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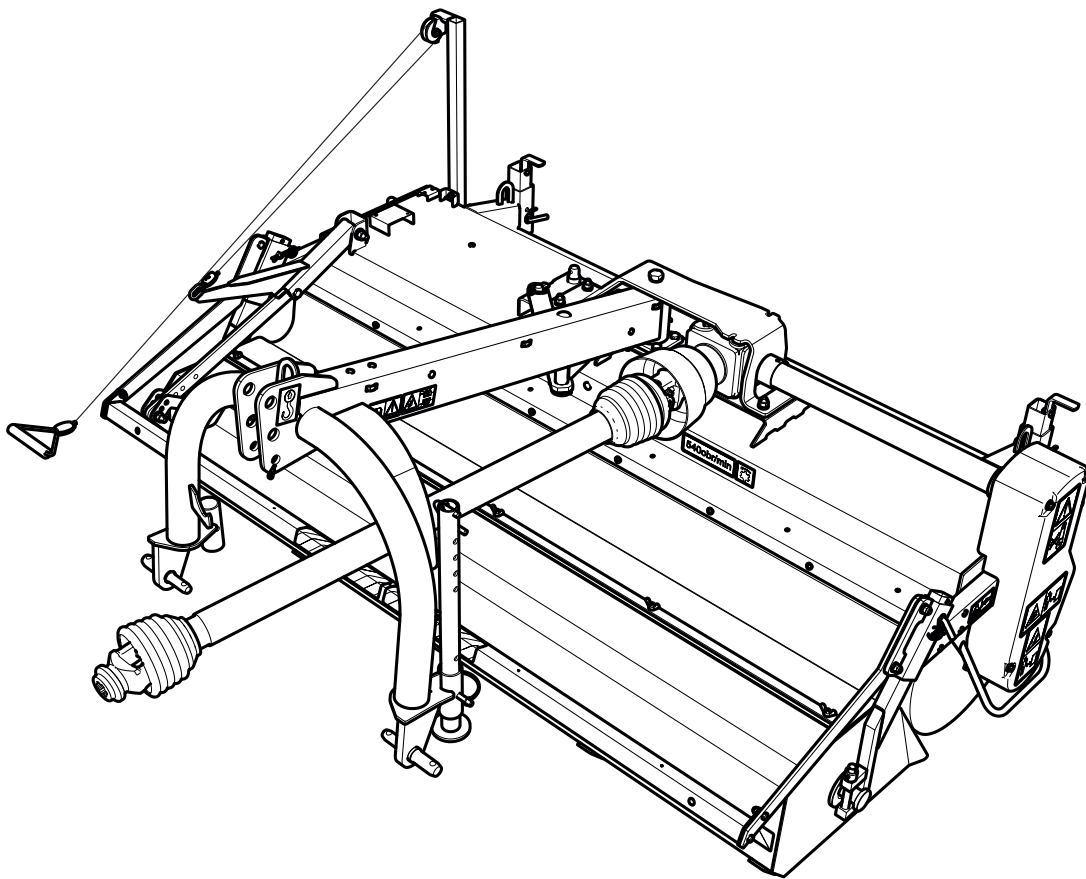
www.pronar.pl

OPERATOR MANUAL

MOUNTED SWEEPER

PRONAR ZM-2000M

TRANSLATION OF THE ORIGINAL COPY OF THE MANUAL



KEEP FOR FUTURE REFERENCE

EDITION: 1A.02.2020

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INTRODUCTION

INTRODUCTION

Information in this document is current at date of publication. As a result of improvements, some numerical values and illustrations in this publication may not correspond to the actual specification of the machine supplied to the user. 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.

It is recommended that the serial numbers of the machine and major subassemblies are inscribed in the spaces below after purchase of the machine.

U.01.1.PL

Machine serial number

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SYMBOLS APPEARING IN THIS OPERATOR MANUAL

DANGER

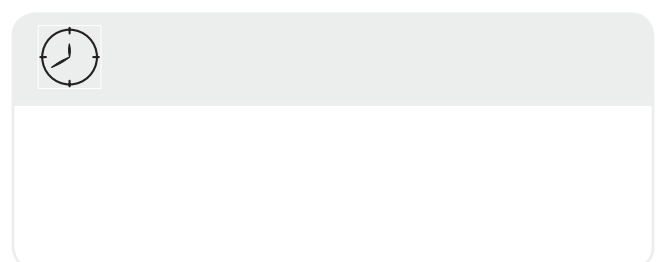
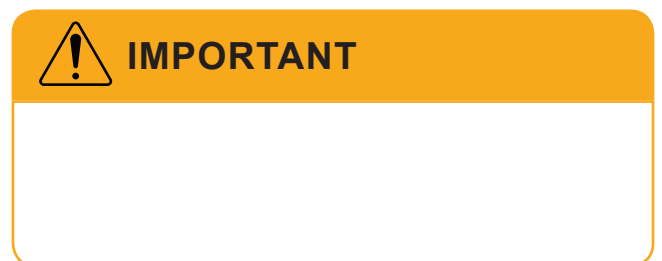
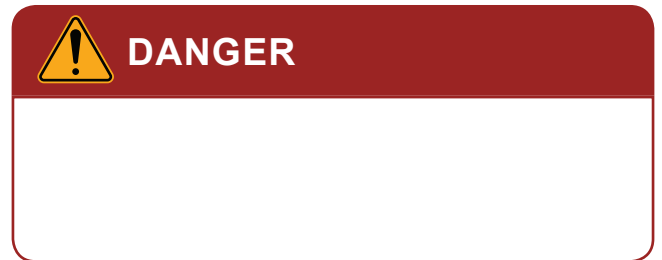
Information, descriptions of danger and precautions as well as recommendations and prohibitions associated with the safety of use are marked in the text with the sign **DANGER**. Failure to observe the instructions may endanger the machine operator's or other person's health or life.

ATTENTION
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.



DIRECTIONS USED IN THIS OPERATOR MANUAL

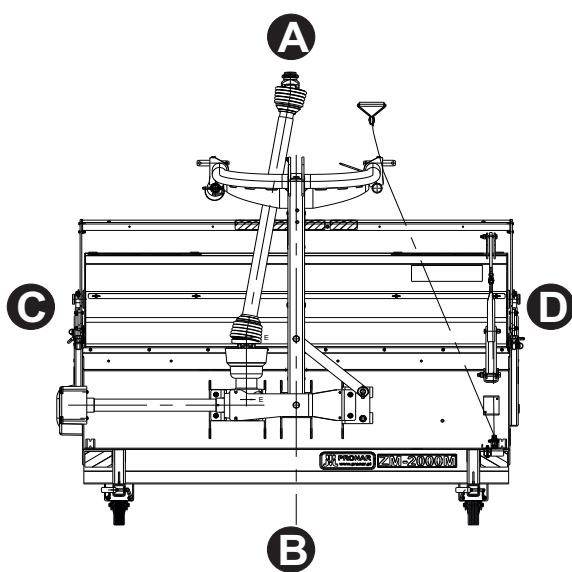
Left side – side to the left hand of the operator facing in the direction of machine's forward travel.

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).

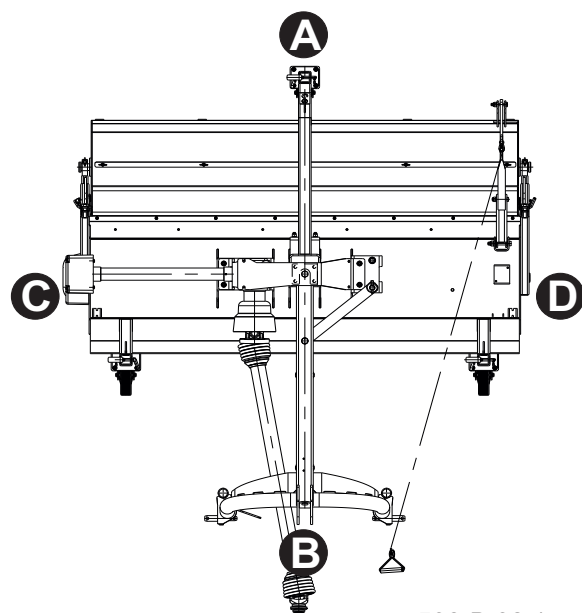
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Figure 1.1 Directions used with reference to the machine - sweeper hitched to the rear of the carrier vehicle

(A) front
(B) rear
(C) left side,
(D) right side



598-B.02.1

Figure 1.2 Directions used with reference to the machine - sweeper hitched to the front of the carrier vehicle

(A) front
(B) rear
(C) left side,
(D) right side



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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:	Tractor attached sweeper
Type:	ZM-2000M
Model:	—
Serial number:	
Commercial name:	Tractor attached sweeper PRONAR ZM-2000M

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 2020-07-24

Place and date

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**Z-CIA DYREKTORA
d/s technicznych
członek zarządu**

Roman Ciechanik

*Full name of the empowered person
position, signature*

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SECTION 1

BASIC INFORMATION

1.1 IDENTIFICATION

ZM-2000M mounted sweeper is marked with a nameplate placed at the rear on the machine frame at the right bracket of the jockey wheel (1.1). When purchasing the machine, make sure that the serial numbers on the machine are the same as entered in the *Warranty Book*, in sales documents and in the *Operator Manual*.

The meaning of individual items of the nameplate – figure (1.1) are presented in the table below:

- A - machine name,
- B - machine type/symbol
- C – serial number,
- D – year of manufacture,
- E – gross weight [kg],
- F - Quality Control stamp,
- G – machine name, name extension

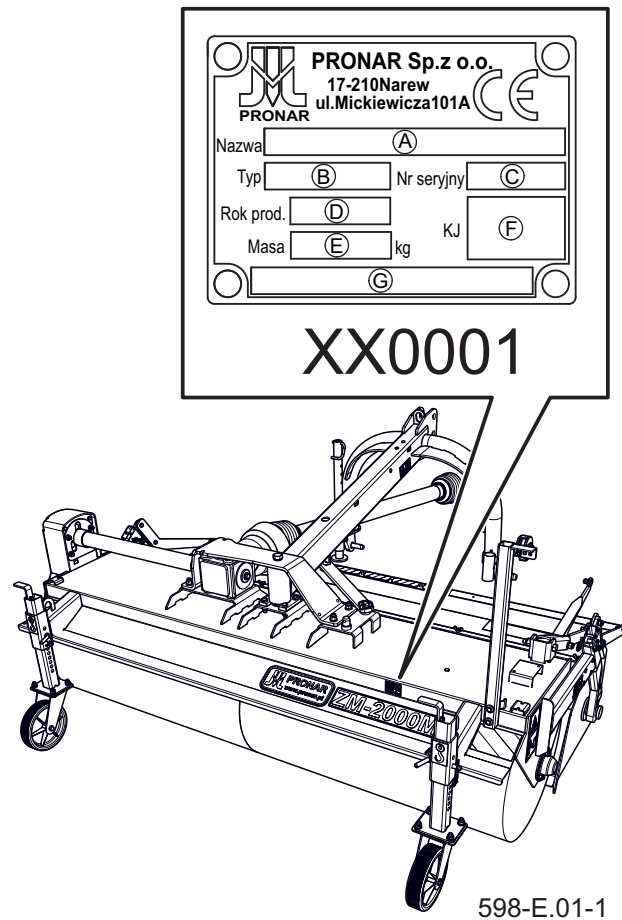


Figure 1.1 Location of the nameplate.

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1.2 INTENDED USE

ZM-2000M mounted sweeper is used for keeping clean access roads, squares, parking spaces, squares, extensive warehouse areas, external surroundings of buildings with paved surfaces made of asphalt, concrete paving blocks, concrete. The sweeper may be used by road maintenance services for cleaning the roadbed prior to application of asphalt layer on renovated road sections. Without the waste container, the sweeper can be used for sweeping dirt or a thin, fresh layer of snow to the right or left without actually collecting the swept materials. Sweeper can be mounted on tractors (carrier vehicles) that meet the requirements presented in Table 1.1.

Using it as intended also involves all actions connected with the safe and proper operation and maintenance of the machine.

Due to the above, the user is obliged to:

- carefully read the OPERATOR MANUAL and comply with its recommendations,
- understand the machine's operating principle and how to operate it safely and correctly,
- comply with general safety regulations while working,
- prevent accidents,



IMPORTANT

The machine must not be used for purposes other than those for which it is intended, in particular for:

- transporting people, animals or any items on the machine
- reloading work

- comply with road traffic regulations.

The machine may only be used by persons, who:

- are familiar with this publication and with the carrier vehicle's operator manual,
- have been trained in machine operation and safe working conditions,
- have the required authorisation to drive the vehicle and are familiar with the road traffic regulations and transport regulations.

Table 1.1. Requirements for carrier vehicle (agricultural tractor).

Contents	Unit	Requirements
Linkage: Three point linkage		I or II cat. according to ISO 730-1, with a "floating" position
Rear power take-off shaft (PTO) Type Max engine RPM	- rpm	Type 1 (1 3/8") acc. to ISO 500, 6 splines 540
Minimum carrier vehicle power	kW (KM)	35 (25)
Electrical system (for spray system and lighting system) Lighting system socket Electrical system voltage	- V	7-pole compliant with ISO 1724 12
Hydraulic system (for side brush) Nominal pressure Type of oil Number and type of hydraulic connectors System performance	MPa	16 – 20* hydraulic, HL32 sockets 12.5 ISO 7241-1 Type A of one hydraulic section (for continuous operation) max 60 l/min
Other requirements Beacon light		Beacon light (orange light)

*- optimum values are given; declared performance and durability of the machine are not guaranteed for other values.

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1.3 EQUIPMENT

Possible machine configurations:

- 589N-00000000 - rear-hitched, with a waste container;
- 589N-00000000-01 - front-hitched, with a waste container;
- 589N-00000000-02 - rear-hitched, without a waste container, turning range +/- 15° ;
- 589N-00000000-03 - front-hitched, without a waste container, turning range +/- 15°

The standard equipment of the machine includes:

- sweeper with mechanical turning system in the configuration version as above
- Operator Manual
- Warranty Book
- roller brush to choose from:
 - very hard brush (PPN 2x3 + wire 0.5)
 - hard brush (PPN 1.6 + wire 0.5)
 - medium brush (PPN 2x3)
 - soft brush (PPN 1.6)

- PTO shaft 71R4121CE007WR7 – for the sweeper without a waste container

Equipment versions:

- right side brush;
- sprinkler system with or without side brush
- clearance lamps
- clearance and driving lamps
- PTO shaft 71R4121CE007007 – for the sweeper with a waste container;
- warning sign bracket – for the sweeper with a waste container;
- reinforced wheels – for the sweeper with a waste container;

Recommended PTO shaft for connection with tractor: B&P 7G4R121CE007WR7 always included with the sweeper without a waste container, for the sweeper version with a waste container: B&P 7G4R121CE007007 (option).

E.2.6.598.03.1.EN

1.4 TERMS & CONDITIONS OF WARRANTY

PRONAR Sp. z o.o. Narew guarantees the reliable operation of the machine when it is used according to its intended purpose as described in the *Operator Manual*. Defects discovered during the warranty period will be removed by the Warranty Service. The repair period is specified in the *Warranty Book*.

The warranty does not cover those parts and sub-assemblies of the machine which are subject to wear in normal usage conditions, regardless of the warranty period. The warranty service only applies to such cases as: mechanical damage which is not the user's fault, factory defects of parts, etc.

In the event of damage arising from:

- mechanical damage which is the user's fault, damage caused by road accidents,
- incorrect use, adjustment or maintenance, use of the machine for purposes other than those for which it is intended,
- use of damaged machine,
- repairs carried out by unauthorised

persons, repairs carried out improperly,

- making unauthorised alterations to machine design,

the user will lose the right to warranty service.

The user is obliged to immediately report all noticed damage, regardless of whether the damage is covered by the warranty or not. For detailed Terms & Conditions of Warranty, please refer to the *Warranty Book* attached to each newly purchased machine.

TIP

Demand that the seller carefully and accurately fills out the **Warranty Book** and warranty repair coupons. A missing date of purchase or sale point stamp may make the user ineligible for any warranty repair or refund.

Do NOT attempt to modify the machine without the written consent of the Manufacturer. In particular, do NOT weld, drill holes in, cut or heat the main structural elements of the machine, which have a direct impact on the machine operation safety.

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1.5 TRANSPORT

The machine is prepared for sale completely assembled and does not require packing. Packing is only required for the machine's technical documentation and any extra accessories (e.g. wiring harness).

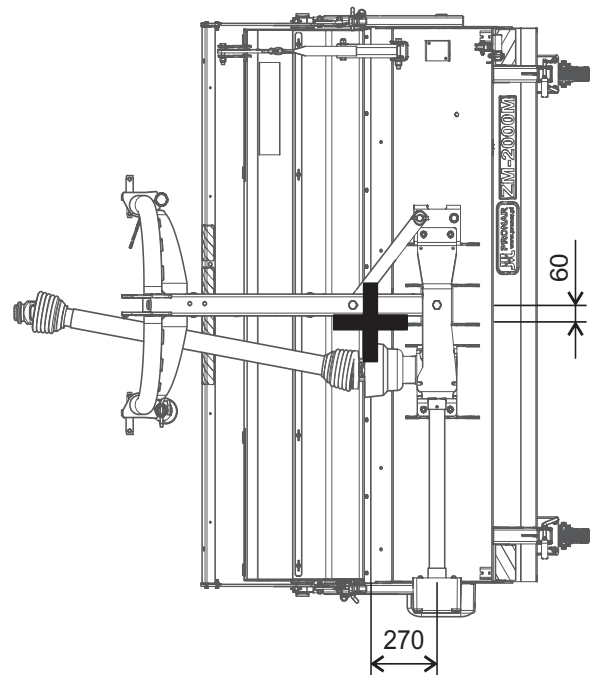
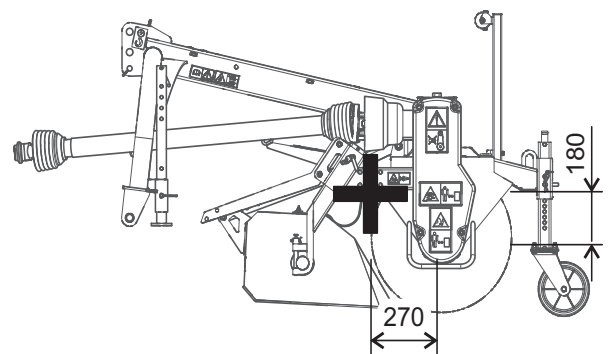
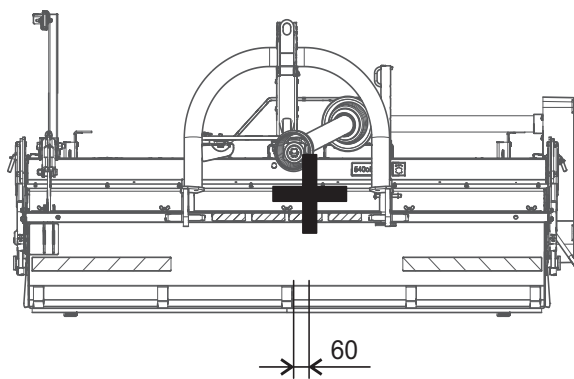
Delivery is either by transport on a vehicle or independently. Transport of the machine is permissible connected to a carrier vehicle provided the vehicle's driver



IMPORTANT

When transporting the machine independently, the user must carefully read this Operator Manual and observe all its instructions.

When being transported on a motor vehicle the machine must be secured on the vehicle's platform in accordance with the transport safety requirements. The driver of the vehicle should use extreme caution while driving. This is due to the vehicle's centre of gravity shifting upwards when the machine is loaded.



598-E.02-1

Figure 1.2 Machine's centre of gravity



IMPORTANT

Do not attach slings and any kind of cargo fasteners to elements other than those intended for this purpose (do NOT attach to hydraulic system and electrical system components).

Persons must NOT be present in the manoeuvring zone when transferring the machine to another means of transport.

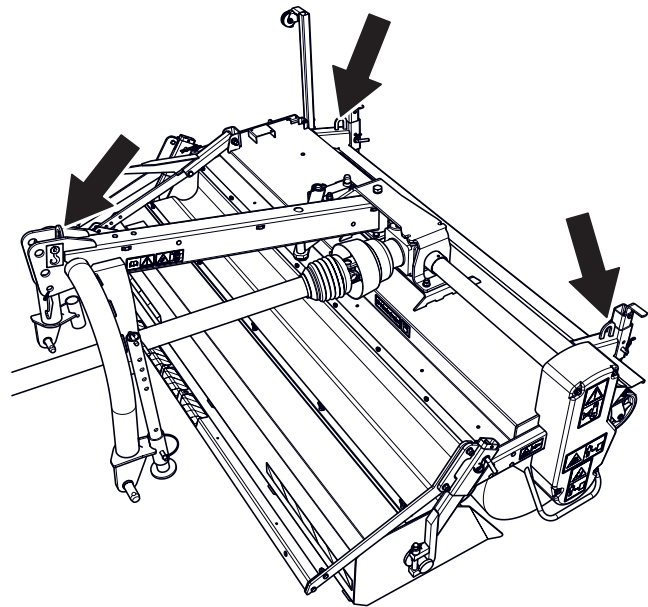
familiarises himself with the machine's Operator Manual and particularly with information concerning safety and principles of hitching and transport on public roads.

When loading and unloading the machine,

TIP

The machine must be set in park position during unloading with lifting equipment. Support leg should be lowered and secured with a pin.

follow the general health and safety regulations for reloading work. Persons operating reloading equipment must have the qualifications required to operate these machines. The machine should be attached to lifting equipment in places specially designed for this purpose and marked (Figure 1.3).



598-E.03-1

Figure 1.3 Location of transport lugs

The ZM-2000M sweeper should be firmly secured on the transport vehicle platform with belts or chains equipped with a tensioning mechanism. The fastening equipment used must have a valid safety certificate. Exercise due caution when lifting the machine. During reloading work, special care should be taken not to damage the paint coating.

E.2.6.598.05.1.EN

1.6 ENVIRONMENTAL RISK

A hydraulic oil leak constitutes a direct threat to the natural environment owing to its limited biodegradability. Maintenance and repair work which involves the risk of an oil leak should be performed in the rooms with oil resistant surface. In the event of oil leaking into the environment, first of all contain the source of the leak, and then collect the leaked oil using available means. Remaining oil should be collected using sorbents, or by mixing the oil with sand, sawdust or other absorbent materials. The oil contaminations, once gathered up, should be kept in a sealed, marked, hydrocarbon resistant container, and then passed on to the appropriate oil waste recycling centre. The container should be kept away from heat sources, flammable materials and food.



DANGER

Used hydraulic oil or gathered remains mixed with absorbent material should be stored in a precisely marked container. Do not use food packaging for this purpose.

Oil which has been used up or is unsuitable for further use owing to a loss of its properties should be stored in its original packaging in the conditions described above.



IMPORTANT

Waste oil should only be taken to the appropriate facility dealing with the re-use of this type of waste. Do NOT dispose of or pour oil into sewerage drains or water reservoirs.

TIP

The hydraulic system of the sweeper is filled with L-HL32 hydraulic oil.

E.1.1.586.06.1.EN

1.7 WITHDRAWAL FROM USE

Should you decide to withdraw the machine from use, comply with the regulations in force in the given country regarding withdrawal from use and recycling of machines withdrawn from use.

Before proceeding to dismantle equipment, oil shall be completely removed from hydraulic system and transmission. Locations of drain plugs and method for draining oil are described in Section 5.

When spare parts are changed, worn out or damaged parts should be taken to a collection point for recyclable raw materials. Used oil and also rubber and plastic elements should be taken to the appropriate facilities dealing with the recycling of this type of waste.



DANGER

During dismantling, use the appropriate tools, equipment (overhead crane, crane or hoist etc.) and use personal protection equipment, i.e. protective clothing, footwear, gloves and eye protection etc.

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SECTION 2

SAFETY ADVICE

2.1 SAFE USE

- Before using the machine, carefully read this Operator Manual, the Operator Manual of the PTO shaft and *Terms & Conditions of Warranty*. When operating the machine, follow all instructions in these documents.
- The machine may only be used by persons qualified to drive carrier vehicles (tractors) and trained in machine operation. Sweeper can be operated by a single person only.
- Careless and improper use and operation of the machine, and failure to comply with the instructions of this Operator Manual is dangerous to your health as well as health of bystanders.
- Be aware of the residual risk. Use caution when operating this machine and follow all relevant safety instructions.
- The machine must never be used by persons, who are not authorised to drive carrier vehicles (agricultural tractors), including children and people under the influence of alcohol



IMPORTANT

If the information in this Operator Manual is difficult to understand, contact the seller who runs the authorised technical service on behalf of the Manufacturer, or contact the Manufacturer directly.

- or other drugs.
- The machine must not be used for purposes other than those for which it is intended. Anyone who uses the machine for purposes other than those for which it is intended takes full responsibility for any consequences of this potentially incorrect use. Use of the machine for purposes other than those for which it is intended by the Manufacturer may invalidate the guarantee.
- The machine may only be used when all the protective features (i.e. safety guards, bolts, cotter pins, warning decals) are technically sound and correctly positioned. In the event of loss or damage to the protective features, they must be replaced with new ones.

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2.2 SAFETY WHEN HITCHING THE MACHINE

- The machine should be hitched to and transported with only such a tractor which meets the manufacturer's requirements (minimum tractor power demand, required tractor hitch etc.) – see table (1.1) REQUIREMENTS FOR CARRIER VEHICLE (TRACTOR).
- Do NOT hitch the machine to the carrier vehicle if different types of hydraulic oil are used in both machines, or if the three point linkage system of the machine is not compatible with the category of the carrier vehicle's linkage system.
- After completion of hitching the machine, check the safeguards.
- Use only genuine pins and safeguards to hitch the machine to the carrier vehicle.
- The carrier vehicle (agricultural tractor) to which the machine will be coupled must be technically reliable and must meet all manufacturer's requirements.
- Be especially careful when hitching and unhitching the machine.
- When hitching, there must be nobody between the machine and the carrier vehicle.
- Coupling and uncoupling may only take place when the machine and tractor (carrying vehicle) are turned off.
- Machine unhitched from the carrier vehicle must be placed on level, sufficiently hard surface in such a manner as to ensure that it is possible to connect it again.

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2.3 SAFETY RULES WHEN MAINTAINING HYDRAULIC SYSTEM

- The hydraulic system is under high pressure when operating.
- Regularly check the technical condition of the hydraulic lines and connections. There must be no oil leaks.
- In the event of the hydraulic system malfunction, discontinue using the machine until the malfunction is corrected.
- When connecting hydraulic lines to carrier vehicle, make sure that the hydraulic system is not under pressure. If necessary, reduce residual pressure in the system.
- In the event of injuries being caused by pressurised hydraulic oil, contact a doctor immediately. Hydraulic oil may find its way under the skin and cause infections. In the event of contact of oil with eye, rinse with large quantity of water and in the event of the occurrence of irritation consult a doctor. In the event of contact of oil with skin wash the area of contact with water and soap. Do NOT apply organic solvents (petrol, kerosene).
- Do not store hydraulic oil in packaging designed for storing food or foodstuffs.
- Rubber hydraulic lines must be replaced every 4 years regardless of their technical condition.
- Repair and replacement of hydraulic system elements should be entrusted to the appropriately qualified persons.

F.1.1.586.03.1.EN

2.4 SAFETY DURING TRANSPORT TRAVEL

Before driving on the roads:

1. Make sure that the machine is correctly attached to the carrier vehicle.
2. Place slow-moving vehicle warning triangle plate in the bracket at the rear of the machine.
3. Check whether lights work correctly.

Also:

- Make sure that the hitched machine does not cover the rear lights of the carrier vehicle. If the lights are covered, use the optionally available rear lights mounted on the sweeper.
- Do not exceed the maximum speed resulting from road conditions and design restrictions (maximum of 20 km/h). Adjust speed to the prevailing road conditions and other limitations arising from road traffic regulations.
- Do NOT leave the machine raised and unsecured while the carrier



IMPORTANT

When driving on public roads, observe all road traffic regulations in force in the country, in which the machine is used.

vehicle is parked. When parked, the machine should be lowered.

- Do NOT ride on the machine or transport any materials on it.
- Before using the machine always check its technical condition, especially in terms of safety. In particular, check the technical condition of the hitch system and elements connecting the hydraulic system.
- During transport, the carrier vehicle's three-point linkage should be locked in the up position to prevent its accidental lowering.
- Reckless driving and excessive speed may cause accidents.

F.2.6.598.04.1.EN

2.5 MAINTENANCE AND CLEANING

- During the warranty period, any repairs may only be carried out by warranty service authorised by the Manufacturer. It is recommended that necessary repairs to machine should be undertaken by specialised workshops.
- In the event of any fault or damage, do not use the machine until the fault has been corrected.
- During work, use appropriate, close-fitting protective clothing, gloves and appropriate tools. When working on hydraulic systems it is recommended to use oil resistant gloves and protective goggles.
- Any modification of the machine releases the manufacturer from any responsibility for damage or detriment to health which may arise as a result.
- Before commencing any work on the machine, turn off the carrier vehicle (agricultural tractor) engine and wait until all rotating parts have come to a stop.
- Regularly check the technical condition of the safety devices and correct tightening of bolt connections.
- Regularly perform service inspections of machine as recommended by the Manufacturer.
- Do NOT perform maintenance or repair work under raised and unsupported machine.
- Before beginning repairs on hydraulic systems, reduce oil pressure.
- Servicing and repair work should be carried out in line with the general principles of workplace health and safety. In the event of injury, the wound must be immediately cleaned and disinfected. In the event of more serious injuries, seek a doctor's advice.
- Repair, maintenance and cleaning work should be carried out with the carrier vehicle (agricultural tractor) engine turned off and the ignition key removed. Immobilise the carrier vehicle (agricultural tractor) with parking brake. Ensure that unauthorised persons do not have access to the carrier vehicle (agricultural tractor) cab.
- Should it be necessary to change individual parts, use only original parts. Non-adherence to these requirements may put the user and other people's health and life at risk, and also damage the machine and invalidate the warranty.

**DANGER**

Carefully read the instructions for application of detergents and maintenance preparations.

While washing with detergents, wear appropriate protective clothing and goggles protecting against splashing.

- Regularly check technical condition and mounting of all guards and protective elements.
- 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.
- The machine must not be supported using fragile elements (bricks or concrete blocks).
- After completing work associated with lubrication, remove excess oil or grease.
- In order to reduce the danger of fire the machine must be kept in a clean condition.

The machine should be cleaned as needed.

Before using the pressure washer the user is obliged to acquaint himself with the operating principles and recommendations concerning safe use of this equipment.

- Before washing, remove manually and as accurately as possible any

remaining mulched plant residue.

- Use only clean running water. Cleaning detergents with neutral pH may be used, which do not react aggressively with the mobile conveyor's structural elements.
- The use of pressure washers increases the effectiveness of washing, but be careful when using them. During washing, the washer nozzle may not be placed closer than 50 cm from the cleaned surface.
- Water temperature should not exceed 55°C.
- Do not aim the water jet directly at system components and equipment, i.e. control valves, bearings, electric and hydraulic plugs, lights, electrical connectors, information and warning decals, nameplate, cable connectors, lubrication points, control panels, safety switches etc. High pressure water jet may penetrate the machine, resulting in mechanical damage or corrosion.
- Do not apply organic solvents, preparations of unknown origin or other substances, which may cause damage to lacquered, rubber or plastic surfaces. In the event of doubt it is recommended to make a test on an unseen surface area.

- Surfaces smeared with oil or grease should be cleaned by application of white spirit or other degreasing agents and then washed with clean water with added detergent. Follow the cleaning agent manufacturer instructions.
- Washing detergent should be kept in original containers, optionally in replacement containers, but very clearly marked. Preparations may not be stored in food and drink containers or in unmarked containers.
- Observe the environmental protection rules, wash the machine in places designed for this purpose.
- Washing and drying the machine must take place at temperature above 0°C.
- Each time after washing lubricate the machine.

F.1.1.586.05.1.EN

2.6 SAFETY DURING MACHINE OPERATION

- Before starting the carrier vehicle with hitched machine, make sure the PTO drive or the external hydraulic system circuit (sweeper with side brush) is not engaged, otherwise the machine may start accidentally.
- Each time the machine is used, always ensure that all the safety guards are in good condition and in place.
- Before lifting or lowering the machine mounted on the carrier vehicle, make sure that there are no bystanders near the machine.
- Before starting the machine make sure that there are no bystanders (especially children) or animals in the danger zone. The operator is obliged to ensure proper visibility of the machine and the working area.
- During machine operation do not occupy a different position than that of the operator in the vehicle's cab.
- Do NOT leave the cab, when the machine is in operation.
- Keep a safe distance from rotating parts of the machine.
- Do NOT approach the machine until the rotating parts come to a complete stop.
- When filling the water tank, the machine should be lowered to working position and the carrier vehicle's engine should be turned off.
- Carrier vehicle should be equipped with warning lights.

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2.7 SAFE OPERATION OF THE PTO SHAFT

- The machine may only be connected to the carrier vehicle (tractor) by means of an appropriately selected PTO shaft recommended by the Manufacturer.
- Before using the machine, carefully read the PTO shaft Operator Manual and follow all instructions.
- Adjust the length of PTO shaft to compatible carrier vehicle (tractor) according to the Operator Manual of PTO shaft.
- The PTO shaft has markings on the casing, indicating which end of the shaft shall be connected to the carrier vehicle (tractor).
- Never use a damaged PTO shaft, it may cause an accident. A damaged shaft must be repaired or replaced.
- Disconnect the shaft drive each time when it is not necessary to drive the machine, or when the carrier vehicle (tractor) and the machine are positioned at an unsuitable angle with regard to each other.
- The chains preventing the shaft cover from turning while the shaft is working, shall be secured to a fixed element of machine structure.
- Do NOT use the securing chains to support the shaft while machine is parked or when transporting the machine.
- The drive shaft must be equipped with a cover. Do NOT use the shaft with damaged or missing guards.
- After connecting the shaft, ensure that it is correctly and safely connected to the carrier vehicle (tractor) and to the machine.
- Before connecting PTO shaft, make certain that the PTO rotation direction is correct.
- Do NOT wear loose clothing, straps or whatever that may become wrapped round the rotating drive shaft. Contact with rotating PTO shaft may cause severe injuries.
- Do NOT go over and under the shaft or stand on it equally during work as also when the machine is parked.



DANGER

Before disconnecting the shaft, you must:

- disengage PTO drive
- switch off the engine of the implement carrier (tractor)
- remove key from ignition.

2.8 RESIDUAL RISK

Pronar Sp. z o. o. in Narew has made every effort to eliminate the risk of accidents. There is, however, a certain residual risk, which could lead to an accident, and this is connected mainly with the actions described below:

- using the machine for purposes other than those for which it is intended,
- being between the carrier vehicle (agricultural tractor) and the machine while the engine is running and when the machine is being attached,
- being on the machine while the engine is running,
- operating the machine with removed or faulty safety guards,
- failure to maintain a safe distance from the danger zone or being within the zones while the machine is operating,
- machine operation by unauthorized persons or persons under the influence of alcohol or psychoactive substances
- cleaning, maintenance and technical

checks when carrier vehicle (agricultural tractor) is connected and engine is running.

The residual risk may be kept to a minimum by following the recommendations below:

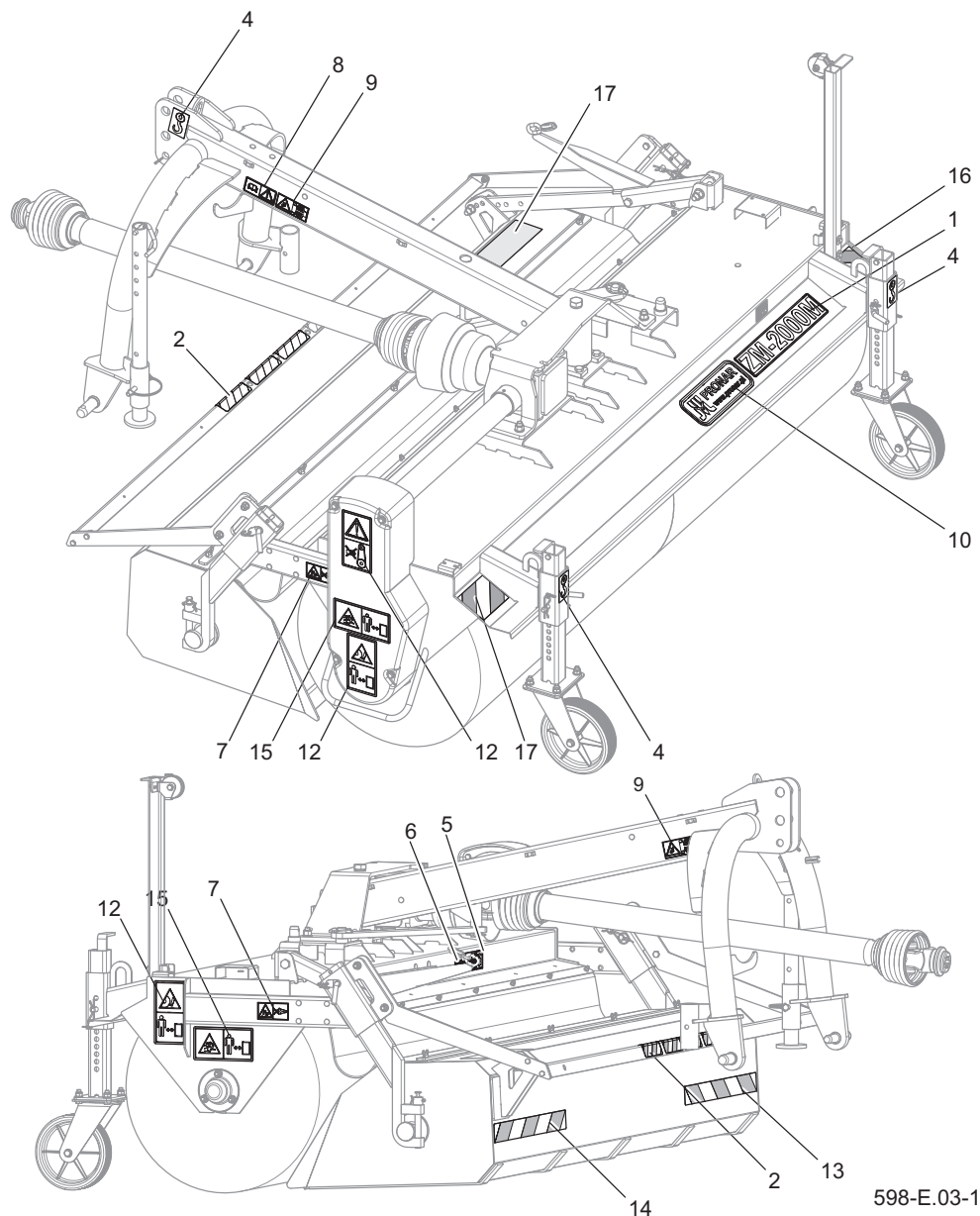
- operate the machine in prudent and unhurried manner,
- sensibly apply the remarks and recommendations contained in the Operator Manual,
- carry out repairs and maintenance work in line with operating safety rules,
- repair and maintenance work should be carried out by persons trained to do so,
- use close fitting protective clothing,
- ensure unauthorised persons have no access to the machine, especially children,
- maintain a safe distance from prohibited or dangerous places
- do not climb on the machine when it is operating or transported

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2.9 INFORMATION AND WARNING DECALS

The machine is labelled with the information and warning decals mentioned in table 2.1. Throughout the machine use, you must ensure that any warning messages and information decals located on the machine are clear and legible. If any are destroyed or damaged, they must



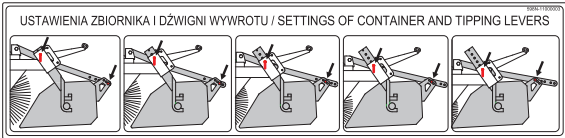




be replaced with new. New assemblies, changed during repair, must be labelled once again with the appropriate safety signs. During machine cleaning do not use solvents, which may damage the coating of information decals and do not subject them to strong water jets.

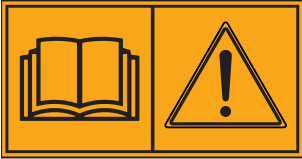











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Figure 2.1 Locations of information and warning decals.

Table 2.1. Information and warning decals

Item	Decal	Meaning
1		<p>Machine type 598N-11000001</p>
2		<p>Danger zone marking 598N-11000002</p>
3		<p>Bracket and tipping lever settings 598N-11000003</p>
4		<p>Transport belts or chains fastening points 35N-27000009</p>
5		<p>Do not exceed the maximum PTO speed 344N-97000002</p>
6		<p>PTO rotation direction 242N-96000004</p>
7		<p>Crushing fingers or hand - force applied from the side Do not reach into the crushing area while the parts are moving 17N-12000006</p>

Item	Decal	Meaning
8		<p>Before starting work, carefully read the Operator Manual. 17N-12000005</p>
9		<p>Crushing the torso - force applied from the side Keep a safe distance from the movement area of the hitch articulated joints when the engine is running. 17N-12000004</p>
10		<p>Manufacturer 142N-16000005</p>
11		<p>Do not open or remove the safety guard while the engine is running. Getting fingers or hand caught - belt transmission 130N-36000009</p>
12		<p>Getting caught - sweeper brush Keep a safe distance from the machine 12N-15000007</p>
13		<p>Outline marking. 12N-150005P</p>

Item	Decal	Meaning
14		<p>Outline marking. 12N-150005L</p>
15		<p>Thrown out objects endanger the whole body. Keep a safe distance from the machine 12N-1500008</p>
16		<p>Outline marking. 12N-1500001P</p>
17		<p>Outline marking. 12N-1500001L</p>

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SECTION 3

DESIGN AND OPERATION

3.1 TECHNICAL SPECIFICATION

Table 3.1. Standard equipment specification

Contents	Unit	ZM-2000M
Mounting method	-	three-point linkage cat. I and II according to ISO 730-1
Sweeping width	mm	2000
Sweeping width (when inclined at 15°)	mm	1875
Capacity*	m ² /h	11,875
Recommended sweeping speed	km/h	6
Transport speed (maximum)	km/h	25
Waste container capacity	dm ³	470
Brush drive	-	mechanical (PTO)
Water tank cubic capacity	dm ³	250
Tare weight (without optional equipment)	kg	405**
Rotation speed of brushes:		
– roller brush	rpm	100 - 200
– side brush	rpm	150 - 300 (13-25 l/min)
Spray system supply		Electrical system 12V
Side brush power supply		Hydraulic system

* – for the recommended sweeping speed, without side brush

** - for the following equipment and configuration: rear mounted, with a waste container, without a PTO shaft.

Level of noise emitted by the sweeper does not exceed 70 dB(A)

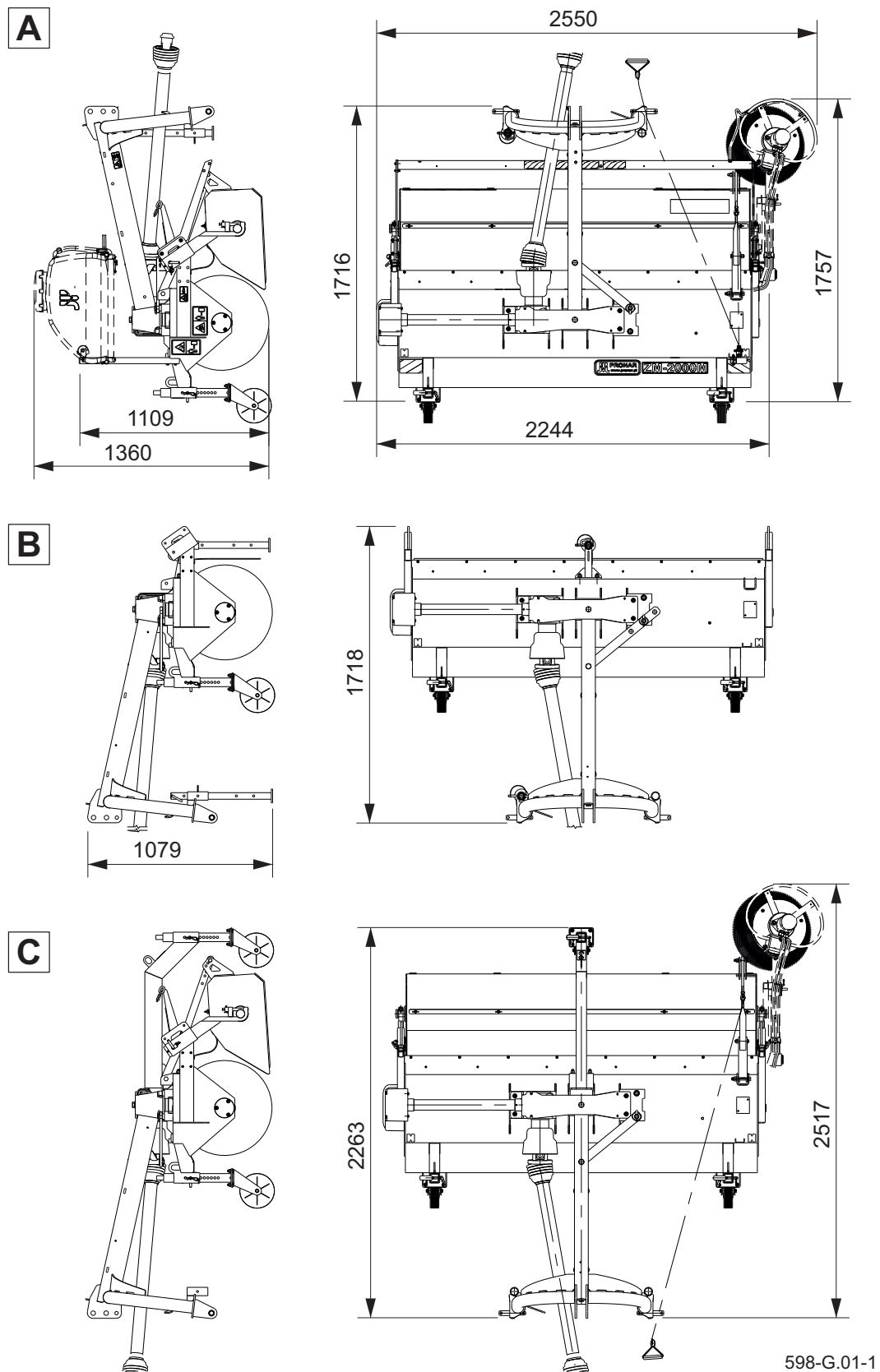
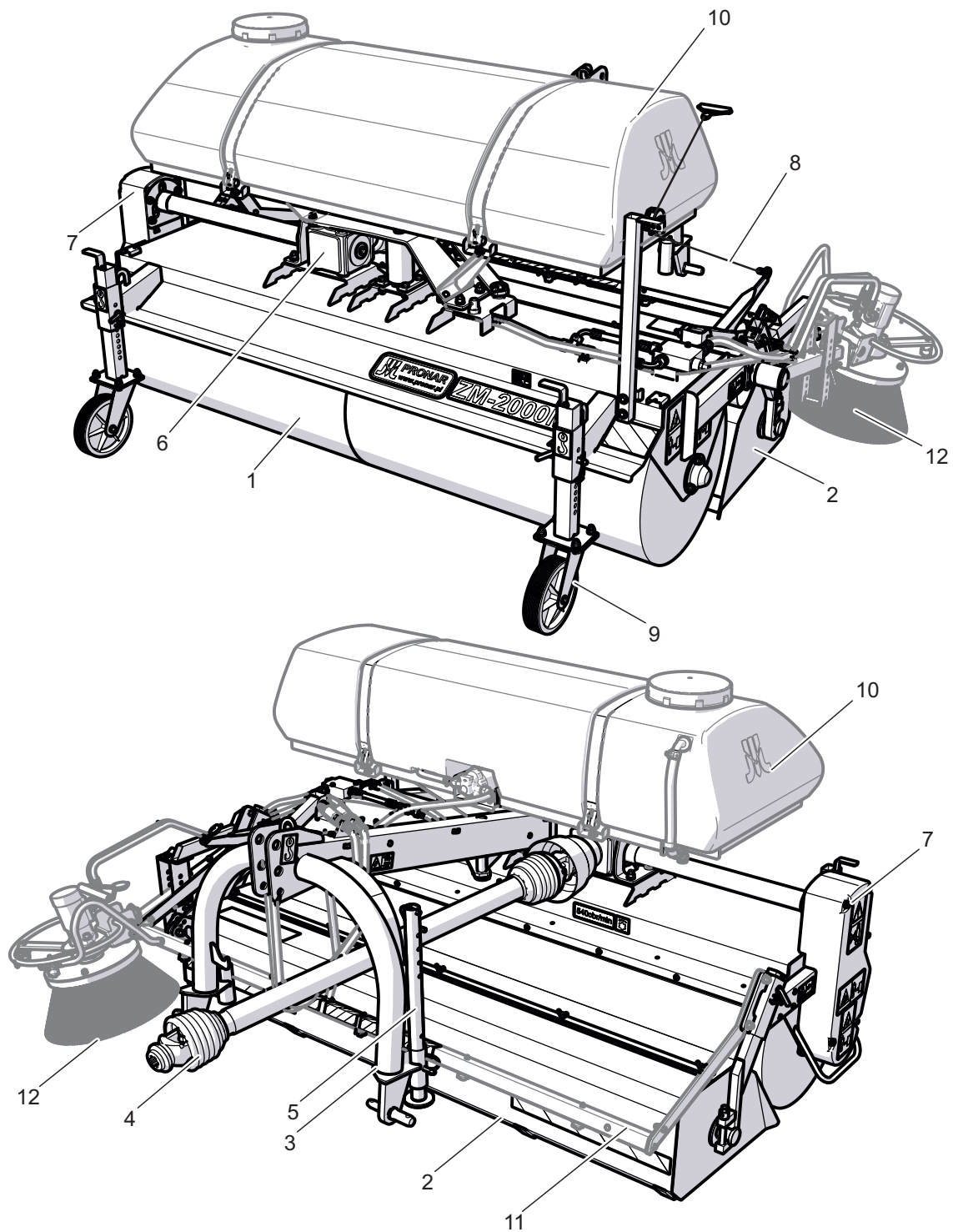


Figure 3.1 Overall dimensions of the sweeper depending on its configuration
 (A) rear-hitched, with a waste container and sprinkler system (B) front-hitched, without a waste container
 (C) front-hitched, with a waste container

3.2 DESIGN AND OPERATION



598-G.02-1

Figure 3.2 ZM-2000M sweeper design

- | | | |
|--------------------------|----------------------------------|----------------------------|
| (1) working brush | (2) waste container | (3) three point linkage |
| (4) PTO shaft | (5) support | (6) bevel gear |
| (7) belt transmission | (8) container tipping mechanism | (9) jockey wheel |
| (10) water tank (option) | (11) sprinkler system (optional) | (12) side brush (optional) |

The ZM-2000M sweeper is a mounted machine that can be hitched only to a carrier vehicle (agricultural tractor) equipped with a three-point linkage of category I and II according to ISO 730-1. The sweeper linkage (3) mounted on the frame by means of a pin allows rotation and operation in front of the carrier vehicle and also operation at an angle - the sweeper without a waste container. Roller brush (1), driven mechanically from the PTO, directs dirt to waste container (2), which can be emptied from the operator's seat by means of a cable. The ZM-2000M sweeper

can be additionally equipped with a side brush (12), which enables sweeping near walls or curbs, and a sprinkler system. The sprinkler system (6) is controlled by means of the electrical system (7). Jockey wheels (9) support the machine on the ground during operation, while the sweeper unhitched from the carrier vehicle rests on its parking stand (9) or on the third jockey wheel.

The machine version without a waste container is equipped with a PTO shaft (4).

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3.3 HYDRAULIC SYSTEM

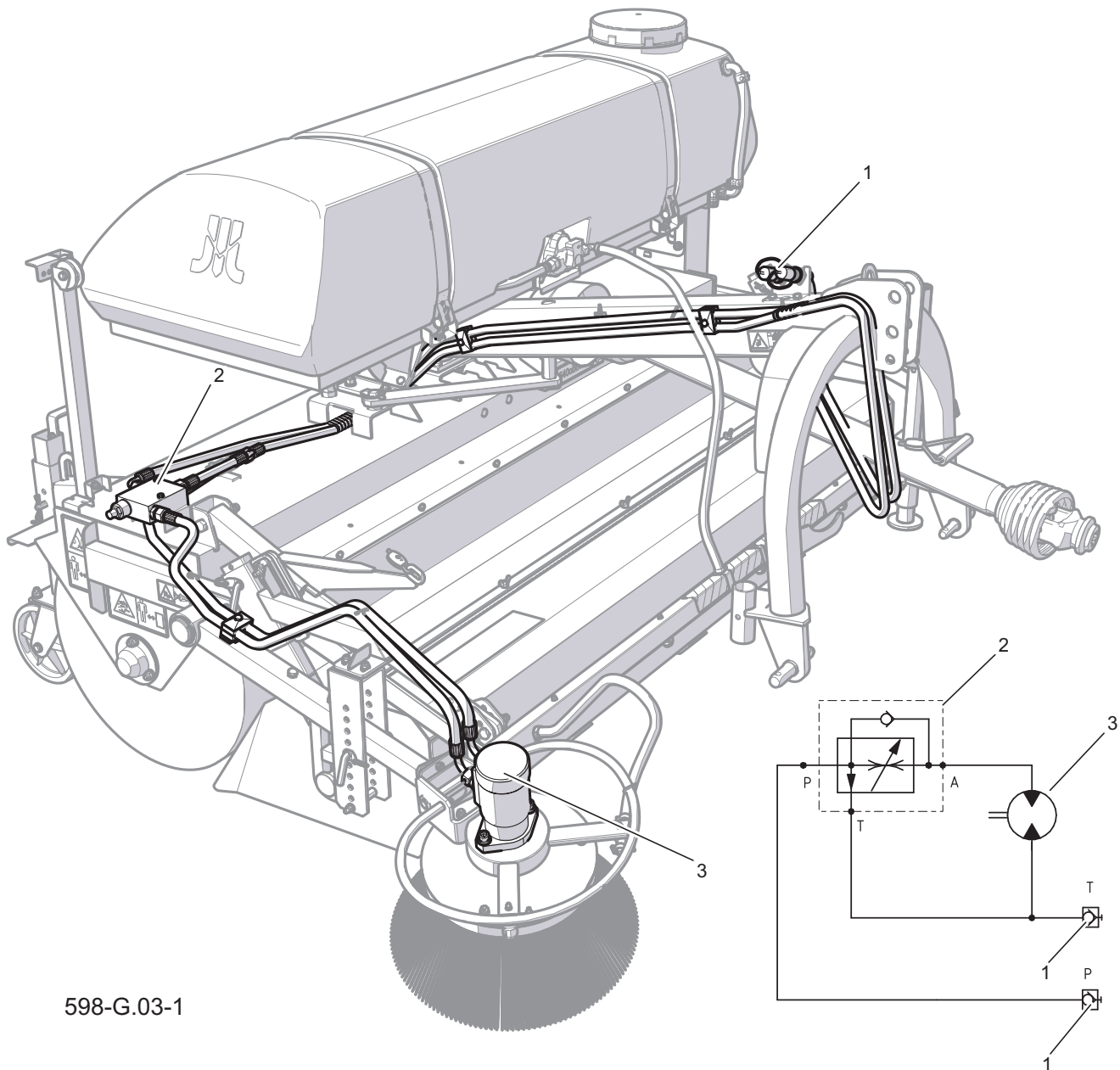


Figure 3.3 Hydraulic system design

(1) hydraulic quick couplers (2) flow regulator (3) side brush hydraulic motor

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3.4 SPRAY SYSTEM

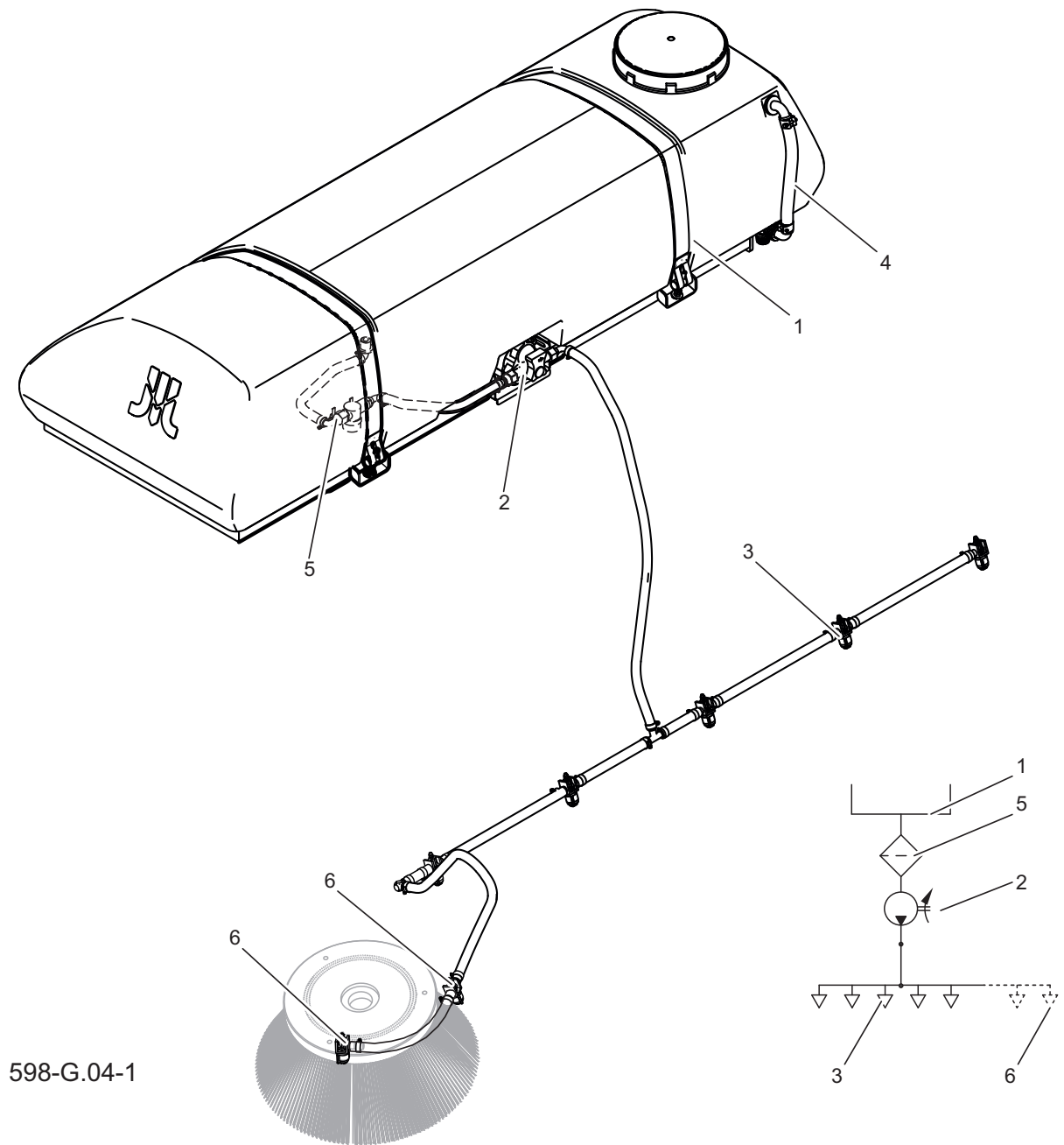


Figure 3.4 Spray system design

(1) water tank

(2) water pump

(3) sprinkling nozzles of roller brush

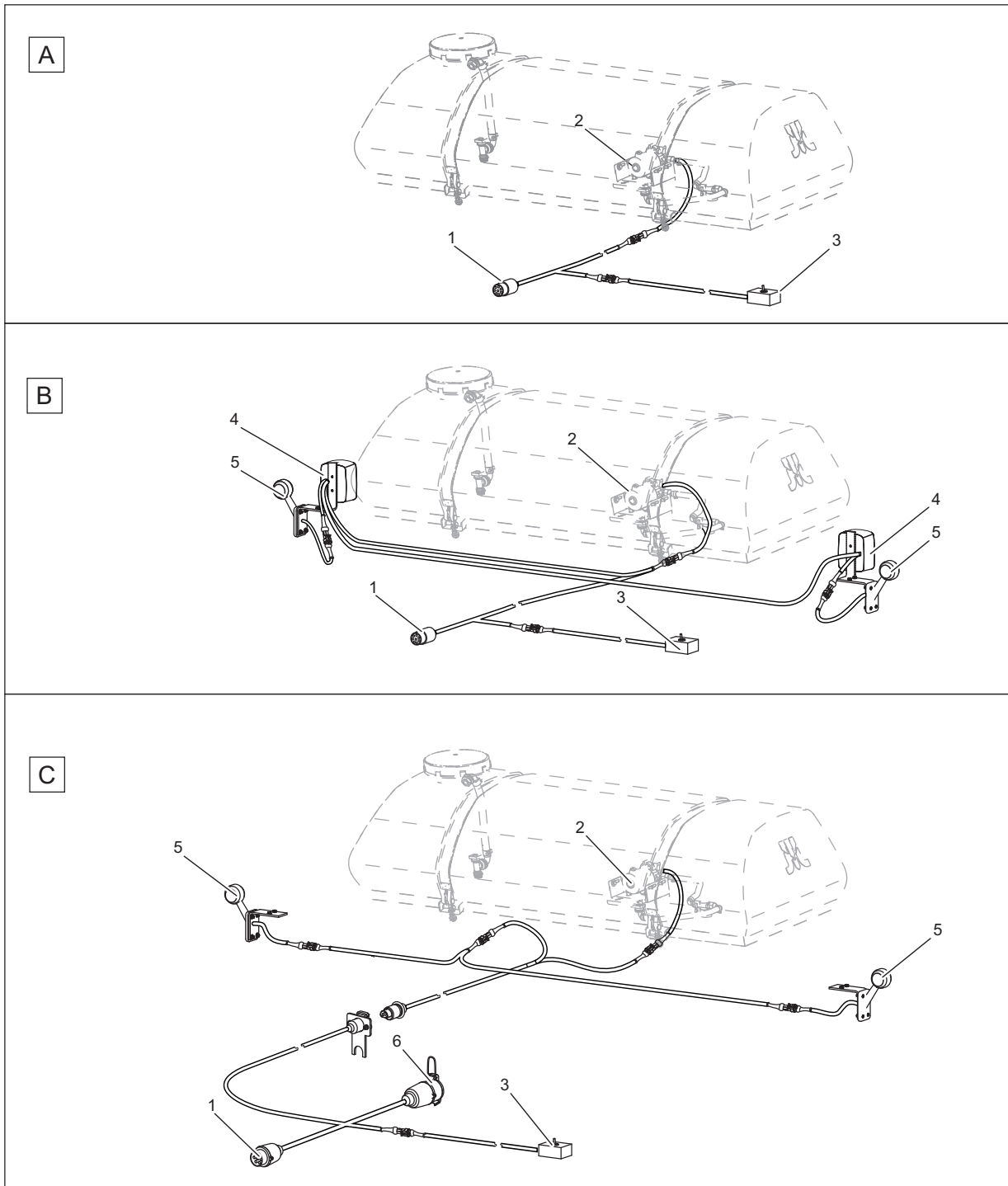
(4) water level indicator

(5) water filter

(6) sprinkling nozzles of side brush

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3.5 ELECTRICAL SYSTEM



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Figure 3.5 Design of the electrical system

A - electrical system of sprinkler system; (B) - electrical system of sprinkler system and lighting system - sweeper hitched to the rear of carrier vehicle; (C) - electrical system- sweeper hitched to the front of carrier vehicle;

(1) - 7-pin plug;

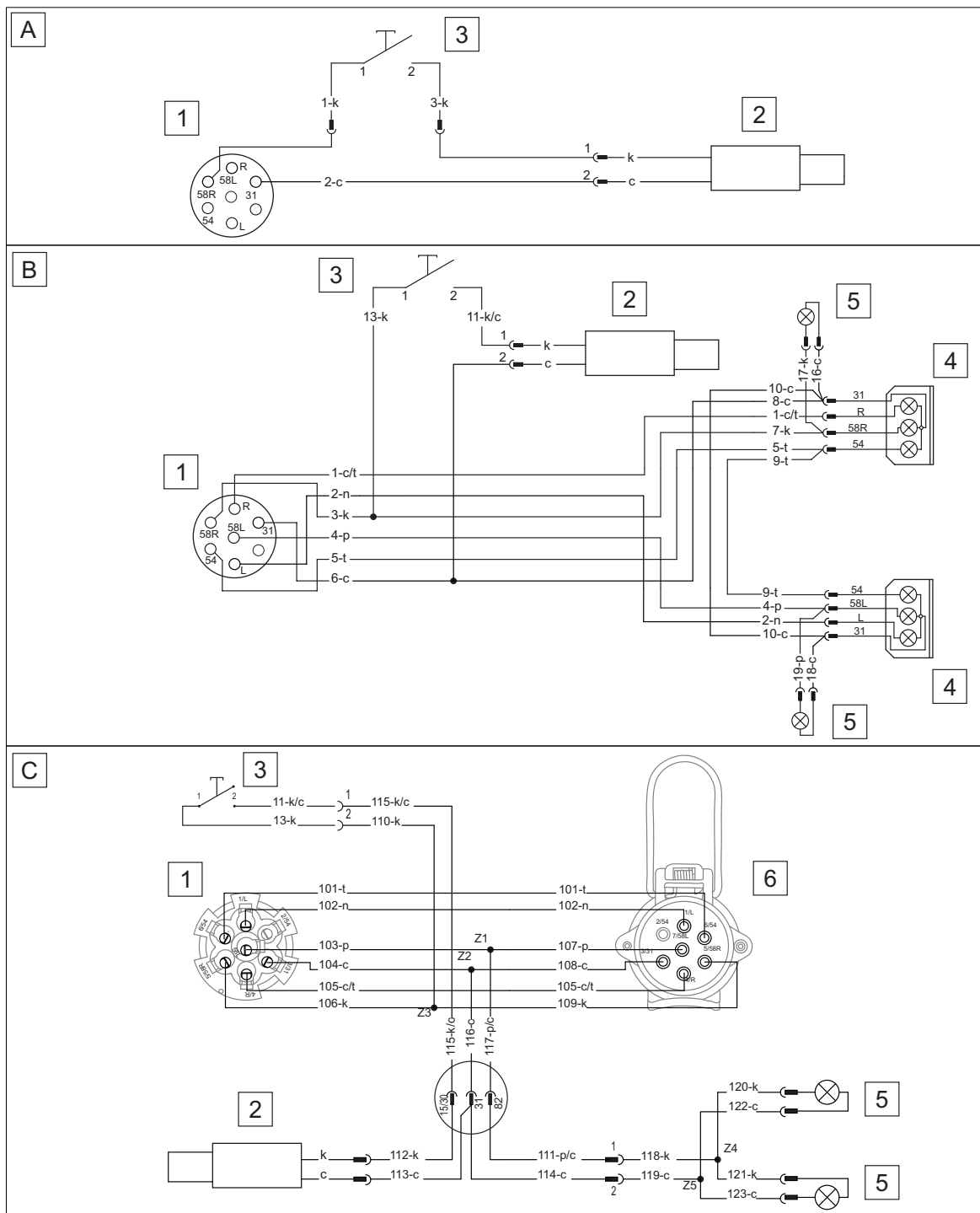
(2) - water pump;

(3) - sprinkler system switch;

(4) - rear lights;

(5) - clearance lights;

(6) - 7-pin socket



598-G.06-1

Figure 3.6 Electrical system diagram

A - electrical system of sprinkler system; (B) - electrical system of sprinkler system and lighting system - sweeper hitched to the rear of carrier vehicle; (C) - electrical system- sweeper hitched to the front of carrier vehicle;

(1) - 7-pin plug; (2) - water pump; (3) - sprinkler system switch;

(4) - rear lights; (5) - clearance lights; (6) - 7-pin socket

G.2.6.598.06.1.EN

SECTION 4

CORRECT USE

4.1 GET READY FOR OPERATION



DANGER

Before using the machine, the user must carefully read this Operator Manual. 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 manufacturer guarantees that the machine 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. The machine is delivered to the user completely assembled (except for the electrical system). Prior to connecting to the carrier vehicle (tractor), machine operator must verify the machine technical condition.



DANGER

The machine must never be used by persons, who are not authorised to drive agricultural tractors (carrier vehicles), including children and people under the influence of alcohol or other drugs. Non-compliance with the safety rules of this Operator Manual can be dangerous to the health and life of the operator and others.



DANGER

Before starting the machine, ensure that there are no bystanders in the danger zone.



IMPORTANT

Before using the machine always check its technical condition. In particular, check the technical condition of the suspension system, drive system, protective covers and lighting (direction indicators, stop lamps, parking lights), condition of the blades and their mounting.



IMPORTANT

Before beginning work lubricate all lubrication points.

In order to do this:

- the user must carefully read this Operator Manual and observe all recommendations, understand the design and the principle of machine operation,
- make sure that the machine's linkage is compatible with that of the carrier vehicle (tractor)
- make sure that power take-off shaft is compatible, e.g. tip type, RPM, rotation direction,
- make sure that the telescopic articulated shaft (PTO) can be connected to the tractor (the shaft should be compatible with the tractor in terms of length, type, strength, etc. - see the manufacturer's operating manual),
- check the compatibility and technical

condition of the hydraulic and electric system, including compatibility of the hydraulic connectors,

- inspect machine's individual components for mechanical damage resulting from incorrect transport (dents, piercing, bent or broken components),
- check technical condition of the brushes and their mounting,
- check the technical condition of the suspension system components, guards and safety pins and if mounting is correct.

If all the above checks have been performed and there is no doubt as to the machine's good technical condition, it can be connected to carrier vehicle, started and all its individual systems checked. In order to do this:



DANGER

When starting machine for the first time as well as after servicing the hydraulic system, extreme caution should be exercised because the aerated hydraulic system causes accelerated movement of the powered components.

- hitch the machine to carrier vehicle (see 4.3 “HITCHING TO CARRIER VEHICLE”),
- after connecting hydraulic system lines and electrical system wiring, check the correct operation of systems and inspect the hydraulic system for tightness,

In the event of a disruption in the operation of the machine immediately discontinue its use, find and remove the fault. If a fault cannot be rectified or the repair could void the warranty, please contact the Manufacturer for additional clarifications.

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4.2 TECHNICAL INSPECTION

To get the machine ready for use, check components according to guidelines presented in Table 4.1.

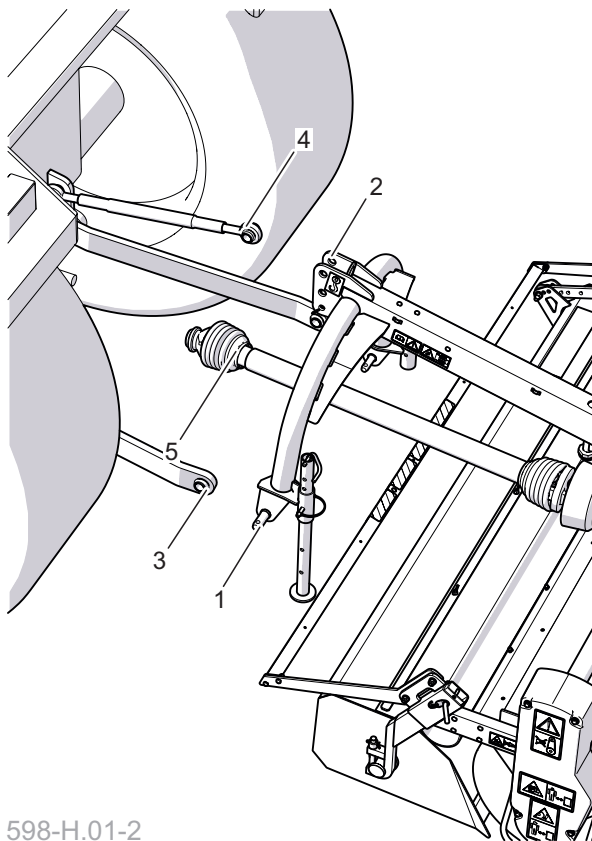
Table 4.1. Technical inspection schedule

Description	Maintenance activities	Frequency
Technical condition of protective shields	Check the technical condition of safety shields, if complete and correctly mounted.	Before each use
Technical condition of PTO shaft, its shields and securing chains,	Inspect visually and check completeness.	Before each use
Correct mounting of sweeping roller brush and side brush	Ensure that elements are correctly tightened. Blades are not excessively worn	Before each use
oil level in drive system gears,	Check as outlined in chapter „DRIVE TRANSMISSION SYSTEM MAINTENANCE”.	Before each use
Check operation of lights and indicators (if present).	Check completeness and technical condition of electrical system, lights and warning signs and indicators.	Before each use
Check condition of belt transmission	Check condition and tension of cog-belt.	50 working hours
Change oil in transmission	In accordance with the guidelines in the chapter “Drive transmission system maintenance.”	500 working hours or once a year, depending on which comes earlier
Check if all main nut and bolt connections are properly tightened	Tightening torque should be according to table (5.7)	Every six months
Lubrication	Lubricate elements according to guidelines presented in section "LUBRICATION".	According to table (5.5)

H.2.6.598.02.1.EN

4.3 CONNECT THE MACHINE TO THE CARRIER VEHICLE (TRACTOR)

The sweeper may be hitched to a carrier vehicle (tractor) which meets the requirements specified in Table 1.1 "*Requirements for carrier vehicle (tractor)*".



598-H.01-2

Figure 4.1 Hitching the sweeper to carrier vehicle

- (1) lower fixing pins, (2) upper attachment point
 (3) lower links of the three-point linkage (4) top link
 (5) articulated telescopic shaft



DANGER

Use only genuine pins and safeguards to hitch the machine to the carrier vehicle.



DANGER

When hitching, there must be nobody between the sweeper and the tractor. When hitching the machine, tractor driver must exercise caution and make sure that nobody is present in the hazard zone.

When hitching the sweeper to carrier vehicle's (tractor's) three-point linkage do the following (Figure 4.1):

- move the lower links of the carrier vehicle's three-point linkage (3) to the lower linking points of the sweeper (1); set lower links at an appropriate height,
- turn off carrier vehicle engine and prevent the vehicle from moving,
- connect the lower pins (1) of the sweeper's linkage with lower links (3) of the three-point linkage and secure with cotter pins,
- connect the carrier vehicle's upper link (4) (central connector) to the upper attachment point (2) of the sweeper's linkage using a pin and secure with a cotter pin,
- eliminate lateral movements of the sweeper by appropriate adjustment of the stabilisers of the lower links

of the carrier vehicle's three-point linkage (both lower links of the three-point linkage are recommended to be set at the same height)

- Connect the articulated telescopic shaft (PTO shaft) (5) to the PTO of the carrier vehicle (tractor) and secure it; immobilize the guards with safety chains.



IMPORTANT

Raising and lowering the sweeper with the PTO engaged may damage the machine.



DANGER

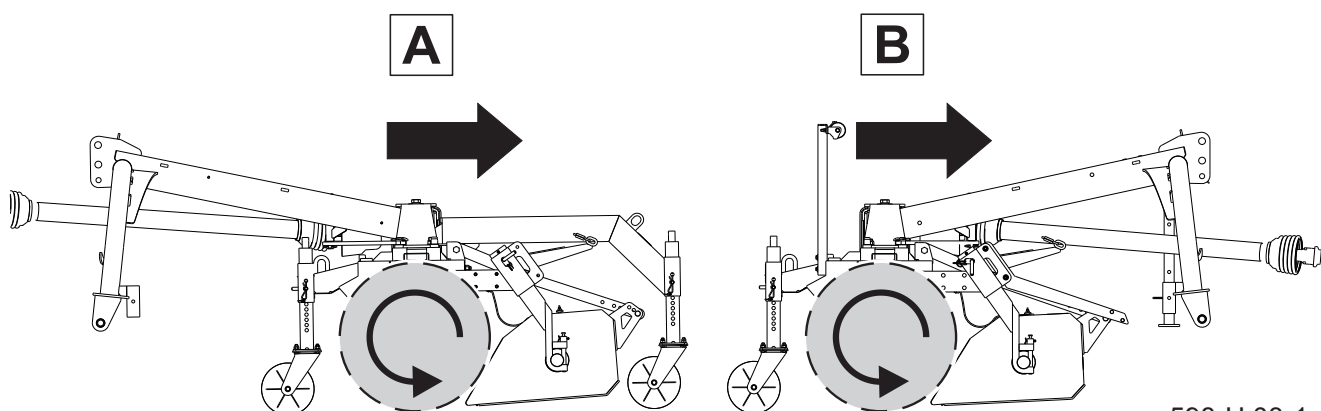
Before connecting the PTO shaft it is absolutely necessary to carefully read the Operator Manual attached by the Manufacturer of the shaft and observe the instructions contained in it.

Before connecting to the carrier vehicle, check technical condition of shaft guards as well as completeness and condition of protecting chains.

- raise the support leg (1) and lock it in upper position.
- PTO drive may be engaged only when the machine is supported on wheels

In the hitched machine, check the roller brush rotation direction (Figure 4.2). The brush should rotate in the direction opposite to travel direction.

If the sweeper is to be hitched on carrier vehicles with different PTO rotation directions, the sweeper can be adapted to them by turning the bevel gear by 180° in the horizontal plane. The bevel gear may only be turned by a specialized mechanical workshop or a manufacturer's service point.



598-H.03-1

Figure 4.2 Roller brush rotation direction
 A) - front-mounted sweeper; (B) - rear-mounted sweeper; ➔ driving direction

OPERATING THE SWEEPER MOUNTED ON THE CARRIER VE- HICLE'S FRONT THREE-POINT LINKAGE

The sweeper can be adapted to mounting on the carrier vehicle's front three-point linkage. To adapt the sweeper for mounting on the carrier vehicle's front three-point linkage, mount the sweeper's linkage at the rear of the machine and turn the bevel gear by 180° in the vertical plane. Depending on the rotation direction of the tractor's front PTO, it may be necessary to rotate the bevel gear also by 180° in the horizontal plane. Relocate the parking



DANGER

After connecting the PTO, make sure that the PTO does not collide with any parts of the machine.

stand from the linkage to the front of the machine and install the second parking stand or an additional jockey wheel (depending on machine version).

The above activities related to adapting the sweeper for mounting on the carrier vehicle's front three-point linkage may only be performed by a specialized mechanical workshop or a manufacturer's service point.

H.2.6.598.03.1.EN

4.4 BALLASTING THE CARRIER VEHICLE (TRACTOR)

Before hitching the machine to the carrier vehicle, confirm that the carrier vehicle is suitable for this purpose. Installation of implements on the three-point linkage must not result in exceeding the permissible total weight, permissible axle load and load capacity of carrier vehicle's tyres. Each axle of the carrier vehicle must be always loaded with at least 20% of the carrier vehicle's weight.

Make the following calculations in order to confirm that these conditions are met:

Calculation of the minimum front ballast

$$G_{Vmin} = \frac{G_H \cdot (c+d) - T_V \cdot 0.2T_L \cdot b}{a+b}$$

Calculation of the minimum rear ballast

$$G_{Hmin} = \frac{G_V \cdot a - T_H \cdot b \cdot 0.45T_L \cdot b}{b+c+d}$$

It is assumed that all parameters for the calculation of the minimum ballast are known.

If the parameters are unknown and cannot be determined, make the measurements

Table 4.2. Ballasting the carrier vehicle (tractor)

Symbol / dimension (FIGURE 4.2)	Unit	Description
T_L	kg	Tractor tare weight
T_V	kg	Front axle load for tractor without machine
T_H	kg	Rear axle load for tractor without machine
t	kg	Load applied to axles of tractor with machine
t_V	kg	Front axle load for tractor with machine
t_H	kg	Rear axle load for tractor with machine
G_H	kg	Total weight of a rear-mounted machine
G_V	kg	Total weight of a front weight
a	m	Distance between the centre of gravity of the front weight and the front axle
b	m	Tractor axle base
c	m	Distance from the rear axle to the three-point linkage axis
d	m	Distance from the three-point linkage axis to the centre of gravity of the rear-mounted machine

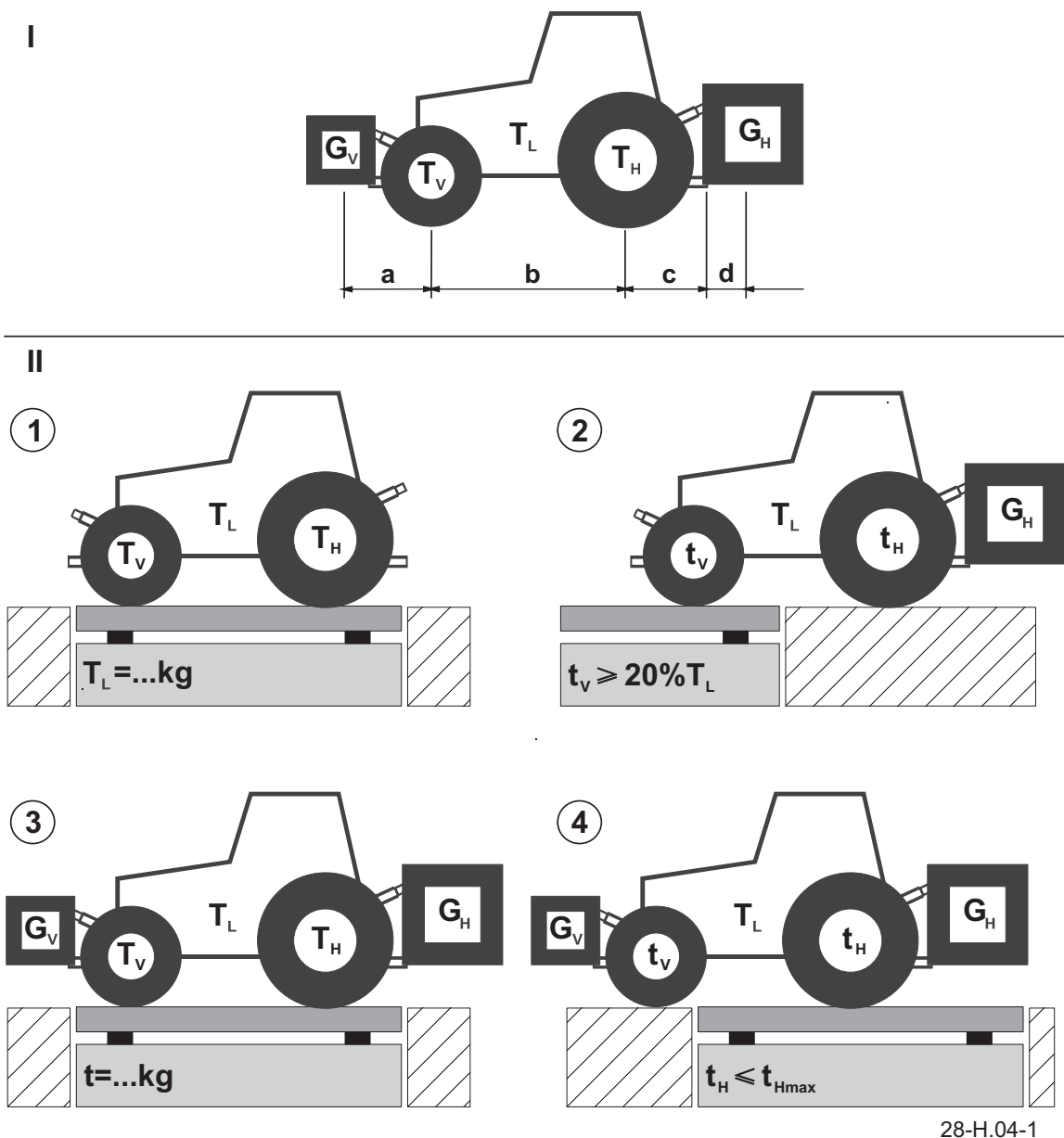


Figure 4.3 Ballasting the carrier vehicle (tractor) front axle.

using a weighing scale (Figure 4.2).

Measurement of permissible axle loads using a weighing scale.

- Measure the tare weight of the carrier vehicle (T_L).
- Hitch the sand spreader to the carrier vehicle and measure the front axle load (t_v). If the axle load is smaller than 20% of the carrier vehicle weight (T_L),

add weights to exceed the minimum axle load value ($t_v \geq 20\% T_L$).

- Measure the total weight (t) of the carrier vehicle with the machine and weights. Check in the carrier vehicle's Operator Manual that the measured value is lower than the carrier vehicle's Permissible Tare Weight.
- Measure the rear axle load (t_H) and

**IMPORTANT**

The load on each axle of the carrier vehicle (tractor) must be at least 20% of its own weight.

check in the carrier vehicle's Operator Manual if the measured value

is smaller than the maximum permissible rear axle load of the carrier vehicle (t_{Hmax}).

The above calculations should also be made when the sweeper is hitched to the front of the carrier vehicle.

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4.5 ADJUSTMENT OF BRUSH PRESSURE

Correct setting of the brush pressure affects the sweeping accuracy, ensures even wear and extends the brush life. The width of brush ground contact surface should be in the range from 60 to 120 mm. Right and left wheel heights should be the same.

Pressure is adjusted by setting the height of jockey wheels in guides (Figure 5.2) as follows:

- raise the sweeper mounted on the carrier vehicle, turn off the engine and



DANGER

Adjustment of brush pressure should be performed only when the engine is stopped, and the machine is raised and secured.

immobilise the vehicle with parking brake,

- remove securing cotter pin (3) and linchpin (2),
- raise or lower the wheel (3) in the guide so that the holes are coaxial,
- insert linchpin (2) into the corresponding hole and secure with cotter pin (3),
- adjust the height of the second wheel in the same way (and the third wheel, if present).

The jockey wheels are adjusted by steps of 10mm. After adjustment, lower the sweeper on the jockey wheels and check

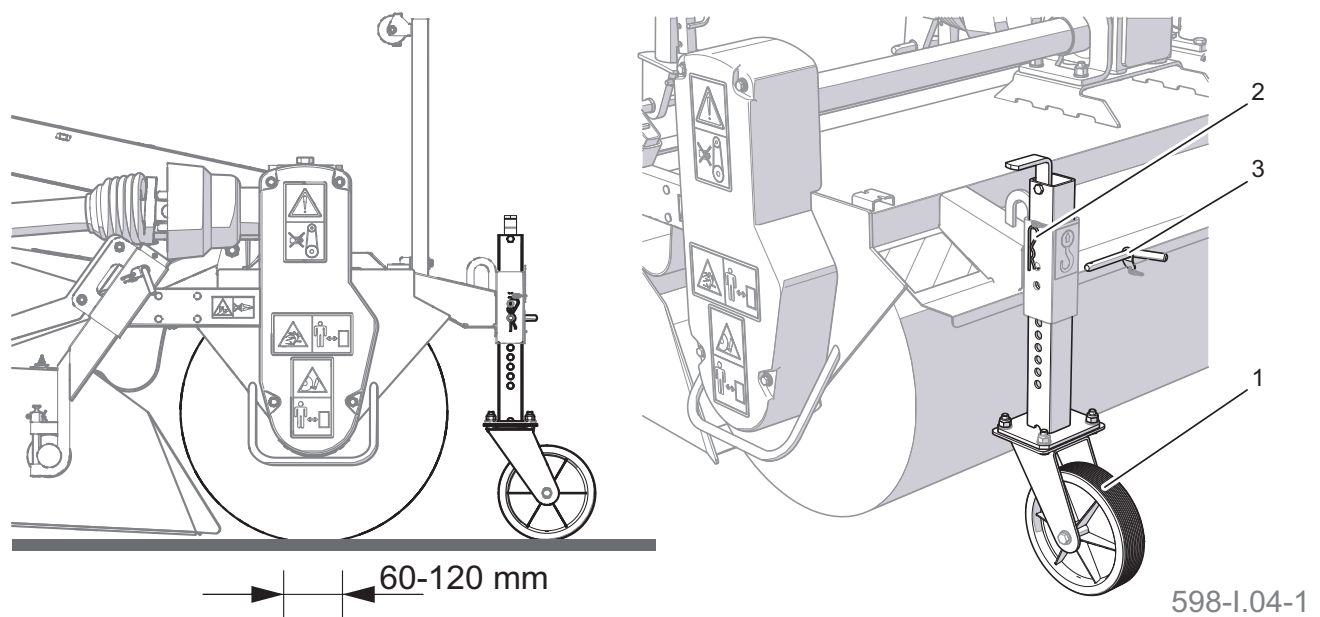


Figure 4.4 Adjustment of brush pressure

(1) jockey wheel

(2)- securing cotter pin

(3) - pin

the width of the brush ground contact surface, adjust again if necessary.

The brush pressure is also influenced by

the central link length adjustment (top link of three point linkage) - not applicable in the version with the third jockey wheel.

TIP

During operation, the tractor three-point linkage must be set in floating position to enable ground surface tracking. Otherwise, the machine may get damaged.

TIP

The machine is designed to operate on even surfaces without obstacles such as humps, raised wells, steep climbs. Exercise extreme caution when crossing such obstacles. It is recommended to reduce the speed and even raise the machine.

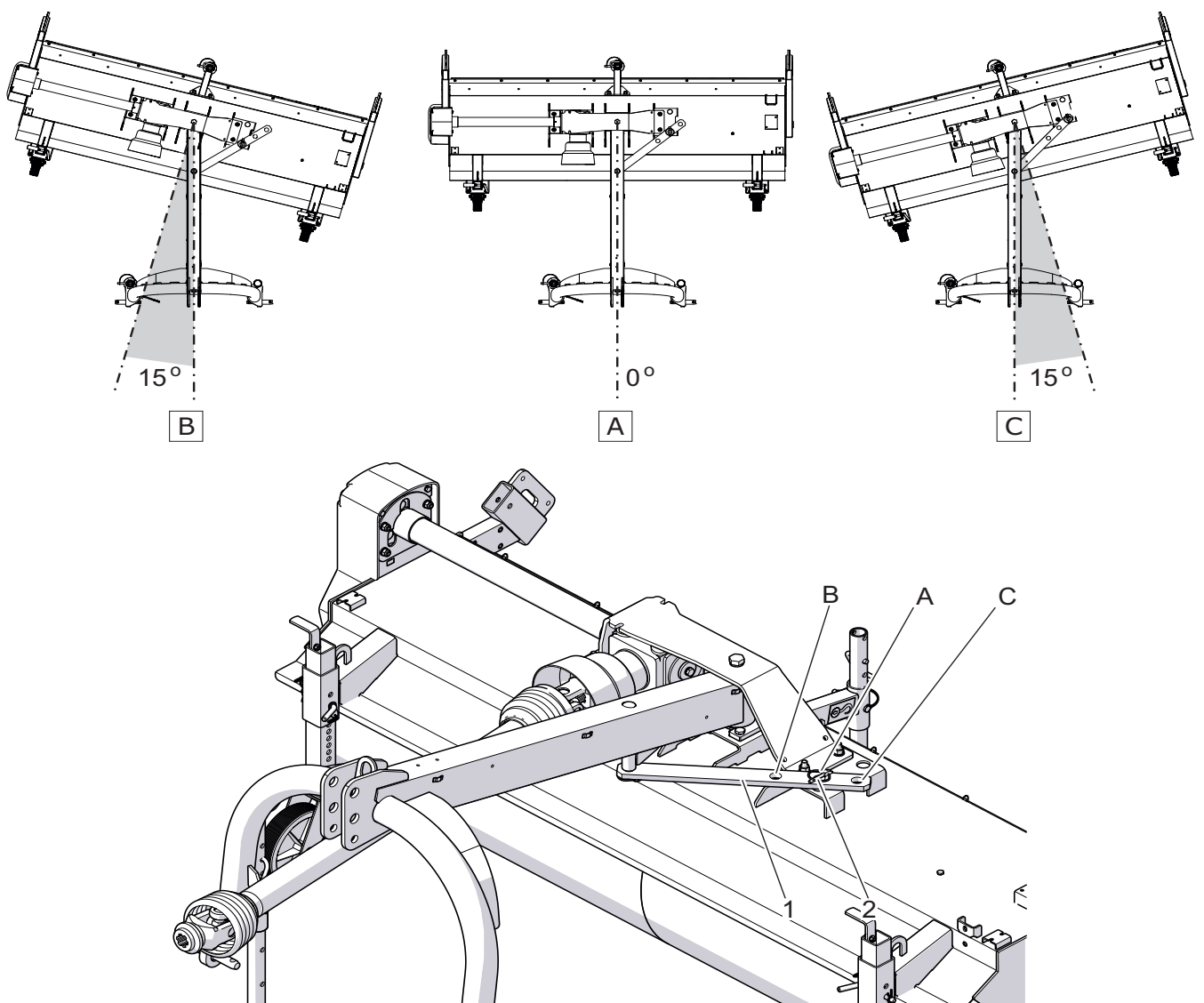
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4.6 CHANGING THE WORKING POSITION ANGLE OF THE SWEEPER WITHOUT A WASTE CONTAINER

3 working angles of the brush can be set in the sweeper equipped with mechanical brush turning system (Figure 4.5). In order to set the working angle of the roller brush change the position of the pin in the appropriate retaining hole (A), (B), (C) of the

strip (1). The pin is installed in hole (A) of the strip (1) when the sweeper tilt during operation is 0°.

Lock the pin in selected position using securing cotter pin (2). The pin is installed



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Figure 4.5 Changing the sweeper working angle
 (1) - strip; (2) - securing cotter pin; (A) - tilt: 0°; (B), (C) - tilt: 15°

in holes (B) and (C) when the working sweeper is tilted by 15° to the right and to the left. The sweeper should be set at an angle during operation without the waste collecting tank. To change the brush (Figure 4.4) working angle:

- raise the sweeper mounted on the three-point linkage, immobilize the carrier vehicle,
- take out securing cotter pin (1),
- manually adjust the sweeper working angle to align a corresponding opening (A, B, C) in the bracket with

the opening in arm (1)

- insert pin (2) into the corresponding hole in the arm and secure with cotter pin (3)

**IMPORTANT**

During operation, the carrier vehicle's linkage must be set in such a manner as to enable ground surface tracking. Carrier vehicle weight must not be transferred to the sweeper.

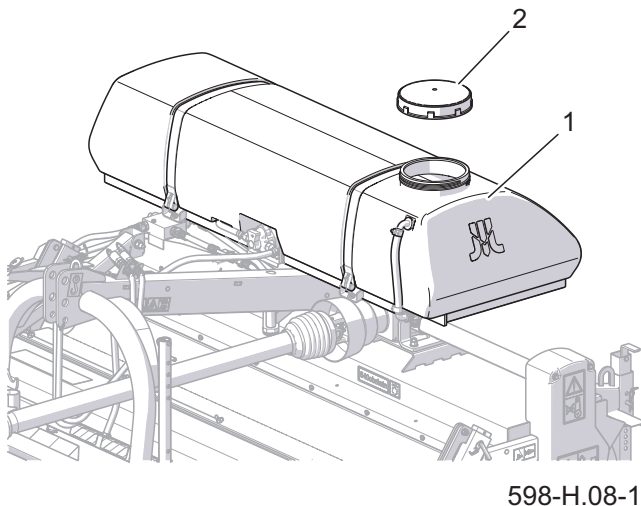
**IMPORTANT**

Changes in the sweeper's working angle can only be made when a wide-angle PTO shaft is used.

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4.7 SPRAY SYSTEM

Fill the tank (1) with water through the filler opening, after unscrewing plug (2) (FIGURE 4.7). Water tank cubic capacity is 250 litres.



598-H.08-1

Figure 4.6 Sprinkler system's water tank
(1) water tank (2) filler plug

To control the sprinkler system, connect electrical system plug (3) to 12V 7-pole socket in the carrier vehicle. Switch the sprinkling system on or off using the switch (1) on the power cord (Figure 4.7). Place the switch in the operator cab in an easily accessible place. Electrical system of water pump is supplied through the parking



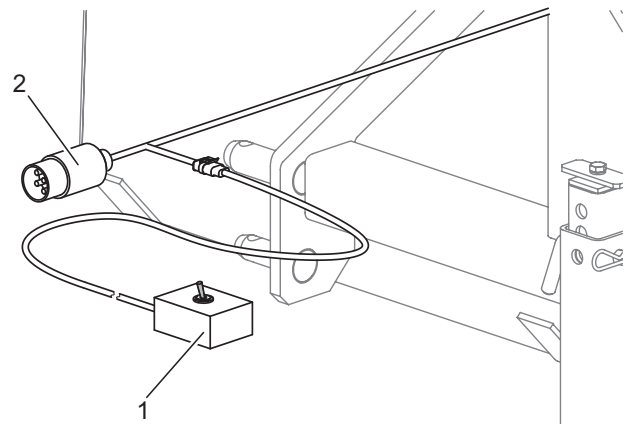
IMPORTANT

If there is no water in the tank, turn off the spray system.



IMPORTANT

If there is a risk that temperatures drop below 0°C, drain water from the spray system, remove filters from spray nozzles and start the water pump without water for about 15 seconds.



598-H.07-1

Figure 4.7 Spray system control
(1)- spray system switch (2) 7-pole socket plug

lights circuit, from the 7-pole socket in the carrier vehicle.

H.1.1.598.08.1.EN

4.8 SIDE BRUSH

The sweeper can be equipped with a side brush. The brush can be turned on and off independently, and its rotation speed can be smoothly adjusted (Figure 4.12).

All adjustments of the side brush head are performed after adjusting the roller brush and waste container, depending on the amount of dirt on the surface being swept and the degree of wear of the head.

Correctly positioned side brush head should touch the surface only with a section of its circumference in such a manner as to ensure that waste is directed to the inside of the sweeper, in front of the roller brush. The correct brush pressure setting is shown in a dark colour on the diagram

(Figure 4.9).

Longitudinal tilting of the head (Figure 4.11) can be set in three positions. This involves changing the position of retaining bolt (1) in head bracket holes (2).

To change the lateral tilt angle (FIGURE

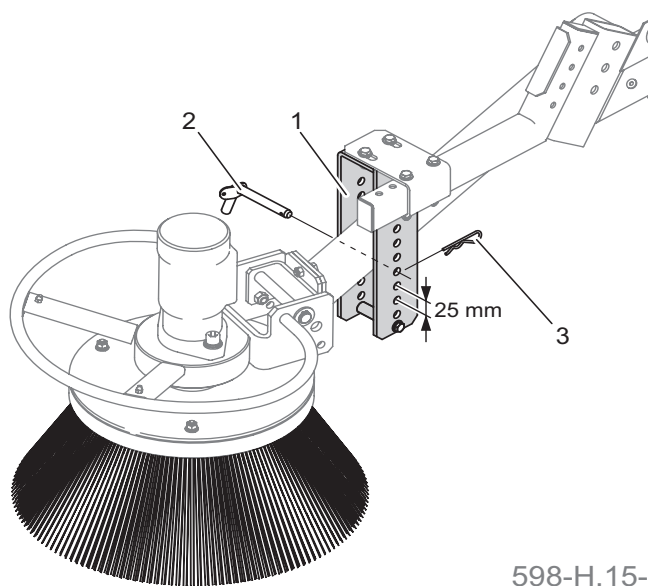


Figure 4.8 Adjusting side brush pressure

(1) - brush arm guide;
(2) - linchpin; (3) - securing cotter pin

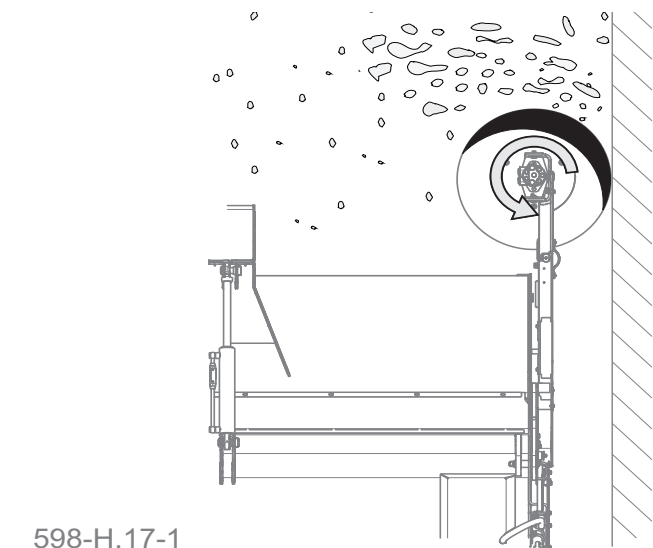


Figure 4.9 Adjusting side brush pressure

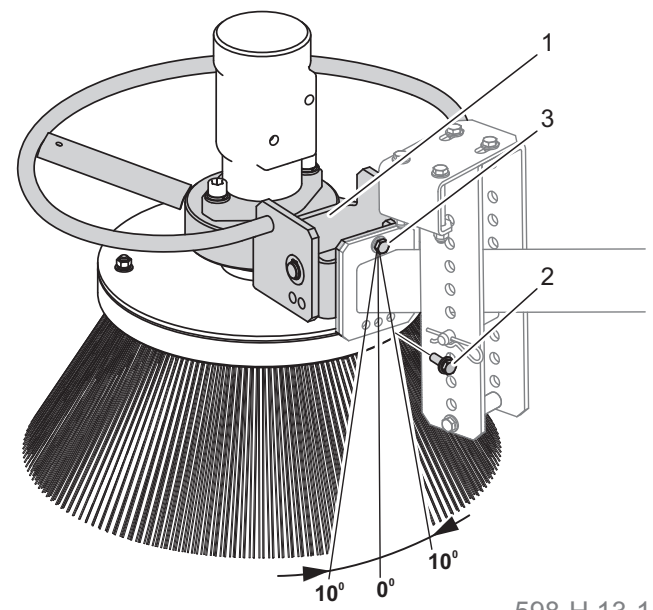
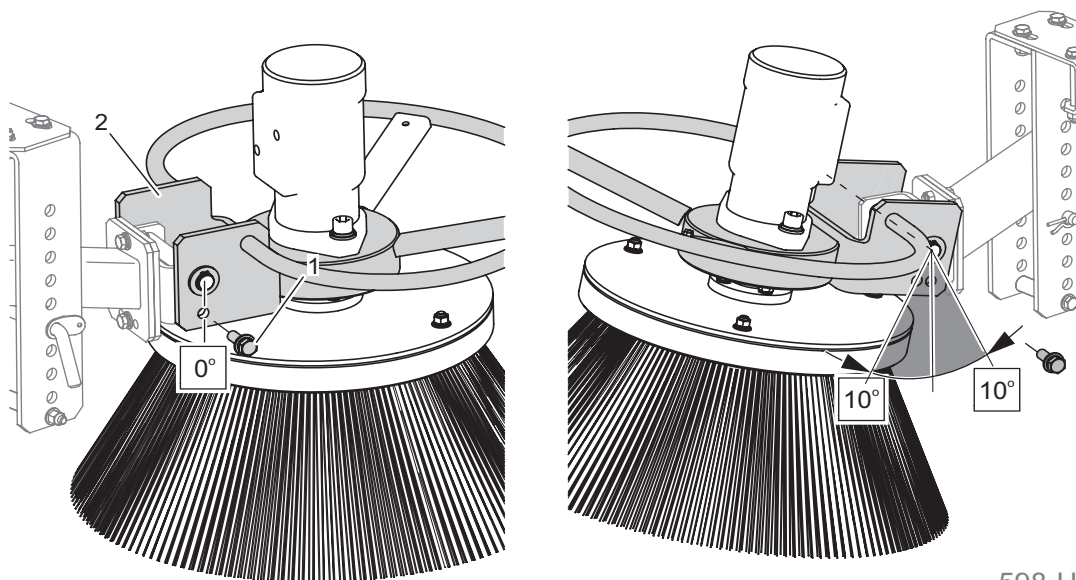


Figure 4.10 Adjusting lateral tilt

(1) - longitudinal tilt retaining bolt;
(2) - brush head bracket



598-H.15-1

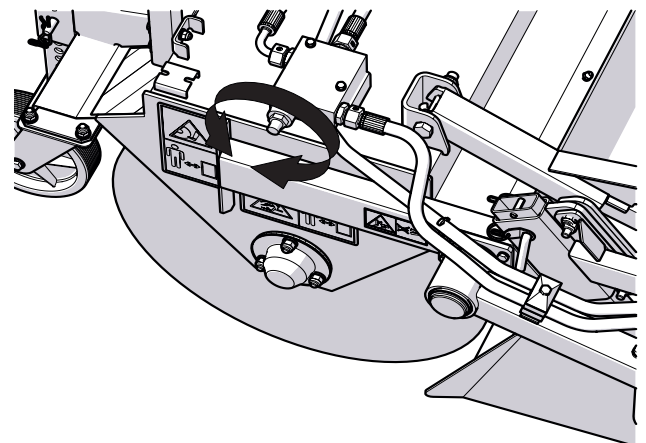
Figure 4.11 Adjust longitudinal tilt

(1) - longitudinal tilt retaining bolt; (2) - brush head bracket

4.10), remove the retaining bolt (2), loosen the bolt (3) and turn bracket (1) to the right or left side so as to place the bolt (2) in the corresponding hole. Tighten fixing bolt (3) after the adjustment of lateral tilt of side brush.

The sweepers with side brush (FIGURE 5.12) are equipped with oil flow regulator (A) for smooth adjustment of the side brush rotation speed.

Rotation speed is controlled using the knob on the regulator.



598-H.16-1

Figure 4.12 Rotation speed adjustment



IMPORTANT

Maximum oil flow - 60 l/min
 Vmax of brush - 300 rpm for 25 l/min of oil.
 Exceeding the above parameters may damage the hydraulic motor.



IMPORTANT

Set the flow regulator according to the capacity of the carrier vehicle's hydraulic system. If the regulator knob (Fig. 4.12) is screwed out excessively, the brush rotation speed will be reduced or the brush will even stop. If the knob is screwed in (clockwise rotation), the brush rotation speed may be too high.

H.1.1.598.04.1.EN

4.9 WASTE CONTAINER - EMPTYING

Before emptying the container, turn off the PTO, raise the sweeper to a height of at least 0.5 m (the maximum height is reached when the PTO housing (1) touches the limiting strip (2)), immobilize the vehicle (sweeper carrier) (Figure 4.13).

To empty the waste container (2) (Figure 4.14) from the operator's seat, pull the cable (1), the container lever mechanism (3) will turn the container and empty it.

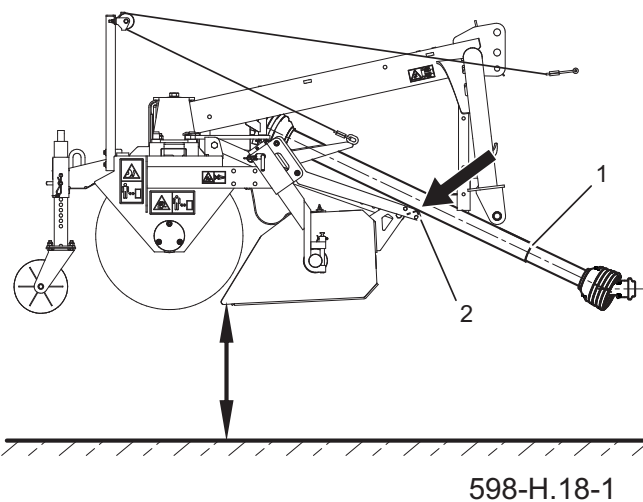


Figure 4.13 Raising the sweeper to empty the container

(1) - PTO shaft

(2) lifting height limiting strip



IMPORTANT

The lifting height for emptying the container is conditioned by the three-point linkage geometry and the tractor's PTO. The sweeper is equipped with a lifting height limiting strip. The maximum lifting height is reached when the strip touches PTO (for rear-hitched sweeper).



DANGER

Do NOT stand under raised sweeper during its operation.



IMPORTANT

Waste container can be opened and closed only after lifting the sweeper.

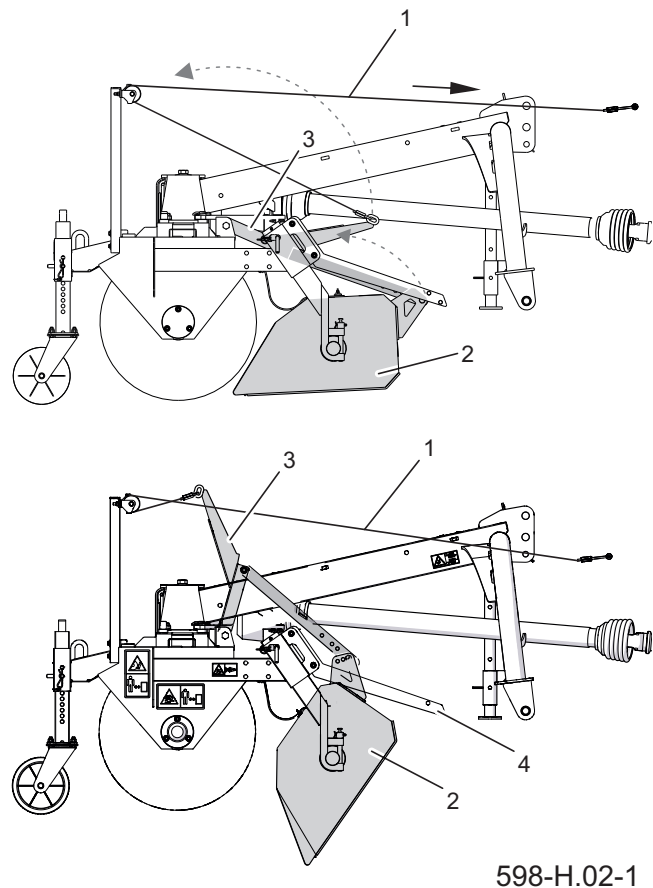


Figure 4.14 Empty the tank

(1) - release cable; (2) waste container
(3) - container lever mechanism. (4) lifting height limiting strip

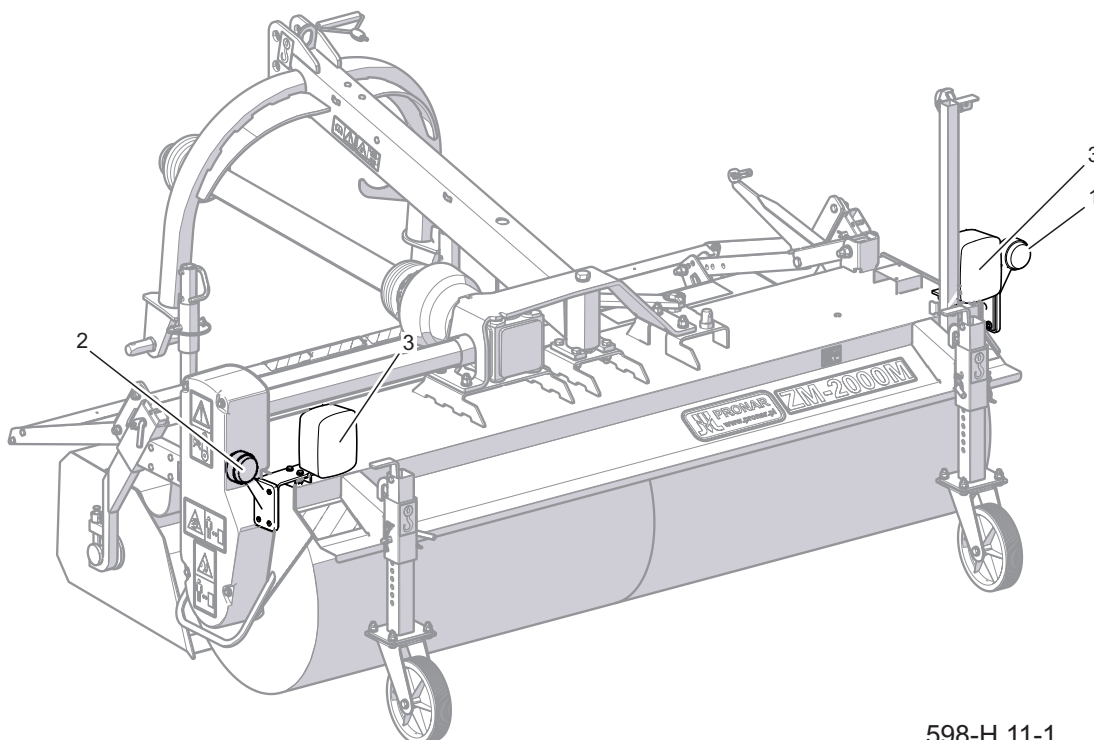
After emptying the container, loosen the cable - the container will return to its normal position. It may happen that the container will not return to its working position after loosening the cable. This may be caused by the debris sticking to the tank surface and shifting the centre of gravity. In such a situation, it is allowed to lower the machine to close the container.

H.2.6.598.05.1.EN

4.10 DRIVING ON PUBLIC ROADS

When driving on public roads, respect the road traffic regulations, exercise caution and prudence. If the machine is operated on pavements special attention should be paid to the bystanders likely to be near the working machine. Listed below are the key guidelines.

- Before moving off, make sure that there are no bystanders, especially children, near the machine or the tractor. Ensure that the driver has sufficient visibility.
- Make sure that the machine is correctly attached to the tractor, and linkage is properly secured.
- Do not exceed the design speed and maximum speed allowed by road traffic regulations. Ground speed should be adjusted to existing road conditions, pavement condition and other conditions.
- While operating the machine, turn on the orange beacon light in the carrier vehicle.
- If the sweeper obscures the slow-moving vehicle warning sign attached to the back of the tractor, the warning sign must be mounted on a dedicated bracket on the sweeper frame (available as an option).



598-H.11-1

Figure 4.15 Additional lights of the sweeper

(1) right clearance lamp (2) left clearance lamp (3) lamp assembly (for rear-hitched sweeper)

- Additional clearance and parking lights should be used if the sweeper obscures the lights installed at the back of the carrier vehicle (Figure 4.9). The clearance lights should be used for the front-mounted sweeper.
- Avoid ruts, depressions, ditches or driving on roadside slopes. Driving across such obstacles could cause the machine and the carrier vehicle to suddenly tilt. Driving near ditches or canals is dangerous as there is a risk of the wheels sliding down the slope or the slope collapsing.
- Speed must be sufficiently reduced before making a turn or driving on an uneven road or a slope.
- When driving on uneven terrain with the implement raised reduce speed due to dynamic loads and the risk of damaging the machine or carrier vehicle.
- When driving with raised machine set it so as not to obscure the lights or restrict the visibility of the operator.
- When driving with raised machine, secure the carrier vehicle's linkage against falling or accidental dropping.

H.2.6.598.05.1.EN

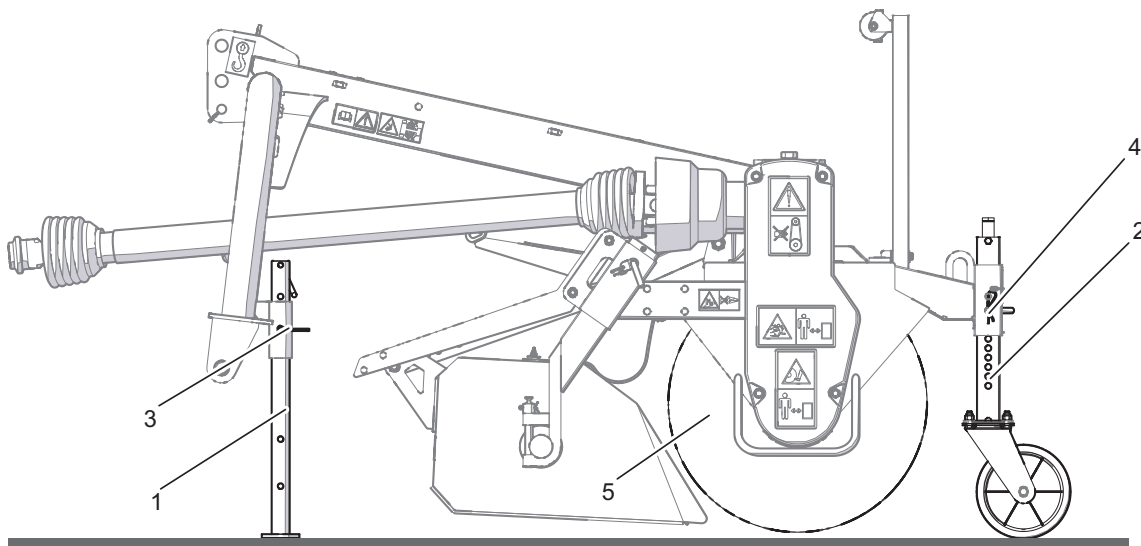
4.11 UNHITCHING THE MACHINE FROM THE CARRIER VEHICLE

Before the sweeper is unhitched from the carrier vehicle, it must be placed on a level, sufficiently hard surface to ensure that it is possible to hitch it again.

Sweeper unhitched from the carrier vehicle should be supported on the parking stand (1) (Figure 4.10) and two jockey wheels (2). If the sweeper roller brush rests on the ground (5), the brush bristle may get deformed.

In order to disconnect the machine from the carrier vehicle, proceed as follows:

- Lower the parking stand (1) and set it at a proper height.
- Lower the sweeper until it fully rests on the ground.
- Turn off the engine, remove key from ignition and engage parking brake.
- Reduce residual pressure in the hydraulic system by moving the appropriate control lever of the hydraulic circuit in the carrier.
- Disconnect the machine articulated telescopic shaft from the tractor PTO;
- After disconnecting the articulated telescopic shaft, place it on the support ;
- Disconnect hydraulic line plugs and



598-H.12-1

Figure 4.16 Parking position

(1) parking stand (2) jockey wheel (3) parking stand linchpin
(4) jockey wheel linchpin (5) roller brush

electric lead plugs (if any) from the carrier vehicle, secure with stoppers.

**DANGER**

Before unhitching the machine from the carrier vehicle, turn off the PTO and the carrier vehicle's engine, engage parking brake and secure the cab against access of unauthorised persons.

Be especially careful when unhitching the machine from the carrier vehicle.

Place hydraulic line plugs in the special bracket on the frame.

- Disconnect the linkage and drive the carrier vehicle away from the machine.

**DANGER**

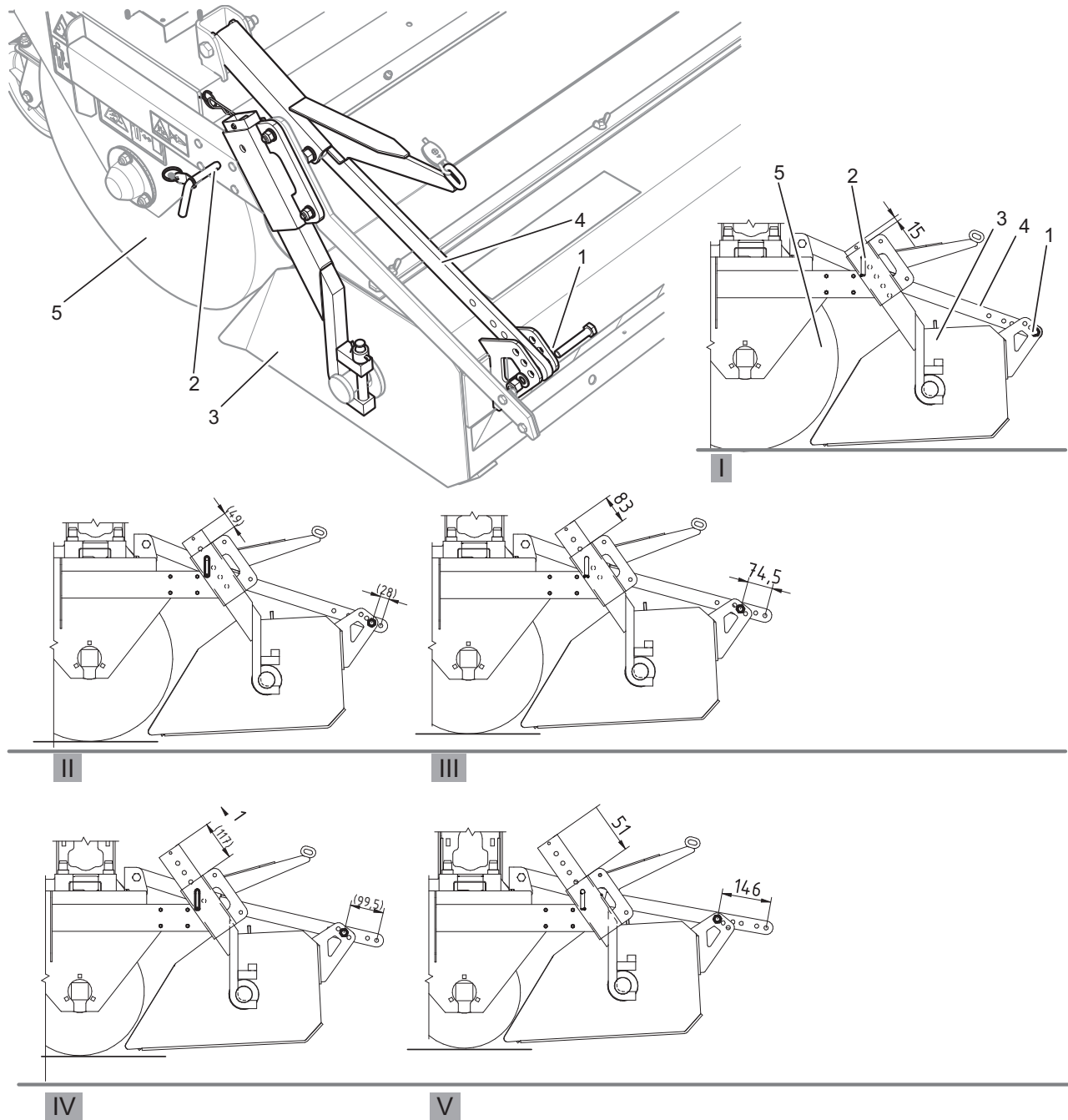
Reduce pressure prior to disconnecting the hydraulic system.

H.2.6.598.06.1.EN

SECTION 5

MAINTENANCE

5.1 WASTE CONTAINER SUSPENSION ADJUSTMENT



598-I.02-1

Figure 5.1 Lifting jack support point

- (1) - waste container rotation lock bolt,
- (2) - pin
- (3) - waste container
- (4) - tipping arm
- (5) - roller brush

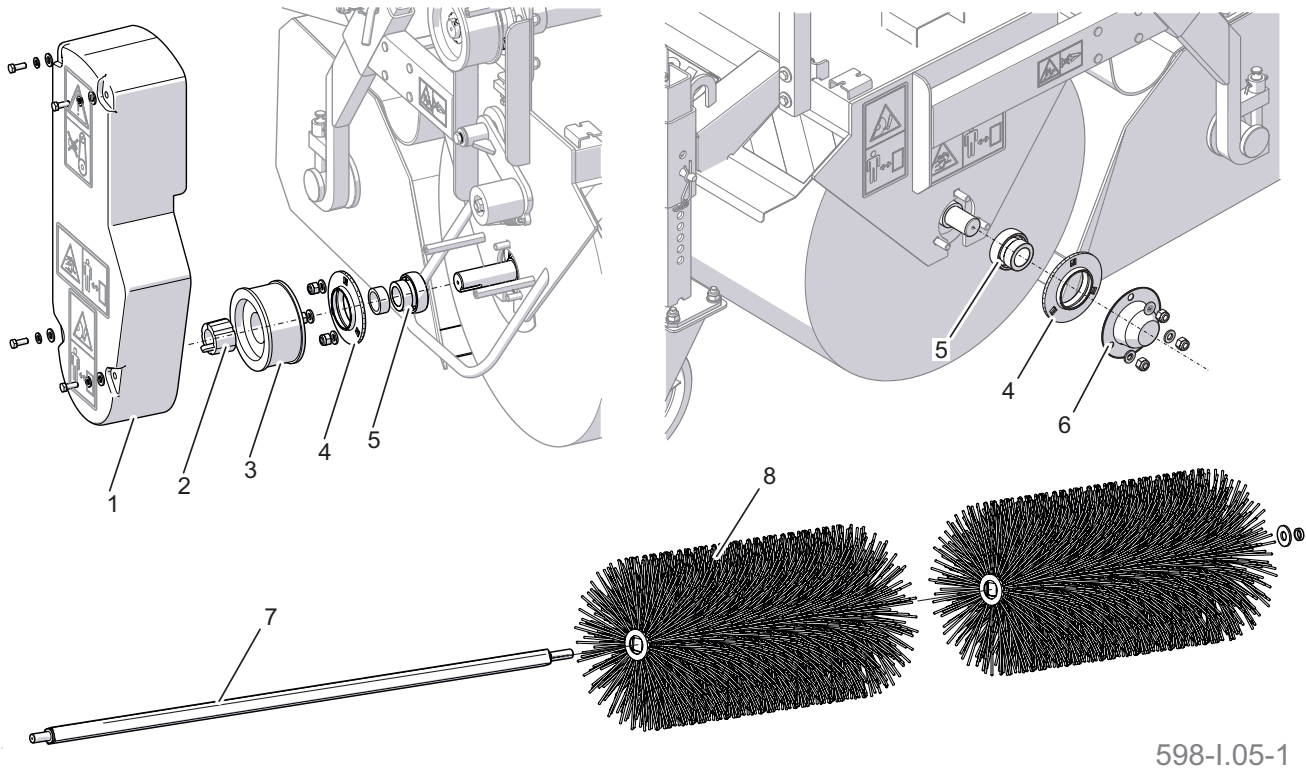
Setting the waste container suspension height is performed after setting the roller brush pressure according to point 4.5.

Then, according to the sketch on label 3 (table 2.1), select the appropriate position of linchpin (2) and bolt (1) to ensure the

container height from the ground in the range of 1-3 cm. Each subsequent setting of the container is used for the increasing wear of the roller brush.

I.1.1.598.01.1.EN

5.2 INSPECTION AND REPLACEMENT OF ROLLER BRUSH



598-I.05-1

Figure 5.2 Replacing the sweeping roller brush

(1) - transmission cover; (2) - Taper Lock conical mounting sleeve; (3) - pulley;
 (4) - flange mount; (5) - self-aligning bearing; (6) - bearing housing; (7) - brush shaft
 (8) - roller brush

Excessively worn or damaged brush should be replaced. Before replacing the sweeping roller brush, make sure that the sweeper is disconnected from PTO.

Sweeping roller brush is composed of two equal segments (8), the so-called roller

brushes, 1000 mm long each, mounted on a common shaft (7) (Figure 5.2).

Depending on customer needs four types

TIP

Technical condition of the sweeper brush should be inspected regularly while using the machine.

Table 5.1. Types of roller brushes

Item	Specification	Part number
1	Medium brush (plastic 2x3mm)	180350.000600
2	Soft brush (plastic 1.6mm)	180350.000580
3	Hard brush (plastic 1.6mm+wire)	180350.700580
4	Very hard brush (plastic 2x3mm+wire)	180350.700600

of roller brushes differing in hardness are available.

List of brushes is shown in Table 5.1

To remove the sweeping roller brush proceed as follows:

- remove the cover (1) and the pulley (3) on the left side of the sweeper
- loosen the screw of the sleeve of the inner bearing clamping rings (5) and slide the sleeves off the shaft journals.

- loosen the bolted connections of the bearing housings (4) and remove the bearings (5) from the shaft (7).

Sweeper can be raised by the carrier vehicle (e.g. tractor) and secured against falling. Remove the roller, slide the brush segments and replace with new. To mount the sweeping roller perform these steps in reverse order.

I.1.1.598.01.1.EN

5.3 SPRINKLER SYSTEM MAINTENANCE

Periodically confirm that spray nozzles are not blocked and that filters inside spray nozzles and filter in the tank are clean in the sweeper's sprinkler system.

The filter with a mesh cartridge (2) under

TIP

The condition of spray nozzles system should be inspected regularly while using the machine. Frequency of filter cleaning depends on amount and size of water contamination.

the water tank must be periodically checked and cleaned (Figure 5.3). To clean the mesh cartridge (2), drain the water, unscrew the cover (3), remove the cartridge (2) from the housing (1) and wash it with water under pressure or blow with compressed air. Install cartridge, tighten filter housing and check tightness

TIP

If there is a leakage in the spray system, water is sprayed in a wrong manner.

of connection.

There is a filter (Figure 5.3) inside each spray nozzle. In order to clean the spray nozzle filter (6), unscrew housing and wash or blow the filter with compressed

TIP

If temperature drops below 0°C, the machine should be stored in a building at a temperature above 0°C, because there is a risk that water in the water pump will freeze and damage the pump. Do not start frozen water pump.

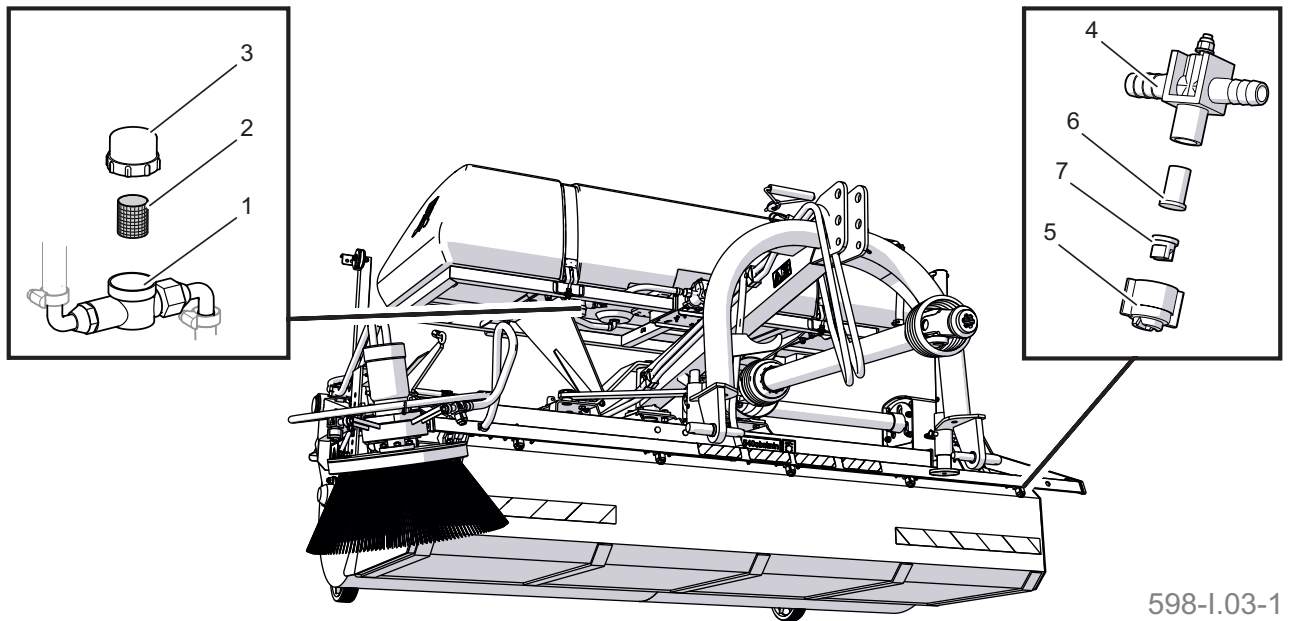
air. Before installing the filter, confirm that the spray nozzle is not blocked. Check technical condition of spray nozzles and, if necessary, replace them. The list of spray nozzle components is included in Table 5.2

TIP

Water filters are recommended to be cleaned at least once a year. Frequency of filter cleaning depends on amount and size of water contamination.

Table 5.2. The list of spray nozzle elements

Item	Name	Part number
4	Pass-through stub pipe S1/R/K End stub pipe S1/R/P	324-600-000150 324-600-000151
5	Wing nut M18	324-200-000147
6	Stub pipe valve	304-110-000007
7	Slotted sprayer	303-790-000002



598-I.03-1

Figure 5.3 Filters in the sprinkler system

- | | | |
|-------------------------------|-----------------------------|------------------------|
| (1) - filter housing | (2) - filter mesh cartridge | (3) - cover |
| (4) - pass-through stub pipe; | (5)- nut; | (6) - stub pipe valve; |
| (7) - slotted sprayer | | |

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5.4 REPLACING THE SIDE BRUSH

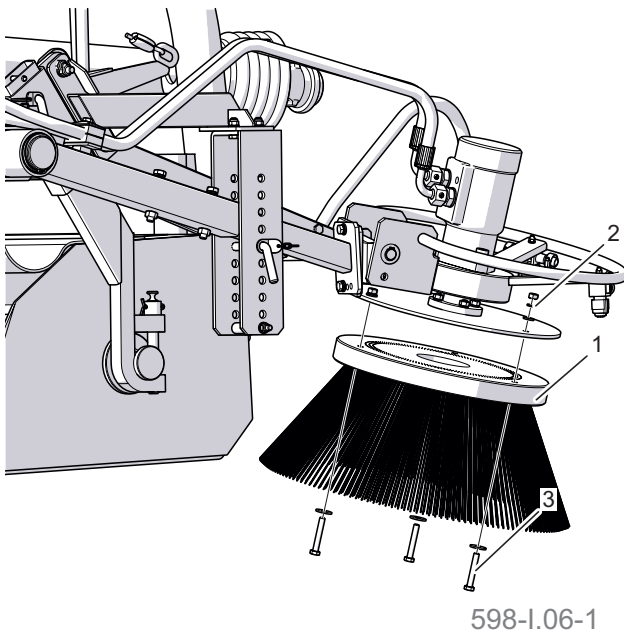


Figure 5.4 Replacing the side brush
(1) - brush, (2) - M8 Nut, (3) - M8x50 bolt

Excessively worn or damaged brush should be replaced. The side brush replacement may only be performed when the sweeper is unhitched from the carrier vehicle and supported on the ground. The side brush arm should be raised and locked in the guide in its highest position.

To replace the side brush:

- undo nuts (2), remove bolts (3) with washers;
- replace worn brush (1),
- insert bolts (3) and washers and tighten nuts (2);

Table 5.3. The types of side brushes

Item	Specification	Part number
1	Medium brush (flat wire + plastic 2x3 mm)	260800.900600
2	Soft brush (plastic 2x3 mm)	260800.000600
3	Hard brush (flat wire)	260800.900000

I.1.1.598.02.1.EN

5.5 HYDRAULIC SYSTEM MAINTENANCE



IMPORTANT

Before starting work, visually inspect the hydraulic system components.

Hydraulic system maintenance duties:

- check tightness;
- check technical condition of hydraulic conduits and quick couplers;

The hydraulic system of new machine is factory filled with HL32 hydraulic oil. Because of its composition, the oil is not clas-



The condition of hydraulic system should be inspected regularly while using the machine.

sified as a dangerous substance, however long-term action on the skin or eyes may cause irritation.

In the event of contact of oil with skin wash the place of contact with water and soap. Do NOT apply organic solvents (petrol, kerosene). Contaminated clothing should be changed to prevent access of oil to skin. In the event of contact of oil with eye, rinse with large quantity of water and in the event of the occurrence of irritation consult a doctor. Hydraulic oil in normal conditions is not harmful to the respiratory tract. A hazard only occurs when oil is strongly



DANGER

The machine with a leaking hydraulic system must NOT be used.

atomised (oil vapour), or in the case of fire during which toxic compounds may be released.

Spilt oil should be immediately collected and placed in a marked tight container.

Used oil should be taken to the appropriate facility dealing with recycling or regeneration of oils.

The hydraulic system must be tight.

If an oil leak is found on hydraulic connections, tighten the connections. If this does not remedy the problem, replace the



DANGER

Oil fires should be quenched with carbon dioxide (CO₂), foam or extinguisher steam. Do NOT use water for fire extinguishing!



IMPORTANT

Hydraulic lines should be replaced every four years.

lines and connection components. Always exchange each mechanically damaged component.

Table 5.4. Hydraulic oil characteristics

Item	Name	Value
1	ISO 3448VG viscosity classification	32
2	Kinematic viscosity at 40°C	28.8 – 35.2 mm ² /s
3	ISO 6743/99 quality classification	HL
4	DIN 51502 quality classification	HL
5	Flash point, [°C]	Above 210°C
6	Maximum operating temperature, [°C]	80

Table 5.5. Hydraulic components tightening torque

Nut thread	Line diameter DN (cal)	Tightening torque [Nm]
M10x1 M12x1.5 M14x1.5	6 (1/4")	30÷50
M16x1.5 M18x1.5	8 (5/16")	30÷50
M18x1.5 M20x1.5 M22x1.5	10 (3/8")	50÷70
M22x1.5 M24x1.5 M26x1.5	13 (1/2")	50÷70
M26x1.5 M27x1.5 M27x2	16 (5/8")	70÷100
M30x1.5 M30x2 M33x1.5	20 (3/4")	70÷100
M38x1.5 M36x2	25 (1")	100÷150
M45x1.5	32 (1.1/4")	150÷200

I.1.1.598.03.1.EN

5.6 DRIVE TRANSMISSION SYSTEM MAINTENANCE

Drive transmission system maintenance

(Figure 5.7) involves:

- periodic inspection and change of oil in the bevel gear,
- lubricate telescopic shafts according to the schedule (Table 5.4).
- inspection and replacement of the brush drive's cogbelt.

Proper oil level in the bevel gear should reach the lower edge of the plug opening. It is best to change oil immediately after



DANGER

If the machine is hitched to the carrier, disengage the PTO, remove the key from the ignition and immobilize the vehicle with the parking brake before you inspect or adjust the transmission system.



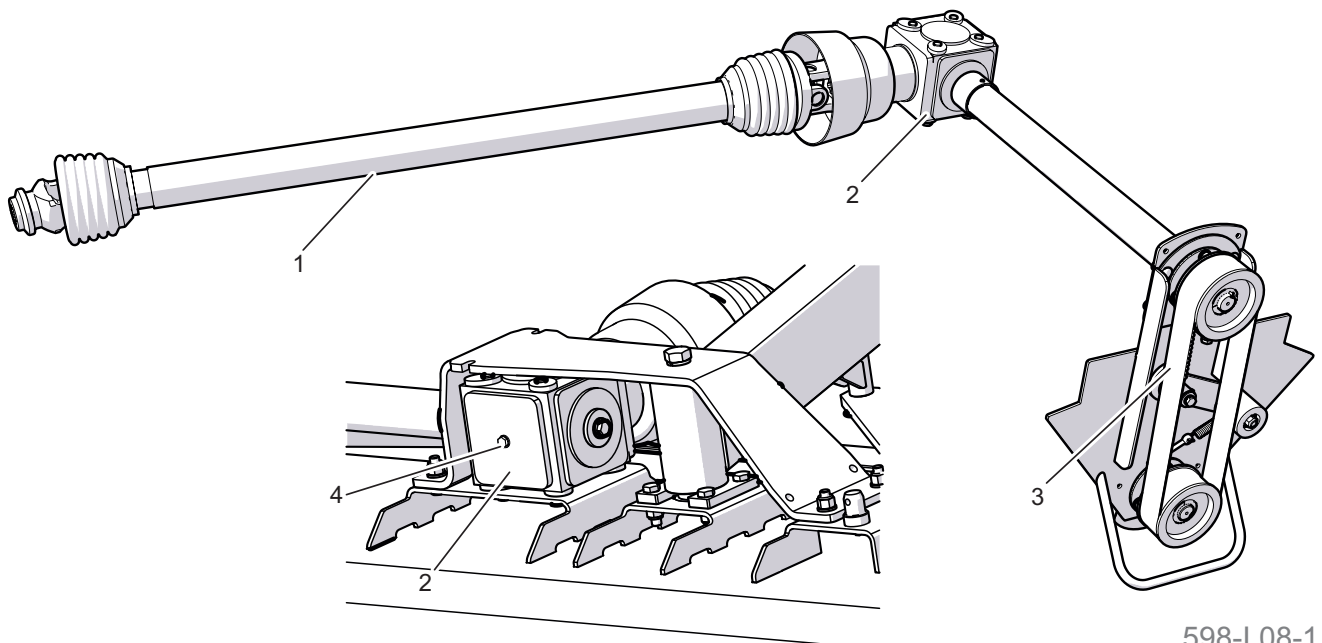
Change oil in the bevel gear for the first time after the first 50 hours of work. The next oil changes should be made every 500 hours or once a year (whichever occurs first).

completing work when the gear is still hot and impurities are suspended in oil. Remove the used oil using a vacuum oil extractor.

Top up oil through the filler opening.

If a leak is noticed, carefully inspect seals and check oil level. Operating the transmission with insufficient amount of oil or without oil may cause permanent damage. Only add or change oil when the machine is disconnected from the tractor, and resting on supports.

Dismount shield (3) to gain access to belt



598-I.08-1

Figure 5.5 Inspect and replace oil in the gearbox

(1) - PTO shaft; (2)- bevel gear; (3)- belt transmission; (4) - filler plug

**IMPORTANT**

Repairs of bevel gear during warranty period may only be performed at authorised mechanical workshops.

TIP

Fill the bevel gear with SAE.90EP (80W90 GL-5) oil
- bevel gear capacity: 1.0 litre.

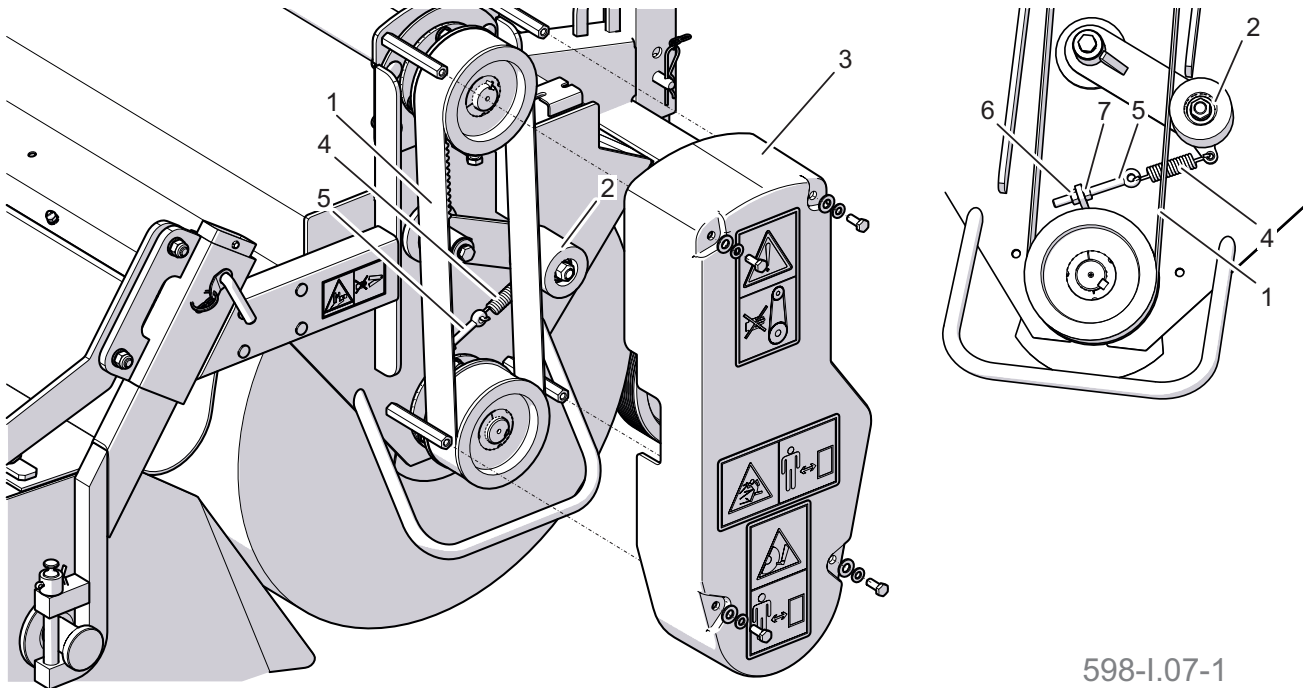
transmission (FIGURE 5.8).

Belt transmission is equipped with spring tensioner (2). Belt tension may be changed

using nut (6) after loosening lock nut (7). In order to dismount cogbelt, loosen proper nut (6), bolts (5) and remove spring (4). After installing the cogbelt, tension the tensioner spring (4) with a force of 160 +/- 10N. After making the adjustment, tighten the lock nut (7) and install the shield (3).

TIP

The belt transmission of brush drive is equipped with cogbelt, part number 1280-8M/Z160X50.



598-I.07-1

Figure 5.6 Belt transmission of brush drive

(1) - cogbelt; (2) - tensioner; (3) - shield; (4) - tension spring; (5) - eye bolt;
(6) - tensioning nut; (7) - lock nut

I.1.1.598.04.1.EN

5.7 ELECTRICAL SYSTEM MAINTENANCE



IMPORTANT

Before beginning repairs of electrical system, disconnect the machine from power source. Turn off the PTO and the carrier vehicle's engine.



DANGER

Do not independently repair electrical system, except items described in chapter ELECTRICAL SYSTEM MAINTENANCE. All electrical system repairs must be performed only by suitably qualified personnel.



IMPORTANT

Do NOT travel with out of order lighting system. Burned-out or damaged lamps must be replaced with new ones.

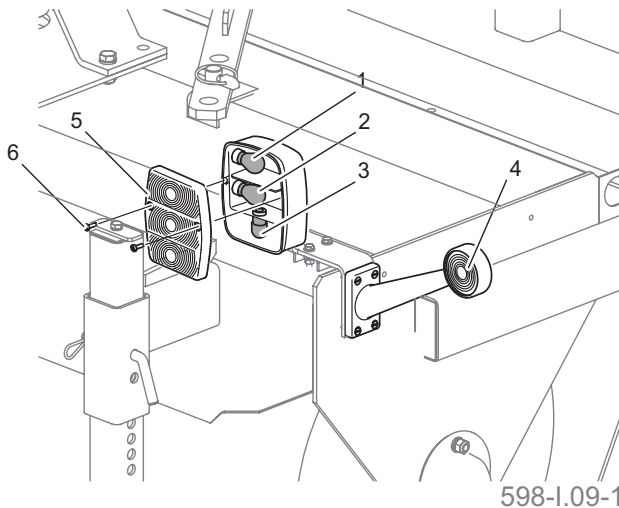


Figure 5.7 Replacement of bulbs
 (1) indicator light bulb; (2) brake light bulb;
 (3) parking light bulb; (4) clearance light;
 (5) lamp assembly lens; (6) screw

Electrical system maintenance involves periodic inspection of the sprinkler system

operation and the lighting system operation (option).

After connecting to 7-pole socket on the tractor, check operation of the lighting system.

In case of bulb burnout in lamp assembly, unscrew screws (6) that secure lamp lens (5) and replace appropriate bulb (FIGURE 5.12). The clearance lights (4) are maintenance-free LED lights.

Table 5.6. List of wearing parts

Item	Name	Part No.	Quantity
1	indicator light	P21W	Lamp assembly W-18U
2	brake light	P21W	
3	parking light	R10W	
4	clearance light	-	Left clearance lamp 295BCL Right clearance lamp 295BCP

I.1.1.598.06.1.EN

5.8 LUBRICATION

Lubricate the machine using a grease gun, filled with ŁT-43-PN/C-96134 grease. Clean the lubrication points before lubricating. Remove and wipe off excess oil or grease. The drive shafts are to be lubricated as instructed in the shaft Operator's Manual provided the shaft manufacturer. Clean the area of old grease before lubrication.

TIP

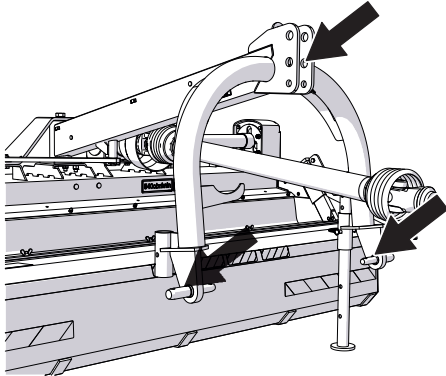
When using the machine the user is obliged to observe lubrication instructions according to attached schedule. Excess lubricant causes depositing of additional contaminants in places requiring lubrication, therefore it is essential to keep individual machine components clean.

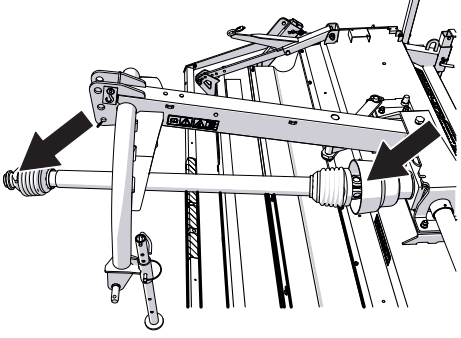
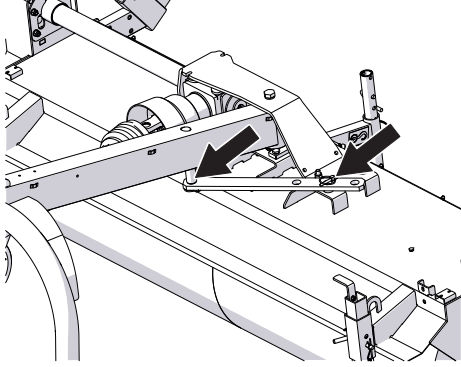
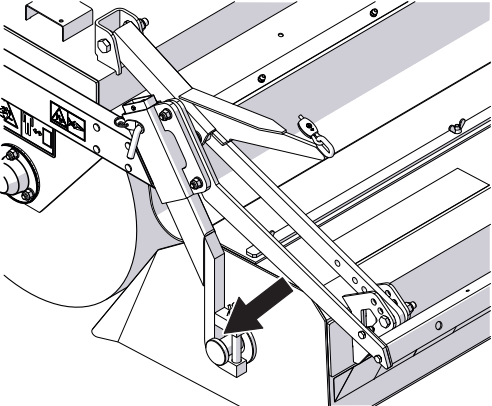
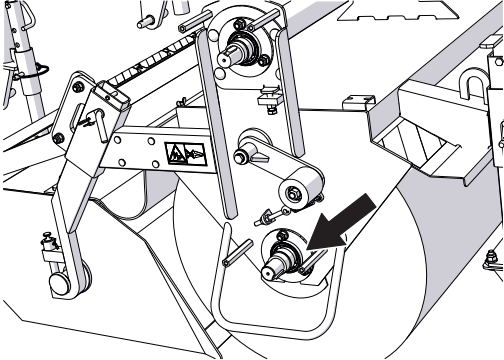


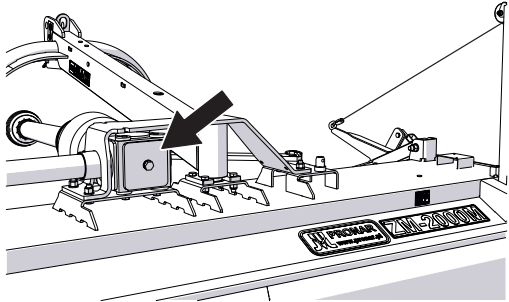
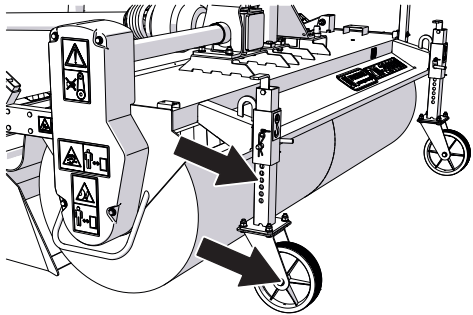
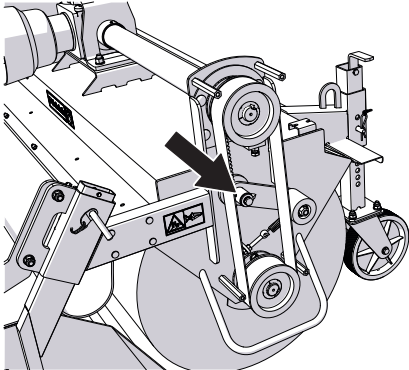
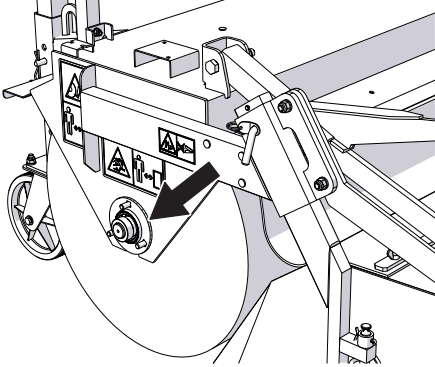
DANGER

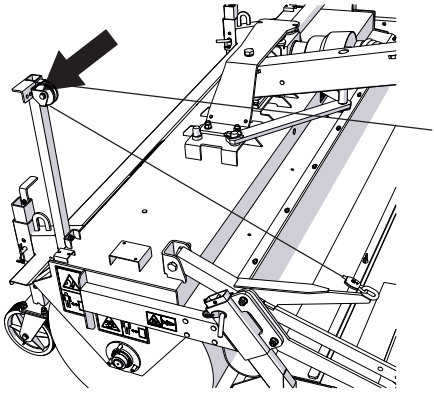
Lubricate the machine when it is lowered on its supports and resting on the ground. Before lubricating, turn off engine, remove key from ignition and engage carrier vehicle brake.

Table 5.7. Lubrication points and lubrication frequency

Name	Number of lubrication points	Type of grease	Frequency	
Three-point linkage	3	B	1D	 <p>598-I.10-1</p>

<p>PTO shaft</p>	<p>3</p>	<p>B</p>	<p>15D</p>	 <p>598-I.11-1</p>
<p>Sweeper tipping lock</p>	<p>2</p>	<p>A</p>	<p>15D</p>	 <p>598-I.12-1</p>
<p>Container hook</p>	<p>2</p>	<p>A</p>	<p>15D</p>	
<p>Transmission shaft bearing and journal</p>	<p>1</p>	<p>A</p>	<p>SZ</p>	 <p>598-I.14-1</p>

<p>Bevel gear</p>	<p>1</p>	<p>E</p>	<p>12M</p>	 <p>598-I.15-1</p>
<p>Jockey wheel column and pin</p>	<p>2</p>	<p>A</p>	<p>15D</p>	 <p>598-I.16-1</p>
<p>Tensioner pin</p>	<p>1</p>	<p>A</p>	<p>6M</p>	 <p>598-I.17-1</p>
<p>Roller brush bearings and journals</p>	<p>2</p>	<p>A</p>	<p>SZ</p>	 <p>598-I.18-1</p>

Cable pulley pin	1	A	15D	
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*- For detailed information on operation and maintenance please refer to Operator Manual enclosed with the shaft.

Table 5.8. Lubricants

Item	Symbol	Description
1	A	machine general-purpose grease (lithium, alkaline),
2	B	grease for heavily loaded elements with addition of MoS ₂ or graphite
3	C	anticorrosion preparation in aerosol
4	D	ordinary machine oil, silicon grease in aerosol
5	E	SAE 90EP (80W90 GL-5) transmission oil .

TIP

Lubrication frequency (see table *Machine lubrication schedule*):

D - working day (8 hours of machine use)

M - month

SZ - replacement of roller brush

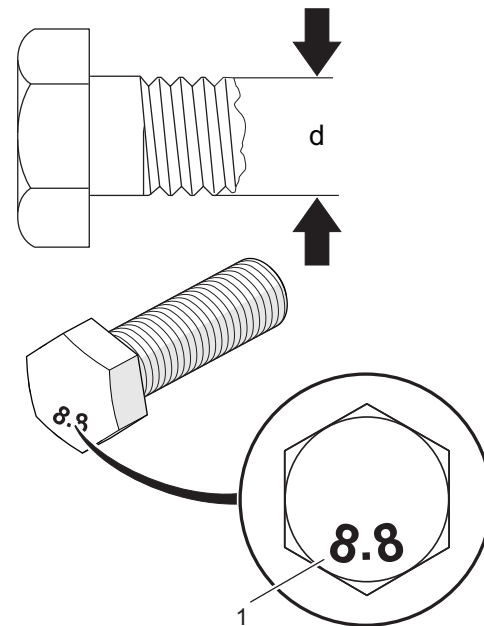
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5.9 TIGHTENING BOLT CONNECTIONS

Before each use of the machine and during maintenance and repair work, confirm that all bolt connections are properly tightened. If any clearances in bolt connections are found, tighten bolt connections using appropriate tightening torque (TABLE 5.6), unless other tightening parameters are given. Recommended torque values apply to non-greased steel bolts.

Table 5.9. Tightening torque for nut and bolt connections

THREAD MARKING [mm]	8.8	10.9
	TIGHTENING TORQUE [Nm]	
M6	10	15
M8	25	36
M10	49	72
M12	85	125
M14	135	200
M16	210	310
M20	425	610
M24	730	1,050
M27	1,150	1,650
M30	1,450	2,100
M32	1,450	2,100



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Figure 5.8 Bolt with metric thread
(1) resistance class (d) thread diameter



IMPORTANT

While washing do not direct a strong water or steam jet at information and warning decals, bearings, hydraulic lines or electrical wires.

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5.10 STORAGE

After finishing work, clean and wash the sweeper thoroughly with a water jet. Nozzle of pressure or steam washer should be kept at a distance of not less than 50 cm from cleaned surface.

After cleaning, inspect the whole machine, inspect technical condition of individual elements. Repair or replace any used or damaged components.

In the event of damage to the paint coat, clean rust and dust from damaged area, degrease and then paint with undercoat and after it is dry paint with surface coat paint retaining colour uniformity and even thickness of protective coating. Until the time of touch-up painting, the damaged place may be covered with a thin layer of grease or anticorrosion preparation.

If the machine will not be used for an extended period of time, protect it against adverse weather conditions. Sweeper should be lubricated according to the instructions provided regardless of the date of the last lubrication. Protect against corrosion all mating components, such as pins or articulated joints. Cover them with a thin layer of grease.

Sweeper should be stored in a roofed building inaccessible for unauthorized people and animals. The machine unhitched from the carrier vehicle (tractor) should be placed on level, sufficiently hard surface in a way as to ensure that it is possible to hitch it again. Protect the control panel against adverse weather conditions.

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5.11 TROUBLESHOOTING

Table 5.10. Troubleshooting

Problem	Possible cause	Solution
Gearbox over-heating	Low oil level.	Add oil to correct level.
	Wrong oil type.	Replace with SAE.90EP (80W90 GL-5)
Leaking gear	Seal damaged	Replace the seal.
	Oil level too high	Drain the oil to obtain the correct level.
	Loose bolts.	Tighten bolts
Waste is not collected	Excessive ground speed	Reduce ground speed.
	RPM too low	Use full PTO speed. (540 rpm)
	Pressure applied to the surface by the roller brush is incorrectly set	Adjust according to the Operator Manual
	Waste container height set incorrectly	Adjust according to the Operator Manual
	Brushes excessively worn	Replace
The brush is rotating in the wrong direction.	The setting of the bevel gear of the brush drive is wrong.	Change the position of the bevel gear Contact the seller
Rapid wear of brushes	Pressure applied to the surface by the roller brush is incorrectly set.	Adjust according to the Operator Manual
	Side brush incorrectly set	
Material is ejected from under the sweeper	Brush rotational speed too high. Brush incorrectly set. Incorrect setting in the carrier vehicle	Check and adjust according to Operator Manual
Spray system is not working	Spray system turned off	Set the sprinkler system switch to "ON" position
	Water pump electrical power supply not connected	Check the connection of the power lead plug. Check the connection of the sprinkling system switch
	No water in the tank	Top up water
	Spray system clogged	Make sure the system is not clogged, clean the filter strainers and water spray nozzles
	Faulty water pump	Notify service point

Side brush does not rotate	Hydraulic system not connected or incorrectly connected	Check connection
	Incorrect oil flow direction	Swap the quick-couplers
	Faulty hydraulic system	Notify service point
Side brush rotates too slowly or too quickly	Sweeper oil flow regulator improperly adjusted	Set brush rotation speed by turning the oil flow regulator knob

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