



PRONAR Sp. z o.o.

17-210 NAREW, UL. MICKIEWICZA 101A, PODLASKIE PROVINCE

phone:	+48 085 681 63 29	+48 085 681 64 29
	+48 085 681 63 81	+48 085 681 63 82
fax:	+48 085 681 63 83	+48 085 682 71 10

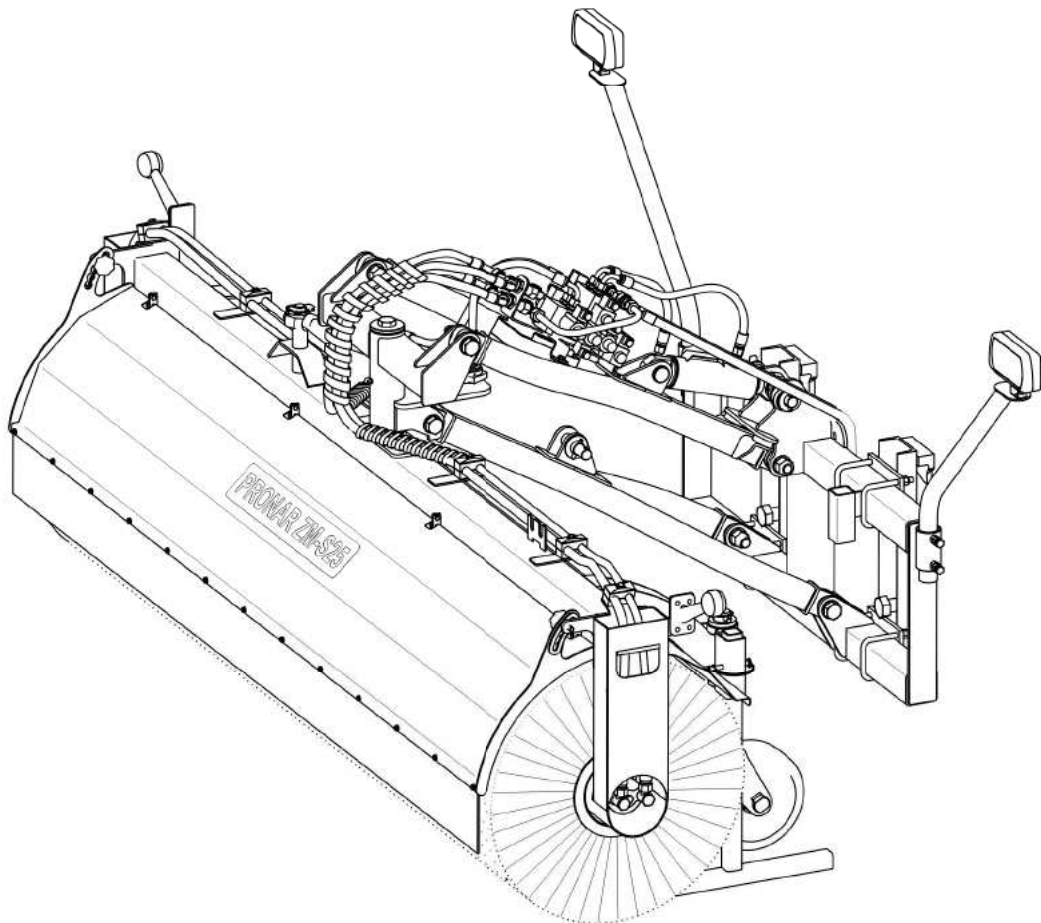
www.pronar.pl

OPERATOR'S MANUAL

TRUCK ATTACHED SWEEPER

PRONAR ZM-S25 / ZM-S25U

TRANSLATION OF THE ORIGINAL COPY OF THE MANUAL



EDITION 2A-09-2012

PUBLICATION NO 285N-0000000-UM



TRUCK ATTACHED SWEEPER

PRONAR ZM-S25 / ZMS-25U

MACHINE IDENTIFICATION

TYPE:

.....

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 malfunction 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.
ul. Mickiewicza 101A
17-210 Narew*

CONTACT TELEPHONES

<i>+48 085 681 63 29</i>	<i>+48 085 681 64 29</i>
<i>+48 085 681 63 81</i>	<i>+48 085 681 63 82</i>

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:



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.



PRONAR Sp. z o.o.

ul. Mickiewicza 101 A

17-210 Narew, Polska

tel./fax (+48 85) 681 63 29, 681 63 81, 681 63 82,
681 63 84, 681 64 29

fax (+48 85) 681 63 83

http://www.pronar.pl

e-mail: pronar@pronar.pl

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:	Truck attached sweeper	
Type:	ZM-S25	ZM-S25U
Model:	—	—
Serial number:		
Commercial name:	Truck attached sweeper PRONAR ZM-S25 Truck attached sweeper PRONAR ZM-S25U	

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

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

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

Narew, the 18 PAŹ. 2012

Place and date

*Full name of the empowered person
position, signature*

TABLE OF CONTENTS

1	BASIC INFORMATION	1.1
1.1	IDENTIFICATION	1.2
1.2	PROPER USE	1.3
1.3	EQUIPMENT	1.5
1.4	TERMS & CONDITIONS OF WARRANTY	1.6
1.5	TRANSPORT	1.7
1.6	ENVIRONMENTAL HAZARDS	1.9
1.7	WITHDRAWAL FROM USE	1.9
2	SAFETY ADVICE	2.1
2.1	BASIC SAFETY RULES	2.2
2.1.1	USE OF MACHINE	2.2
2.1.2	HITCHING AND UNHITCHING FROM CARRYING VEHICLE	2.3
2.1.3	HYDRAULIC SYSTEM	2.3
2.1.4	TRANSPORTING THE MACHINE	2.4
2.1.5	MAINTENANCE	2.4
2.1.6	MACHINE OPERATION	2.6
2.2	DESCRIPTION OF MINIMAL RISK	2.6
2.3	INFORMATION AND WARNING DECALS	2.7
3	DESIGN AND OPERATION	3.1
3.1	TECHNICAL SPECIFICATION	3.2
3.2	GENERAL DESIGN	3.4
3.3	HYDRAULIC SYSTEM	3.5
3.4	ELECTRICAL SYSTEM	3.8
3.5	SPRINKLER SYSTEM	3.11

4	CORRECT USE	4.1
4.1	PREPARING FOR WORK	4.2
4.2	CHECKING TECHNICAL CONDITION	4.4
4.3	HITCHING TO CARRYING VEHICLE	4.5
4.4	SWEeper OPERATION	4.13
4.4.1	DISASSEMBLY OF TRANSPORT LOCK	4.13
4.4.2	CONTROL PANEL (ZM-S25)	4.14
4.4.3	SETTING WORKING HEIGHT	4.19
4.5	TRANSPORTING THE MACHINE	4.20
4.6	UNHITCHING THE SWEEPER FROM CARRYING VEHICLE	4.22
5	MAINTENANCE	5.1
5.1	INSPECTION AND REPLACEMENT OF BRUSH	5.2
5.2	HYDRAULIC SYSTEM OPERATION	5.3
5.3	ELECTRICAL SYSTEM MAINTENANCE	5.6
5.4	SPRINKLER SYSTEM OPERATION	5.8
5.5	LUBRICATION	5.9
5.6	STORAGE	5.10
5.7	TIGHTENING TORQUE FOR NUT AND BOLT CONNECTIONS	5.11
5.8	TROUBLESHOOTING	5.13

SECTION

1

BASIC INFORMATION

1.1 IDENTIFICATION

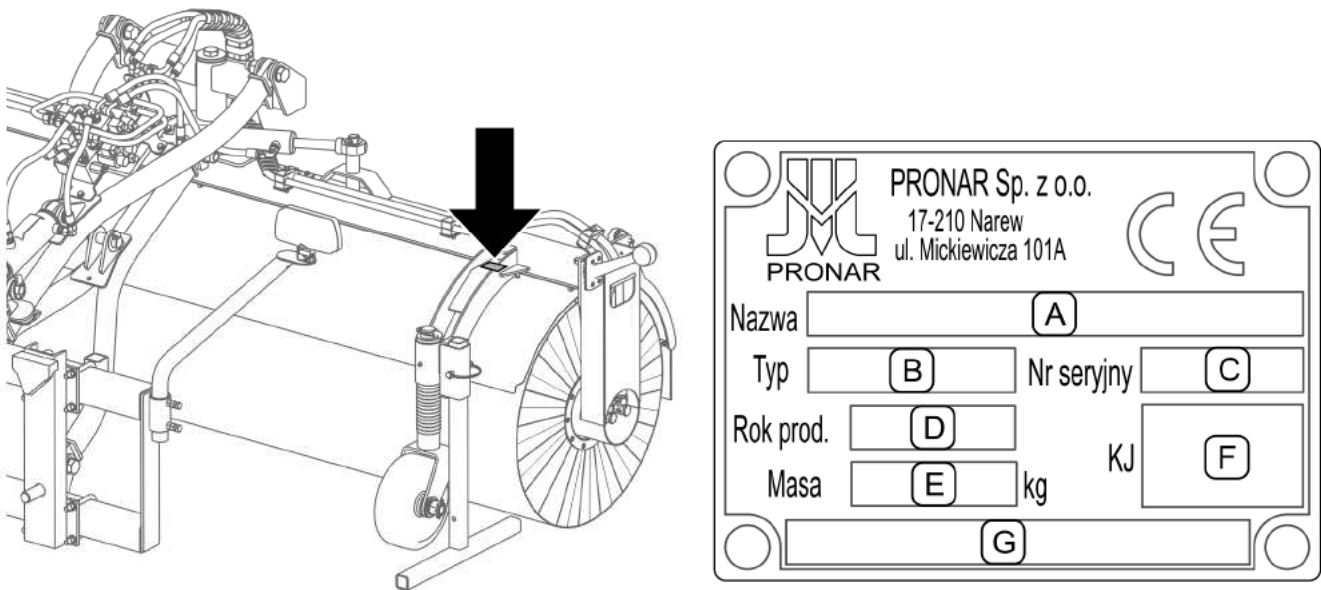


FIG. 1.1 Location of the data plate

Meaning of data plate items (FIG. 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 (*e.g. type of linkage*)

Serial number is stamped on the data plate. The data plate is located on the right wheel bracket, on the joint with the brush frame (FIG. 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 PROPER USE

Sweeper PRONAR ZM-S25 / ZM-S25U is used for sweeping roads, pavements, squares with paved surfaces such as asphalt, concrete paving blocks, cobblestone, concrete. The sweeper operation consists in sweeping dirt to the right or left side, without collecting dirt. The sweeper may be used by road maintenance services for technological cleaning of the roadbed prior to application of asphalt layer on renovated road sections. In winter, the sweeper may be used for sweeping sideways a thin layer of fresh snow. Use for other purposes should be regarded as improper.

Depending on the equipment, the sweeper can be mounted on trucks and special vehicles that are equipped with a head plate according to DIN 76060 standard and meet the requirements set out in Table 1.1. Other types of linkage approved by PRONAR are permitted.

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.

TAB. 1.1 Carrying vehicle requirements

	UNIT	REQUIREMENTS
Standard method of mounting Front mounting plate: - according to DIN 76060 - according to MB UNIMOG	— —	TYPE A, TYPE B D11, D12 <i>(depending on sweeper version)</i>
Electrical system Electrical system voltage Connection type <i>(applies to ZM-S25U)</i>	V —	12 or 24 <i>(depending on sweeper version)</i> E45 socket according to EN 15431
Hydraulic system Nominal pressure Oil delivery Type of hydraulic system <i>(applies to ZM-S25)</i> Type of hydraulic system <i>(applies to ZM-S25U)</i> Types of hydraulic couplings Type of oil	MPa dm ³ /min — — — —	16 * 40 * 2 sockets of one hydraulic section with lock function in "on" position, installed on the front of the carrying vehicle HP4, HP6, HP7, HP8 <i>(according to EN 15431 for MB UNIMOG)</i> „flat face” couplings according to ISO16028 couplings according to ISO 7241-1/ISO 5675 <i>(depending on sweeper version)</i> hydraulic, HL-32
Model of vehicle <i>(applies to MB UNIMOG)</i>	—	U20, U300, U400, U500
Other requirements Equipment of carrying vehicle	—	beacon light <i>(orange light)</i>

* - 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 whatever materials.

1.3 EQUIPMENT

The standard equipment of the machine includes:

- Operator's Manual,
- Warranty Book,
- control panel with a 6-m long electric cable (*applies to ZM-S25*),
- electric feeder cable with a 3-pin socket (*applies to ZM-S25*),

Equipment version:

- 24V or 12V power supply (*depending on voltage in carrying vehicle's electrical system*),
- mechanical or hydraulic brush turning system,
- hard roller brush (*PPN+wire*) or soft roller brush (*PPN*),
- mounting system acc. to DIN 76060-A or DIN 76060-B with securing bolts,
- sprinkler system (*only ZM-S25U*),
- clearance lamps (*only ZM-S25U*),
- another mounting system.

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 warranty 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,
- wheels,
- bearings;
- bulbs,
- fuses (*if present*)

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 warranty 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 forbidden. 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

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 carrier platform by means of certified belts or chains fitted with a tightening mechanism and its frame should be supported.

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.



ATTENTION!

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).

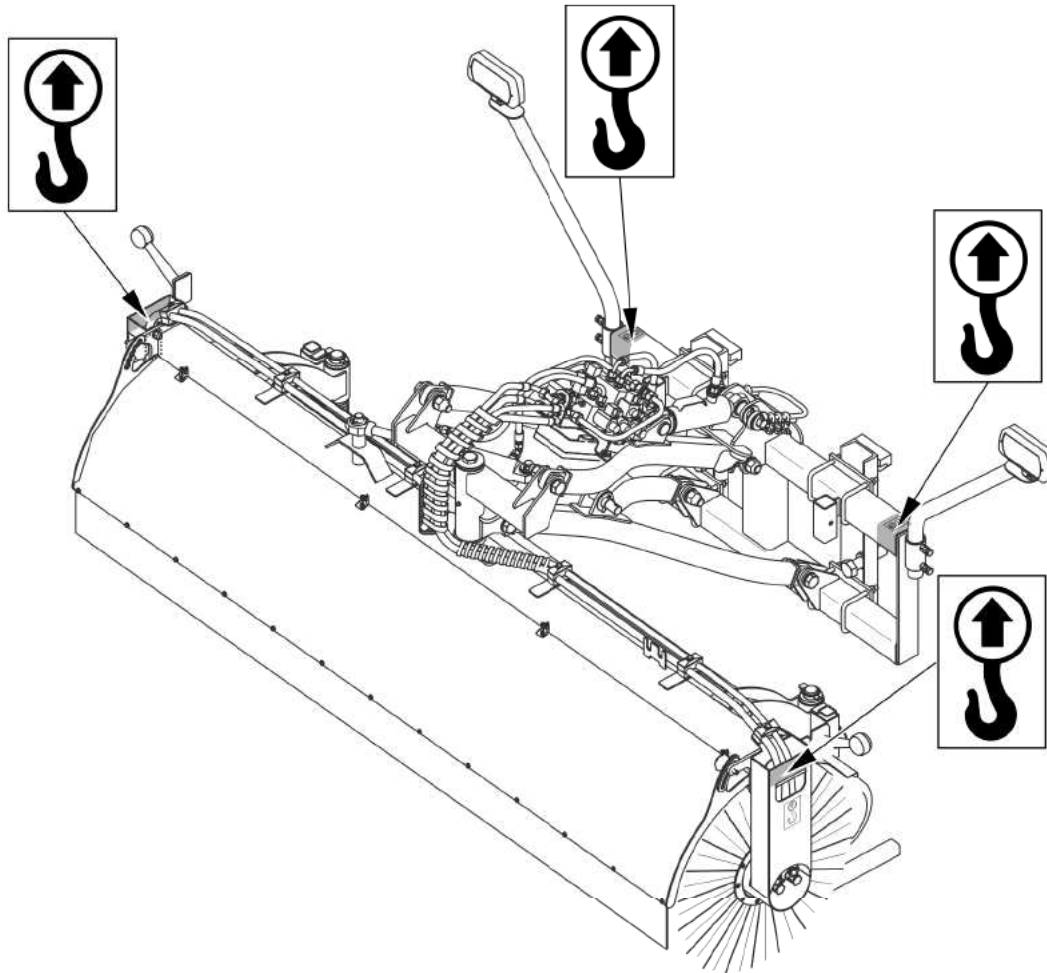


FIG. 1.2 Transport suspension points

The machine should be attached to lifting equipment in places specially designed for this purpose (FIG. 1.2) i.e. by the upper beam of the linkage frame and hydraulic motor brackets located on the brush sides. 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.

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.

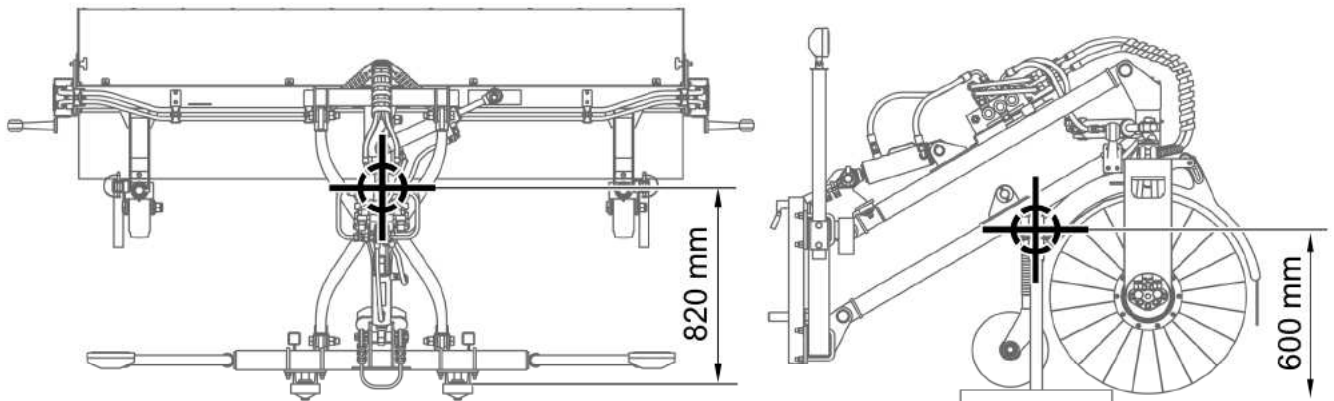


FIG. 1.3 Centre of gravity

Location of centre of gravity is given for the brush set straight



ATTENTION!

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 its limited biodegradability. 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 pollution, 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.

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 the recommendations.
- 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 stated in the Operator's Manual is difficult to understand, contact a seller, who runs an authorised technical service on behalf of the manufacturer, 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 minimal 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 warranty.
- 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 link the machine to the carrying vehicle use only linking elements envisaged by the Manufacturer.
- The carrying vehicle to which the machine will be hitched must be technically reliable and must fulfil the requirements of 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 sweeper.
- Machine, which is unhitched from the carrying vehicle must be supported on the parking stands.

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 lines. There must be no oil leaks.
- In the event of malfunction of the hydraulic system, the machine shall be disconnected from use 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 conduits 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

- 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 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 the technical condition of the hitch and hydraulic and electrical system.
- When driving with raised implement, 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 Warranty Service authorised by the manufacturer. It is recommended that necessary repairs to machine should be undertaken by specialised workshops.
- In the event of any fault or damage 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 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.

2.2 DESCRIPTION OF MINIMAL RISK

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

- using the sweeper 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:

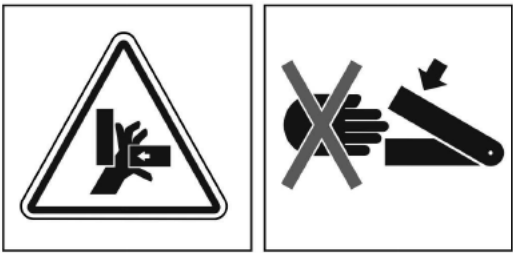





- prudent and unhurried operation of the machine,
- sensible application of the remarks and recommendations stated in the Operator's Manual,
- carrying out repair and maintenance work in line with operating safety rules,
- carrying out repair and maintenance work by persons trained to do so,
- using close fitting protective clothing,
- ensuring unauthorised persons have no access to the machine, especially children,
- maintaining safe distance from forbidden or dangerous places
- a ban on being 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.

TAB. 2.1 Information and warning decals

ITEM	SYMBOL	DESCRIPTION
1		Before starting work, carefully read the Operator's Manual.

ITEM	SYMBOL	DESCRIPTION
2		<p>Do not reach into crushing space because elements may move. Danger of crushing hands or fingers.</p>
3		<p>Thrown out objects endanger the whole body. Keep a safe distance from the operating machine.</p>
4		<p>Pressurised liquid. Keep a safe distance.</p>
5		<p>Lifting equipment attachment points while loading the machine</p>
6		<p>Outline marking.</p>
7		<p>Machine model</p>

Numbers in the item column correspond to decals (FIG. 2.1)

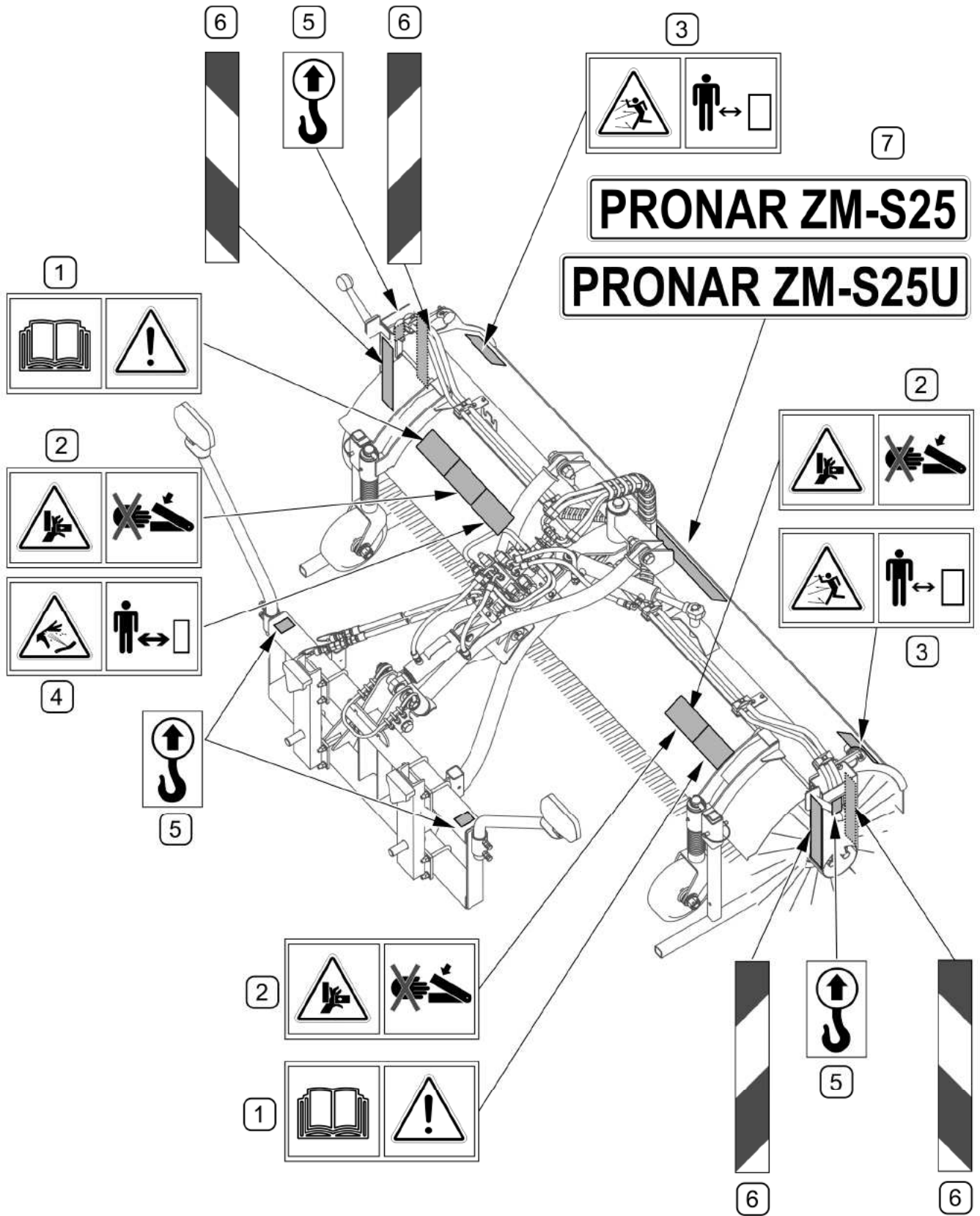


FIG. 2.1 Locations of information and warning decals.

Meaning of symbols (TAB. 2.1)

SECTION

3

**DESIGN AND
OPERATION**

3.1 TECHNICAL SPECIFICATION

TAB. 3.1 BASIC TECHNICAL SPECIFICATION

	Unit	ZM-S25	ZM-S25U
Type of sweeper	–		
Theoretical capacity (for recommended working speed, brush setting angle $\pm 30^\circ$)	m ² /h	17 240	
Working width (FIG. 3.1): – angle of $\pm 30^\circ$ (A, B) – angle of $\pm 15^\circ$ (C, D) – straight 0° (E)	mm	2 155 2 400 2 500	
Total width: – angle of $\pm 30^\circ$ – angle of $\pm 15^\circ$ – straight 0°	mm	2 690 2 990 3 080	
Total height (parking position)	mm	1 240	
Total length (parking position): – angle of $\pm 30^\circ$ – angle of $\pm 15^\circ$ – straight 0°	mm	2 205 1 930 1 620	
Number of working positions: – with mechanical brush turning system – with hydraulic brush turning system	–	5 fixed positions (0° , $+15^\circ$, -15° , $+30^\circ$, -30°) smooth adjustment within the range of $\pm 30^\circ$	
Rotation speed of brush recommended / maximum	RPM	160 / 200	
Hydraulic power	–	external hydraulic system of the carrying vehicle	
Electric power supply	–	3-pin socket on the front of the carrying vehicle	7-pole socket E45 (MB UNIMOG)
Electrical system voltage	V	24 or 12 (depending on the carrying vehicle system)	
Operation	–	with the aid of the control panel, from the operator cab	with the aid of the external hydraulic system of the carrying vehicle
Number of hydraulic cylinders: – with mechanical brush turning system – with hydraulic brush turning system	item	1 2	
Working speed (recommended)*	km/h	8	
Weight of machine ready for operation	kg	420	
Other information	–	Single person operation	

* - working speed may vary depending on working conditions.

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

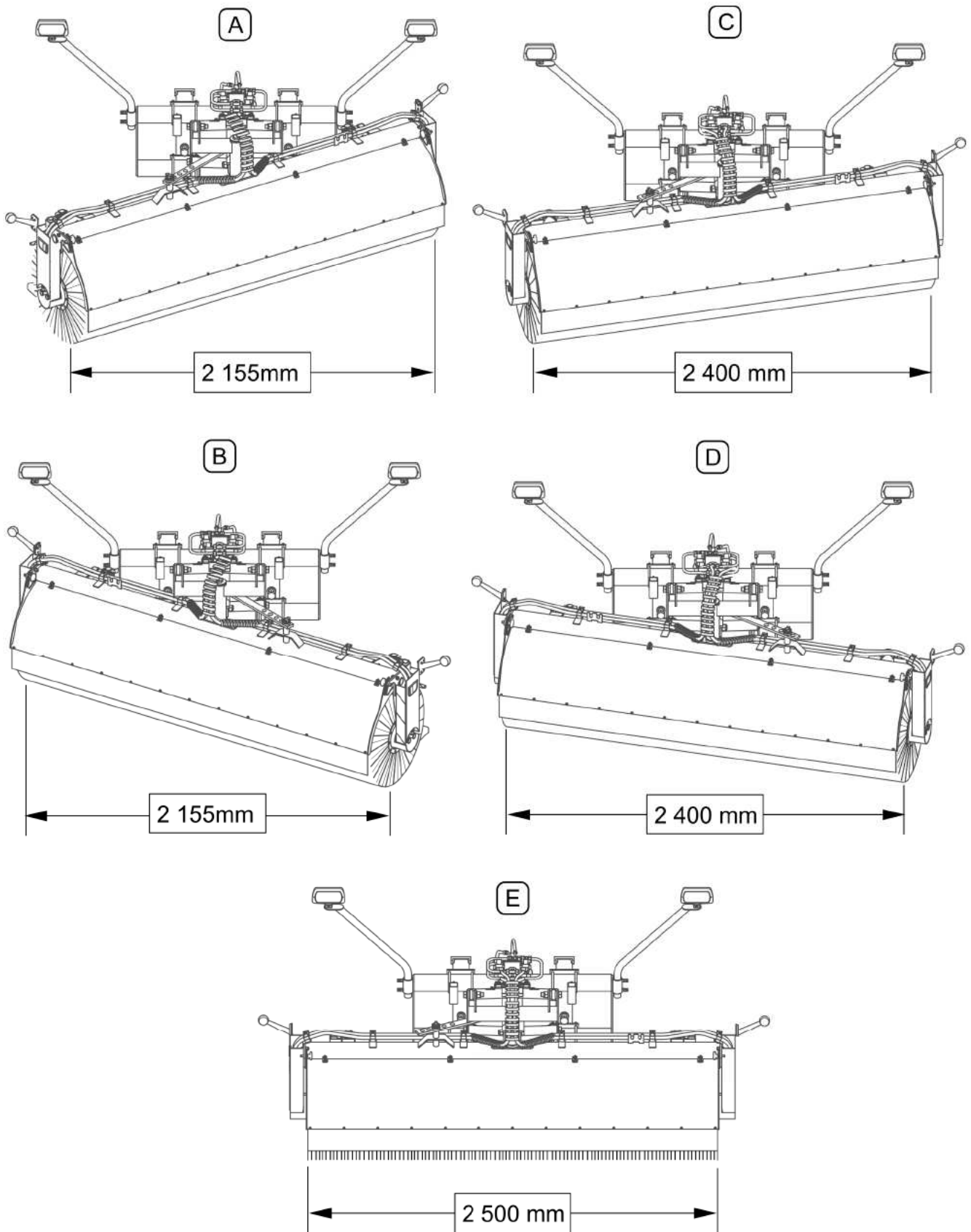


FIG. 3.1 Width depending on the operating position:
 (A, B) - angle of $\pm 30^\circ$; (C, D) - angle of $\pm 15^\circ$; (E) - straight 0°

3.2 GENERAL DESIGN

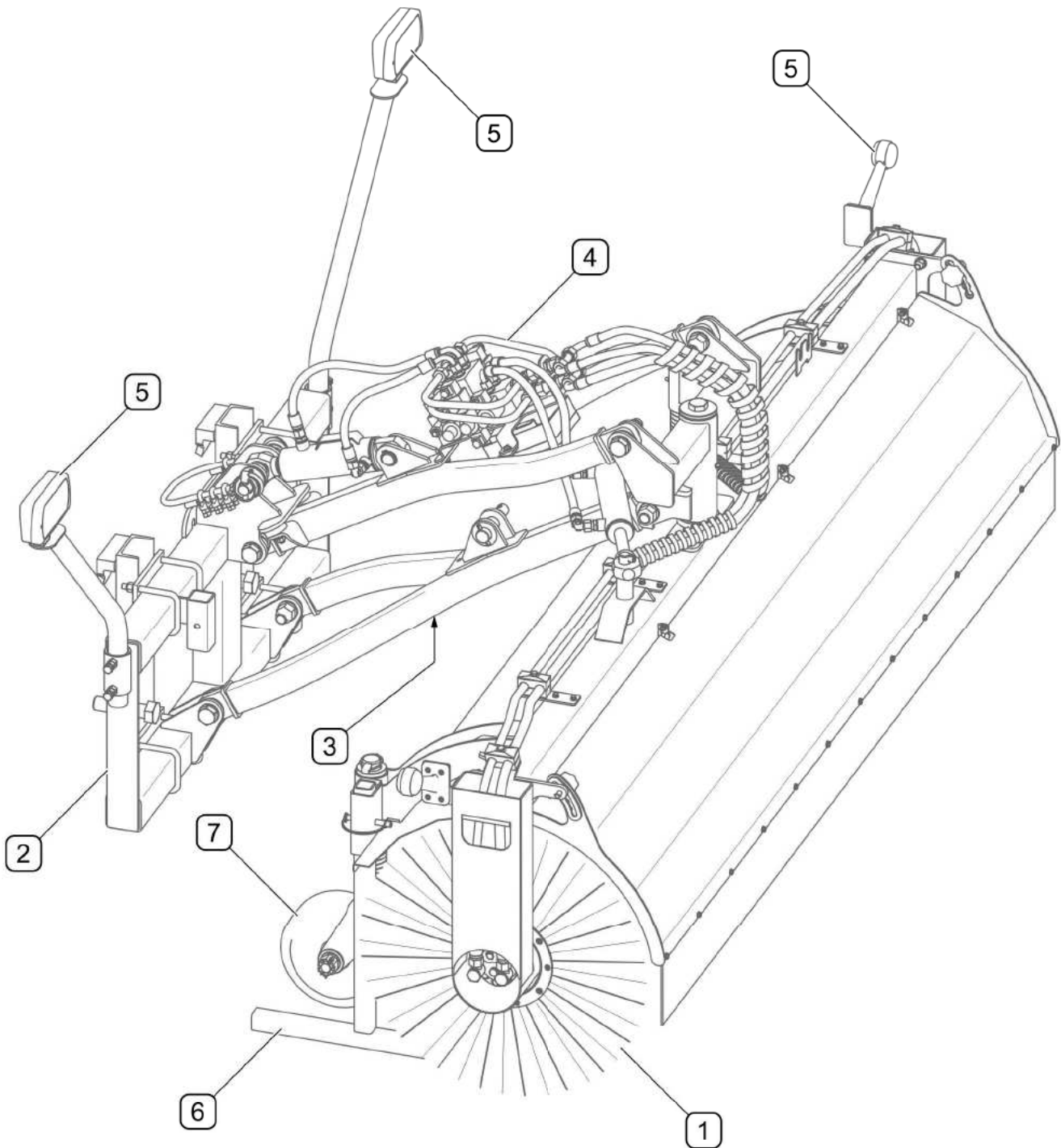


FIG. 3.2 **General design**

(1) - roller brush; (2) - frame; (3) - rocker arm; (4) - hydraulic system; (5)- electrical system; (6) - parking stands; (7) - wheels

Sweeper ZM-S25 consists of roller brush (1) that is centrally mounted to frame (2) by means of rockers (3). Hydraulic system (4), controlled electrically by means of control panel from the operator's cab (ZMS-25) or by means of the external hydraulic system of the carrying vehicle

(ZM-S25U), is used for driving the brush and changing its working position. Pressure applied to the surface by the brush is limited by adjustable wheels (7). Frame (2) is equipped with fixing elements that enable hitching the machine to a carrying vehicle equipped with front mounting plate of type A or B according to DIN 76060 or another type of mounting plate (depending on the machine version). Parking stands (6) are used to support the sweeper when it is unhitched from the carrying vehicle.

3.3 HYDRAULIC SYSTEM

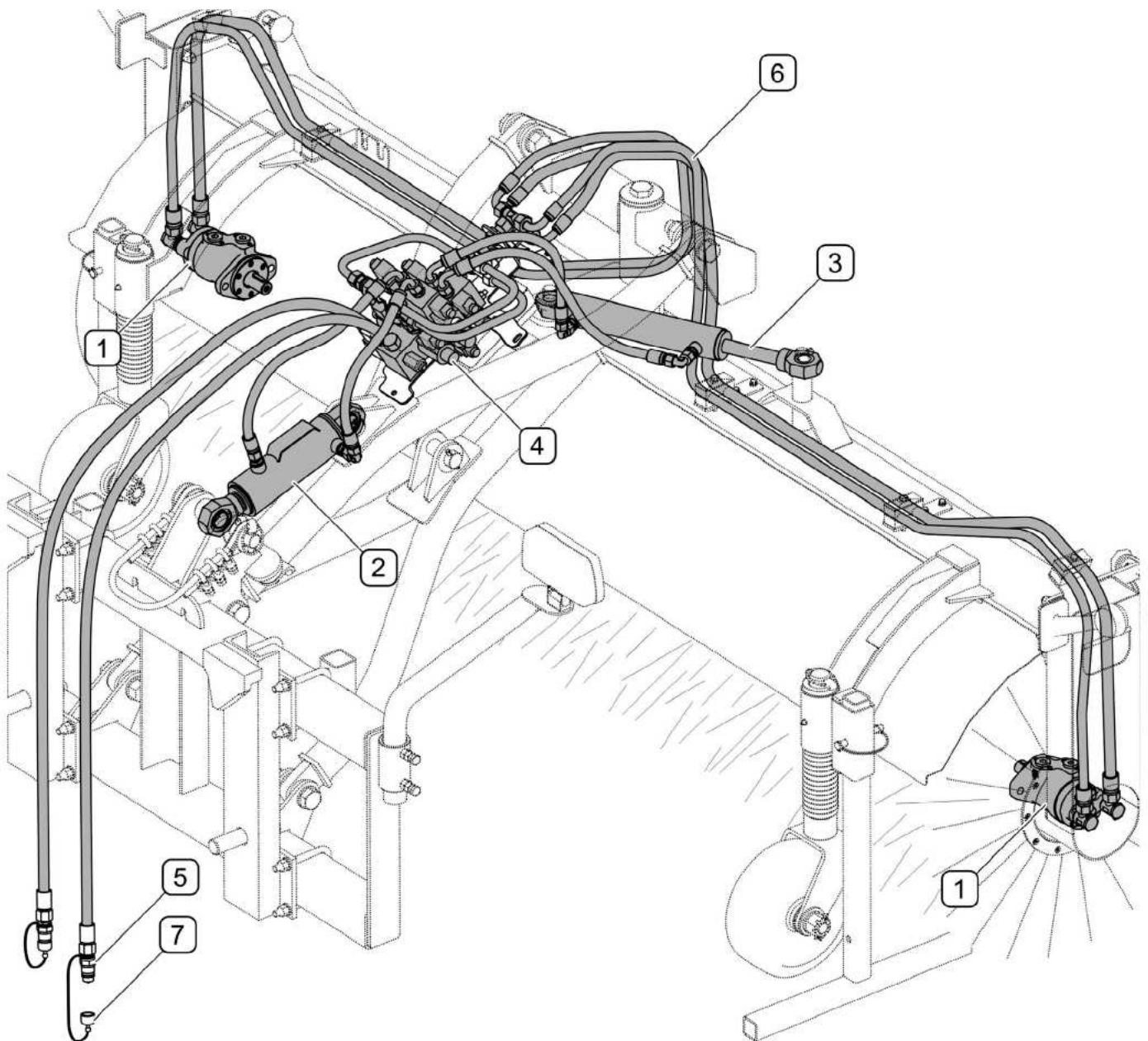


FIG. 3.3 Design of the hydraulic system (ZM-S25)

(1) - hydraulic motor; (2) - brush raising cylinder; (3) - brush turning cylinder (option);
 (4) - hydraulic manifold; (5) - hydraulic quick couplers; (6) - conduits; (7) - stoppers

The sweeper's brush is driven by two hydraulic motors (1) that are supplied from the external hydraulic system of the carrying vehicle through conduits (6) terminated with quick couplers (5). Raising and lowering the brush as well as changing the working angle (option) is done by hydraulic manifold (4) that is controlled by means of control panel from the carrying vehicle's cab (*only ZM-S25*).

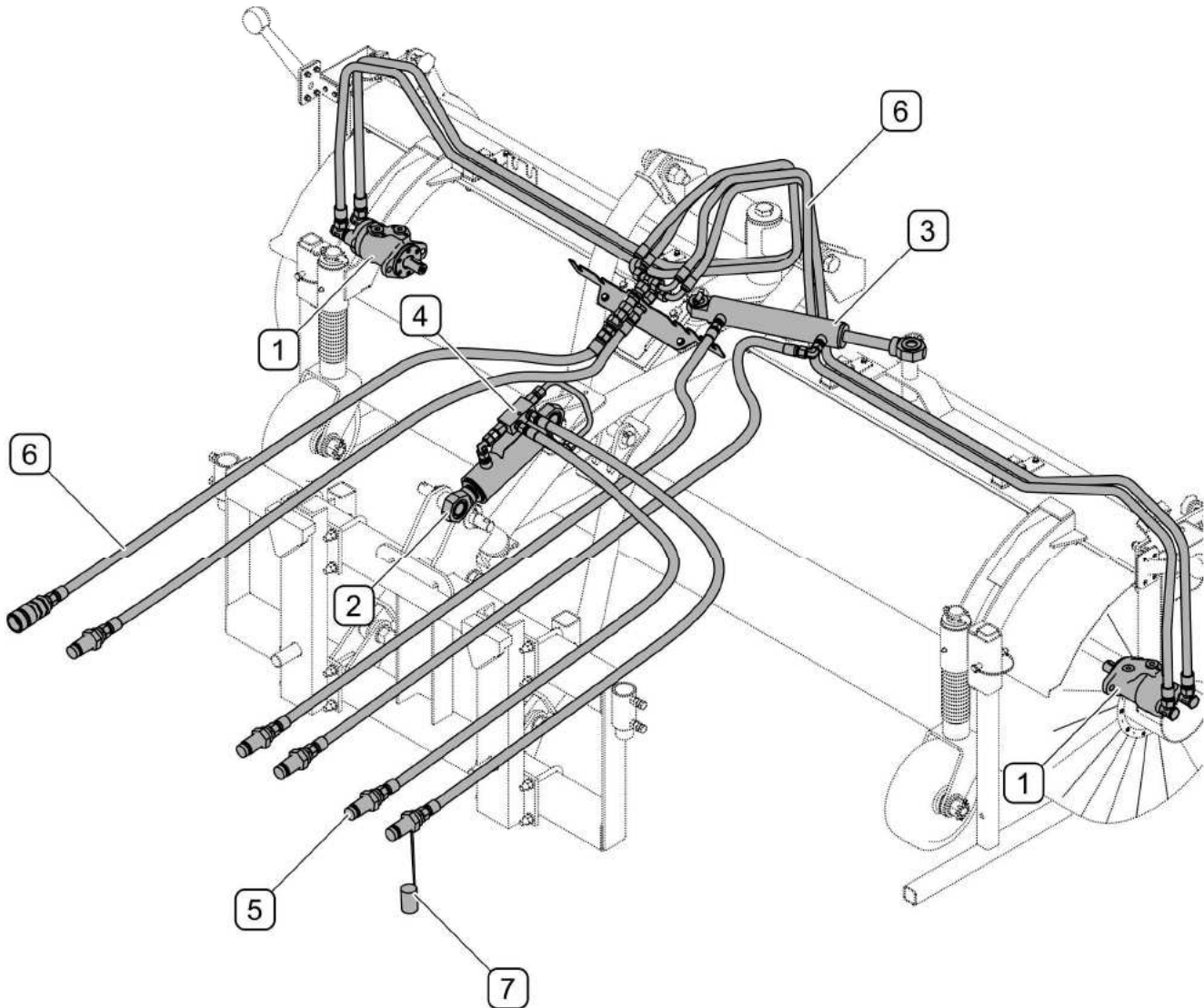


FIG. 3.4 Design of the hydraulic system (ZM-S25U)

(1) - hydraulic motor; (2) - brush raising cylinder; (3) - brush turning cylinder; (4) - hydraulic lock; (5) - hydraulic quick couplers; (6) - conduits; (7) - stoppers

In case of ZM-S25U sweepers (*for MB UNIMOG vehicles*), the external hydraulic system of the carrying vehicle is used for driving the hydraulic motors of the brush and controlling the sweeper's functions.

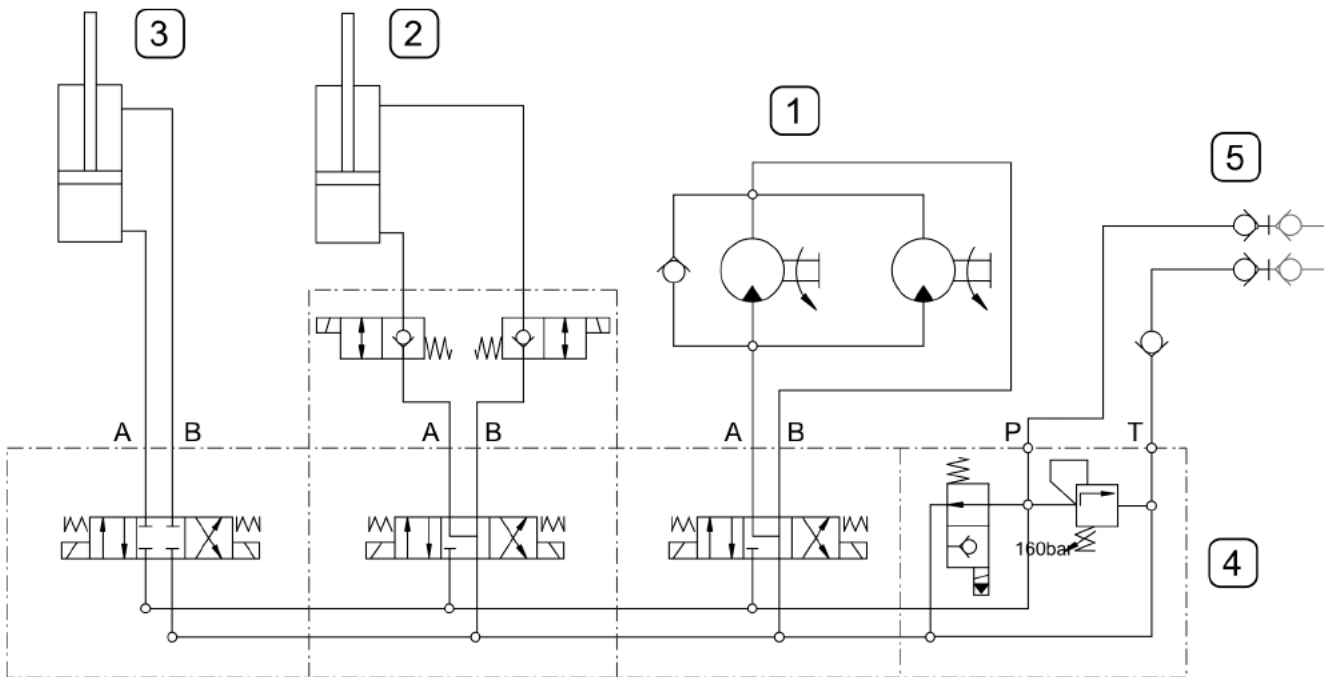


FIG. 3.5 Hydraulic system concept diagram (ZM-S25)

(1) - hydraulic motors; (2) - brush raising cylinder; (3) - brush turning cylinder (option);
 (4) - hydraulic manifold; (5) - hydraulic quick couplers

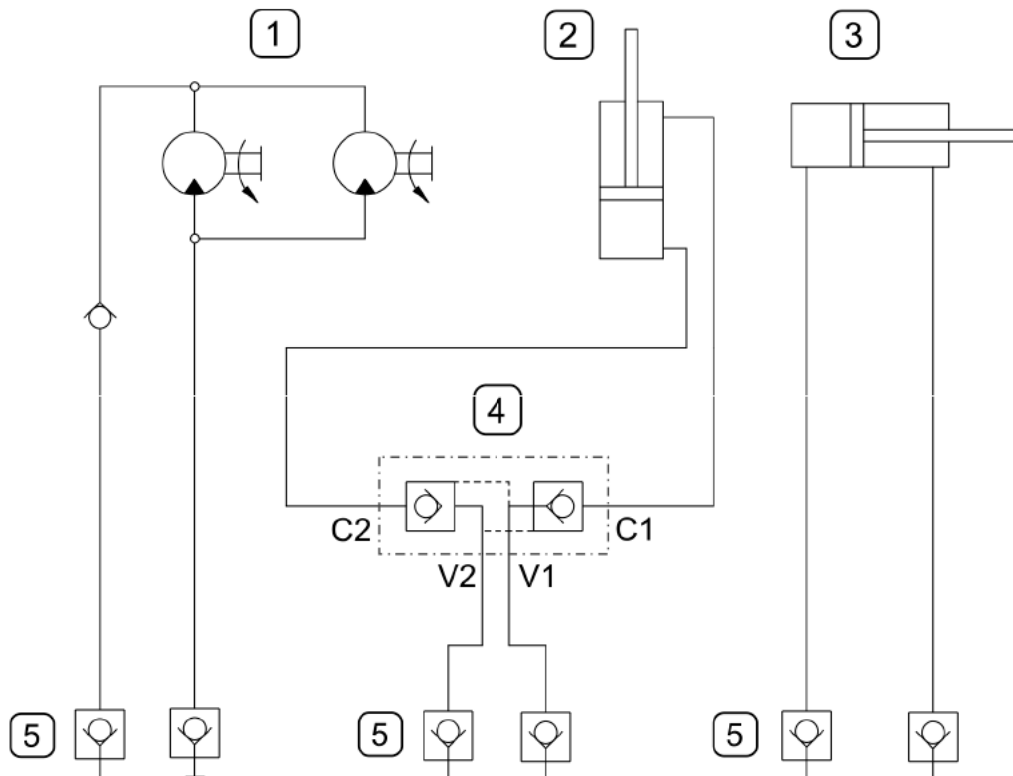


FIG. 3.6 Hydraulic system concept diagram (ZM-S25U)

(1) - hydraulic motors; (2) - brush raising cylinder; (3) - brush turning cylinder (option);
 (4) - hydraulic lock; (5) - hydraulic quick couplers

3.4 ELECTRICAL SYSTEM

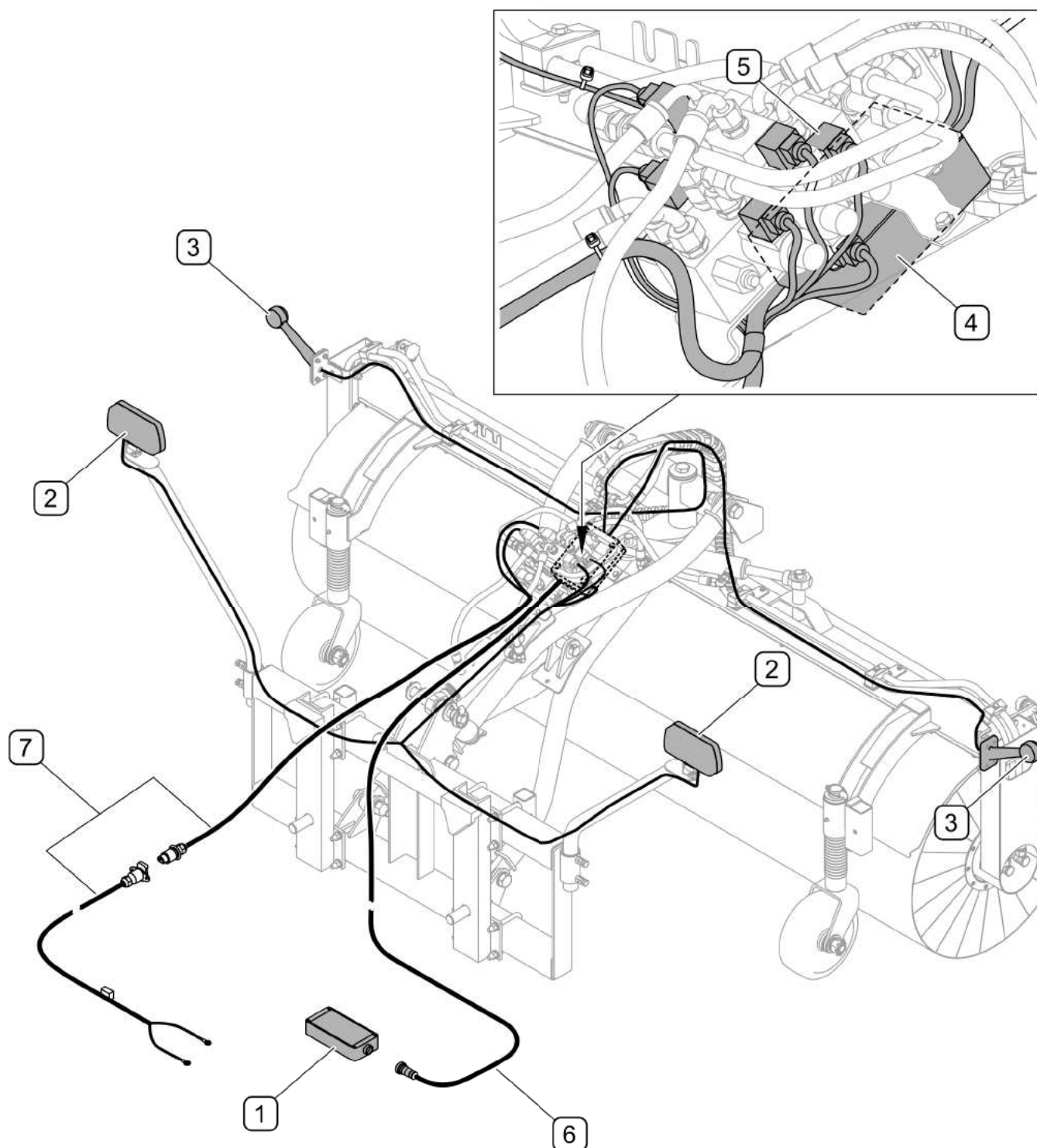


FIG. 3.7 Design of the electrical system (ZM-S25)

(1) - control panel; (2) - additional working lights; (3) - clearance lights; (4) - connecting box; (5) - solenoid valves; (6) - control panel lead; (7) - power lead

Electrical system of ZM-S25 sweeper (FIG. 3.7) is used for supplying and controlling the sweeper's lighting system that consists of working lights (2) and clearance lights (3) and for controlling solenoid valves (4) of the hydraulic manifold. The sweeper's electrical system is connected to the carrying vehicle using power lead (7) terminated with a socket and a 3-pin plug. Depending on machine version, the sweeper can be supplied from 12V or 24V electrical system of the carrying vehicle. The sweeper is controlled by means of control panel (1) that is connected to the sweeper with lead (6).

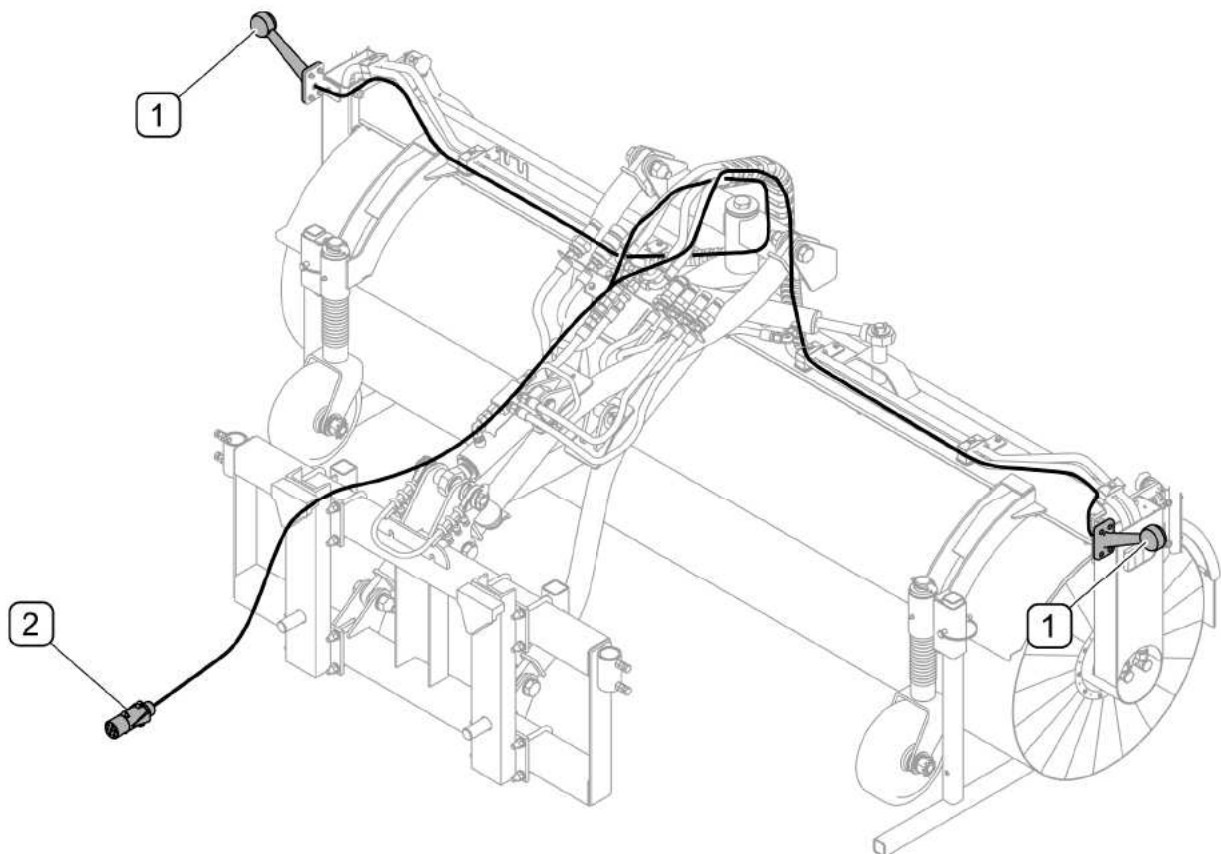


FIG. 3.8 Design of the electrical system (ZM-S25U)

(1) - clearance lights; (2) - power supply plug

Electrical system of ZM-S25U sweeper (for MB UNIMOG vehicles) is used for supplying the sweeper's clearance lights and consists of clearance lights (1). The electrical system (FIG. 3.8) is connected to the carrying vehicle by means of power supply plug (2). Depending on machine version, the sweeper can be supplied from 12V or 24V electrical system of the carrying vehicle.

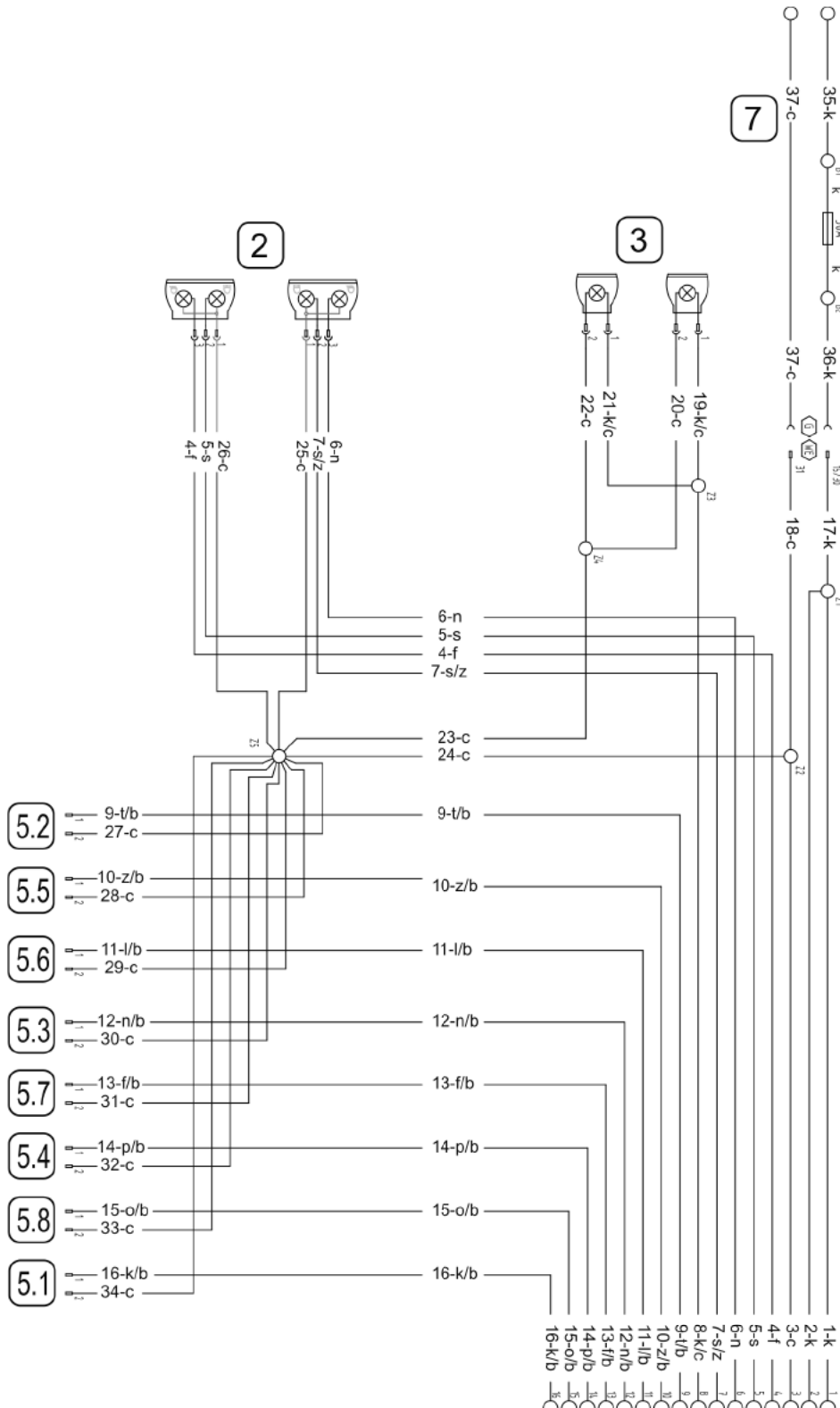


FIG. 3.9 Electrical system concept diagram (ZM-S25)

(2) - additional working lights; (3) - clearance lights; (5.1) - main solenoid valve; (5.2) - solenoid valve of brush turning to the right; (5.3) - solenoid valve of brush turning to the left; (5.4) - solenoid valve of brush raising; (5.5) - solenoid valve of linking; (5.6) - solenoid

valve of 1-st floating position; (5.7) - solenoid valve of 2-nd floating position; (5.8) - solenoid valve of sweeping

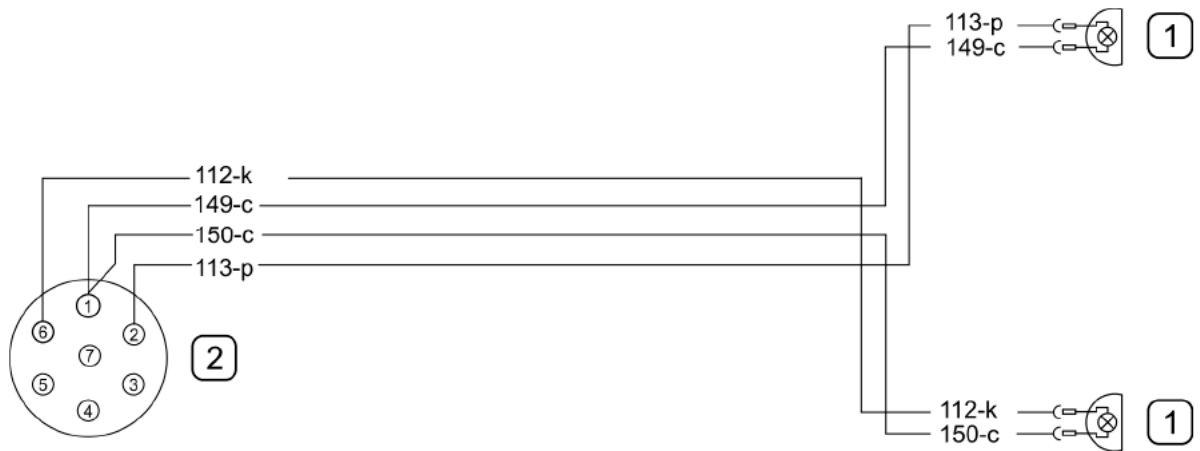


FIG. 3.10 Electrical system concept diagram (ZM-S25U)

(1) - clearance lights; (2) - power supply plug

3.5 SPRINKLER SYSTEM

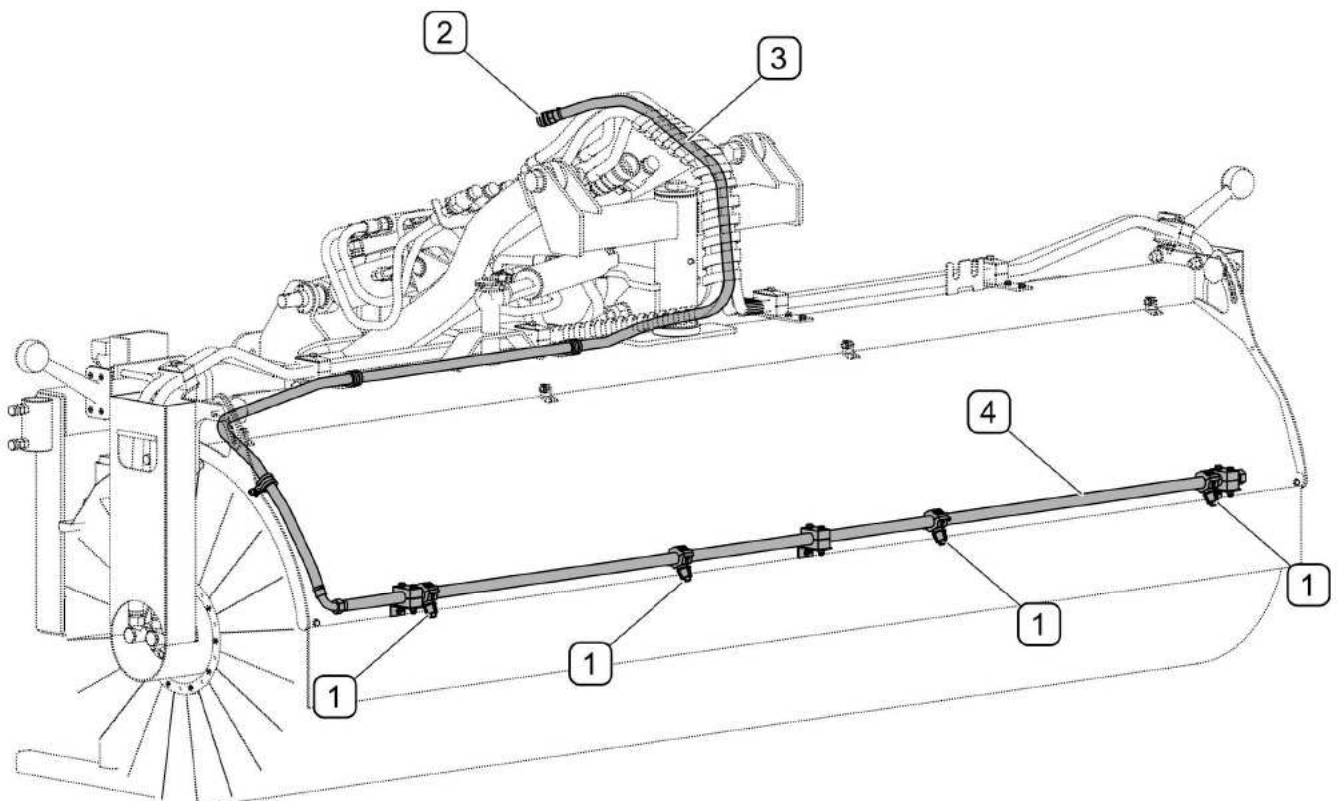


FIG. 3.11 Design of the sprinkler system (optional equipment of ZM-S25U sweeper)

(1) - sprinklers; (2) - connection; (3) - rubber hose; (4) - pipe

Optionally, ZM-S25U sweeper can be equipped with the sprinkler system that consists of four sprinklers (1) installed on pipe (4) and a rubber hose with a socket for Rectus connections, series 26, DN 7,2 mm. The sprinkler system is designed for connecting to an external water supply source (*e.g. water tank PRONAR R1000*)

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 vehicle, 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 use. This does not release the user from an obligation to check the machine's condition after delivery and before first use. The machine is delivered to the user completely assembled (except for the electrical system on the carrying vehicle) (*applies to ZM-S25*). 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 the hydraulic system and electrical system;
- check the technical condition and compatibility of the machine's linkage with the carrying vehicle's linkage,
- check technical condition of protective guards and check if they are correctly installed,

**ATTENTION!**

Non-adherence to the recommendations stated 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 all its individual components checked. In order to do this:

- hitch the machine to a carrying vehicle (see 4.3 „*HITCHING TO CARRYING VEHICLE*”),
- after connection of electrical and hydraulic system wiring, check the correct operation of individual sweeper functions and operation of lighting system and inspect tightness of the system and hydraulic cylinders,

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 warranty, please contact the Manufacturer for additional clarifications.

**ATTENTION!**

After mounting the sweeper on the carrying vehicle, set additional headlights in such a manner as not to dazzle oncoming drivers (applies to ZM-S25).

**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

TAB. 4.1 TECHNICAL INSPECTION SCHEDULE

DESCRIPTION	SERVICE OPERATION	FREQUENCY
Technical condition of safety guards	Check technical condition of safety guards, if complete and correctly mounted.	Before beginning work
Technical condition of brush	Check the technical condition and if correctly mounted. Replace if necessary.	
Technical condition of the electrical system and lighting system components	Visually inspect the technical condition, check the operation	
Secure mounting of the machine on the carrying vehicle	Check the tightening torques of securing bolts (see FIG. 4.7)	Daily, at least every 8 working hours
Tightening of all main nut and bolt connections	See section 5.6 <i>TIGHTENING TORQUE FOR NUT AND BOLT CONNECTIONS</i>	Once a week
Lubrication	Lubricate elements according to section 5.5 <i>LUBRICATION</i> .	According to table 5.4



ATTENTION!

Do NOT use a malfunctioning or incomplete machine.

4.3 HITCHING TO CARRYING VEHICLE



ATTENTION!

Before hitching the sweeper to carrying vehicle, read the carrying vehicle operator's manual.



DANGER

When hitching, there must be nobody between the machine and the carrying vehicle. Exercise caution when hitching the machine to carrying vehicle.

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

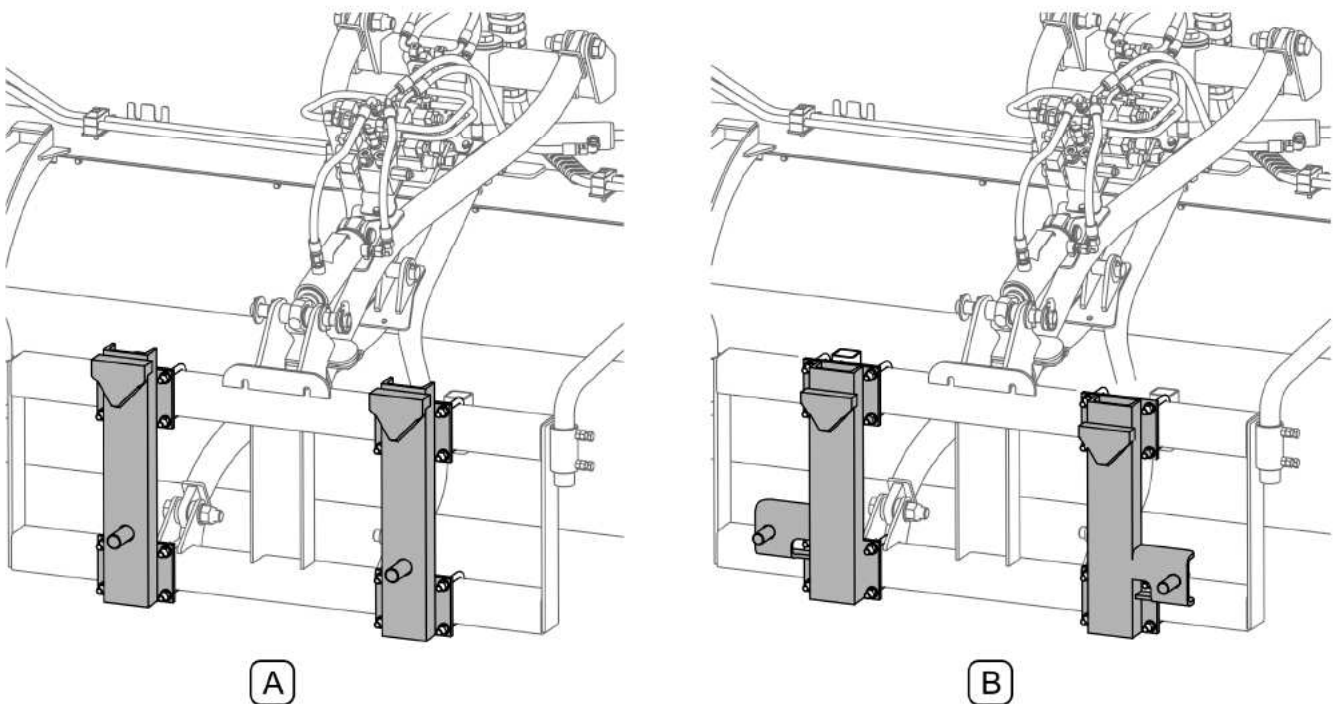


FIG. 4.1 Types of standard linkages of the sweeper

(A) - type A according to DIN 76060; (B) - type B according to DIN 76060

Depending on machine version, the sweeper can be equipped with type A or B linkage according to DIN 76060 (FIG. 4.1) or another, special linkage.

The carrying vehicle head plate should be mounted horizontally (axially with regard to the vehicle). The upper edge of the plate should be located at the following height from the ground:

- 900 ±60 mm, B type plate acc. to DIN 76060
- 980 ±60 mm, A type plate acc. to DIN 76060

ZM-S25 sweeper should be supplied from the 3-pin electrical socket installed on the front of the carrying vehicle. If the carrying vehicle is not equipped with such a socket or is equipped with a different type of socket, carry out the socket installation according to the diagram (FIG. 4.2).

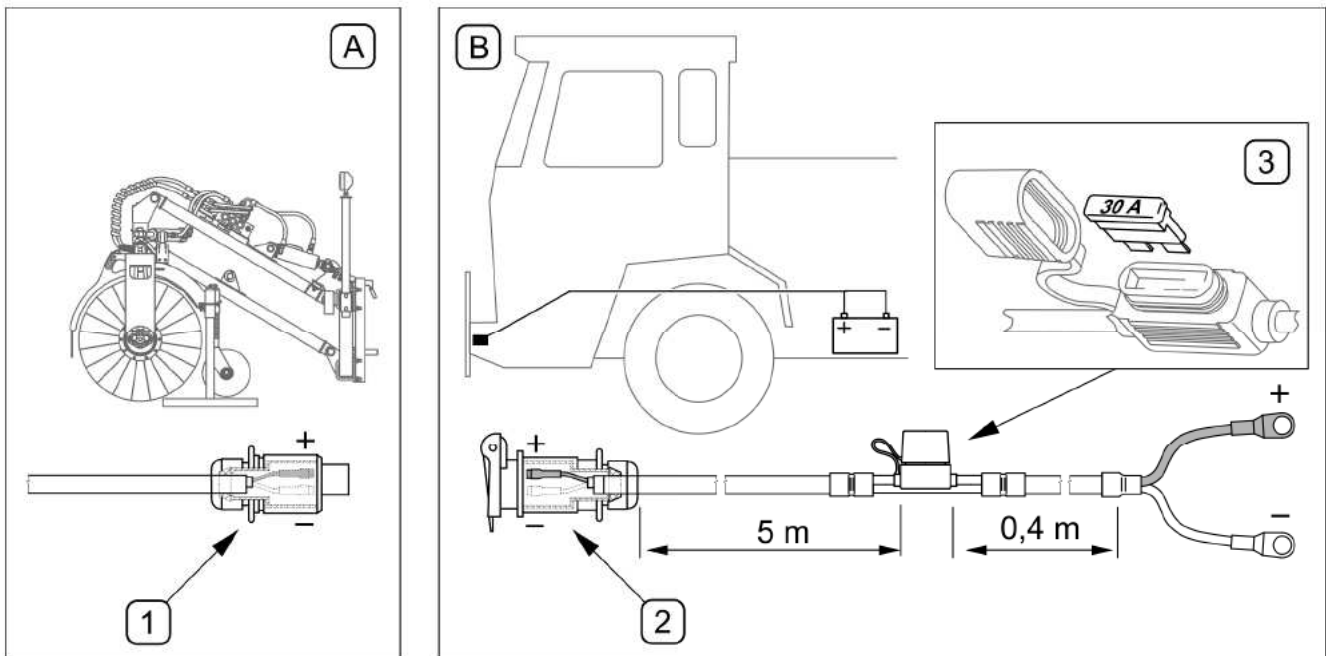


FIG. 4.2 Installing power lead of ZM-S25 sweeper

(A) - elements of the sweeper's electrical system; (B) - power lead in the carrying vehicle; (1) - 3-pole plug; (2) - 3-pin socket; (3) - UNIVAL 30A fuse

Connect power lead (B) to the carrying vehicle's electrical system (FIG. 4.2) and place socket (2) in the front, near the front plate. Power lead (B) has an UNIVAL 30 A fuse (3) on the supply lead „+”.

No additional connection sockets have to be installed on ZM-S25U sweeper.

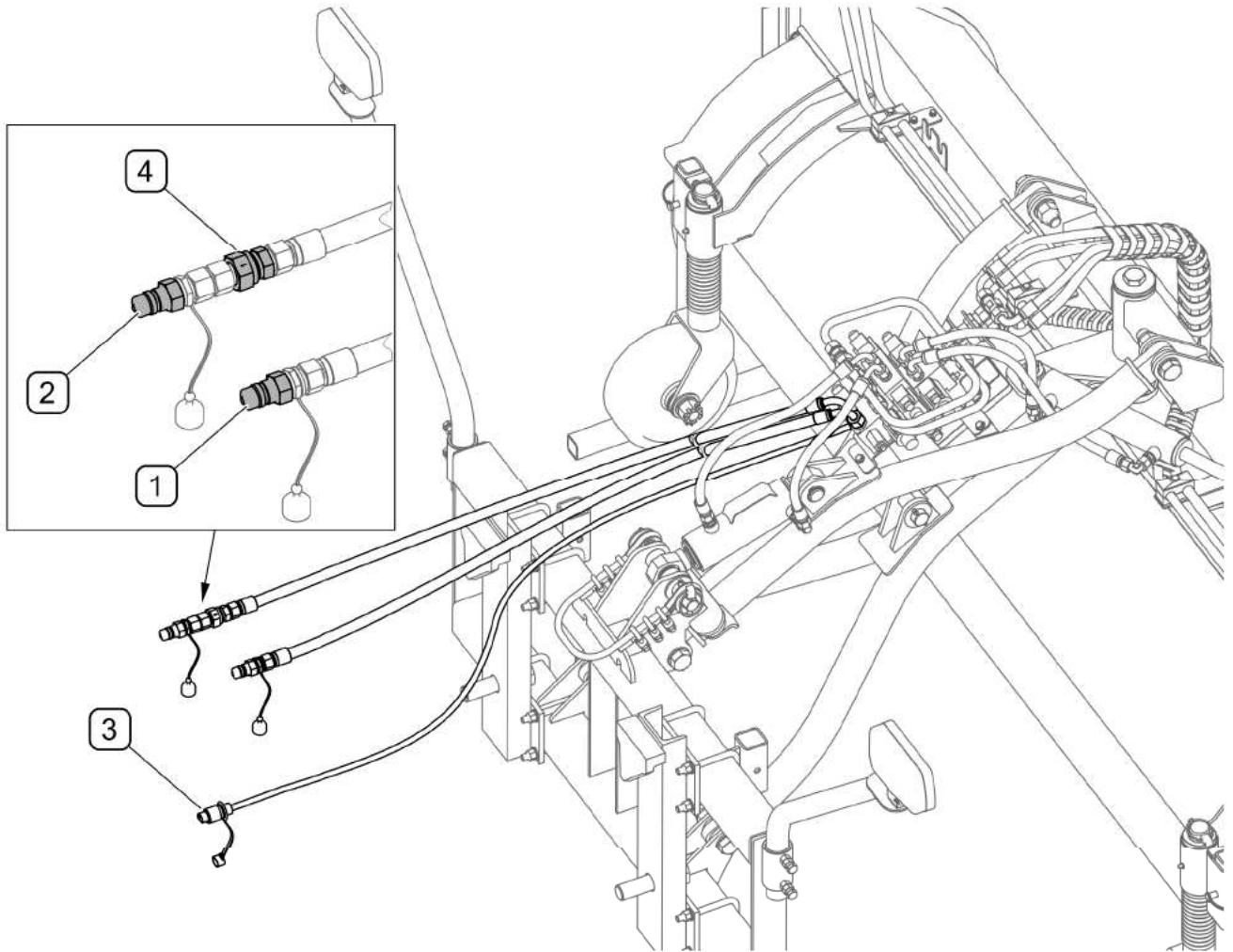


FIG. 4.3 Connecting the electrical system and hydraulic system (ZM-S25)

(1) - oil supply hydraulic connection; (2) - oil return hydraulic connection; (3) - 3-pin plug of electrical system supply; (4) - non-return valve;



IMPORTANT!

Connect hydraulic connection (2) equipped with non-return valve (4) as oil return to the carrying vehicle's hydraulic system (FIG. 4.3)

ZM-S25U sweeper (for MB UNIMOG vehicles) is designed for connecting with the external hydraulic system of the carrying vehicle (FIG. 4.4). Connect hydraulic conduit connectors (B),(C),(D), (E) and supply plug (A) of the sweeper's clearance lights to proper sockets on the front of the carrying vehicle (FIG. 4.4).

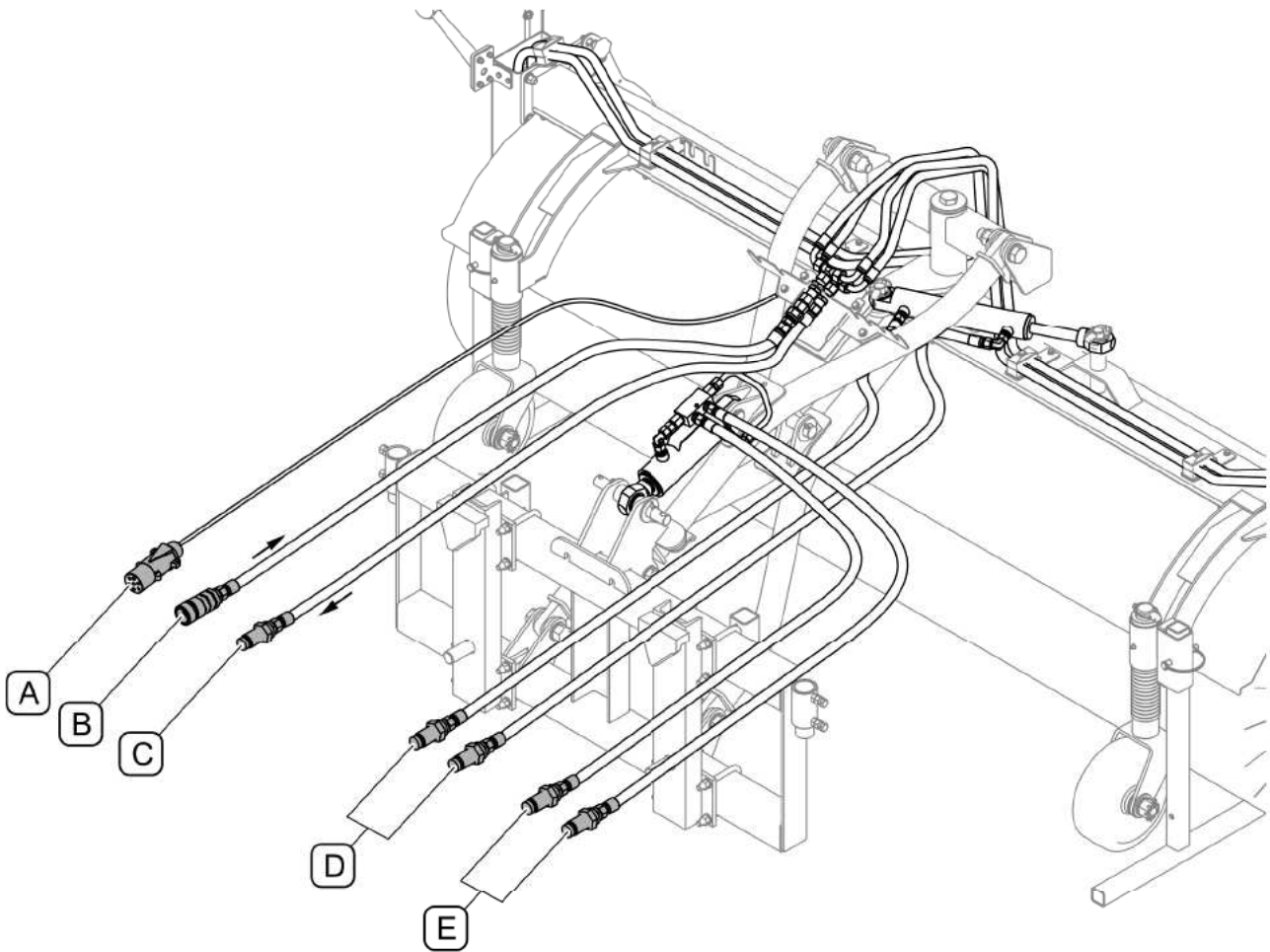


FIG. 4.4 Connecting the electrical system and hydraulic system (ZM-S25U)

(A) - plug of clearance light system; (B) - oil supply connection for hydraulic motors of the brush; (C) - connection for return of oil from hydraulic motors to the carrying vehicle's system; (D) - hydraulic connections for turning the brush to the right / left; (E) - hydraulic connections for raising / lowering the brush



ATTENTION!

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

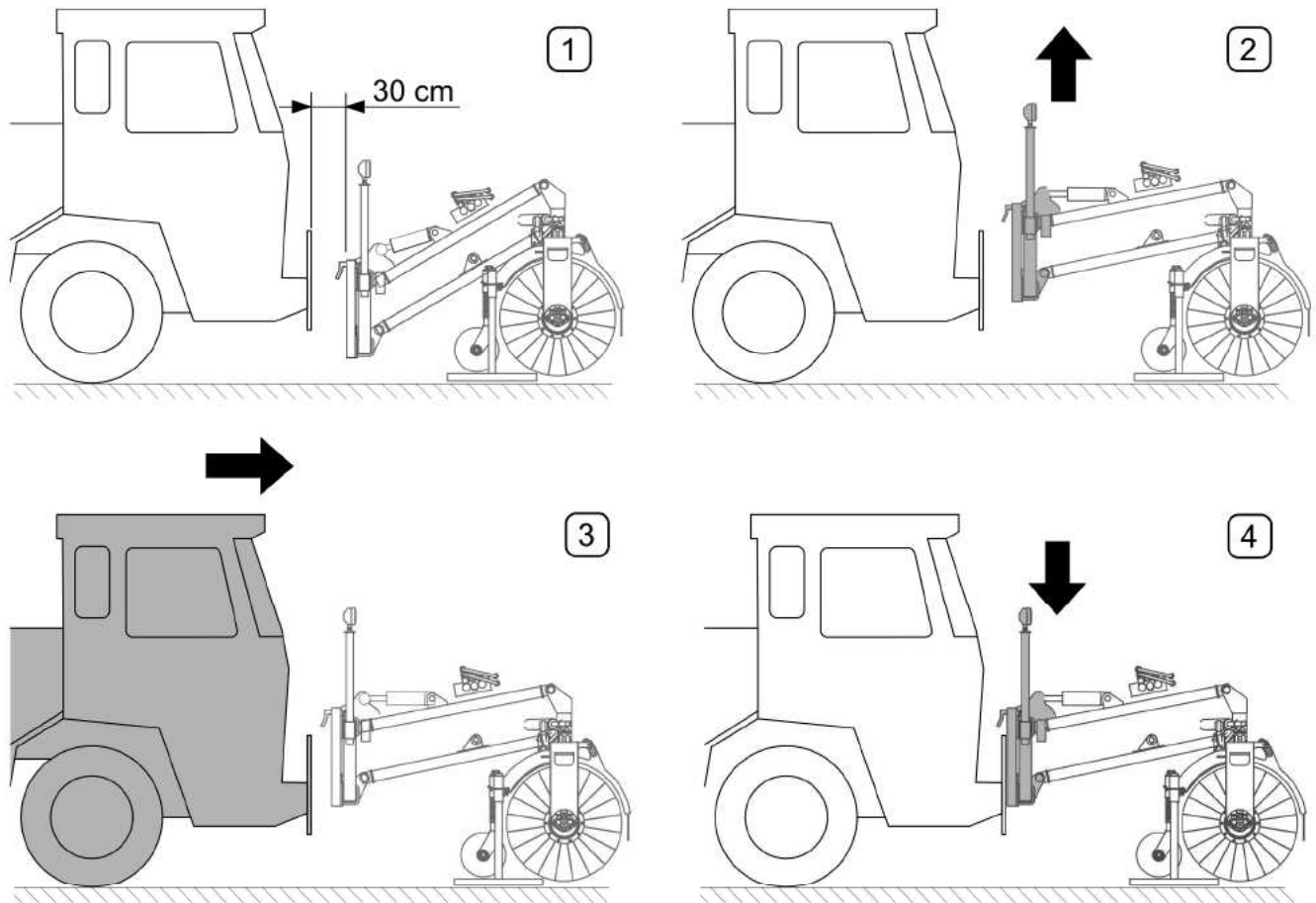


FIG. 4.5 Hitching the sweeper to the carrying vehicle

(1,2,3,4) - successive stages of hitching the sweeper to the carrying vehicle

Check the linkage compatibility before hitching the sweeper to the carrying vehicle.

To hitch ZM-S25 sweeper to the carrying vehicle:

- 1) Drive the carrying vehicle to the sweeper's linkage to a distance of about 30 cm from the linkage and immobilise the vehicle with parking brake. Connect electrical system supply plug (3) to the socket installed on the front of the carrying vehicle (FIG. 4.3). Connect the control panel with the sweeper using a lead (if it is disconnected). Connect oil supply hydraulic connection (1) and oil return hydraulic connection (2) to the carrying vehicle's hydraulic system (FIG. 4.3).
- 2) Switch on the control panel by means of switch (1) (FIG. 4.6) and press push-buttons (2) and (3) simultaneously in such a manner as to position the mounting hooks above the seats of the carrying vehicle's head plate.
- 3) Drive the carrying vehicle carefully to the sweeper until the carrying vehicle's head plate and the sweeper's linkage plate come into contact, engage the parking brake.

4) If the mounting hooks and the carrying vehicle head plate are correctly aligned, operate switch (4) on the control panel (FIG. 4.6) in order to lower the sweeper's linkage onto the carrying vehicle's head plate. Check if correctly installed. Lift the sweeper and check if correctly hitched. Using two bolts, connect the frame of the sweeper's linkage with the carrying vehicle's head plate (FIG. 4.7). Dismantle both parking stands (FIG. 4.8). Place the control panel in the operator cab in an easily accessible place.

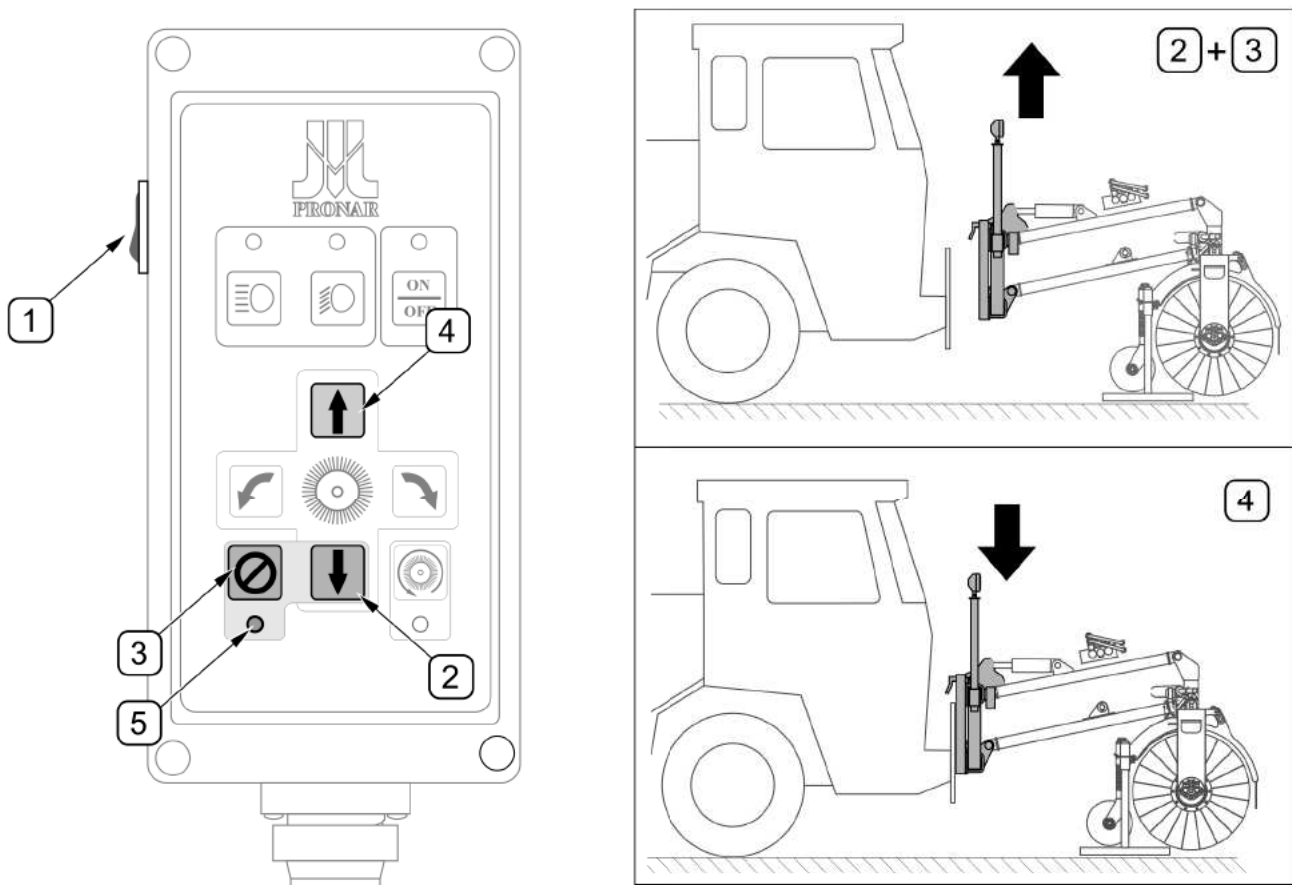



FIG. 4.6 Controlling the sweeper during hitching to carrying vehicle (ZM-S25)

(1) - main switch of control panel; (2) - brush lowering push-button; (3) - linking push-button; (4) - brush rising push-button; (5) - linking activation indicator light



ATTENTION!

Linking push-button (3) should be used only while hitching or unhitching the sweeper from the carrying vehicle.

While hitching and unhitching from the carrying vehicle, the machine should rest on the ground on parking stands. In order to raise the sweeper's linkage while hitching to the carrying vehicle, press simultaneously brush lowering push-button (2) and linking push-button

(3) on the control panel (FIG. 4.6). In order to lower the sweeper's linkage, press brush rising push-button (4).

To hitch ZM-S25U sweeper (for MB UNIMOG vehicles) to the carrying vehicle:

- 1) Drive the carrying vehicle to the sweeper's linkage to a distance of about 30 cm from the linkage and immobilise the vehicle with parking brake. Connect hydraulic conduit connectors (FIG. 4.4) to corresponding sockets of the external hydraulic system on the front of the carrying vehicle.
- 2) Using the carrying vehicle's hydraulic system, set the sweeper's linkage in such a manner as to position the mounting hooks above the seats of the carrying vehicle's head plate.
- 3) Drive the carrying vehicle carefully to the sweeper's linkage, engage the parking brake.
- 4) If the mounting hooks and the carrying vehicle's head plate are correctly aligned, lower the sweeper's linkage until the mounting hooks are set in the seats of the carrying vehicle's head plate. Lift the sweeper and check if correctly hitched. Using two bolts, connect the frame of the sweeper's linkage with the carrying vehicle's head plate (FIG. 4.7). Connect the supply plug of the clearance lights (FIG. 4.4) to the socket of the carrying vehicle's electrical system. Dismantle both parking stands (FIG. 4.8).

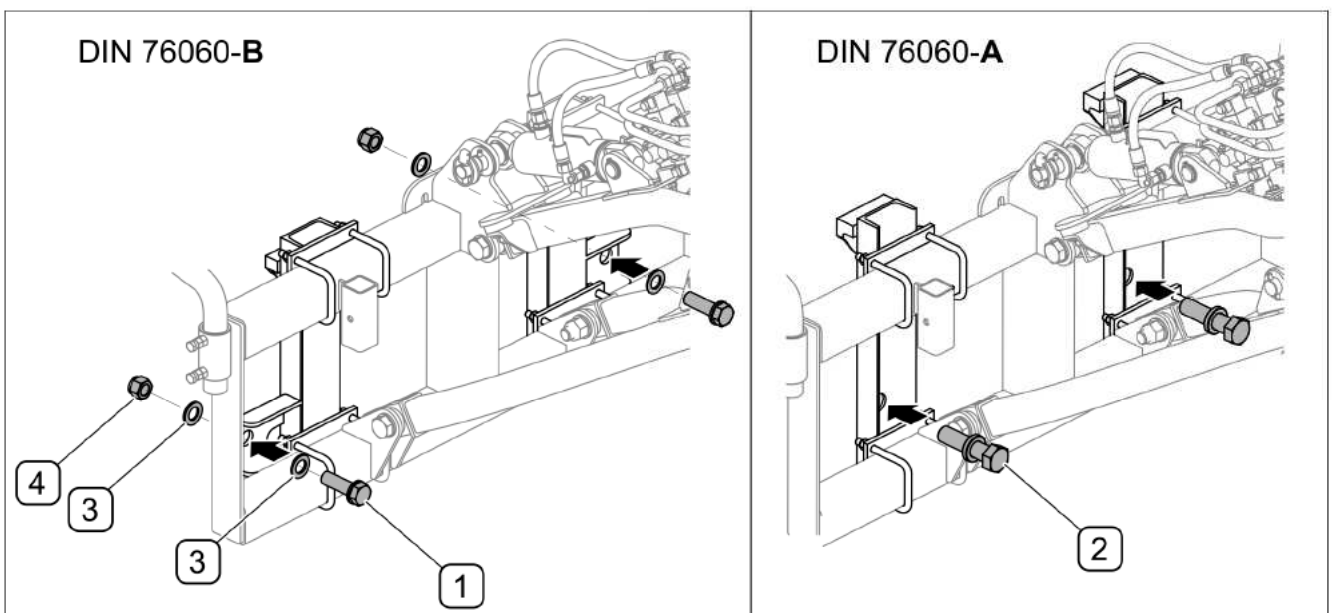



FIG. 4.7 Bolts securing the sweeper's linkage (sweeper's equipment)

(1) - bolt M24X80-8.8-A2J (for B type DIN plate); (2) - securing bolt M30 220N-95050000 (for A type DIN plate); (3) - washer 24-100HV; (4) - self-locking nut M24-8-A2J


Bolts (1) or (2) (depending on type of linkage) prevent the sweeper's linkage frame and the carrying vehicle's head plate from disconnecting (FIG. 4.7)

TIP

 Depending on type of the carrying vehicle's linkage, (FIG. 4.7) tighten the securing bolts using the following tightening torques:

- bolts (1) (plate DIN 76060-B) - 500 Nm
- bolts (2) (plate DIN 76060-A) - 600 Nm

DANGER

 To link the machine to the carrying vehicle use only linking elements envisaged by the Manufacturer.

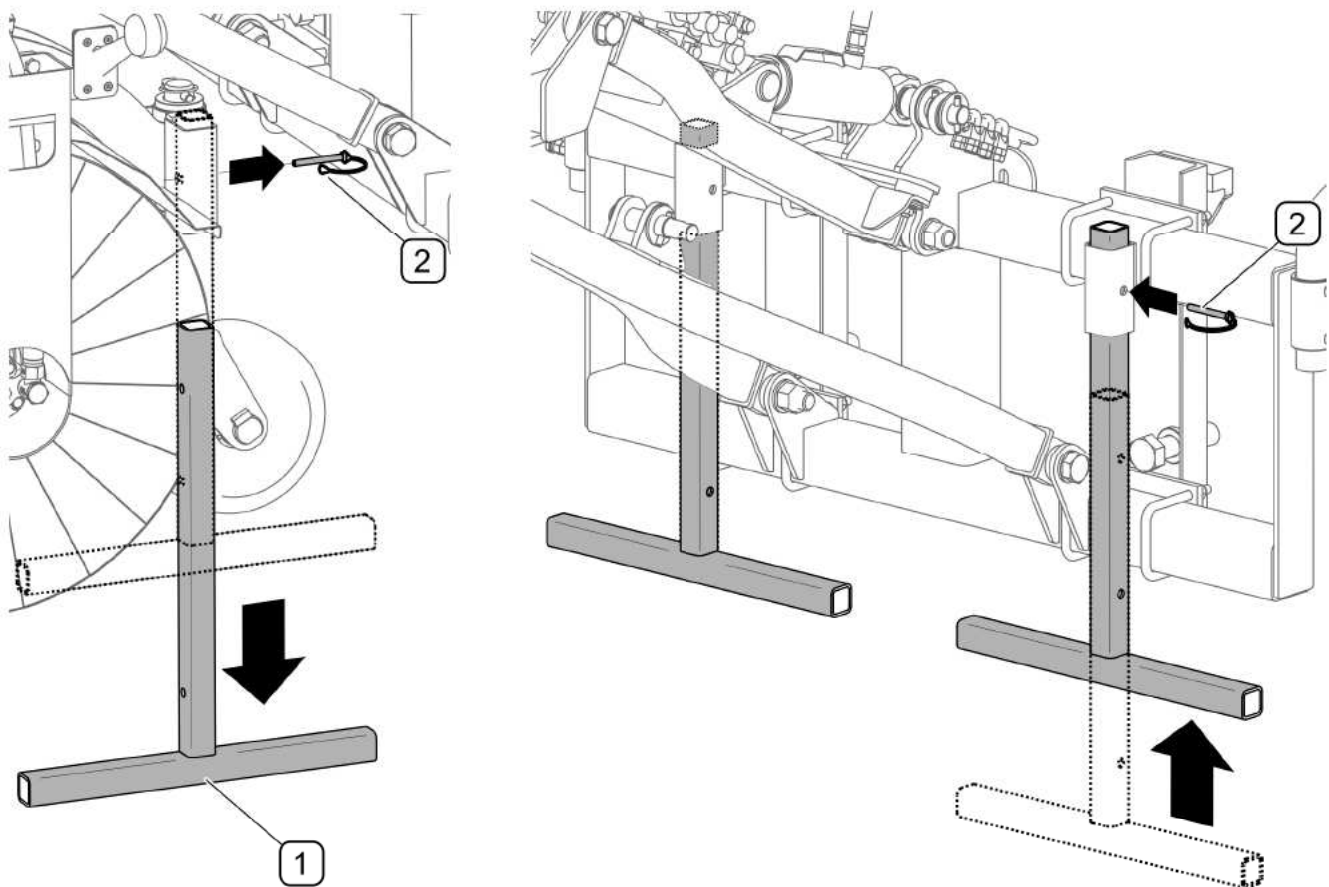


FIG. 4.8 Dismantling parking stands
 (1) - parking stand; (2) - locking cotter pin

The sweeper is equipped with two parking stands (FIG. 4.8). To dismantle the parking stand:

- lift the machine mounted on a carrying vehicle,

- take out securing cotter pin (2), pull out parking stand (1) from the guide on the brush frame and mount in the guide on the linkage frame,
- dismantle the second parking stand in the same way.

4.4 SWEEPER OPERATION

4.4.1 DISASSEMBLY OF TRANSPORT LOCK

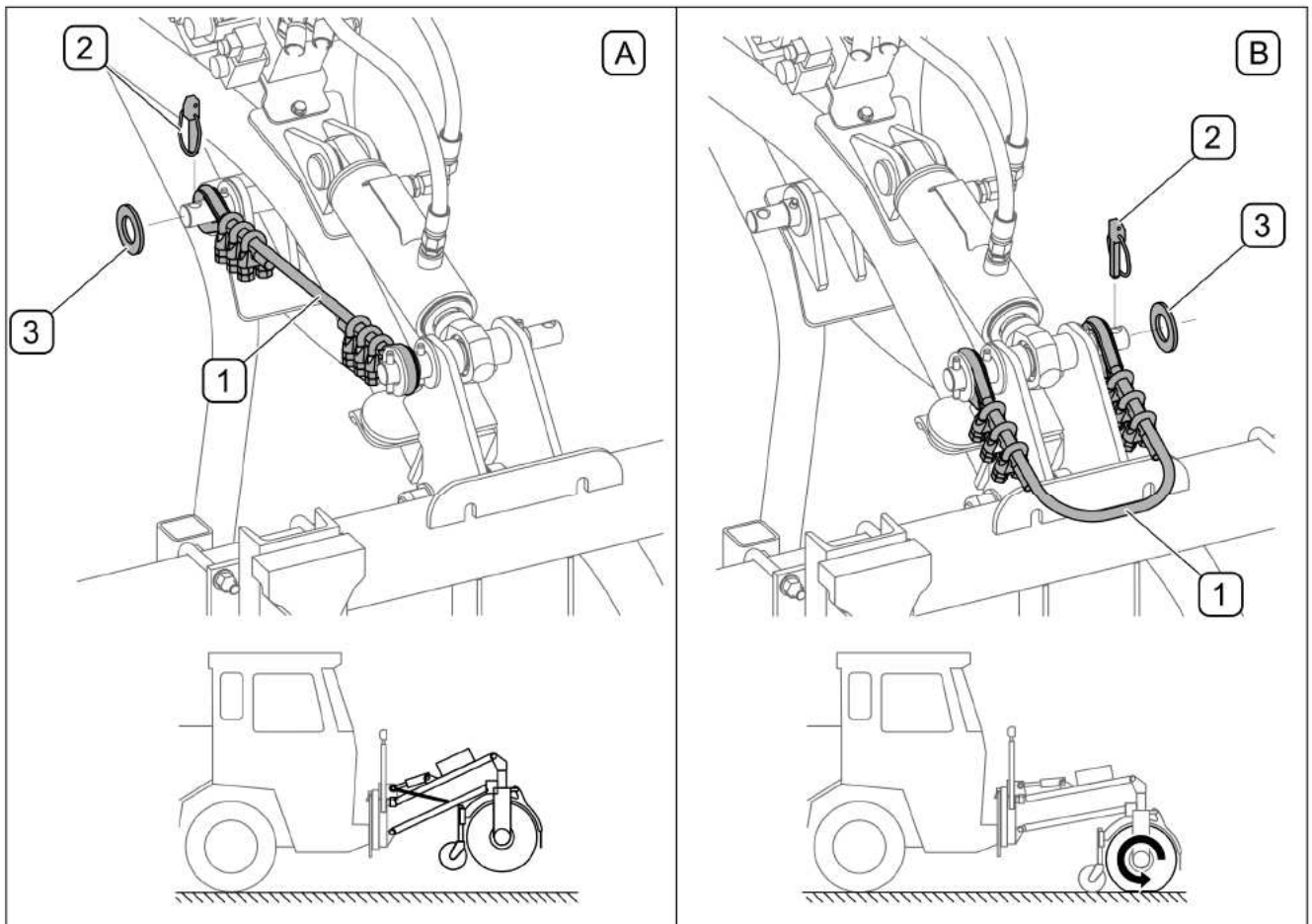


FIG. 4.9 Disassembly of transport lock

(1) - securing cable; (2) - cotter pin; (3) - washer; (A) - linkage secured with cable; (B) - cable attached during machine operation

If the sweeper linkage system has been locked in upper transport position, release the transport lock before lowering the machine (FIG. 4.9).

To disassemble the transport lock (FIG. 4.9) :

- raise the sweeper to the extreme upper position, immobilise the vehicle with parking brake,

- take out securing cotter pin (2) and remove washer (3),
- take out the cable end from rocker arm pin (A) and attach to cylinder pin (B)
- secure the cable again with washer (3) and cotter pin (2)

4.4.2 CONTROL PANEL (ZM-S25)

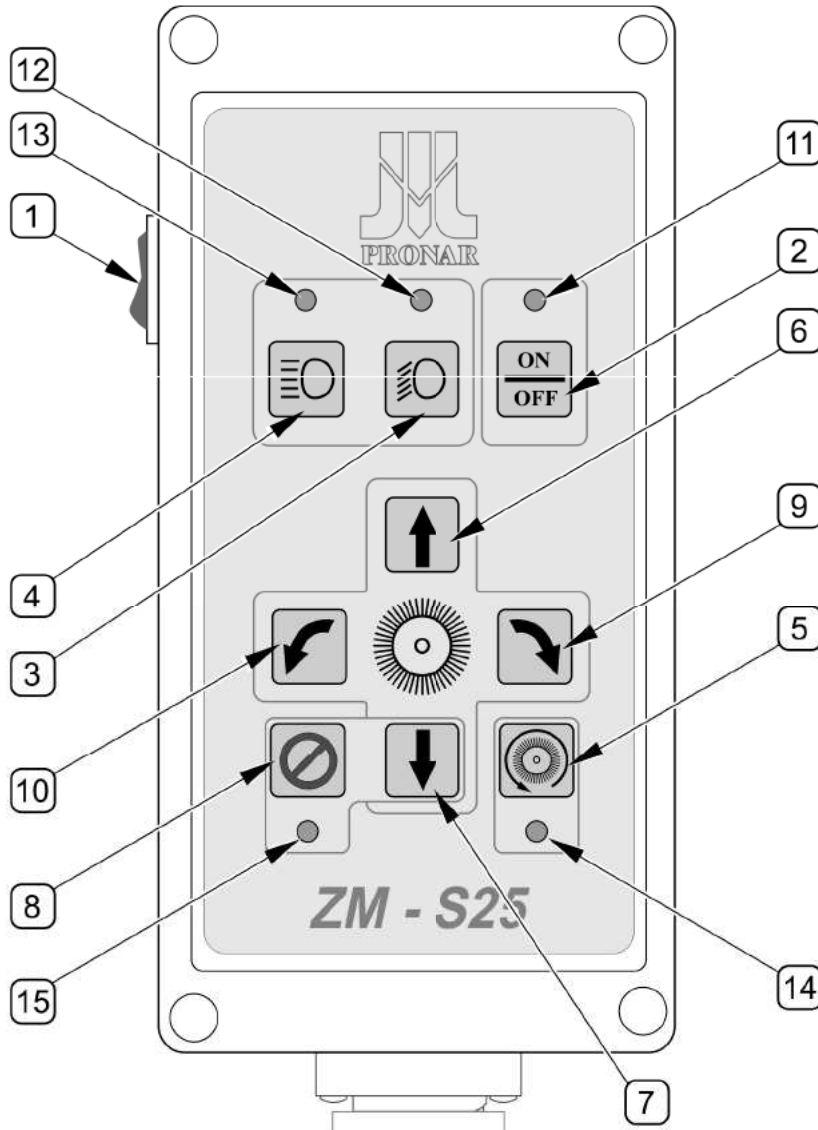


FIG. 4.10 Arrangement of controls on the control panel (ZM-S25)

(1) - main switch of control panel; (2) - main switch of lights and clearance lights; (3) - dipped beam switch; (4) - high beam switch; (5) - brush drive switch; (6) - brush rising push-button; (7) - brush lowering push-button; (8) - linking push-button; (9) - push-button of brush turning to the right; (10) - push-button of brush turning to the left; (11) - clearance lights ON indicator light; (12) - dipped beam ON indicator light; (13) - high beam ON indicator light; (14) - brush drive ON indicator light; (15) - "linking" function indicator light

Control panel (FIG. 4.10) is protected against accidental use by the main switch (1).

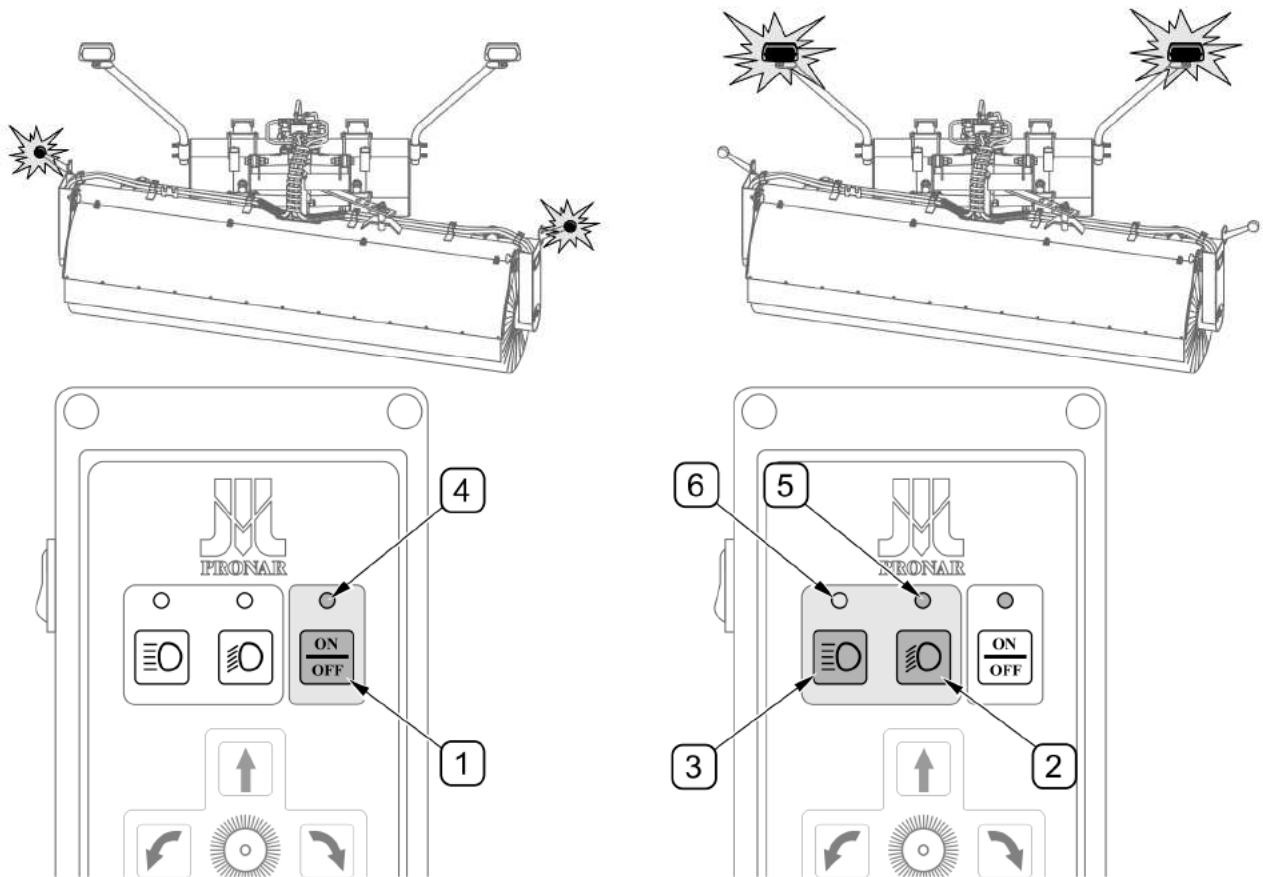


FIG. 4.11 Switching on additional lights (ZM-S25)


(1) - main switch of lights and clearance lights; (2) - dipped beam switch; (3) - high beam switch; (4) - clearance lights ON indicator light; (5) - dipped beam ON indicator light; (6) - high beam ON indicator light

ZM-S25 sweeper is equipped with clearance lights and additional working lights (FIG. 4.11). Push-button (1) is used for switching on and off the machine's clearance lights. Indicator light (4) lights up when the clearance lights are switched on. When push-button (1) is pressed again, the clearance lights and indicator light (4) go out. To switch on the sweeper's dipped beams or high beams, first switch on the clearance lights. Switch (2) is used for switching on dipped beams while switch (3) is used for switching on high beams. When high beams are switched on the dipped beams are switched off and vice versa. When the lights are switched on (FIG. 4.11), corresponding indicator lights (5) or (6) light up. Lights are switched on by pressing switch (1).



TIP

Switch(1) must be ON in order to switch on dipped beams or high beams -indicator light (4) is ON (FIG. 4.11). When clearance lights are switched off the dipped beams and high beams are switched off (applies to ZM-S25)

 **DANGER**
When sweeper is in use there must be no bystanders near the machine.

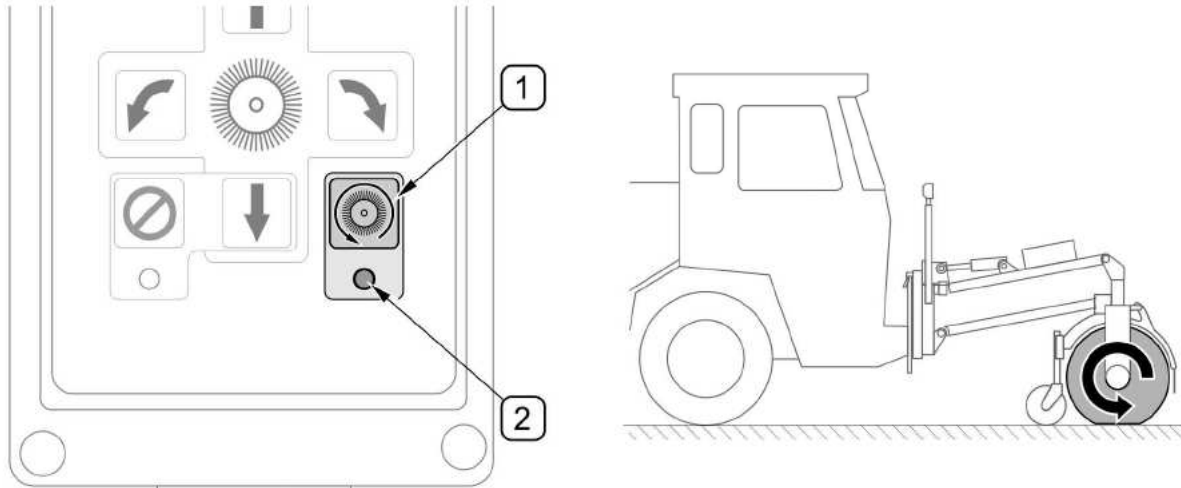


FIG. 4.12 Brush drive switch (ZM-S25)

(1) - brush drive switch; (2) - brush drive ON indicator light;

Brush drive is switched on and off using switch (1) on control panel (FIG. 4.12). When the brush drive is switched on indicator light (2) lights up. Brush rotation direction should be the opposite to direction of vehicle travel (FIG. 4.12.)

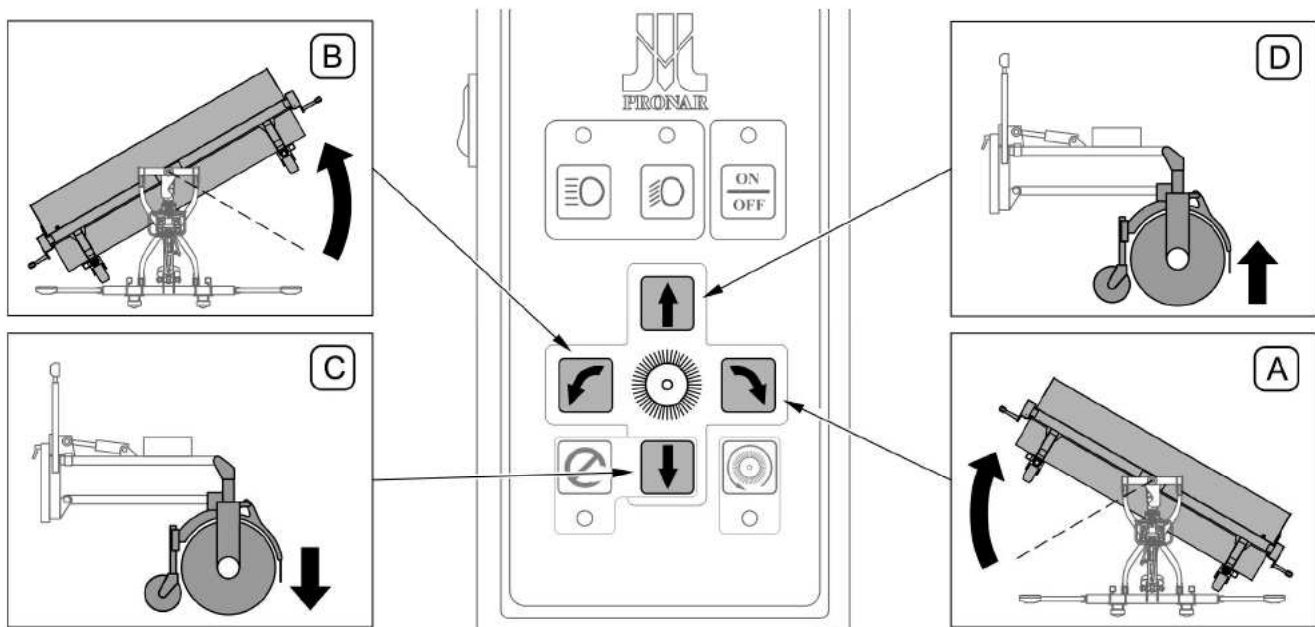


FIG. 4.13 Changing the sweeper's working position (ZM-S25 sweeper with hydraulic brush turning)

(A) - turning the brush to the right; (B) - turning the brush to the left; (C) - lowering the brush; (D) - raising the brush

Working position of ZM-S25 sweeper with hydraulic brush turning can be smoothly adjusted within the range of $+30^{\circ}$ / -30° . In order to change the sweeper's working position, the control panel should be ON. Push-buttons (A and B) on the control panel are used for changing the sweeper's working position (FIG. 4.13). Push-button (A) is used for shifting the brush to the right (looking in the direction of vehicle travel), whereas push-button (B) is used for shifting the brush to the left. In order to set the brush in an intermediate position, release the corresponding push-button in a proper moment.

The brush (FIG. 4.13) is raised when push-button (D) is pressed. Press push-button (C) to lower the brush.

5 working angles of the brush can be set in the sweeper equipped with mechanical brush turning system (FIG. 4.14).

The brush with mechanical turning system is raised and lowered using the control panel. Brush working angle is changed by means of adjusting strip (1) with openings to be secured on the brush frame pin (FIG. 4.14)

To change the brush (FIG. 4.14) working angle:

- take out securing cotter pin (2),
- remove washer (4) and shock absorbing washer (3),
- dismount adjusting strip (1) from the pin on the brush frame,
- manually change the brush working angle to align a corresponding opening (C, D, E, F or G) in the adjusting strip with the securing pin on the brush frame,
- attach adjusting strip (1) using washers (3), (4) and cotter pin (2).

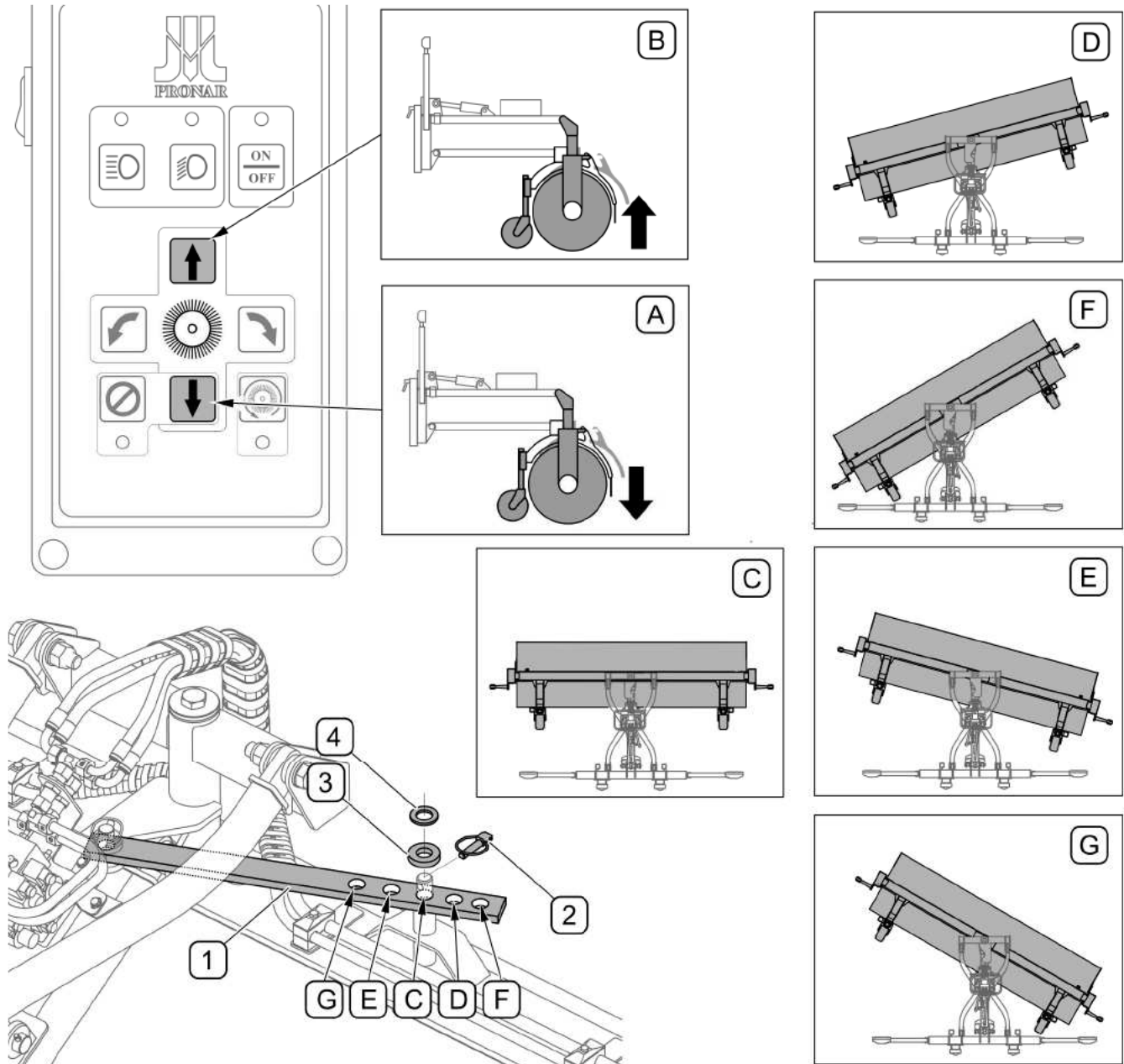


FIG. 4.14 Changing the sweeper's working position (ZM-S25 sweeper with mechanical brush turning)

(A) - brush lowering; (B) - brush rising; (C) - straight; (D) - angle of 15° to the left; (E) - angle of 15° to the right; (F) - angle of 30° to the left; (G) - angle of 30° to the right; (1) - adjusting strip; (2) - securing cotter pin; (3) - shock absorbing washer; (4) - washer

4.4.3 SETTING WORKING HEIGHT



DANGER

Setting the working height should be performed only when the engine is stopped, and the machine is raised and secured.

Working height is set (FIG. 4.15) by proper setting of the wheel height. Wheel height is adjusted with the use of 10 mm-high spacer washers (3). In order to lift wheel (1), take out cotter pin (2) and relocate spacer washers above the wheel bracket and secure with cotter pin (2). Right and left wheel heights should be the same. When setting the brush, take its wear into account. Sweeping brush ground contact surface should be in the range from 60 do 120 mm (FIG. 4.15). After adjustment, lower the sweeper on the wheels and check the width of the sweeper ground contact surface, adjust again if necessary.

Proper adjustment of wheels ensures uniform wear and long service life of the brush.

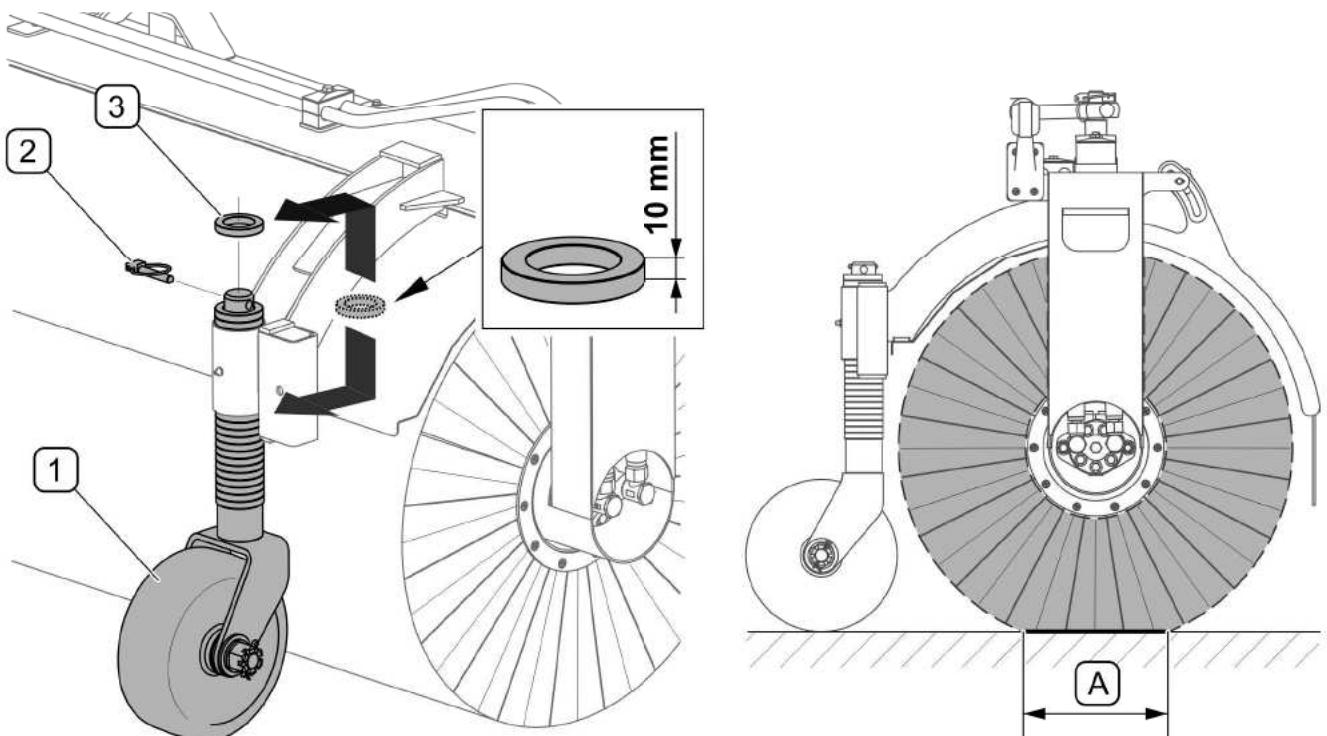


FIG. 4.15 Working height adjustment

(1) - wheel; (2) - securing cotter pin; (3) - spacer washer; (A) = 60÷120 mm - recommended width of surface of brush pressure to the ground

4.5 TRANSPORTING THE MACHINE

When driving on public roads, respect the road traffic regulations, exercise caution and prudence. If the clearing with sweeper is done 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.
- The maximum working speed and the maximum speed allowed by road traffic regulations must not be exceeded. Speed of travel should be adjusted to prevailing road conditions and other conditions.
- While driving on public roads turn on clearance lamps and additional lights of the sweeper (if any).
- 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 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 transporting a raised machine, protect the linkage against falling or accidental dropping with transport lock (FIG. 4.16).

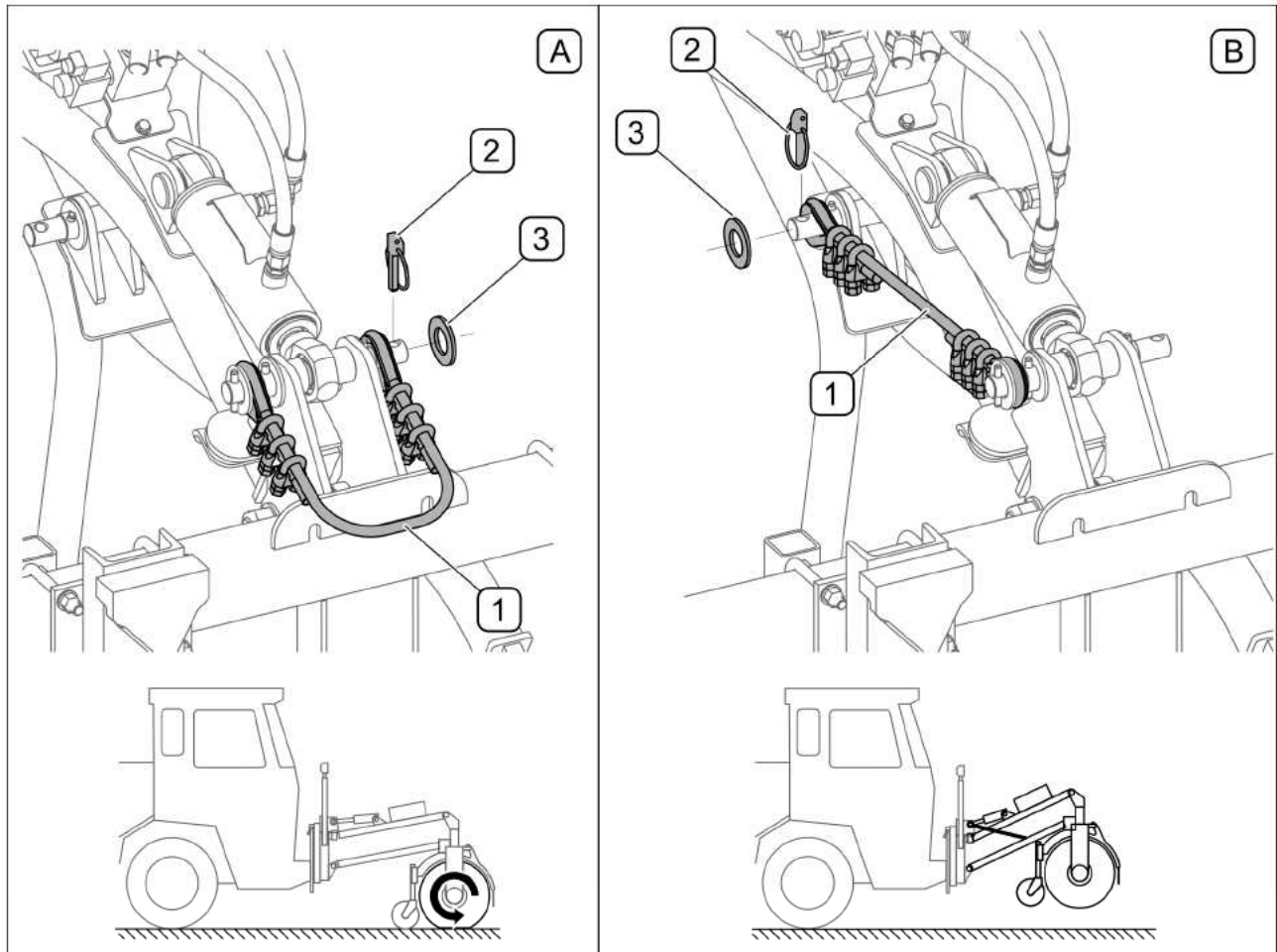


FIG. 4.16 **Installing transport lock**


(1) - cable; (2) - cotter pin; (3) - washer; (A) - cable attached during machine operation; (B) - linkage secured against lowering

In order to secure the machine's linkage in transport position and protect it against falling or accidental dropping (FIG. 4.16) :

- raise the sweeper to the extreme upper position, immobilise the vehicle with parking brake,
- take out securing cotter pin (2) and remove washer (3),
- take out the cable end (1) from cylinder pin (A) and attach to rocker arm pin (B)
- secure the cable again with washer (3) and cotter pin (2)

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.

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. Install parking stands before unhitching the machine from the carrying vehicle (FIG. 4.17).

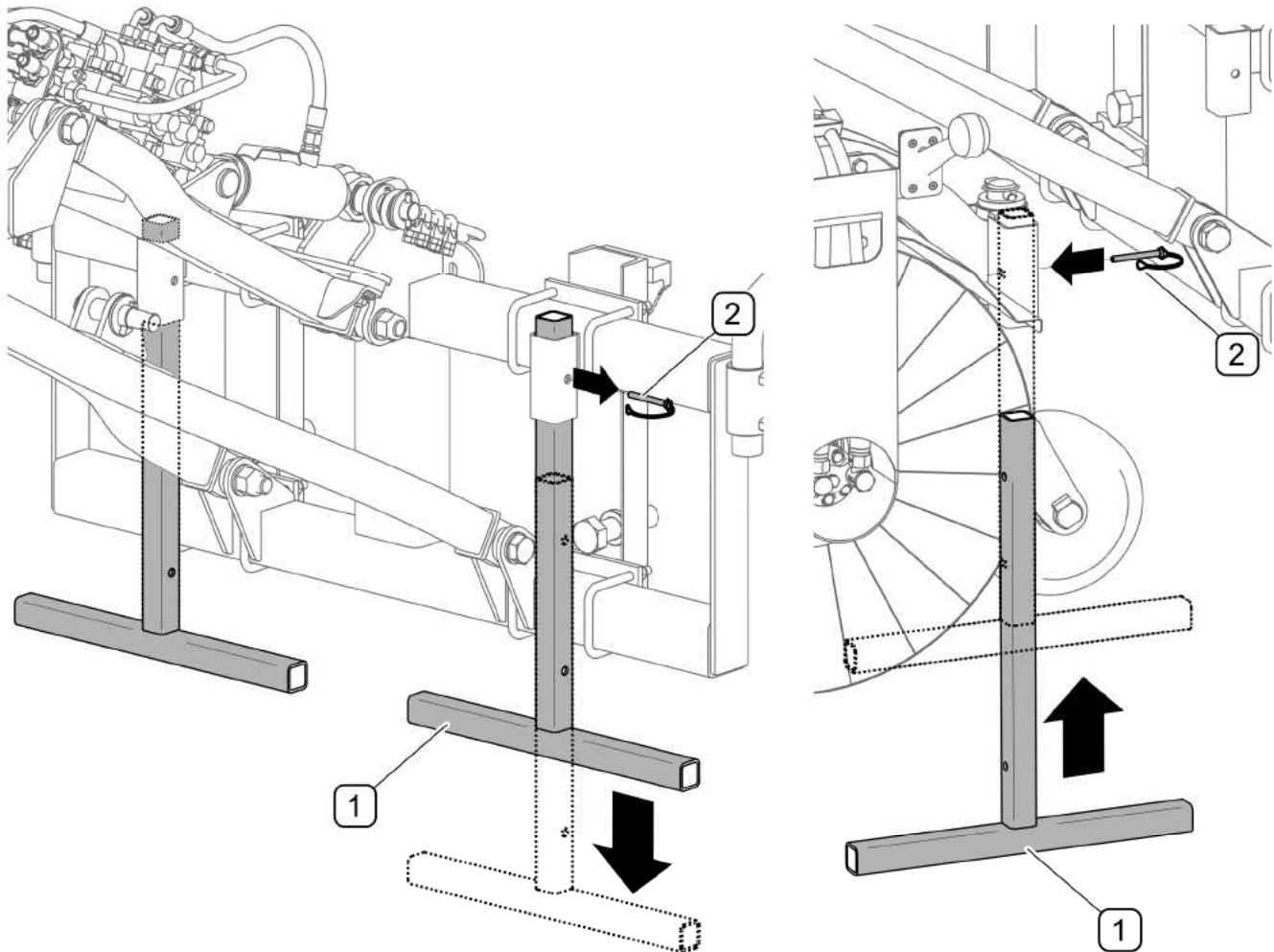


FIG. 4.17 Installing the parking stands

(1) - parking stand; (2) - locking cotter pin

Machine unhitched from the carrying vehicle should rest on the ground on two parking stands (FIG. 4.17). To install the parking stands:

- raise the machine mounted on the carrying vehicle, turn off the engine and immobilise the vehicle with parking brake,
- take out securing cotter pin (2), pull out parking stand (1) from the guide on the linkage frame and mount in the guide on the brush frame,
- lock parking stand (1) using cotter pin (2),
- install the second parking stand in the same way.

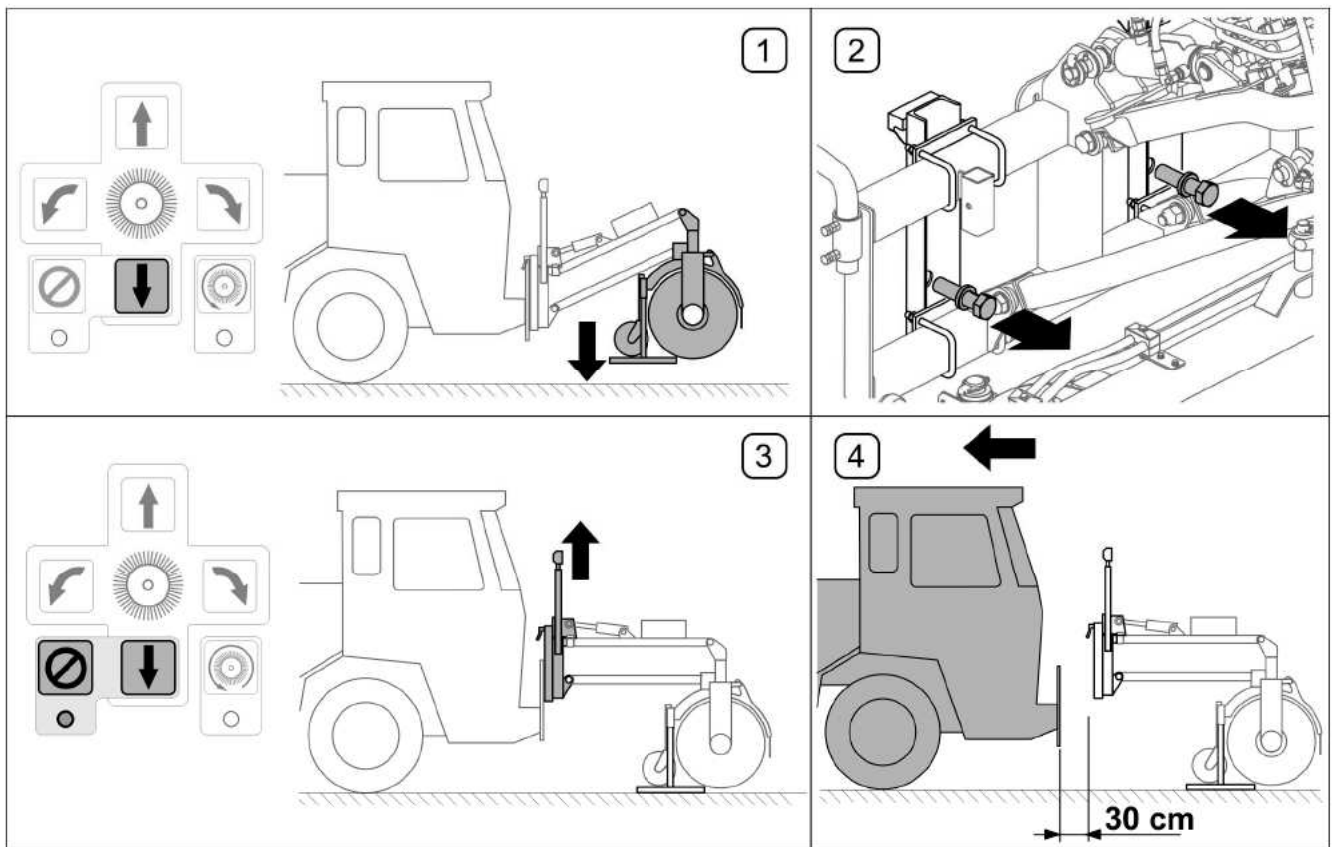


FIG. 4.18 Unhitching the sweeper from the carrying vehicle (ZM-S25)

(1,2,3,4) - successive stages of sweeper unhitching

To unhitch ZM-S25 sweeper (FIG. 4.18) from the carrying vehicle:

- 1) Lower the brush until parking stands fully rest on the ground.
- 2) Unscrew two bolts that fix the linkage frame to the carrying vehicle's head plate.

- 3) Pressing simultaneously the linking push-button and the brush lowering push-button, raise the sweeper's linkage in such a manner as to position the mounting hooks above the seats of the carrying vehicle's head plate.
- 4) Drive the carrying vehicle away from the sweeper to a distance of about 30 cm, lower the sweeper's linkage, turn off the engine and immobilise the carrying vehicle with parking brake.
- 5) Disconnect power supply plug from the carrying vehicle. Disconnect hydraulic conduit connectors (1) from the carrying vehicle, secure them with stoppers (2) and place in bracket (3) on the brush frame (FIG. 4.19). Control panel should be disconnected from the machine and protected against adverse weather conditions.

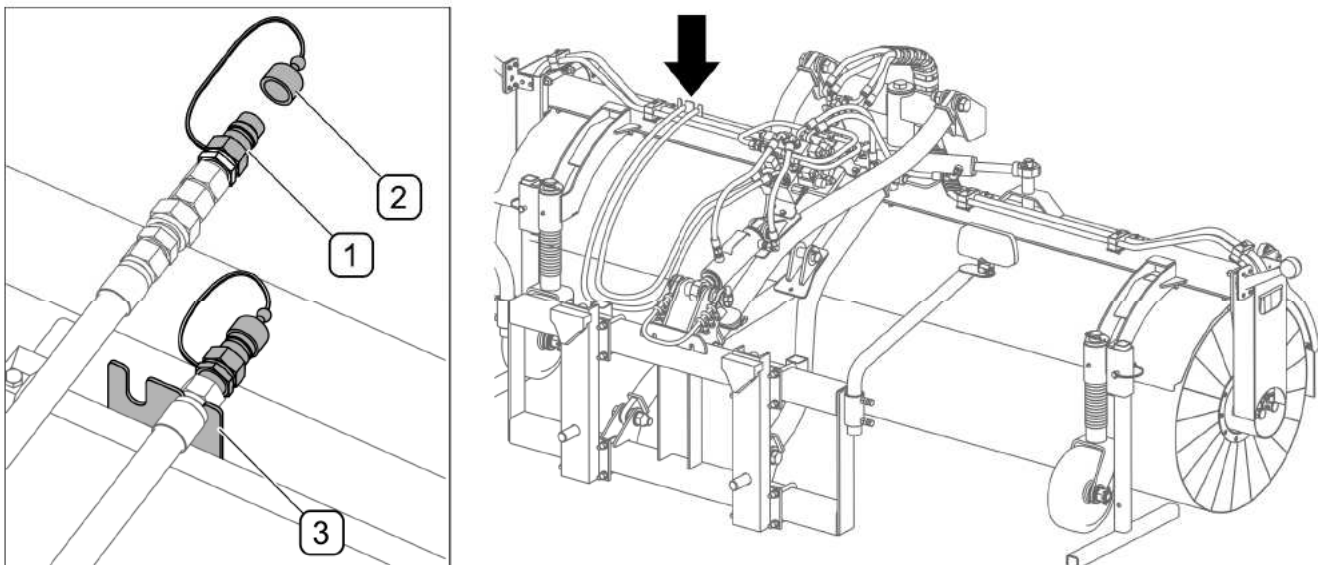


FIG. 4.19 Protecting hydraulic conduit connectors (ZM-S25)

(1) - hydraulic conduit connectors; (2) - protective stoppers; (3) - bracket



TIP

Protect the control panel against adverse weather conditions. If the sweeper shall not be used for a long period of time, disconnect the control panel completely from the machine (applies to ZM-S25)

Successive stages of unhitching ZM-S25U sweeper from the carrying vehicle:

- 1) Lower the brush until it fully rests on the ground.
- 2) Unscrew two bolts that fix the linkage frame to the carrying vehicle's head plate.

- 3) Using the external hydraulic system of the carrying vehicle, set the sweeper's linkage in such a manner as to position the mounting hooks above the seats of the carrying vehicle's head plate.
- 4) Drive the carrying vehicle about 30 cm away from the sweeper and engage parking brake.
- 5) Disconnect hydraulic conduit plugs and electric lead from the carrying vehicle. Secure hydraulic conduit plugs (1) with stoppers (2) and place them in bracket (3) on the machine frame (FIG. 4.20). Drive the carrying vehicle away from the sweeper.

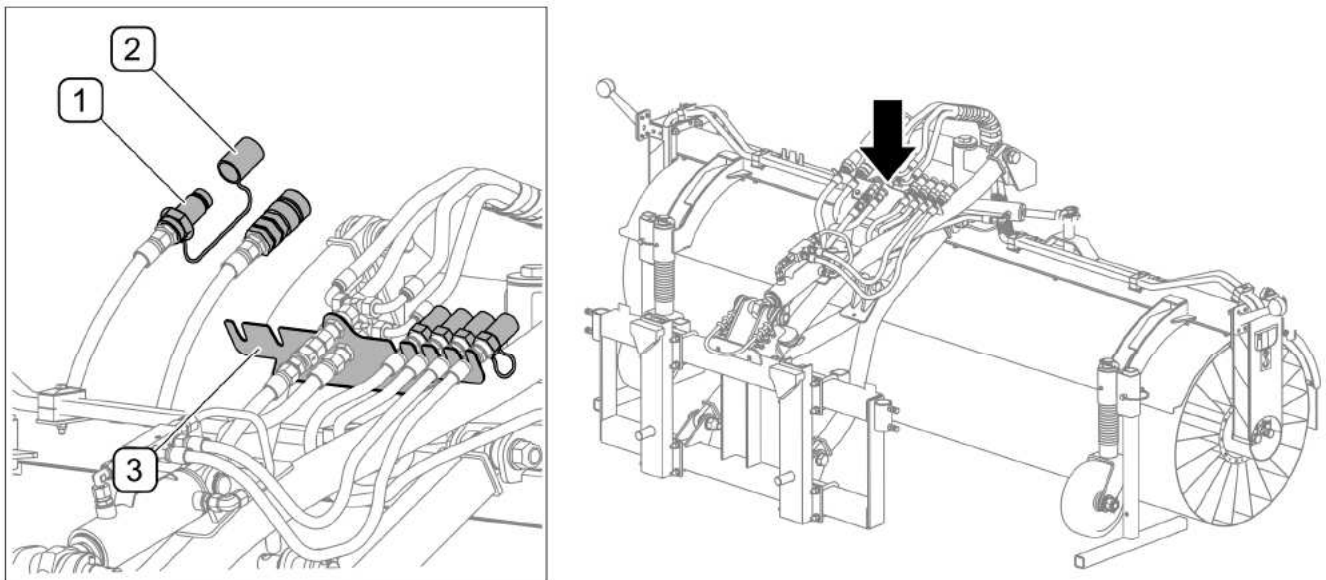


FIG. 4.20 **Protecting hydraulic conduit connectors (ZM-S25U)**


(1) - hydraulic conduit connectors; (2) - protective stoppers; (3) - bracket

SECTION

5

MAINTENANCE

5.1 INSPECTION AND REPLACEMENT OF BRUSH



DANGER

During inspection and replacement of brush, switch 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. Before replacing the brush, support the machine with parking stands, turn off the engine and immobilise vehicle with parking brake.

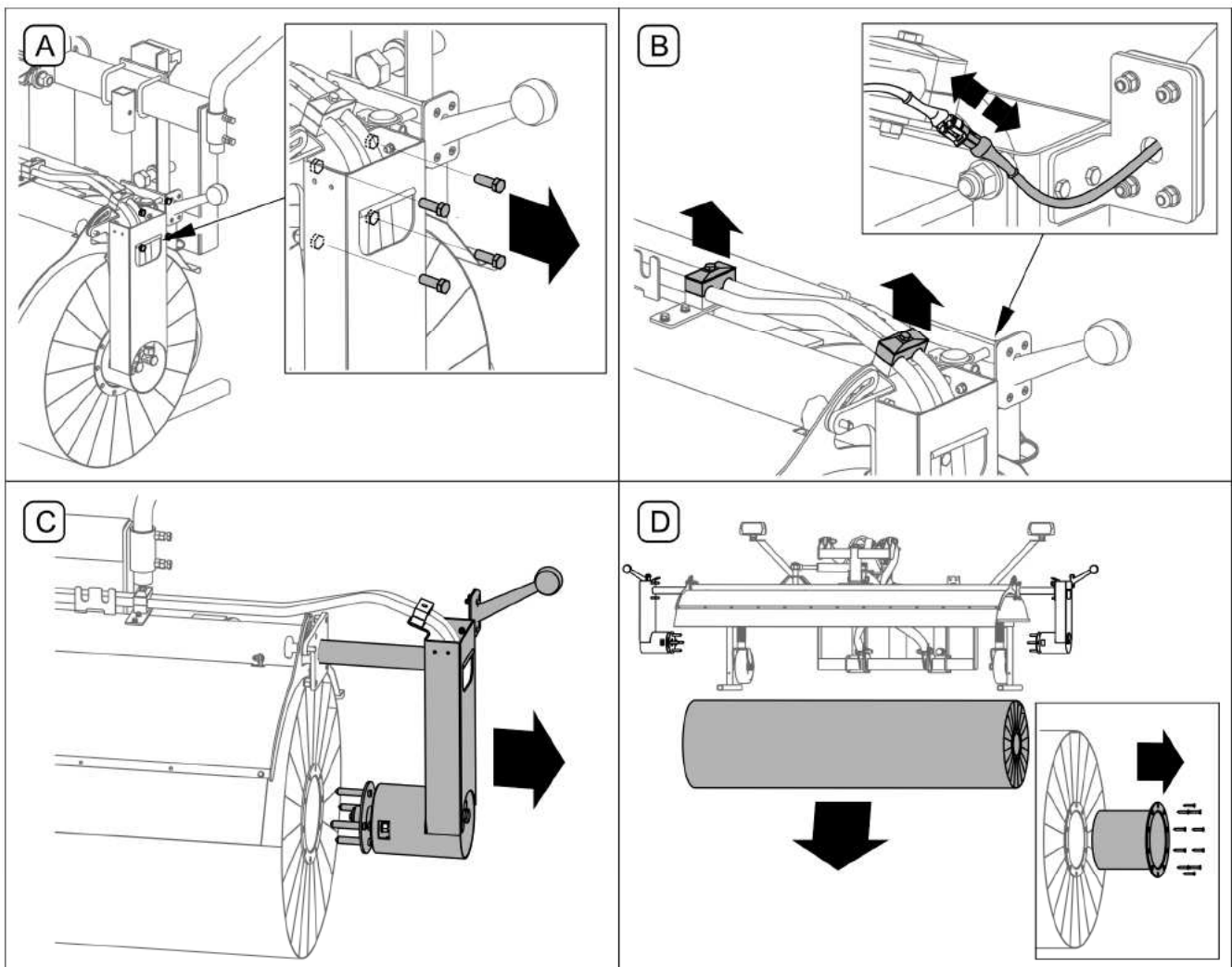


FIG. 5.1 Brush replacement

(A), (B), (C), (D) - successive steps of the brush replacement

All the brush replacement activities (FIG. 5.1) should be performed on the right and left side of the machine. To remove the brush:

- Unscrew bolts (4 bolts on each side) that fix the hydraulic motor's bracket to the brush frame (A, FIG. 5.1)
- Loosen clamping rings of hydraulic conduits and disconnect electrical connectors on clearance lights on the right and left side of the machine (B, FIG. 5.1)
- Slide out both brackets of hydraulic motors (C, FIG. 5.1)
- Remove the brush, unscrew screws (10 screws on each side) that fix the brush to the drive drum and remove the brush mounting (D, FIG. 5.1)

Depending on customer needs two types of brushes differing in hardness are available (TAB. 5.1).

TAB. 5.1 Types of roller brushes

ITEM	SPECIFICATION	PART NUMBER
1	Soft brush (<i>plastic</i>)	285N-00000001-01
2	Hard brush (<i>plastic & wire</i>)	285N-00000001

5.2 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;



DANGER

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



DANGER

During work on hydraulic systems 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 (CO₂), foam or extinguisher steam. Do NOT use water for fire extinguishing!

**ATTENTION!**

Before you begin, visually inspect the hydraulic system components.

TAB. 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, °C	Above 210°C
6	Maximum operating temperature, °C	80

Spilt oil should be immediately collected and placed in marked tight container. Used oil should be taken to the appropriate facility dealing with the re-use of this type of waste.

The hydraulic system should be completely tight sealed. Inspect the seals when hydraulic ram cylinders are completely extended. In the event of confirmation of oil on hydraulic ram cylinder bodies ascertain 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.



ATTENTION!

The hydraulic system is vented automatically during machine operation.



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

5.3 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 and lighting system. Additional working lights (A) of the machine are equipped with a H4 bulb. Bulb (2) in additional light (A) is accessible after unscrewing screws (3) and removing lens (1). List of lighting elements is included in TAB. 5.3

The sweeper's clearance lights (B) are maintenance-free LED lights.

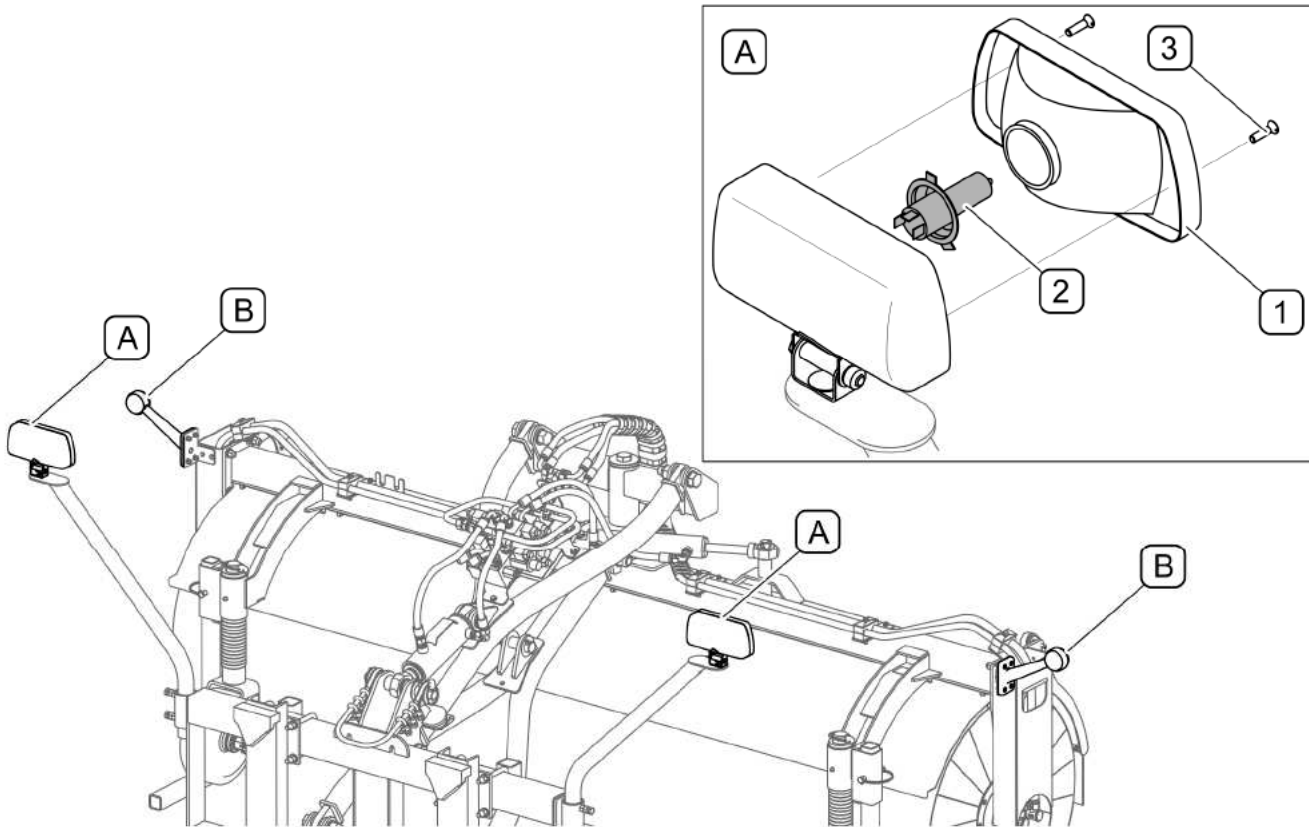


FIG. 5.2 Changing bulbs

(A) - additional working light (not applicable to ZM-S25U); (B) - clearance lamp; (1) - light lens; (4) - H4 75/70W 24V bulb or H4 60/55W 12V bulb (depending on the machine version)

TAB. 5.3 LIST OF LIGHTING COMPONENTS

LAMP TYPE	BULB TYPE	NUMBER of bulbs
Front light RE.25677. H4	H4 75/70W 24V (H4 60/55W 12V *)	2
Right clearance lamp W21.3rf 295 BCP	LED	1
Left clearance lamp W21.3rf 295 BCL	LED	1

* - depending on the machine version

In ZM-S25 sweepers, fuse (1) is installed on the supply lead „+” that is terminated with a 3-pin socket and connected to the carrying vehicle's electrical system (FIG. 5.3). To check the fuse, remove cover (2) and take the fuse out of the housing (3). Blown fuse should be replaced with a new one (UNIVAL 30A).

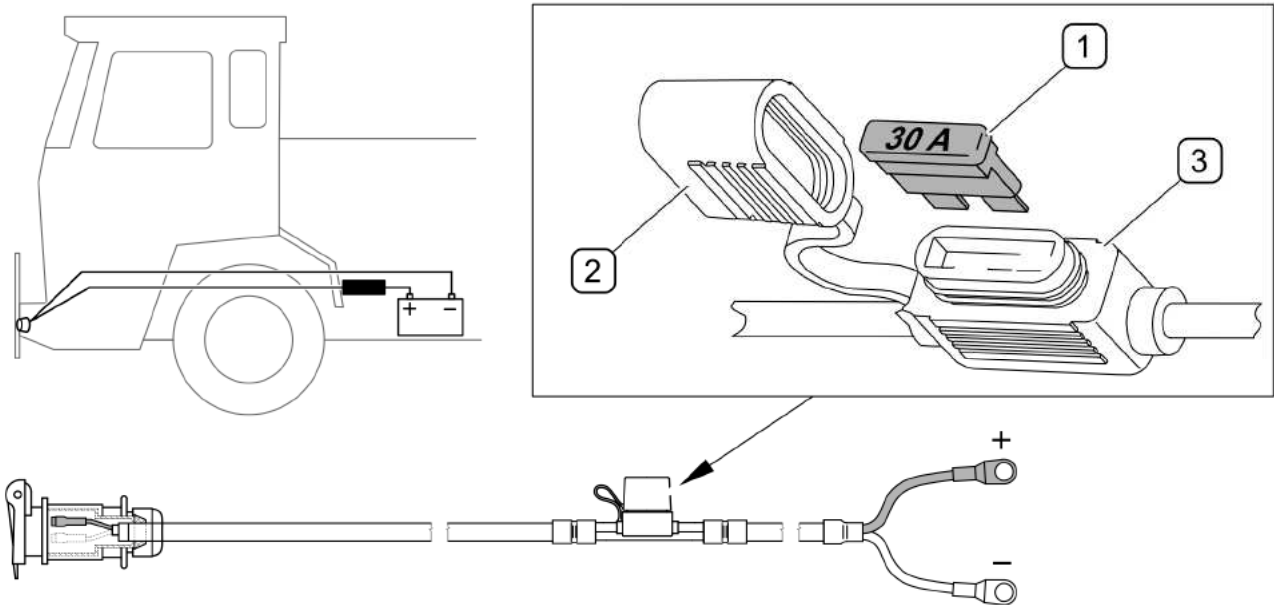


FIG. 5.3 Fuse of ZM-S25 sweeper's electrical system

(1) - 30A UNIVAL fuse ; (2) - cover; (3) - housing

5.4 SPRINKLER SYSTEM OPERATION

Periodically confirm that sprinklers are not blocked and filters are clean in ZM-S25U sweepers that are optionally equipped with sprinkler system (FIG. 5.4). There is a strainer (2) in each of four sprinklers. In order to clean the strainer, dismantle nut (4) with sprinkler (3). Rinse the strainer (2) or blow it with compressed air. Confirm that sprinkler (3) is not blocked. Check technical condition of sprinklers, if necessary replace. The list of sprinkler elements TAB. 5.4

TAB. 5.4 The list of sprinkler elements

MARKING (FIG. 5.4)	NAME	CATALOGUE NO.
1+4	1/2" bracket with nut	8230012
2	Filter	8139004
3	Sprinkler	TP11006VP

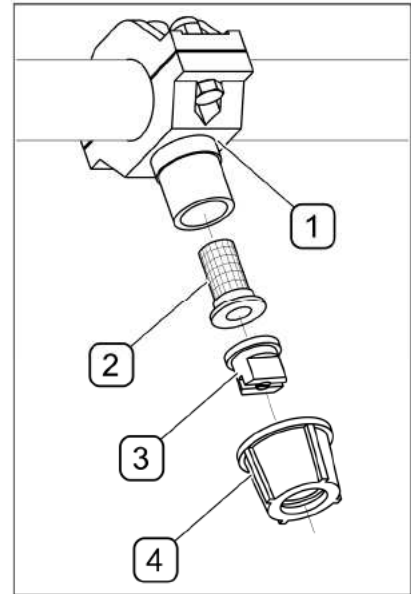
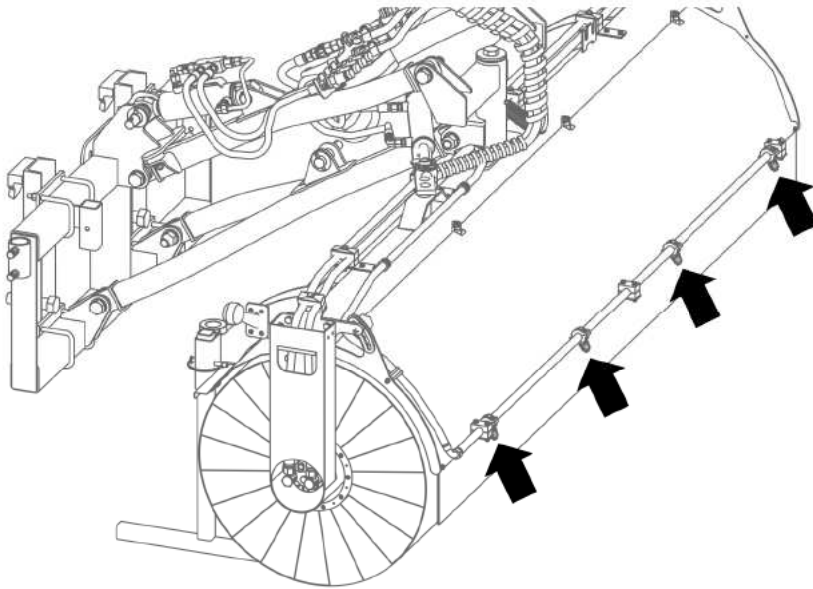


FIG. 5.4 Filters of sprinklers

(1) - bracket; (2) - filter; (3) - sprinkler; (4) - nut

	<p>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.</p>
--	--

5.5 LUBRICATION

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

	<p>DANGER</p>
<p>Lubrication may only be performed when sweeper is lowered, and resting on the ground.</p>	
<p>Before lubricating, switch off engine, remove key from ignition and engage carrying vehicle brake.</p>	

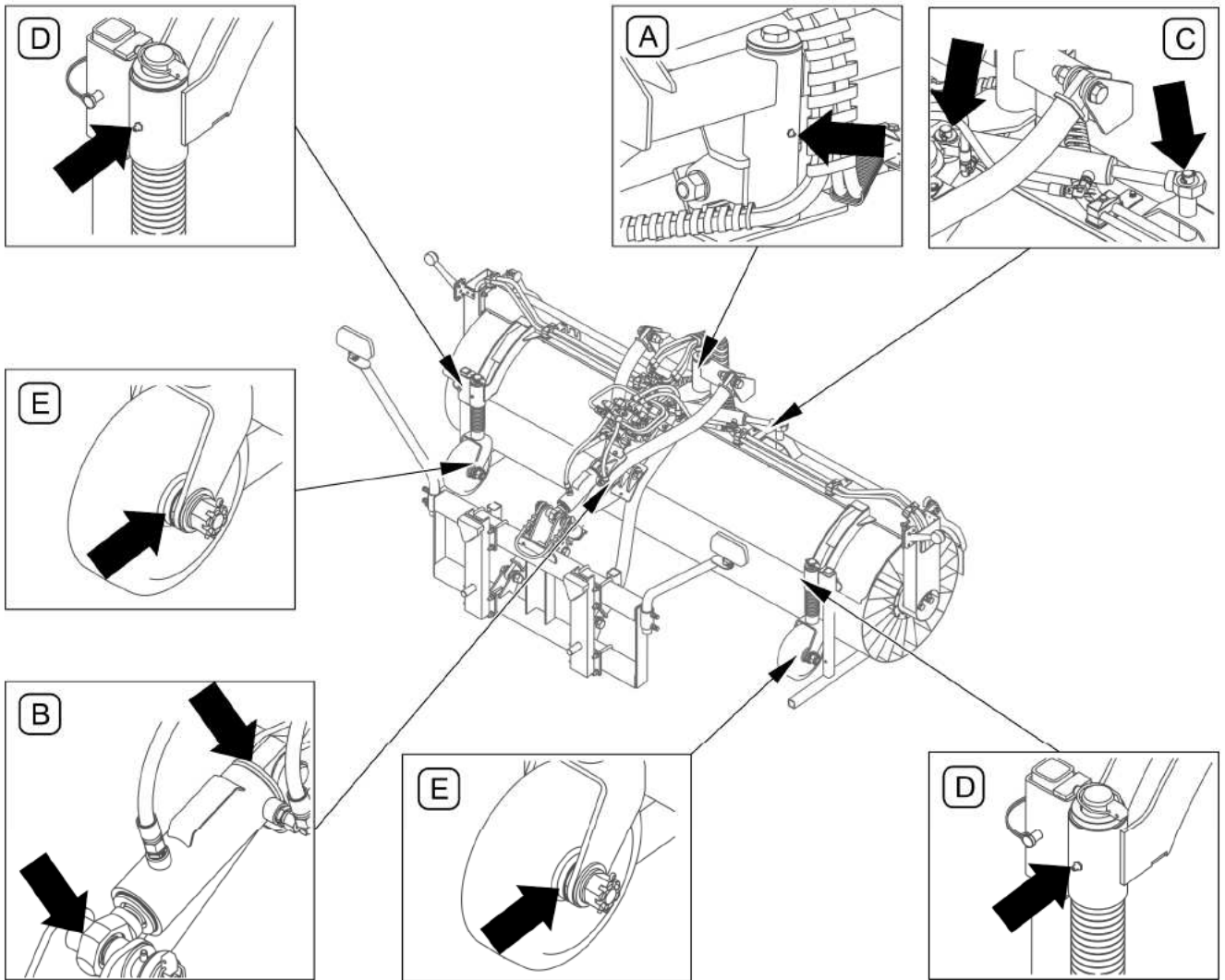


FIG. 5.5 Lubrication points

Lubrication points described in table 5.4



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.

TAB. 5.5 LUBRICATION POINTS AND LUBRICATION FREQUENCY

ITEM	NAME	NUMBER OF LUBRICATION POINTS	TYPE OF GREASE	LUBRICATION FREQUENCY
A	Brush frame rotation pin	1	grease	50 hours
B	Eye of cylinder ram and rising cylinder	2		50 hours
C	Eye of cylinder ram and turning cylinder *	2		50 hours
D	Wheel rotation sleeve	2		50 hours
E	Wheel bearings	2		10 hours

* – in the version with hydraulic brush turning

Marking description in Item column (0) conforms with numbering shown (FIG. 5.5)

5.6 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 period of the last lubrication process.

Sweeper should be placed on parking stands. Control panel should be disconnected from the sweeper and protected against adverse weather conditions (*applies to ZM-S25*). If there is a risk that temperatures drop below 0°C, drain water from the sprinkler system.

5.7 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 TAB. 5.6

TAB. 5.6 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

Values given in the table do not apply to special engineering solutions (see FIG. 5.6)



ATTENTION!

Fasteners in the places featuring special engineering solutions (FIG. 5.6) should be tightened only to eliminate clearance.

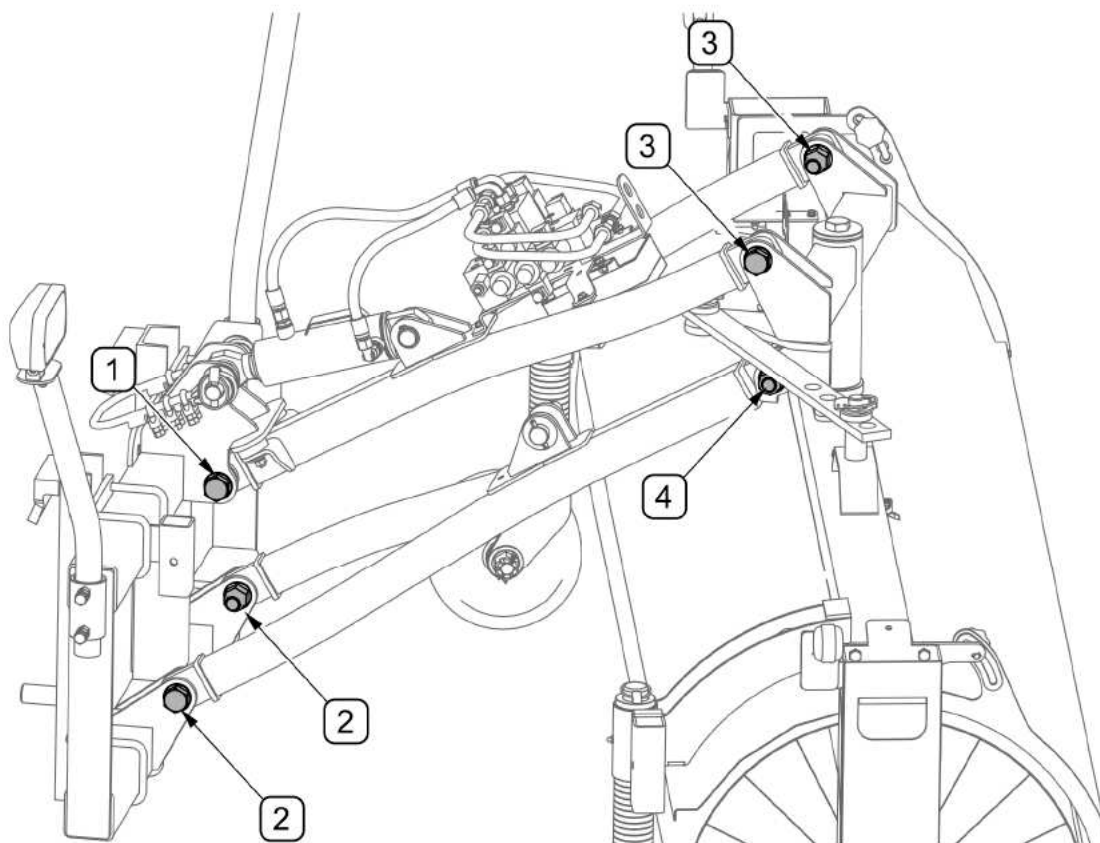


FIG. 5.6 Special engineering solutions

Marking description is presented in TAB. 5.7

TAB. 5.7 SPECIAL ENGINEERING SOLUTIONS

MARKING (FIG. 5.6)	CONNECTION NAME	NUMBER OF LOCATIONS
1	Fixing of upper rocker arm to the linkage frame	1
2	Fixing of lower rocker arm to the linkage frame	2
3	Fixing of upper rocker arm to the brush frame	2
4	Fixing of upper rocker arm to the brush frame	1



ATTENTION!

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 damage the machine.

5.8 TROUBLESHOOTING

TAB. 5.8 TROUBLESHOOTING

TYPE OF FAULT	CAUSE	REMEDY
Working position cannot be changed (hydraulic turning)	Electrical system is not connected to the carrying vehicle or control panel is not connected (ZM-S25)	Connect power lead to the carrying vehicle's electrical system. Connect control panel.
	Control panel is switched off (ZM-S25)	Switch control panel on
	Hydraulic system is not connected or is connected incorrectly.	Check connection to the carrying vehicle's hydraulic system. Engage supply of the external hydraulic system of the carrying vehicle
	Fuse is blown (ZM-S25)	Check and, if necessary, replace the fuse on the electrical system's power lead.
	Hydraulic system is damaged	Repair at authorised service point
	Faulty wiring (ZM-S25)	Repair at authorised service point
	Control panel is damaged (ZM-S25)	Repair at authorised service point
Brush can not be lowered or raised	Transport position lock is engaged	Disengage transport position lock
	Hydraulic system is not connected or is connected incorrectly.	Connect hydraulic conduits in a proper manner to the carrying vehicle's hydraulic system. Engage supply of the external hydraulic system of the carrying vehicle
	Fuse is blown (ZM-S25)	Check and, if necessary, replace the fuse on the electrical system's power lead.
	Hydraulic system is damaged	Repair at authorised service point

Continued TAB. 5.8 TROUBLESHOOTING

TYPE OF FAULT	CAUSE	REMEDY
Brush does not rotate or works incorrectly	Hydraulic system is not connected or is connected incorrectly.	Connect hydraulic conduits in a proper manner to the carrying vehicle's hydraulic system.
	Insufficient oil pump delivery in the carrying vehicle or wrong pressure in the hydraulic system	Check parameters of the carrying vehicle's hydraulic system
	Hydraulic system is damaged	Repair at authorised service point
Brush does not collect waste	Pressure applied to the surface by the brush is incorrectly set	Check and adjust height of wheels
	Brush excessively worn	Check and replace if necessary
No lighting	Electrical system not connected	Connect electrical system
	Burned-out bulb in lamp	Replace light bulb
	The machine electrical system is damaged	Repair at authorised service point
	Control panel components are damaged (ZM-S25)	Repair at authorised service point

NOTES

A series of horizontal dotted lines for writing notes.