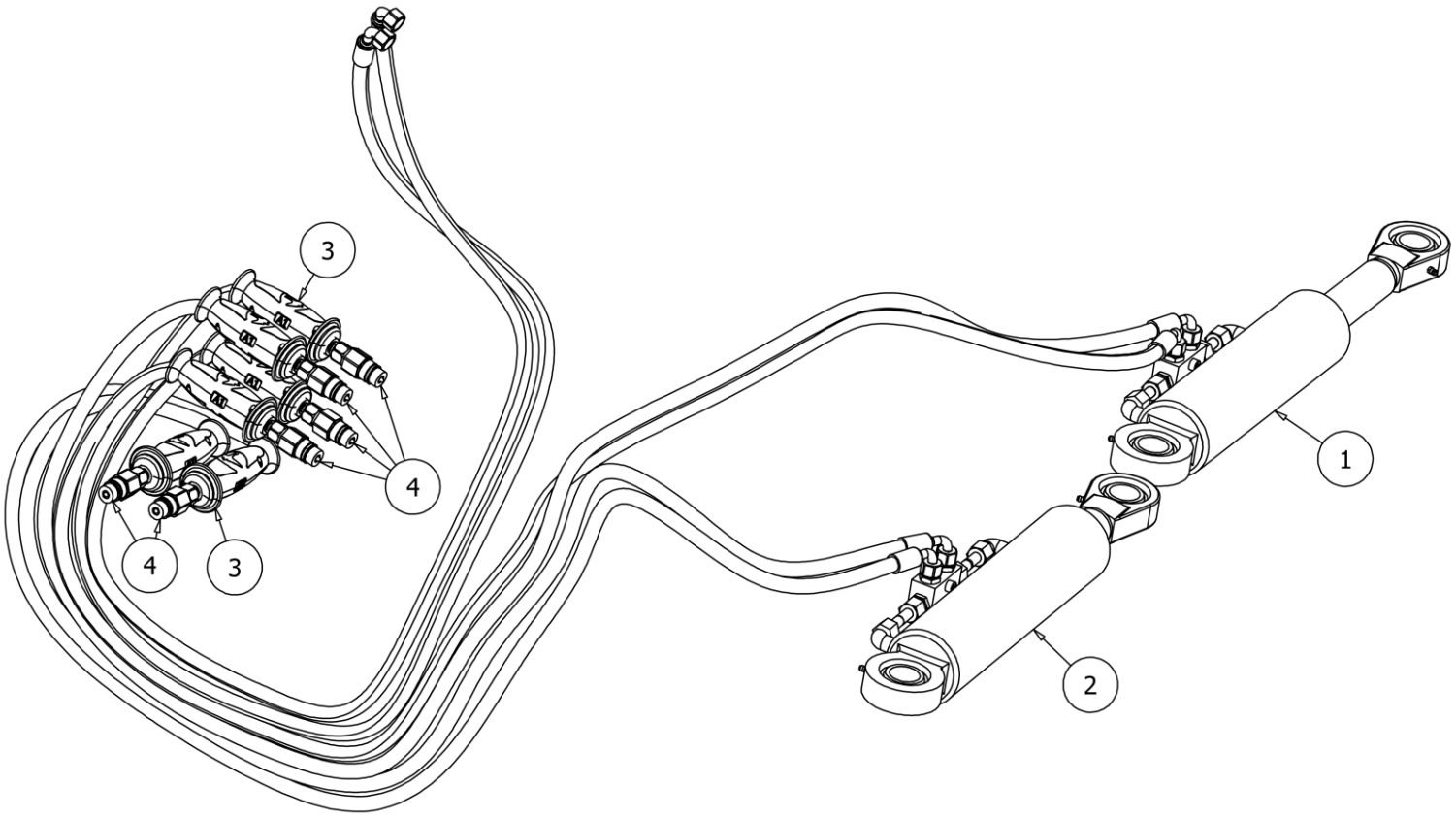
LIST OF PARTS			
NO.	QUANTITY	REFERENCE NUMBER	DESCRIPTION
1	1	PL00710	Arm
2	1	PL00716	Handle
3	1	PL00721	Pin 45
4	1	PL00723	Anchor
5	1	P36/O	Flat washer M36 zinc plated
6	1	EW00052	Girmann link (PJ length-wise)
7	2	PL00794	Link pin dia25.5xL105
8	2	EL00044	Spring peg dia10xL45
9	2	P12/O	Flat washer M12 zinc plated
10	1	S12x40/8.8/O	Bolt M12x40 8.8 zinc-plated
11	1	NS12/O	Locknut M12 zinc plated
12	2	EL00055	Bearing nut KM7
13	10	P20/O	Flat washer M20 zinc plated
14	5	NS24/O	Locknut M24 zinc plated
15	3	S20x195/8.8/O	Bolt M20x195 8.8 zinc-plated
16	2	S20x60/8.8/O	Bolt M20x60 8.8 zinc-plated

Figure R22	PL00723 Anchor



LIST OF PARTS			
NO.	QUANTITY	REFERENCE NUMBER	DESCRIPTION
1	1	PL00708	Sail upper
2	1	PL00714	Sail lower
3	3	PL00910	Sleeve 17x30x100
4	12	P16/O	Flat washer M16 zinc plated
5	6	S16x150/8.8/O	Bolt M16x150 8.8 zinc-plated
6	6	NS16/O	Locknut M16 8 zinc plated

Figure R23	HY00069 Hydraulics for hydraulic plough



LIST OF PARTS			
NO.	QUANTITY	REFERENCE NUMBER	DESCRIPTION
1	1	EW00666	Actuator SMTAM 80x45x150-00+valve
2	1	EW00731	Ruling cylinder POV 80x45x220
3	6	BT01081	Hose tie complete
4	6	EW00414	Euro M18 fitting