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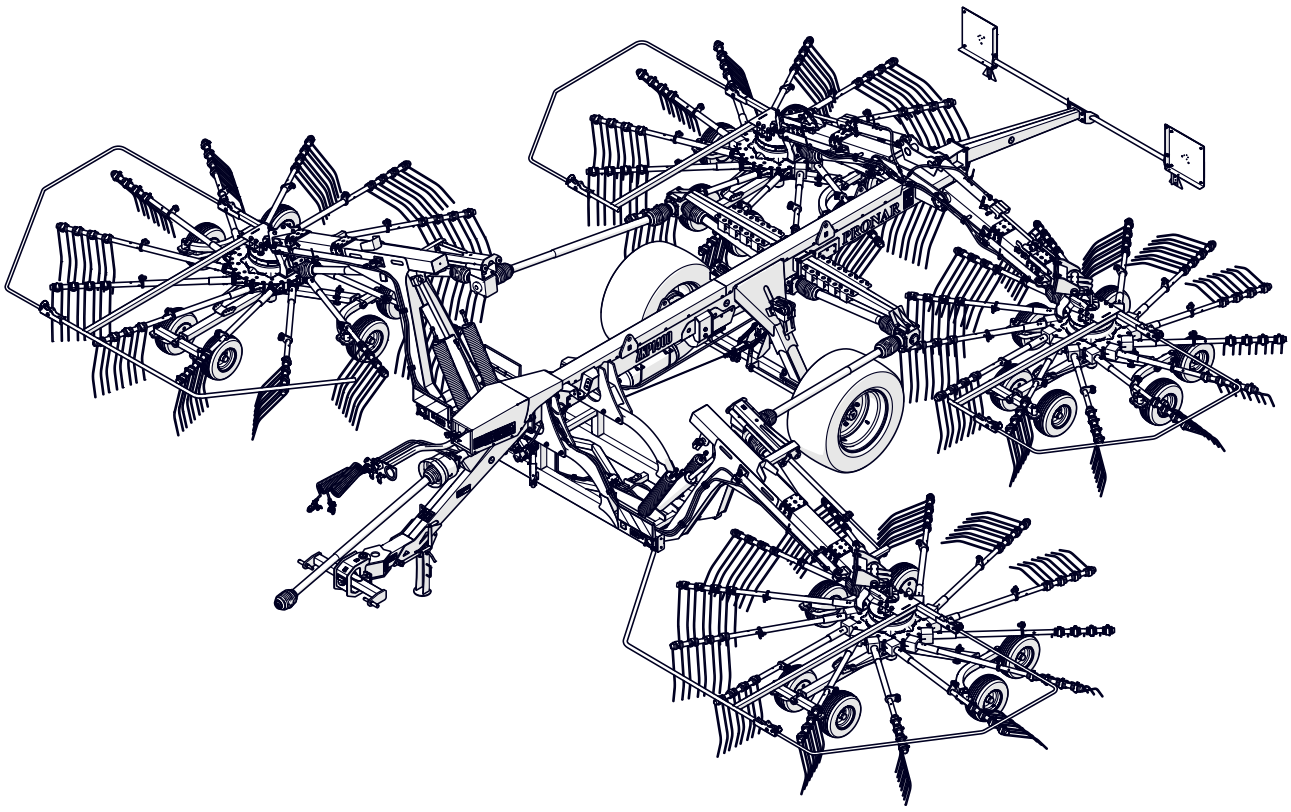
OPERATOR MANUAL

ROTARY RAKE

PRONAR ZKP1400

TRANSLATION OF THE ORIGINAL COPY OF THE MANUAL



KEEP FOR FUTURE REFERENCE

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EN

INTRODUCTION

1.1 INTRODUCTION

Information in this document is current at date of publication. As a result of improvements, some numerical values, illustrations and assemblies (standard, additional and optional equipment) referred to in this publication may not correspond to the actual specification of the machine delivered to the user.

The figures shown in this publication are intended to explain the principle of operation of the machine and may differ from the actual specification. The above cannot be a reason for any claims.

The manufacturer reserves the right to introduce design changes in machines produced that facilitate and improve the quality of machine operation, without making minor amendments to this Operator Manual.

This Operator Manual is an integral part of the machine documentation. Before using the machine, the user must carefully read this Operator Manual and observe all recommendations. This guarantees safe operation and ensures failure-free work of the machine. The machine is designed to meet obligatory standards, documents and legal regulations currently in force.

If the information in this Operator Manual needs clarification, refer for assistance to the sale point where the machine was purchased or to the Manufacturer. The serial numbers of the machine and major subassemblies should be inscribed in the spaces below after purchase of the machine.

Machine serial number:

This Operator Manual contains important safety and operating instructions for the machine. The Operator Manual should be kept near the machine so that it is accessible to authorized operators.

Keep this manual for future reference. If the Operator Manual is lost or damaged, contact the seller or the manufacturer for a copy.

The Operator Manual is intended for the end user. For this reason, some required maintenance activities are listed in the inspection tables but the procedure is not described in this Operator Manual. To perform these steps, call the manufacturer's authorized service centre.

1.2 SYMBOLS APPEARING IN THIS OPERATOR MANUAL

DANGER

Information, descriptions of danger and precautions as well as recommendations and prohibitions associated with the safety of use are marked in the text with the sign **DANGER**. Failure to observe the instructions may endanger the machine operator's or other person's health or life.

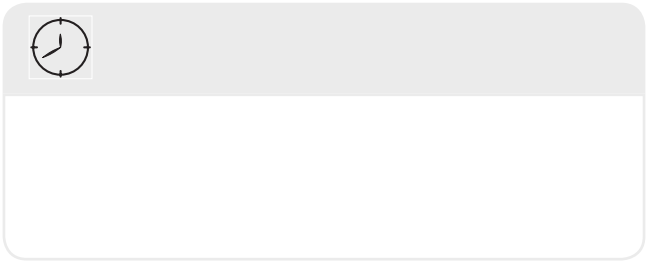
IMPORTANT

Vital information and instructions that must be observed are highlighted by a border and accompanied by the text **IMPORTANT**. Failure to observe the instructions may lead to damage to the machine as a result of improper operation, adjustment or use.

TIP

Additional tips included in the Operator Manual describe useful advice for the machine operation and are marked with the sign **TIP**.

In order to focus the user's attention on the need to perform maintenance, the relevant section of the Operator Manual is marked with the clock pictogram.



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1.3 DIRECTIONS USED IN THIS OPERATOR MANUAL

Left side – side to the left hand of the operator facing in the direction of machine's forward travel.

Right side – side to the right hand of the operator facing in the direction of machine's forward travel.

Rotation to the right – clockwise rotation of a mechanism (the operator is facing the mechanism).

Rotation to the left – counterclockwise rotation of a mechanism (the operator is facing the mechanism).

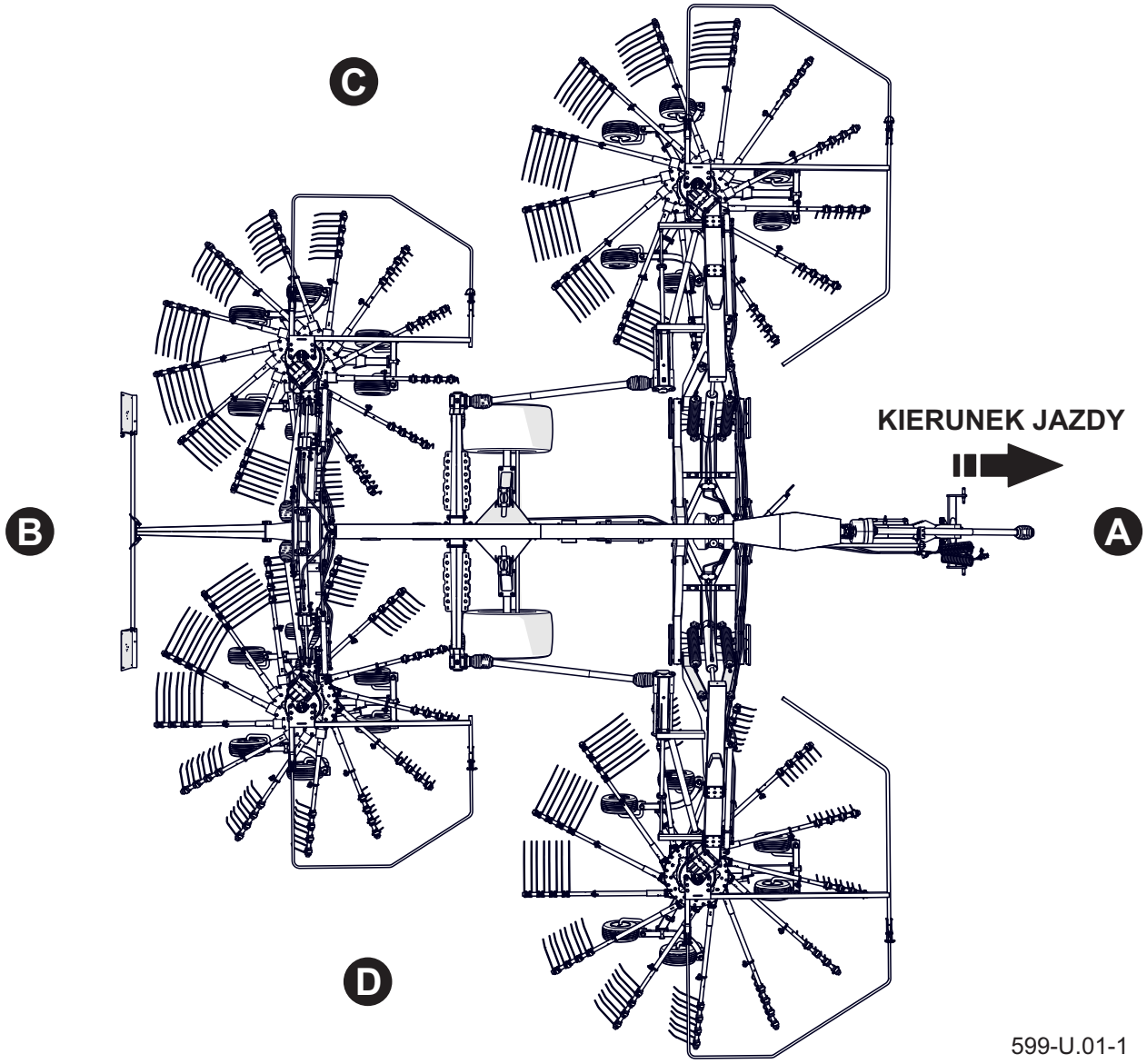

Figure 1.1 Directions used with reference to the machine
(A) front, - (B) rear, - (C) left side, - (D) right side

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1.4 INSPECT THE MACHINE UPON DELIVERY

The manufacturer guarantees that the trailer is fully operational and has been checked according to quality control procedures and is ready for use. This does not release the user from an obligation to check the machine's condition after delivery and before first use. Detailed information concerning the machine hand-over are included in the *WARRANTY BOOK*.

Annex to this manual includes INITIAL SET-UP INSTRUCTIONS describing the first installation steps after delivery.

Before hitching the machine to the tractor, confirm that it is suitable for this purpose (see *Requirements for carrier vehicle*).

INSPECTION RECOMMENDATIONS

- Check completeness of the machine according to order (standard and optional equipment).
- Check the machine for missing parts or damage resulting from wrong transport of the machine to its destination (crushing, piercing, bending or breaking of parts etc.).
- Check technical condition of covers and protection devices.
- Check condition of paint coating; check the machine for traces of corrosion.
- Check technical condition of tyres and tyre pressure.
- Check if the nuts and bolts fixing the wheels are properly tightened.
- Check technical condition of suspension system and if correctly installed.
- Check technical condition of hydraulic and pneumatic lines.
- Check that there are no hydraulic oil leaks.
- Check technical condition of the rotary rake lights and indicators,
- Check technical condition of PTO shafts, their shields and securing chains.
- Check hydraulic cylinders for leaks of hydraulic oil.

Discovered defects should be notified directly to the seller in order to remove them.

TIP

Releasing the machine to the buyer involves a detailed visual inspection and verification of the trailer operation, as well as instructing the buyer on the basic principles of operation. The trailer is operated for the first time in the presence of the Seller.

U.11.3.EN

1.5 FIRST START-UP OF THE MACHINE

Before you start using the machine, you should familiarize yourself with its design, principle of operation, available equipment and operation and, above all, with safety rules.

PROCEDURE

- The user must read this *Operator Manual* and follow all instructions.
- Perform the daily inspection of the machine in accordance with the guidelines in the inspection schedule.
- Check all the machine lubrication points, lubricate if necessary according to the recommendations in the lubrication schedule.
- Drain air tank of the braking system.
- Check all nut and bolt connections (in particular raking arms, spring rake tines, wheels, protective shields).
- Check oil level in bevel gears.
- Check technical condition of PTO shafts, their shields and securing chains.
- Check technical condition of hitching system pins and locking cotter pins.
- Ensure that hydraulic, pneumatic and electric connections in agricultural tractor are according to the requirements, if not the machine should not be hitched to the carrier vehicle.
- Make sure that the oil of the same kind and grade is used in the machine hydraulic system and the tractor hydraulic system or the oils used in the machine hydraulic system and the tractor hydraulic system are mixable.
- Make sure that the attached PTO shaft may be connected to the tractor (*PTO shaft should be suitable for the tractor – see the OPERATOR MANUAL OF PTO SHAFT),*

  Check the PTO shaft length in the most favourable and the most difficult working conditions, check whether the PTO shaft pipes are sufficiently covered when the widest angle is set between the tractor and the machine, check whether the PTO shaft can be still slid when the smallest angle is set (while turning), make sure that the tractor PTO rotation direction is correct.

If all the above checks have been performed and there is no doubt as to the ma-

IMPORTANT

During the first use, the machine is checked in the presence of the Seller. The Seller is obliged to conduct the training in safe and correct operation of the trailer.

Training by the seller does not release the user from the obligation to read this Operator Manual and the Operator Manual of PTO shaft attached to the machine and observe all recommendations.

IMPORTANT

Pipe profiles of the PTO shaft must overlap at least at 1/2 of the length in normal working conditions and at least at 1/3 of the length in all working conditions.

When adjusting the PTO shaft, follow the instructions presented in the Operator Manual of the PTO shaft.

When the tractor with the manure spreader are turning or travelling on an uneven terrain, the PTO shaft may be damaged and/or destroyed if it is squeezed or disconnected as a result of its wrong adjustment.

TIP

Adjustment of the PTO shaft applies only to a specific type of tractor. If the machine is connected to a different type of tractor, the adjustment procedure for this type of tractor should be possibly carried out.

chine good technical condition, it can be connected to tractor (see section *HITCHING TO TRACTOR*).

Start tractor engine, check all systems and perform a test run of the machine without load before beginning work. It is recommended that the inspection is conducted by two people, one of which should always remain in the tractor cab. Test start should be conducted according to the sequence shown below.

- Hitch the machine to tractor.
- Connect PTO shaft and secure it in a proper manner.
- Connect hydraulic, pneumatic and electrical system lines. Connect control panel and place it in the tractor cabin.
- Check for correct operation of brake system and lights.
- Set raking arms, raise raking assemblies upwards maximally using the crank, so that springtines do not touch surface.
- Start tractor.
- Check for correct operation of the hydraulic systems of the following assemblies: raking assembly lifting/lowering system, raking width adjusting system.

  Using control panel start individual functions of the rotary rake. Check whether hydraulic lines are connected in a correct manner.

- Start tractor PTO slowly (starting the drive of the raking assembly gears) and leave it for a few minutes.

  Check that there is no knocking or noise in the drive system and

DANGER

Careless and incorrect use and operation of the machine, and failure to follow instructions in this Operator Manual is dangerous to your life and health.

The machine must never be used by unauthorised persons, including children, and people under the influence of alcohol or other abusive substances.

Non-compliance with the safety rules of this Operator's Manual can be dangerous to the health and life of the operator and others.

in the raking assembly gears arising from scraping or grinding of metal elements, Check proper rotation of raking system. Check proper action of cam mechanism of the raking assembly gear (spring tines should lower and raise according to current arm position),

- Turn off the PTO drive, turn off the agricultural tractor engine, immobilize the tractor with the parking brake. Unhitch the rotary rake from the tractor and immobilise with parking brake (place the wheel chocks under the wheel).

The machine may be used only when all preparatory activities have been completed satisfactorily. If during test run worrying symptoms occur such as:

- excessive noise and abnormal sounds originating from the rubbing of moving elements,

IMPORTANT

Before using the rotary rake always check its technical condition. In particular check the technical condition of the raking system, wheel system, all protective guards and correct condition of mounting of raking fingers.

Failure to follow instructions in this Operator Manual or starting the rotary rake incorrectly may cause damage to the machine.

The technical condition of the machine before its use must be no cause for concern.

- hydraulic oil leak,
- incorrect operation of hydraulic and / or pneumatic cylinders,
- brake system leak,
- other faults,

immediately cut off oil supply, turn off tractor PTO drive and do not operate the machine until the malfunction is corrected. If a fault cannot be rectified or the repair could void the warranty, please contact retailer for additional clarifications or to perform the repair.

U.31.1.EN

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EC DECLARATION OF CONFORMITY OF THE MACHINERY

PRONAR Sp. z o.o. declares with full responsibility, that the machine:

Description and identification of the machinery	
Generic denomination and function:	**Rotary Rake**
Type:	**ZKP1400**
Model:	–
Serial number:	
Commercial name:	**Rotary Rake PRONAR ZKP1400**

to which this declaration relates, fulfills all the relevant provisions of the Directive **2006/42/EC** of The European Parliament and of The Council of 17 May 2006 on machinery, and amending Directive 95/16/EC (Official Journal of the EU, L 157/24 of 09.06.2006).

The person authorized to compile the technical file is the Head of Research and Development Department at PRONAR Sp. z o.o., 17-210 Narew, ul. Mickiewicza 101A, Poland.

This declaration relates exclusively to the machinery in the state in which it was placed on the market, and excludes components which are added and/or operations carried out subsequently by the final user.

Narew, the 2020-12-01

Place and date

z-CA DYREKTOR
d/s technicznych
członek zarządu
Roman Omeljaniuk

Full name of the empowered person position, signature

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SCHEDULE OF TECHNICAL INSPECTIONS

TECHNICAL SUPPORT

TYRE SYSTEM

GENERAL

CHAPTER1

1.1 IDENTIFICATION

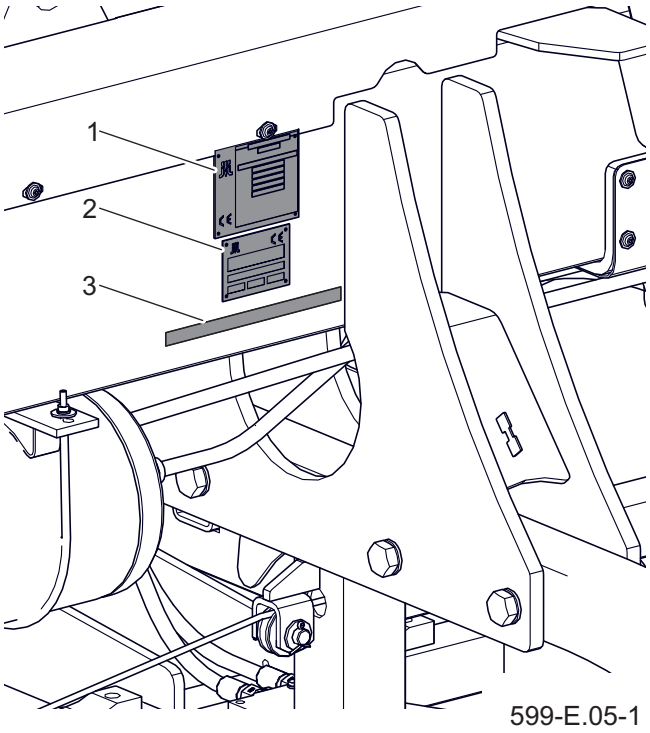

Figure 1.1 Machine identification

(1) EU nameplate (2) CE plate

(3) VIN number

The rotary rake is identified by nameplates (1) and (2) and by the factory VIN number in the highlighted area on the right side of the subframe. When purchasing a rotary rake, check that the factory numbers on the machine match the numbers entered on the *Warranty Card*, on sales documents and in the *User Manual*.

The meaning of the individual fields on the nameplates is shown in the following tables.

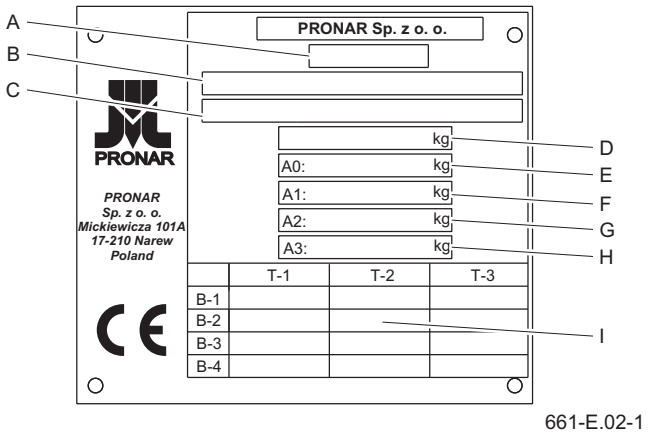

Figure 1.2 EU Nameplate

Table 1.1. UE nameplate markings

ITEM	Meaning
A	Category, subcategory and vehicle speed rating
B	Approval number
C	Product VIN number
D	Permissible total weight
E	Permissible load per coupling
F	Maximum permissible mass per axle 1
G	Maximum permissible mass per axle 2
H	Maximum permissible mass per axle 3
I	Technically permissible towable masses

Table 1.2. CE nameplate markings

ITEM	Meaning
A	Product trade name or generic designation and function
B	Product VIN number
C	Product type (granted in the EU type-approval process)
D	Year of production
E	Product model

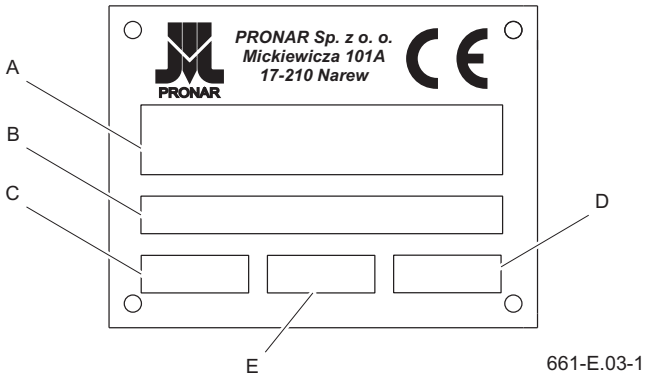

Figure 1.3 CE Nameplate

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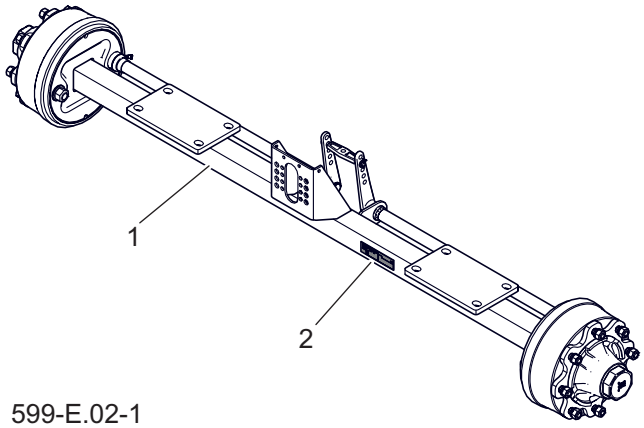
1.2 IDENTIFICATION OF THE DRIVING AXLE



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The serial number of the driving axle and its type are stamped on the nameplate (2) attached to the driving axle housing (1). - figure *(1.2)*.

ADVICE

When it is necessary to order spare parts or when problems arise, it is very often necessary to enter the serial number of the machine or the serial number of the travel axle, so it is recommended that these numbers are entered below.

Figure 1.4 Location of the nameplate

(1) driving axle (2) axle plate

Axle serial number	

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1.3 INTENDED USE

The rotary rake is designed for agricultural work: raking the cuttings (straw, grass, hay) and forming them into a roller on uncompacted grassland with an even surface. Use of the machine in any other way is prohibited.

The transport of people, animals and other materials is prohibited and treated as incompatible. When operating the machine, the traffic and transport regulations in force in the country in question must be complied with, and any infringement of these regulations is regarded by the manufacturer as misuse.

Intended use also includes all activities related to the correct and safe operation and maintenance of the machine.

Therefore, the user is obliged to:

- to acquaint themselves with the contents of this *USER MANUAL*, *WARRANTY CARD* and the contents of the *INSTRUCTIONS FOR THE OPERATION OF THE TRANSMISSION AND TELESCOPE SHAFT* and to apply the instructions contained therein,
- understand the principle of machine operation and the safe and proper operation,
- work in compliance with established maintenance and adjustment plans,
- work in compliance with general safety regulations,
- accident prevention,
- to comply with the traffic and transport rules in force in the country in which the machine is being used,
- read and follow the contents of the AGRICULTURAL TRACTOR OPERATION INSTRUCTIONS,
- only aggregate the machine with an agricultural tractor which fulfils all the requirements of the machine manufacturer.

CAUTION

The machine must not be used contrary to its intended use, in particular:
- for transporting people, animals,
- for the carriage of any material or object.

The machine may only be used by persons who:

- have become acquainted with the contents of this publication and of the documents accompanying the machine, as well as with the contents of the instruction manual for the agricultural tractor,
- have been trained in the machine operation and work safety,

- have the required driving licence and are familiar with road traffic and transport regulations.

Table 1.3. Tool carrier (tractor) requirements.

Content	Unit	Requirements
Rear three-point linkage		
Category	-	II according to ISO 730-1
Rear power take-off (PTO)		
Type	-	Type 1 acc. to ISO 500 (nominal diameter 35 mm, 6 splines)
Speed (max)	rpm	540
Braking system		
Pneumatic installation sockets	-	ISO 1728 compliant
Nominal pressure in the installation	bar	6.5
The hydraulic system		
Hydraulic oil	-	(GL - 4) Agrol U(1)
Nominal pressure in the installation	bar / MPa	160 / 16
Hydraulic sockets	-	One double-sided section
Oil pump output	l/min	
Electrical system		
Electrical system voltage	V	12
Lighting installation socket	-	7-pin, ISO 1724
Electrical connection	-	3-pin
Other requirements		
Minimum carrier power requirement	kW/hpm	59 / 80
Pressure on the coupling	kg	615

(1) - it is permissible to use a different oil, provided that it can be mixed with the oil poured into the rake. Please refer to the product information sheet for details.

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1.4 EQUIPMENT

Table 1.4. Machine equipment

Equipment	STANDARD	ADDITIONAL	OPTIONAL
User Manual	●		
Warranty Card	●		
Two-line air brake system	●		
Parking brake	●		
Connection cable for lighting installation	●		
Wheel chocks	●		
Wide angle shaft to connect the rake to the tractor	●		
Reflective warning triangle		●	
Document tube		●	
Protection of raking fingers		●	

ADVICE

Recommended wide-angle roller to connect the rake to the tractor: DH7R146CEKR7K02.

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1.5 TERMS OF WARRANTY

PRONAR Sp. z o.o. in Narew guarantees smooth operation of the machine when it is used in accordance with the technical and operational conditions described in the *USER MANUAL*. Defects revealed during the guarantee period will be rectified by the Guarantee Service. Deadline for completion of repairs is specified in the *Warranty Card*.

The warranty does not apply to parts and sub-assemblies of the machine, which are subject to wear in normal operating conditions, regardless of the warranty period.

The warranty services only apply to such cases as: mechanical damage not caused by the fault of the user, factory defects of parts, etc.

In the event that damage occurs as a result of:

- mechanical damage caused by the user's fault, road accident,
- from improper operation, adjustment and maintenance, using the machine contrary to its purpose,

ADVICE

You should require the seller to carefully fill out the **Warranty Card** and complaint coupons. The lack of e.g. date of sale or point of sale stamp exposes the user to not accept any complaints.

- use of a damaged machine,
- repairs carried out by unauthorized persons, improper repairs,
- execution of user changes in machine design,

the user loses the warranty.

The user is obliged to immediately report all damage noticed, regardless of whether the damage is covered by the warranty or not. Detailed warranty conditions are given in the *WARRANTY CARD* attached to the newly purchased machine.

Modifications to the machine without the written consent of the Manufacturer are prohibited. In particular, welding, reaming, cutting and heating of major structural components of the machine that directly affect safety during work with machine is not permitted.

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1.6 TRANSPORT

For shipping, the rake is partially disassembled to save space. Before first commissioning, it must be assembled in accordance with Annex A *"FIRST INSTALLATION INSTRUCTIONS"* in preparation for normal operation.

Delivery to the user is made by truck. Transport after connection to the carrier is permitted, provided that the carrier driver is familiar with the machine's operating instructions, particularly the safety information and the rules for connection and transport on public roads.

When loading and unloading the machine, follow the general health and safety rules for handling work. Persons operating handling equipment must have the required authorisation to use the equipment. The machine should be hooked up to lifting equipment at the points specifically designated for this purpose - drawing (*1.4*). The fixing points have been marked with

CAUTION

When transporting the carrier alone, the carrier operator should familiarise himself with the contents of this manual and follow the recommendations contained therein.
When transporting by road, the machine must be secured on a platform in accordance with safety requirements during transport. The driver of a car, when driving, should exercise extreme caution. This is due to the fact that the centre of gravity of the vehicle with the loaded machine has been shifted upwards.

DANGER

Improper use of restraints can cause an accident.
No one is allowed in the manoeuvring area while the rake is being moved to another means of transport.

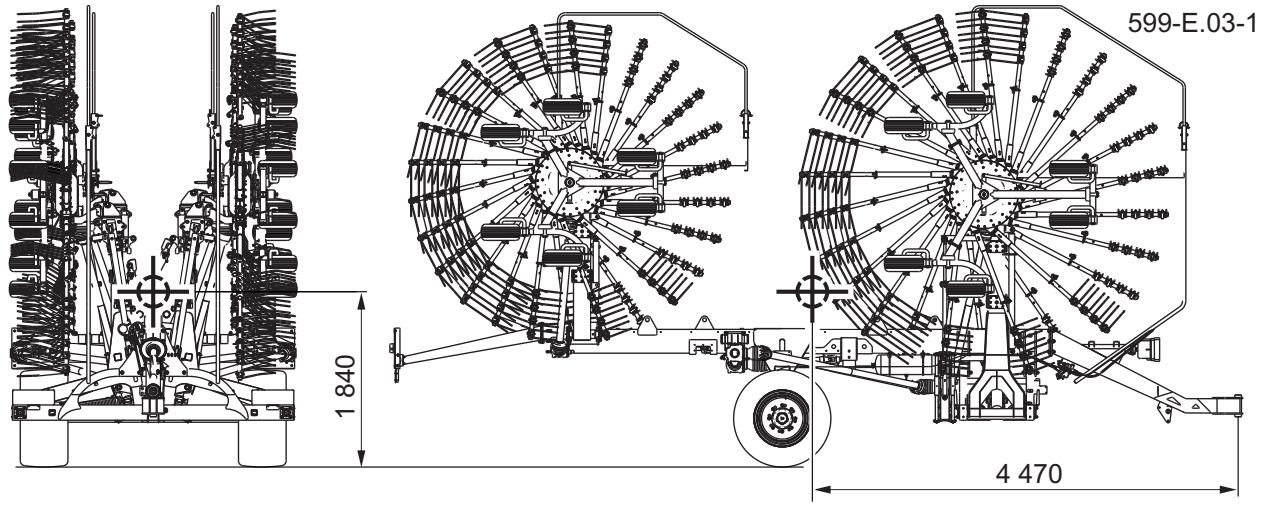

Figure 1.5 Position of the centre of gravity of the machine

an information sticker.

It is recommended that the rake is placed in the transport position during handling and transport, i.e. all raking units should be raised and the parking support should be unfolded. It is recommended that the rake arms are removed when moving the machine. If the ropes or straps of the handling equipment can snag on protruding parts of the rake placed in the transport position, they should also be removed. Special care must be taken when lifting the rake due to the possibility of the machine tipping over and the risk of injury from protruding

CAUTION

Use only approved and technically reliable securing measures. Familiarise yourself with the contents of the attachment manufacturer's Operating Instructions.
It is forbidden to attach slings and load securing components of any kind to components other than those indicated (e.g. the hydraulic system and electrical installations).

ADVICE

When loading, the rake should be folded into the transport position.

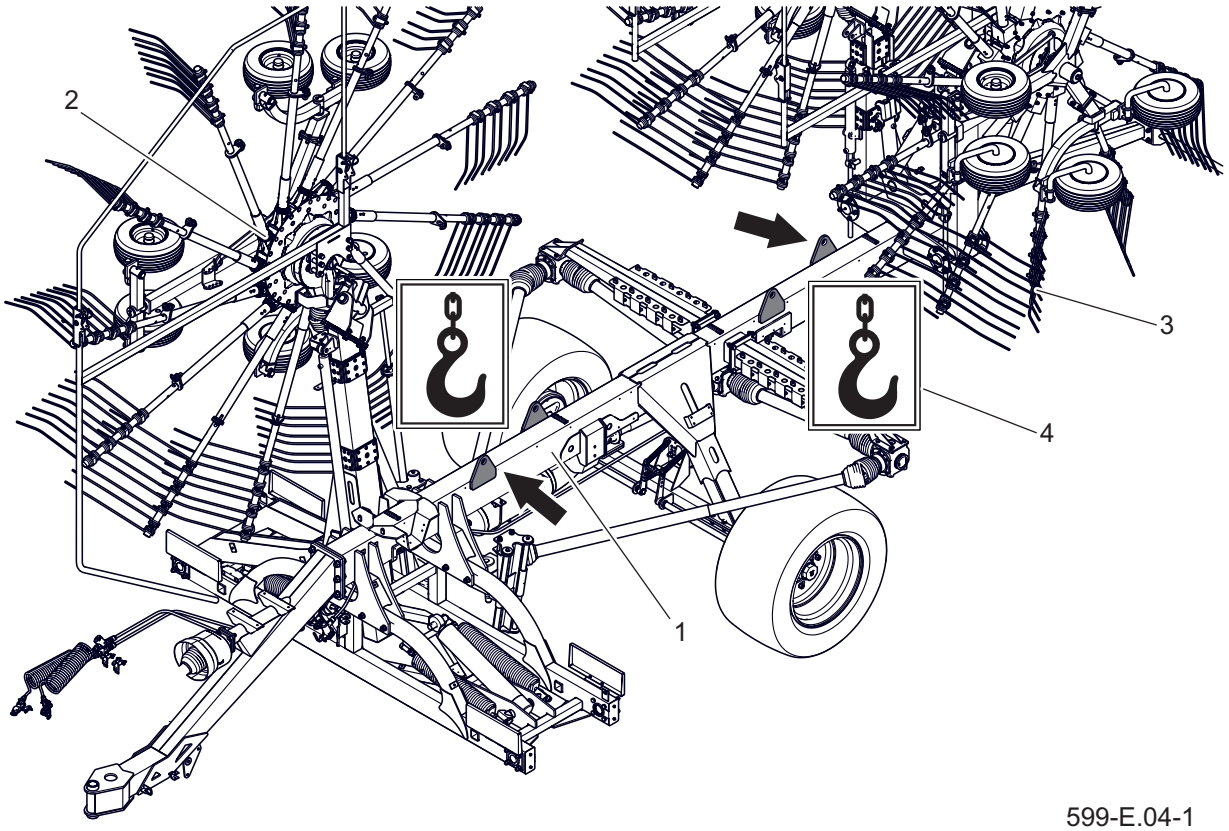

Figure 1.6 Location of transport fixtures

(1) frame (2) front rake unit (3) rear rake unit (4) sticker

machine parts.

The machine should be attached firmly to the platform of the vehicle using straps oraz chains equipped with a tensioning mechanism. Fastening agents must have current safety approval. Wedges or other items without sharp edges should be placed under the wheels of the rake to prevent the machine from rolling. The wedges must be fixed to the platform of the means of transport. During handling operations, special care must be taken not to damage the rake's equipment components and paint finish. The carb weight of the rake in running condition is given in table *(3.1).*

CAUTION

PTO shafts must be protected from damage during transport.
The arms of the rake mechanisms and other structural components that are not strong enough for this type of operation must not be used to attach or hitch up the machine.

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1.7 ENVIRONMENTAL RISK

A hydraulic oil spill poses direct environmental risks due to its limited biodegradability. When carrying out maintenance and repair work where there is a risk of oil spillage, the work should be carried out in rooms with an oil-resistant surface. In the event of a spill into the environment, the source of the spill must first be secured and the spilled substance must then be collected using available means. Collect oil residues with sorbents or mix with sand, sawdust or other absorbent materials. Collected oil contaminants should be stored in a sealed and labelled hydrocarbon-resistant container and then taken to an oil waste disposal facility. Keep the container away from heat sources, flammable materials and food.

Used oil or oil unsuitable for reuse due to loss of its properties is recommended to be stored in the original packaging under the same conditions as described previously. Detailed information on oils can be found in the product safety data sheets.

DANGER

Used oil or collected residues mixed with absorbent material should be stored in an accurately labelled container. Do not use food packaging for this purpose.

CAUTION

Oil waste may only be taken to an oil recycling or reclamation centre. It is forbidden to discharge or pour oil into drains or bodies of water.

ADVICE

The machine's hydraulic system is filled with Agrol U Lotos oil.

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1.8 WITHDRAWAL FROM USE

If you decide to dispose of the machine, you must comply with the regulations in force in your country regarding the disposal and recycling of end-of-life machinery.

Oil must be completely removed from the hydraulic system before dismantling the machine.

When replacing parts, hand over worn or damaged items to a recycling centre.

DANGER

During dismantling, use appropriate tools, equipment (cranes, hoists, etc.), use personal protective equipment, i.e. protective clothing, footwear, gloves, goggles, etc.
Avoid oil contact with the skin. Do not allow oil to leak.

Dispose of used oil as well as rubber or plastic parts at recycling facilities for this type of waste.

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CHAPTER2

SAFETY IN USE

2.1 SAFETY RULES WHEN USING MACHINE

- Before operating the machine, the user should carefully read the contents of this publication, the instructions supplied with the PTO shaft and the *Warranty Card*. All recommendations contained therein must be followed during operation.
- Use and operation of the machine may only be carried out by persons who are authorised to drive the implement carriers (tractors) and who have been trained in the operation of the machine. The rake is operated by one person.
- Careless and improper use and operation of the machine, failure to comply with the instructions in this manual, poses a health risk to operators and bystanders.
- The residual risk of hazards is warned, so the application of the principles of safe use and prudent handling should be the basic principle for the use of the machine.
- The use of the machine by persons not authorised to drive implement carriers (tractors), including children, intoxicated persons and persons under the influence of drugs or other intoxicating substances, is prohibited.

CAUTION

If you do not understand the information contained in this manual, please contact your dealer providing authorised technical service on behalf of the manufacturer, or contact the manufacturer directly.

- The machine may not be used for purposes other than those for which it was intended. Anyone who uses the machine in a manner which is not in accordance with its intended use shall assume full responsibility for any consequences arising from its use. Use of the machine for purposes other than those envisaged by the manufacturer is incompatible with the intended use of the machine and may invalidate the warranty.
- The machine may only be used if all safety components (e.g. guards, pins, pins, warning stickers) are technically sound and in the right place. If the safety elements are damaged or lost, they must be replaced with new ones.
- Care must be taken to ensure that the covers are used appropriately, as the tarpaulin covers used are flammable.
- It is forbidden to use a faulty machine.
- Any modifications to the machine

will relieve PRONAR Narew of any responsibility for damage or injury caused.

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2.2 SAFETY WHEN AGGREGATING THE MACHINE

- Only couple and transport the machine with a tractor that meets the manufacturer's requirements (minimum tractor power requirement, required three-point linkage category, etc.) - see table *AGRICULTURAL TRACTOR REQUIREMENTS*.
- Before connecting the machine, check the condition of the hitching system of the rake and the tractor.
- It is forbidden to connect the machine to a carrier (tractor) if the hydraulic oils used in both machines are not miscible.
- Use only original pins and locks to connect the machine to the carrier (tractor).
- The carrier (agricultural tractor) to which the machine will be connected must be in good working order and must meet the requirements set out by the machine manufacturer.
- Special care must be taken when connecting and disconnecting the machine.
- No one is allowed between the machine and the carrier during the connection.
- Once aggregation is complete, check the safety features.
- Before each use of the rake, check its technical condition, especially with regard to safety. In particular, check the condition of the suspension system, the running gear, the components of the brake system, the condition of the hydraulic system and the correct attachment of the rake and safety guards.
- Coupling and uncoupling must only take place with the machine and implement carrier (tractor) switched off.
- The machine disconnected from the carrier must be placed on a horizontal, sufficiently firm surface so that it can be reconnected.
- The rake, when uncoupled from the tractor, must be supported by a stand and secured against rolling using wheel chocks or other components without sharp edges. Secure the rake with the parking brake.
- The machine disconnected from the carrier must be protected against unauthorised use by means of safety devices.

F.1.7.599.01.1.EN

2.3 SAFETY RULES FOR OPERATING A HYDRAULIC SYSTEM

- The hydraulic system is under high pressure during operation of the machine.
- Use the hydraulic oil recommended by the manufacturer. Never mix two types of oil.
- Regularly check the technical condition of connections and hydraulic lines. Oil leaks are unacceptable.
- In the event of failure of the hydraulic system, the machine must be decommissioned until the failure is remedied.
- When connecting the hydraulic lines to the carrier, ensure that the hydraulic system is not under pressure. If necessary, reduce the residual pressure in the system.
- In the event of injuries being caused by pressurized hydraulic oil, contact a doctor immediately. Hydraulic oil can penetrate the skin and cause infection. If the oil gets into the eyes, rinse with plenty of water and if irritation occurs, contact a doctor. In the event of contact of oil with skin, wash the area of contact with water and soap. Do not use organic solvents (petrol, paraffin).
- It is forbidden to store hydraulic oil in packaging intended for food storage.
- Rubber hydraulic conduits must be replaced every 4 years regardless of their technical condition.
- Repairs and replacements of plumbing components should be entrusted to suitably qualified persons.

F.1.7.578.03.1.EN

2.4 SAFETY RULES FOR OPERATING A PNEUMATIC SYSTEM

- If the brake system is defective, it is prohibited to use the machine until the fault has been rectified.
- Regularly check the technical condition of connections and pneumatic lines.
- If individual components of the pneumatic system have to be replaced, only original components should be used. Failure to comply with these requirements may create a risk to the health or life of bystanders or those operating the machine.
- Drain the air tank regularly, particularly before the winter period. Freezing water can cause damage to brake components. Check the patency of the brake actuator vents.
- Protect flexible pneumatic hoses, seals, plug caps from oil, grease or petrol.
- Periodically check the stroke of the brake cylinder.

F.1.7.599.02.1.EN

2.5 SAFETY DURING TRANSPORT JOURNEYS

Before starting to drive:

1. Ensure that the machine is correctly connected to the carrier (tractor) and check that the lighting and braking systems are working correctly.
2. Fold the rake into the transport position.
3. Moving parts of the machine must be secured so that they do not present any danger when driving.
4. A triangular plaque distinguishing slow-moving vehicles should be placed at the rear of the machine in the plaque holder - Figure *(2.1)*.

And above that:

- When driving on public roads, comply with the traffic regulations of the country in which the machine is being operated.
- Do not exceed the speed limit imposed by road conditions and construction constraints (max.30km/h). Adapt your speed to the prevailing road conditions, and to the restrictions imposed by traffic laws.
- It is forbidden to carry persons on the machine or to transport materials.
- It is forbidden to leave the tractor operator's seat while driving.
- When driving on public roads, the tractor operator must ensure that an approved or homologated warning reflective triangle is fitted to the rake and tractor.
- Brash driving and excessive speed can cause accidents.
- When driving the machine on uneven terrain, take particular care and reduce the speed of travel due to the possibility of damage and/or overturning of the carrier with the machine.

F.1.7.599.02.1.EN

2.6 SAFETY DURING MAINTENANCE WORK

- During the warranty period, any repairs may only be carried out by a manufacturer-authorised warranty service. It is recommended that any repairs are carried out by specialised workshops.
- If any malfunctions or damage is found, the machine must be taken out of service until repaired.
- Appropriate close-fitting protective clothing, gloves and appropriate tools must be used during the work. Oil-resistant gloves and safety goggles are recommended when working on the hydraulic system.
- Any modifications to the machine will relieve PRONAR Narew of any responsibility for damage or injury caused.
- Before any work is undertaken on the machine, switch off the engine of the implement carrier (tractor) and wait for all rotating parts to stop.
- Regularly check the technical condition of the safety devices and the correct tightening of the screw connections.
- Carry out regular maintenance of the machine in accordance with the scope specified by the manufacturer.

DANGER

It is essential to disconnect the roller from the tractor during transport. Place the detached PTO shaft in the holder provided.
It is forbidden to drive the machine with a faulty brake system.

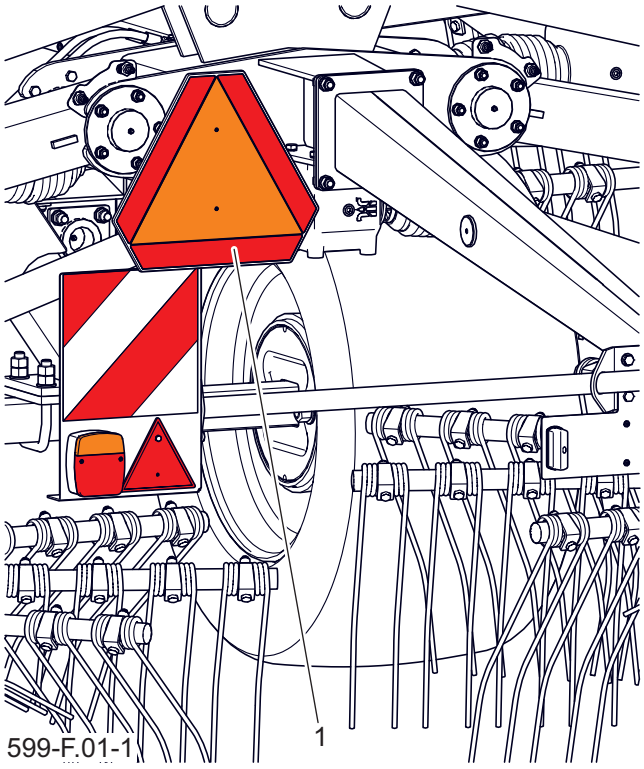


Figure 2.1 Distinguishing sign
(1) distinguishing sign

- It is forbidden to carry out maintenance or repair work under a raised and unsecured machine.
- Reduce the pressure in the relevant system before carrying out repair work on the hydraulic and pneumatic systems.

- Perform maintenance and repair activities applying the general principles of health and safety at work. In case of injury, wash and disinfect the wound immediately. In case of serious injuries consult a physician.
- Repair, maintenance and cleaning work should only be carried out with the engine of the implement carrier (tractor) switched off and the ignition key removed from the ignition lock. Secure the implement carrier (tractor) with the parking brake. Secure the cabin of the implement carrier (tractor) against unauthorised access.
- If individual components need to be replaced, only original components should be used. Failure to comply with these requirements may create a risk to the health or life of bystanders or operators, contribute to damage to the machine and constitute grounds for revocation of the warranty.
- Before welding or electrical work, the machine must be disconnected from the permanent power supply.
- The paint coating must be cleaned before welding work begins. The fumes of burning paint are poisonous to humans and animals. Welding work should be carried out in a well-lit and ventilated room.
- During welding work, attention must be paid to flammable or easily fusible components (system components, electrical, hydraulic, pneumatic, components made of plastic). If there is a risk of ignition or damage, they must be removed or covered with non-flammable material before welding. Before starting work, it is recommended to prepare a CO_2 or foam extinguisher.
- Check the condition of protective elements, their technical condition and correct fastening.
- In the event of work requiring the machine to be raised, use properly certified hydraulic or mechanical lifts for this purpose. After lifting the machine, stable and durable supports must also be used.
- It is forbidden to support the machine with fragile elements (bricks, hollow bricks, concrete blocks). Use the parking brake and support wedges when the machine is stationary.
- After completing work associated with lubrication, remove excess grease or oil.
- Perform daily visual and performance checks to detect damage at early stages or prevent accidents.

- To reduce the risk of fire, keep the machine clean.

F.1.7.599.03.1.EN

2.7 SAFETY WHEN OPERATING THE MACHINE

- Before starting the machine, make sure that there are no bystanders (especially children) or animals in the danger zone.

  Stop the machine when bystanders are in the danger zone.
- The machine operator must ensure that the machine and the working area are properly visible.
- Do not enter the working and folding area of the machine.
- Ensure that all guards are in working order and correctly positioned before starting the machine each time. Damaged or incomplete components must be replaced with new original components.
- Always check the condition and correctness of the attachment of the spring fingers to the rake arms before starting work.
- When raking, use the correct working position setting. and the recommended working speed.
- Before raising and lowering the raking units of the machine, make sure that there are no bystanders in the vicinity.
- It is forbidden to work the machine while driving backwards, such driving leads to damage to the machine. Raise the rake arms before driving backwards.
- Before starting the tractor with the aggregated machine, ensure that the PTO is not engaged - otherwise the machine may start uncontrollably.
- It is forbidden to occupy any position other than that of the operator in the vehicle cab when operating the machine. It is forbidden to leave the operator's cab while the machine is in operation.
- It is forbidden to approach the machine before the rotating parts have stopped.

F.1.7.599.04.1.EN

2.8 SAFE OPERATION OF THE PTO SHAFT

- The machine can only be connected to the implement carrier (tractor) by means of an appropriately sized telescopic shaft recommended by the manufacturer.
- Before starting work, read and follow the drive shaft manufacturer's instruction manual.
- Adjust the length of the telescopic PTO shaft to the mating implement carrier (tractor) according to the shaft operating manual.
- The PTO shaft has markings on the housing indicating which end of the shaft should be connected to the implement carrier (tractor).
- Never use a defective telescopic PTO shaft as there is a risk of accident. The defective shaft must be replaced with a new one.
- Disconnect the shaft drive whenever there is no need to drive the machine or when the implement carrier (tractor) and machine are at an unfavourable angle to each other.
- During transport, the shaft should be stored horizontally to avoid damage to guards and other safety components.
- Place the detached PTO shaft in the holder provided.

DANGER

Before connecting/disconnecting the shaft,:
- Switch off the PTO drive,
- Switch off the engine of the implement carrier (tractor),
- Apply the parking brake,
- Remove the key from the ignition.

The carrier cabin must be equipped with a fire extinguisher and a first aid kit.

- Before starting the PTO, make sure that the direction and selected speed (540rpm) of the PTO matches the permitted speed and direction on the machine.
- When using the shaft and rake, do not exceed the permissible shaft speed. It is forbidden to overload the shaft and rake and to engage the clutch abruptly.
- The chain which prevents the shaft guard from rotating during shaft operation must be attached to a fixed machine component.
- It is forbidden to use safety chains to support the shaft when the machine is stationary or being transported.
- The drive shaft must be fitted with guards. It is forbidden to use the shaft with damaged or missing safety components.
- Once the roller has been installed,

ensure that it is correctly and securely connected to the implement carrier (tractor) and the machine.

- Ensure that the direction of rotation of the PTO is correct before connecting the PTO shaft.
- It is forbidden to wear loose clothing, loose belts or anything that could screw into the rotating shaft. Contact with the rotating telescopic shaft can cause serious injury.
- It is forbidden to walk over or under the roller or to stand on it, either during operation or when the machine is at a standstill.
- Pivot shaft components (especially the clutch) can become very hot. They should not be touched.
- Articulated shaft extensions/adapters must not be used.

ADVICE

Recommended wide-angle roller to connect the rake to the tractor: DH7R146CEKR7K02.

F.1.7.599.05.1.EN

2.9 DESCRIPTION OF RESIDUAL RISK

Pronar Sp. z o. o. in Narew made every effort to eliminate the risk of an accident. However, there is some residual risk that can lead to an accident and is primarily associated with the following activities:

- misuse of the machine,
- staying between the carrier (tractor) and the machine while the engine is running and while the machine is coupled,
- being on the machine during engine work,
- operation of the the machine with the covers removed or inoperative,
- failure to keep a safe distance from danger zones or to occupy a place in these zones while the machine is running,
- the operation of the machine by persons who are not authorised and capable of operating the machine, in particular children, persons under the influence of alcohol, persons under the influence of drugs or other intoxicants, etc,
- cleaning, maintenance and technical inspection with the implement carrier (tractor) connected and running,
- making changes to the machine without the Manufacturer's approval,
- use of a defective telescopic PTO shaft.

Residual risk can be reduced to a minimum by following these recommendations:

- prudent and leisurely machine operation,
- sensible application of the remarks and recommendations contained in the User Manual,
- performing maintenance and repair work in accordance with the principles of operating safety,
- carrying out maintenance and repair work by trained persons,
- use of close-fitting protective clothing,
- Securing the machine against access by unauthorized persons, especially children.
- keeping a safe distance from prohibited and dangerous places,
- Prohibition on being on the machine during operation or transport.

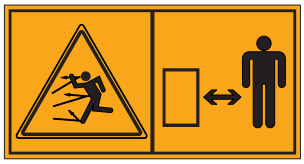
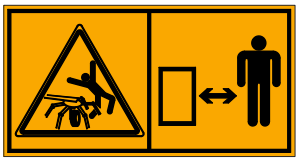
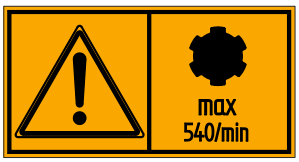
F.1.7.578.08.1.EN

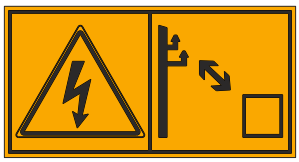
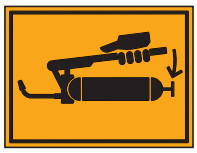
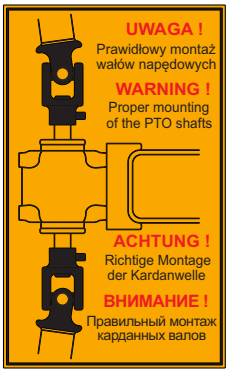
2.10 INFORMATION AND WARNING STICKERS

The machine is marked with the information and warning stickers listed in Table 2.1. The operator of the machine must, throughout the entire period of use, ensure that the inscriptions, warning and information symbols placed on the machine are legible. If they are damaged, they should be replaced with new ones. New assemblies replaced during repair must be marked again with the appropriate safety signs. When cleaning the machine, do not use solvents that can damage the coating of the labels and do not direct a strong jet of water at them.

Table 2.1. Information and warning stickers

ITEM	Sticker	Meaning
1		Caution. Read the contents of the operating instructions before use. **178N-00000001**
2		Danger of unexpected start-up, rolling of the machine. Before carrying out any maintenance or repair work, switch off the tractor engine and remove the ignition key. **178N-00000002**
3		Do not reach into the crush area while the components can move. There is a danger of crushing fingers or hands. **178N-00000005**

ITEM	Sticker	Meaning
4		Thrown or flying objects, whole body hazard. Keep a safe distance **178N-00000006**
5		Risk of being struck by rotating machine components. Maintain a safe distance from the raking unit. **178N-00000007**
6		Marking of transport handles. **178N-00000009**
7		Caution. Danger from rotating articulated-telescopic shaft. **185N-00000003**
8		Caution. The permissible PTO speed is 540 rpm. **185N-00000004**
9		Risk of impact from moving machine assemblies into transport or working position. **185N-00000007**
10		Do not stand directly behind the tractor when controlling the linkage.. **185N-00000008**

ITEM	Sticker	Meaning
11		Maintain a safe distance from power lines. **185N-00000009**
12		Lubricate the machine according to the schedule in the USER MANUAL. **185N-00000011**
13		Correct alignment of articulated-telescopic shafts. **231N-00000002**
15		Machine model ZKP1400. **599N-10000001**
16		DIN 11033 warning sign. **324-950-000216**
17		Warranty Card. **178N-00000013**

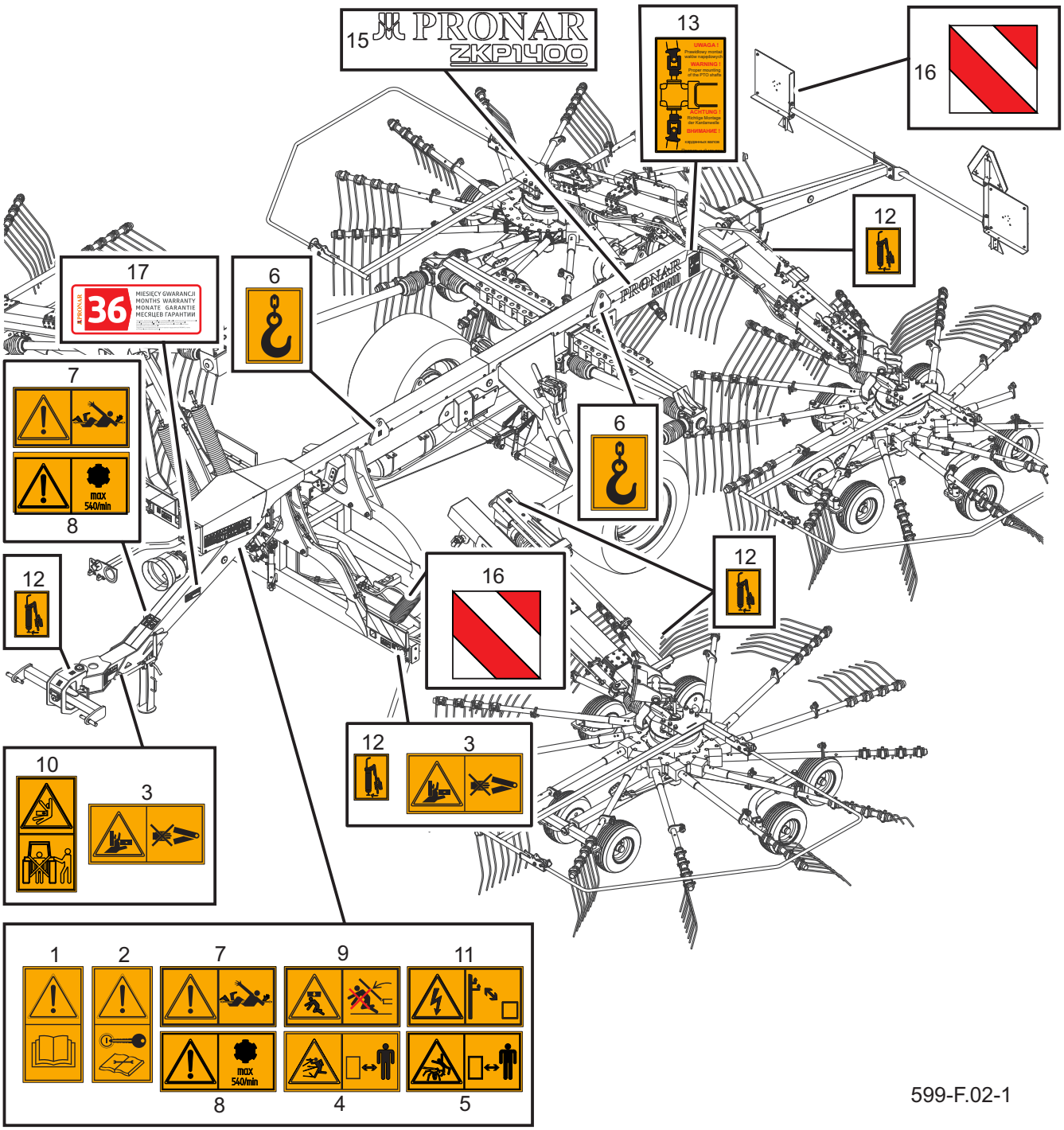


Figure 2.2 Arrangement of information and warning stickers.

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CHAPTER3

CONSTRUCTION AND PRINCIPLE OF OPERATION

3.1 TECHNICAL SPECIFICATIONS

Table 3.1. Basic technical data*

Content	Unit	ZKP1400
Dimension		
Overall length	mm	9,250
Width in transport position	mm	2,990
Width in working position		
- minimum	mm	11,960
- maximum	mm	13,600
Height in transport position (rake removed)	mm	3,990
Height in working position	mm	1,880
Performance parameters		
Curb weight	kg	6,030
Working width		
- minimum	mm	11,300
- maximum	mm	13,500
Number of rollers to be raked	pcs	1
Number of carousels	pcs	4
Number of raking tines on the working arm	pcs	4
Number of operating arms per carrousel	pcs	13
Type of rotary gears	-	dry (lubricated with grease)
Axle load	kg	5,415
PTO speed	rpm	540
Pressure on the coupling	kg	615
Other information		
Suspension system	-	cat. II according to ISO 730-1
Frame running gear	-	two wheels on the braked axle
Running gear of the raking unit	-	six wheels in tandem arrangement
Tyre size	-	500/45-22.5 142A8 FL09
- driving axle		
- tyre pressure	kPa	320
- raking unit	-	16x6.5-8(6PR)
Rake width adjustment	-	hydraulic
Power demand	hpm/kW	59 / 80

**- depending on the legal restrictions in the country of sale and on the completion of the machine, the data may differ from those given.*

3.2 GENERAL CONSTRUCTION

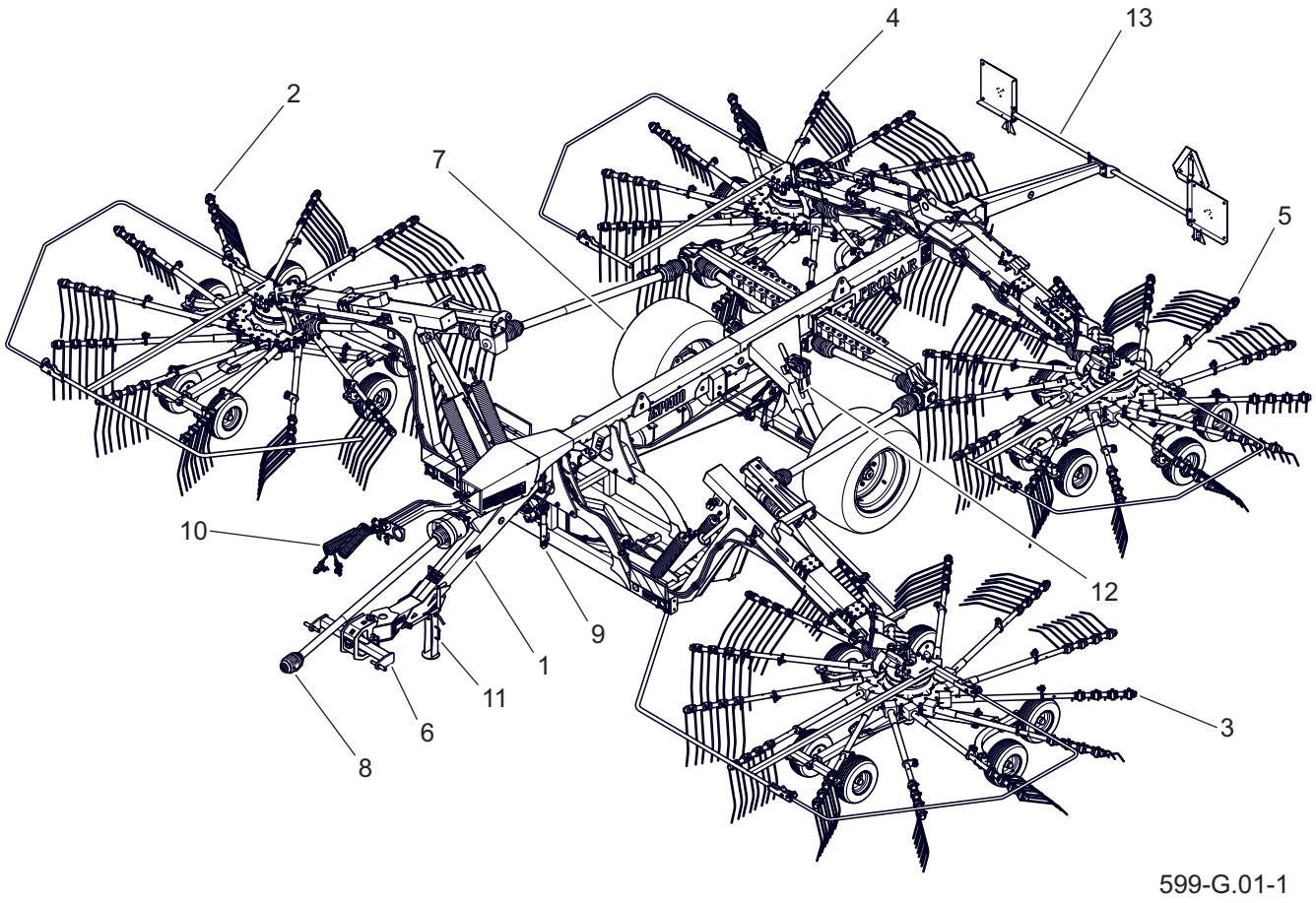

Figure 3.1 Construction of the rake

(1) main frame *(2) front right arm* *(3) front left arm*
(4) rear right arm *(5) rear left arm* *(6) coupling system*
(7) running gear *(8) drive train* *(9) parking brake*
(10) brake system *(11) support* *(12) support wedges*
(13) rear boom

The construction of the rake is shown in Figure (3.1). The main sub-assembly of the machine is the main frame (1). At its front end is a load-bearing suspension (6) for connection to the tractor's three-point linkage (three-point linkage). A rear beam (13) is located at the rear. A folding support (11) is positioned on the drawbar. Two extension arms were mounted on each side of the main frame, on which the right and left rake units were mounted. Extension and lifting of the arms is done hydraulically and control by remote control is from the operator's cab.

The gears of the rake units are driven by a drive system (8) consisting of gears and articulated-telescopic shafts. At the rear of the rake there is a running gear (7)

consisting of an axle with running wheels. Above, support wedges (12) were placed on the frame.

The machine is equipped with an air brake system and a parking brake (9).

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3.3 RUNNING AND TRACTION SYSTEM

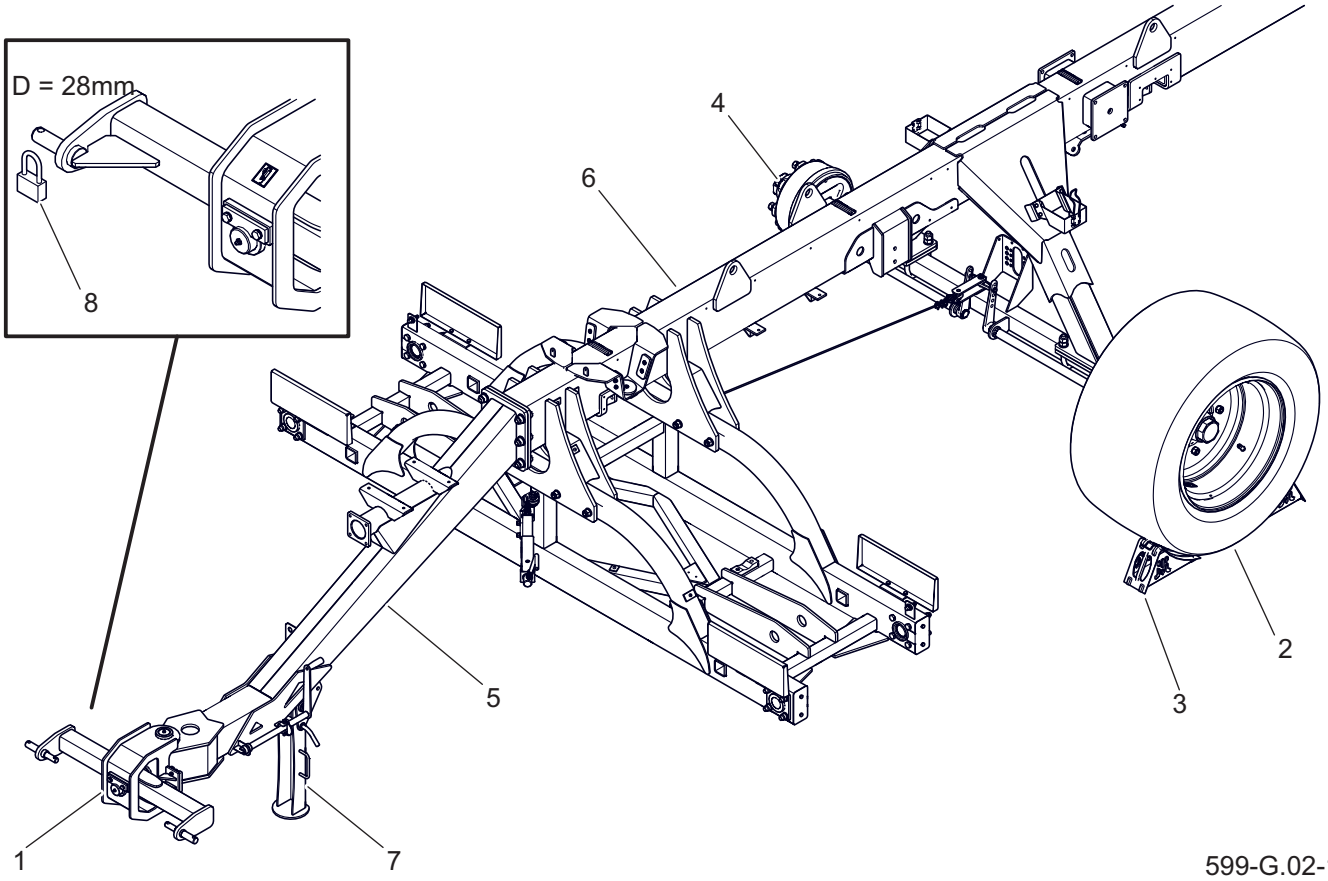

Figure 3.2 Machine construction

(1) catch *(2) running wheel* *(3) support wedge*
(4) driving axle *(5) drawbar* *(6) frame*
(7) parking support *(8) safety padlock*

In the centre of the frame (6), a running axle (4) was mounted on hubs with two running wheels. A drawbar (5) was mounted to the front of the frame, on which a pendulum hitch (1) was fitted, adapted for aggregation with the rear three-point linkage of a category II carrier according to ISO 730-1.

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3.4 POWERTRAIN

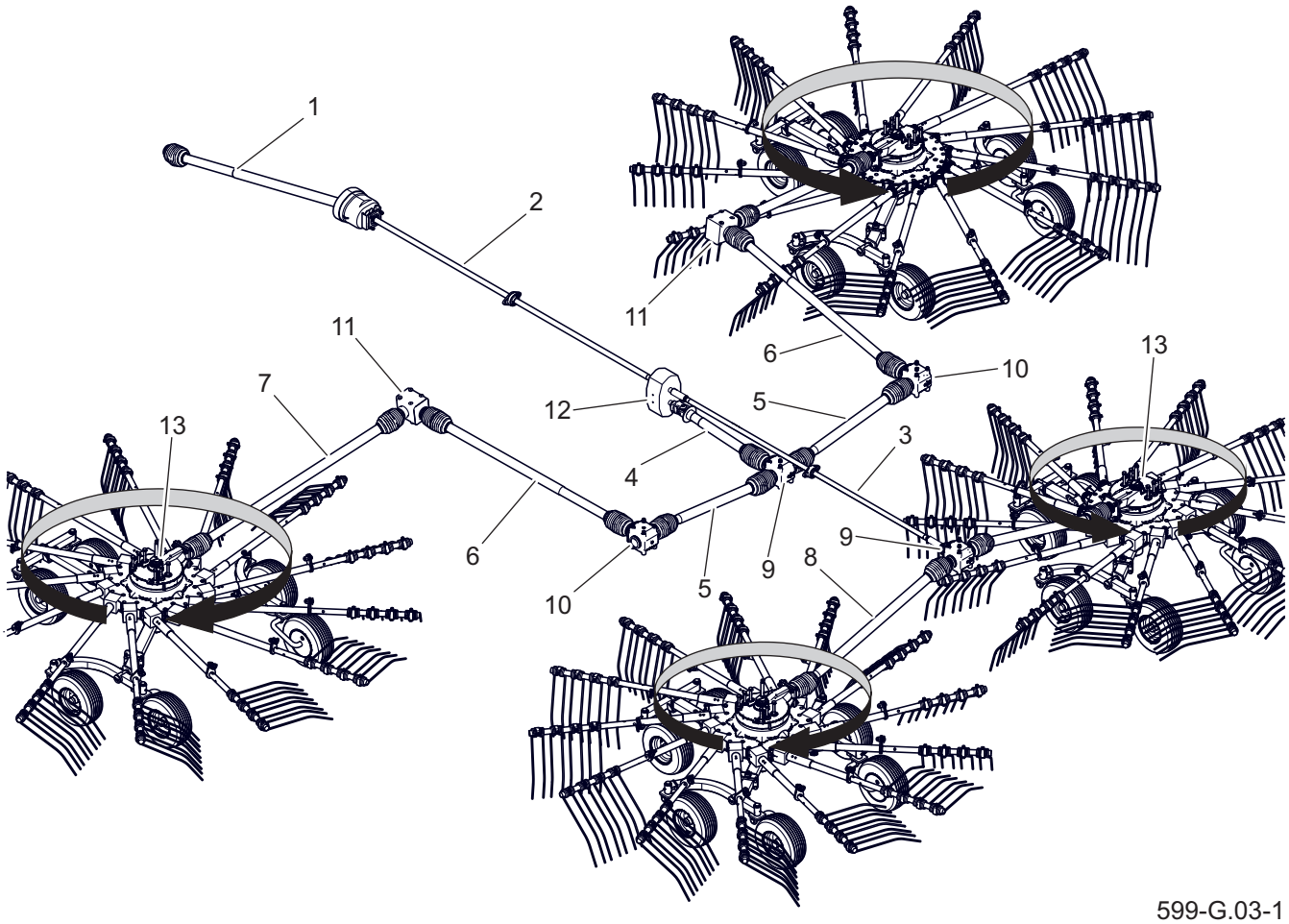

Figure 3.3 Transmission

(1) wide angle drive shaft
(2) front drive shaft
(3) rear drive shaft
(4) front gearbox shaft
(5) front PTO shaft I
(6) front PTO shaft II
(7) carousel shaft front
(8) carousel shaft rear
(9) distributor gear
(10) bevel gearbox I
(11) bevel gearbox II
(12) distributor gearbox
(13) rotary gearbox

Drive is transmitted from the tractor's power take-off (PTO) via a wide-angle articulated telescopic shaft (1) to a drive shaft (2), which drives a distributor gear (12) that transmits drive to the front and rear pair of raking units.

The drive to the front carrousels passes from the gearbox (12) via the shaft (4) to the distributor gearbox (9), from where the torque is transferred to the front pair of carrousel gearboxes (13) via the rollers (5), (6) and (7) via the bevel gearboxes

CAUTION

It is forbidden to exceed a PTO speed of 540 rpm on the tractor shaft.

(10) and (11).

Drive to the rear rake units is provided by means of a drive shaft (3) connecting the distributor gear (12) with the rear gear (9) from where it goes via shafts (8) to the rear pair of gears (13). The direction of rotation of the raking mechanisms is indicated in Figure *(3.3)*.

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3.5 RAKING UNIT

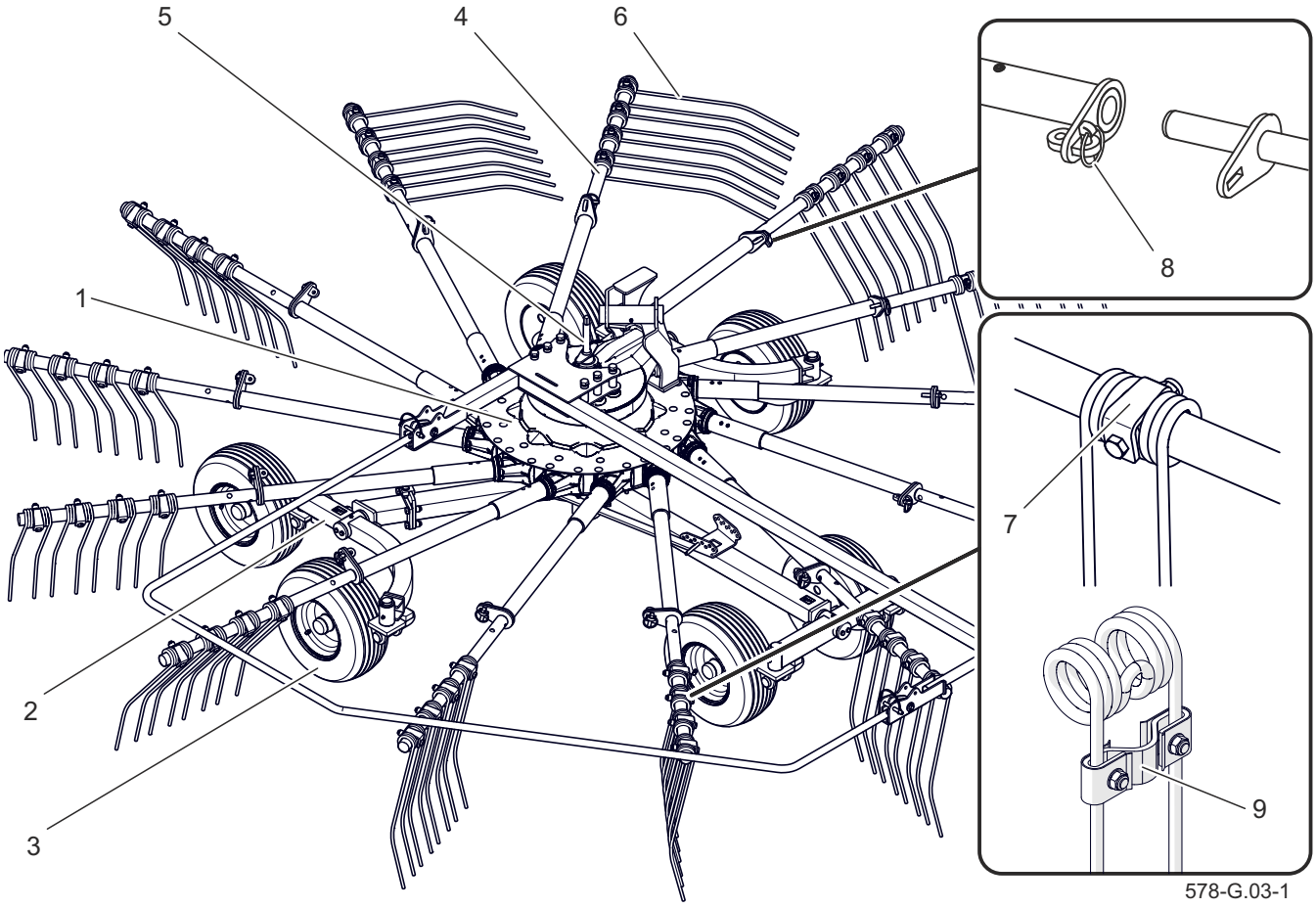

Figure 3.4 Construction of the raking unit

(1) gearbox *(2) rocker* *(3) wheel*
(4) raking arm *(5) adjustment screw* *(6) spring tine*
(7) fixing bracket *(8) pin* *(9) tine protection*

The machine is equipped with two pairs of raking units (front and rear), with each pair raking the swath inwards. The gearbox (1) has 13 output shafts to which the rake arms (4) are attached. Each arm is equipped with 4 spring tines (6) for raking the swath. The tines are mounted to the arm boom by means of fixing angles (7) that prevent them from moving and rotating. Depending on the direction of rotation of the rake unit, there are right-hand and left-hand raking arms. They are attached to the gearbox (1) and secured with pins (8). At the bottom of the raking unit, there is a running gear that ensures good raking on uneven ground. The suspension arms (2) are attached to the chassis frame, together with the running wheels (3). The height of the rake arms from the ground is adjusted by means of a screw (5) and secured by means of a locking device.

The cam mechanism used in the gearbox

(1) allows the individual arms to rotate so that the raking tines lower or raise depending on their current position. When raking, the spring tines are lowered almost vertically. The swath is raked inwards so that an even roll is formed. In other cases, the raking tines are raised to the upper position.

To prevent loss of the broken-off part of the tine, a safety device (9) can be fitted to each spring tine - accessory. Broken tines found in the swath can damage other agricultural machinery involved in field work.

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3.6 SERVICE BRAKE

The hydraulic service brake is operated from the operator's cab by pressing the tractor's brake pedal. The function of the control valve (1) - Figure (3.6), is to apply the brakes of the machine at the same time as the tractor brake is applied. In addition, in the event of an unforeseen disconnection of the cable, located between the rake and the tractor, the control valve automatically applies the machine brake. The valve used has a button (2) that releases the brake, used when the machine

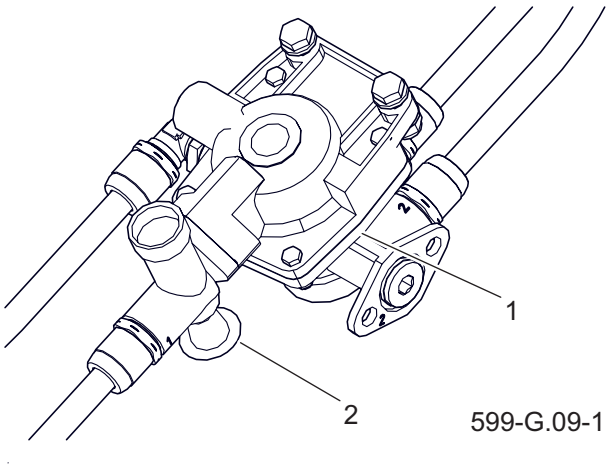


Figure 3.6 Control valve
(1) control valve (2) release button

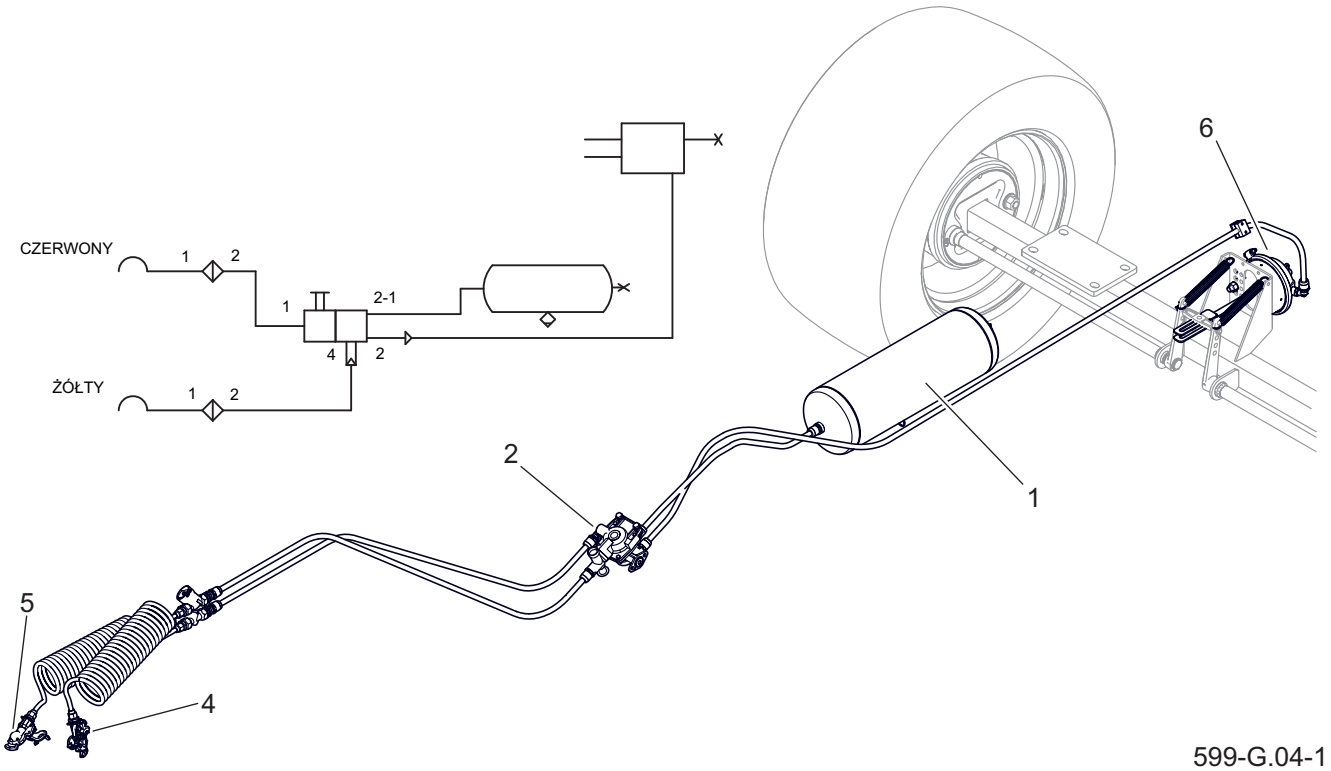
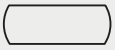


Figure 3.5 Structure and diagram of the dual circuit pneumatic brake system
(1) air reservoir *(2) brake valve* *(4) red line*
(5) yellow line *(6) brake cylinder*

Table 3.2. List of symbols used in the diagrams

Symbol	Description
	Pneumatic connection, plug
	Pneumatic connection, socket
	Drainage valve
	Main control valve
	Relay valve
	Automatic brake force regulator
	Manual brake force regulator
	Connection of cables
	Air reservoir
	Brake actuator
	Control valve (connector)
	Air filter

is disconnected from the tractor. When the air line is connected to the tractor, the release device automatically moves to a position that allows the brakes to operate normally.

CAUTION

It is not permitted to use the machine with a defective or faulty brake system.

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3.7 PARKING BRAKE

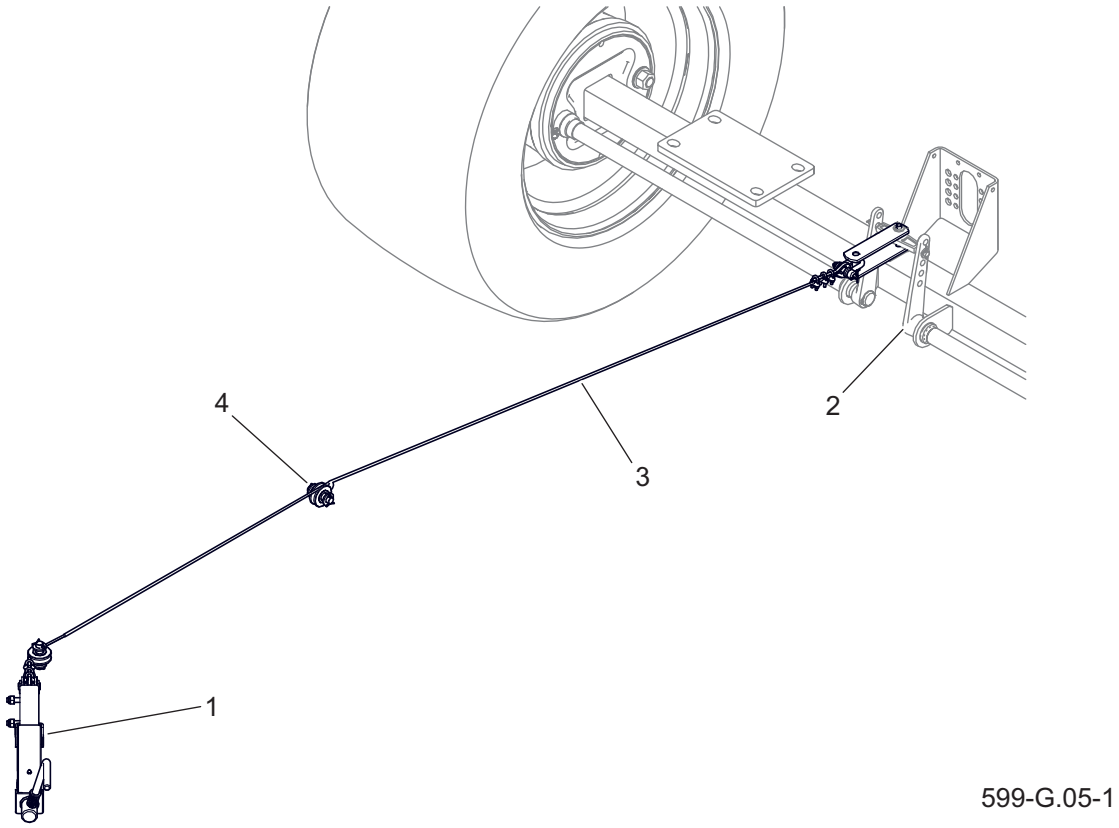

Figure 3.8 Parking brake
(1) brake mechanism *(2) spreader lever* *(3) cable*
(4) guide wheel

Parking brake - Figure *(3.8)* - is used to immobilise the machine when stationary. The brake crank mechanism (1), located at the front, right side of the frame, is connected by a steel cable (3) to the spreader levers (2) of the driving axle. By turning the mechanism crank (1) clockwise, the steel cable tightens, causing the brake spreader levers to pivot, which, by spreading the brake shoes, immobilise the rake. The parking brake must be released before driving - the steel cable must hang loosely.

CAUTION

Ensure that the parking brake is unlocked before driving.

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3.8 THE HYDRAULIC SYSTEM

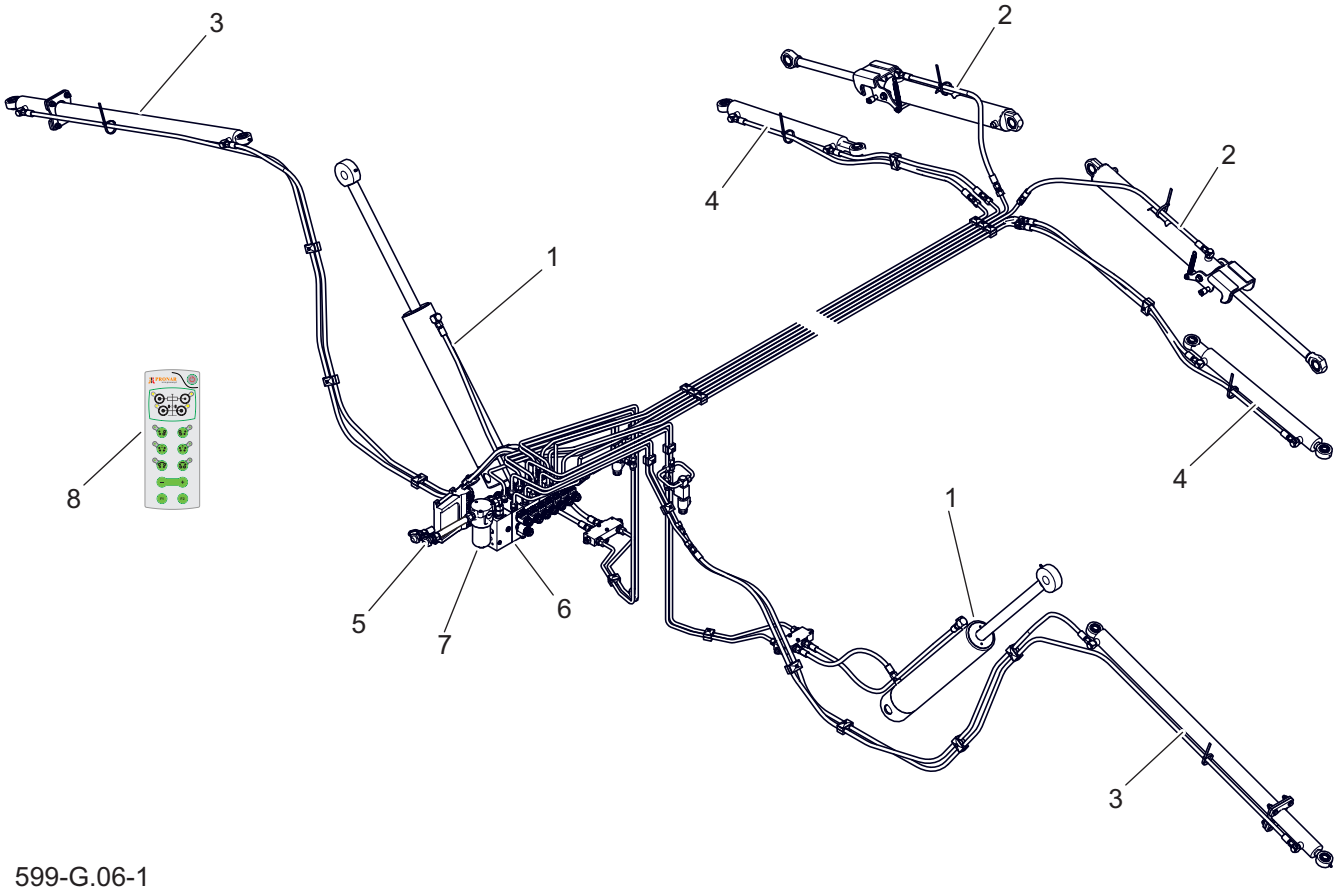

Figure 3.9 Construction of the hydraulic system
(1) lifting/lowering cylinder for front arms *(2) lifting/lowering cylinder for rear arms*
(3) lifting cylinder for front arms *(4) lifting cylinder for rear arms*
(5) connecting hoses *(6) electro-hydraulic distributor* *(7) oil filter*
(8) control panel

The hydraulic system is used to control the rake arms and to set the raking width. The system is fed from the tractor's external hydraulic system via hydraulic quick couplings (5). The various machine control functions are carried out from the operator's cab using a remote control (8).

ADVICE

The hydraulic system was filled with Agrol U Lotos hydraulic oil.

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3.9 ELECTRICAL INSTALLATION OF THE MANIFOLD

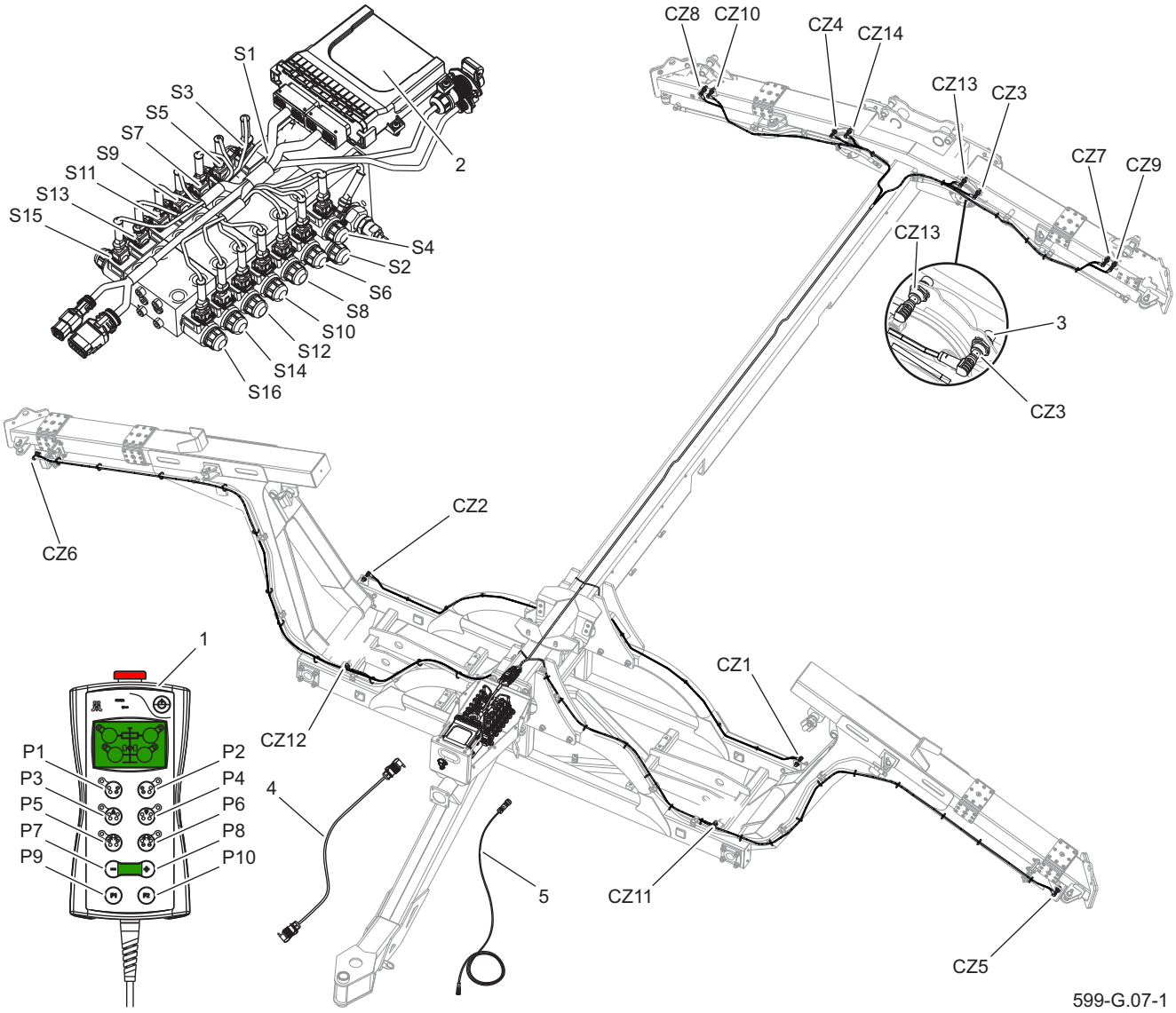

Figure 3.10 Electrical control installation

(1) control unit *(2) control module* *(3) inductive sensor*
(4) 3-pin cable *(5) remote control cable* *(CZ...) sensor designation*
(S...) coil designation *(P..) button designation*

The distributor's electrical system is supplied with 12 V DC via a 3-pin cable connected to the tractor. The control of the individual machine functions is carried out by means of a remote control (1), which sends signals to the hydraulic distributor coils. Correct operation of the rake is ensured by sensors located on the raking arms of the machine.

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3.10 LIGHTING INSTALLATION

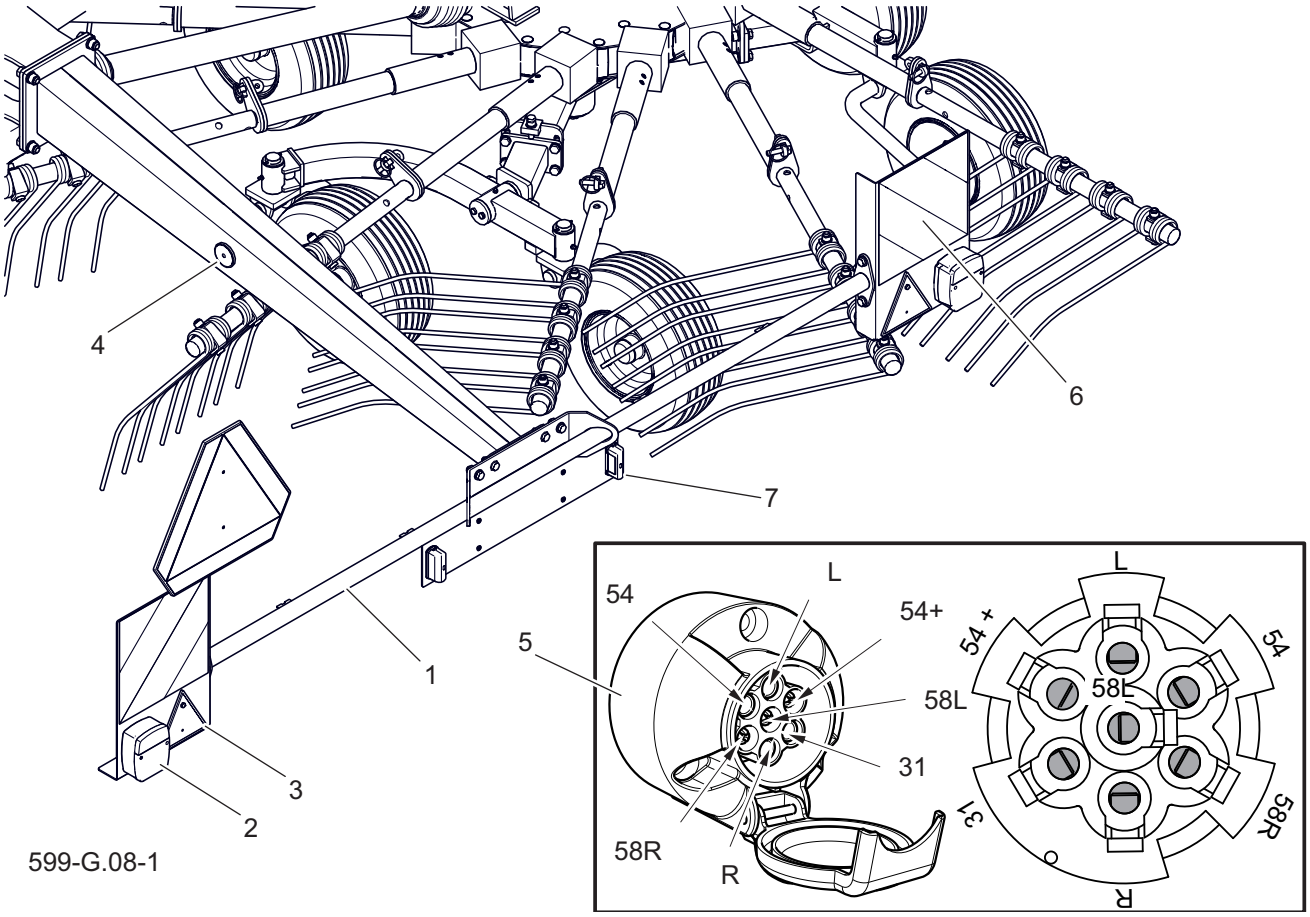

Figure 3.11 Lighting installation

(1) light bar *(2) rear lamp* *(3) reflector triangle*
(4) yellow reflector *(5) connection socket* *(6) warning sign*
(7) number plate lamp

Table 3.3. Connector socket connection markings

Designation	Function
31	Weight
54+	Power supply +12V
L	Left indicator
R	Right indicator
54	STOP light
58L	Rear position lamp left
58R	Rear position lamp, right
R	Right indicator

The rake's electrical system is designed to be powered from a 12V DC source. Connect the electrical system of the machine to the tractor using a suitable connection cable.

The layout of the electrical installation components is shown in drawing *Lighting installation*.

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CHAPTER 4

REMOTE CONTROL

4.1 GENERAL INFORMATION

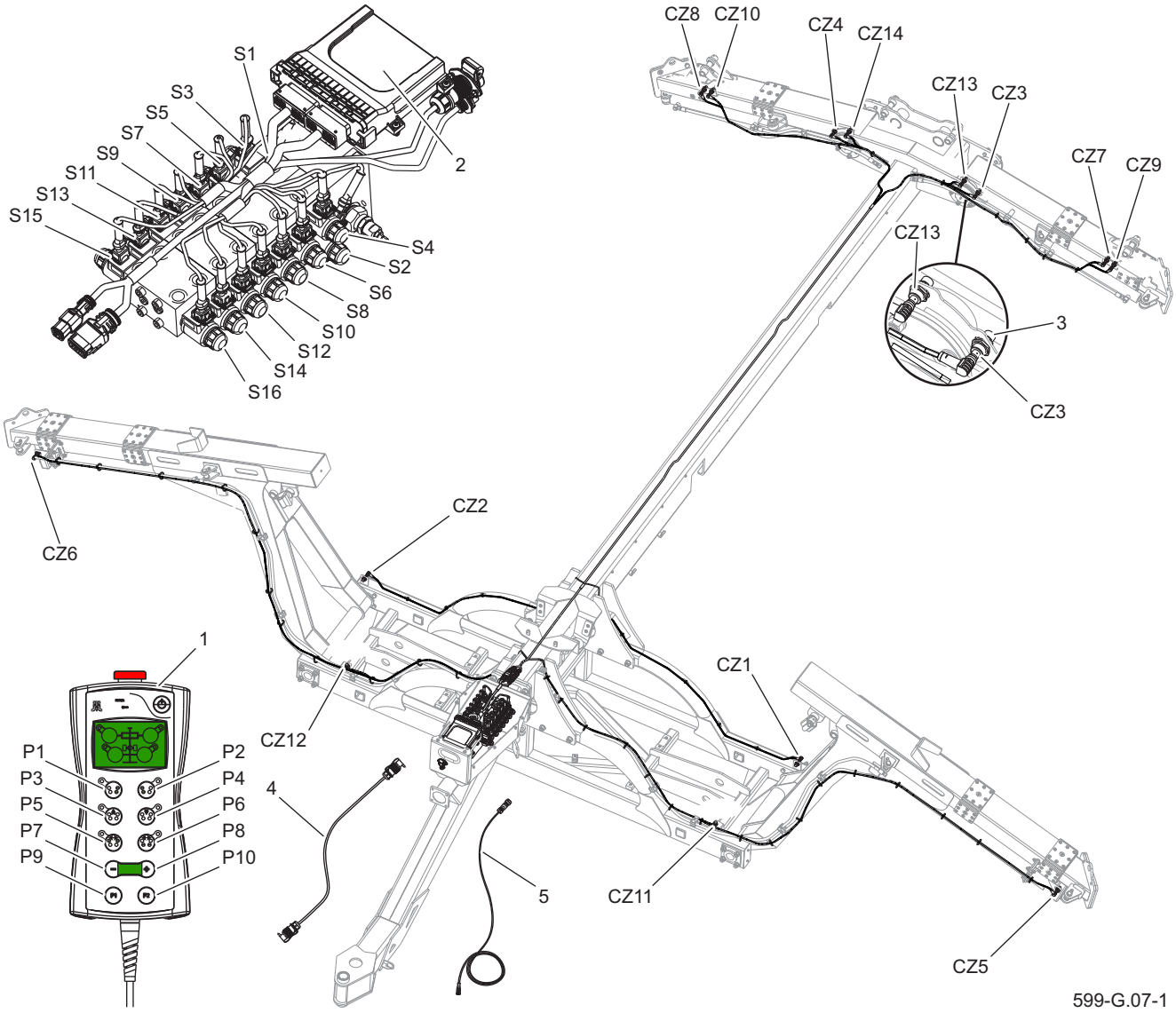

Figure 4.1 Control installation components

(1) control unit *(2) control module* *(3) inductive sensor*
(4) 3-pin cable *(5) remote control cable* *(CZ...) sensor designation*
(S...) coil designation *(P..) button designation*

The distributor's electrical system is supplied with 12 V DC via a 3-pin cable connected to the tractor. The control of the individual machine functions is carried out by means of a remote control (1), which sends signals to the hydraulic distributor coils. The distributor actuates the relevant hydraulic sections of the rake. Correct operation of the rake is ensured by sensors located on the raking arms of the machine.

4.2 FUNCTION CONTROL PANEL

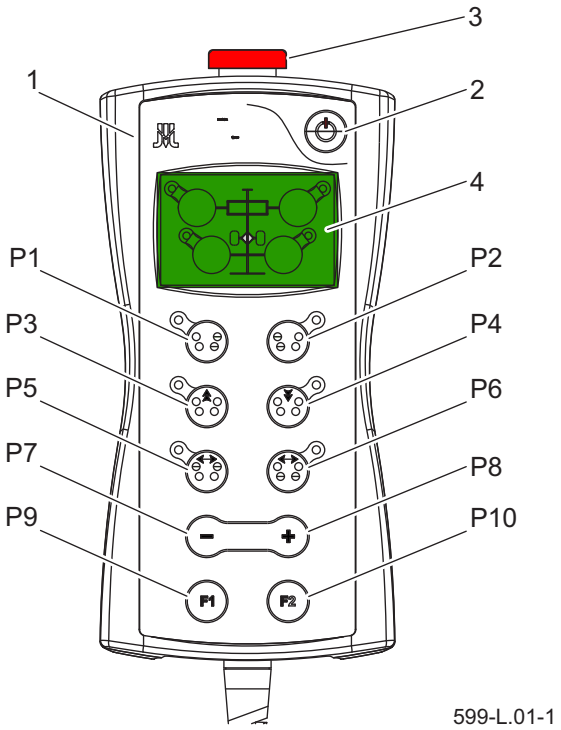

Figure 4.2 Construction of the remote control

(1) remote control *(2) ON / OFF button*

(3) safety button *(4) signalling*

When the button is pressed, the LED next to the button lights up. The individual functions of the rake are represented by the LEDs in diagram (4).

EMERGENCY STOP OF MACHINE

FUNCTIONS

The emergency stop function of the rake is used when there is a risk to the life or health of persons in the vicinity of the working machine or when there is a risk of serious damage to the machine.

To stop the machine functions in emergency mode, press the safety button (3) on the remote control.

To deactivate the emergency mode, restart the remote control with the "ON / OFF" button.

Before restarting the machine, ensure that the resumption of the crusher does not endanger bystanders and that any problems have been rectified.

CAUTION

The safety button will not stop the machine drive. In the event of a serious breakdown, stop the rake drive, switch off the tractor engine and remove the ignition key.

Table 4.1. Remote control buttons

Button	Pictogram	Function
P1		Raising / lowering left arms to over swath / working position
P2		Raising / lowering right arms to over swath / working position

Button	Pictogram	Function
P3		Lifting all arms into position over swaths
Hold P3		Automatic folding into transport position
P4		Lowering all arms to working position
Hold P4		From the transport position automatically to the over swath position
P5		Rear arm width adjustment
P6		Width adjustment of the front arms
P7		Arms folding
P8		Arms extending
P9		Button inactive
P10		Button inactive

4.3 DESCRIPTION OF CONTROL PANEL FUNCTIONS

FOLDING FROM THE TRANSPORT POSITION TO THE WORKING POSITION

1. Actuate the hydraulics section of the tractor and press and hold the P4 button. The rake will automatically unfold from the transport position to the driving position over the swaths by performing the following sequence:
- The rear arms are deployed first into the over-swath position (the arms are retracted by single-acting main cylinders (creating clearance between the pawl and the arm), then the arm extension cylinder raises the pawl and releases the single-acting main cylinder).
- The front arms are then unfolded into position over the swaths.
2. Press button P4 to lower all arms from the over swath position to the working position.

CAUTION

The automatic unfolding/folding process takes place while holding down the P4 / P3 button. Releasing the button at any time interrupts the operation immediately.
It is advisable to check all the functions of the rake before operating the machine.

RAISE ALL ARMS TO PASS OVER SWATHS

1. Pressing the P3 button

(the front arms lift first and then the back arms).

LOWERING ALL ARMS TO WORKING POSITION

- Pressing the P4 button

(the front arms lower first and then the rear arms)

RAISE RIGHT ARMS TO PASS OVER SWATHS

- Pressing the P2 button

(first the right front arm is lifted and then the right rear arm)

LOWERING THE RIGHT ARMS TO THE WORKING POSITION

- Pressing the P2 / P4 button

(first the front right arm is lowered then the rear right arm)

RAISE LEFT ARMS TO PASS OVER SWATHS

- Pressing the P1 button

(first the front left frame is lifted then the rear left frame is lifted)

LOWERING THE LEFT ARM TO THE WORKING POSITION

- Pressing the P1 / P4 button

(first the front left arm is lowered then the rear left arm)

RAKE WIDTH ADJUSTMENT FOR FRONT ROTORS

- Pressing the P6 button

(the front arms are raised to a position above the swath and the adjustment function is activated)

- Pressing the P7 button

(folding of the front raking arms)

- Pressing the P8 button

(extending front raking arms).

RAKE WIDTH ADJUSTMENT FOR REAR ROTORS

- Pressing the P5 button

(the rear arms are raised to a position above the swath and the adjustment function is activated)

- Pressing the P7 button

(rear rake arm folding)

- Pressing the P8 button

(extending rear rake arms).

FOLD THE RAKE INTO THE TRANSPORT POSITION

1. Press and hold the P3 button. The rake will automatically fold from the position over the swath to the transport position by performing the following sequence:

- Raise all arms to a position above the swath; the arms are then slid back (if they were extended).
- By continuing to hold the P3 button, the arms will fold into the transport position.

CAUTION

Fold the guards and remove the rake tines before folding the rake for transport.
Check the correct locking of the rear arms before starting to drive.

DANGER

The folding and unfolding process should be controlled by the tractor operator. Make sure that there is enough space in the working area to unfold / fold the machine.
It is forbidden to lay out / fold the machine under and in direct proximity to overhead power lines.

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4.4 INDUCTIVE SENSORS

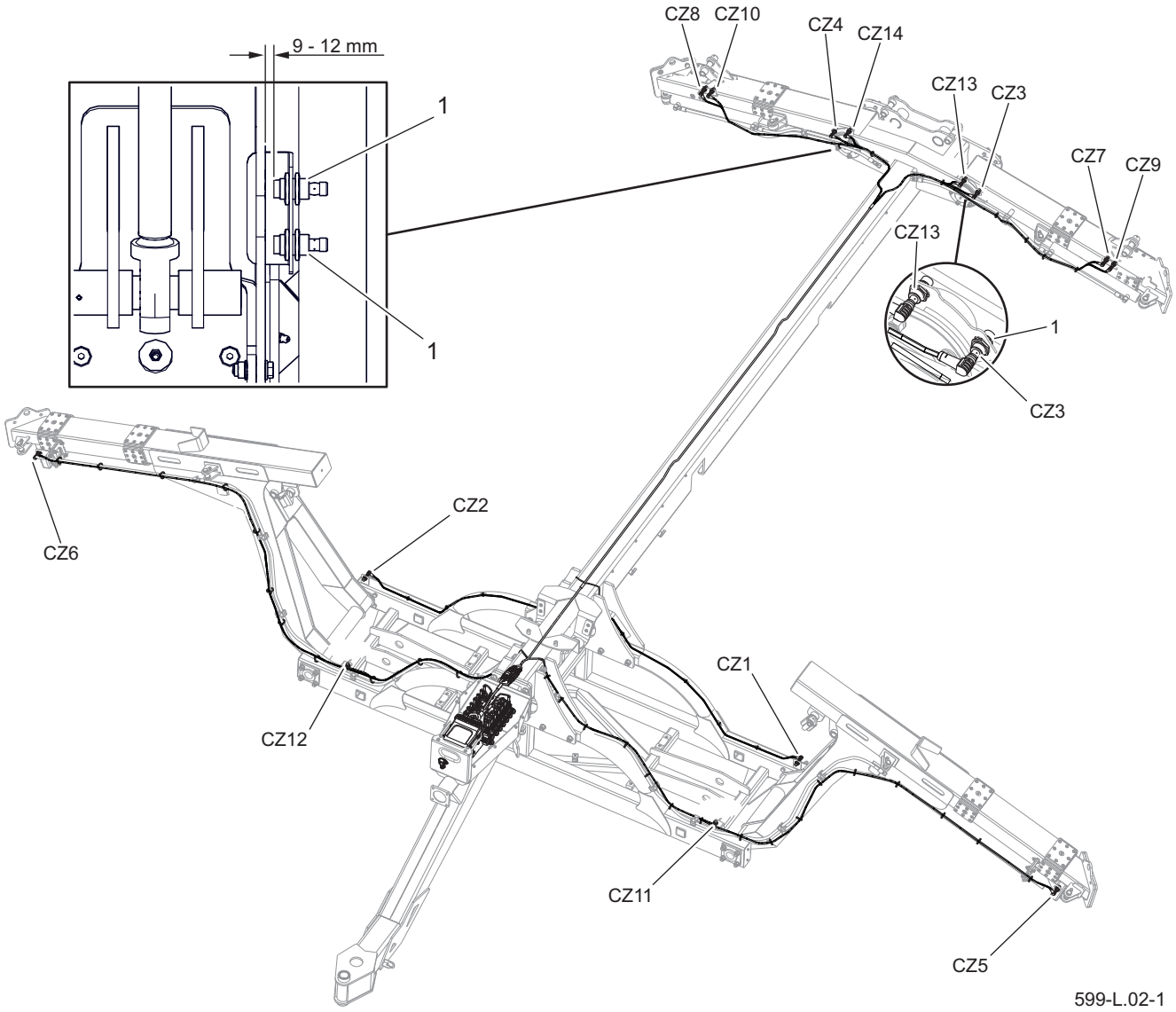

Figure 4.3 Control installation components
(1) inductive sensor (CZ...) sensor designation

CAUTION

Set the distance of the sensors from the proximity elements to a distance of 9 - 12mm.

ADVICE

Sensor activity, i.e. the reading of a proximity item, is signalled by a yellow LED next to the M12 connector.

Fourteen inductive sensors are mounted on the rake structure, located on the arms that monitor the swing and extension of the raking mechanisms.

J.1.7.599.02.2.EN

RULES OF USE

CHAPTER5

5.1 ADJUSTING THE PTO SHAFT (WPT)

DANGER

Before adjusting the shaft, switch off the tractor engine, remove the ignition key and brake the tractor with the parking brake. Secure the tractor against unauthorised access.

CAUTION

When fitting the PTO shaft, first follow and use the instructions in the PTO shaft operating manual.

CAUTION

Each time you change tractors, check the length of the PTO shaft according to the shaft manufacturer's recommendations and correct it if necessary. Failure to do so may result in damage to the shaft, machine or tractor PTO.

CAUTION

If the PTO shaft is fitted with an overload clutch, ensure when fitting the shaft that the overload clutch is fitted on the machine side.

Adjust the length of the articulated-telescopic shaft before the first start-up.

For this purpose:

- Hitch the machine to the tractor's suspension system.
- Position the machine so that it is in a position where the distance between the power take-off (PTO) terminals of the tractor and the machine is the smallest.

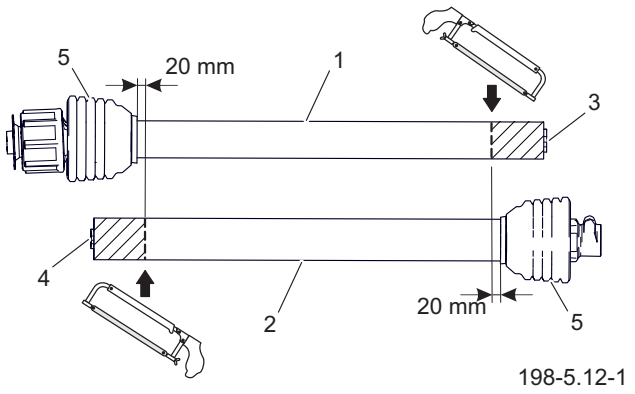

Figure 5.1 Principle of matching the pivot-telescopic shaft at the shortest operating position.

(1) Shield inner tube *(2) Shield outer tube*

(3) Shaft outer profile tube

(4) Shaft inner profile tube

(5) Tapered covers for the universal joints

- Pull the PTO shaft cover apart into two parts (1) and (2).
- Fit one part of the shaft to the tractor's PTO shaft extension.
- Fit the other part of the shaft to the PTO end of the machine.

The installation of the shaft is specified in detail in the shaft manufacturer's operating instructions.

- Lay both parts of the shaft guard (1) and (2) side by side in parallel.
- Mark the point where the casing pipes are to be shortened, maintaining a minimum distance. 20 mm from the tapered covers (5) of the shaft universal joints.

- Shorten the casing tubes (1) and (2) at the mark.
- Shorten the profile tubes (3) and (4) by the same length as the casing tubes (1) and (2).
- Gently dull the sharp edges of the profile tubes (3) and (4) with a file and remove any metal filings.
- Coat the outer surface of the inner profile tube (4) with grease.
- Slide off the profile tubes (3) (4) and guard tubes (1) (2) of the shaft.
- Check that there is sufficient overlap between the profile tubes (3) and (4) at the greatest distance between the PTO shaft ends of the tractor and the machine.

Please refer to the shaft manufacturer's operating instructions for details on fitting and checking the shaft.

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5.2 CONNECTING THE MACHINE TO THE TOOL CARRIER

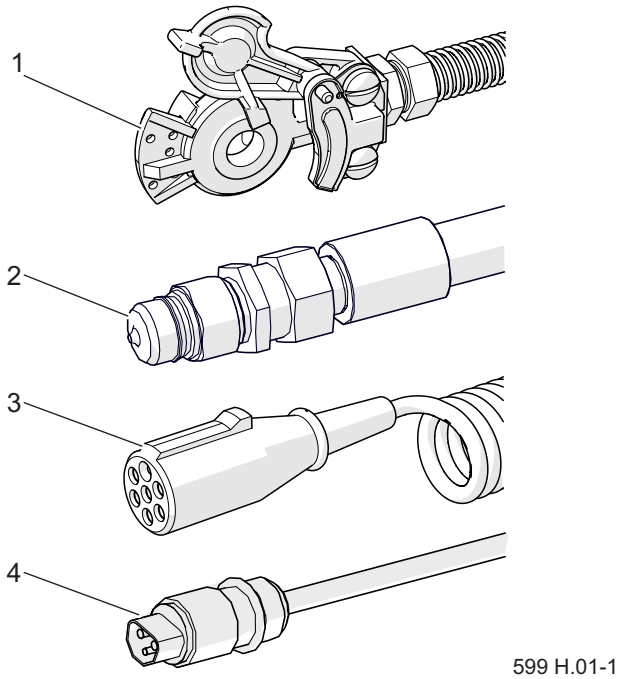

Figure 5.2 Machine connections

(1) air brake plug *(2) hydraulic plug,*
(3) electric cable *(4) 3-pin connector*

DANGER

No bystanders are allowed between the machine and the tractor during coupling. The operator of an agricultural tractor should take special care when coupling the machine and ensure that no bystanders are in the danger zone during coupling.
Use only original pins and locks to connect the machine to the carrier (tractor).
It is forbidden to use a faulty machine.

CAUTION

Before connecting the rake, check the technical condition of the hitching system of the machine and the tractor, as well as the connection elements of the pneumatic, hydraulic and electrical systems.
Ensure that the oils in the tractor's hydraulic system and in the rake's hydraulic system are compatible.
Read the carrier's instructions and follow the manufacturer's recommendations before connecting the hydraulic and electrical lines.

DANGER

When connecting the hydraulic hoses to the tractor, ensure that the hydraulic system of the tractor and the rake is not under pressure.

The rake may be connected to an agricultural tractor if all the connections (electrical, hydraulic and pneumatic) and the suspension system on the agricultural tractor comply with the machine manufacturer's requirements. The wheels of the machine must be immobilised with wedges. Ensure adequate visibility when coupling.
The following recommendations should be followed to connect the rake to the tractor:

- While reversing with the tractor, bring the lower links (B) of the tractor's three-point linkage closer to the pins (1) of the rake.
- Adjust the tractor linkages (B) to the correct height.
- Switch off the tractor engine and close the cab securing it against unauthorised access Secure the tractor with the parking brake.
- Remove the safety device (9).
- Connect the lower pins (1) to the linkages (B) and secure with pins.
- Connect the lines of the air brake system.

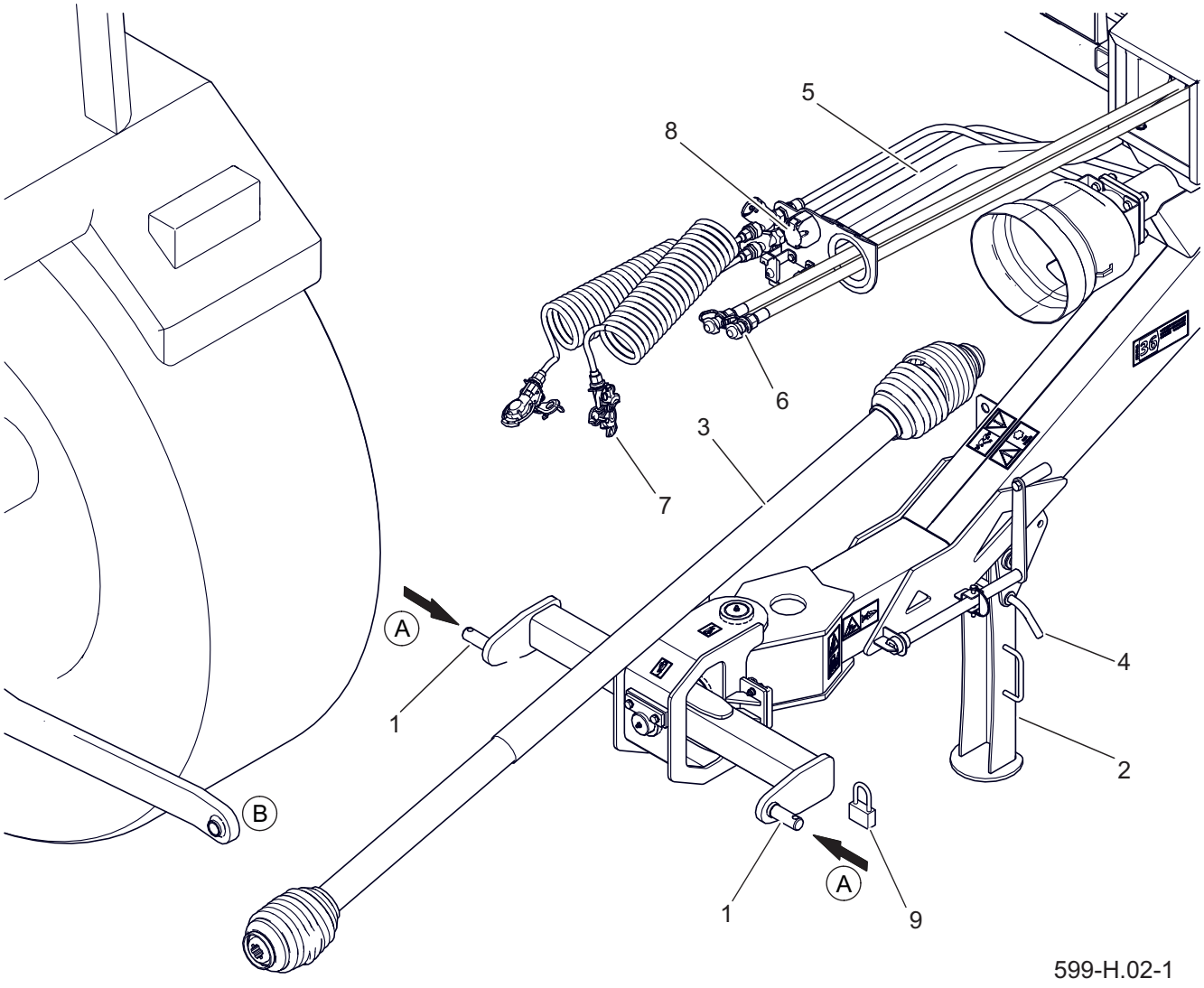

Figure 5.3 Folding support

(1) Suspension bolt *(2) Support* *(3) Drive shaft*
(4) pin with pin *(5) hose bracket* *(6) hydraulic plug*
(7) brake connector *(8) electrical socket* *(9) safety device*
(A) Category II lashing points *(B) lower links of the tractor's three-point linkage*

Connect the air line marked yellow to the yellow socket on the tractor. Then connect the pneumatic hose marked red to the red socket on the tractor

- Connect the hydraulic lines to the tractor..
- Lift the rake with the tractor's three-point linkage.
- Raise the support (2) and secure with

DANGER

Before connecting the PTO shaft, it is essential to read and follow the instructions provided by the shaft manufacturer.
Before connecting to the carrier, check the condition of the shaft guards, the completeness and condition of the safety chains.

a pin with pins (4).

The tractor's lower links must be set at the same height.

- Connect the lighting cable to the socket (8) of the lighting supply cable.
- Connect the power and communication cables of the remote control.
- Connect the PTO shaft (3) to the carrier PTO and secure with safety chains.

  Ensure that the shaft ends on the tractor and rake side are well-fitted and the hitch is correctly fixed.
- Immediately before starting to drive, remove the wheel chocks and release the parking brake on the machine.

  Turn the crank of the brake mechanism counterclockwise as far as it will go.

CAUTION

When coupling is complete, secure the hoses of the hydraulic, brake and electrical systems so that they do not become entangled in moving parts of the agricultural tractor while driving and are not liable to kink or cut when turning.

ADVICE

The coaxiality of the PTO shaft of the implement carrier (tractor) with that of the machine drive train significantly extends the life of the drive shaft.

CAUTION

If the machine is parked for a long time, the air pressure in the air brake system may not be sufficient to release the brake shoes. In this case, after starting the tractor and air compressor, wait until the air in the air system tank has been replenished.

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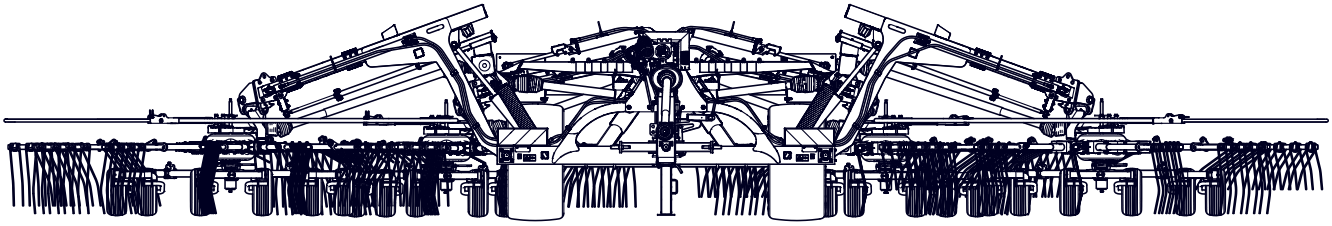
5.3 TRANSPORT

A



B

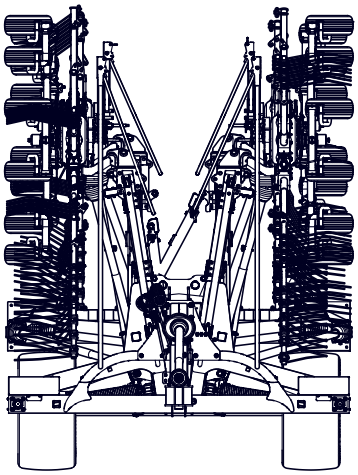


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Figure 5.4 Folding support
(A) working position *(B) transport position*

For the transport to and from the work site, the rake must be placed in the transport position. To move the machine from the working position (A) to the transport position (B), the following steps must be taken:

- Move the protective covers from the working position (1) to the transport position (2) to reduce the overall transport height.

  (I) Unlock and pull out the pin (3), then fold the cover into position

DANGER

When moving the machine to the working or transport position, make sure that no-one is in the danger area.
Transport of the machine is only possible with the telescopic roller detached.

CAUTION

The parking support must be raised when the machine is in operation and running.
Ensure that the parking brake is released before moving off.

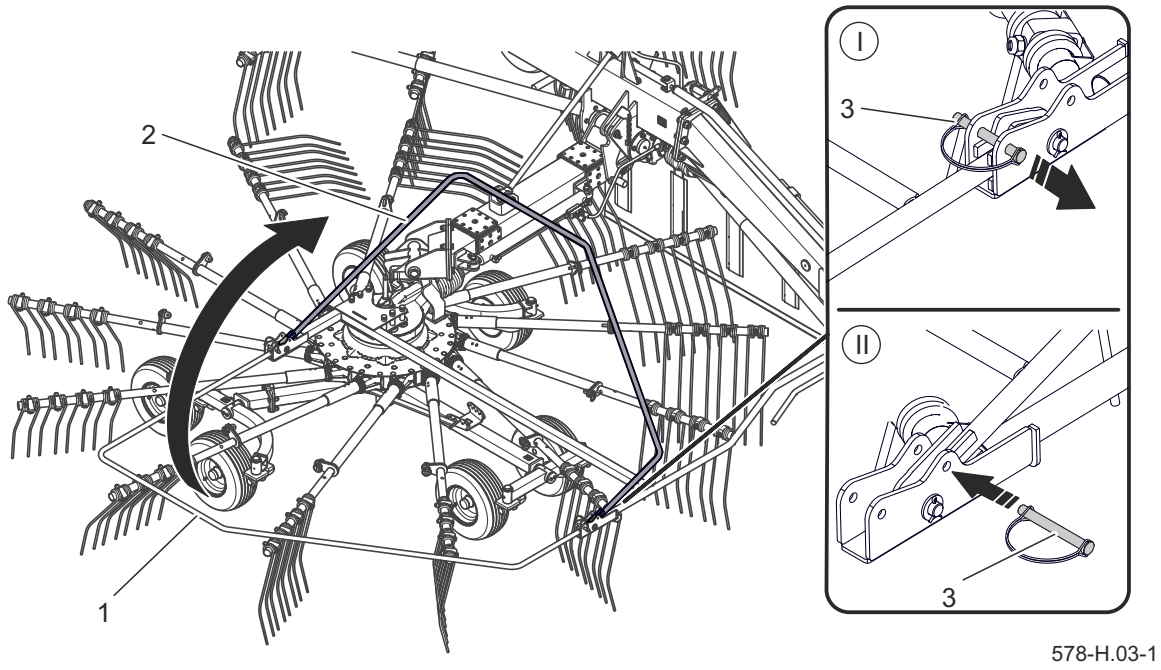

Figure 5.5 Operation of protective guards
(1) Shield in operating position (2) Shield in transport position (3) Safety pin

(2). (II) Secure the cowl in the transport position with a safety pin (3).

- Remove the twenty raking arms located on the outside of the raking units.

When removing the rake arms (1), remove the safety pin (2)

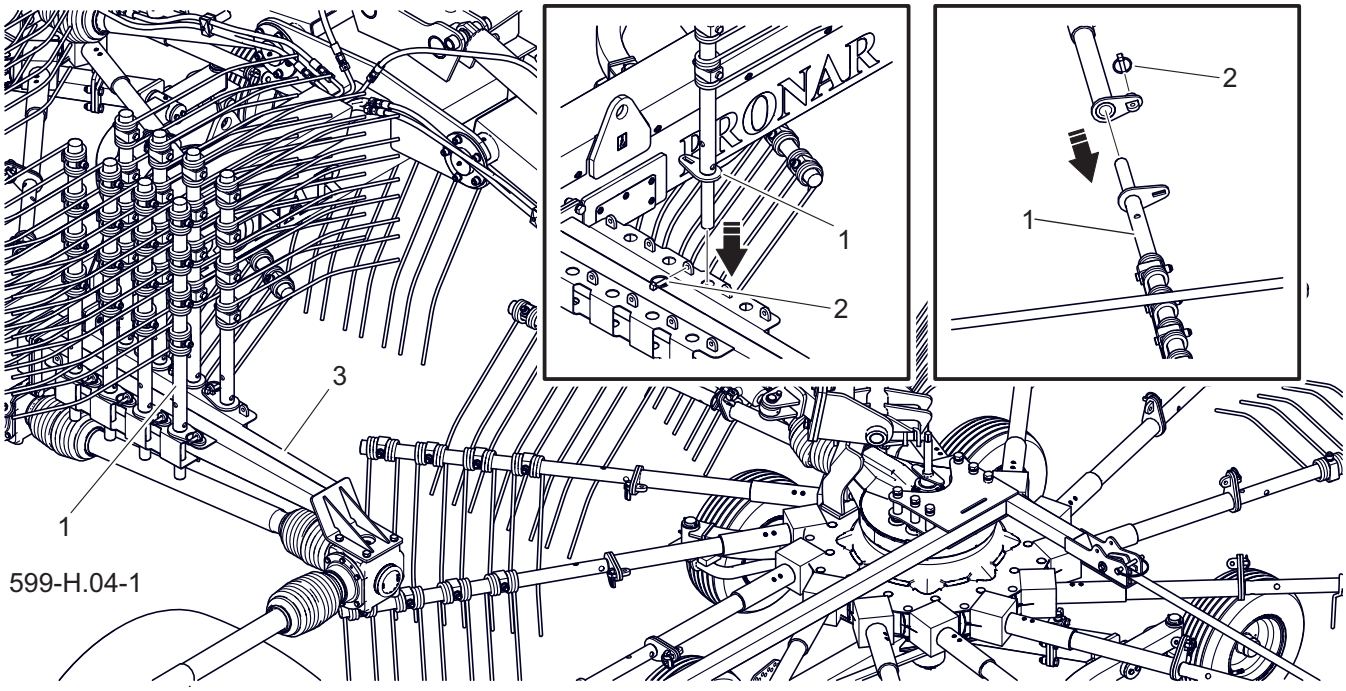

Figure 5.6 Operation of protective guards
(1) raking arm (2) pin (3) main frame

DANGER

It is forbidden to transport people or animals.
Keep a safe distance from overhead power lines when working.

and then pull the rake arm out of the arm mounting in the rake unit gearbox. Place the rake arms in the sockets located on the main frame (3) and secure with pins (2).

- Start the media. Activate the relevant section of the external hydraulics.
- Activate the remote control.
- Fold the arms of the raking units

  Hold down the P3 button.
- Raise the support arms with the rake assemblies to the transport position - position (A).
- Check the security of the rear arms with the ratchet.

ADVICE

Note the direction of rotation of the rake units and the mounting side of the rake arms. Left and right arms are mounted on the machine, mounting them in reverse orientation is not acceptable and can lead to damage to the rake.

CAUTION

The rake arms of the machine in the transport position are secured only by means of pins, which are used to secure the rake arms in the working position.

DANGER

The removal and installation of the rake arms must be carried out with the tractor engine switched off. Remove the key from the ignition and secure the tractor against unauthorised access. Brake the tractor with the parking brake.
Take special care, possibility of injury.

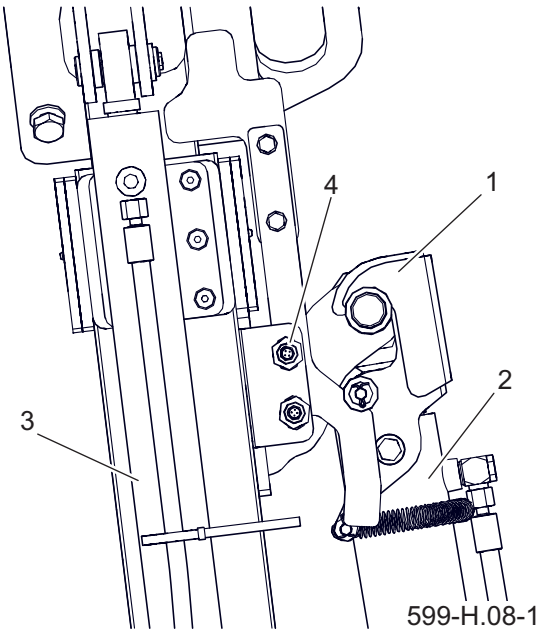

Figure 5.7 Locking rear arms

(1) ratchet *(2) folding cylinder*

(3) extension actuator *(4) sensor*

5.4 WORKING WITH THE MACHINE

DANGER

It is forbidden to occupy any position other than that of the operator in the vehicle cab when operating the machine. It is forbidden to leave the operator's cab while the machine is in operation.
It is forbidden to be between the carrier and the machine.

DANGER

When moving the machine to the working or transport position, make sure that no-one is in the danger area.
Keep a first aid kit and a fire extinguisher readily available during work.

MOVING THE RAKE INTO THE WORKING POSITION

Once the machine has been transported to the work site, it must be changed from its transport configuration to its working configuration. Adaptation of the machine to work can only take place on level, stable ground. To move the machine to the working position you must:

- Activate the relevant section of the external hydraulics.
- Activate the remote control.
- Select the unfolding option on the remote control, lower the front and rear support arms with rake units.

  From the transport position, hold down the P4 button. All mechanisms will be abandoned.
- Stop the tractor engine and remove the ignition key, immobilise the tractor with the parking brake and secure against unauthorised access.
- If the rake arms (1) have been disassembled, they must be fitted by inserting them into the arm mount (2) and securing them with a pin (3).
- Move the protective covers from the transport position (2) to the working position(1).

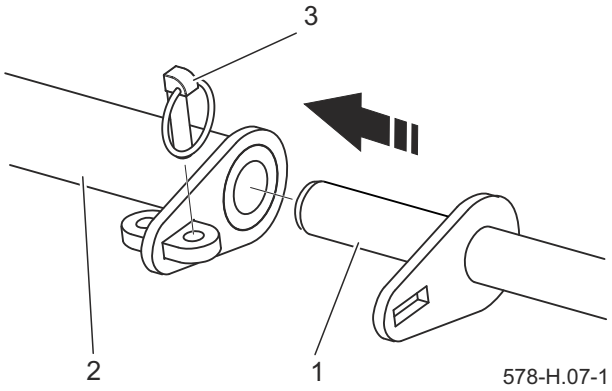

Figure 5.8 Assembly of rake arms
(1) raking arm *(2) arm mounting*
(3) safety pin

SETTING THE RAKING WIDTH

Depending on the types of forage and the fit with the equipment working in the field after the rake, set the appropriate working width. By increasing the raking width, the swath width increases.
To change the working width:

- Position the rake in the over swath

position.

From the work position, press P3 .

From the transport position, hold P4 .

- Select the P6 front arm width adjustment button on the control panel. Set the desired width of their extension; push button P7 to retract the arms and P8 to extend the arms.
- Select the rear arm width adjustment button P5 on the control panel. Set the desired width of their extension ; push button P7 to retract the arms and P8 to extend the arms.

SETTING THE RAKING HEIGHT

The rake height adjustment must be made after the machine has been lowered to the working position. To adjust the rake height:

- Position the tractor and rake on flat, level ground.
- Set the operating mode of the rear three-point linkage to position control.
- Stop the tractor engine and remove the ignition key, immobilise the tractor with the parking brake and secure against unauthorised access.
- Adjust the correct height of the lower links.

Adjust the height of the

ADVICE

The working width of the rake ranges from 11 300mm to 13 500mm.

ADVICE

Adjustment of the raking width with the rake arm extension can only be made in the position over the swaths.

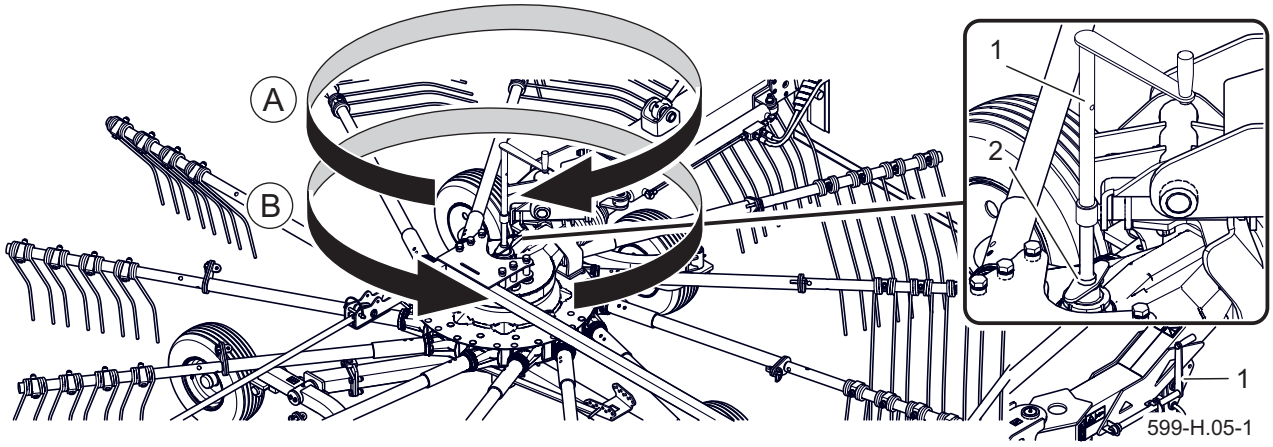

Figure 5.9 Setting the raking height

(A) raising the raking unit *(B) lowering the raking unit*

(1) crank *(2) counter nut*

tractor's lower linkage forks so that the rake units are horizontal or slightly inclined forwards.

- Unscrew the counter nut (2) in an anti-clockwise direction.
- Adjust the height of the spring tines so that they gently touch the ground surface.

Turning the crank (1) clockwise (A) raises the rake assembly. Turning the crank (1) counter-clockwise (B) lowers the rake unit.

- Tighten the counter-nut (2).

The choice of rake height depends on the amount of forage to be cut, the degree of moisture content, the assumed raking speed and the ground on which the rake will run. If the toe is too high off the ground, there is a risk that less than a full swath will be raked. With a low setting, the swath can become contaminated with uprooted soil, turf, stones, etc. In addition, the risk of damage to the rake, mainly to the raking tines and their attachment to the arm, increases. The height selection should be checked continuously during the operation of the raking units and the settings adjusted if necessary.

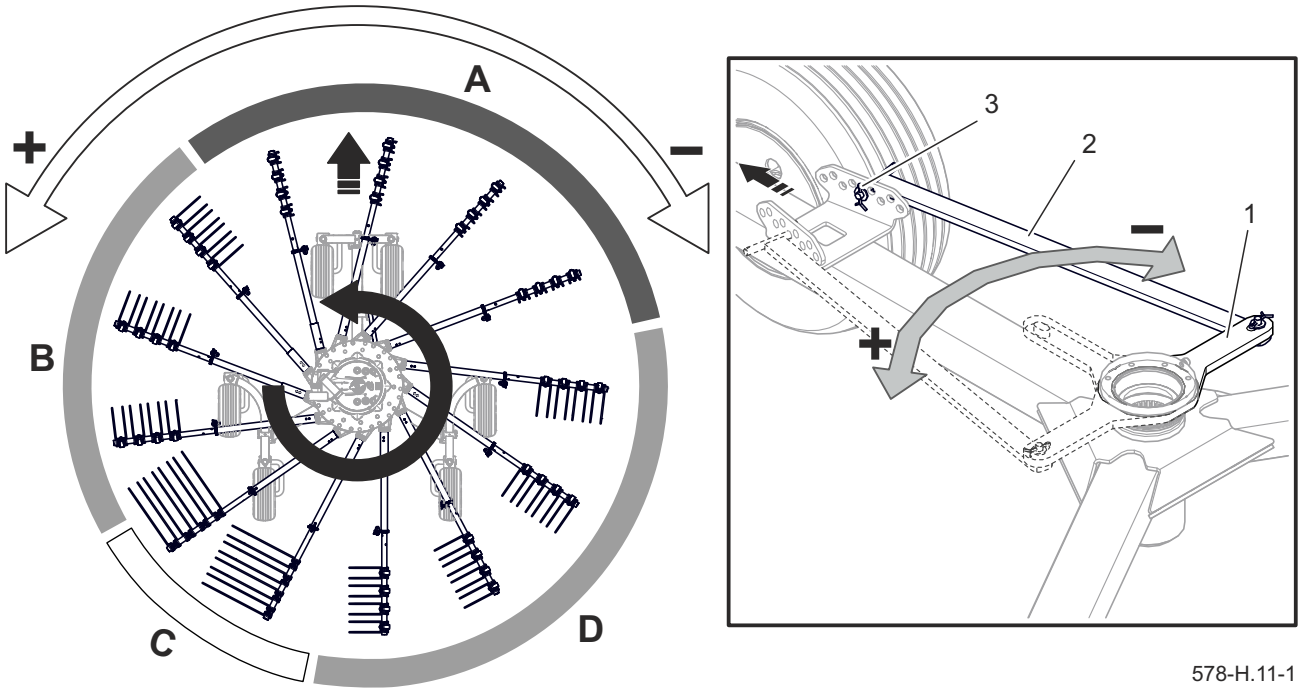

Figure 5.10 Adjustment of raking phases
(A) arms in working position (B) arms raised (C) arms raised
(D) lowering arms (1) rake phase adjustment lever (2) lever linkage
(3) cotter pin

ADJUSTMENT OF RAKING PHASES

Adjusting the raking phases by changing the position of the lever (1) ensures that a suitable shaft is formed ready for the next job. After setting the lever (1) to the desired position, the lever linkage (2) must be secured with the linkage pin (3).

RAKING

If the rake has been set up correctly, is in full working order and is in perfect working order, you can start working.

The machine's operation, which is carried out by hydraulic cylinders, is controlled by a remote control located in the carrier operator's cab.

The travel speed is adjusted during operation. It should be adjusted so that the forage is raked cleanly and the roller is formed correctly. The permissible PTO shaft speed is 540 rpm, but it is recommended that this speed is set so that the forage being raked is not unnecessarily scattered. When raking a drier swath, it is recommended to reduce the PTO speed.

Roller speed and travel speed depend on several factors, including swath size, moisture content, swath length, terrain, so it is up to the rake operator to choose the right parameters. When the machine is in operation, the suspension system must be switched to position control operation.

DANGER

Ensure that the PTO drive is switched off before starting the carrier engine. Failure to do so may result in uncontrolled starting of the machine endangering the life and health of bystanders.
The machine drive can only be started if all safety guards are correctly fastened.
Before engaging the PTO drive, ensure that there are no bystanders, especially children, in the vicinity of the rake. Ensure adequate visibility of the machine during operation.
Bystanders should be at a safe distance from the rake during operation due to the danger of objects (stones, branches) being thrown from under the spring tines.

CAUTION

It is forbidden to start the machine with a PTO speed higher than the permitted one.
Before starting, ensure that the parking support is folded in and correctly locked and the parking brake released.

ADVICE

Check the height of the raking arms frequently during operation.

When turning or reversing, the PTO shaft drive must be switched off. Raise the support arms of the raking units to a position above the swaths.

When the rake is in operation, it is possible to raise and lower the raking mechanisms smoothly from the over swath position to the working position and vice versa.

- press P1  ; depending on the operating status, the left arms are raised from the working position to the over

swath position or lowered from the over swath position to the working position.

- press P2 ; depending on the operating status, the right arms are raised from the working position to the over swath position or lowered from the over swath position to the working position.
- press P3 ; this raises all arms from the working position to the over swath position.
- press P4 ; all arms are lowered from above the swath to the position.

REMOTE CONTROL

The electrical system of the distributor is supplied with 12 V DC via a 3pin cable connected to the tractor.

The individual functions of the rake are carried out using the remote control (1), a description of which can be found in the following table.

DANGER

When driving the machine on uneven terrain, take particular care and reduce the speed of travel due to the possibility of damage and/or overturning of the carrier with the machine.

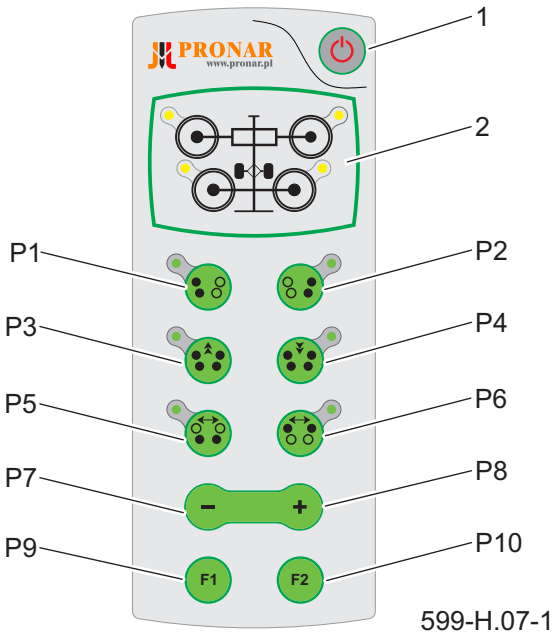

Figure 5.11 Remote control

(1) ON/OFF button (2) display

Table 5.1. Remote control

Button	Description of operation
P1	Raising / lowering left arms to over swath / working position
P2	Raising / lowering right arms to over swath / working position
P3	Lifting all arms into position over swaths Hold P3 -automatic folding to transport position
P4	Lower all arms to working position Hold P4 - automatic unfolding from transport position / over swaths
P5	Activation of the rear arm width adjustment
P6	Activation of the front arm width adjustment
P7	Arms folding
P8	Arms extending
P9	Button inactive
P10	Button inactive

H.1.7.599.03.1.EN

5.5 DISCONNECTION FROM THE CARRIER

The machine disconnected from the carrier must be placed on a horizontal, sufficiently firm surface so that it can be reconnected. To disconnect the rake from the carrier, perform the following steps:

- Lower the parking support (6) and secure it with a cotter pin (7).
- Move the rake by means of the three-point linkage to a position where the support (6) is fully resting on the ground.
- Switch off the tractor engine, remove

DANGER

Before disconnecting the machine from the carrier, switch off the engine, apply the parking brake and secure the cab against unauthorised access.
Special care must be taken when disconnecting the machine from the carrier.
Reduce the pressure in the system before disconnecting the hydraulic system.
It is forbidden to use safety chains to support the shaft when the machine is stationary or being transported.

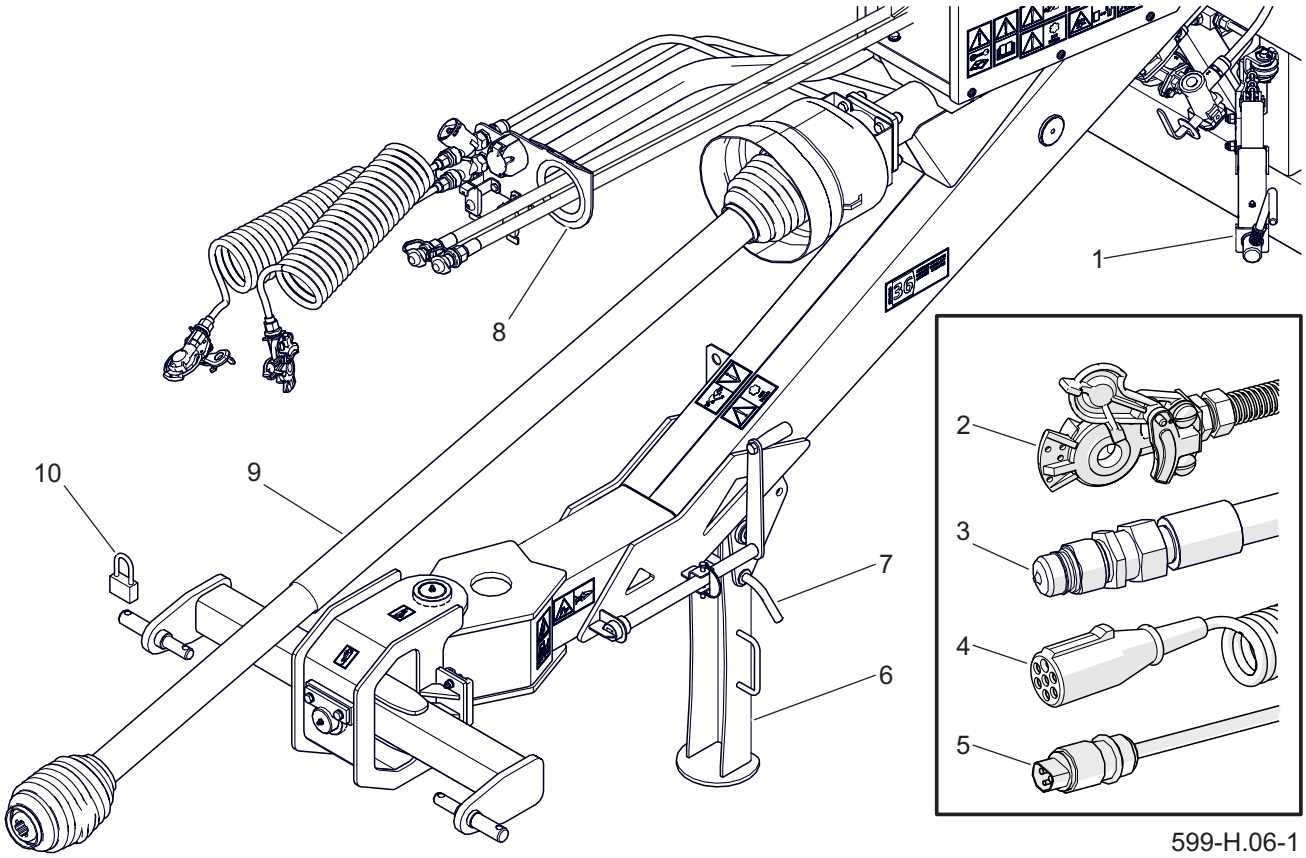

Figure 5.12 Disconnection from the carrier

(1) parking brake *(2) air plug* *(3) hydraulic plug*
(4) electric cable *(5) 3-pin plug* *(6) parking support*
(7) safety element *(8) cable support* *(9) drive shaft*
(10) safety device

the ignition key, switch on the the parking brake of the carrier.

- Place safety chocks under the wheel of the rake.

  The wheel chocks must be positioned so that one is at the front of the wheel, the other at the back of the wheel.

- Immobilise the rake with the parking brake (1).

  Turn the mechanism crank clockwise to activate the parking brake.

- Reduce the residual pressure in the hydraulic system by moving the appropriate hydraulic circuit control lever on the carrier.
- Disconnect the hydraulic hoses (3), pneumatic hoses (2), lighting electrical supply line (4) from the carrier. Disconnect the 3 pin cable of the control installation. Place the wires on the bracket (8).

  Disconnect the red brake line first, then disconnect the yellow line.

- Disconnect the telescopic PTO shaft (9) from the carrier PTO.
- Disconnect the lower rake pins and drive the tractor away from the machine.
- Secure the machine against unauthorised use with the safety device (10).

DANGER

Refer to the instructions for using cleaning detergents and preservatives.
When washing with detergents, wear suitable protective clothing and splash goggles.
When cleaning the machine, the tractor engine must be switched off and the PTO shaft must be disconnected.

It is not necessary to disconnect the PTO shaft, but it is recommended to remove it. Taking sharp turns, especially in field conditions, can be difficult because of this. If the shaft has not been dismantled, it is essential that the PTO drive on the tractor is not activated during the transport run.

H.1.7.599.04.1.EN

5.6 RULES FOR THE USE OF TYRES

- When working on the tyres, the machine must be secured against rolling by placing safety chocks under the wheel.
- Repair work on wheels or tyres should be carried out by persons trained and authorised for this purpose. This work should be carried out with appropriately selected tools.
- Checking the tightness of the nuts should be carried out after the first use, after the first day of operation, then at regular intervals every 50 hours of operation. Each time the check must be repeated if the machine wheel has been dismantled. The running wheel nuts should be tightened as recommended in section *5.. TECHNICAL SERVICE*.
- Regularly check and maintain the correct tyre pressure as recommended in the manual (especially after not using the machine for a long period of time).
- Tyre pressures should also be checked during a day's intensive work. It should be taken into account that an increase in tyre temperature can increase the pressure by up to 1 bar. With such an increase in temperature and pressure, driving speed should be reduced.
- Never depressurise by venting if the pressure increases due to temperature.
- Secure the tyre valves with suitable caps to avoid contamination.
- Do not exceed the permitted machine speed.
- Monitor the temperature of the tyres during the all-day cycle.
- Avoid damaged pavement, sudden and variable manoeuvres and high speeds when turning.

H.1.7.599.05.1.EN

5.7 CLEANING THE MACHINE

The machine should be cleaned as required and before a period of prolonged downtime. The use of the pressure washer obliges the user to familiarise himself with the principle of operation and the recommendations for the safe use of this equipment.

GUIDELINES FOR CLEANING MACHINES

- Use only clean running water or water with a ph-neutral cleaning detergent to clean the machine.
- The use of pressure washers increases the effectiveness of cleaning, but great care must be taken when working. During cleaning, the nozzle of the cleaning unit must not approach within 50 cm of the surface to be cleaned.
- The water temperature should not exceed 55 ° C.
- Do not point the water jet directly on machine components and equipment, i.e. valves, hydraulic cylinders, electrical and hydraulic plugs, lights, electrical connectors, information and warning labels, rating plate, cable connections, machine lubrication points, etc. High water jet pressure can cause mechanical damage to these components.
- For cleaning and maintenance of plastic surfaces, it is recommended to use clean water or specialised preparations designed for this purpose.
- Do not use organic solvents, preparations of unknown origin or other substances which may damage the painted, rubber or plastic surface. It is recommended to make a test on an invisible surface in case of doubt.
- Surfaces oily or greasy by grease should be cleaned with petrol or degreasing agents, and then washed with clean water and detergent. Follow the cleaning product manufacturer's recommendations.
- Detergents for washing should be stored in the original containers, or alternatively in substitute containers, but very carefully labelled. Detergents must not be stored in food or drink storage containers.
- Keep the hoses and gaskets clean. The materials from which these elements are made may be susceptible to organic substances and some detergents. As a result of long-term effects of various substances, the aging process is accelerated and the

risk of damage increases. Elements made of rubber are recommended to be maintained with the help of specialized preparations after thorough washing.

- Observe the environmental protection rules Observe environmental protection rules, clean the machine in the designated areas.
- Washing and drying of the machine must take place at an ambient temperature higher than 0 °C.
- After cleaning, allow the machine to dry and then lubricate all control points as recommended. Wipe off any excess grease or oil with a dry cloth.

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5.8 STORAGE

It is recommended that the rake is stored in a closed or covered area. If the machine is not going to be used for a long period of time, it must be protected from the weather (sun and rain), which causes corrosion of the steel and accelerates the ageing of the tyres. Carry out the protection in accordance with the instructions given below.

- The machine should be thoroughly cleaned of plant residues as such material absorbs moisture, which promotes corrosion.
- After cleaning, the entire machine should be inspected and a visual inspection of the condition of the individual components should be carried out. Worn or damaged components must be repaired or replaced with new ones.
- When disconnected from the implement carrier (tractor), the machine should be placed on a horizontal, sufficiently firm surface so that it can be reconnected.
- If the machine will not be used for a long period of time, it is essential to protect it from the elements, especially those that cause corrosion of the steel and accelerate ageing of the tyres.
- Corroded areas should be cleaned of rust, degreased and protected with primer and then painted with a topcoat according to the colour scheme.
- In the event of prolonged downtime, it is essential to lubricate all components regardless of the period of the last treatment.
- Rims and tyres should be thoroughly washed and dried. When storing an unused machine for an extended period of time, it is advisable to reposition the machine once every 2 to 3 weeks so that the point of contact between the tyre and the ground is in a different position. The tyres will not deform and will retain the correct geometry. You should also check the tyre pressure from time to time and, if necessary, inflate the wheels to the correct value.
- Telescopic PTO shafts should be stored horizontally.
- At the end of the season, the remote control and cabling must be removed from the tractor cab and protected from the weather.

CHAPTER 6

SCHEDULE OF TECHNICAL INSPECTIONS

6.1 BASIC INFORMATION

During the course of the machine's use, it is essential to constantly check its condition and carry out maintenance to keep the machine in good working order. Therefore, the user of the machine is obliged to carry out all maintenance, inspection and adjustment operations specified by the manufacturer according to a set schedule.

Repairs during the warranty period may only be carried out by Authorised Sales and Service Outlets (APSiO).

In the event of unauthorised repairs, changes to the factory settings or actions not included as possible by the trailer operator (not described in this manual), this user will forfeit the warranty.

CAUTION

It is forbidden to use a damaged mast.
Repairs during the guarantee period may only be carried out by authorised service centres.

The warranty inspection of the machine is only carried out by an authorised service centre.

After the warranty expires, it is recommended that servicing is carried out by specialised repair shops.

I.1.7.578.01.1.EN

6.2 SCHEDULE OF PERIODIC INSPECTIONS

Table 6.1. Review categories

Category	Description	Respon-sible	Frequency
A	Daily review	Operator	Every day before first start-up or every 10 hours of continuous shift work.
B	Maintenance	Operator	Inspection performed every 50 operating hours. All daily inspection activities should also be carried out before starting work.
C	Maintenance	Operator	Inspection every 250 operating hours or every six months, whichever comes first. All maintenance must also be carried out every 50 hours of operation before starting work.
D	Maintenance	Operator	Inspection every 500 operating hours or every 12 months, whichever comes first. All maintenance must also be carried out every 250 hours of operation before starting work.
E	Maintenance	Service (1).	Inspection every 4 years of machine use

(1) - post-warranty service

Table 6.2. Technical inspection schedule

Description of activities	A	B	C	D	E	Page
Preparing the rake	•					6.6
Air pressure measurement, inspection of tyres and wheels	•					6.7
Draining water from air tank	•					6.8
Inspection of connection plugs and sockets	•					6.9
Inspect covers	•					6.10
Inspect the machine before driving off	•					6.12
Clean the air filters			•			6.13
Checking brake shoe linings for wear			•			6.14
Checking wheel axle bearings for slackness			•(2)			6.15
Inspection of mechanical brakes				•		6.17
Cleaning the drain valve				•		6.18
Inspection of parking brake cable tension					•	6.19
Maintenance check of telescopic shafts(1).	•					-
Inspect the hydraulic system					•	6.21
Inspection of pneumatic system					•	6.22
Inspection of electrical installation and signalling elements	•					6.23
Checking the attachment of the spring tines to the rake arms	•					6.24
Checking and topping up gearbox oil	•					6.25
Gearbox oil change		•(3)		•		

Description of activities	A	B	C	D	E	Page
Lubrication	See table: *Trailer lubrication schedule*					5.29
Inspection of nut and bolt connections	See table: *Timing of tightening of vital screw connections*					5.33
(1) in accordance with the manufacturer's operating instructions for the telescopic shaft *(2) after the first month of use, and every 6 months of use in each case* *(3) first exchange*						

Table 6.3. Control parameters and settings

Description	Value	Notes
Braking system		
Piston rod stroke in pneumatic systems	25 - 45 mm	
Minimum brake lining thickness	5 millimeters	
Angle between spreader axis and fork	90°.	With the brake applied
Parking brake		
Permissible parking brake cable play	100 millimeters	

I.1.7.599.01.1.EN

6.3 PREPARING THE RAKE

DANGER

Secure the tractor cab against unauthorised access. When working with the lift, read the instructions for this equipment and follow the manufacturer's recommendations. The lift must stand firmly against the ground and machine components.
Before carrying out maintenance and repair work on a raised rake, make sure that the machine is properly secured and will not roll away during operation.

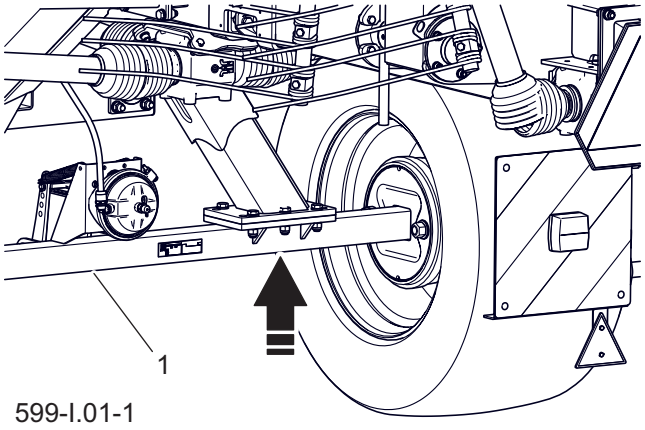

Figure 6.1 Recommended jacking points
(1) driving axle

THE SCOPE OF ACTIVITIES

- Connect the rake to the tractor.
- Place the tractor and rake on firm, level ground for straight ahead driving.
- Apply the tractor's parking brake.
- Switch off the tractor engine and remove the ignition key from the ignition switch. Close the tractor cab to protect the tractor from unauthorised access.
- Place locking wedges under the rake wheel. Ensure that the machine does not roll during inspection.
- If the wheel needs to be lifted during inspection, the locking chocks should be placed under the wheel on the opposite side. Place the lift at the points indicated by the arrow. The jack must rest on a firm and stable surface.
- The lift must be matched to the machine's own weight.
- In exceptional cases, the machine's parking brake must be released, e.g. when measuring the play of the running axle bearings. Take special care then.

I.1.7.599.02.1.EN

6.4 AIR PRESSURE MEASUREMENT, TYRE AND WHEEL INSPECTION

Pressure checks should be carried out before starting a journey when the tyres are not warmed up or after the machine has been parked for a while.

ADVICE

If the machine is used intensively, we recommend more frequent pressure checks.
The tyre inflation pressure can be found on an information sticker on the wheel rim.

THE SCOPE OF ACTIVITIES

- Connect a pressure gauge to the valve and check the air pressure. If necessary, inflate the wheel to the required pressure.
- Check the technical condition of the tyres (tread depth, tyre sidewalls).
- Inspect the tyre for loss, cuts, deformation, bulges indicating mechanical damage to the tyre. In the event of mechanical damage, consult the nearest tyre service centre and ascertain whether the defect in the tyre qualifies it for replacement.

DANGER

Damaged tyres or rims can cause a serious accident.

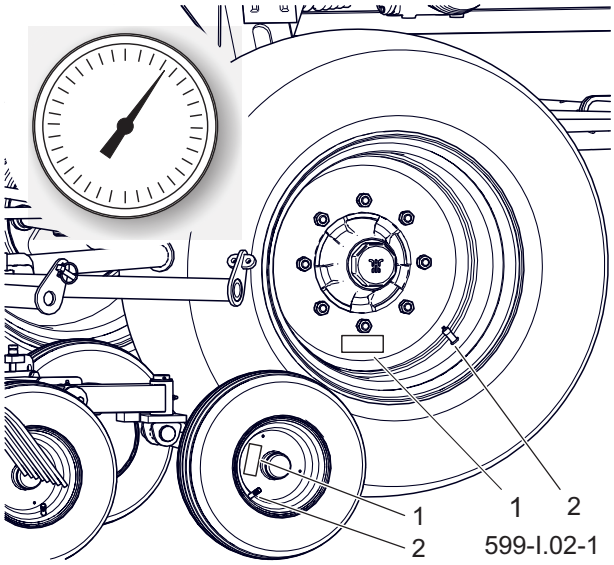

Figure 6.2 Rake wheels

(1) information sticker (2) valve

CAUTION

Incorrect tyre pressure can lead to permanent tyre damage through delamination of the material and is also the cause of faster tyre wear.

- Check that the tyre is correctly seated on the rim.
- Check the age of the tyre.

During pressure checks, pay attention to the condition of the rims. Rims should be inspected for deformation, cracks in the material, cracks in the welds, corrosion, especially around the welds and at the point of contact with the tyre.

6.5 DEHYDRATION OF THE AIR TANK

THE SCOPE OF ACTIVITIES

- Push in the stem of the drainage valve (1) located at the bottom of the tank (2).

  The compressed air in the tank will remove the water outside.

- When the stem is released, the valve should close automatically and stop the flow of air from the tank.
- If the valve stem does not want to return to its position, wait until the tank empties. Then unscrew and clean or replace the valve with a new one.

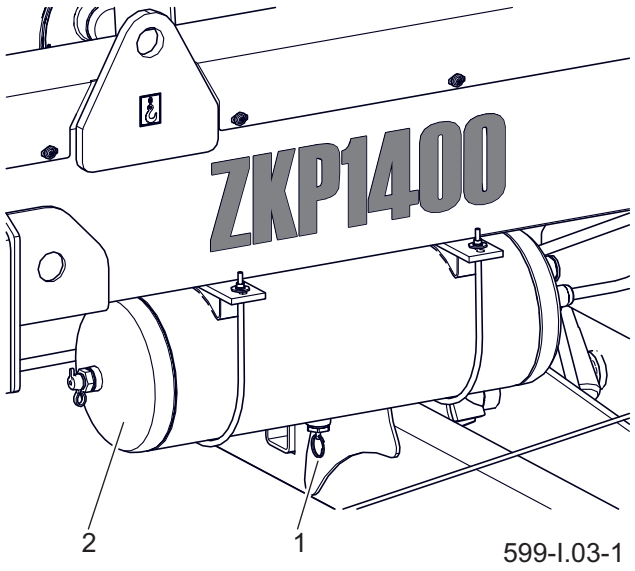

Figure 6.3 Air reservoir
(1) drain valve *(2) air tank*

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6.6 INSPECTION OF CONNECTORS AND SOCKETS

DANGER

Faulty and contaminated machine connections can result in the improper operation of individual rake systems.

A damaged coupling body or hydraulic or pneumatic hose socket qualifies it for replacement. If the lid or gasket is damaged, these components must be replaced with a new, working one. Contact of the seals of pneumatic connections with oil, grease, petrol, etc. can contribute to their damage and accelerate the ageing process.

If the machine is disconnected from the tractor, the connections must be secured with lids and placed in the sockets provided. Before winter, it is advisable to seal the gasket using preparations designed for this purpose (e.g. silicone lubricants for rubber components).

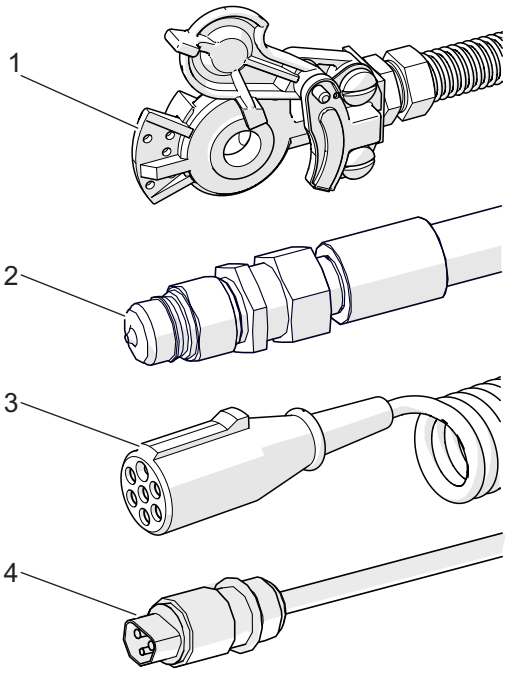

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Figure 6.4 Machine connections

(1) air brake plug *(2) hydraulic plug,*
(3) electric cable *(4) 3-pin connector*

Check the technical condition and cleanliness of the connections and sockets on the agricultural tractor before connecting the machine. Clean or repair tractor sockets if necessary.

I.1.7.599.04.1.EN

6.7 INSPECTION OF SHIELDS

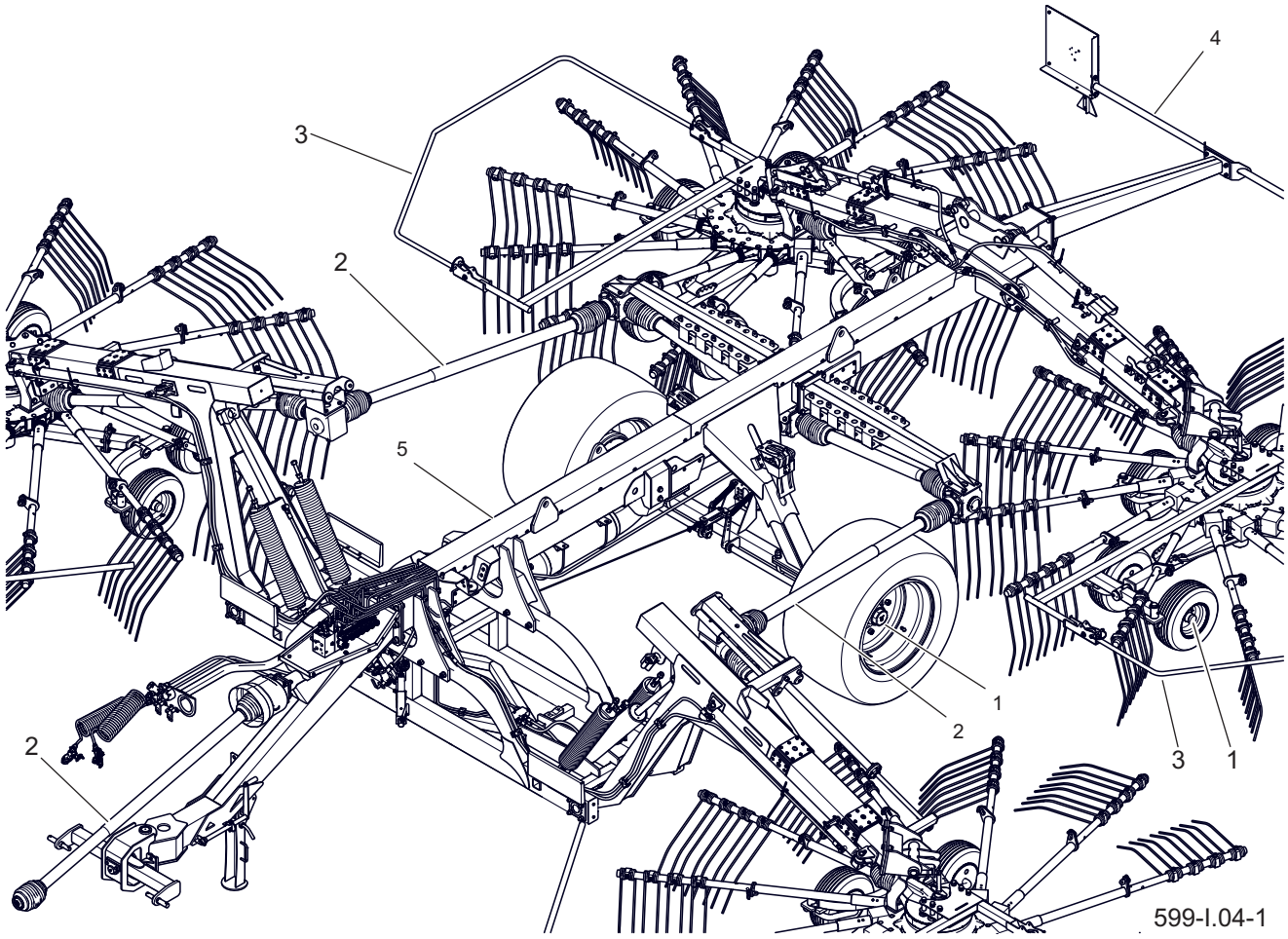

Figure 6.5 Shields
(1) Wheel hubcap *(2) Drive shaft* *(3) Protective cover*
(4) rear boom

Shields protect the user of the machine from loss of health or life, and are a protective element for machine components. For this reason, their technical condition must be checked before starting work. Damaged or lost components must be repaired or replaced with new ones.

THE SCOPE OF ACTIVITIES

- Check the completeness of the safety shields.
- Check that the shields are fitted

DANGER

It is forbidden to use the rake with damaged or incomplete shields.
The shields of the rake units must be unfolded and properly interlocked before starting work. Working with folded or damaged rake unit covers is not permitted.
The large number of rotating units poses the risk of a serious accident, do not approach the machine while the raking units are in operation, take extra care.
The telescopic shaft shields must be complete and correctly secured with chains.

correctly, assess the condition of the rear beam (4) and the protective shields (3).

- Check that the safety chains are correctly attached and that the shields of all telescopic shafts (2) are complete.
- Check the security and completeness of the wheel caps (1).

DANGER

It is forbidden to wear loose clothing, loose belts, loose long hair or anything that could screw into the rotating shaft. Contact with the rotating telescopic shaft can cause serious injury.

- If necessary, tighten the screw connections of the casing mountings, refill the pins.

I.1.7.599.05.1.EN

6.8 MACHINE CHECK BEFORE STARTING TO DRIVE

- Before connecting the machine to the tractor, make sure that the hydraulic and pneumatic hoses are not damaged.
- Check the completeness, technical condition and correct functioning of the machine and tractor lighting.
- Check the cleanliness of all electric lamps and reflectors.
- Check that the triangular plate holder of slow-moving vehicles and the plate itself are correctly fitted.
- Ensure that a warning reflective triangle is fitted to the tractor.
- Check that the ventilation openings of the actuator; are not clogged with debris and that there is no water or ice inside. Check that the actuator is fitted correctly.

Clean the actuator if necessary. During the winter period, it may be necessary to defrost the actuator and remove accumulated water through the blocked vents. If damage is found, replace the actuator. When installing the actuator, the original position of the actuator in relation to the bracket must be maintained.

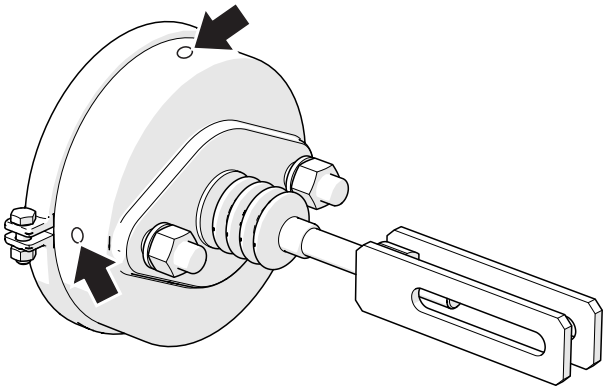

Figure 6.6 Brake actuator

DANGER

Driving with a faulty brake system is prohibited.
If the machine is damaged, do not use it until it has been repaired.

- When starting from a standstill, check the function of the service brake system. It should be remembered that an adequate level of air pressure in the machine's air tank is required for proper operation of the pneumatic system.
- Check the correct functioning of the other systems on an ongoing basis during trailer operation.

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6.9 CLEANING OF THE AIR FILTERS

The air filter inserts are located on the connection lines of the pneumatic system. They are reusable and cannot be replaced unless they are mechanically damaged.

THE SCOPE OF ACTIVITIES

- Reduce pressure in the supply line.

  Reducing the pressure in the line can be done by pushing in the pneumatic connection plug as far as it will go.

- Slide out the filter safety slide (1).
- Hold the filter cover (2).
- Hold the filter cover (2) with the other hand. When the gate valve is removed, the cover will be pushed out by a spring, located in the filter housing.
- Wash the cartridge and filter body thoroughly with water and blow out with compressed air. Assembly should be carried out in reverse order.

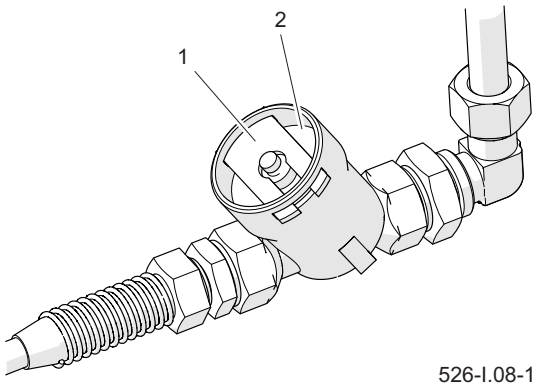

Figure 6.7 Air filter

(1) filter gate *(2) cover*

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6.10 CHECKING OF THE SHOE LINING WEAR

ADVICE

Checking brake lining wear:
- according to the review schedule,
- in the event of brake overheating,
- in the event that the travel of the brake cylinder piston rod is considerably extended,
- in the event of unnatural noises coming from the vicinity of the driving axle drum.

During the life of the machine, the friction linings of drum brakes are subject to wear. In this case, the complete brake shoes must be replaced with new ones. Excessive brake shoe wear is a condition where the thickness of the brake linings bonded or riveted to the steel shoe structures exceeds a minimum value.

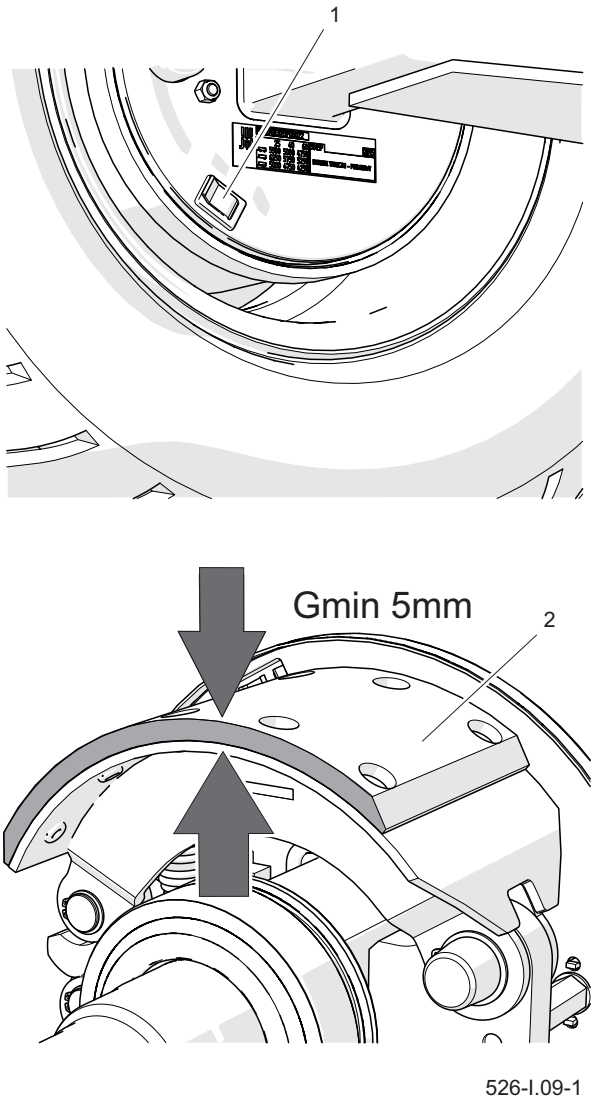

Figure 6.8 Brake lining thickness check
(1) plug *(2) brake lining*

TERMS OF REFERENCE

- Locate the inspection hole (depending on the design variant of the running axle, the inspection hole may be in a different position than shown in the drawing, but will always be located on the brake guard disc).
- Remove the top and bottom caps and check the thickness of the cladding.
- The brake shoes must be replaced if the brake lining thickness is less than 5 mm.
- Inspect the remaining cladding for wear and tear.

I.1.7.599.06.1.EN

6.11 TRACK AXLE BEARING PLAY CHECK

THE SCOPE OF ACTIVITIES

- Connect the machine to the tractor, immobilise the tractor with the parking brake.
- Position the tractor and rake on firm, level ground for straight ahead driving.
- Locking chocks must be placed under the machine wheel opposite the lifted wheel. Ensure that the rake does not roll during inspection.
- Lift the wheel (located on the opposite side of the stacked wedges). The jack should be placed under the spring plate attaching the driving axle to the spring. The lift must be matched to the empty weight of the trailer.
- Turn the wheel slowly in two directions. Check that the movement is smooth and the wheel turns without excessive resistance or jamming.
- Unbolt the wheel so that it rotates very quickly, check for unnatural sounds coming from the bearing.
- Try to feel for play by moving the wheel.
- Repeat the steps for each wheel separately, bearing in mind that the jack must be on the opposite side of the wedges.

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Figure 6.9 Bearing play check

DANGER

Before starting work, read the elevator instructions and follow the manufacturer's recommendations.
The lift must stand firmly on the ground and the spring plate.
Ensure that the machine does not roll when checking the play of the running axle bearings.
Checking the bearing clearance can only be carried out when the rake is connected to the tractor.

ADVICE

A damaged or missing hub cover will cause dirt and moisture to penetrate into the hub, resulting in much faster wear of the bearings and hub seals.
The life of the bearings depends on the operating conditions of the machine, the load, vehicle speed and lubrication conditions.

- If play is perceptible, carry out an adjustment of the bearings. Unnatural sounds emanating from the bearing can be symptoms of excessive

wear, contamination or damage. In this case, the bearing, together with the sealing rings, must be replaced with a new one, or cleaned and relubricated.

- Check the condition of the hub cap, replace with a new one if necessary.

I.1.7.599.07.1.EN

6.12 MECHANICAL BRAKE INSPECTION

In a correctly adjusted brake, the piston rod travel (X-Y) of the actuator should be in the range 25 - 40mm and depends on the type of actuator used. When the wheel is fully braked, the optimum angle between the spreader lever and the piston rod should be approximately 90°. With this setting, the braking force is optimal. Checking the brakes involves measuring this angle and the piston rod stroke.

THE SCOPE OF ACTIVITIES

- Measure distance X with the tractor brake pedal released.
- Measure distance Y with the tractor brake pedal depressed.
- Calculate the difference in the X-Y distance (pitch of the roller).
- Check the angle between the cylinder piston rod axis and the spreader lever.
- If the angle of the spreader arm (2) and the piston rod travel exceeds the range specified above, the brake must be adjusted.

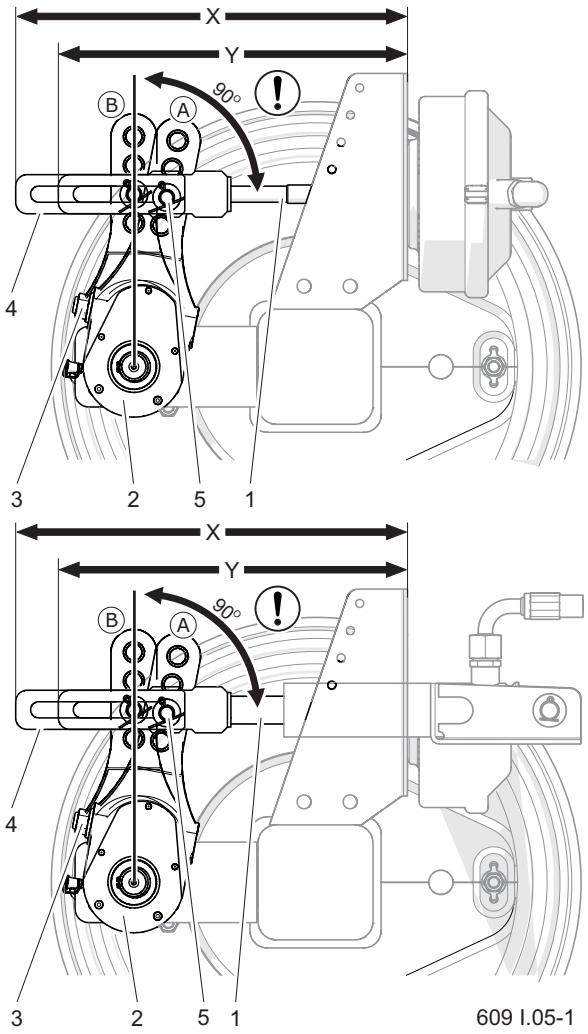

Figure 6.10 Service brake inspection

(1) Actuator piston rod *(2) Spreader arm*

(3) Adjustment screw *(4) Actuator fork*

(5) Pin position

(A) arm position in deceleration position

(B) position of arm in braking position

I.1.7.599.08.1.EN

6.13 CLEANING THE DRAINAGE VALVE

DANGER

Bleed the air tank before removing the drain valve.

THE SCOPE OF ACTIVITIES

- Completely depressurise the air reservoir (2).

  Pressure reduction in the tank can be achieved by swinging the stem of the drainage valve.

- Unscrew the valve (1).
- Clean the valve, blow out with compressed air.
- Replace the gasket.
- Screw in the valve, fill the tank with air, check the tank for leaks.

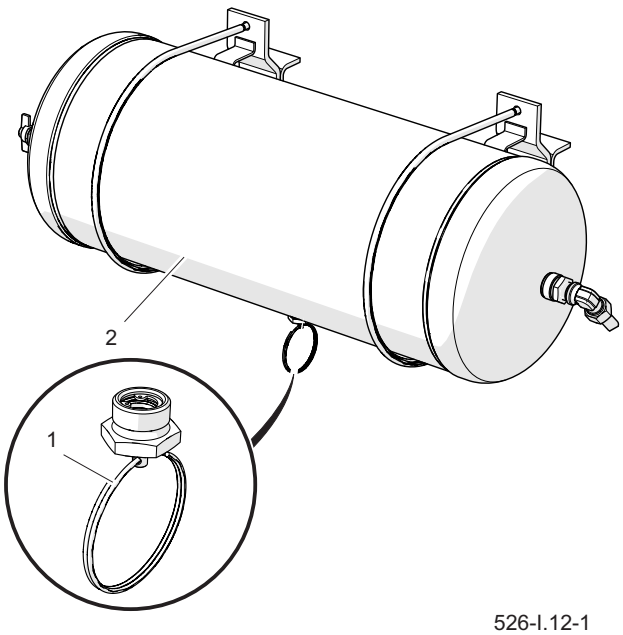

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Figure 6.11 Air reservoir

(1) drainage valve *(2) tank*

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6.14 PARKING BRAKE CABLE TENSION CHECK

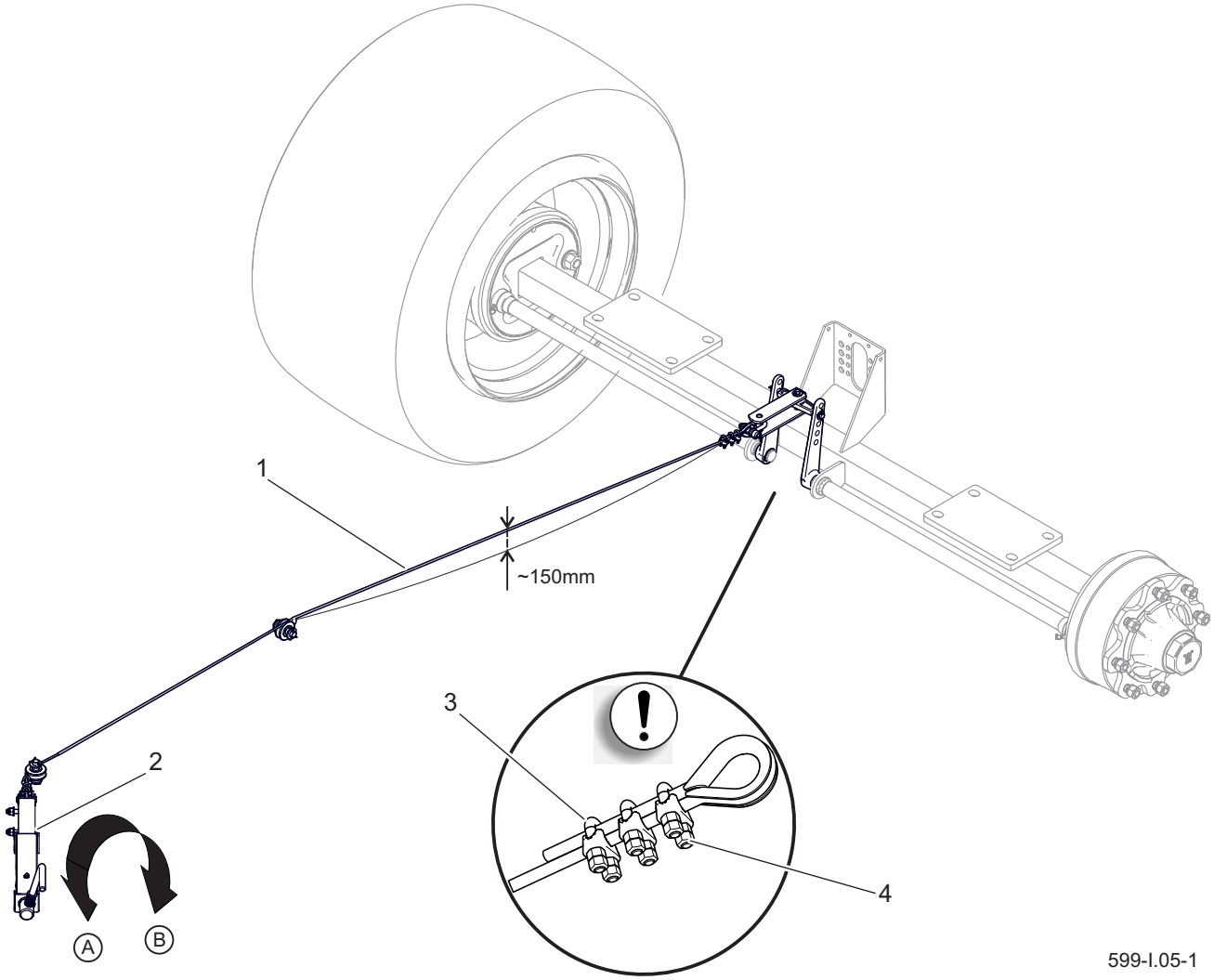

Figure 6.12 Parking brake cable tension check
(1) cable (2) brake mechanism (3) cable clamp
(4) clamp nut

VOLTAGE CONTROL

Check the parking brake after checking the mechanical brake on the driving axle.

- Connect the machine to the tractor. Place the rake and tractor on level ground.
- Place chocks under one wheel of the machine.
- Turn the brake mechanism crank (2) in direction (B) to apply the parking brake.
- Check cable tension (1).
- With the mechanism screw fully removed, the cable should dangle about 150 mm.

CABLE TENSION ADJUSTMENT

- Remove the brake mechanism screw (2) to the maximum by turning the crank in direction (A).
- Loosen the nuts (4) of the cable clamps (3) on the handbrake cable (1).
- Tension the cable (1) and tighten the nuts (4) of the clamps.
- Apply the parking brake and release it again. Check (approximately) the cable slack. When the service and parking brake are fully released, the cable should sag approximately 150 mm. The axle spreader levers should be in the rest position.

DANGER

It is forbidden to use the trailer with a faulty brake system.

I.3.2.589.14.1.EN

6.15 INSPECTION OF THE HYDRAULIC SYSTEM

LEAKAGE CHECK OF THE HYDRAULIC SYSTEM

- Connect the machine to the tractor. Connect all hydraulic and electrical system lines (3 pin) as recommended in the operating instructions.
- Clean hose connections, hydraulic cylinders and fittings.
- Actuate all hydraulic systems sequentially by extending and retracting the cylinder pistons. Repeat all steps 3 - 4 times.
- Leave the hydraulic cylinders in the maximum extended position. Check all hydraulic circuits for leaks.
- Once the inspection is complete, fold all actuators into the rest position.

If oil is found on the hydraulic cylinder body, check the nature of the leak. With the cylinder fully extended, check the sealing points. Minor leaks with 'sweating' symptoms are acceptable, but if 'drip' type leaks are noticed, operation of the machine should be discontinued until the fault has been rectified.

DANGER

It is forbidden to operate the machine with a defective lighting system.

If there is visible moisture on the cable joints, the joint should be tightened to the specified torque and the test should be carried out again. If the problem persists, replace the leaking component. Rubber hydraulic hoses should be replaced every 4 years, regardless of their condition. This activity should be entrusted to specialised workshops.

HYDRAULIC CONNECTIONS CONTROLS

The hydraulic couplings for the connection to the tractor must be in good working order and kept clean. Each time before connecting, ensure that the sockets on the tractor are maintained. Tractor and trailer hydraulic systems are sensitive to the presence of solid contaminants, which can cause damage to precision components of the system (jamming of hydraulic valves, scratching of cylinder surfaces, etc.).

I.1.7.599.09.1.EN

6.16 INSPECTION OF THE PNEUMATIC INSTALLATION

THE SCOPE OF ACTIVITIES

- Connect the machine to the tractor.
- The tractor and the machine should be immobilized with the parking brake. In addition, wedges are placed under the rear wheel of the machine.
- Start the tractor to top up the air in the tank of the machine's braking system.
- Turn off the tractor engine.
- Check the system components with the tractor brake pedal released.
- Pay particular attention to the hose connection points and the brake actuator.
- Repeat the system check with the tractor brake pedal depressed.

In the event of a leak, compressed air will leak through the damaged areas to the outside with a characteristic hissing sound. A leak in the system can be detected by coating the components to be checked with a cleaning fluid or foaming preparation that will not have an aggressive effect on the system components. Damaged components must be replaced with new ones or submitted for repair. If leakage has occurred in the vicinity of the joints, the joint should be tightened. If air continues to flow out, replace the joint components or seals with new ones.

DANGER

It is forbidden to use the machine with a faulty brake system.
Repair, replacement or reconditioning of pneumatic system components can only be carried out in a specialised workshop.

When checking for leaks, additional attention should be paid to the condition and cleanliness of the system components. Contact of pneumatic hoses, seals, etc. with oil, grease, petrol, etc. can contribute to their damage or accelerate the ageing process. Bent, permanently deformed, cut or abraded wires only qualify for replacement.

I.1.7.599.10.1.EN

6.17 INSPECTION OF ELECTRICAL INSTALLATION AND SIGNALLING ELEMENTS

It is the responsibility of the user to carry out a technical check of the electrical installation and warning elements and to replace bulbs if necessary.

THE SCOPE OF ACTIVITIES

- Connect the rake to the tractor with the 7 pin lighting installation cable.

  Ensure that the connection cable is in good working order. Check the connection sockets on the tractor and on the rake.
- Check the completeness, technical condition and correct operation of the lighting.
- Check the completeness of all reflective elements.
- Ensure that a warning reflective triangle is fitted to the tractor before driving on a public road.

CAUTION

Driving with a faulty lighting system is prohibited. Damaged lamp shades and burnt-out bulbs must be replaced immediately before driving. Lost or damaged reflectors should be replaced with new ones.

ADVICE

Make sure all lights and reflectors are clean before leaving.

DANGER

It is forbidden to carry out repairs to the electrical installation yourself, with the exception of the operations described in this chapter. Repairs to the electrical system must only be carried out by suitably qualified persons.

I.1.7.599.10.1.EN

6.18 INSPECTION AND REPLACEMENT OF SPRING TINES

DANGER

Before starting inspection work, switch off the tractor engine, remove the ignition key and brake the tractor with the parking brake. Secure the tractor cab against unauthorised access.

The spring tines and their attachments must be checked on an ongoing basis during rake operation. Damaged components should be replaced with new ones. Spring tines cannot be repaired.

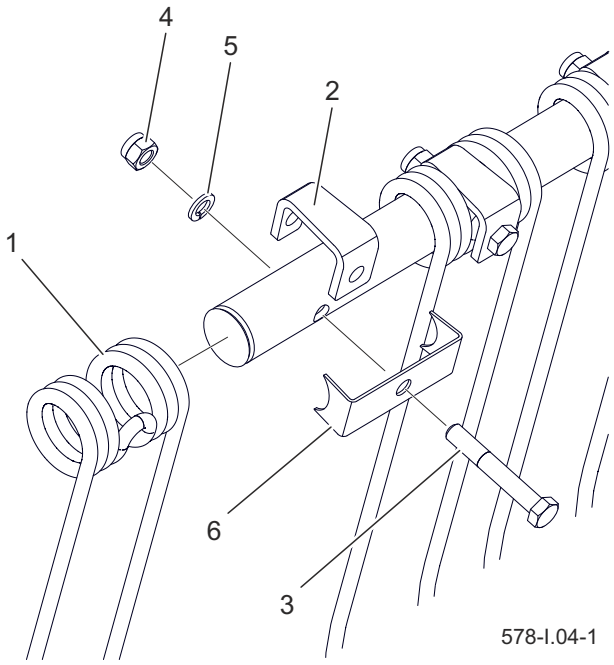

Figure 6.13 Spring tines

(1) spring pin *(2) clamping bracket*
(3) screw *(4) nut*
(5) washer *(6) tine protection*

REPLACEMENT OF SPRING TINES

- Unscrew the nut (4).
- Remove the fixing angle (2), the rake tine protection (6) and the screw (3).

  A rake tine safety device is available as an accessory on the machine.
- Remove the defective spring tine (1) from the arm and insert a new one.
- Fit bolt, tine protection and angle bracket. Tighten the nut to the correct torque in accordance with table *Tightening torques for bolted connections*.

Table 6.4. Spring tine

Name	Catalogue number	Quantity
Spring tine	178N-02010300-01	208

I.1.7.599.11.1.EN

6.19 GEARBOX OPERATION

ADVICE

The first oil change in gearboxes should be carried out after the first 50 hours of operation. Subsequent oil changes should be carried out every 500 hours or once a year (whichever comes first).

Maintenance of the rake gearboxes comes down to a general inspection of their condition, replacing or topping up gear oil losses. If the gearbox is damaged, contact an authorised service centre for repair.

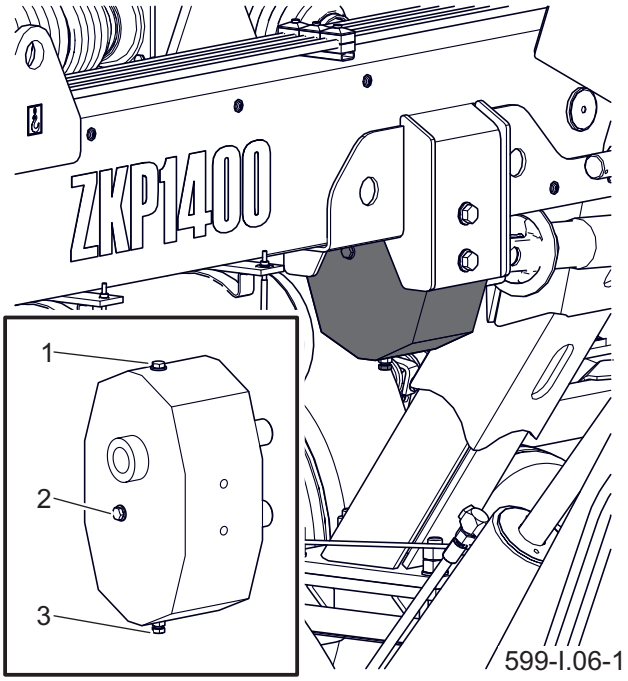

Figure 6.14 Main gearbox
(1) filler plug *(2) test plug*
(3) drain plug

MAIN GEARBOX

CHECKING THE OIL LEVEL

- Place the machine on a firm, level surface.
- Unscrew the control plug (2);

The oil level should reach the lower edge of the inspection plug hole (2).

DANGER

With the machine connected to the carrier, switch off the PTO and engine, remove the ignition key and immobilise the vehicle with the parking brake before carrying out the inspection.
It is forbidden to carry out maintenance and repair work underneath a raised and unsecured machine.
Do not touch the gearbox once the machine has stopped! Due to the high oil temperature, gearbox surfaces can reach high and dangerous temperatures.
Appropriate personal protective equipment, i.e. protective clothing, footwear, gloves, goggles, must be worn during oil inspection and refilling work. Avoid oil contact with the skin.

ADVICE

Gear oil SAE 90 EP (API GL-5 SAE 80W/90) in an amount of 0.8 litres is used to lubricate the main gearbox of the rake.

- If necessary, unscrew the plug (1) and top up the oil to the required level. Tighten the plug.

OIL CHANGE

- Place the machine on a firm, level surface.
- Unscrew the filler cap (1) and control cap (2).
- Unscrew the drain plug (3) and drain

the oil into the previously prepared container.

- If the oil manufacturer recommends flushing the gearbox, this should be done in accordance with the oil manufacturer's instructions.

  Such notes may be listed on the oil package.

- Tighten the drain plug (3).
- Fill the gearbox with oil to the required level.

  The oil level should reach the lower edge of the inspection plug hole (2).

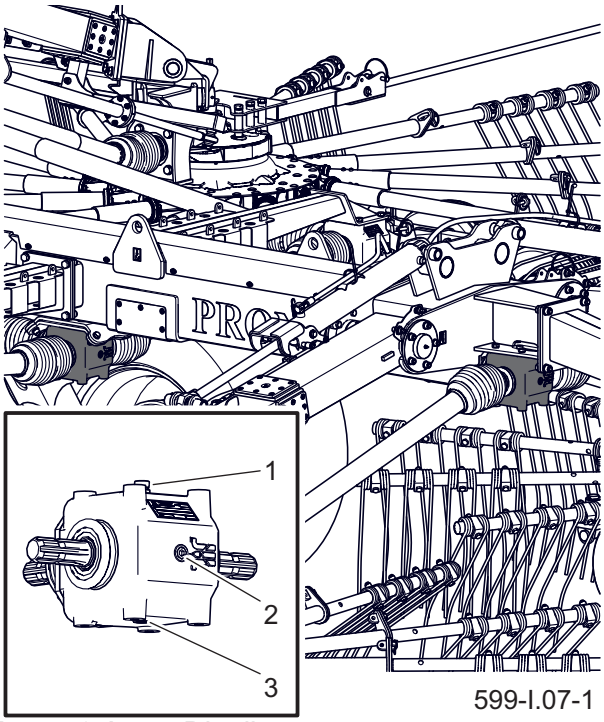

Figure 6.15 Distributor gears

(1) filler plug *(2) test plug*

(3) drain plug

DISTRIBUTOR GEAR

CHECKING THE OIL LEVEL

- Place the machine on a firm, level surface.
- Unscrew the control plug (2);

  The oil level should reach the lower edge of the inspection plug hole (2).

- If necessary, unscrew the plug (1) and top up the oil to the required level. Tighten the plug.

OIL CHANGE

- Place the machine on a firm, level surface.
- Unscrew the filler cap (1) and control

ADVICE

Gear oil SAE 90 EP (API GL-5 SAE 80W/90) is used to lubricate the distributor gears of the rake at a rate of 1.12 litres per gear.

CAUTION

The oil level in the gearboxes should be checked before every time the machine is started.
When checking the gearbox, the machine must be switched off and the oil cooled.
Do not pour too much oil. Exceeding the gearbox oil level can cause the gearbox temperature to rise excessively.
If a leak is noticed, the seal should be carefully inspected and the oil level checked. Operating the gearbox with too little or no oil can lead to permanent damage to its mechanisms.
Repair of the gearbox during the warranty period may only be carried out by specialised mechanical workshops.

cap (2).

- Unscrew the drain plug (3) and drain the oil into the previously prepared container.
- If the oil manufacturer recommends flushing the gearbox, this should be done in accordance with the oil manufacturer's instructions.

  Such notes may be listed on the oil package.

- Tighten the drain plug (3).
- Fill the gearbox with oil to the required level.

  The oil level should reach the lower edge of the check plug hole (2).

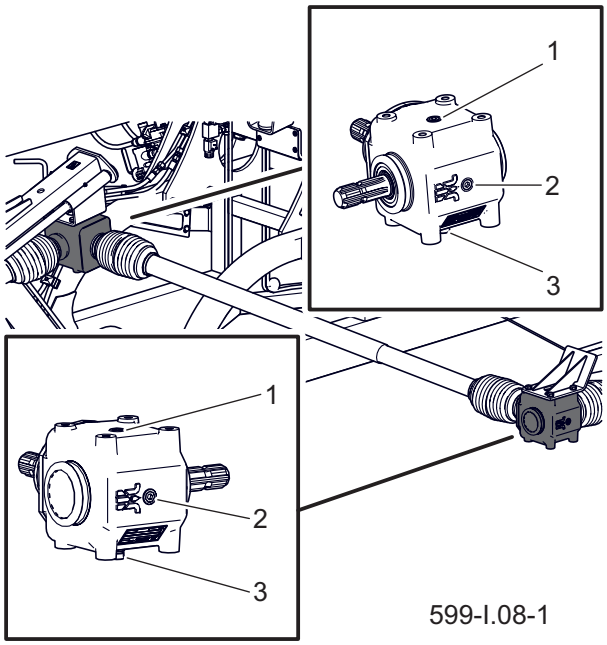

Figure 6.16 Bevel gearboxes

(1) filler plug *(2) test plug*

(3) drain plug

BEVEL GEARBOXES

CHECKING THE OIL LEVEL

- Place the machine on a firm, level surface.
- Unscrew the control plug (2);

  The oil level should reach the lower edge of the inspection plug hole (2).

- If necessary, unscrew the plug (1) and top up the oil to the required level. Tighten the plug.

OIL CHANGE

- Place the machine on a firm, level surface.
- Unscrew the filler cap (1) and control cap (2).
- Unscrew the drain plug (3) and drain the oil into the previously prepared container.
- If the oil manufacturer recommends flushing the gearbox, this should be done in accordance with the oil manufacturer's instructions.

  Such notes may be listed on the oil package.

ADVICE

Gear oil SAE 90 EP (API GL-5 SAE 80W/90) is used to lubricate the rake angle gears at a rate of 1.12 litres per gear.

- Tighten the drain plug (3).
- Fill the gearbox with oil to the required level.

The oil level should reach the lower edge of the inspection plug hole (2).

Used oil should be taken to an oil recycling or reconditioning facility.

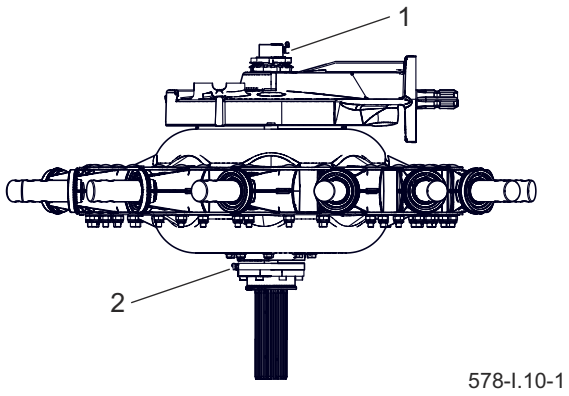

Figure 6.17 Carousel gearbox
(1) grease nipple for the adjusting screw
(2) grease nipple for phase change lever

CAROUSEL GEARBOXES

The rotary gears of the rake units are filled with grease and require no maintenance after the first filling. The operation of rotary gearboxes amounts to a general visual inspection and lubrication in accordance with section *Greasing*. If the gearbox is damaged, contact an authorised service centre for repair.

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6.20 LUBRICATION

Lubrication of the machine must be carried out according to a specific schedule or every time the machine is washed, regardless of the time of the last lubrication treatment. Lubrication points must be kept clean, as excess lubricant contributes to dirt settling. Lubrication of the machine must be carried out with commonly available tools such as hand, foot, air-powered lubricators, etc., which are filled with the recommended lubricant.

Lubrication points must be cleaned before lubrication. Check the grease nipples and replace missing parts if necessary. When finished, wipe off excess grease.

In addition, the drive shafts are lubricated in accordance with the shaft manufacturer's instruction manual.

Have the grease in the bearings of the driving axle hubs replaced by a specialised service centre with the appropriate tools. As recommended by the manufacturer of the driving axle, the entire hub must be dismantled, the bearings and the individual sealing rings removed. After thorough washing and visual inspection, install the lubricated components. If necessary, bearings and seals should be replaced with new ones. Lubrication of the running axle bearings should be carried out at least once every 2 years or after 50,000 km. In the case of intensive use, these operations should be carried out more frequently.

DANGER

Before starting work, switch off the tractor engine, remove the ignition key and brake the tractor with the parking brake. Secure the tractor against unauthorised access.

CAUTION

Dispose of empty grease or oil containers in accordance with the lubricant manufacturer's recommendations.

ADVICE

During the use of the machine, the user is obliged to follow the lubrication instructions according to the schedule set out. Excess lubricant will cause additional dirt to be deposited on the areas that need lubrication, so it is essential to keep the various machine components clean.

Table 6.5. Lubrication schedule

ITEM	Lubrication point	Number of lubrication points	Type of grease (Table 5.6)	Frequency
1	Hub bearings	2	A	24M
2	Spreader shaft sleeve	2	A	3M
3	Handbrake mechanism	1	A	6M
4	Axle of brake cable guide wheel	2	A	6M
5	Three-point frame horizontal pin	1	A	8H
6	Vertical pivot point of the three-point frame	1	A	8H
7	Front arm shaft pivot	4	A	60H
8	Front arm actuator pin	4	A	8H
9	Drive shaft spline	2	A	20H
10	Suspension arm pivot	24	A	60H
11	Suspension arm axle	12	A	60H
12	Suspension pin for the rake unit	8	A	60H
13	Spring pin	4	A	60H
14	Guide slide	4	A	60H
15	Front arm extension actuator pin	4	A	60H
16	Rear arm extension actuator pin	4	A	60H
17	Sliding plane of the extension arms	32	A	60H
18	Main gearbox cross member	1	A	60H
19	Rear arm pin	4	A	60H
21	Adjustment screw (thread)	4	A	60H
22	Guide bushing for running gear	4	A	60H
23	Adjustment screw (operating phase change lever)	4	A	60H
26	Telescopic PTO shafts *	*	*	*
27	Angular gearbox **	5	B	500H
28	Main gearbox **	5	B	500H
29	Carousel gearboxes ***	***	***	***
30				

H - hour | D - day | M - month | PU - each time before use
** For detailed information on operation and maintenance, please refer to the shaft manufacturer's operating instructions.*
*** First replacement after 50 hours of operation*
**** Gearbox is pre-filled with GADUS S2 V220AD 2 grease, after the first filling the gearbox requires no maintenance*

Table 6.6. Lubricants

ITEM	Symbol	Description
1	A	general purpose solid lubricant (lithium, calcium),
2	B	solid lubricant for heavily loaded parts with MoS_2 or graphite additives
3	C	anti-corrosion spray
4	D	ordinary machine oil, silicone spray lubricant
5	E	Gear oil SAE 90EP (80W90 GL-5)

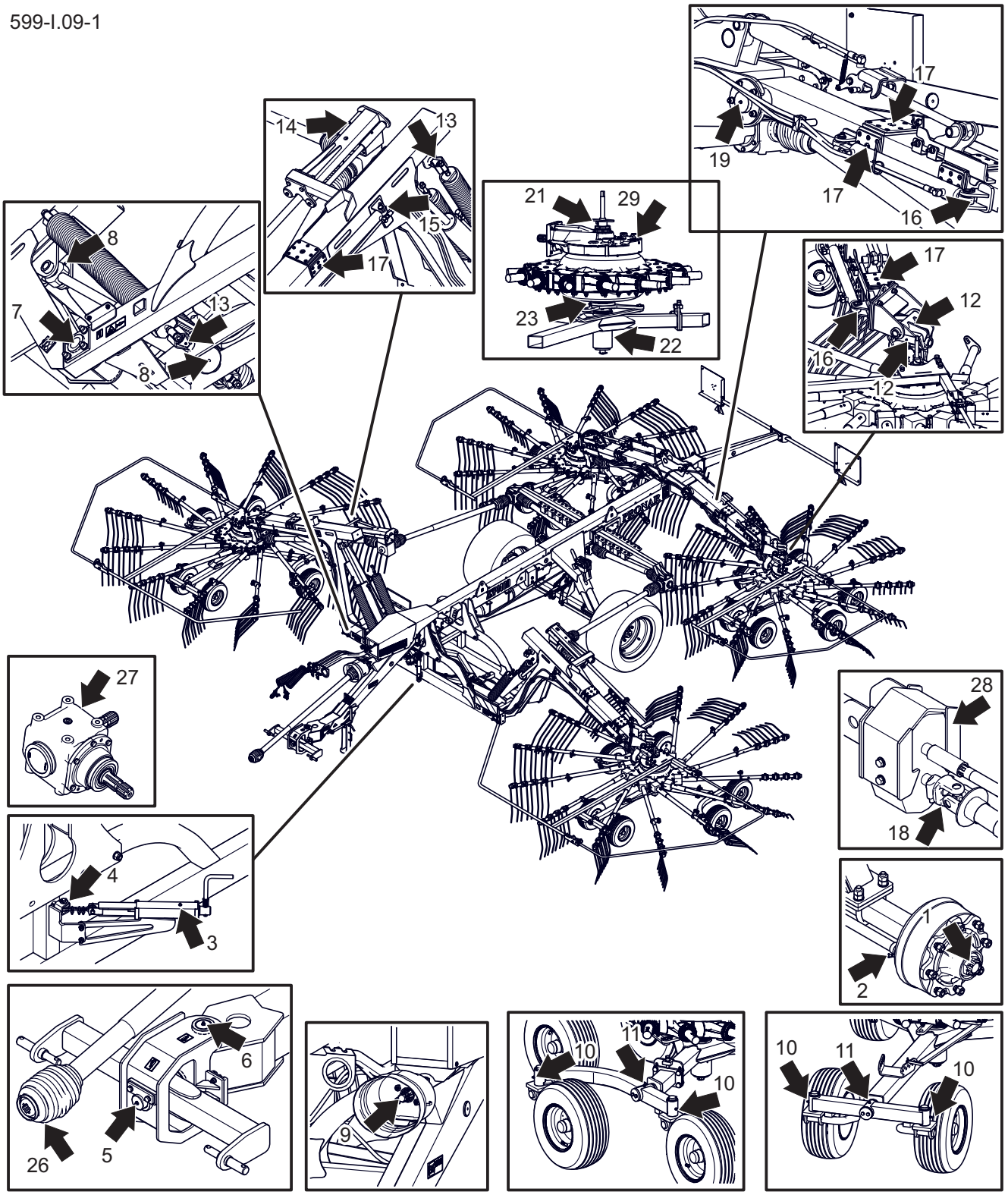

Figure 6.18 Lubrication points on the rake

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6.21 INSPECTION OF BOLTED CONNECTIONS

Each time before using the machine and during maintenance and repair work, check the tightness of all screw connections. If there is any play in bolted connections, the bolted connection should be tightened to the correct torque (table *Tightening torques for bolted connections*), unless other tightening parameters are specified. The recommended torques apply to unlubricated steel screws.

Table 6.7. Tightening torque

Thread	Tightening torque		
	5.8(*)	**8.8**(*)	**10.9**(*)
M8	18	25	36
M10	37	49	72
M12	64	85	125
M14	100	135	200
M16	160	210	310
M20	300	425	610
M24	530	730	1,050
M27	820	1,150	1,650
M30	1,050	1,450	2,100

(*) - Strength class in accordance with DIN ISO 898

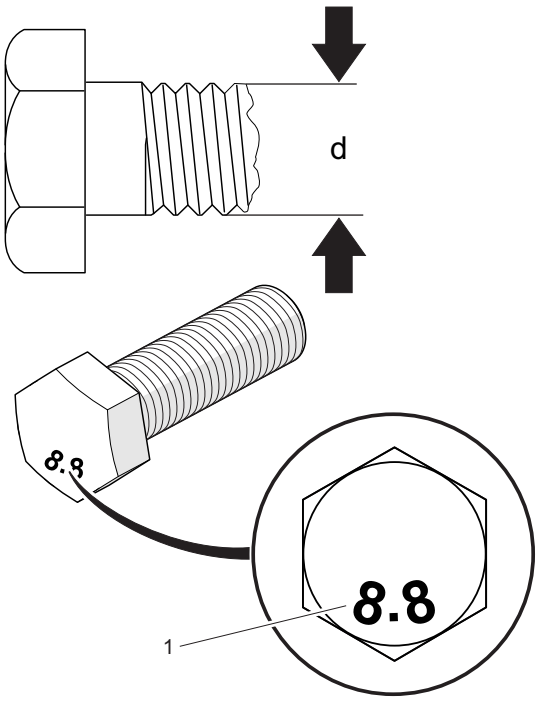

Figure 6.19 Screw with metric thread.
(1) Strength class (d) Thread diameter

6.22 DEFECTS AND HOW TO RECTIFY THEM

Table 6.8. Defects and how to rectify them

Defects	Possible cause	Solution
Excessive vibration during operation	Damaged PTO shaft	Check the shafts, if need to be replaced
	Defective rake unit gearbox	Have the repair carried out by a service centre
Excessive heating of the gearbox	Incorrect oil level.	Check oil level and top up cavities.
	Incorrect oil type.	Change the oil to that recommended by the manufacturer.
	Damaged bearings.	Have the repair carried out by a service centre
Loud gearbox operation	No oil in the gearbox	Fill up with oil according to the operating instructions
	Incorrectly adjusted (shortened) shaft	Have the repair carried out by a service centre
Leakage from the gearbox	System leakage	Check seals, check bolt tightness and lubricant level.
Stopping of the machine drives during raking	Defective rake unit gearbox	Have the repair carried out by a service centre
	Damaged bevel gearbox	Replace or repair by the service
The rake arm does not raise or lower	Incorrectly connected or defective couplings	Check quick couplings and method of connection
	Locked latch of the rear arm cylinders	Unlock the latch by extending the rear arm extension cylinders
	Defective tractor hydraulic system	Check the condition of the tractor's hydraulic system
Leaving some forage behind (rakes inaccurately)	Tractor PTO speed too low	Maintain correct, constant PTO speed
	Incorrect tilt of the rake unit	Position the raking units horizontally or with a minimal forward tilt
	Worn or missing spring tines	Fit or replace spring tines
	Incorrect rake height	Set according to chapter *Setting the rake height*.
Damage to spring tines	Too low an arm position for the raking units	Set according to chapter *Setting the rake height*.

Problem with starting the machine	Brake system lines not connected	Connect the brake lines (applicable to pneumatic systems)
	Parking brake applied	Release the parking brake
	Damaged connection lines of the pneumatic system	Replace
	Leaky joints	Tighten, replace washers or seal sets, replace wires
	Defective control valve or brake force regulator	Check valve, repair or replace
Noise in the driving axle hub	Excessive bearing play	Check play and adjust if necessary
	Damaged bearings	Replace bearings
	Damaged hub components	Replace
Low efficiency of the braking system	Pressure in the system too low	Check the pressure on the tractor's pressure gauge, wait for the compressor to fill the tank to the required pressure. Defective air compressor on the tractor. Repair or replace. Defective brake valve on the tractor. Repair or replace. Leaking installation. Check installations for leaks
Excessive heating of the axle hub of the travel axle	Service or parking brake incorrectly adjusted	Adjust the position of the spreader arms
	Worn brake pads	Replace the brake shoes
Incorrect hydraulic system operation.	Incorrect hydraulic oil viscosity.	Check the quality of the oil, make sure that the oils in both machines are of the same grade. Change the oil in the tractor and/or trailer if necessary
	Insufficient tractor hydraulic pump capacity, defective tractor hydraulic pump.	Check the hydraulic pump on the tractor.
	Damaged or contaminated actuator	Check the cylinder piston rod (bending, corrosion), check the cylinder for leaks (piston rod seal), repair or replace the cylinder if necessary.
	Damaged hydraulic lines	Check and make sure that the hydraulic hoses are tight, not kinked and properly tightened. Replace or tighten as necessary.

Malfunction of the remote control	Damaged electrical wiring	Replace the wires
	Electrical wiring not connected	Connect the wires
	Defective remote control	Replace the remote control
	Incorrect supply voltage system	Check the voltage at the tractor's power socket. Repair the tractor socket or circuit

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CHAPTER 7

TECHNICAL SUPPORT

7.1 WHEEL ASSEMBLY AND REMOVAL

WHEEL DISMANTLING

- Immobilise the machine with the parking brake.
- Locking chocks must be placed under the wheel opposite the wheel to be removed.
- Ensure that the machine is properly secured and does not roll away during wheel removal.
- Loosen the wheel nuts according to the order shown in the diagram opposite.
- Put the jack and raise the machine to such a height that the wheel to be replaced does not rest on the ground. The lift used should have an adequate load capacity and should be technically sound. The lift must be placed on a level, hard surface that will prevent it from caving in or slipping during operation. Where necessary, use suitably sized sleepers to reduce the unit pressure of the jack base on the ground to prevent sinking into the ground.
- Remove the wheel.

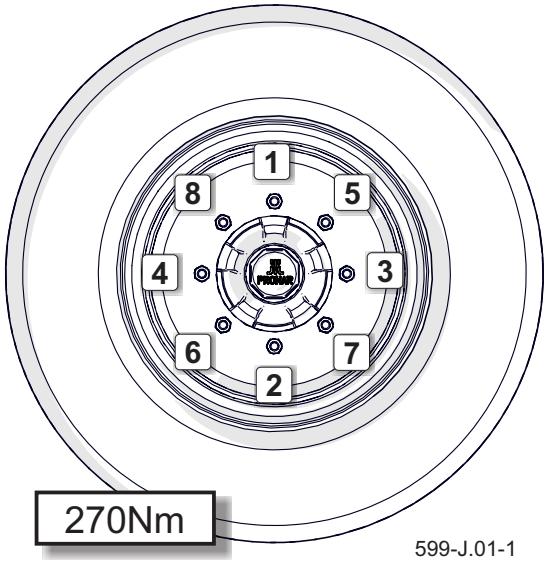

Figure 7.1 The sequence of unscrewing and tightening nuts

WHEEL ASSEMBLY

- Clean the running axle pins and nuts of debris.

  Do not lubricate the threads of the nut and pin.

- Check the condition of the pins and nuts, replace if necessary.
- Fit the wheel onto the hub, tighten the nuts so that the rim fits snugly onto the hub.
- Lower the machine, tighten the nuts to the recommended torque and in the correct sequence.

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7.2 PARKING BRAKE CABLE REPLACEMENT

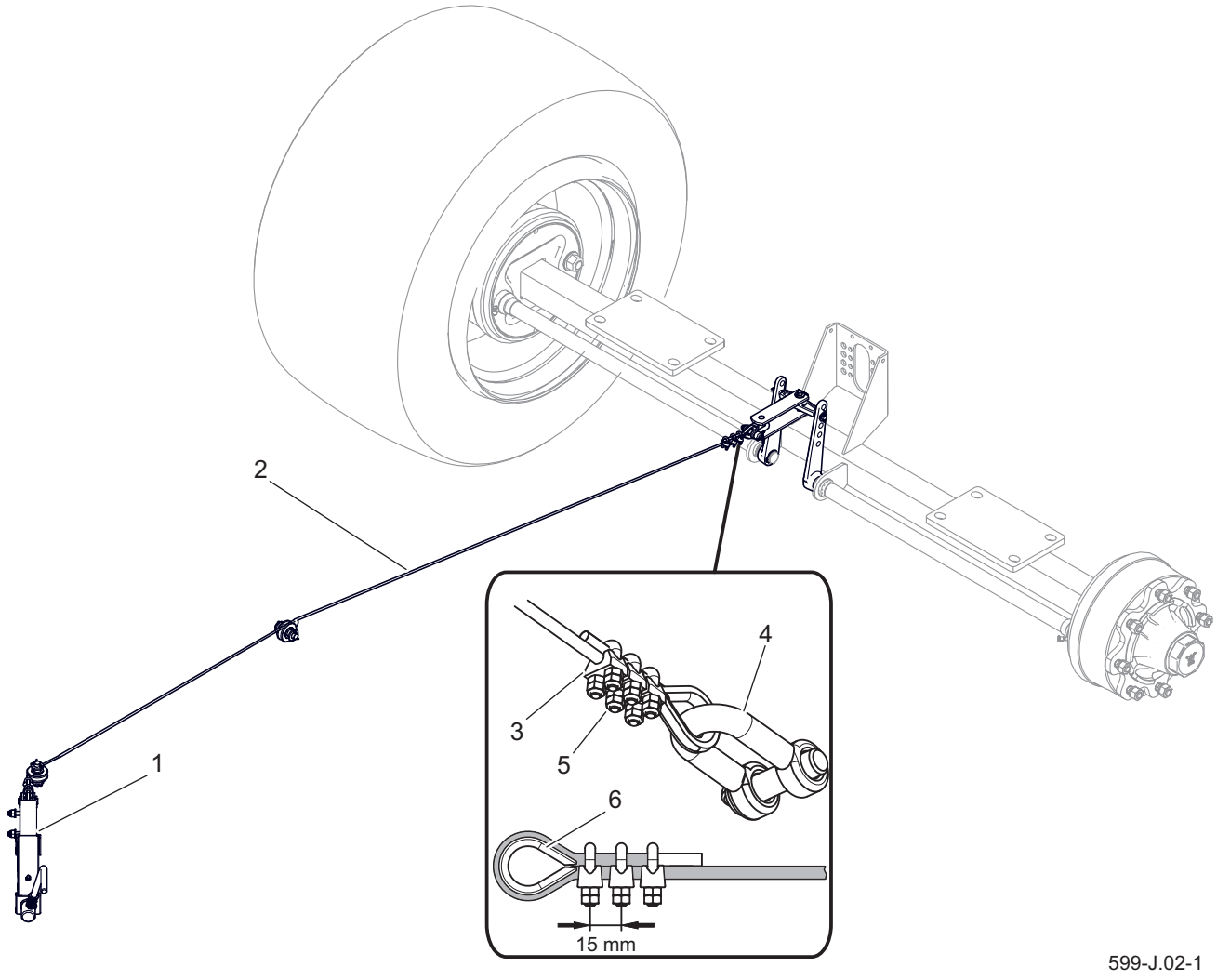

Figure 7.2 Parking brake cable replacement

(1) brake mechanism, (2) brake cable, (3) caliper, (4) shackle, (5) caliper nut, (6) turnbuckle

THE SCOPE OF ACTIVITIES

- Connect the machine to the tractor. Place the rake and tractor on level ground.
- Place chocks under one wheel of the machine.
- Remove the brake crank mechanism screw (1) to the maximum.
- Loosen the nuts (5) of the cable clamps (3).
- Remove the shackles (6), clamps and cable (2).
- Clean the parking brake components.
- Lubricate the crank mechanism (1) of the parking brake and the pins of the cable guide wheels.
- Place a shackle and bail clamps on one end of the line (2). Ensure that the clamps are fitted correctly.
- Fit one end of the cable, replace the

CAUTION

The jaws of the clamps must be on the side of the cable carrying the load.
Secure the ends of the cable with heat shrink tubing. The distance between the clamps should be 15 mm, with the first clamp placed as close as possible to the rubber band.

shackle pin and secure it with new pins.

- Pull the other end of the cable through the guide wheels and install the other end of the cable in a similar manner.
- Adjust cable tension.
- Tighten the nuts.
- Tension the cable with the crank mechanism and loosen again. If necessary, correct the tension of the brake cable.

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7.3 ADJUSTING THE PLAY OF THE RUNNING-AXLE BEARINGS

CAUTION

Bearing play adjustment can only be carried out when the machine is connected to the tractor.

THE SCOPE OF ACTIVITIES

- Prepare the tractor and machine for adjustment operations.
- Remove the hub cover (1).
- Remove the pin (2) securing the crown nut (3).
- Tighten the crown nut to remove the play.

  The wheel should turn with slight resistance.

- Unscrew the nut (3) (no less than 1/3 turn) to overlap the nut groove closest to the hole in the running axle journal (the pin hole is marked with a black arrow in the drawing). The wheel should turn without excessive resistance.

  Do not overtighten the nut. Excessive pressure is not recommended due to the deterioration of the bearings.

- Secure the crown nut with a cotter pin and fit the hub cover (1).

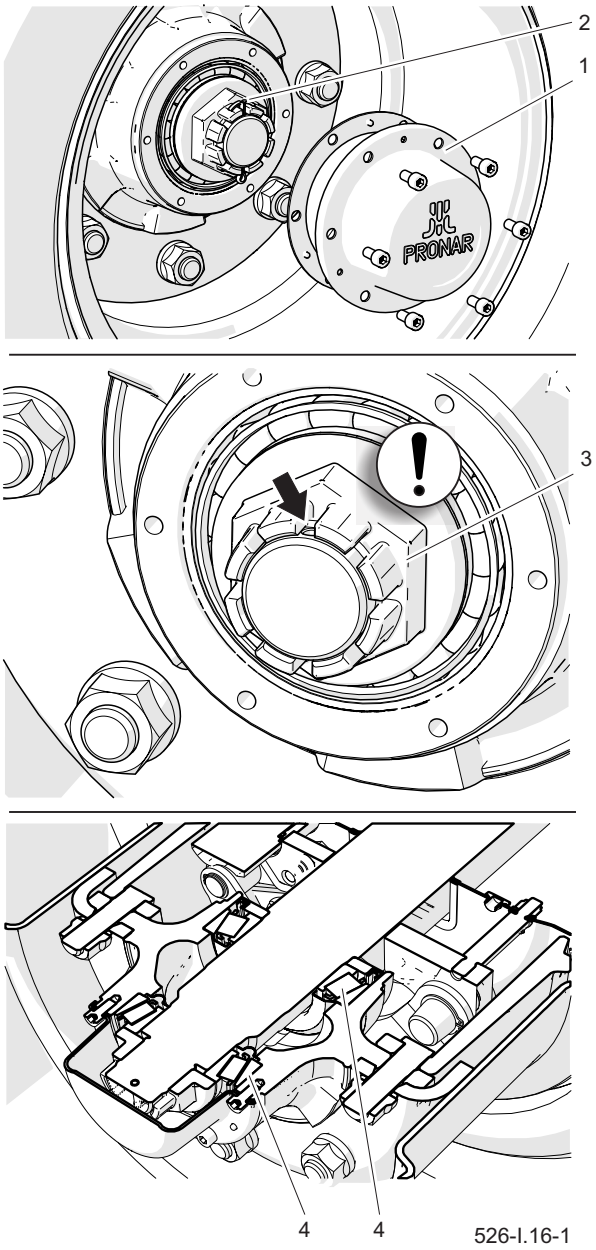

Figure 7.3 Bearing play adjustment rule

(1) hub cover *(2) pin*

(3) nut *(4) tapered roller bearing*

- Tap the hub gently with a rubber or wooden mallet.

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7.4 BRAKE ADJUSTMENT

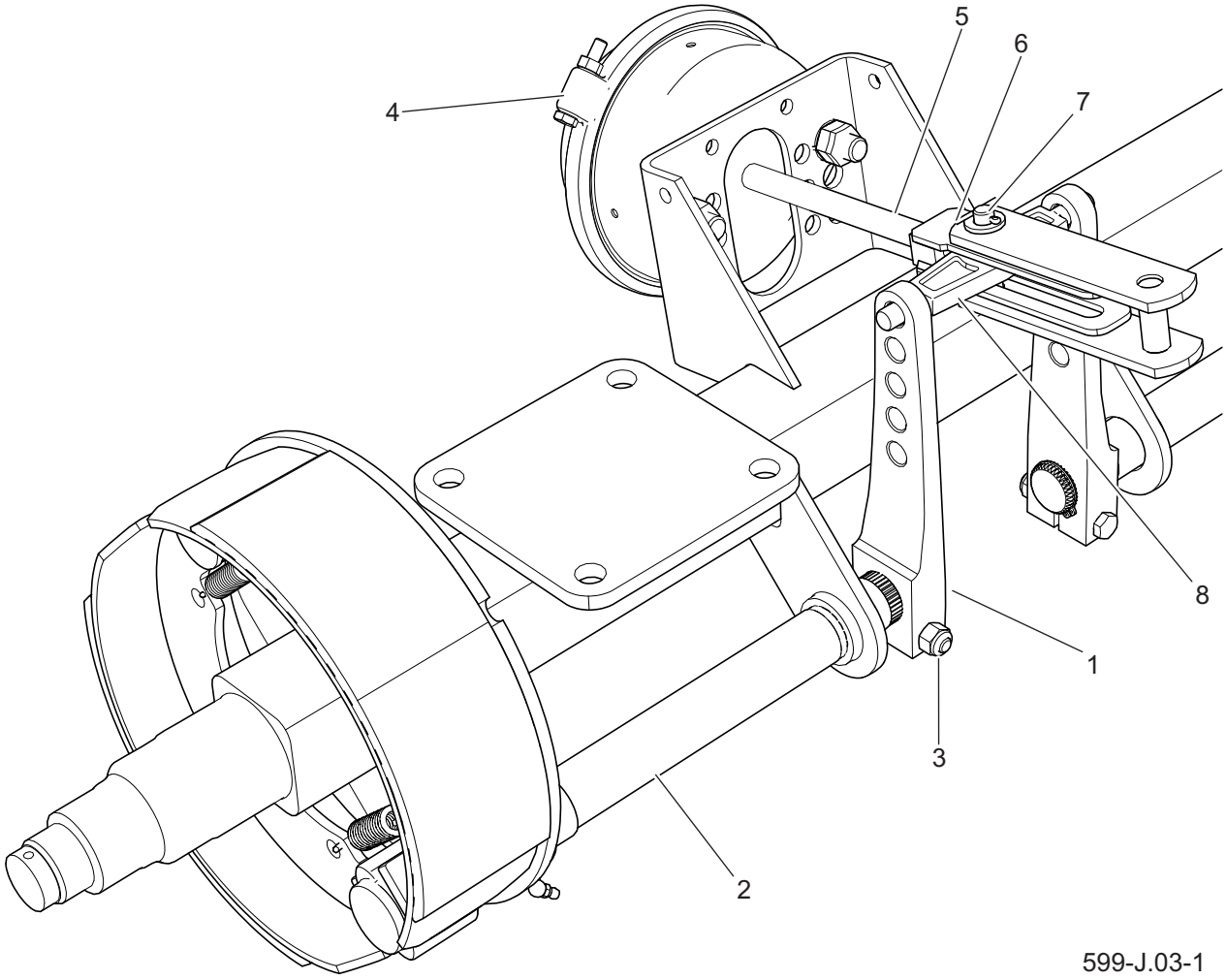

Figure 7.4 Construction of the air brake on the running axle

(1) spreader arm *(2) spreader shaft* *(3) adjusting screw*
(4) pneumatic actuator *(5) actuator piston rod* *(6) actuator fork*
(7) actuator pin *(8) rocker arm*

ADVICE

The correct piston rod travel should be in the range 25-45 mm.

Significant wear of the brake shoe linings increases the piston rod travel of the brake actuator and reduces braking performance. During braking, the piston rod travel should be within the specified operating range and the angle between the piston rod (1) and the spreader arm (3) should be approximately 90°. The wheels of the machine must brake simultaneously.

The braking force also decreases when the angle of the brake cylinder piston rod (1), relative to the spreader arm (3), is not

appropriate. In order to achieve the optimum mechanical operating angle, the piston rod fork (5) must be mounted on the spreader arm (3) in such a way that the operating angle is approximately 90° at full braking.

The check consists of measuring the length of extension of each piston rod during braking at standstill. If the piston rod travel exceeds the maximum value (45mm), the system must be adjusted.

When removing the actuator fork (6), note or mark the original alignment of the rocker arm (8) to the spreader arms (1). The mounting position depends on the type of braking system and tyre size used on the machine, is selected by the manufacturer and cannot be changed.

CAUTION

The attachment positions of the brake actuator in the bracket holes and the actuator pin in the spreader arm are fixed by the manufacturer and cannot be changed.
Whenever removing a pin or actuator, it is advisable to mark the location of the original fixing.

CAUTION

An improperly adjusted brake can cause the shoes to rub against the drum, resulting in faster wear of the brake linings and/or overheating of the brake.

THE SCOPE OF ACTIVITIES

- Connect the machine to the tractor.
- Switch off the tractor engine and remove the keys from the ignition.
- Immobilise the tractor with the parking brake.
- Ensure that the rake is not braked.
- Secure the machine against rolling using wheel chocks.
- On the piston rod (1) - cylinder, mark with a dash (A) the position of maximum piston rod retraction when the machine brake is off.
- Press the brake pedal on the tractor, mark with a dash (B) the position of maximum piston rod extension.
- Measure the distance between the dashes (A) and (B). If the piston rod travel is not within the correct operating range (25-45mm), the spreader arm must be adjusted.
- Remove the actuator fork pin (7).
- Note or mark the original position of the orifice (8) in the holes of the spreader arms (3).
- Check that the piston rod of the actuator moves freely and within the full nominal range.
- Check that the actuator vents are not clogged with debris and that there is no water or ice inside (pneumatic actuator). Check that the actuator is fitted correctly.

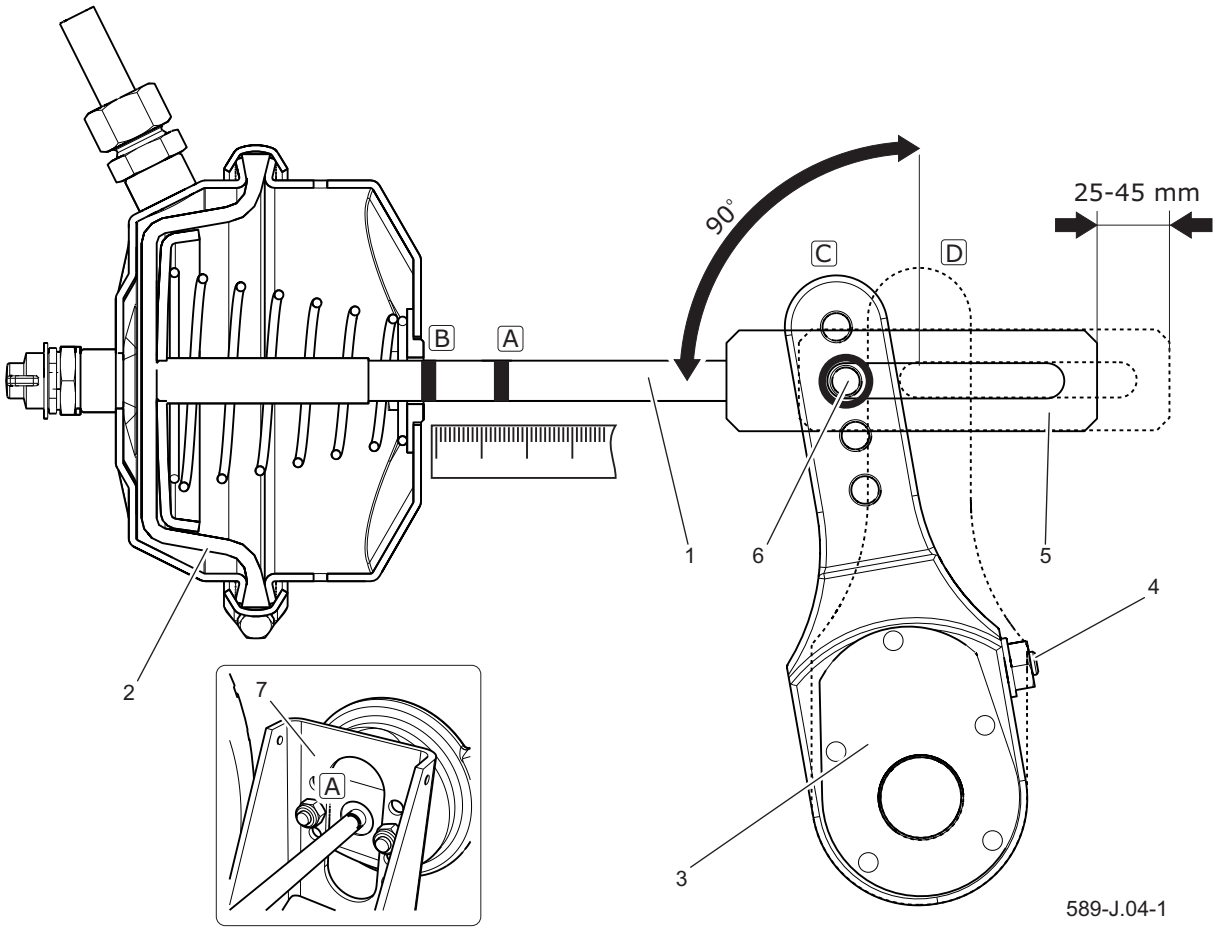

Figure 7.5 Air brake adjustment principle

(1) actuator piston rod *(2) actuator diaphragm* *(3) spreader arm*
(4) screw *(5) actuator fork* *(6) clevis pin*
(7) actuator bracket *(A) mark on piston rod in deceleration position*
(B) mark on piston rod in full braking position *(C) position of arm in deceleration position*
(D) position of arm in braking position

- Clean the actuator, defrost if necessary and remove the water through the blocked vents (pneumatic actuator). If damage is found, replace the actuator with a new one. When installing the actuator, maintain its original position relative to the bracket (7).
- Remove the arm and reposition to the correct position.

During adjustment, the diaphragm (2) must rest against the rear wall of the actuator.

- Fit the piston rod fork pin, washers and secure the pin with cotter pins.
- Wipe off the previous markings, and re-measure the piston rod travel.
- If the piston rod travel is not in the correct operating range, repeat the adjustment.

FUNCTIONAL CHECK

- After the adjustment has been completed, carry out a test drive.
- Perform several braking operations. Stop the machine and check the temperature of the brake drums.
- If any drum is too hot, correct the brake adjustment and test drive again.

CAUTION

Do not unscrew the diaphragm actuator. The membrane is glued in and can lose its tightness.

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7.5 OPERATION OF ELECTRICAL INSTALLATION AND WARNING ELEMENTS

Work on repairing, replacing or reconditioning electrical components shall be carried out by specialised workshops that have the technology and qualifications to carry out this type of work.

It is the user's responsibility only to carry out a technical check of the electrical installation and the reflectors.

THE SCOPE OF ACTIVITIES

- Connect the machine to the carrier with the appropriate connection cable.
- Ensure that the connection cable is in good working order. Check the connection sockets on the carrier and on the machine.
- Check the completeness, technical condition and correct functioning of the machine lighting.
- Control the various functions of the machine using the remote control.

CAUTION

Driving with a faulty lighting system is prohibited. Damaged lamps must be replaced immediately with new lamps before driving. Lost or damaged reflectors must be replaced with new ones.
Make sure all lights and reflectors are clean before ride.

ADVICE

The light source in the lamps is an LED and, in the event of damage, can only be replaced as a complete lamp without the possibility of repair or reconditioning.

- Check the completeness of all reflectors.
- Check that the triangle plate holder of slow-moving vehicles is fitted correctly.
- Ensure that a warning reflective triangle is fitted to the tractor before driving on a public road.

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7.6 CONSUMABLES

HYDRAULIC OIL

Absolutely observe the principle that the oil in the machine's hydraulic system and in the tractor's hydraulic system should be of the same grade. When using different types of oil, make sure that the two hydraulic agents can be mixed together. The use of different grades of oil can cause damage to the machine or agricultural tractor. On the new machine, the system is filled with Agrol U Lotos hydraulic oil.

If you need to change the hydraulic oil for another one, read the oil manufacturer's recommendations very carefully. If he recommends flushing the installation with a suitable preparation, follow these recommendations. Ensure that the chemicals used for this purpose do not have an aggressive effect on the materials of the hydraulic system. During normal operation of the machine, it is not necessary to change the hydraulic oil, but if this is necessary, it should be entrusted to a specialist service centre.

The oil used is not classified as a hazardous substance due to its composition; however, prolonged exposure to skin or eyes may cause irritation. In the event of contact of oil with skin, wash the area of contact with water and soap. Do not use organic solvents (petrol, paraffin). Remove soiled clothing to prevent oil getting on the skin. If the oil gets into your eyes, rinse them with very large amounts of water and if irritation occurs, contact your doctor. Hydraulic oil does not have a harmful effect on the respiratory tract under normal conditions. The danger is only present when the oil is highly atomised (oil mist), or in the event of a fire, during which poisonous compounds can be released. If oil ignites, extinguish with carbon dioxide, foam or

Table 7.1. Characteristics of Agrol U oil

ITEM	Name	Unit	
1	Quality class	-	GL-4
2	Kinematic viscosity at 100°C	mm^2/s	10.0-11.5
3	Viscosity index	-	> 95
4	Flow temperature	°C	< - 24
5	Flash point	°C	230

vapour extinguisher Do not use water to extinguish an oil fire.

LUBRICANTS

Lithium lubricants with molybdenum disulphide (MoS_2) or graphite are recommended for highly loaded parts. For less heavily loaded components, it is recommended to use general-purpose machine lubricants that contain anti-corrosion additives and are highly resistant to water washout. Similar properties should characterise aerosol formulations (silicone lubricants, anti-corrosive agents).

Before using lubricants, read the information leaflet for your chosen product. In particular, safety rules and how to handle the lubricant in question and how to dispose of waste (used containers, contaminated rags, etc.) are important. The information leaflet (product data sheet) should be kept with the lubricant.

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TYRE SYSTEM

SECTION 7

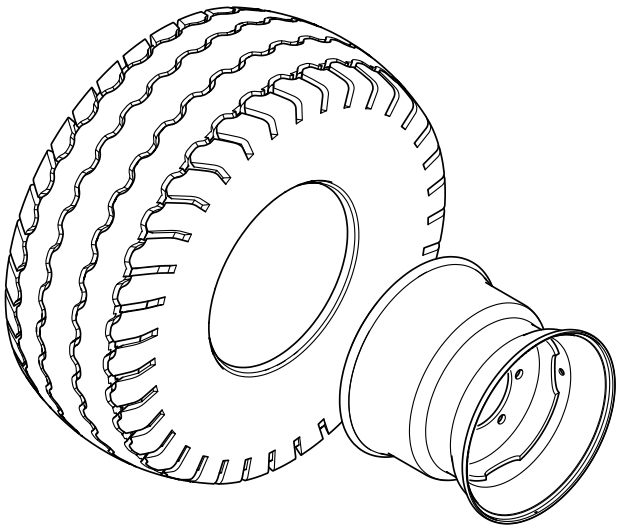

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Table 7.1 Machine tyres

Item	Tyre dimensions	Wheel rim size	Pressure in tyres
1	500 / 45- R22.5 142A8 FL09 16PR	16.00 x 22.5;	320 kPa
2			