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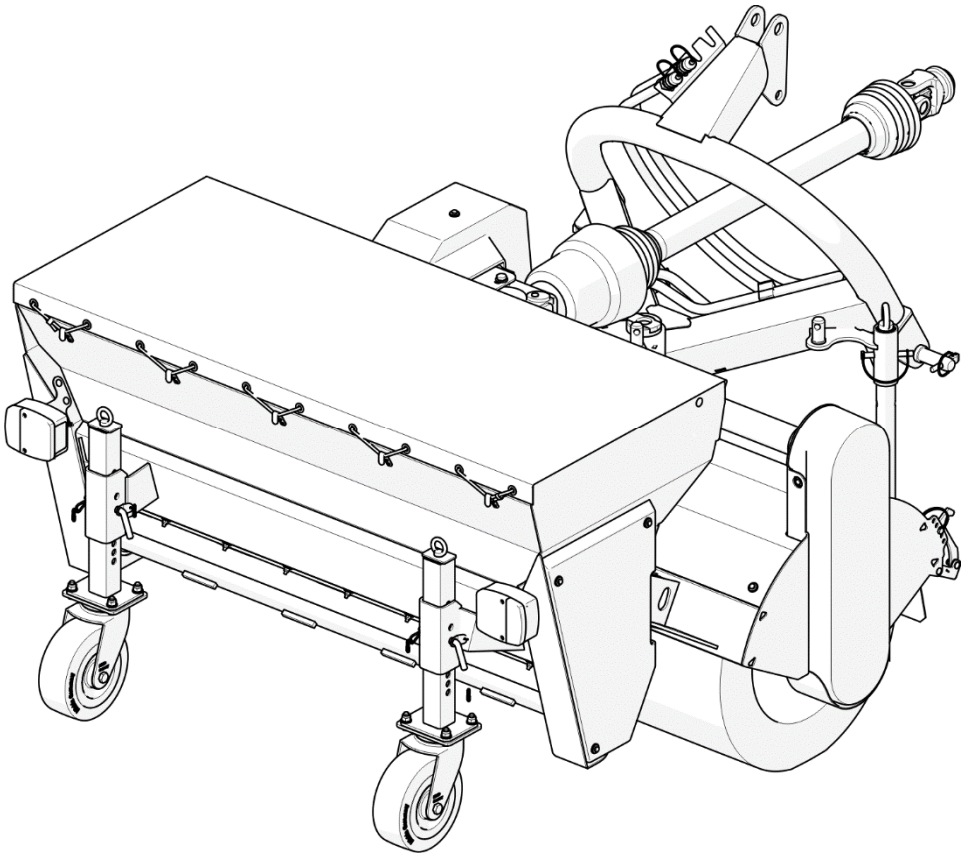
OPERATOR'S MANUAL

SWEEPER

PRONAR ZM-P16

TRANSLATION OF THE ORIGINAL COPY OF THE MANUAL



EDITION 1A-03-2015

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EN

SWEEPER

PRONAR ZM-P16

MACHINE IDENTIFICATION

TYPE: *ZM-P16*

SERIAL NUMBER:

INTRODUCTION

Information contained herein is current at date of publication. As a result of improvements, some numerical values and illustrations contained in this publication may not correspond to the factual specification of the machine supplied to the user. The manufacturer reserves the right to introduce design changes in machines produced that facilitate operation and improve the quality of their work, without making minor amendments to this Operator's Manual.

This Operator's Manual is an integral part of the machine's documentation. Before using the machine, the user must carefully read this Operator's 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.

The manual describes the basic safety rules and operation of the machine. If the information stated in the Operator's Manual needs clarification then the user should refer for assistance to the sale point where the machine was purchased or to the Manufacturer.

MANUFACTURER'S ADDRESS:

PRONAR Sp. z o.o.
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17-210 Narew

CONTACT TELEPHONES

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SYMBOLS APPEARING IN THIS OPERATOR'S MANUAL

Information, descriptions of danger and precautions and also recommendations and prohibitions associated with user safety instructions are marked:

and also preceded by the word **"DANGER”.** Failure to observe the instructions may endanger the machine operator's or other person's health or life.

Particularly important information and instructions, the observance of which is essential, are distinguished in the text by the sign:

and also preceded by the word **"ATTENTION".** Failure to observe the instructions may lead to damage to the machine as a result of improper operation, adjustment or use.

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

Additional tips and advice for machine operation are marked with the sign:

and also preceded by the word **"TIP".**

DIRECTIONS USED IN THIS OPERATOR'S 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.

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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:	**Sweeper**
Type:	**ZM-P16**
Model:	–
Serial number:	
Commercial name:	**Sweeper PRONAR ZM-P16**

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.

Z-CA DYREKTORA
d/s technicznych
członek zarządu
Roman Omelaniuk

Narew, the 2015-03-18

Place and date

Full name of the empowered person position, signature

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BASIC INFORMATION

1.1 IDENTIFICATION

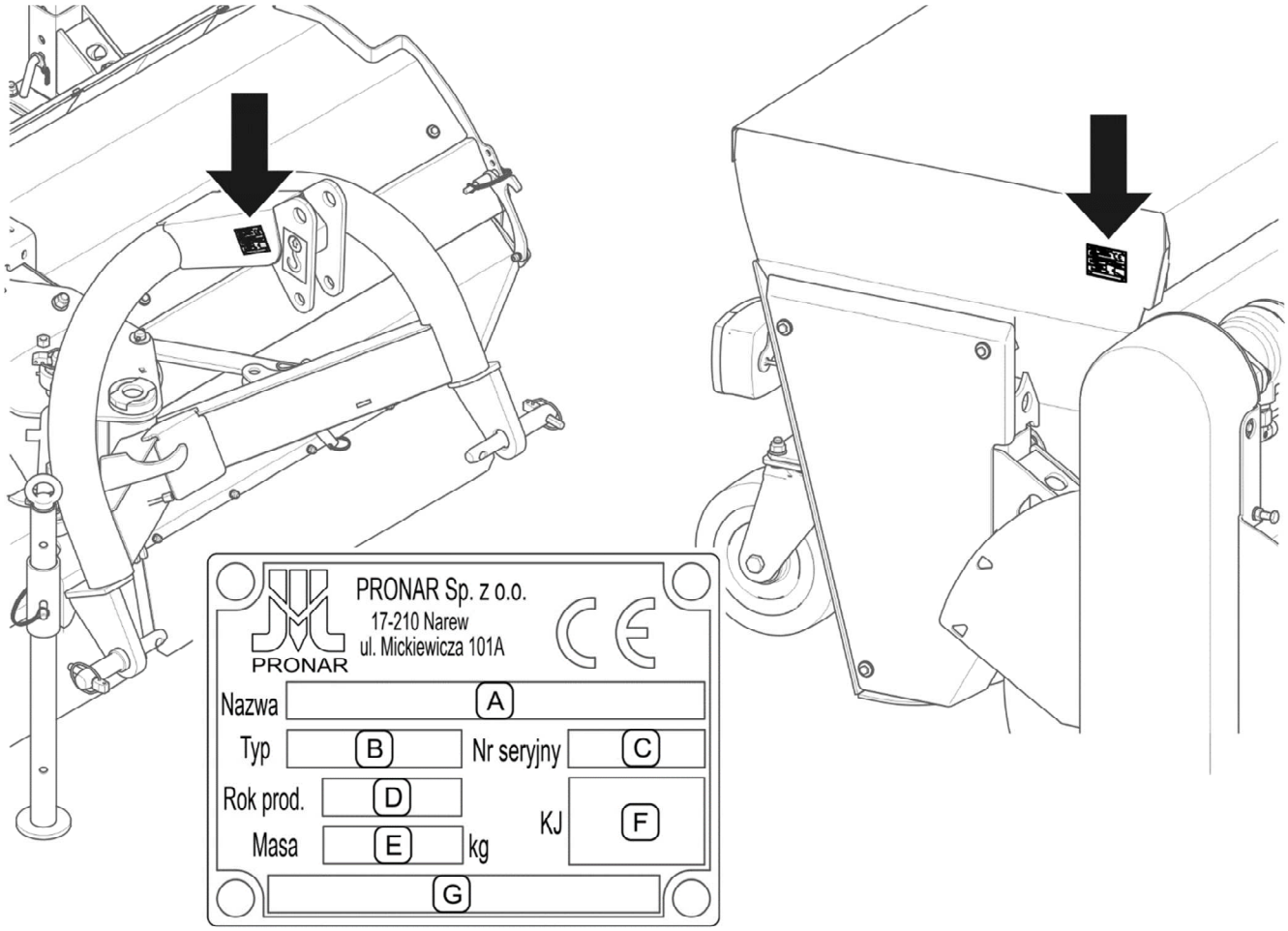


FIGURE 1.1 Location of the data plate

Meaning of data plate items (FIGURE 1.1):

A - machine name

B – type

C – serial number

D – year of manufacture

E – machine tare weight [kg]

F – Quality Control stamp

G – additional information

The serial number is stamped into the data plate and under the data plate. The sweeper's data plate is located on the central connection fixing bracket. The spreader's data plate is located on the right wall of the tank (FIGURE 1.1).

When buying the machine, confirm that the serial number on the machine corresponds to the number indicated in the *WARRANTY BOOK*, in the sales documents and in the *OPERATOR'S MANUAL*.

1.2 PURPOSE

Depending on the version, PRONAR ZM-P16 sweeper is used for sweeping roads, pavements, squares with paved surfaces such as asphalt, concrete paving blocks, cobblestone and concrete. The sweeper operation consists in sweeping dirt to the right or left side, without collecting dirt. In winter, the sweeper can be used for sweeping sideways a thin layer of fresh snow and for spreading sand, salt and mixtures of sand and salt. The use of the snowplough for other purposes should be regarded as improper.

Depending on its equipment, the sweeper can be mounted on carrying vehicles that meet the requirements set out 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'S 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,
- comply with road traffic regulations.

The machine may only be used by persons, who:

- are familiar with the contents of this publication and with the contents of the carrying vehicle Operator's 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 Carrying vehicle requirements

ZM-P16 sweeper with mechanical PTO drive

	UNIT	REQUIREMENTS
Mounting method:		
- sweeper	-	front or rear three-point linkage of cat. I or II according to ISO730-1
- sweeper with salt and sand spreader	-	rear three-point linkage of cat. I or II according to ISO730-1
Power take-off shaft (PTO)		
PTO speed	RPM	540
PTO rotation direction	- -	right (left - *after turning the gear*)
PTO shaft profile	-	type 1 according to ISO 500 *(Ø 35 mm, 6 splines)*
Minimum power on PTO shaft	hp (kW)	20.4 (15)
Electrical system		
Electrical system voltage	V	12
Connection type:		
- on the carrying vehicle's front		
• sweeper	-	- 7-pole socket *(for sprinkler system - option)*
- on the carrying vehicle's rear		
• sweeper	-	- 7-pole socket *(for sprinkler system - option)*
• sweeper with salt and sand spreader	-	- 7-pole socket *(for lighting system - option)* and 3-pin socket
Hydraulic system		
Nominal pressure	MPa	16*
Oil delivery	l/min	10 ÷ 40
Number and type of hydraulic connectors	- -	2 sockets of one hydraulic section *(supply of spreader)* 2 sockets of the other hydraulic section *(hydraulic turning system - option)*
Type of oil	-	hydraulic, HL-32
Equipment of carrying vehicle	-	beacon light *(orange light)*

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

ZM-P16 sweeper with hydraulic drive

	UNIT	REQUIREMENTS
Mounting method:		
- sweeper	-	front or rear three-point linkage of cat. I or II according to ISO730-1
- sweeper with salt and sand spreader	-	rear three-point linkage of cat. I or II according to ISO730-1
Electrical system		
Electrical system voltage	V	12
Connection type:		
- on the carrying vehicle's front	-	
• sweeper		- 7-pole socket *(for sprinkler system - option)*
- on the carrying vehicle's rear	-	
• sweeper	-	- 7-pole socket *(for sprinkler system - option)*
• sweeper with salt and sand spreader		- 7-pole socket *(for lighting system - option) and* 3-pin socket
Hydraulic system		
Nominal pressure	MPa	16 *
Oil delivery	l/min	10 ÷ 40
Number and type of hydraulic connectors	-	2 sockets of one hydraulic section *(supply of sweeper and spreader)*
	-	2 sockets of the other hydraulic section *(hydraulic turning system - option)*
Type of oil	-	hydraulic, HL-32
Equipment of carrying vehicle	-	beacon light *(orange light)*

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

IMPORTANT

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

- **transporting people, animals or any materials,**
- **spreading other materials than those specified by the Manufacturer.**

1.3 ACCESSORIES

The standard equipment of the machine includes:

- rear-mounted sweeper with mechanical turning system
- Operator's 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)*

- brush for leaves and snow

- brush for snow

Equipment versions:

- front-mounted sweeper
- salt and sand spreader
- hydraulic sweeper turning system
- sprinkler system *(only for sweeper)*
- rear lights *(only for sweeper with salt and sand spreader)*
- PTO shaft *(71R4121CEWR7007) – for PTO drive*

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'S MANUAL*. Defects discovered during the warranty period will be removed by the Warranty Service. The repair period is specified in the *WARRANTY BOOK*.

The guarantee does not apply to those parts and sub-assemblies of the machine, which are subject to wear in normal usage conditions, regardless of the warranty period. Consumables include the following parts/sub-assemblies:

- working elements of the brush,
- spreading roller,
- wheels,
- bearings,
- bulbs,
- fuses,
- protective coatings in working areas (interior of sweeper frame, tank, sieve)

The warranty service only applies to factory defects and mechanical damage that is not due to the user's fault.

In the event of damage arising from:

- mechanical damage which is the user's fault, caused by road accidents,
- by inappropriate use, adjustment or maintenance, use of the machine for purposes other than those for which it is intended,
- use of damaged or malfunctioning machine,
- repairs carried out by unauthorised persons, improperly carried out repairs,
- making unauthorised alterations to machine design,

the user will lose the right to warranty service.

TIP

Demand that the seller carefully and precisely fills out the *WARRANTY BOOK* and guarantee repair coupons. A missing date of purchase or sale point stamp, may make the user ineligible for any warranty repair or refund.

During warranty period the user is obliged to report immediately on noticing any wear in the paint coating or traces of corrosion, and to have the faults rectified whether they are covered by the warranty or not. For detailed Terms & Conditions of Warranty, please refer to the *WARRANTY BOOK* attached to each machine.

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

1.5 TRANSPORT

DANGER

When transporting independently, the user must carefully read this Operator's Manual and observe all recommendations. When being transported on a motor vehicle the machine must be mounted on the vehicle's platform in accordance with the transport safety requirements. The driver of the vehicle should take particular care while transporting the machine. This is due to the vehicle's centre of gravity shifting upwards when loaded with the machine.

The machine is prepared for sale completely assembled and does not require packing. Packing is only required for the machine operator's manual and electrical system components.

Delivery is either by transport on a vehicle or independently, after being attached to a tractor. Transport of the machine is permissible connected to a carrying vehicle provided the vehicle's driver familiarises himself with the machine's Operator's Manual and particularly with information concerning safety and principles of connection and transport on public roads.

During road transport the machine should be firmly secured on the load platform by means of certified belts or chains fitted with a tightening mechanism.

When loading and unloading the machine, comply with the general principles of workplace health and safety 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 (FIGURE 1.2) i.e. by the upper bracket of the linkage hitch and by the brackets of the support wheels guides. The sweeper with salt and sand spreader is equipped with two additional attachment points located on both sides, under the side shields of the spreader drive mechanism. These attachment points are used for mounting the spreader on the sweeper and dismounting the spreader from the sweeper. Suspension points are identified with information decals. When lifting the machine take particular care due to the possibility of tipping over the machine and the risk of injuries from protruding parts. To keep lifted machine in the correct direction it is recommended to apply additional guy cables. During the loading work particular care should be taken not to damage paint coating.

NOTE

Do NOT secure lifting slings or any types of load securing elements to hydraulic cylinders, electrical system components and fragile elements of the machine (e.g. guards).

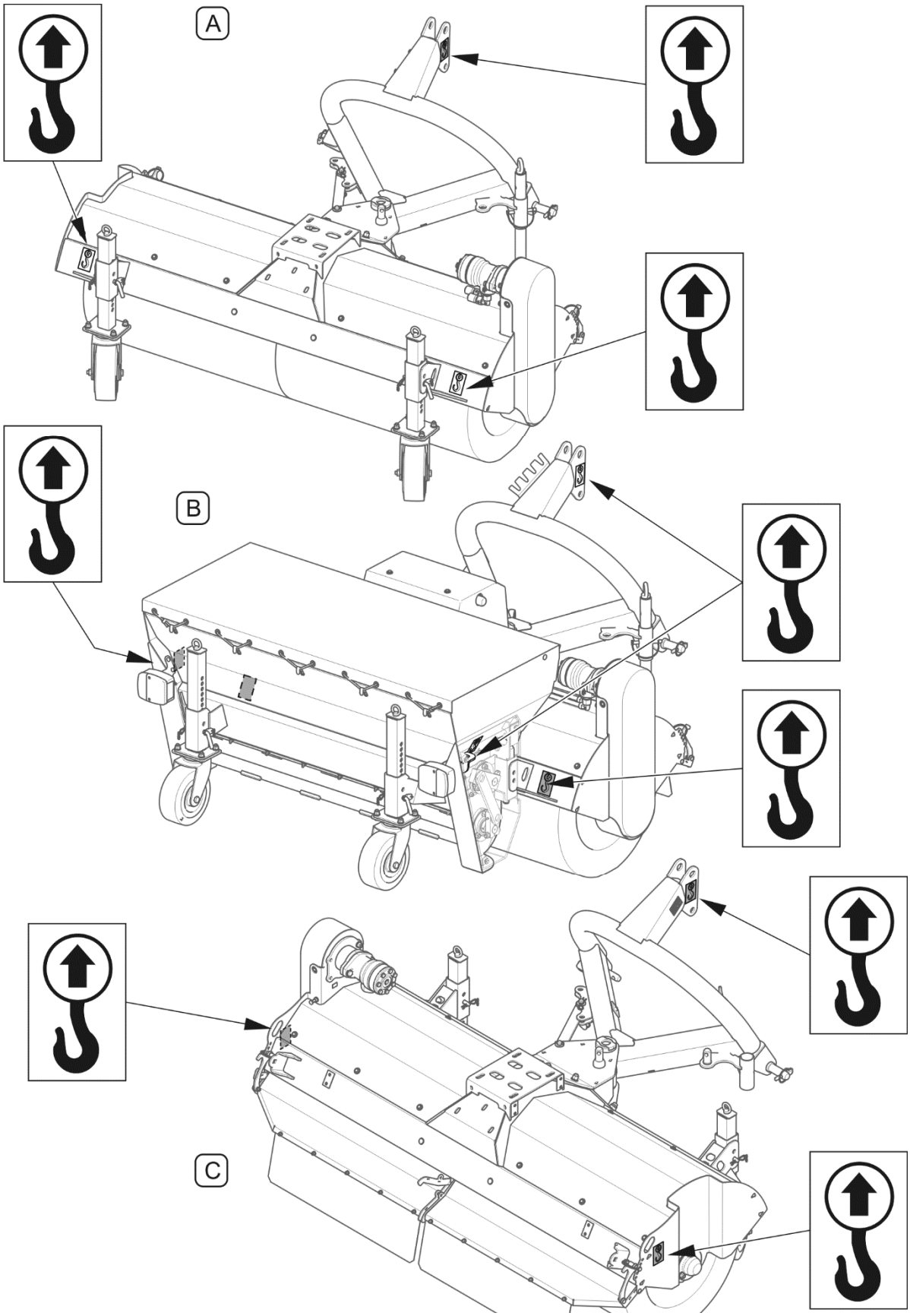


FIGURE 1.2 Transport suspension points

(A) - rear-mounted sweeper; (B) - sweeper with salt and sand spreader; (C) - front-mounted sweeper

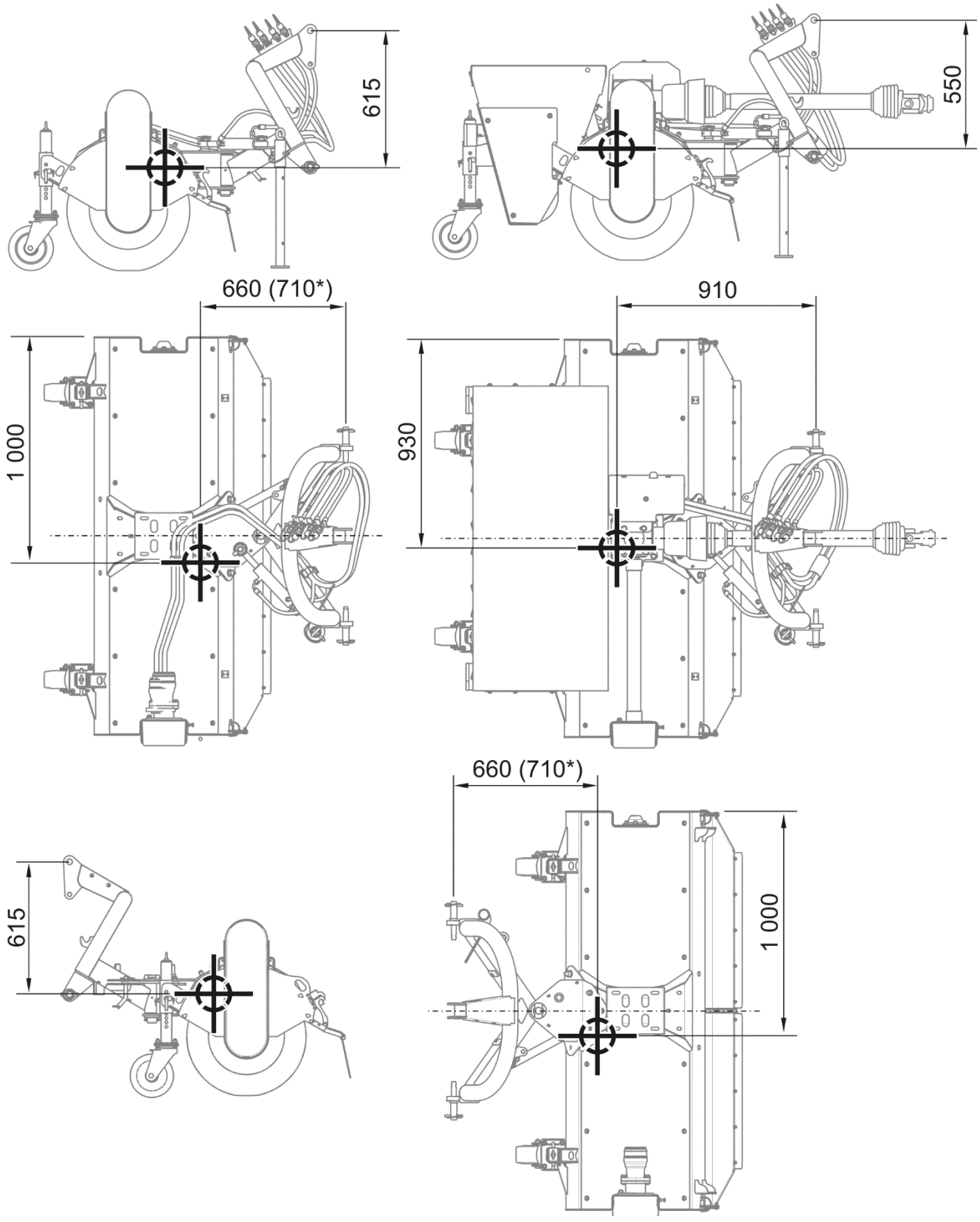


FIGURE 1.3 Centre of gravity

** - for sweeper with sprinkler system.*

Position of centre of gravity (FIGURE 1.3) is given in millimetres [mm] for the machine positioned to drive forwards, with an empty spreader's tank (if installed).

NOTE

Centre of gravity, depending on the machine version varies in the ±50 mm range.

1.6 ENVIRONMENTAL HAZARDS

A hydraulic oil leak constitutes a direct threat to the natural environment owing to limited biodegradability of oil. While carrying out maintenance and repair work which involves the risk of an oil leak, this work should take place on an oil resistant floor or 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.

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.

1.7 WITHDRAWAL FROM USE

In the event of decision by the user to withdraw the machine from use, comply with the regulations in force in the given country concerning withdrawal from use and recycling of machines withdrawn from use.

IMPORTANT

During dismantling personal protection equipment shall be used i.e. protective clothing, boots, gloves and protective goggles etc.

Avoid contact of skin with oil. Do not allow used oil to spill.

Before dismantling the machine, drain oil completely from the hydraulic system and the intersecting axis gear *(if installed).*

When spare parts are changed, worn out or damaged parts should be taken to a collection point for recyclable raw materials. Waste oil and also rubber and plastic elements should be taken to establishments undertaking the utilisation of such waste.

SECTION

2

SAFETY ADVICE

2.1 BASIC SAFETY RULES

2.1.1 USE OF MACHINE

- Before using the machine, the user must carefully read this Operator's Manual and the *WARRANTY BOOK*. When operating the machine, the operator must comply with all recommendations contained in the Operator's Manual.
- The machine may only be used and operated by persons qualified to drive carrying vehicle and trained in the use of the machine.
- If the information in this Operator's Manual is difficult to understand, contact the dealer, who runs an manufacturer authorised service, or contact the manufacturer directly.
- Careless and improper use and operation of the machine, and non-compliance with the recommendations given in this operator's manual is dangerous to your health.
- Be aware of the existence of a residual risk, and for this reason the fundamental basis for using this machine should be the application of safety rules and sensible behaviour.
- The machine must never be used by persons, who are not authorised to drive carrying vehicle, including children and people under the influence of alcohol or other drugs.
- The machine must not be used for purposes other than those for which it is intended. Anyone who uses the machine other than the way intended takes full responsibility for himself for any consequences of this 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 elements (i.e. safety guards, bolts, cotter pins) are technically sound and correctly positioned. In the event of loss or destruction of the safety guards, they must be replaced with new ones.

2.1.2 HITCHING AND UNHITCHING FROM CARRYING VEHICLE

- Do NOT hitch the machine to a carrying vehicle, if the linkage system of the machine is not compatible with the linkage system of the carrying vehicle.
- After completion of hitching the machine, check the safeguards. Carefully read the carrying vehicle Operator's Manual.
- To hitch the machine to the carrying vehicle use only linking elements recommended by the Manufacturer.
- The carrying vehicle to which the machine will be hitched must be technically reliable and must fulfil the requirements specified by the machine Manufacturer.
- Be especially careful when hitching the machine to carrying vehicle.
- When hitching, there must be nobody between the machine and the carrying vehicle.
  Exercise caution when unhitching the machine.
- Machine unhitched from the carrying vehicle must be supported on the parking stand and wheels.

2.1.3 HYDRAULIC SYSTEM

- The hydraulic system is under high pressure when operating.
- Regularly check the technical condition of the connections and the hydraulic conduits. There must be no oil leaks.
- In the event of the hydraulic system malfunction, discontinue using the machine until the malfunction is corrected.
- 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).
- Use the hydraulic oil recommended by the Manufacturer. Never mix two types of oil.

- Used oil or oil which has lost its properties should be stored in original containers or replacement containers resistant to action of hydrocarbons. Replacement containers must be clearly marked and appropriately stored.
- 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.

2.1.4 TRANSPORTING THE MACHINE

- Before driving on public roads, check operation of lights *(if installed).*
- When driving on public roads, comply with the road traffic regulations in force in the country, in which the machine is used.
- Do not exceed the permitted speed arising from road conditions and design limitations. Adjust travel speed to the prevailing road conditions and other limitations arising from road traffic regulations limits.
- Do NOT leave the machine raised and unsecured while the carrying 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 technical condition of linkage, shields and components of hydraulic system and electrical system.
- When driving with raised machine, use transport lock.
- Reckless driving and excessive speed may cause accidents.

2.1.5 MAINTENANCE

- During the warranty period, any repairs may only be carried out by 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 whatsoever, do not use the machine until the fault has been corrected.

- During work, use the proper, 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 to the machine frees PRONAR from any responsibility for damage or detriment to health which may arise as a result.
- 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.
- 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 carrying vehicle's engine turned off and the ignition key removed. Immobilise the carrying vehicle with parking brake and ensure that unauthorised persons do not have access to the vehicle's 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.
- Regularly check technical condition and mounting of all guards and protective elements.
- Do NOT weld, drill holes in, cut or heat the main structural elements, which have a direct impact on the machine operation safety.
- In the event of work requiring the machine to be raised, use properly certified hoists or lifting devices. After lifting the machine, stable and durable supports must also be used. Do NOT perform service or repair work under raised and unsupported machine.
- 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.

2.1.6 MACHINE OPERATION

- Before starting the carrying vehicle with hitched machine, make sure the PTO drive is not engaged (or the lever of the external hydraulic system - depending on the machine drive), otherwise, the machine may be started in an uncontrolled manner.
- Before activating the machine, always ensure that all the safety guards are in good condition and in place.
- Before lowering or lifting the machine mounted on carrying vehicle make sure there are no bystanders, especially children, near the machine.
- Before starting the machine make sure that there are no bystanders (especially children) or animals in the danger zone. The carrying vehicle operator is obliged to ensure proper visibility of the machine and the working area.
- While working with the machine, turn on the orange beacon light (included in the carrying vehicle equipment).
- 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.
- Person must not stand in the machine operation area and also between the carrying vehicle and the machine.
- Take special care and reduce vehicle speed when passing by or overtaking.

2.1.7 OPERATION OF PTO SHAFT

(refers to the machines with PTO drive system)

- The machine may only be connected to the carrying vehicle by means of a proper PTO shaft.
- Never use a damaged PTO drive shaft, it may cause an accident. A damaged shaft must be repaired or replaced.

- Disconnect the drive shaft each time when it is not necessary to drive the machine.
- 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.
- Before using the machine, the user should carefully read the Operator's Manual of the PTO shaft and adhere to the recommendations contained in it.
- The shaft must be equipped with guards. Do NOT use the shaft with damaged or missing guards.
- After connecting shaft ensure that it is correctly and safely connected to the tractor and to the machine.
- Before starting PTO shaft make certain that the PTO rotation direction is correct.
- Before disconnecting the shaft, turn off the tractor engine and remove the key from the ignition.
- 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.
- During machine storage, the PTO shaft (if installed) should be supported on special bracket.

2.2 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 carrying vehicle 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,
- not maintaining safe distance from the danger zone or being within the zones while the machine is operating,
- operation of the machine by unauthorised persons or persons under the influence of alcohol or other intoxicating substances,
- cleaning, maintenance and technical checks when carrying vehicle is connected and engine is running.

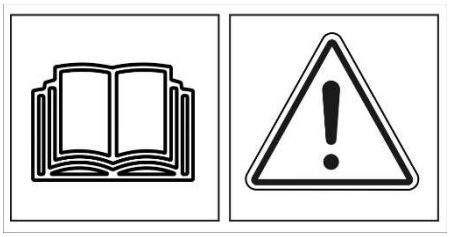
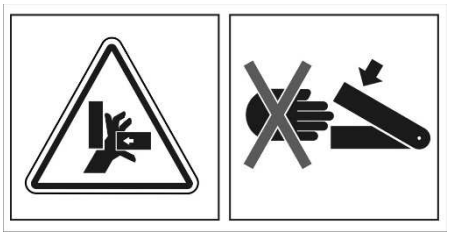
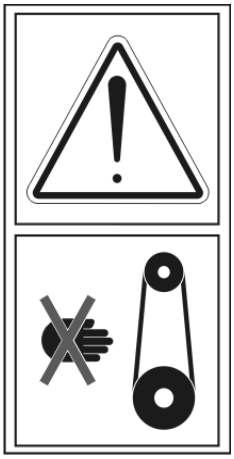
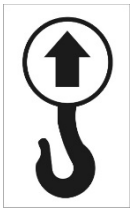
The minimal risk may be kept to a minimum by following the recommendations below:

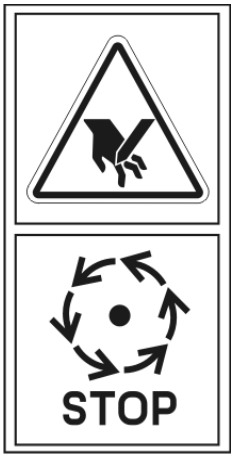
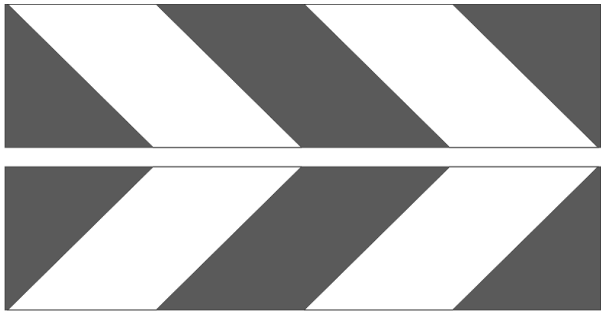
- operate the machine in prudent and unhurried manner,
- reasonably apply all the remarks and recommendations stated in the Operator's Manual,
- carry out repairs and maintenance work in line with operating safety rules,
- repair and maintenance work should be carried out by persons trained to do so,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

2.3 INFORMATION AND WARNING DECALS

All signs should always be legible and clean, visible to the operator and also to persons possibly being in the vicinity of the machine in operation. If any safety sign is lost or illegible, it should be replaced with a new one. All elements having safety signs replaced during repairs should be affixed with these signs. Safety signs and decals may be purchased from the Manufacturer or the Seller.

TABLE 2.1 Information and warning decals

ITEM	SYMBOL	DESCRIPTION
1		Before starting work, carefully read the Operator's Manual.
2		Do not reach into crushing space because elements may move. Danger of crushing hands or fingers
3		Thrown out objects endanger the whole body. Keep a safe distance from the operating machine.
4		Pressurised liquid. Keep a safe distance.
5		Do not reach into the belt transmissions' working area.
6		Lifting equipment attachment points for loading the machine

ITEM	SYMBOL	DESCRIPTION
7		Nie dotykać obracających się elementów do chwili a complete standstill.
8		Outline marking.
9		Machine model

Numbers in the item column correspond to decals (FIGURE 2.1 and FIGURE 2.2)

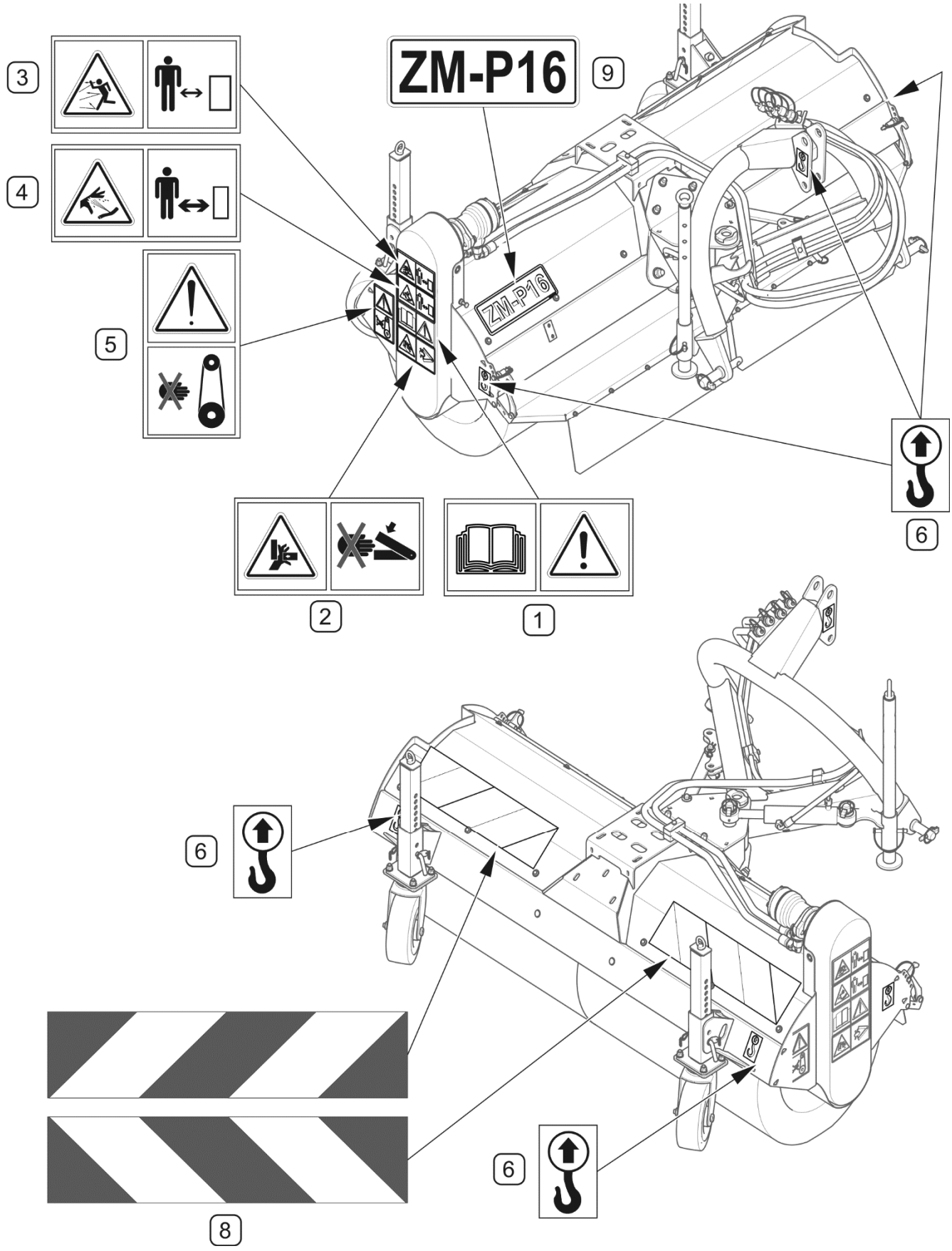


FIGURE 2.1 Locations of information and warning decals on the sweeper.

Meaning of symbols (TABLE 2.1)

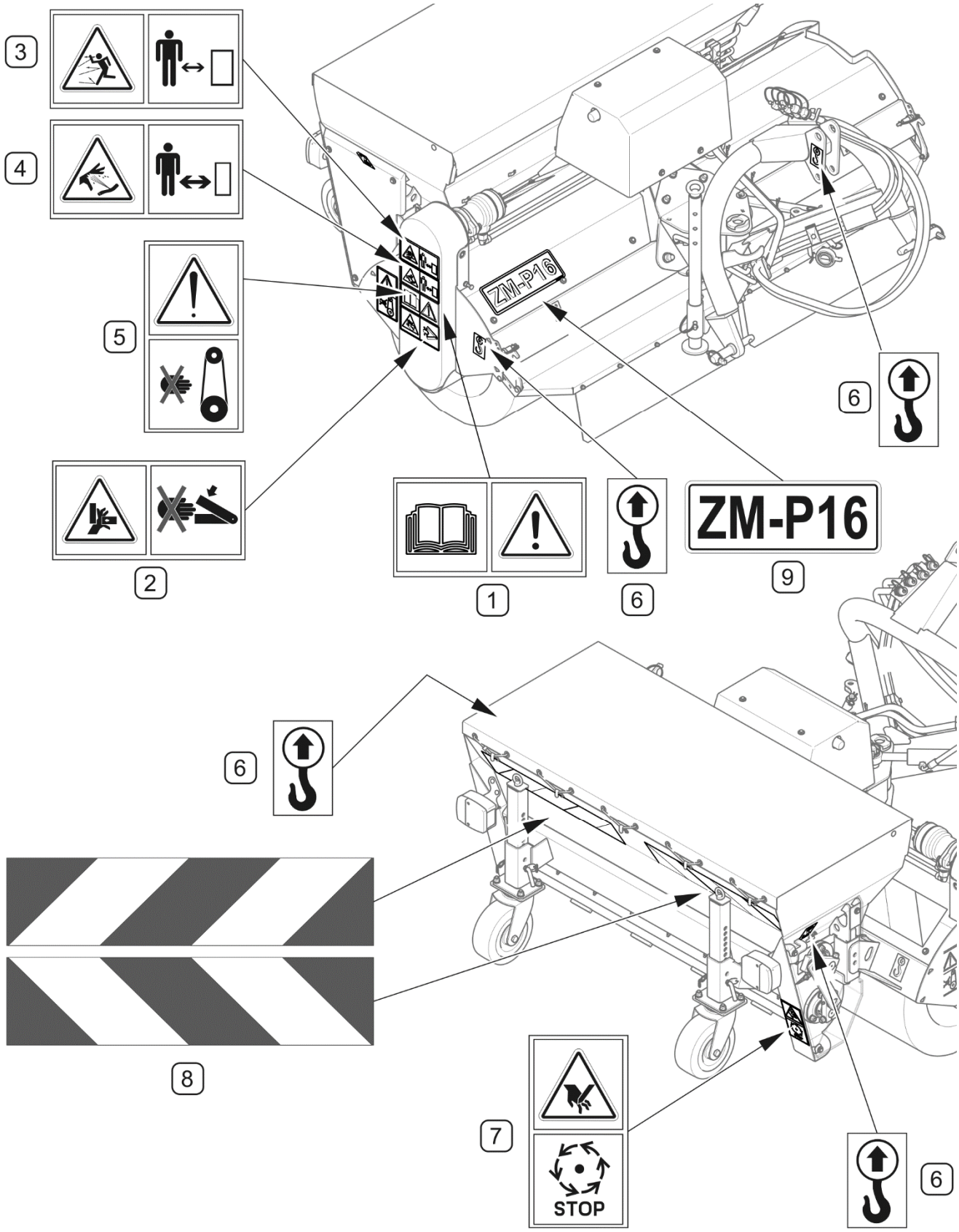


FIGURE 2.2 Locations of information and warning decals on the sweeper with the salt and sand spreader.

Meaning of symbols (TABLE 2.1)

SECTION

3

DESIGN AND OPERATION

3.1 TECHNICAL SPECIFICATION

TABLE 3.1 BASIC TECHNICAL DATA

Type of sweeper	–	ZM-P16
Mounting method: - sweeper - sweeper with salt and sand spreader	 - -	 front or rear three-point linkage of carrying vehicle rear three-point linkage of carrying vehicle
Category of linkage	-	cat. I or II according to ISO 730-1
Sweeping capacity *(for nominal power rating)*	m^2/h	16,000
Spreading capacity *(for nominal power rating)*	kg/min	12 ÷ 150 (salt) 10 ÷ 100 (sand or sand+salt)
Working width for sweeping - angle of ±30° - straight 0°	 mm mm	 1,440 1,600
Working width for sand and salt spreading - angle of ±30° - straight 0°	 mm mm	 1,020 1,170
Total width - angle of ±30° - straight 0°	 mm mm	 1,885 1,835
Total length: - sweeper - sweeper with sprinkler system - front-mounted sweeper - front-mounted sweeper with sprinkler system - sweeper with salt and sand spreader	 mm mm mm mm mm	 1,295 1,600 1,350 1,770 1,650
Total height *(parking position)*	mm	1,105
Spreader cubic capacity	m^3	0.26
Spreader carrying capacity	t	0.45
Water tank cubic capacity	l	200
Number of working positions: – with mechanical brush turning system – with hydraulic brush turning system	 - -	 3 fixed positions (+30°, 0°, -30°) smooth adjustment within the range of ±30°
Rotation speed of brush *recommended / maximum*	 RPM	 200-250 / 350
Sweeper drive	-	Hydraulic system / PTO
Spreader drive	-	Hydraulic system
Sprinkler system supply	-	Electrical system 12V
Control panel supply	-	Electrical system 12V
Other information	-	single person operation

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

3.2 GENERAL DESIGN

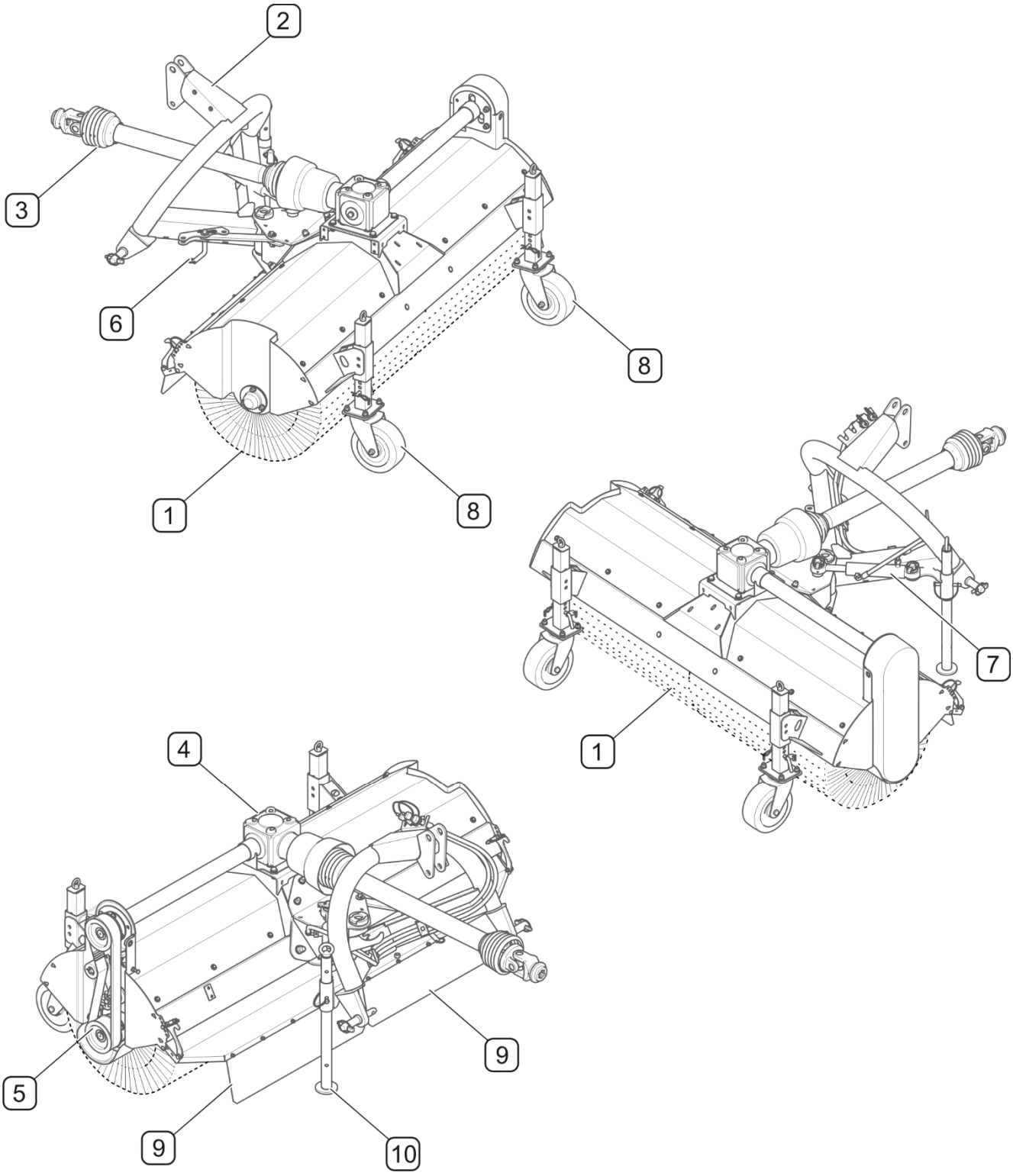


FIGURE 3.1 General design of sweeper (PTO drive)

(1) - brush; (2) - linkage; (3) - PTO shaft; (4) - intersecting axis gear; (5) - belt transmission; (6) - mechanical turning system; (7) - hydraulic turning system (option); (8) - support wheel; (9) - movable shield; (10) - parking stand

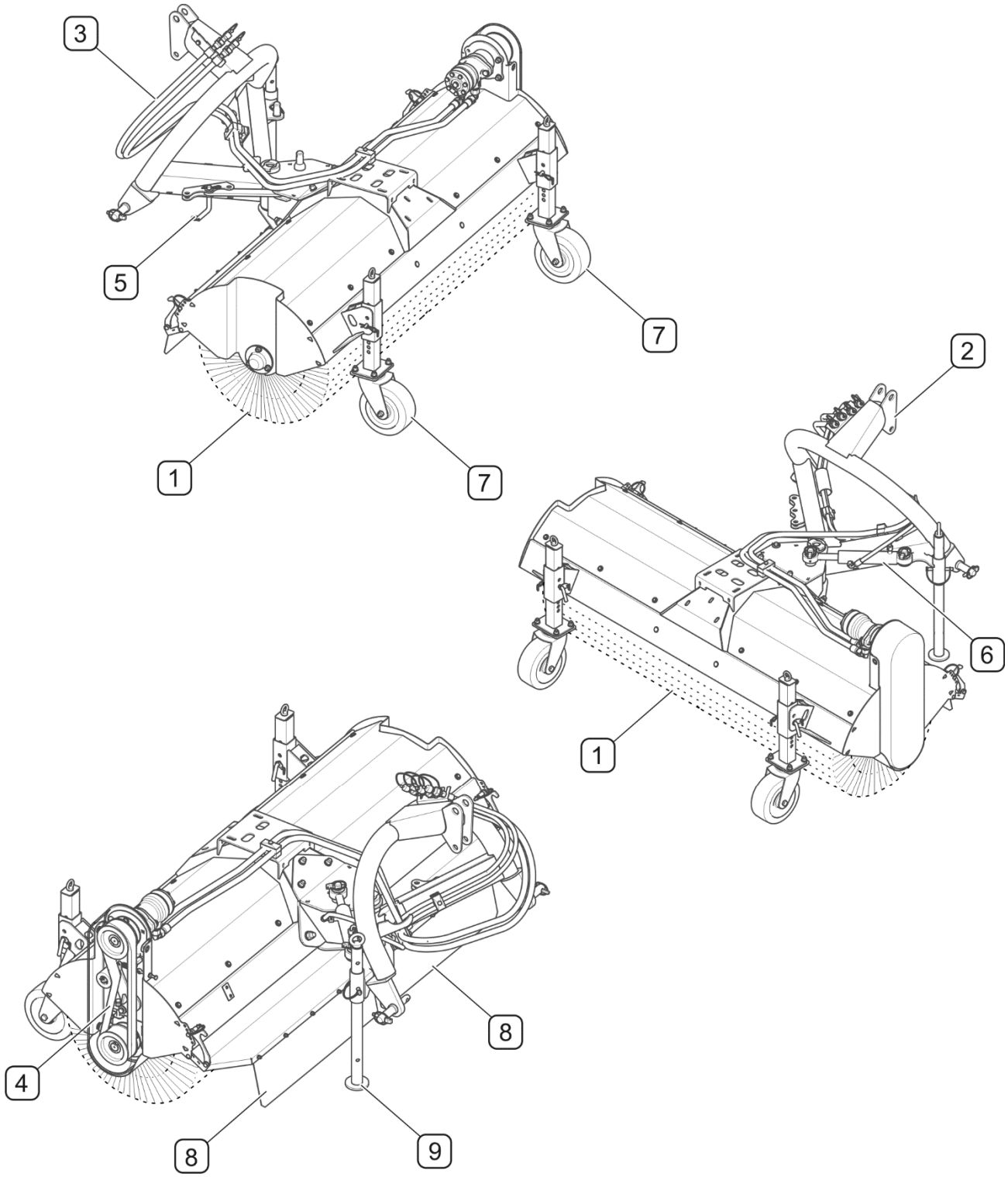


FIGURE 3.2 General design of sweeper (hydraulic drive)

(1) - brush; (2) - linkage; (3) - hydraulic system; (4) - belt transmission; (5) - mechanical turning system; (6) - hydraulic turning system (option); (7) - support wheel; (8) - movable shield; (9) - parking stand

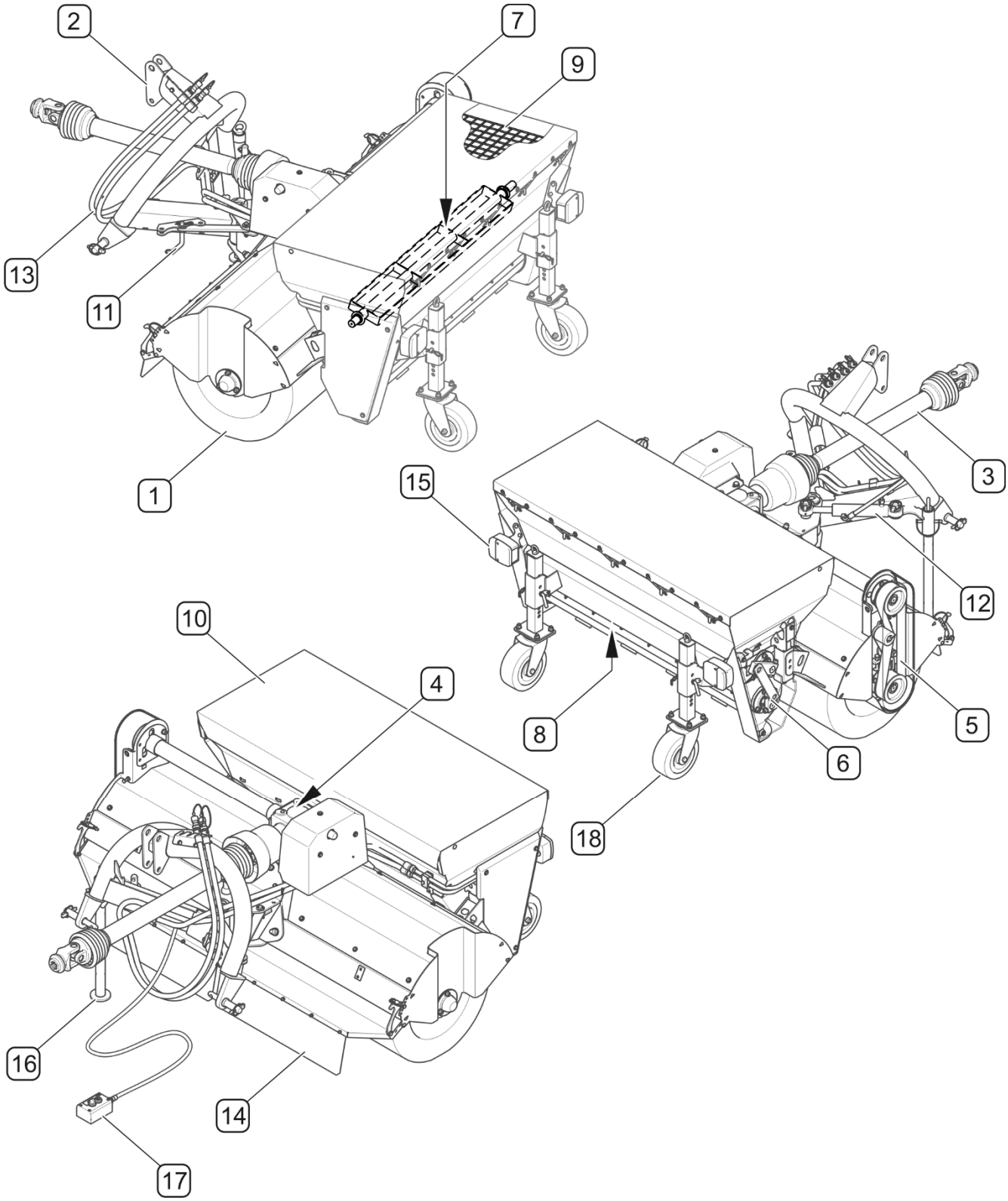


FIGURE 3.3 General design of sweeper with PTO drive (with salt and sand spreader)

(1) - brush; (2) - linkage; (3) - PTO shaft; (4) - intersecting axis gear; (5) - belt transmission; (6) - crank mechanism; (7) - agitator; (8) - spreading roller; (9) - grid; (10) - tarpaulin cover; (11) - mechanical turning system; (12) - hydraulic turning system (option); (13) - hydraulic system; (14) - movable shield; (15) - lighting system; (16) - support leg; (17) - control panel; (18) - support wheel

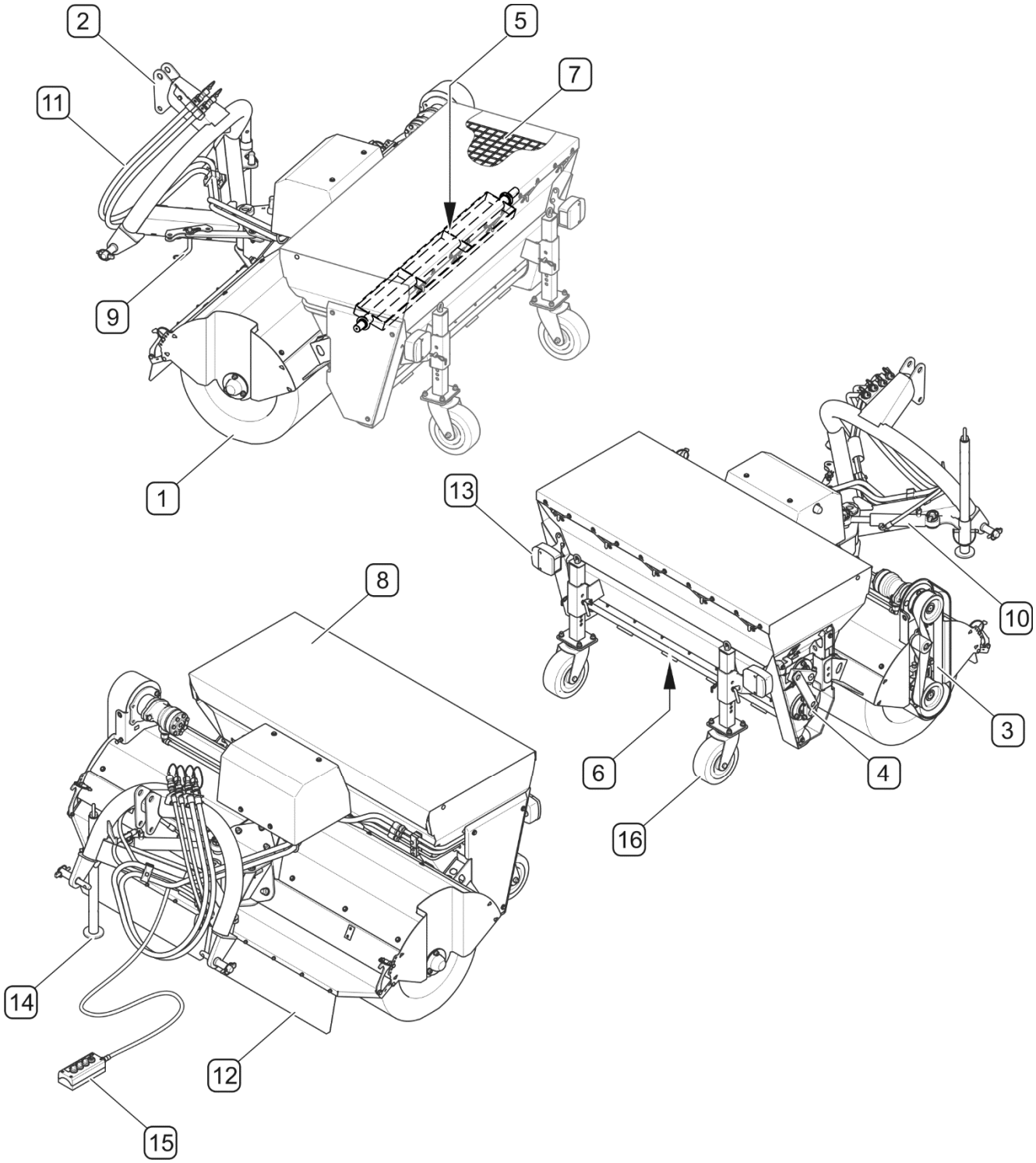


FIGURE 3.4 General design of sweeper with hydraulic drive (with salt and sand *(1) - brush; (2) - linkage; (3) - belt transmission; (4) - crank mechanism; (5) - agitator; (6) - spreading roller; (7) - grid; (8) - tarpaulin cover; (9) - mechanical turning system; (10) - hydraulic turning system (option); (11) - hydraulic system; (12) - movable shield; (13) - lighting system; (14) - support leg; (15) - control panel; (16) - support wheel*

3.3 HYDRAULIC SYSTEM

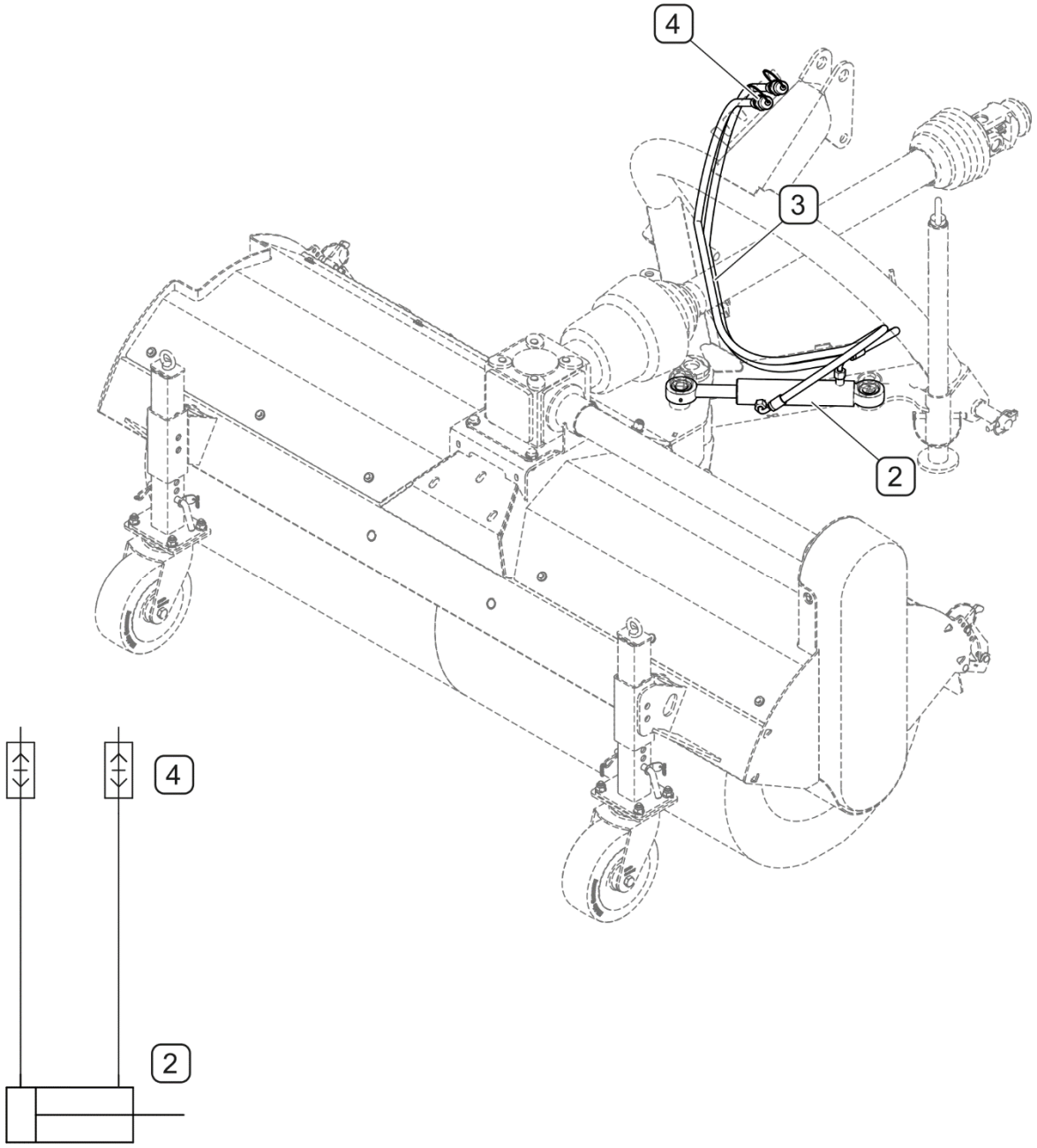


FIGURE 3.5 Design of hydraulic system of sweeper (PTO drive)

(2) - cylinder of hydraulic turning system (option); (3) - conduits; (4) - quick couplers

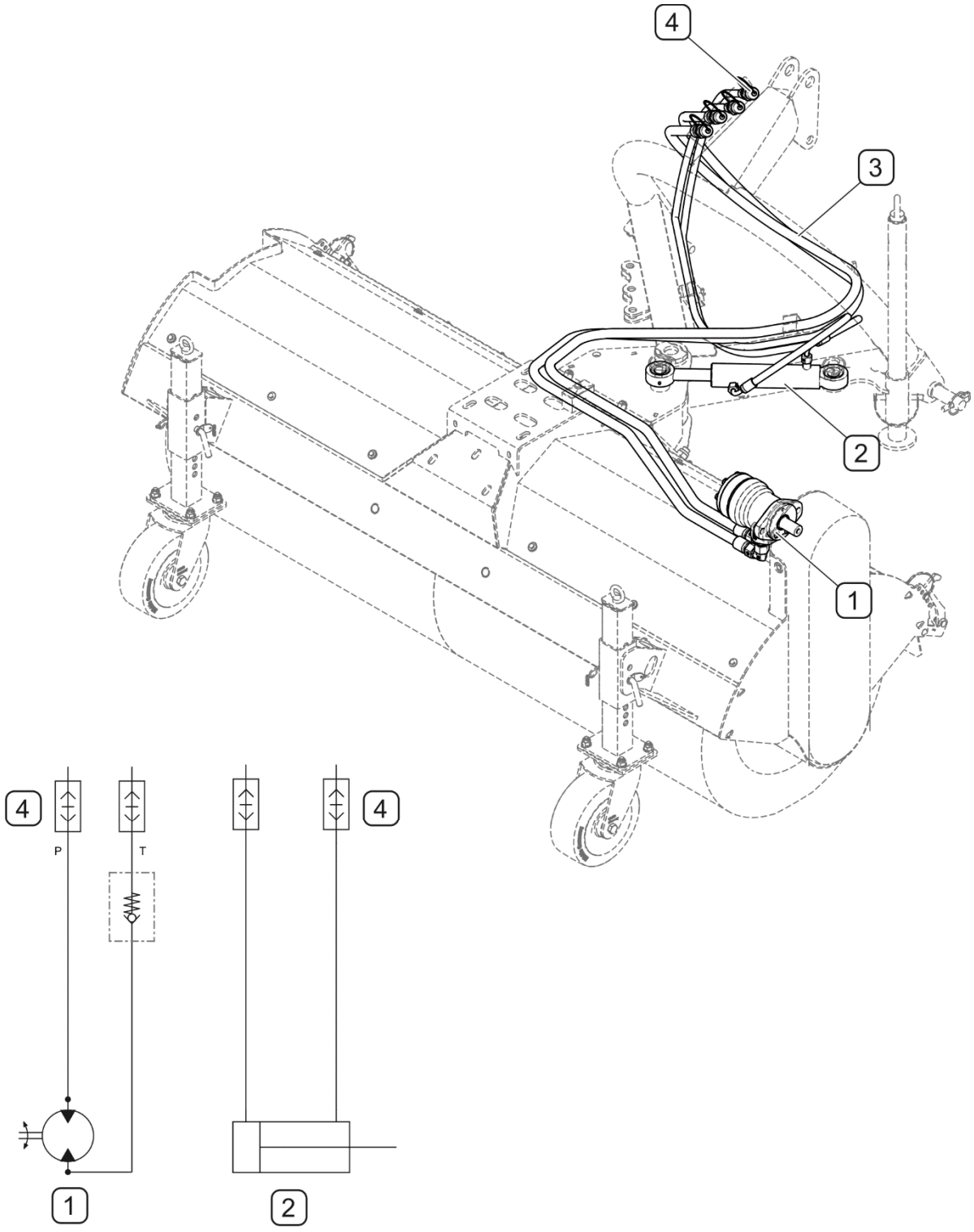


FIGURE 3.6 Design of hydraulic system of sweeper (hydraulic drive)

(1) - hydraulic motor of brush drive; (2) - cylinder of hydraulic turning system (option); (3) - conduits; (4) - quick couplers

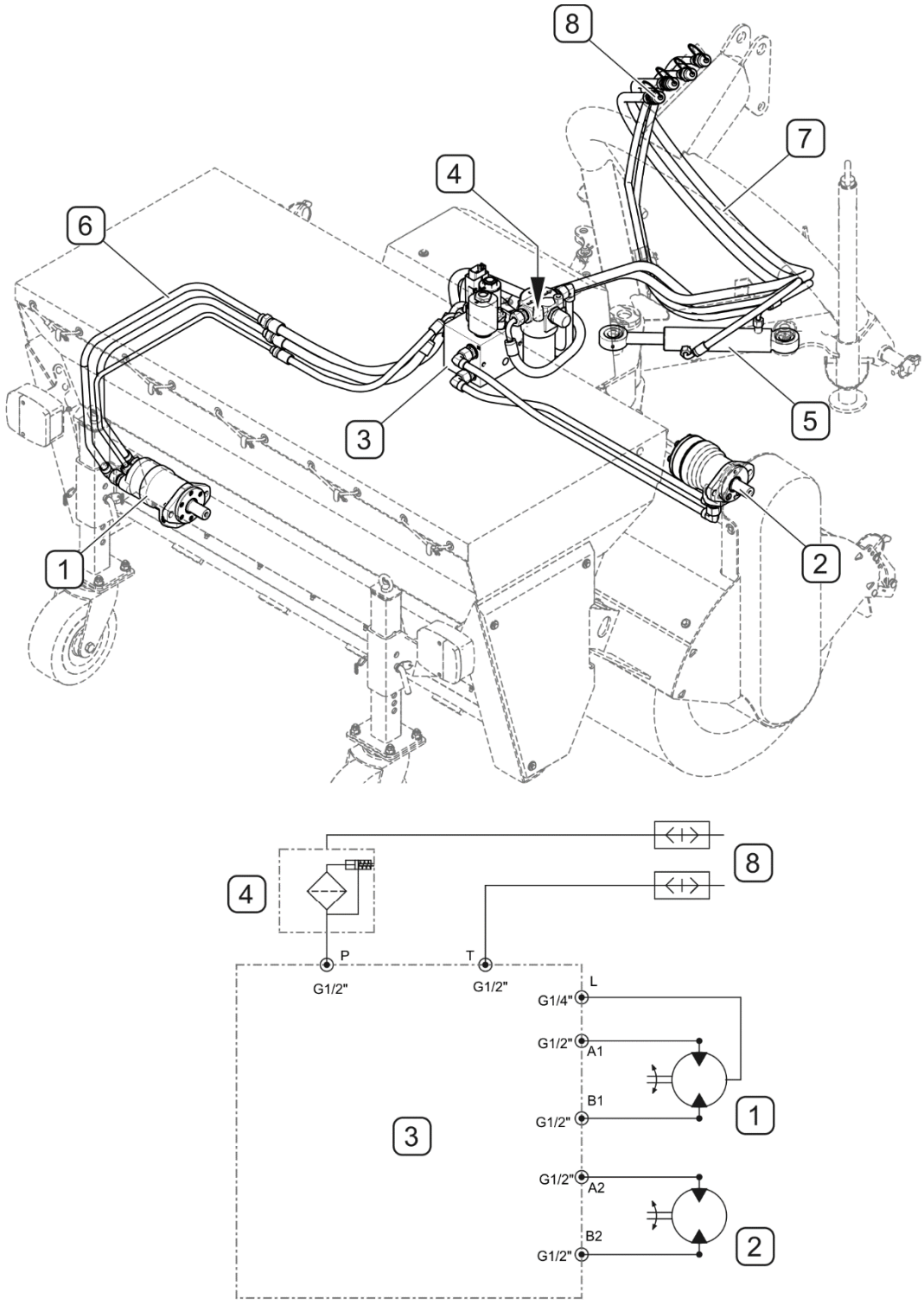


FIGURE 3.7 **Hydraulic system of sweeper with hydraulic drive** (with salt and sand spreader)

(1) - hydraulic motor of spreading roller drive (2) - hydraulic motor of brush drive; (3) - control unit „ZS-170"; (4) - oil filter; (5) - cylinder of hydraulic turning system (option); (6) - metal

hydraulic conduits; (7) - rubber hydraulic conduits; (8) - quick couplers

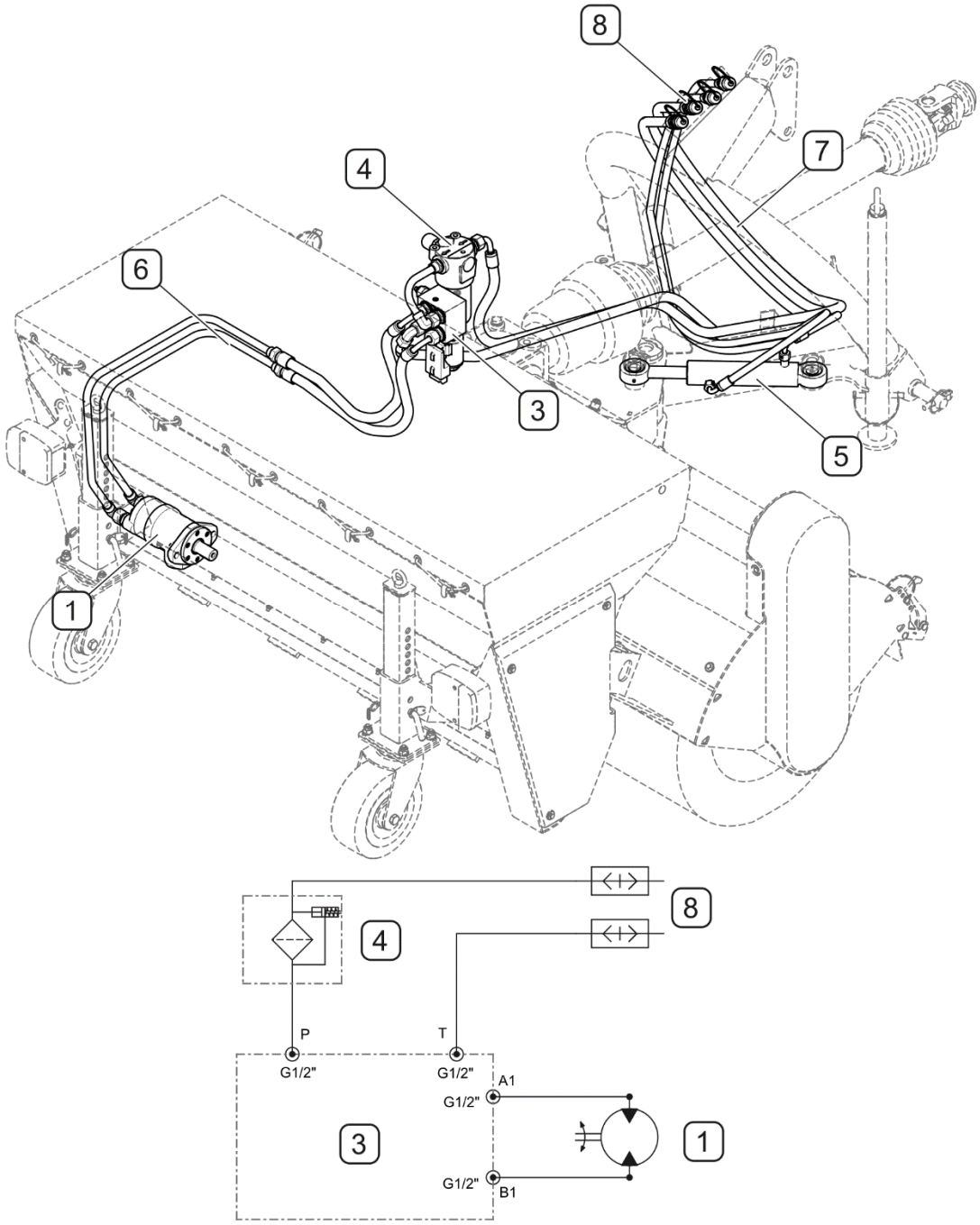


FIGURE 3.8 Hydraulic system of sweeper with PTO drive (with salt and sand spreader)

(1) - hydraulic motor of spreading roller drive (3) - control unit „ZS-184"; (4) - oil filter; (5) - cylinder of hydraulic turning system (option); (6) - metal hydraulic conduits; (7) - rubber hydraulic conduits; (8) - quick couplers

3.4 SPRINKLER SYSTEM

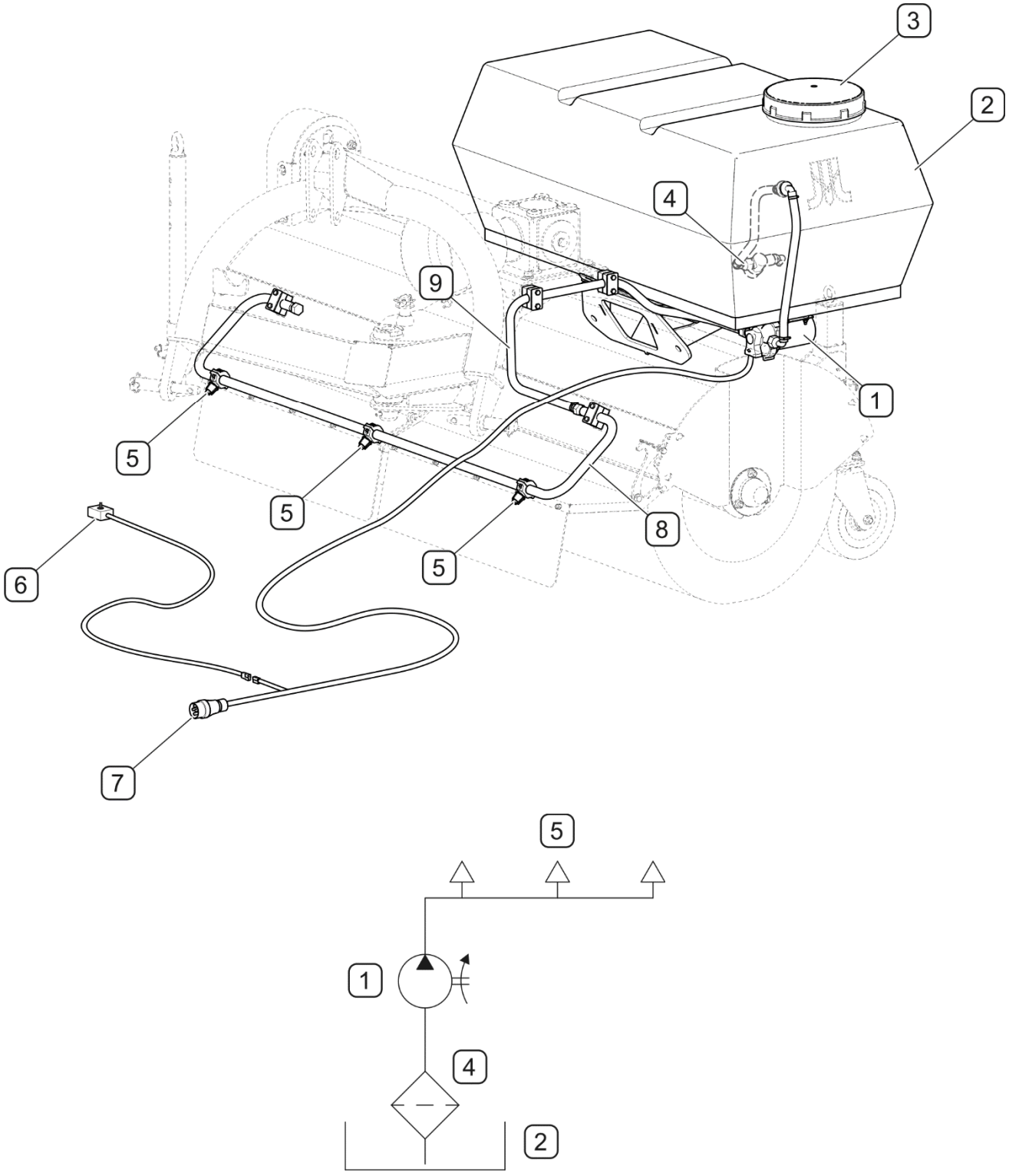


FIGURE 3.9 Sprinkler system design

(1) - water pump; (2) - tank; (3) - plug; (4) - filter; (5) - sprinklers; (6) - water pump switch; (7) - 7-pole plug; (8) - pipe; (9) - rubber conduit

SECTION

4

CORRECT USE

4.1 PREPARING FOR WORK

DANGER

Before using the machine, the user must carefully read this Operator's Manual.

Careless and improper use and operation of the machine, and non-compliance with the recommendations given in this Operator's Manual is dangerous to your health.

The machine must never be used by persons who are not authorised to drive carrying vehicles, including children and people under the influence of alcohol or other drugs.

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

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

The manufacturer guarantees that the machine is fully operational and has been checked according to quality control procedures and is ready for normal 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. Prior to connecting to the carrying vehicle, machine operator must verify the machine technical condition. In order to do this:

- the user must carefully read this Operator's Manual and observe all recommendations, understand the design and the principle of machine operation
- check the condition of protective paint coat,
- inspect machine's individual components for mechanical damage resulting from incorrect transport (dents, piercing, bent or broken components),
- check technical condition of brush,
- check all the lubrication points, lubricate the machine as needed according to recommendations provided in section 5 *MAINTENANCE*,
- check technical condition of hydraulic system and electrical system *(if installed),*
- check the technical condition and compatibility of the machine's linkage with the carrying vehicle's linkage,
- check compliance of power take-off shaft parameters e.g. type of tip, rotational speed,

- make sure that the PTO shaft can be connected to the tractor (PTO shaft should be suitable for the tractor – see the Operator's Manual of PTO shaft)
- check technical condition of protective shields and pins and check if they are correctly installed,

ATTENTION!

Non-adherence to the recommendations contained in the Operator's Manual or improper use may cause damage to the machine.

The technical condition before starting the machine must be no cause for concern.

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 carrying vehicle, started and its individual components checked. In order to do this:

- hitch the machine to carrying vehicle (see *4.3 HITCHING TO CARRYING VEHICLE*),
- connect PTO shaft *(depending on machine version)*
- after connecting the electrical system leads and hydraulic system conduits *(depending on machine version)*, check the correct operation of individual functions of the sweeper with the salt and sand spreader *(depending on machine version)*, operation of lights *(if installed)* and inspect the hydraulic system and hydraulic cylinders for tightness,
- fill the sprinkler system *(if installed*) and check its operation.

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

ATTENTION!

Before using the machine always check its technical condition. In particular, check the technical condition of the linkage and hydraulic system and lighting system.

4.2 CHECKING TECHNICAL CONDITION

When preparing the machine for normal use, check individual elements according to guidelines presented in table 4.1.

TABLE 4.1 TECHNICAL INSPECTION SCHEDULE

DESCRIPTION	MAINTENANCE ACTIVITIES	FREQUENCY
Technical condition of safety guards	Check the technical condition of safety guards, if complete and correctly mounted.	Before using
Technical condition of brush	Check the technical condition and if correctly mounted. Replace if necessary.	
Technical condition of spreading roller	Check the technical condition and if correctly mounted.	
Technical condition of the electrical system and lighting system components (if installed)	Visually inspect the technical condition, check the operation	
Check if all main nut and bolt connections are properly tightened	See section *5.6 TIGHTENING TORQUE FOR NUT AND BOLT CONNECTIONS*	Once a week
Lubrication	Lubricate the elements according to section *5.7 LUBRICATION.*	According to table *5.6*

ATTENTION!

Do not use a malfunctioning or deficient machine.

4.3 HITCHING TO CARRYING VEHICLE

ATTENTION!

Before hitching the machine to carrying vehicle, the user must carefully read the operator's manual of the carrying vehicle.

DANGER

When hitching, there must be nobody between the machine and the carrying vehicle.

Exercise caution when hitching the machine to carrying vehicle.

The sweeper can be hitched to a carrying vehicle that meets the requirements contained in Table 1.1 *„REQUIREMENTS FOR CARRYING VEHICLE”*.

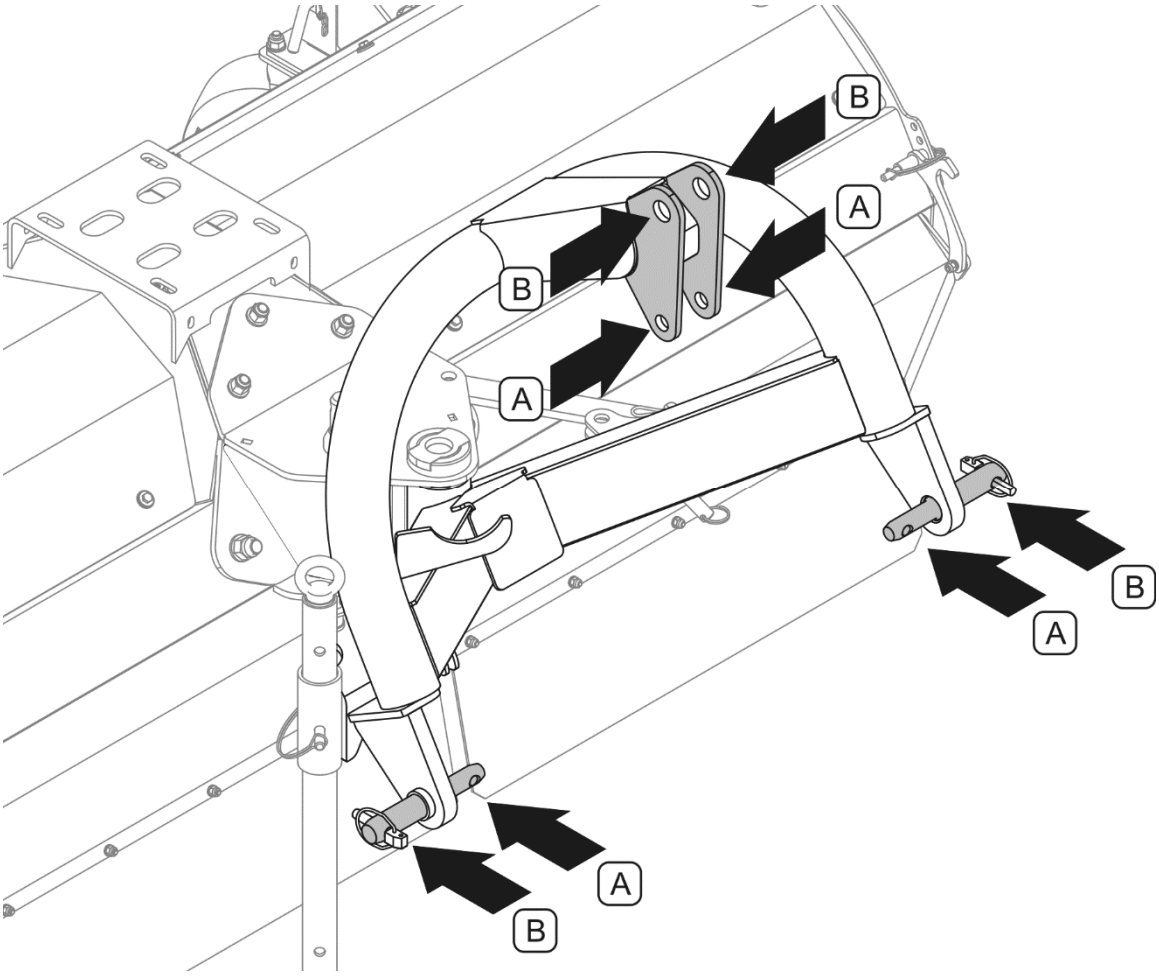


FIGURE 4.1 Three-point linkage categories according to ISO 730-1

(A)- linkage of category I ISO 730-1; (B) - linkage of category II ISO 730-1;

Before hitching the sweeper to tractor's three-point linkage, make sure that the category of the tractor linkage is compatible with that of the machine.

In order to hitch the sweeper to tractor, proceed as follows:

- Reverse the tractor so as to move the lower links of the tractor's three-point linkage to the pins of the sweeper linkage.
- Set the lower links of the tractor at appropriate height.
- Switch off tractor's engine and prevent it from rolling.
- Connect the lower pins of the sweeper linkage with the lower links of the tractor and secure with pins.
- Using a pin, connect top link of the tractor linkage with the top point of the sweeper linkage and secure. Set stabilizers (tensioners) of tractor linkage lower links tractor so as to eliminate lateral movement of the machine.
- Connect PTO shaft (FIGURE 4.2) to the machine and to the tractor PTO *(machine with PTO drive)*
- Connect hydraulic conduit plugs to appropriate sockets on the tractor *(depending on machine version)*
- Connect electrical system *(if installed)* to appropriate socket on the tractor.
- Lift the sweeper using the tractor three point linkage.
- Raise the parking stand (FIGURE 4.8) or two parking stands in case of front-mounted sweeper and secure them with a pin and securing cotter pin.

Set both tractor lower linkage arms at the same height.

DANGER

Before connecting the PTO shaft, turn off the tractor's engine and remove the key from the ignition. Ensure that unauthorised persons do not have access to the tractor.

The use of PTO shaft and its technical condition must be in accord with the Operator's Manual of PTO shaft.

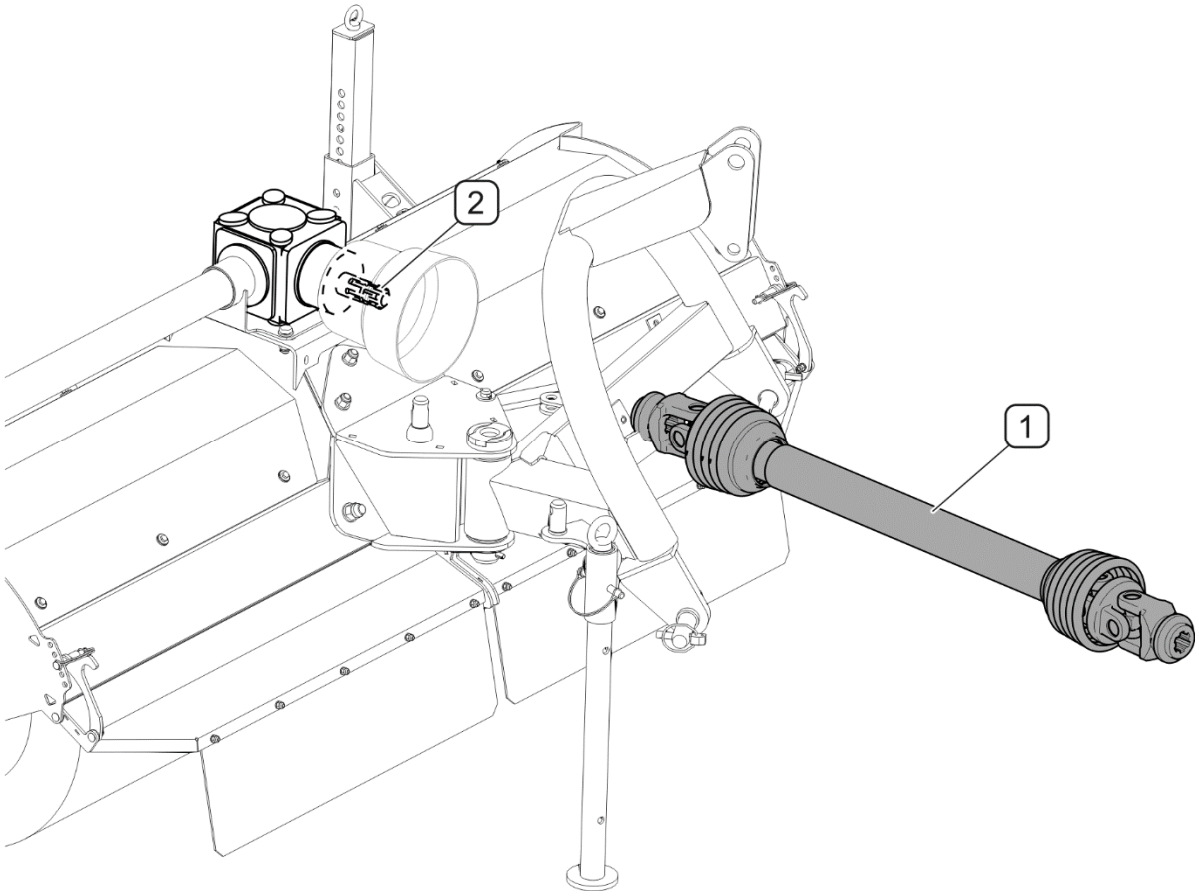


FIGURE 4.2 Connecting PTO shaft Sweeper with mechanical drive (PTO)

(1)- PTO shaft; (2)- intersecting axis gear's shaft

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

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

Connect the end of PTO shaft (1) with wide-angle 80˚ articulated joint to the shaft (2) of intersecting axis gear (FIGURE 4.2). Connect the other end of the shaft to the carrying vehicle's PTO.

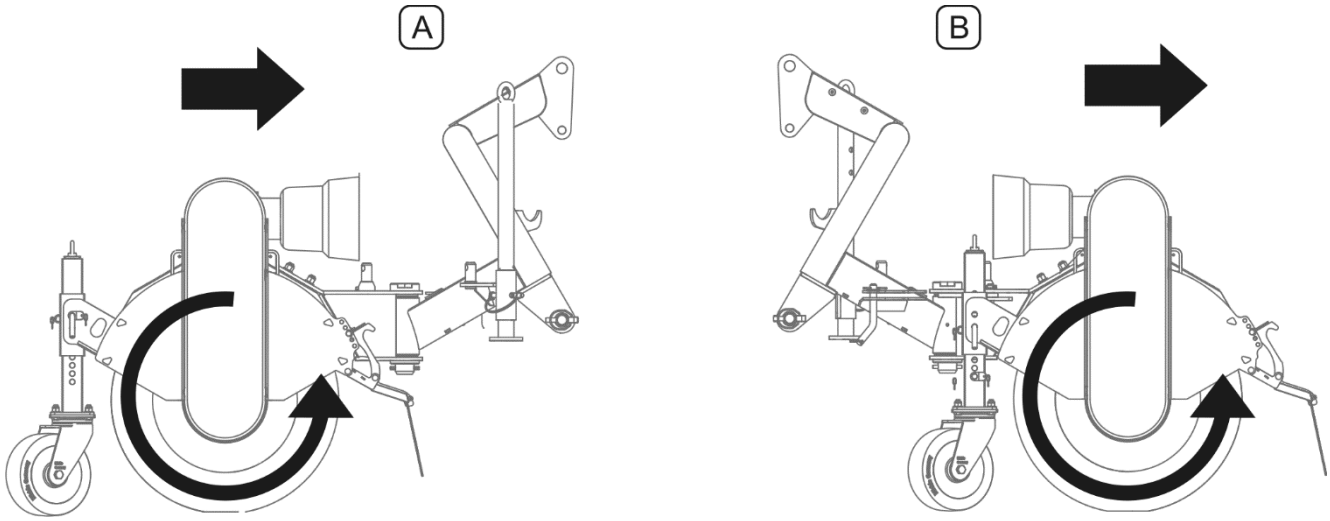


FIGURE 4.3 Brush rotation direction

(A) - rear-mounted sweeper; (B) - front-mounted sweeper

Check brush rotation direction (FIGURE 4.3). The brush should rotate in the direction opposite to travel direction. If the brush rotation direction is wrong, dismount the intersecting axis gear, turn it by 180˚ and secure again to the frame (FIGURE 4.20)

DANGER

When connecting the hydraulic conduits, make sure that the hydraulic system of the carrying vehicle is not under pressure.

ATTENTION!

The connecting cables should be routed so that they do not get entangled in moving machine parts.

ATTENTION!

Disconnect the supply of the carrying vehicle's hydraulic section if there is no need to drive the machine (e.g. while transporting the machine).

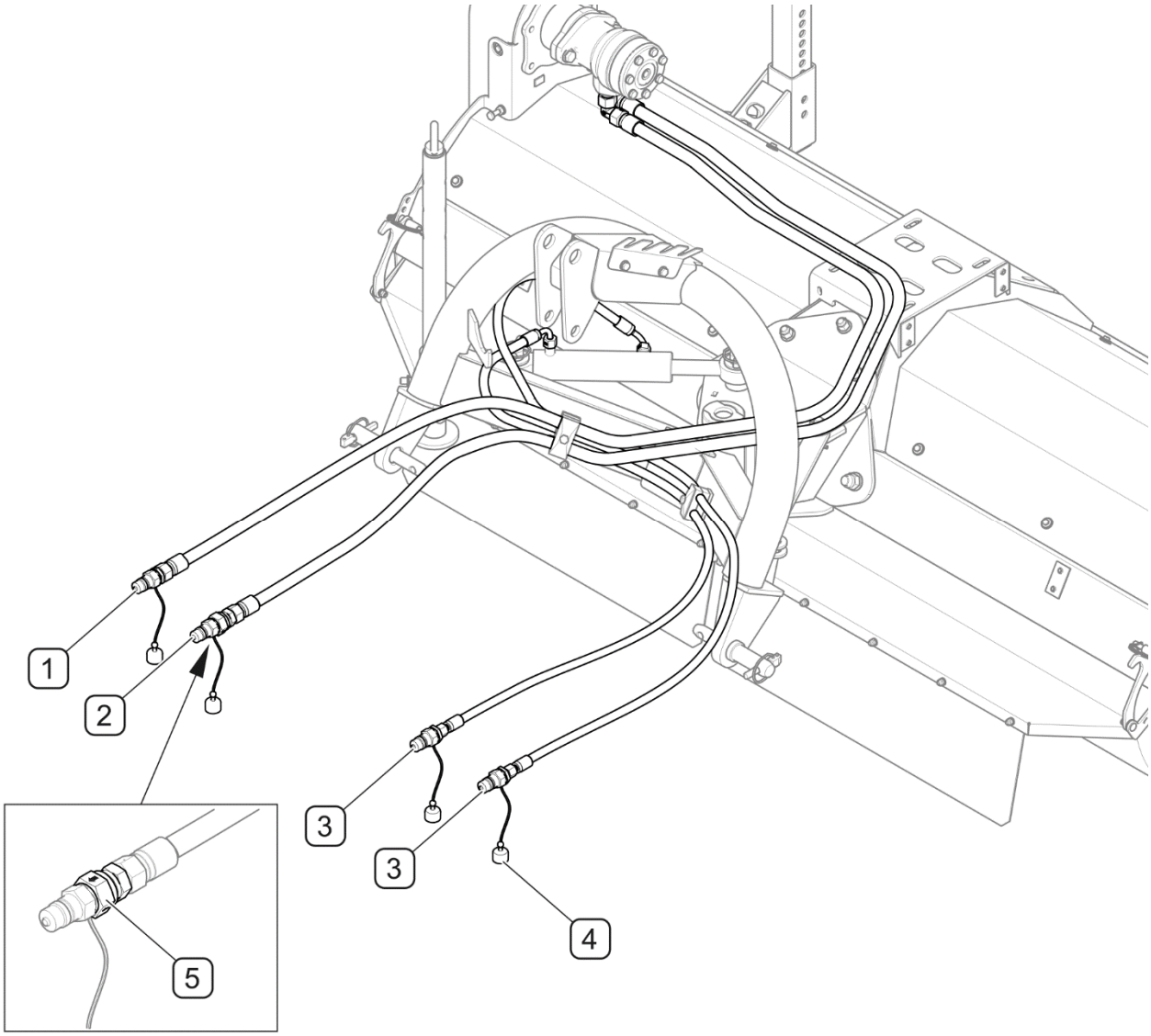


FIGURE 4.4 Connecting the hydraulic system. Sweeper with hydraulic drive and hydraulic turning system (option)

(1) - supply connection of brush drive motor; (2) - oil return connection; (3) - control connections of cylinder of hydraulic turning system (option); (4) - protective plug; (5) - check valve

When connecting the hydraulic system to the carrying vehicle (FIGURE 4.4), connect quick coupler (1) as supply and quick coupler (2) with check valve (5) as oil return. Protective plugs (4) are available in various colours to ensure easy identification of conduits.

ATTENTION

Connect hydraulic connection (2) equipped with check valve (5) as oil return to the carrying vehicle's hydraulic system (FIGURE 4.4)

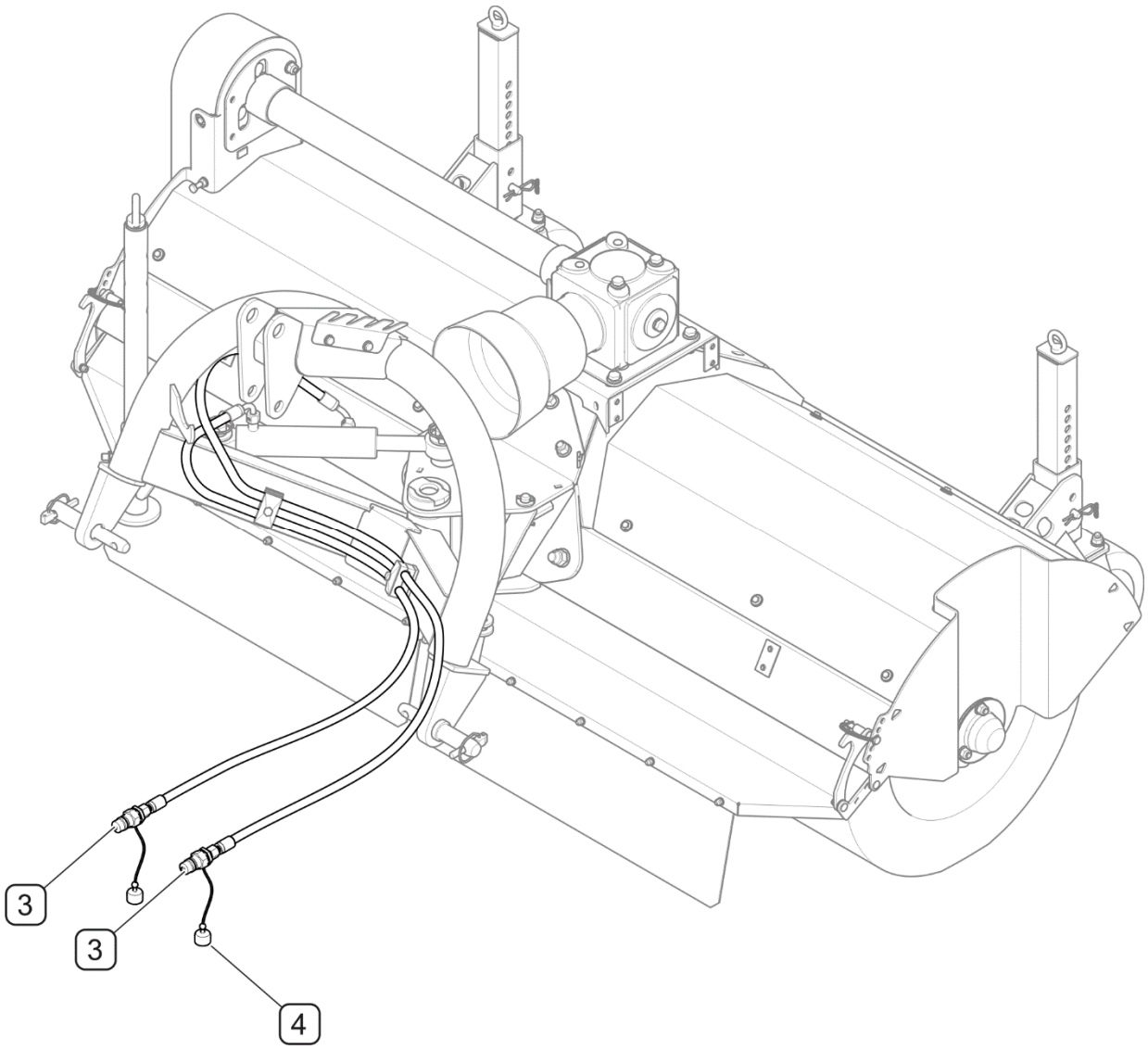


FIGURE 4.5 Hydraulic system connection Sweeper with PTO drive and hydraulic turning system (option)

(3) - connections of cylinder of hydraulic turning system (option); (4) - protective plug

Control connections (3) of hydraulic turning system (FIGURE 4.4, FIGURE 4.5) should be connected to one section of hydraulic system with the possibility of changing the direction of oil circulation.

TIP

The hydraulic system of the machine is filled with L-HL32 hydraulic oil according to PN-91/C-96057/04

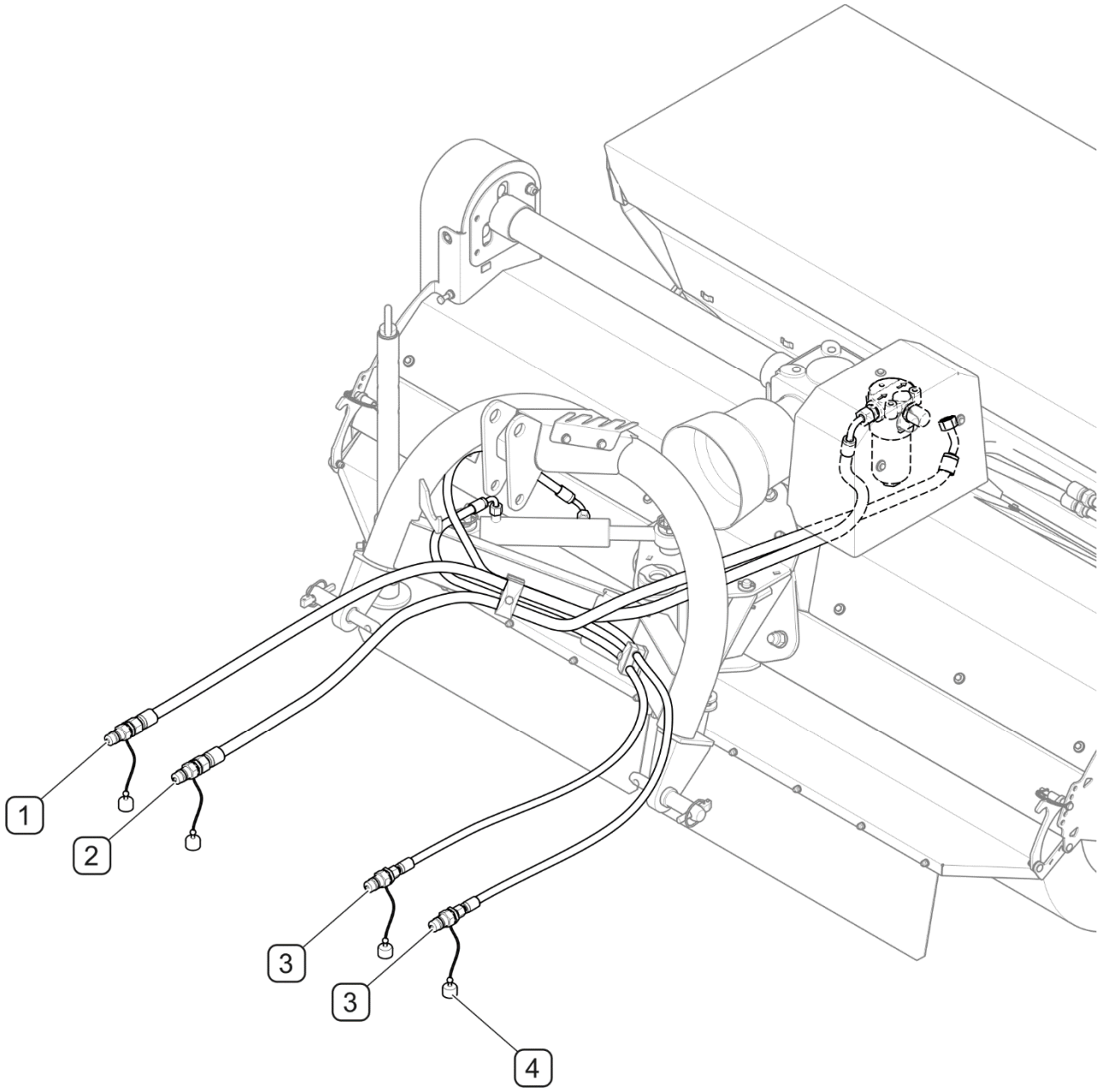


FIGURE 4.6 Hydraulic system connection. Sweeper with PTO drive with salt and sand spreader and hydraulic turning system (option)

(1) - oil supply connection; (2) - oil return connection; (3) - control connection of cylinder of hydraulic turning system (option); (4) - protective plug

In case of sweeper with salt and sand spreader (FIGURE 4.6 and FIGURE 4.7), only one flow direction is possible when connecting the hydraulic system to the carrying vehicle. Connect connection (1) to the connection of oil supply from the carrying vehicle's hydraulic system and connection (2) to the connection of oil return to the carrying vehicle's hydraulic system. That is why, after connecting quick couplers (1) and (2) to the hydraulic system section (e.g. with lock function in "ON" position), check, by starting for the first time, whether

it is necessary to swap quick couplers (1) and (2). To facilitate identification of quick couplers (1) and (2), protective plugs (4) in various colours are used. If the machine is equipped with hydraulic turning system (option), connections (3) should be connected to one section of hydraulic system with the possibility of changing the direction of oil circulation.

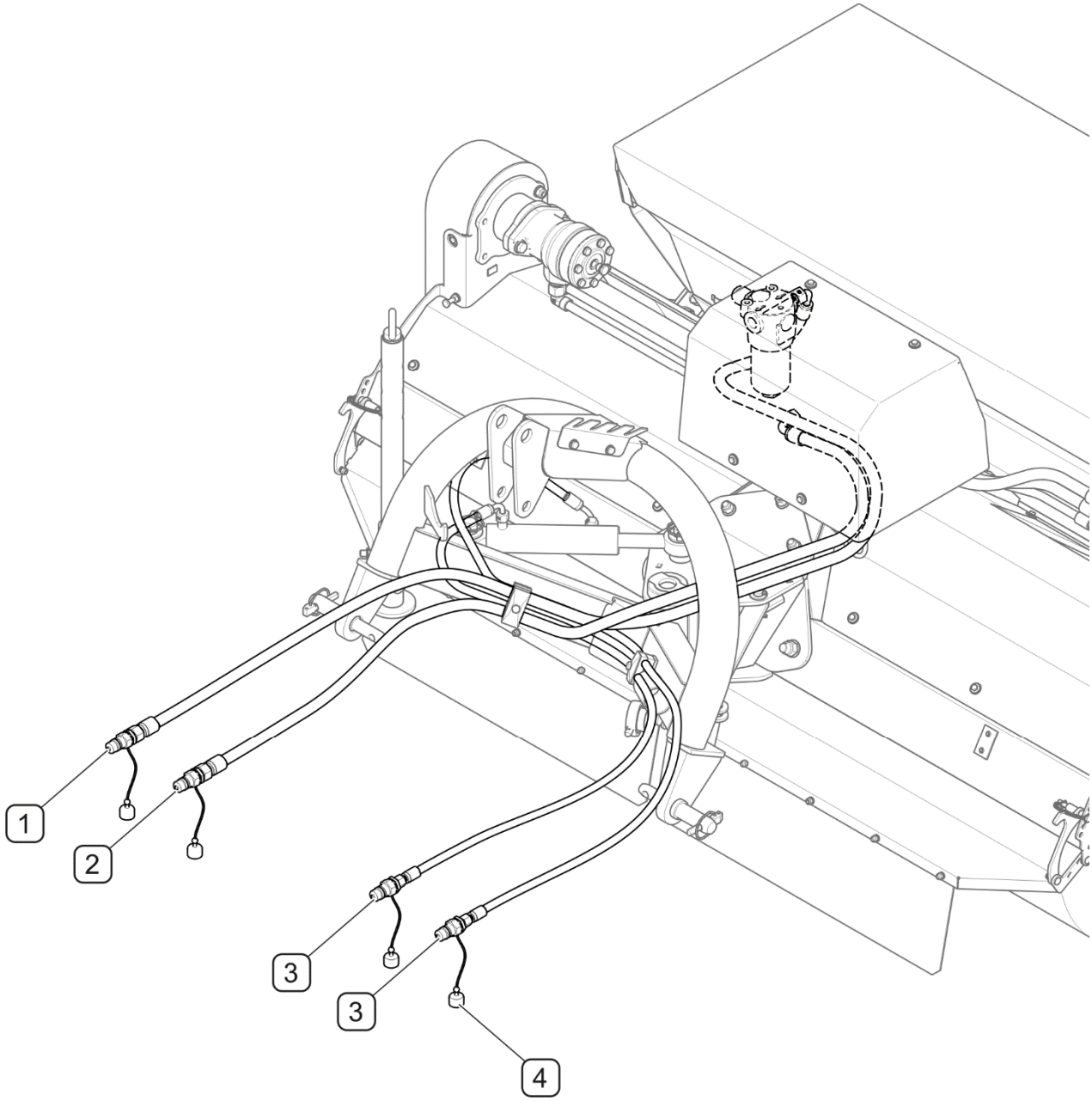


FIGURE 4.7 Hydraulic system connection Sweeper with hydraulic drive with salt and sand spreader and hydraulic turning system (option)

(1) - oil supply connection; (2) - oil return connection; (3) - control connection of cylinder of hydraulic turning system (option); (4) - protective plug

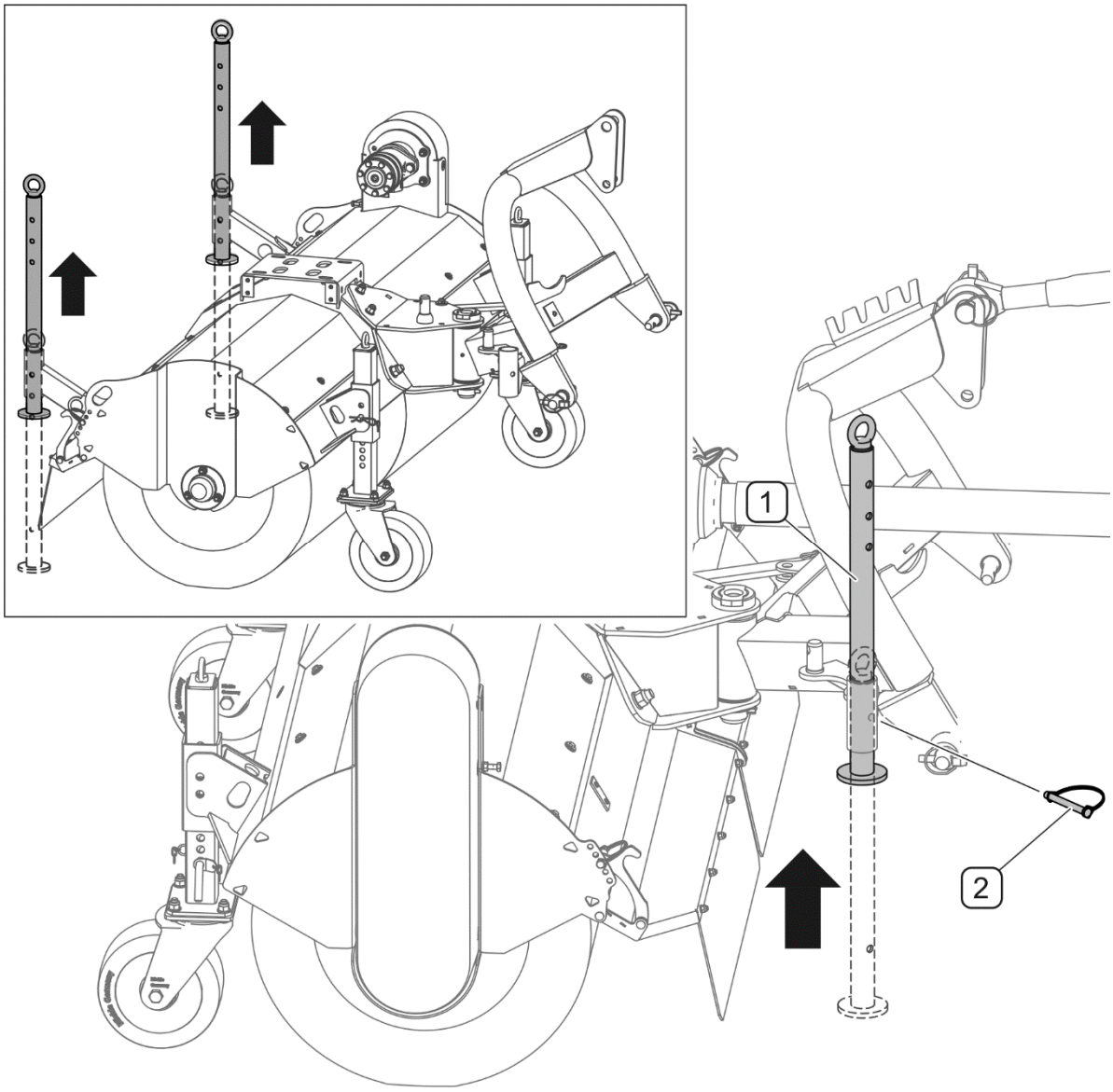


FIGURE 4.8 Parking stand

(1) - parking stand; (2) - locking linchpin

After rising the machine on the carrying vehicle's three-point linkage, raise the parking stand and lock it in upper position. (FIGURE 4.8). In case of front-mounted sweeper, raise two parking stands.

4.4 MACHINE OPERATION

4.4.1 ADJUSTMENT OF BRUSH PRESSURE

DANGER

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

Proper adjustment of brush pressure ensures uniform wear and long service life of the brush. The width of brush ground contact surface should be in the range from 60 do 120 mm. Right and left wheel heights should be the same.

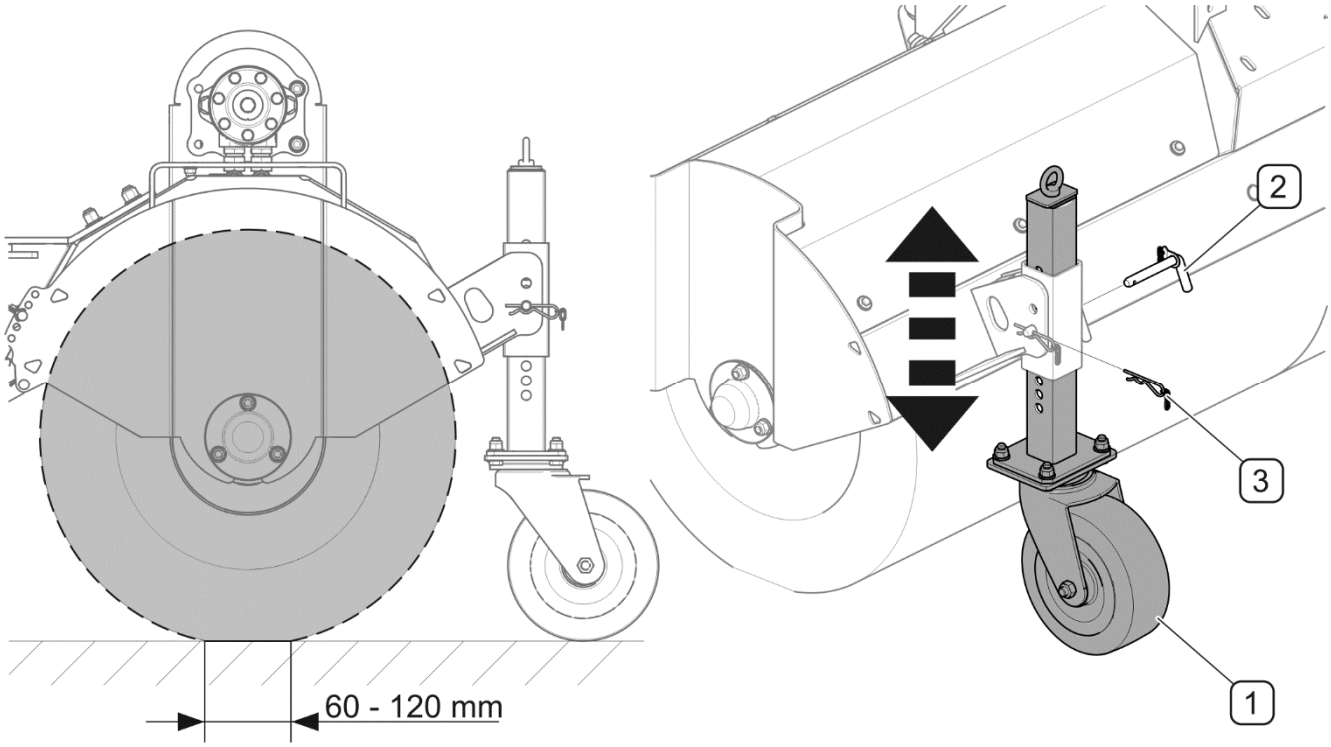


FIGURE 4.9 Adjustment of brush pressure

(1) - jockey wheel; (2) - linchpin; (3) - securing cotter pin

Brush pressure is adjusted by changing the position of jockey wheels in guides (FIGURE 4.9) as follows:

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

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

ATTENTION!

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

ATTENTION!

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.

4.4.2 CHANGE OF WORKING POSITION

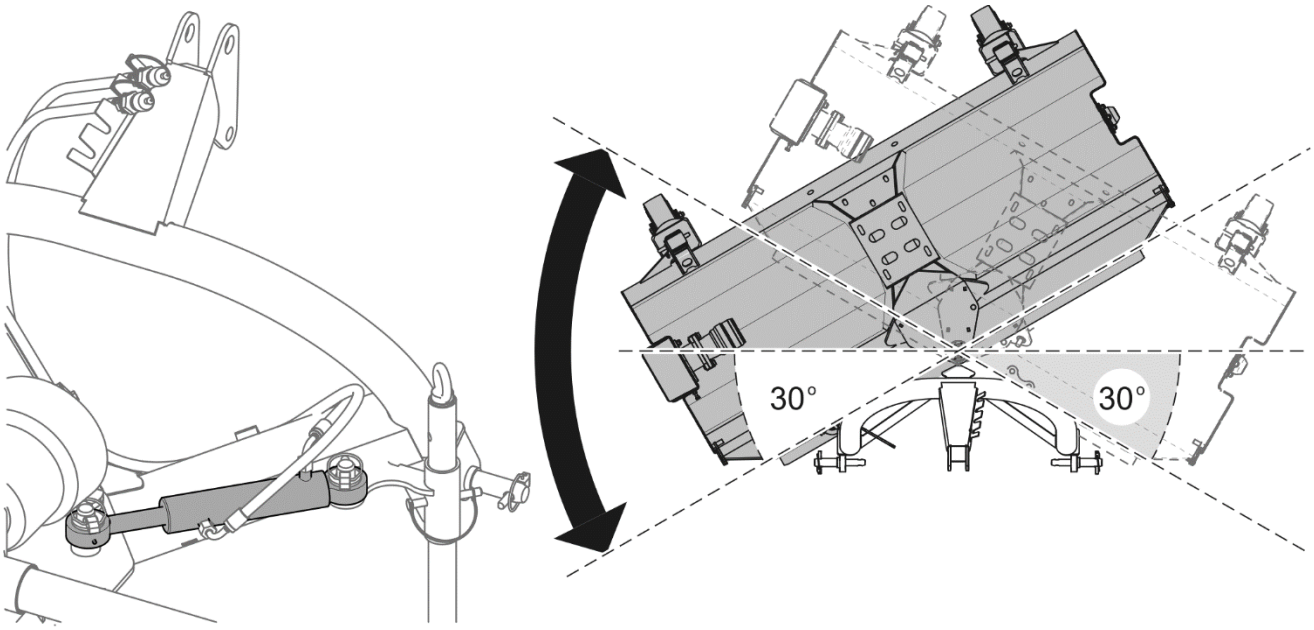


FIGURE 4.10 Change of working position *(sweeper with hydraulic turning system)*

Working position of the sweeper with hydraulic brush turning system (option) can be smoothly adjusted within the range of +30º / -30º. The adjustment is made by means of

hydraulic cylinder (FIGURE 4.10) controlled by appropriate section of the external hydraulic system of the carrying vehicle.

3 working angles of the brush can be set in the sweeper equipped with mechanical brush turning system (FIGURE 4.11). To change the brush (FIGURE 4.11) working angle:

- raise the sweeper mounted on the three-point linkage, immobilize the carrying vehicle,
- remove securing cotter pin (3) and pin (1),
- manually change 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)

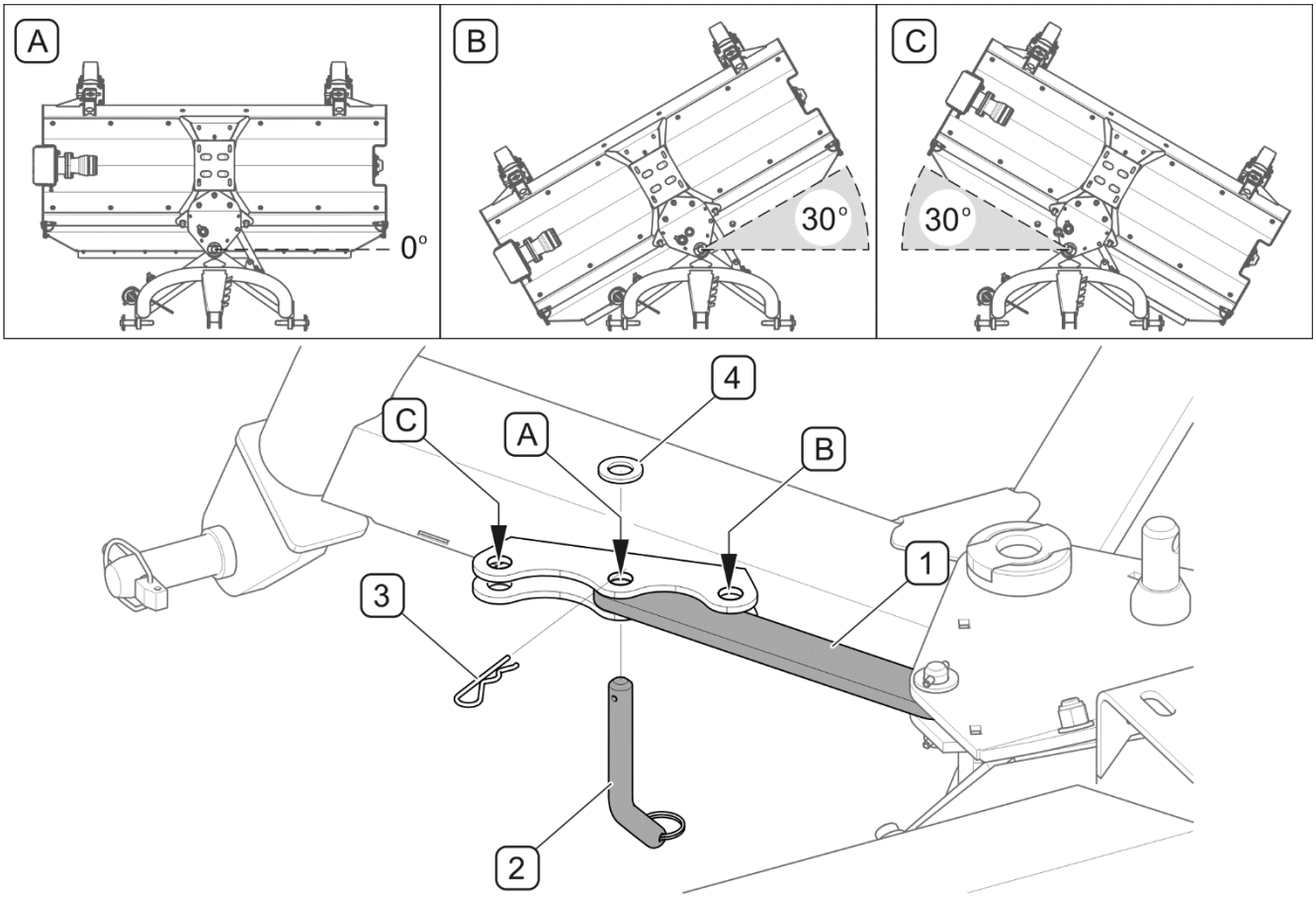


FIGURE 4.11 Change of working position *(sweeper with mechanical turning system)*
(A) - straight; (B) - angle of 30º to the left; (C) - angle of 30º to the right; (1) - arm; (2) - pin; (3) - securing cotter pin

4.4.3 CONTROL PANEL

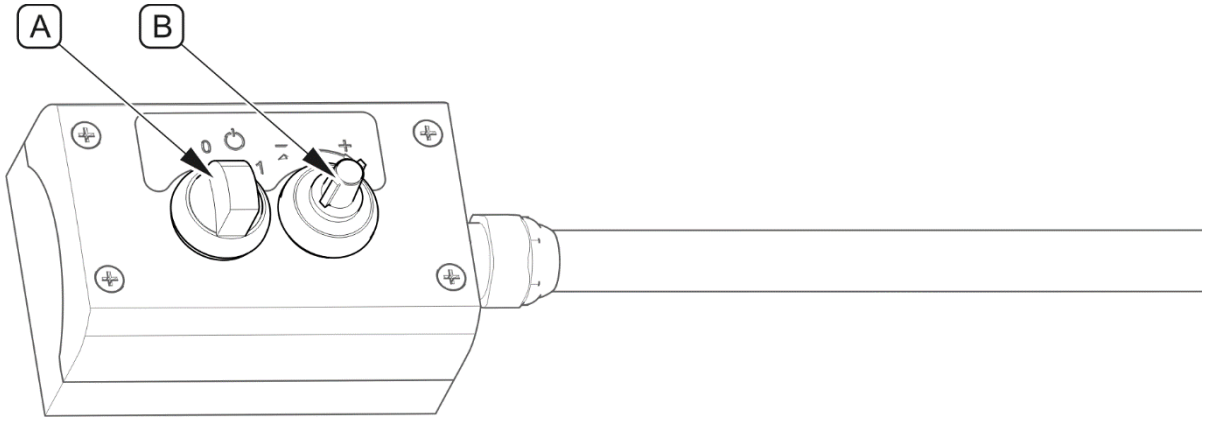


FIGURE 4.12 Spreader's control panel

(A) - spreader drive switch; (B) - spreading roller speed adjustment knob

TABLE 4.2 Functions of spreader's control panel

MARKING (FIGURE 4.12)	**FUNCTION**	**FUNCTION DESCRIPTION**
A	Spreading function switch	(1) - spreading function is on (switch is backlit) (0) - spreading function is off
B	Spreading adjustment knob	(+) - increase rotation speed of spreading roller (–) - decrease rotation speed of spreading roller

The sweeper with salt and sand spreader with mechanical PTO drive is equipped with control panel (FIGURE 4.12). When the switch (A) is turned clockwise to position (1), the spreading roller drive is started. Switch (A) in position (1) is backlit in white colour. Rotation speed of spreading roller is adjusted using knob (B). Turn the knob to the right (+) to increase the rotation speed of the spreading roller and to the left (–) to decrease the rotation speed.

ATTENTION

In order to start individual functions of the machine equipped with control panel, it is necessary to switch on the supply of a corresponding section of the external hydraulic system of the carrying vehicle.

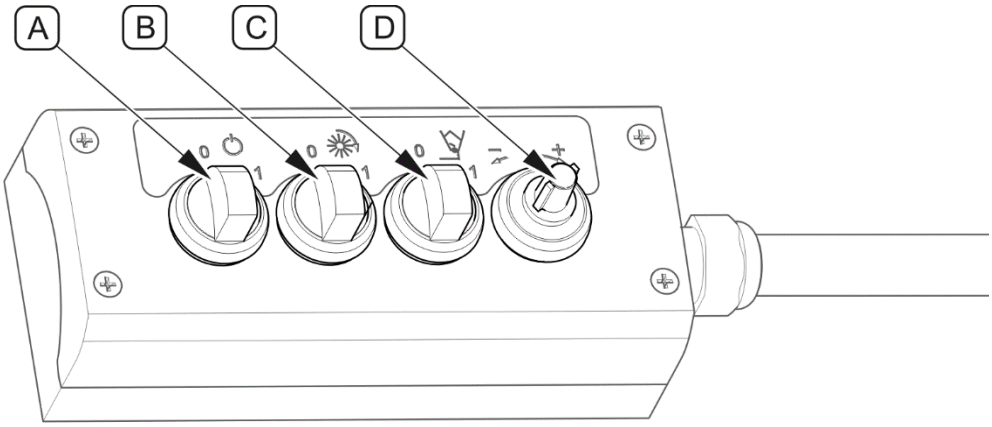


FIGURE 4.13 Control panel of sweeper and salt and sand spreader

(A) - main switch of control panel; (B) - switch of sweeper's brush drive; (C) - spreader drive switch; (D) - spreading roller speed adjustment knob

TABLE 4.3 Functions of control panel of sweeper and salt and sand spreader

MARKING (FIGURE 4.13)	**FUNCTION**	**FUNCTION DESCRIPTION**
A	Main switch of control panel	(1) - control panel is switched on (0) - control panel is switched off
B	Sweeping function switch	(1) - sweeping function is on (switch is backlit) (0) - drive of sweeper's brush is switched off
C	Spreading function switch	(1) - spreading function is on (switch is backlit) (0) - spreading function is off
D	Spreading adjustment knob	(+) - increase rotation speed of spreading roller (–) - decrease rotation speed of spreading roller

The sweeper with salt and sand spreader with hydraulic drive is equipped with control panel (FIGURE 4.13). Set switch (A) to position (1) to turn on the control panel supply.

Turn power supply on using switch (A) and set switch (B) to position (1) to start the sweeper brush drive.

Turn power supply on using switch (A) and set switch (C) to position (1) to start the spreader drive. The spreader's drive and the sweeper's drive can be started independently.

Switches (A, B, C) are backlit in white colour when they are set to position (1)

Rotation speed of spreading roller is adjusted using knob (D). Turn the knob to the right (+) to increase the rotation speed of the spreading roller and to the left (–) to decrease the rotation speed.

In case of a defect or power failure of control panel (FIGURE 4.13), the sweeper can be started without spreader. To do this, set switch (A) to position (0) and start the carrying vehicle's hydraulic system.

4.4.4 SPRINKLER SYSTEM

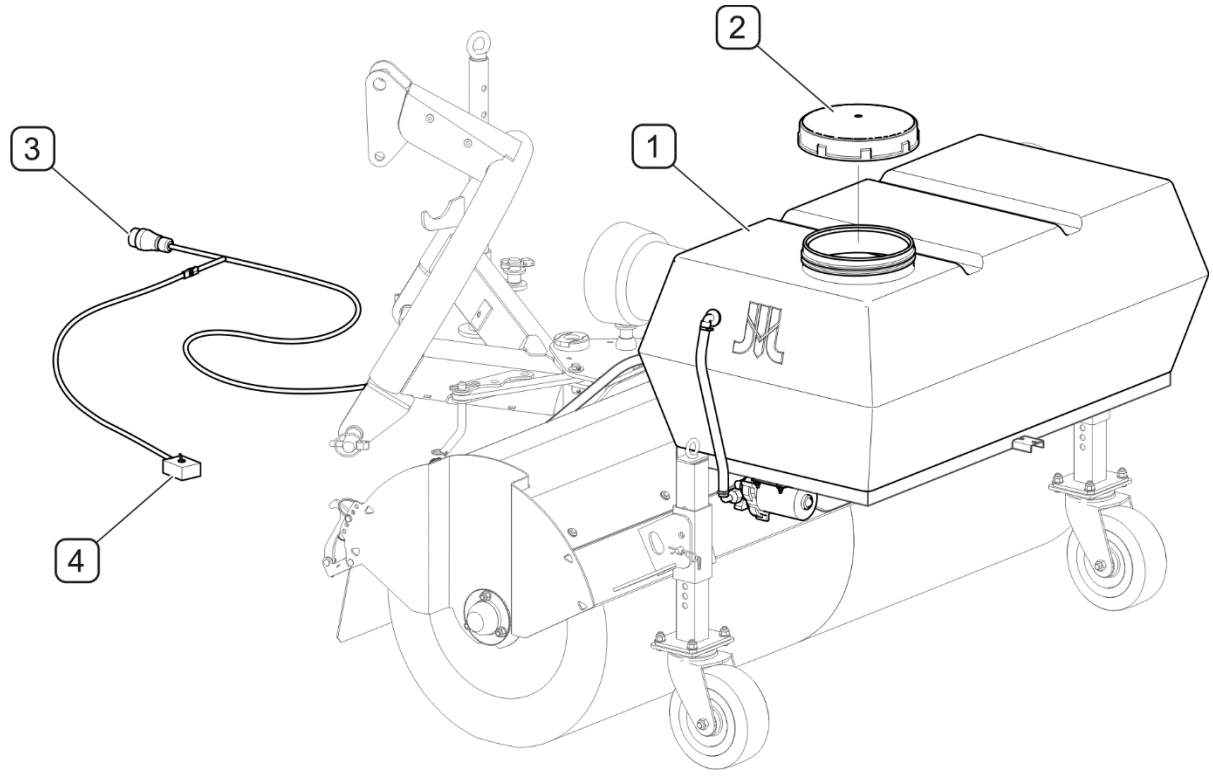


FIGURE 4.14 Sprinkler system

(1) - water tank; (2) - filler plug with a seal; (3) - 7-pole plug; (4) - sprinkler system switch

Fill the tank (1) with water through the filler opening, after unscrewing plug (2) (FIGURE 4.14). Water tank cubic capacity is 200 l (litres).

Connect electrical system plug (3) to 12V 7-pole socket in the carrying vehicle. Switch the sprinkling system on or off using the switch (4) on the power cord (FIGURE 4.14). Place the switch in the operator cab in an easily accessible place. Electrical system of water pump is supplied through the parking lights circuit, from the 7-pole socket in the carrying vehicle.

ATTENTION

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

ATTENTION

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

4.4.5 SAND SPREADER

DANGER

Filling of the spreader's tank may be performed only when the carrying vehicle's engine is stopped and the spreader is lowered.

Loading of the spreader's tank may be performed only when the machine is hitched to tractor, lowered and its wheels are supported on the ground. Avoid throwing material into the tank from a great height during loading because the protective grid may get damaged. The spreader is designed for spreading such materials as sand, salt and mixtures of sand and salt according to the regulations issued by the General Directorate of Domestic Roads and Motorways. The use of materials other than those recommended by the Manufacturer is forbidden.

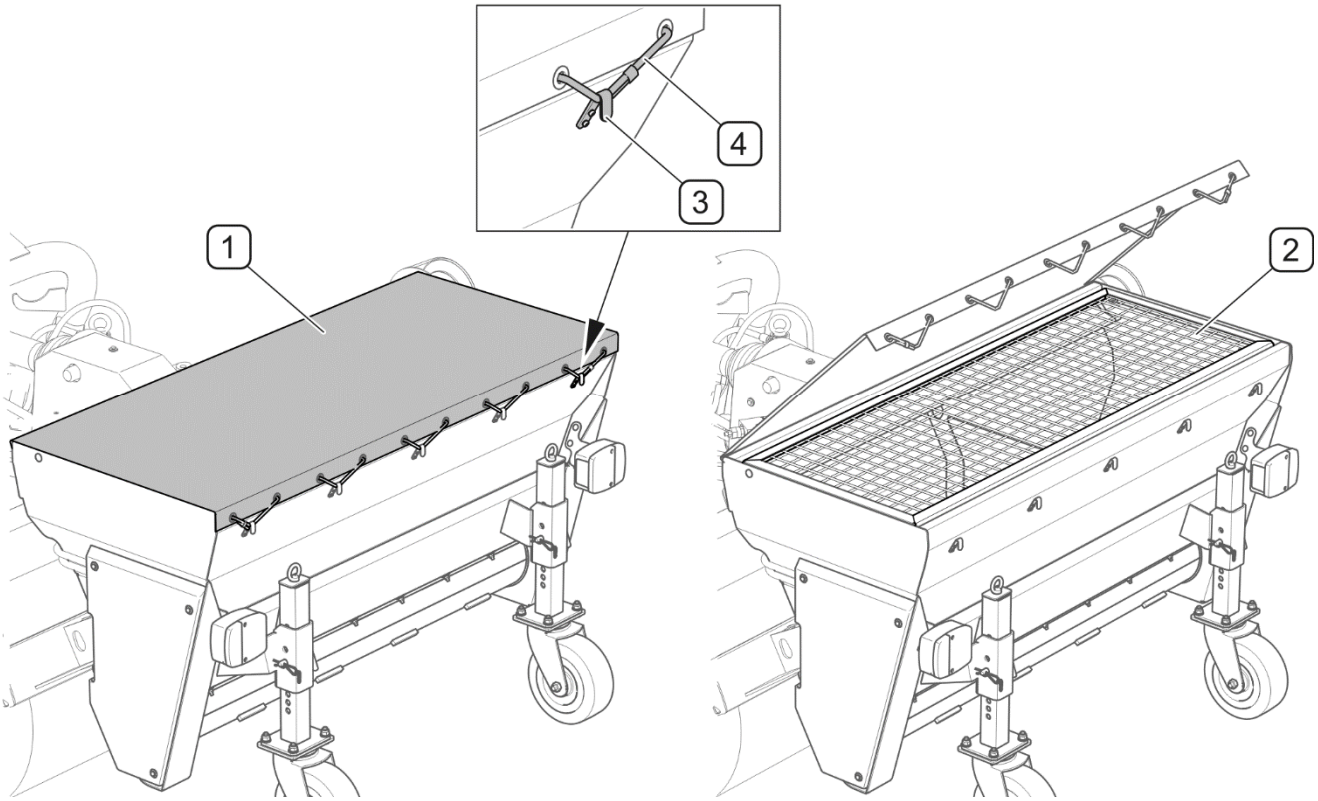


FIGURE 4.15 Spreader tank

(1) - tank's tarpaulin cover; (2) - protective grid; (3) - catch; (4) - rubber expander

Remove tarpaulin cover before loading the tank (FIGURE 4.15). To do this, remove rubber expander (4) from catches (3) of the tank and fold the tarpaulin cover towards the carrying vehicle. Materials are loaded through grid (2). After loading the tank, install tarpaulin cover (1).

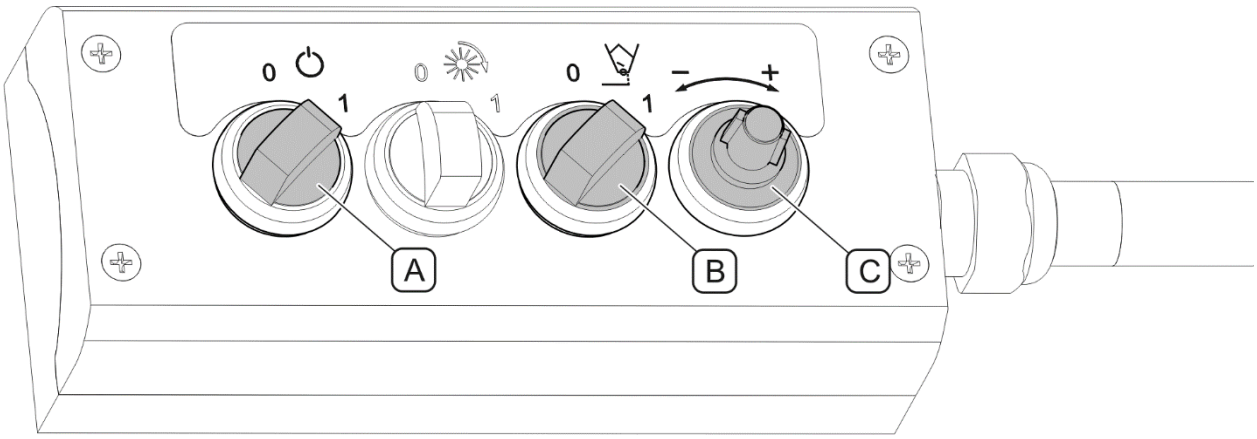


FIGURE 4.16 Controlling the spreader (sweeper with hydraulic drive)

(A) - main switch; (B) - spreading switch; (C) - spreading adjustment knob

In order to switch on the spreading function, start corresponding section on the manifold of the external hydraulic system of the carrying vehicle to which the machine is connected.

In the sweeper with hydraulic drive with salt and sand spreader (FIGURE 4.16), set main switch (A) to position 1 to start the control panel. Set switch (B) to position 1 to start spreading function. Switches (A) and (B) in position (1) are backlit in white colour. Set the potentiometer knob (C) in specific position (1÷10) in order to adjust the spreading material dose.

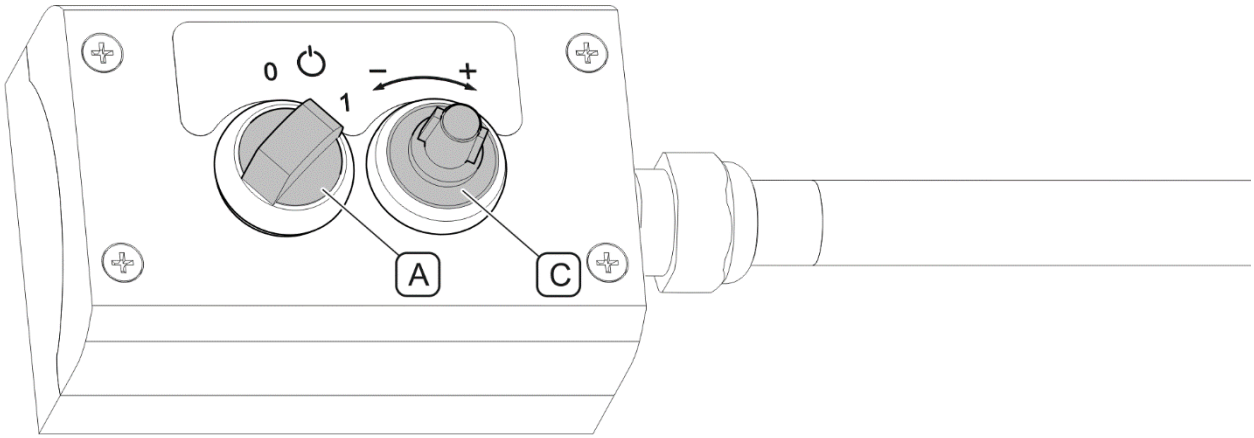


FIGURE 4.17 Controlling the spreader (sweeper with PTO drive)

(A) - main switch and spreading switch; (C) - spreading adjustment knob

In the sweeper with PTO drive with salt and sand spreader (FIGURE 4.17), set switch (A) to position 1 to start spreading function. Switch (A) in position (1) is backlit in white colour. Set the potentiometer knob (C) in specific position (1÷10) in order to adjust the spreading material dose.

If there is no need to operate the spreader (e.g. while transporting the machine), disconnect the supply of the section of the external hydraulic system of the carrying vehicle to which the machine is connected.

4.4.6 OPERATING THE SWEEPER MOUNTED ON THE FRONT THREE-POINT LINKAGE OF THE CARRYING VEHICLE

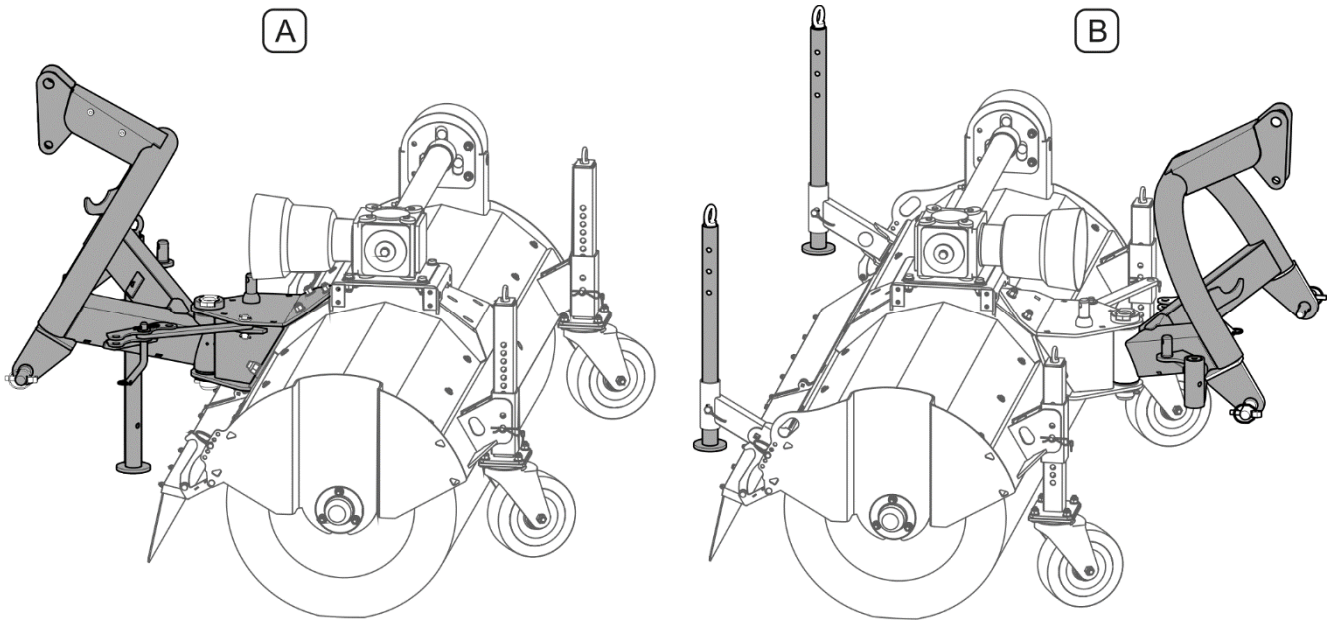


FIGURE 4.18 Changing the linkage setting

(A) - linkage set for working with rear three-point linkage of carrying vehicle; (B) - linkage set for working with front three-point linkage of carrying vehicle

The sweeper can be adapted to mounting on front three-point linkage of carrying vehicle. To adapt the sweeper for mounting on the front three-point linkage of carrying vehicle (FIGURE 4.18), mount the sweeper's linkage at the rear of the machine. Relocate the parking stand from the linkage to the front of the machine and install the second parking stand. The additional parking stand is the standard equipment of the front-mounted sweeper. Otherwise, the additional parking stand should be purchased separately. In the sweeper with sprinkler system, dismount the water tank and install it in the linkage fixing place.

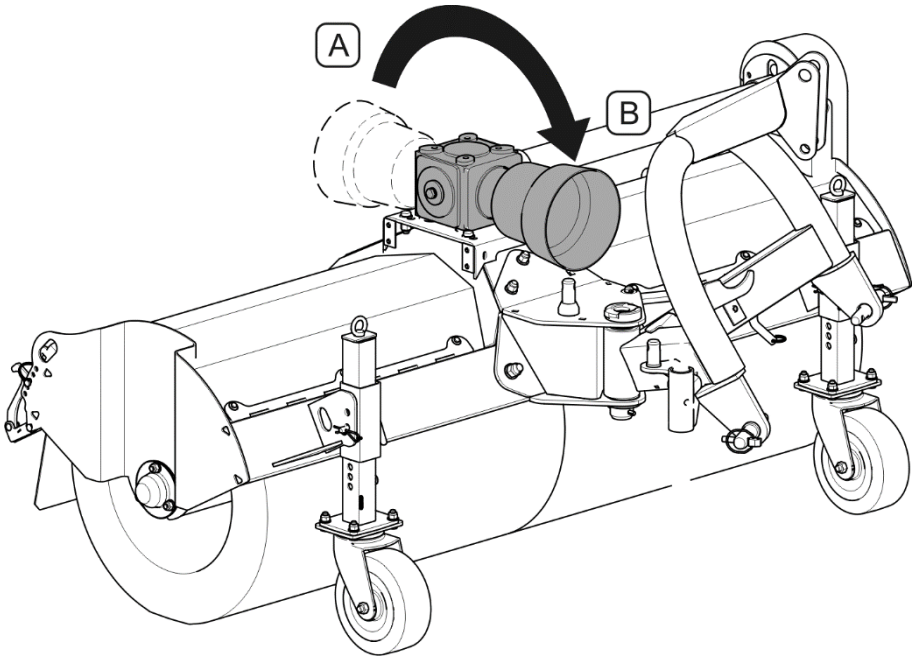


FIGURE 4.19 Changing the position of the intersecting axis gear's shaft

(A) - intersecting axis gear set for working with rear three-point linkage of carrying vehicle;
(B) - intersecting axis gear set for working with front three-point linkage of carrying vehicle

In order to adapt the sweeper with PTO drive to working on the front three-point linkage (FIGURE 4.19), change the position of the intersecting axis gear's shaft from position (A) to position (B). To do this, unscrew bolts fixing the intersecting axis gear to the machine's frame. Turn the intersecting axis gear by 180˚ and secure it again to the frame.

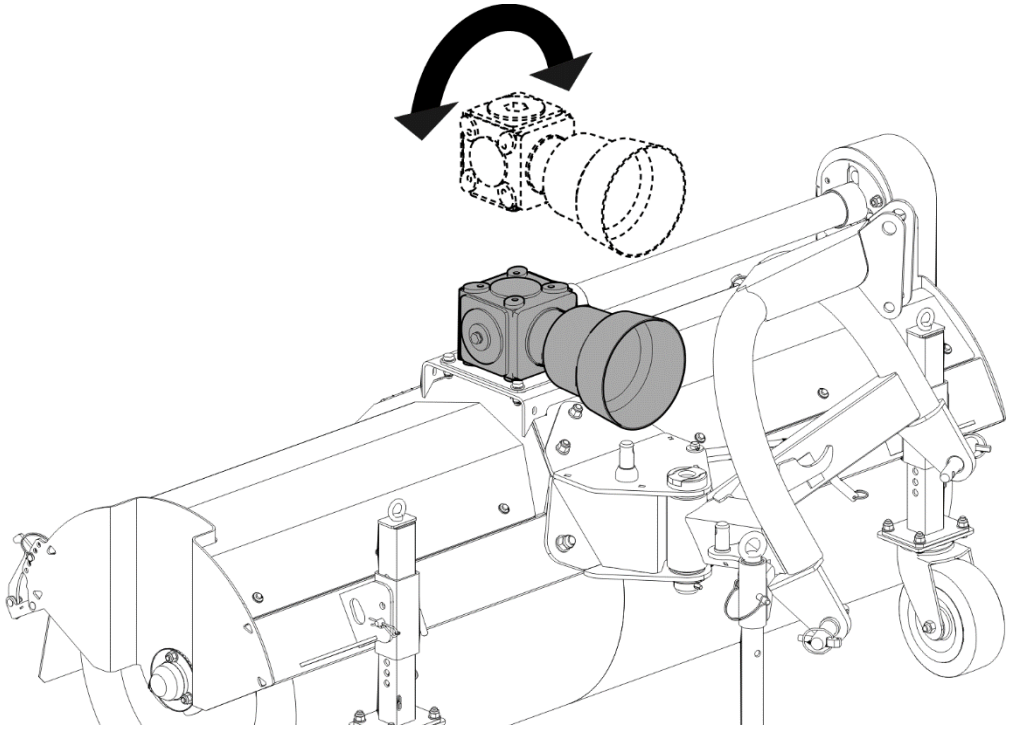


FIGURE 4.20 Changing the rotation direction of the intersecting axis gear's shaft

Rotation direction of the input shaft of the intersecting axis gear's shaft (sweeper with PTO drive) can be changed. In order to change the rotation direction of the intersecting axis gear's shaft, unscrew bolts fixing the intersecting axis gear to the machine's frame, turn the intersecting axis gear by 180˚ and secure it again to the frame (FIGURE 4.20). The list of tightening torque values for nut and bolt connections is given in table 5.7 in section 5.

4.4.7 ADJUSTMENT OF BRUSH SHIELDS

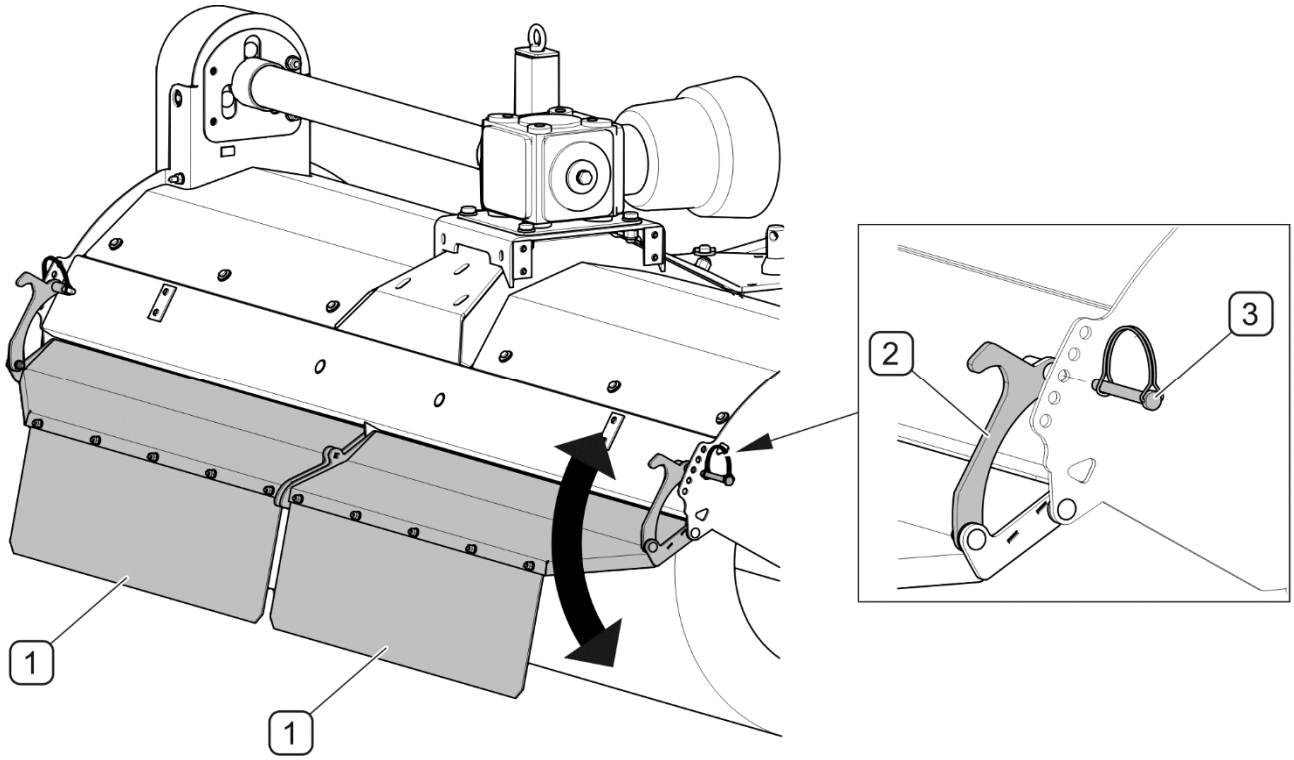


FIGURE 4.21 Brush shields

(1) - shield; (2) - arm; (3) - cotter pin

The purpose of brush shields (1) is to limit the ejection of swept contaminations (FIGURE 4.21). The tilt of the shields can be changed depending on whether the sweeper is mounted in the front or in the rear of the carrying vehicle. To change the tilt of the shields (1), take out securing cotter pin (3), set the shield and catch as needed and lock with cotter pin (3). The right shield and the left shield are set independently

4.5 TRANSPORTING THE MACHINE

When driving on public roads, respect the road traffic regulations, exercise caution and prudence. If the sweeper is working on a pavement or promenade 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 and the carrying vehicle. Take care that the driver has sufficient visibility.
- Make sure that the sweeper is correctly attached to the carrying vehicle, and linkage is properly secured.
- Permissible design speed and maximum speed allowed by road traffic law must not be exceeded. Speed of travel should be adjusted to prevailing road conditions and other conditions.
- While driving on public roads, turn on additional lights of the sweeper (if installed).
- While working with the sweeper, turn on the orange beacon light (included in the carrying vehicle equipment).
- Avoid ruts, depressions, ditches or driving on roadside slopes. Driving across such obstacles could cause the machine and the carrying 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 machine raised, reduce speed due to dynamic loads and the risk of damaging the machine or carrying vehicle.
- When driving with raised machine, secure the tractor linkage against falling or accidental dropping.

4.6 UNHITCHING THE SWEEPER FROM CARRYING VEHICLE

DANGER

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

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

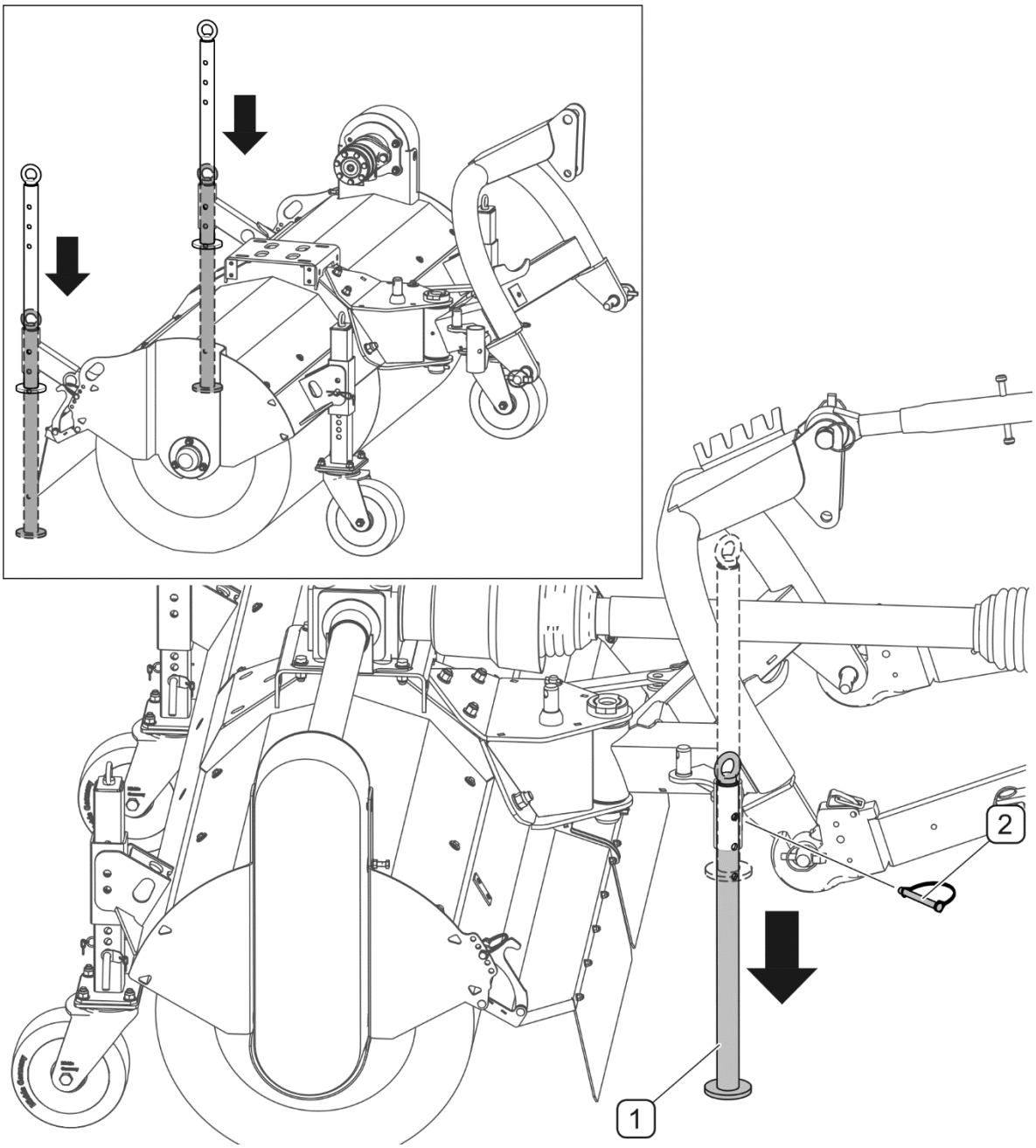


FIGURE 4.22 Lowering of parking stand

(1) - parking stand; (2) - locking linchpin

Lower the parking stand before unhitching the machine from the carrying vehicle (FIGURE 4.22). In front-mounted sweepers, lower two parking stands. In order to lower the parking stand (FIGURE 4.22) to parking position, unlock securing cotter pin (2), take it out from the guide, lower the support (1) and lock it in lower position.

The machine unhitched from the carrying vehicle should be supported on support wheels and a parking stand (two parking stands in case of front-mounted sweepers).

In order to disconnect the sweeper from the carrying vehicle, proceed as follows:

- Lower the parking stand (FIGURE 4.22) (two parking stands in case of front-mounted sweepers) and lock it at a proper height.
- Lower the sweeper on the carrying vehicle's three-point linkage until its wheels fully rest on the ground.
- Switch off engine, remove key from ignition and engage parking brake.
- Reduce residual pressure in the hydraulic system by movements of appropriate lever controlling the tractor's hydraulic circuit.
- Disconnect hydraulic conduit plugs from tractor, secure them with caps and put in a special bracket on the frame (FIGURE 4.24)
- Disconnect PTO shaft from the carrying vehicle's PTO and place the shaft on the PTO shaft bracket (FIGURE 4.23)
- Disconnect upper link (so-called central connector), dismount lower arms of three point linkage from pins and drive carrying vehicle away from the machine.

Machine unhitched from the carrying vehicle must be placed on level, sufficiently hard surface in such a manner as to ensure that it is possible to connect it again.

TIP

Control panel (if installed) should be disconnected completely from the machine and protected against adverse weather conditions.

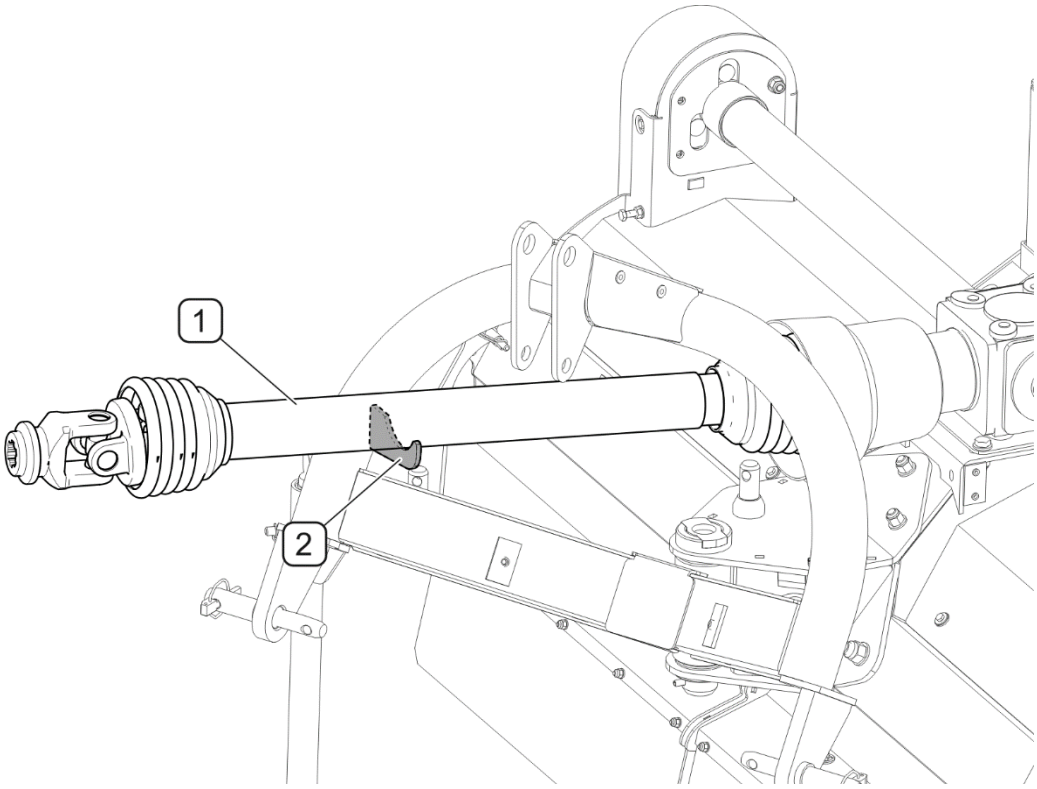


FIGURE 4.23 PTO shaft bracket

(1)- PTO shaft; (2) - PTO shaft bracket

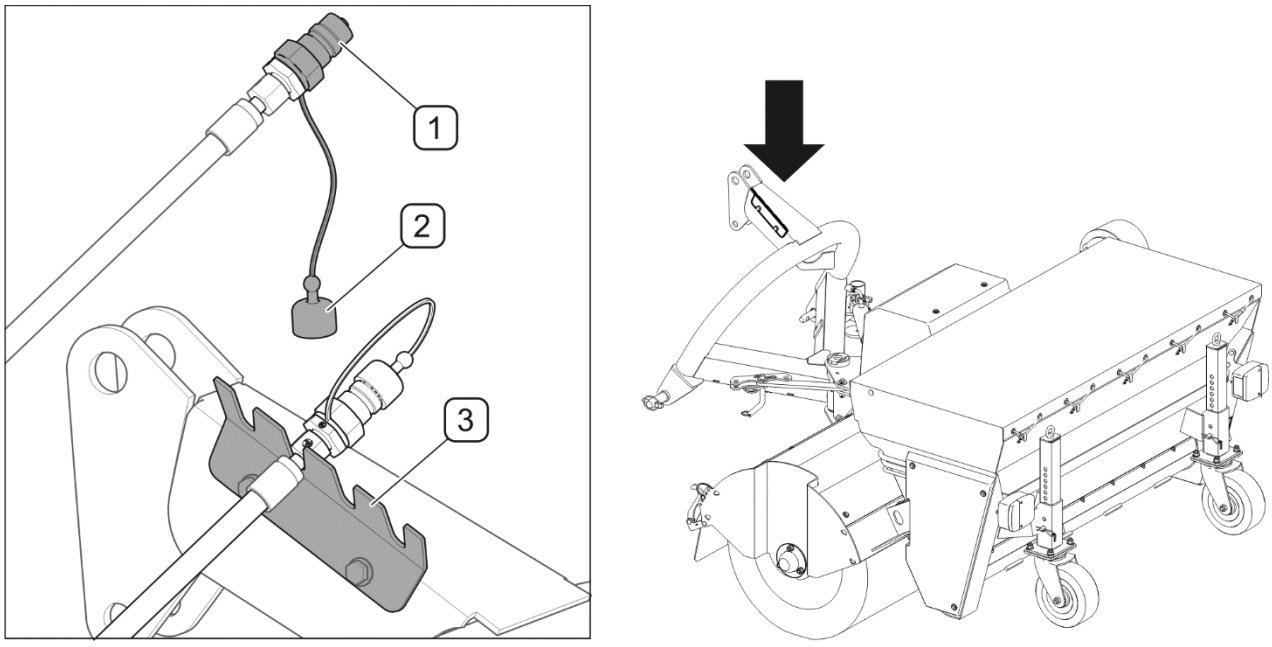


FIGURE 4.24 Protection of hydraulic conduit connectors

(1) - hydraulic conduit connector; (2) - protective plug; (3) - bracket

SECTION

5

MAINTENANCE

5.1 INSPECTION AND REPLACEMENT OF SWEEPER'S BRUSH

DANGER

During inspection and replacement of brush, turn off vehicle's engine and remove the key from the ignition.

Do NOT perform service or repair work under raised and unsupported machine.

Excessively worn or damaged brush should be replaced.

Roller brush consists of 2 identical segments installed on common shaft.

Brushes having various parameters and designed for various applications are available depending on the customer's requirements. List of brushes is shown in TABLE 5.1

TABLE 5.1 Types of roller brushes

ITEM	NAME	SPECIFICATION	PART NUMBER	QUANTITY
1	Segment of roller brush	Soft brush *(plastic 1.6 mm)*	180730B.000580	2
2	Segment of roller brush	medium brush *(plastic 2x3 mm)*	180730B.000600	2
3	Segment of roller brush	Hard brush *(plastic 1.6 mm + wire 0.5 mm)*	180730B.700580	2
4	Segment of roller brush	Very hard brush *(plastic 2x3 mm + wire 0.5 mm)*	180730B.700600	2
5	Segment of roller brush	brush for leaves and snow *(plastic 2.5 mm)* for sleeve ø125 *(5 - three-row spirals on the circumference)*	127.2176	2
6	Segment of roller brush	brush for snow (plastic 2.5 mm) for sleeve ø200 *(8 - three-row spirals on the circumference)*	127.2464	2

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

5.2 MAINTENANCE OF SPREADING UNIT

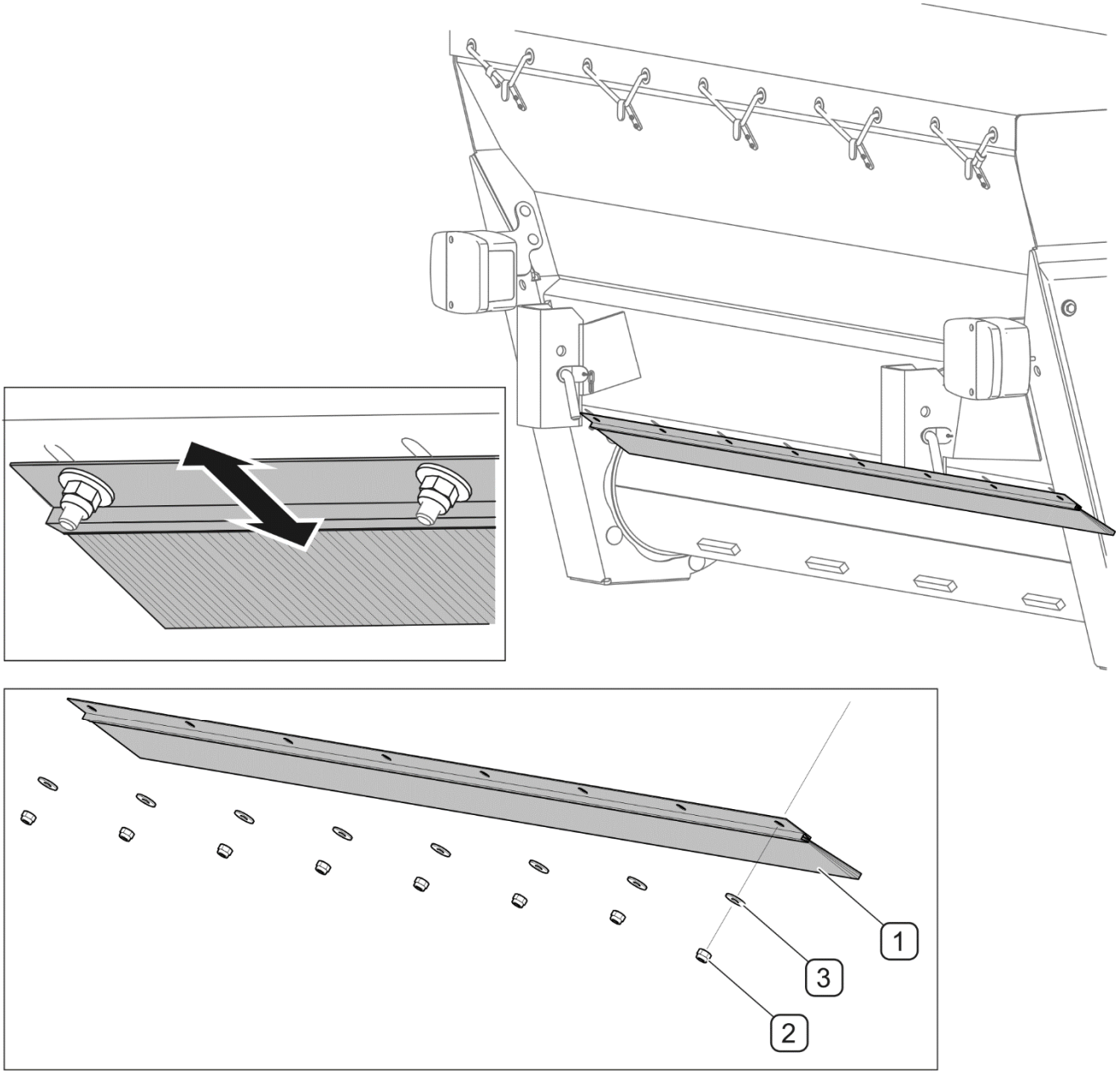


FIGURE 5.1 Strip brush of spreading roller

(1) - strip brush, part number 394N-06000002; (2) - nut; (3) - washer

Strip brush (FIGURE 5.1) is used for scraping the remaining material from the spreading roller. The brush is installed at the rear, in the lower part of the spreader's tank. Degree of wear of the strip brush should be checked periodically. As the strip brush wears down (FIGURE 5.1), it can be shifted towards the spreading roller after loosening nuts (2). Excessively worn or damaged strip brush must be replaced. The distance between the brush and the spreading roller should be the same over the entire length.

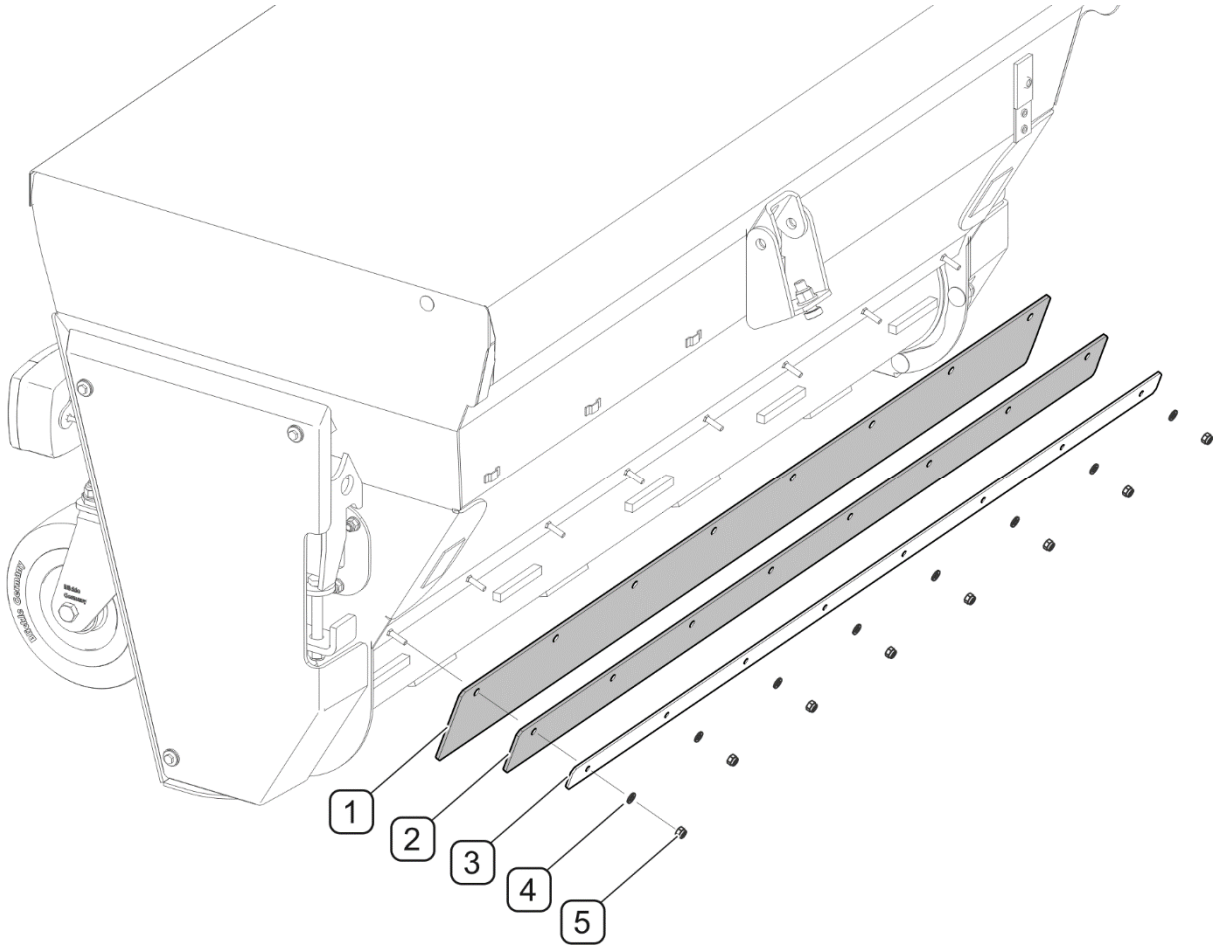


FIGURE 5.2 Sealing strips

(1) - rubber strip, part number 394N-06000007; (2) - polyurethane strip, part number 394N-06000006; (3) - clamping strip 394N-06000005; (4) - washer; (5) - nut

In the front part of the tank, the spreading roller is sealed with strips (1) and (2) (FIGURE 5.2). Technical condition of sealing strips should be checked periodically. Excessively worn or damaged sealing strips should be replaced.

Technical condition of strip brush and sealing strips should be inspected regularly while using the machine.

5.3 HYDRAULIC SYSTEM OPERATION

DANGER

Do not repair hydraulic system on your own. All hydraulic system repairs must be performed only by qualified personnel.

The duties of the operator connected with the hydraulic system include:

- checking tightness of cylinders hydraulic connections,
- checking technical condition of hydraulic lines;
- replacement of oil filter cartridge

DANGER

Before commencing whatever work on hydraulic system reduce the residual pressure in the system.

DANGER

During work on hydraulic system, use the appropriate personal protection equipment i.e. protective clothing, footwear, gloves and eye protection. Avoid contact of skin with oil.

Because of its composition the oil applied is not classified 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 atomised (oil vapour), or in the case of fire during which toxic compounds may be released.

DANGER

Oil fires should be quenched with carbon dioxide (CO_2), foam or extinguisher steam. Do NOT use water for fire extinguishing!

NOTE

Before you begin, visually inspect the hydraulic system components.

TABLE 5.2 HL32 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, ^0C	Above 210°C
6	Maximum operating temperature, ^0C	80

Spilt oil should be immediately collected and placed in marked tight container. Used oil should be taken to the appropriate facility dealing with recycling or regeneration of oils.

The hydraulic system should be completely tight sealed. Inspect the seals when the hydraulic cylinder is completely extended. If oil is found on hydraulic cylinder body, check origin of leak. Minimum leaks are permissible with symptoms of "sweating", however in the event of noticing leaks in the form of "droplets" stop using the machine until faults are remedied.

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

In the event of confirmation of an oil leak on hydraulic line connections, tighten connections, and if this does not remedy faults then change line or connection elements. Change of sub-assemblies is equally required in each instance of mechanical damage.

Hydraulic lines should be replaced after 4 years of machine use.

Cleanliness of oil filter cartridge should be checked periodically. If filter cartridge is contaminated, the indicator (FIGURE 5.3) changes its colour from green to red.

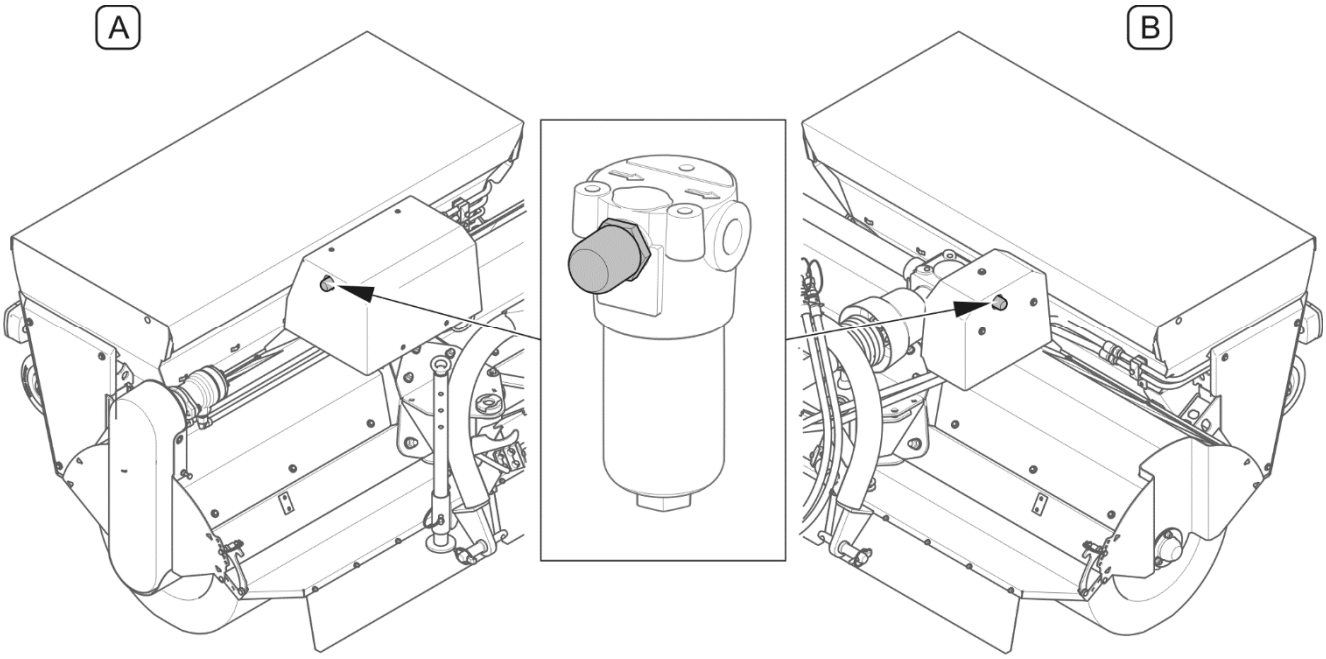


FIGURE 5.3 Filter contamination indicator *(applies to sweeper with salt and sand spreader)*

(A) - sweeper with salt and sand spreader with hydraulic drive; (B) - sweeper with salt and sand spreader with PTO drive

Oil filter cartridge should be replaced when the indicator located on the filter indicates filter contamination (red colour)

Oil filter (FIGURE 5.4) is located under the housing (3). In order to replace oil filter cartridge:

- remove bolts and washers that fix the housing (3);
- unscrew lower filter housing (2) and remove filter cartridge (1);
- lubricate gaskets with oil, install new filter cartridge and tighten the lower housing (2).

Check technical condition of other filter components and replace damaged components. The list of oil filter components including catalogue numbers is shown in (FIGURE 5.4)

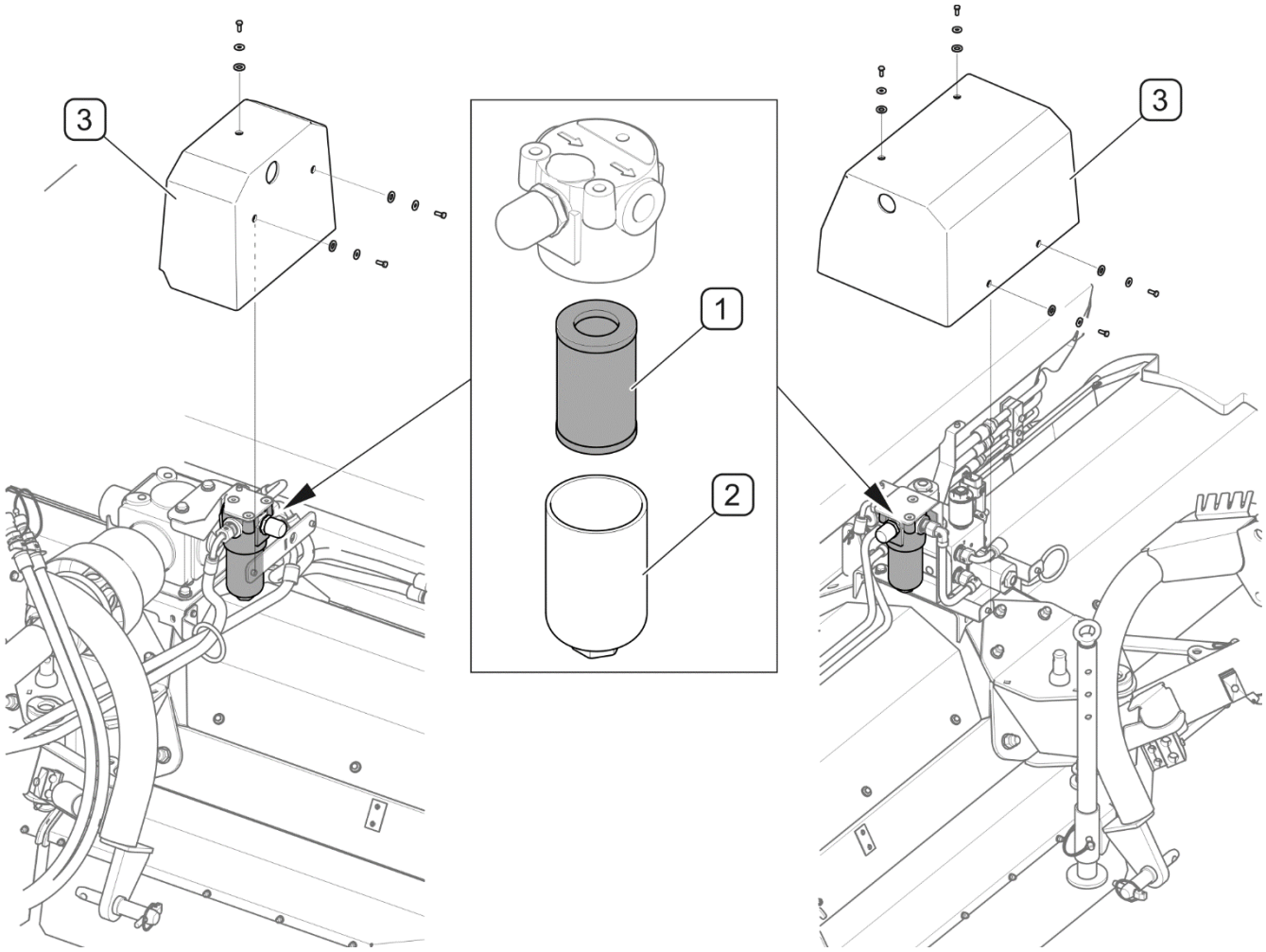


FIGURE 5.4 Replacement of oil filter *(applies to sweeper with salt and sand spreader)*

(1) - filter cartridge; (2) - filter housing; (3) - shield

TABLE 5.3 LIST OF OIL FILTER COMPONENTS

NAME	PART NUMBER
Filter cartridge (replaceable)	HP0502A10ASP01 (or HP0504A10HP01)
Filter contamination indicator	1V7 (or V7)
Oil filter (complete)	FMM0502SACA10SP03

NOTE

The hydraulic system is vented automatically during machine operation.

5.4 DRIVE TRANSMISSION SYSTEM MAINTENANCE

DANGER

If the machine is hitched to carrying vehicle, before inspecting, adjusting tension or replacing the drive transmission system belt, switch off the vehicle's engine, remove the key from the ignition and immobilise the vehicle with parking brake.

Drive transmission system maintenance involves:

- inspection of belt transmission of brush drive
- periodic inspection and change of oil in intersecting axis gear (sweeper with PTO drive)

The first change of oil in intersecting axis gear should be made after the first 50 hours of work. The next oil changes should be made every 500 -800 hours or once a year (whichever occurs first).

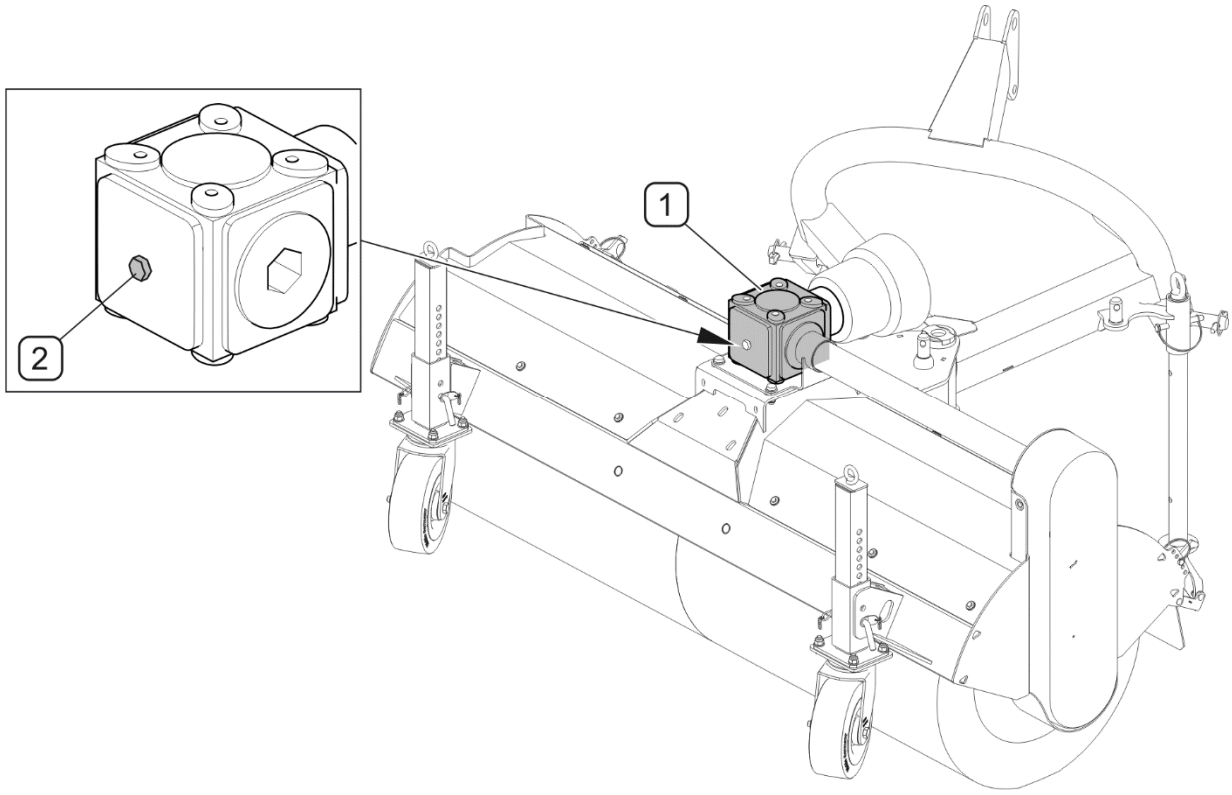


FIGURE 5.5 Inspection and change of oil in intersecting axis gear *(sweeper with PTO drive)*

(1) - gear; (2) - inspection and filler plug

Proper oil level in the intersecting axis gear should reach the lower edge of the plug opening

(2) (FIGURE 5.5). It is best to change oil immediately after completing work when transmission gear is still hot and impurities are suspended in oil. Plug (2) installed on the rear wall of the gear (FIGURE 5.5) is used for draining and adding oil.

Used oil can be removed by means of a vacuum device for sucking oil off or by tilting the gear unscrewed from the machine frame. Used oil should be taken to the appropriate facility dealing with recycling or regeneration of oils.

If a leak is noticed, carefully inspect seals and check oil level. Transmission operation with insufficient oil may cause permanent damage of the mechanism.

TIP

To lubricate intersecting axis gear (FIGURE 5.5) use SAE 90EP oil in the amount of 1l.

NOTE

Repairs of intersecting axis gear (FIGURE 5.5) during guarantee period may only be performed at authorised mechanical workshops.

Maintenance of belt transmission (FIGURE 5.6) of brush drive involves periodic inspection, adjustment and possible replacement of cogbelt.

Dismount shield (3) to gain access to belt transmission (FIGURE 5.6). Belt transmission is equipped with spring tensioner (2). Belt tension may be changed using nut (6) after loosening counter nut (7). In order to dismount cogbelt, loosen proper nut (6), bolts (5) and remove spring (4). After installing the cogbelt, tighten the tensioner spring (4) using force of 155-168 N. After the adjustment, tighten counter nut (7) and install shield (3).

TIP

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

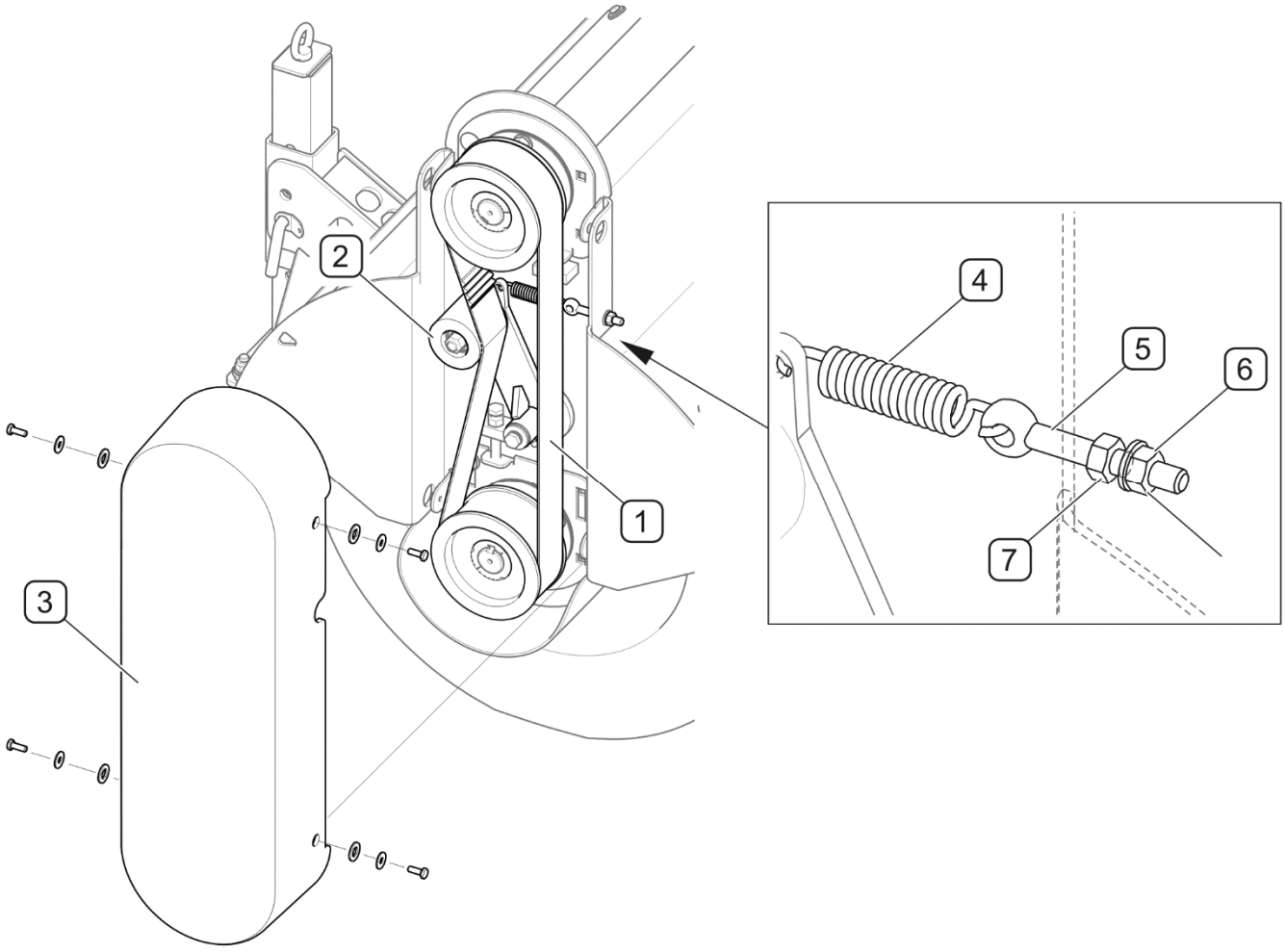


FIGURE 5.6 Belt transmission of brush drive

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

5.5 ELECTRICAL SYSTEM MAINTENANCE

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.

Electrical system maintenance is conducted during the periodical checking the operation of control system and lighting system. To replace the bulb (FIGURE 5.7) in lamp assembly (1), unscrew two screws (3) fixing light lens (2).

List of bulbs is shown in **Błąd! Nie można odnaleźć źródła odwołania.**

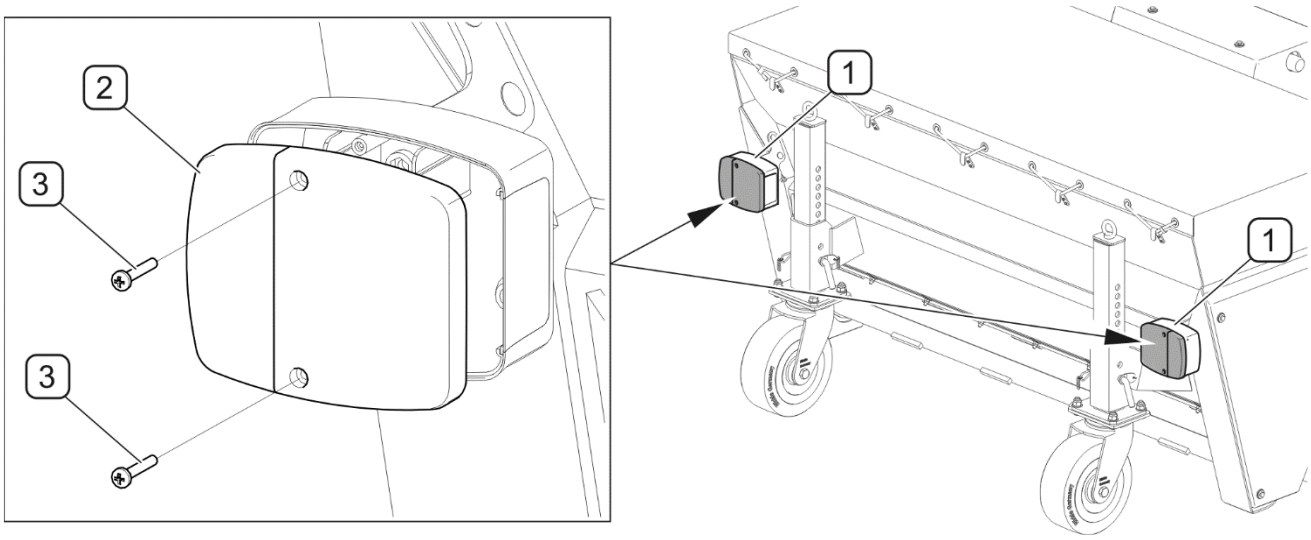


FIGURE 5.7 Change bulbs

(1) - rear lamp assembly; (2) - lamp assembly lens; (3) - screws

TABLE 5.4 LIST OF BULBS

TYPE OF LIGHT	BULB	LAMP
indicator light	P21W / 12V	Lamp assembly W-18U
brake light	P21W / 12V	
parking light	R10W / 12V	

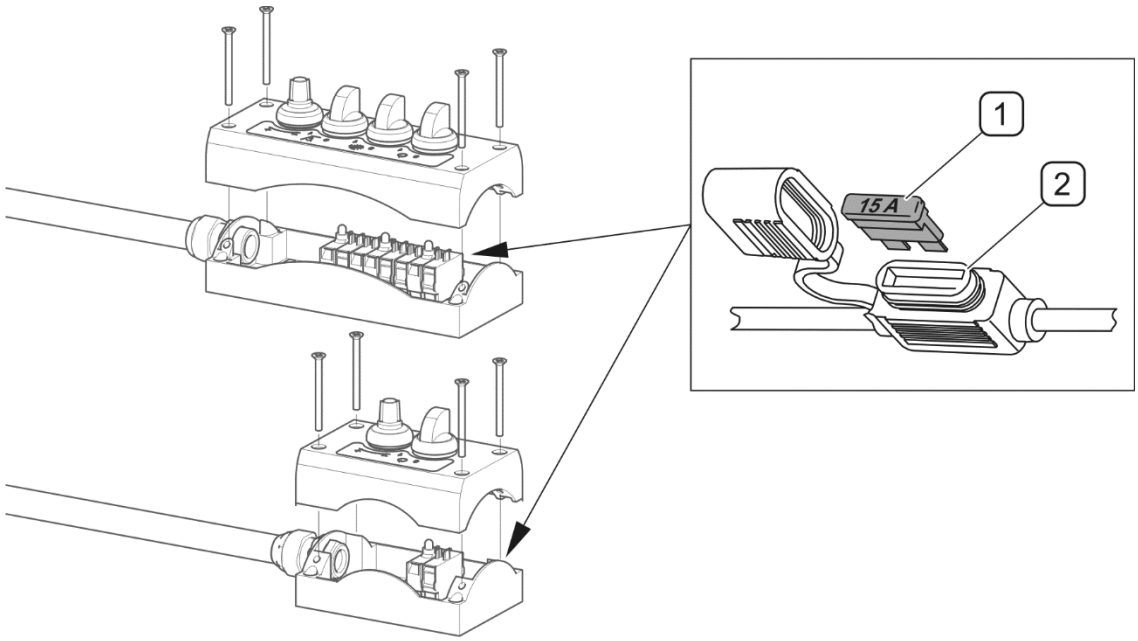


FIGURE 5.8 Replacement of fuse in control panel

(1) - UNIVAL 15A fuse; (2) - fuse holder

Electrical control system of the sweeper with salt and sand spreader is equipped with UNIVAL 15A fuse (1) located inside the control panel (FIGURE 5.8).

5.6 SPRINKLER SYSTEM MAINTENANCE

NOTE

If there is a risk that temperatures drop below 0°C, drain water from the sprinkler system.

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

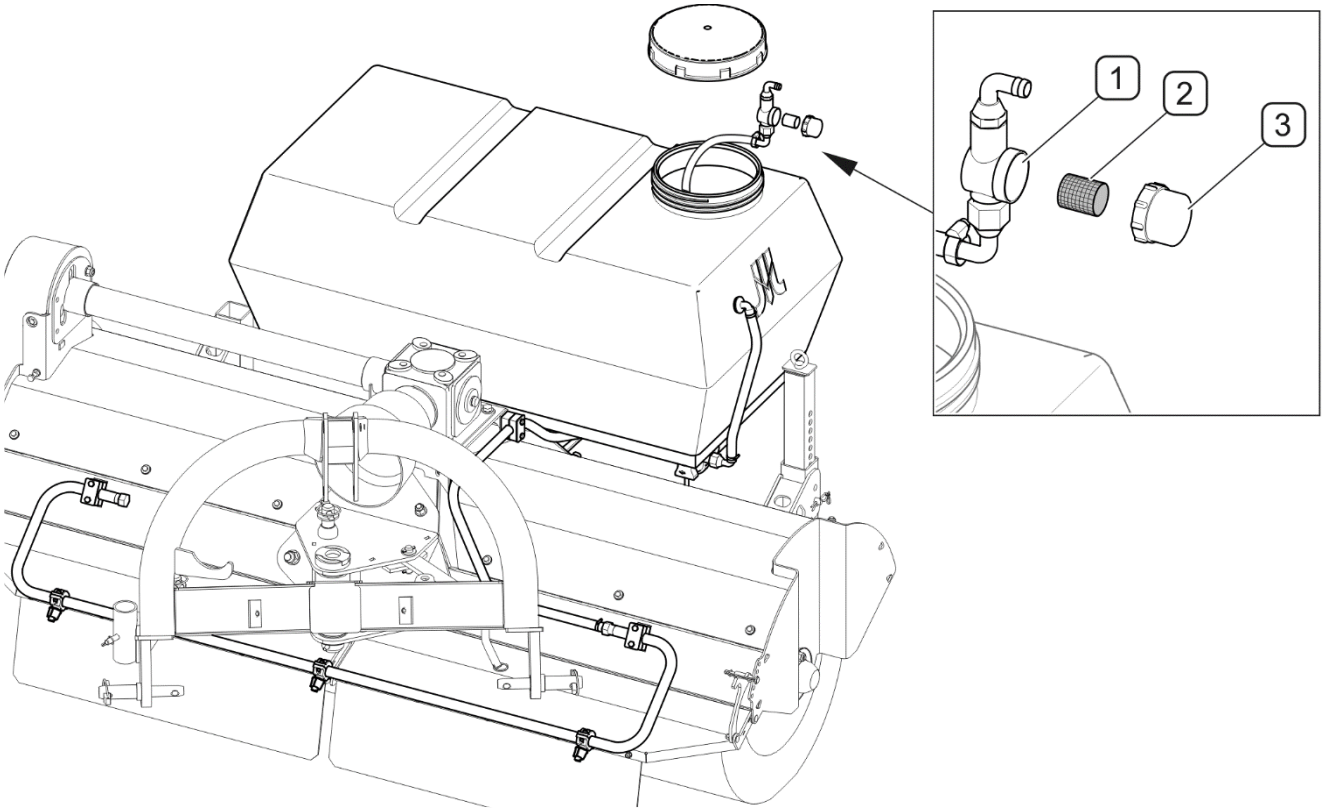


FIGURE 5.9 Filters in water tank

(1) - filter housing; (2) - mesh cartridge; (3) - cover

In the tank there is a water filter (FIGURE 5.9) installed on suction conduit *(applies to pump, part number 2095-161-2401)*. In order to clean the filter, take it out together with the conduit through the tank opening, unscrew cover (3), remove mesh cartridge (2) and wash it with water under pressure or clean with compressed air. After replacing the strainer reassemble filter housing and check for leaks. In case of pump, part number 8411001, the water filter is installed next to the pump.

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

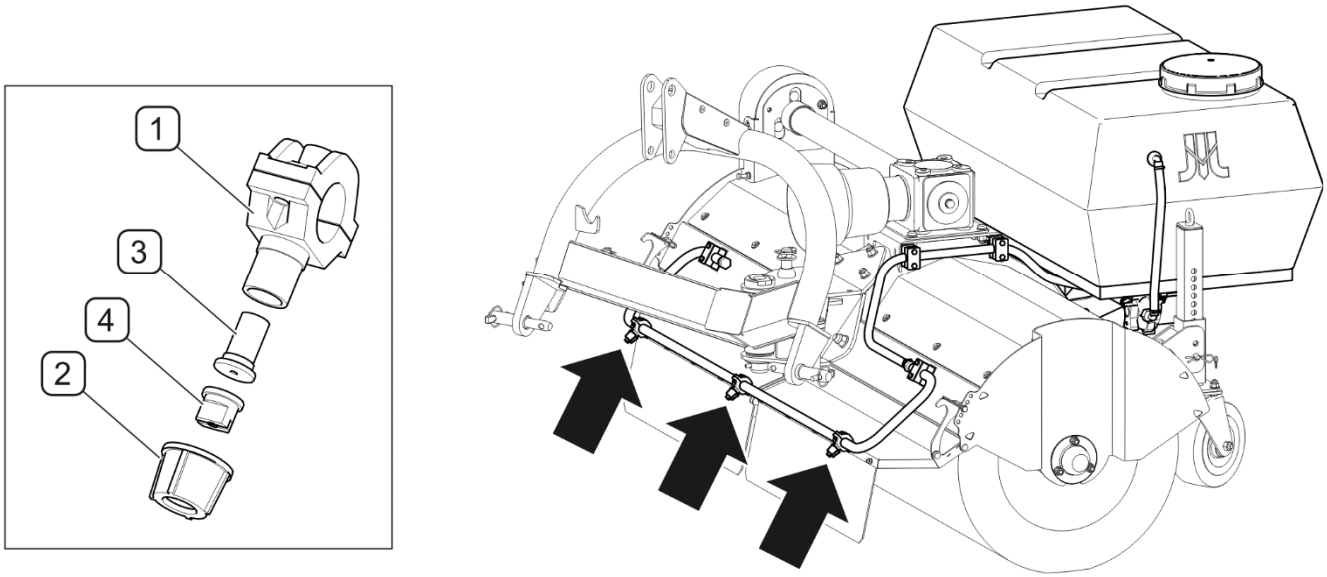


FIGURE 5.10 Filters of sprinklers

(1) - holder; (2) - nut; (3) - sprinkler filter with a check valve; (4) - spray nozzle

There is a filter (FIGURE 5.10) inside each sprinkler. In order to clean the sprinkler filter (3), unscrew housing and wash or blow the filter with compressed air. Before installing the filter, confirm that the spray nozzle is not blocked. Check technical condition of sprinklers, if necessary replace. The list of sprinkler elements TABLE 5.5

IMPORTANT

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.

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

NOTE

Leakage in the sprinkler system causes abnormal water spraying.

TABLE 5.5 The list of sprinkler elements

DESIGNATION (FIGURE 5.10)	NAME	CATALOGUE NO.
1+2	1/2” bracket with nut	8230012
3	Filter	8139004
4	Spray nozzle with capacity of 2 l/min Spray nozzle with capacity of 1 l/min	TP11006VP TP11003VP

5.7 LUBRICATION

TABLE 5.6 LUBRICATION POINTS AND LUBRICATION FREQUENCY

ITEM	NAME	NUMBER OF LUBRICATION POINTS	TYPE OF GREASE	LUBRICATION FREQUENCY
A	Linkage hitch rotation pin	1	grease	50 hours
B	Crank mechanism of spreader agitator drive	2		50 hours
C	Eye of cylinder rod and turning cylinder (option)	2		50 hours
D	Intersecting axis gear *(machine with PTO drive)*	2	gear oil SAE 90EP	50 hours - *first change* 500 hours
E	Tensioner arm	1	grease	50 hours
F	Jockey wheel	2+2	grease	10 hours
G	PTO shaft	*	*	*

**- For detailed information on maintenance please refer to operator's manual attached to the shaft.*

Marking description in Item column (TABLE 5.6) conforms with numbering shown (FIGURE 5.11)

Machine lubrication should be performed with the aid of a manually or foot operated grease gun, filled with generally available grease. Before commencing lubrication insofar as is possible remove old grease and other contamination. Remove and wipe off excess oil or grease ŁT-43-PN/C-96134 grease is recommended for lubrication.

DANGER

Lubrication may only be performed when the sweeper is lowered and resting on the ground.

Before lubricating, turn off engine, remove key from ignition and engage carrying vehicle brake.

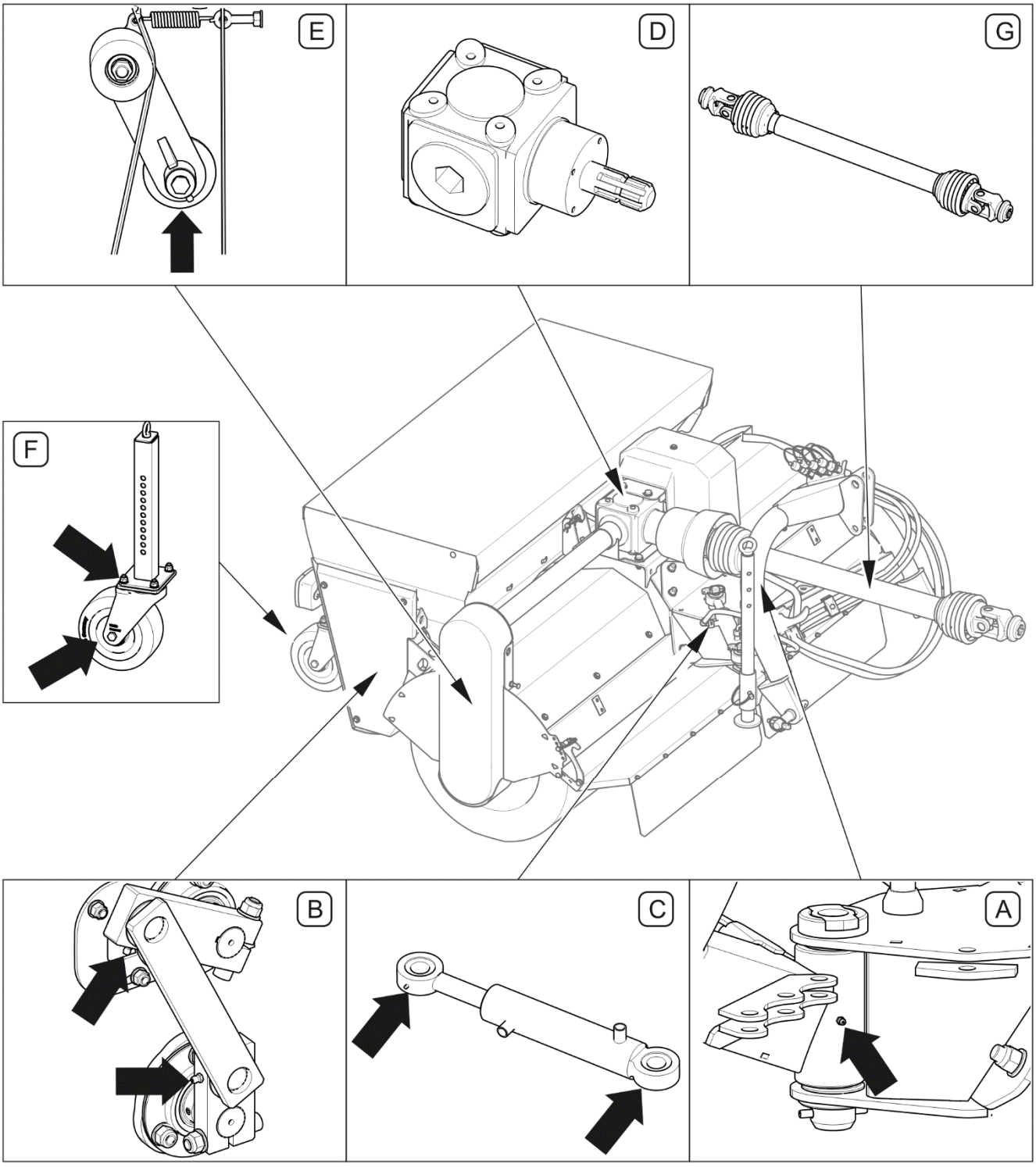


FIGURE 5.11 Lubrication points

Lubrication points are described in TABLE 5.6

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

5.8 STORAGE

After finishing work, machine should be thoroughly cleaned and washed with water jet. While washing, do not direct a strong water or steam jet at information and warning decals or hydraulic lines and electrical system components. Nozzle of pressure or steam washer should be kept at a distance of not less than 30 cm from cleaned surface.

After cleaning, inspect the whole machine, inspect technical condition of individual elements. Used or damaged elements should be repaired or replaced. 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. Machine should be kept in closed or roofed building. If the machine shall not be used for a long period of time, protect it against adverse weather conditions. Lubricate machine according to the instructions provided. In the event of prolonged work stoppage, it is essential to lubricate all elements regardless of the date of the last lubrication.

Control panel should be disconnected from the machine and protected against adverse weather conditions *(applies to sweeper with salt and sand spreader)*

5.9 TIGHTENING TORQUE FOR NUT AND BOLT CONNECTIONS

During maintenance and repairs use appropriate torque for bolt connections (unless other is specified for a particular connection). Recommended torque values apply to non-greased steel bolts TABLE 5.7

TABLE 5.7 TIGHTENING TORQUE FOR NUT AND BOLT CONNECTIONS

THREAD DIAMETER [mm]	**5.8**	**8.8**	**10.9**
	TIGHTENING TORQUE [Nm]		
M6	8	10	15
M8	18	25	36
M10	37	49	72
M12	64	85	125
M14	100	135	200
M16	160	210	310
M20	300	425	610
M24	530	730	1,050

NOTE

Should it be necessary to change individual parts, use only original parts or those indicated by the Manufacturer. Non-adherence to these requirements may put the user and other people's health and life at risk, and also cause damage to the machine.

5.10 TROUBLESHOOTING

TABLE 5.8 TROUBLESHOOTING

TYPE OF FAULT	POSSIBLE CAUSE	REMEDY
Working position cannot be changed *(hydraulic turning)*	The hydraulic system is not connected.	Check connection to the carrying vehicle's hydraulic system.
	Conduits of cylinder of hydraulic turning system are not connected or connected in a wrong manner	Check the connection. Engage supply of the external hydraulic system of the carrying vehicle
	Hydraulic system is damaged	Repair at an authorised service point
The sweeper's brush is not rotating.	Hydraulic system of brush drive is not connected or is connected incorrectly. (applies to sweeper with hydraulic drive system)	Check connection of hydraulic conduits to the carrying vehicle's hydraulic system. Engage supply of the external hydraulic system of the carrying vehicle
	Fuse is blown	Check and, if necessary, replace the fuse inside the control panel or in the carrying vehicle.
The brush is rotating in the wrong direction.	The setting of the intersecting axis gear of the brush drive is wrong. (applies to sweeper with PTO drive)	Change the position of the intersecting axis gear
Spreader is not spreading salt or sand	Hydraulic system of spreader drive is not connected or is connected incorrectly.	Check connection of hydraulic conduits to the carrying vehicle's hydraulic system. Engage supply of the external hydraulic system of the carrying vehicle
	Control panel is not connected	Check connection of the control panel to the carrying vehicle's system and to the machine.
	Control panel is not switched on.	Set the main switch of the control panel to position „1” and engage the spreader's drive.
	Fuse is blown	Check and, if necessary, replace the fuse inside the control panel or in the carrying vehicle.
	Failure of electronic system	Repair at an authorised service point
	Wrong material (wet, gluey, frozen)	Change the material
	Contaminated oil filter	Replace filter element

NOTE

The brush of the hydraulically driven sweeper with salt and sand spreader can be started without use of control panel, only using a hydraulic system lever in the carrying vehicle (the sweeper with salt and sand spreader with PTO drive is started by engaging PTO drive). Simultaneous sweeping and spreading or only spreading is possible only with the use of control panel.

NOTES