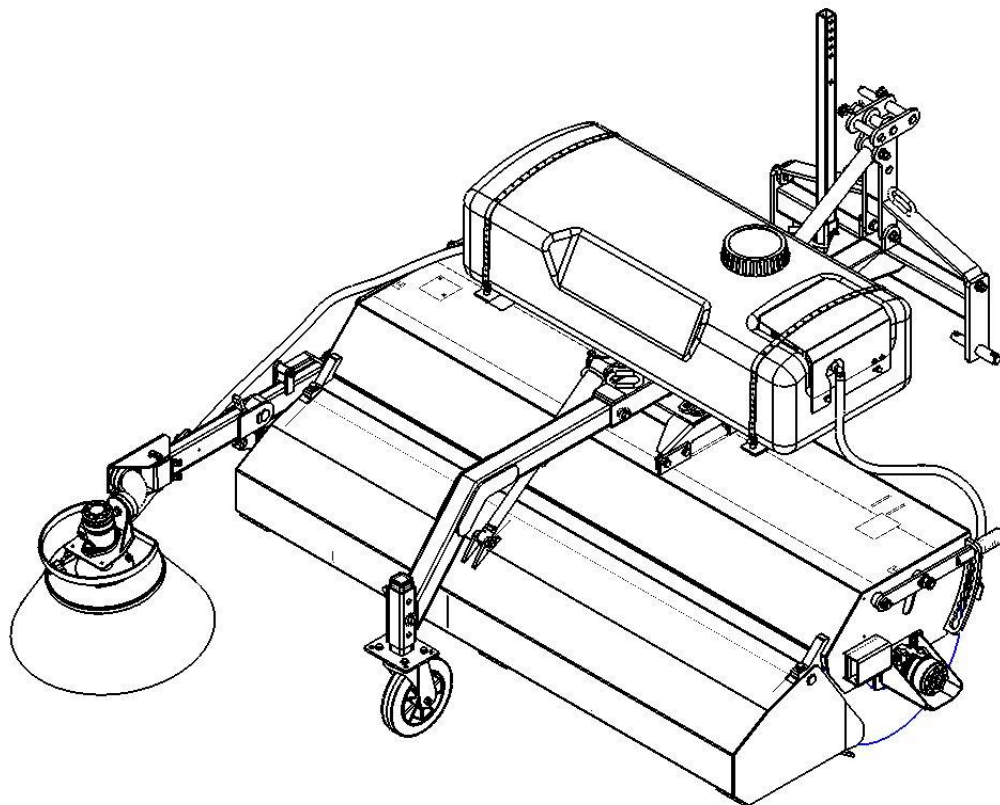




Operating Manual

Sweeper

PLUS 590



59000.0314.0000.00.001-01



03.2016
Printed in Germany



Read and follow these
instructions before the initial
startup.
Keep for future reference.

Introduction

Dear Customer,

You have decided on a quality product from the comprehensive product range of the Tuchel Maschinenbau GmbH. We thank you for your confidence in us.

On receipt of this sweeper, please check for any transport damage or whether parts are missing. On the basis of the delivery note check completeness of the delivered sweeper including any special equipment you ordered. Only immediate claims can be eligible for compensation.

Read and observe this operating manual before first start-up and especially the safety instructions. After careful reading, you will be able to make full use of the advantages of your new vehicle-mounted sweeper.

Ensure that all operators of the sweeper read this operating manual before they use the machine.

The sweeper can be supplied with special equipment. Owing to the individual features of your sweeper, it is possible that not all the descriptions in this operating manual will apply to your particular sweeper. Special equipment items are marked in this operating manual.

If you have any queries about the handling of this sweeper or this operating manual, please do not hesitate to contact us.

Regular servicing and timely replacement of worn or damaged parts will increase the life expectancy of your sweeper.

User assessment

Dear reader,

Our operating manual is regularly updated. Your suggestions for improvements will help us to design an even more user-friendly operating manual. Please send your proposals by fax or e-mail to:

Tuchel Maschinenbau GmbH

Postal address: Holsterfeld 15

D-48499

Salzbergen

Tel.: + 49 (0) 5971-9675-0

Fax.: + 49 (0) 5971-9675-30

E-mail: info@tuchel.com

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1 General

The present operating instructions are valid for the Sweeper PLUS 590.

1.1 Intended applications

The Sweeper PLUS 590 is designed for the attachment to wheel loaders and construction machinery.

Because of its robust construction and the various working widths, this sweeper is suited for permanent use on roads and paths.

The Sweeper PLUS 590 can be mounted via the mechanically or hydraulically operated quick hitch unit of the respective carrier vehicle, fitting a pallet fork arm into fork pockets, via an A-frame or a three-point linkage.

The basic version of the Sweeper PLUS 590 comes as a simple sweeping model (without dirt hopper) and is therefore suitable for cleaning large paved areas.

The various items of additional equipment, such as the dirt hopper with an integrated 3rd support wheel, the water-spraying system for dust binding, one or two side brushes for sweeping near edges, a hydraulical lateral adjustment in order to facilitate operation, extra strong guide rollers, side marker lights and warning flags, permit adaptation to different working environments.

1.2 Information on the product

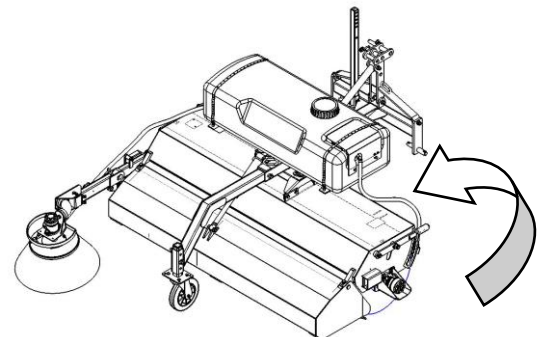
1.2.1 Manufacturer's address

Tuchel Maschinenbau GmbH
 Holsterfeld 15
 D-48499 Salzbergen
 Phone: +49 (0)5971 9675-0
 Fax: +49 (0)5971 9675-30
 E-mail: info@tuchel.com
 Spare parts: service@tuchel.com

1.2.2 Descriptive label

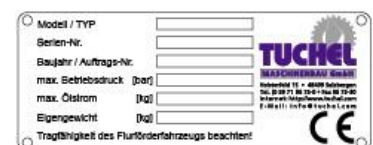
The descriptive label can be found on the nameplate.

Model	<input type="text"/>
Serial No.	<input type="text"/>
Build-year / Job No.	<input type="text"/>
Max. operating pressure [bar]	<input type="text"/>
Max. oil flow [l/min]	<input type="text"/>
Weight [kg]	<input type="text"/>



NOTE

The overall descriptive label (nameplate, safety label, etc.) has the status of a certificate. It must not be changed or rendered illegible and must be replaced if damaged or missing.



1.2.3 Conformity declaration

EC conformity declaration

..... as defined in the EC Machinery Directive 2006/42/EC

The manufacturer:

Tuchel Maschinenbau GmbH

Holsterfeld 15

D-48499 Salzbergen

Herewith declares that the following described machine:

Make: **Sweeper PLUS 590**

Type: **1382**

Machine No.:

Is in conformity with the provisions of the following EU Directives:

- Machine Directive 2006/42/EC
- EMV Directive 2004/108/EC (electromagnetic compatibility)

Applicable standards and technical specifications:

- DIN EN ISO 12100:2011
- DIN EN 13857:2008
- DIN EN 349:2008
- DIN EN 982:2009
- DIN EN 4254:2013
- DIN EN 703:2009

Salzbergen, March 2016

Dieter Beckmann
Managing Director

1.2.4 Information for inquiries and orders

When placing orders for spares or accessories, please provide the type designation, serial no. and the year of manufacture for the Sweeper PLUS 590.

Address: see manufacturer's address

Tel.: + 49 (0) 5971-9675-24

Fax: + 49 (0) 5971-9675-45

Online: <http://www.tuchel.com>

E-mail: info@tuchel.com



- The use of accessories or spare parts from other manufacturers is not permitted.
- Original accessories and original spare parts promote safety.
- The use of other accessories / spare parts voids any liability for resulting consequences.

1.2.5 Formal information for operating instructions

Document number: 59000.0314.0000.00.001-01

Date of creation: March 2016

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1.2.6 Details of operating pressures

Maximum operating pressure for continuous use 160 bar

Type of oil: Hydraulic oil ISO VG 46 DIN 51524 (e.g. Vitam GF 46 from Aral)

1.2.7 Connections

Hydraulic connections:
see following table

<ul style="list-style-type: none"> • Hydr. drive 	1 x EW
<ul style="list-style-type: none"> • Hydr. drive • Dirt hopper 	1 x DW
<ul style="list-style-type: none"> • Hydr. drive • Dirt hopper • Side brush 	1 x DW
<ul style="list-style-type: none"> • Hydr. drive • Dirt hopper • Electro-hydr. lateral adjustment 	1 x DW
<ul style="list-style-type: none"> • Hydr. drive • Dirt hopper • Electro-hydr. lateral adjustment • Side brush 	1 x DW
<ul style="list-style-type: none"> • Hydr. drive • Dirt hopper • Electro-hydr. lateral adjustment • Electro-hydr. swinging side brush 	1 x DW

EW = Single-action control circuit

DW = Double-action control circuit

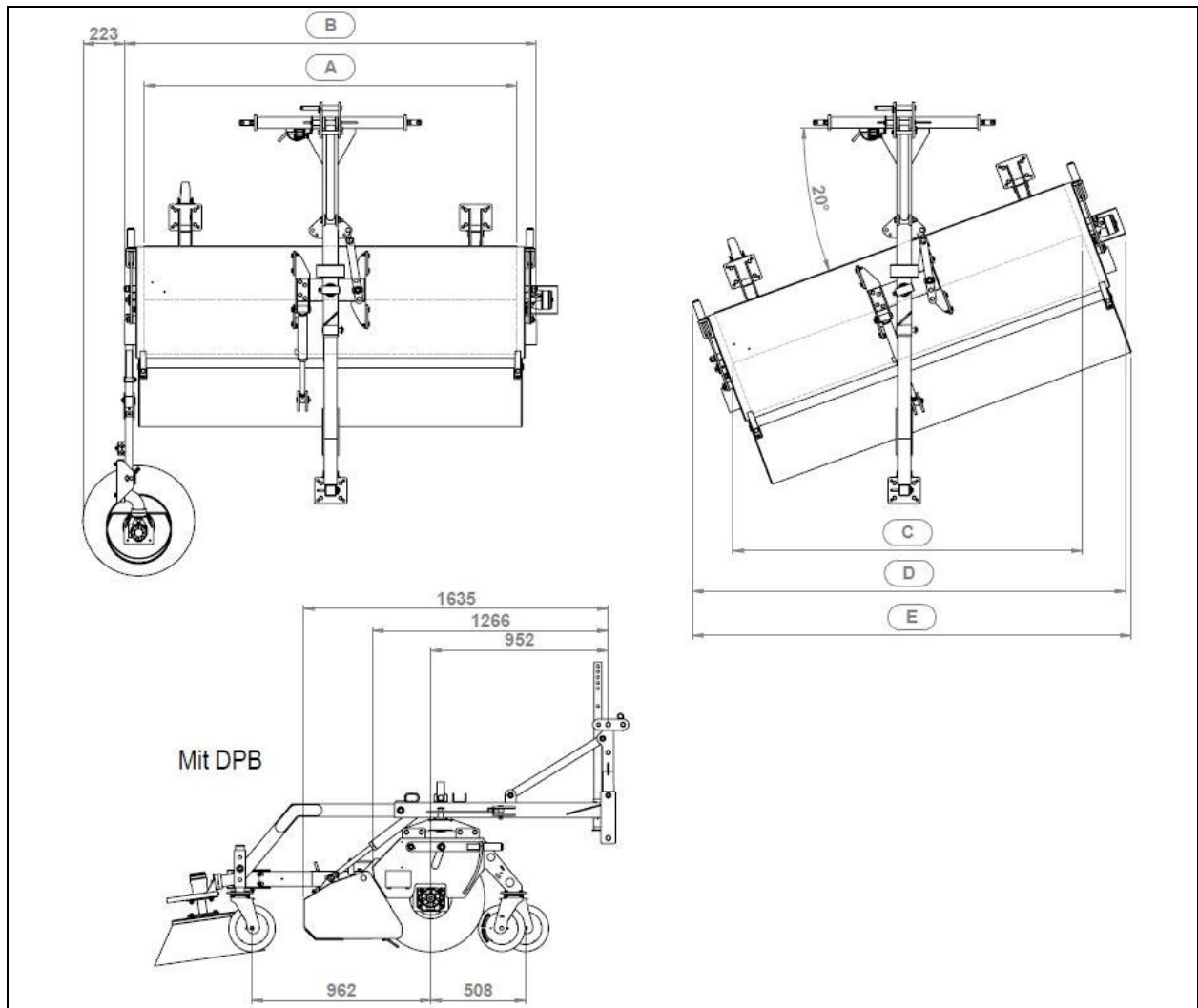
1.2.8 Approved utilisation

The Sweeper PLUS 590 is a machine that can be moved by means of a hydraulic circuit and by means of the adaptation to the corresponding carrier vehicle. Its purpose is the cleaning of paved/hard covered surfaces with normal level of dirt.

We, as the manufacturer, accept no liability for safety in the event that the machine is used for a purpose other than that described above; the risk for this lies solely with the user.

Approved utilisation also includes fulfilment of the works for operation, maintenance and repair specified by us as well as associated conditions.

1.2.9 Technical data sheet



Technical Data PLUS 590		1.35	1.50	1.80	2.00	2.30	2.60
A = working width	mm	1350	1500	1800	2000	2300	2600
B = total width (motor inside)	mm	1564	1714	2014	2214	2514	2814
B = overall width (outside motor)	mm	1677	1827	2127	2327	2627	2927
C = working width at 20° angle setting	mm	1267	1407	1689	1877	2158	2440
D = overall width at 20° angle setting (without hopper)	mm	1716	1858	2139	2326	2608	2889
E = overall width at 20° angle setting (with hopper)	mm	1747	1888	2170	2357	2639	2920
Weight of basic machine	kg	264	274	294	308	329	353
Weight of basic machine + hopper	kg	329	344	373	398	429	462
Volume of dirt hopper	l	166	184	220	244	280	315
Ø Main brush	mm	590	590	590	590	590	590
Ø Side brush	mm	600	600	600	600	600	600

2 Safety information

This chapter contains important information for the owner and the operator for safe and problem-free operation of the sweeper.



Please observe all the safety instructions of this operating manual.

Most accidents are caused by the simplest safety rules not being observed.

By observing all the safety instructions in this operating manual, you are helping to prevent accidents.

2.1 Safety-conscious working practices

The machine described is built in accordance with state of the art technology and the recognised safety regulations. However, in the use of the sweeper hazards and impairments can arise:

- to life and limb of the operator or third parties,
- to the sweeper itself,
- to other goods or equipment.

For the safe working of the sweeper please observe

- this operating manual, especially:
 - The basic safety instructions, the operation-related safety instructions and the operating instructions,
 - The information on approved utilisation.
- the warning instructions on the sweeper,
- the generally applicable national regulations for safety at work , for accident prevention and for the protection of the environment,
- the national traffic regulations for road transport.

Operate the sweeper only in a technically safe and perfect condition.

WARNING



Danger to persons due to squashing, cutting, catching, pulling-in or impact can occur when the vehicle and sweeper do not possess adequate safety preparation for use in traffic and in operation.

Before each use, check the vehicle and sweeper for traffic and operating safety.

2.2 Organisational measures



The operating manual:

- Should always be kept at the place of use of the sweeper.
- Must be freely available at all times for operator and service personnel.

2.2.1 Obligations of the owner

The owner is under obligation

- to observe the generally applicable national regulations for safety at work, for accident prevention and for the protection of the environment,
- to only permit persons to work with/on the sweeper who:
 - are familiar with the fundamental regulations of safety at work and accident prevention,
 - are trained in working with / on the sweeper,
 - have read and understood this operating manual.
- to keep all warning instructions about the sweeper in a legible condition,
- to renew damaged warning instructions,
- to provide the necessary personal protective equipment such as:
 - protective goggles,
 - working gloves according to DIN EN 388,
 - safety shoes,
 - protective suit,
 - skin-protection products, etc.

2.2.2 Obligations of the operator

All persons who are tasked with working with/on the sweeper are obligated, before starting to work:

- to observe the national generally applicable regulations for works protection, for accident prevention and for the protection of the environment,
- to read and observe the Chapter "Basic safety instructions" from pages 2-7 of this operating manual,
- to read the "Warning information and instructions information" from pages 2-16 of this operating manual and to observe the warning instructions when operating the sweeper,
- to familiarise themselves with the sweeper,
- to read the chapters of the operating manual that is important for the implementation of the working duties allocated to them.

In the event that the operator finds that a safety item is not in perfect condition, then the operator must remove this defect immediately. If this is not within the working duties of the operator or if the relevant knowledge is missing then the operator must report the defect to his superior or the owner.

2.2.3 Qualifications of the persons and activities carried out



Only trained and instructed persons may work with/on the sweeper. The owner must clearly define the responsibilities of the persons for its operation, servicing and maintenance.

A person in training may only work with/on the sweeper under the supervision of an experienced person.

The operator may only carry out the work described in this operating manual.

Only specialised workshops that have specialised expertise may carry out work on the sweeper. Specialised workshops have qualified personnel and suitable aids (tools, lifting and support equipment) for carrying out technical and safe work.

This applies to all works.

- that are not mentioned in this operating manual,
- and which are marked in this operating manual in the appendix "Workshop work".

Activity \ Persons	Specially trained persons ¹⁾	Trained person ²⁾	Individuals with subject-specific training (workshop) ³⁾
Loading / transport	X	X	X
Start-up	--	X	X
Setting up, equipping	--	X	X
Operation	--	X	X
Cleaning, servicing and maintenance	--	X	X
Error search and repair	--	X	X
Disposal	X	--	--

Key: X..permitted --..not allowed

- 1) A person who can undertake a specific task and can carry it out for a correspondingly qualified company.
- 2) Trained persons are those who have been instructed about and, where appropriate, trained on their appointed duties and on the possible hazards due to incorrect actions and also about the required protective equipment and protective measures.
- 3) Specialists are persons with trade-specific training (skilled technician). Based on their technical training and the knowledge of the applicable regulations, they are in a position to assess the work assigned to them and recognise possible hazards.

Note:

A qualification equal to that of a specialist training can also be obtained by several years' experience gained in the relevant field of work.

2.3 Product safety

2.3.1 Safety-oriented operation of the sweeper

The sweeper may only be operated by a person from the driver's position of the vehicle when there is no person within the danger area around the vehicle. For this purpose, take note of the Chapter "Safety conscious working practices", Page 2-7.

2.3.2 Safety and protection equipment

- Operate the sweeper only when all safety and protective equipment has been attached and is fully functional.
- Defective or disassembled safety and protective equipment can lead to dangerous situations.
- Check all safety and protective equipment for externally visible damage and functionality before taking the sweeper into use.

2.3.3 Structural modifications

- Structural modifications as well as additions to or conversions of the sweeper may only be carried out after you have obtained the written approval of the manufacturer.
- The conformity declaration and the CE stamp for the sweeper lose their validity in the event of unauthorised structural modifications as well as additions or conversions.
- Only use original equipment spare parts or conversion components or accessories approved by the manufacturer so that:
 - The conformity declaration and the CE stamp of the sweeper retain their validity.
 - The proper function of the sweeper is ensured.
- The manufacturer accepts no liability for damage due to:
 - unauthorised modifications of the sweeper,
 - non-approved conversion equipment and accessories,
 - welding or drilling works on load-bearing parts of the sweeper.

2.3.4 Spare parts, wear parts and consumables

Immediately replace equipment parts that are not in perfect condition.

For this purpose, use only original parts from the manufacturer or parts approved by the manufacturer. In the event of use of spare and wearing parts from third party manufacturers, there is no guarantee that they have been designed and produced for the loading and safety requirements.

The manufacturer accepts no liability for damage caused by the use of non-approved spare and wearing parts or consumables.

2.3.5 Warranty and liability

In principle, our "General sales and delivery conditions" apply. These have been handed to the operator at the latest with the signing of the contract.

Guarantee and liability claims for personal injury and damage to property are excluded when derived from one or more of the following causes:

- Improper use of the sweeper,
- Unprofessional fitting, start-up, operation or servicing of the sweeper,
- Operating the sweeper with defective safety equipment or improperly attached or non-functioning safety and protective equipment,
- Non-observance of the instructions in the operating manual as regards start-up, use and servicing,
- Unauthorised structural modifications of the sweeper,
- Defective monitoring of the component parts subject to wear,
- Unprofessionally conducted repairs,
- Catastrophe cases caused by the effects of foreign bodies or force majeure.

2.4 Basic Safety Instructions

Basic safety instructions:

- Apply fundamentally for safety-oriented operation of the sweeper.
- Are summarised in the following sub-chapters.

2.4.1 General safety and accident prevention instructions

- Besides the safety instructions in this chapter, also observe the generally applicable national safety and accident prevention instructions.
- Wear your personal protective equipment when working on the sweeper.
- Observe the warning information and instructions affixed to the sweeper. They will supply you with important advice for safety-oriented and trouble-free operation of the sweeper.
- Besides the basic safety instructions of this chapter, also observe the activity related safety instructions of the other chapters.
- Instruct people to leave the surroundings of the sweeper before moving it or setting the sweeper into operation. Pay special attention to children.
- Do not carry persons or objects on the vehicle. The transport of persons or objects on the sweeper is prohibited.
- Drive in such a manner that the vehicle with the attached sweeper is always under safe control.
- Take into account your personal capabilities, the road, traffic, visibility and weather conditions, the driving characteristics of the vehicle, as well as the influence of the sweeper.

a) Coupling and uncoupling the sweeper

- Couple and transport the sweeper only with a carrier vehicle that is suited for the purpose.
- Couple the sweeper to the specified equipment in the prescribed manner.

- Ensure that the following values are not exceeded when coupling the sweeper to the front of the vehicle:
 - The permissible overall weight of the vehicle,
 - The permissible axle loads of the vehicle,
 - The permissible support load at the point of coupling of the vehicle,
 - The permissible trailer load of the coupling attachment,
 - The permissible tyre load capacity of the vehicle.
- Secure the vehicle and sweeper against rolling away before coupling or uncoupling the sweeper.
- Persons are not permitted to be between vehicle and sweeper when the vehicle moves towards the sweeper.

Those present may only be there to give directions next to the vehicles and are only to step between the vehicles when the latter are stationary.
- During coupling and uncoupling, secure the required support equipment into the support position (stability).
- When activating the support equipment, be aware of the danger of crushing and shearing action.
- Be particularly careful when coupling to or uncoupling the sweeper from the vehicle. Between the vehicle and the sweeper there are points where crushing or shear-action could occur in the area around the couplings.
- Persons are not allowed to be positioned between the vehicle and sweeper when operating the three-point hydraulics.
- Check the coupled supply lines. Coupled supply lines:
 - must be able to easily accommodate all movements when driving round curves without tension, bending or rubbing.
 - must not rub against other components.
- Always position the uncoupled sweeper so that it is stable (cannot fall over).

b) Use of the sweeper

- Before starting work, familiarise yourself with all the equipment and operating elements of the sweeper as well as with their functions. Trying to do this while working on it is too late
- Wear tight-fitting clothing. Loose clothing increases the danger of catching onto or winding round drive shafts.
- Operate the attachment only if all protective devices have been fitted and positioned to provide protection.
- Note the maximum loading of the sweeper and the permissible axle and support loads of the vehicle. If possible, drive with only partly filled load compartment.
- The presence of persons is prohibited:
 - in the working / hazard area of the sweeper,
 - in the dirt ejection region of the sweeper,
 - within the rotation and swinging areas of movable parts of the sweeper,
 - under raised and unsecured movable parts of the sweeper.

- There are squashcrushing and shear-action points on moving parts of the sweeper operated by external-forces (e.g. hydraulics)
- You must only activate external-force operated parts of the sweeper when there is no person present in the hazard area of the sweeper.
- Secure the vehicle against inadvertent starting and rolling, before leaving the vehicle.
- Support raised covers securely before staying under the raised covers.

c) Transporting the sweeper

- Before transporting check:
 - The proper connection of the supply lines,
 - The hydraulic system for obvious defects,
- Always ensure sufficient steering and braking ability of the vehicle.
The sweeper attached to the vehicle and the rear loads influence the movement ability as well as the steering and braking of the vehicle.
- Use rear weights if required
- Always fix the rear weights to the provided fixing points according to the instructions.
- Take into account the maximum loading of the attached sweeper and the permissible axle and support loads of the vehicle.
- Check the braking before moving off. The vehicle must achieve the prescribed braking interval for the combination of vehicle plus sweeper.
- When driving round curves with attached sweeper take the broad slewing radius and the centrifugal mass of the sweeper into account.
- Avoid sudden swerves, in particular when driving on a slope, uphill, downhill or across the axis of the slope.
- Before transporting place all movable parts of the sweeper into transport position.
- Before transporting secure all movable parts of the sweeper are in their transport position. For this purpose make use of the transport fixings provided.
- Adapt your driving speed to the prevailing conditions.

2.4.2 Hydraulic system

The hydraulic system is at high pressure.

- Ensure correct connection of the hydraulic hose lines.
- When connecting the hydraulic hose lines, ensure that the hydraulic system of the vehicle is de-pressurised.
- Do not block any operating levers on the vehicle that serve for direct operation of hydraulic or electrical movement of components, e.g. folding, swinging and pushing processes.

The respective movements must stop automatically when the corresponding levers are released.

This does not apply to movements of equipment:

- that are continuous,

- that are automatically regulated,
- that require a floating or pressure loaded position due to their function.
- Before working on the hydraulic system:
 - lower the sweeper,
 - secure raised movable parts of the sweeper against unintended lowering,
 - depressurise the hydraulic system,
 - switch off engine of the vehicle,
 - apply the parking brake,
 - remove the ignition key.
- Have the hydraulic hoses checked for operating safety and condition at least once a year by an expert.
- Replace any hydraulic hoses with obvious defects, damage and ageing. Use only original hydraulic hose lines.
- The period of use of the hydraulic hose lines must not exceed six years including a possible storage time of at most two years.

Hoses and hose connections are subject to natural ageing even with proper storage and permissible level of use, so that their storage time and period of use are limited. Deviations this period of use can be determined according to the experience values, especially when taking the hazard potential into account. The same guidelines apply for hoses and hydraulic hose lines in thermoplastic materials.

- Never attempt to seal leaking hydraulic hose lines with your hand or fingers!
Escaping high pressure fluid (hydraulic fluid) may pass through the skin and ingress into the body, causing serious injuries!
In the case of injury from hydraulic oil, contact a doctor immediately. Danger of infection.
- Because of the possible serious infection danger, never feel for leaks with the naked hand. When searching for possible leaks use suitable aids (cleaning spray, special leak-searching spray).

2.4.3 Sweeper

- Only one person may operate the sweeper. Instruct people to leave the hazard zone of the sweeper.
- It is prohibited:
 - To climb onto the upper container edge of the collecting container,
 - To climb or reach into the collecting container hopper when the motor is running.
- It is prohibited for anyone to remain within the sweeper working area.
Danger due to objects flung out of the sweeper discharge opening.
- Warn people leave the working area of the sweeper before operating the sweeper.
- Do not put any foreign objects in the collecting hopper.

2.4.4 Cleaning, servicing and maintenance

- Carry out the defined works for cleaning, servicing and maintenance at the proper times.
- Secure the vehicle and sweeper against inadvertent starting or rolling before the sweeper is cleaned, serviced or maintained.
- Existing mechanical or hydraulic/electrical residual energies can cause inadvertent movement of the sweeper.

When working on servicing and maintenance, take account of the presence of residual energy in the sweeper. Warning instructions designate components with residual energy. Detailed instructions are found in the respective chapters of this operating manual.

- Secure all operating media, such as hydraulic oil against inadvertent start-up.
- Carefully fix and secure larger assemblies onto their lifting gear when carrying out replacement work on these larger assemblies.
- Regularly check secure seating of bolts and nuts. Retighten any loosened bolts and nuts.
- Secure the lifted sweeper or lifted parts of the sweeper against inadvertent lowering before cleaning, servicing or maintaining the sweeper.
- When replacing working tools with cutting edges use suitable tools and gloves.
- Check loosened bolt connections for tight seating. Check the function of safety and protective equipment after completion of maintenance works.
- Dispose of oils, greases and filters in a proper manner.
- Properly handle and dispose of substances and materials for cleaning the sweeper, especially:
 - when working with lubricating systems and installations,
 - when cleaning with solvents.
- Disconnect the cable from the dynamo and battery of the vehicle before carrying out electrical welding works on the vehicle or the attached sweeper.
- Spare parts must satisfy at least the defined technical requirements of the manufacturer. This is ensured by the use of original parts.
- Please observe the service intervals for wearing parts.

2.5 Activity-related safety instructions and important information

The operating manual contains activity-related safety instructions and important information. The purpose of signal words and symbols is to make activity-related instructions and important safety information visible at a glance.

Activity-related safety instructions:

- Warn of danger that can occur in a particular situation or in connection with a certain behaviour,
- Are mentioned in the individual chapters immediately in front of an activity associated with danger,
- Are characterised by the triangular safety symbol and a preceding signal word. The signal word describes the seriousness of the threatening danger.

DANGER



DANGER

Indicates an immediate danger with high risk that can cause very serious injury (loss of limbs or long-term injury) or death if it is not avoided.

Non-observance of the safety instructions marked with "DANGER" means the possibility of very serious injury, possibly resulting in death.

WARNING



WARNING

Indicates possible hazards with medium risk of serious injuries or death when they are not avoided.

Non-observance of the safety instructions marked with "WARNING" means the possibility of very serious injury possibly resulting in death.

CAUTION.



CAUTION.

Indicates possible hazards with a small risk of light or medium injuries or property damage if they are not avoided.

Non-observance of the safety instructions marked with "CAUTION" means the possibility of light or medium injuries or property damage.

2.6 Warnings and instruction notes



The following instructions are affixed to the sweeper:

- Warning instructions indicate danger points on the sweeper and warning of dangers that can occur in a particular situation or in connection with certain behaviour.
- Instructions contain information regarding proper handling of the sweeper.

Always keep these instructions in a clean and easily legible condition. Replace illegible instructions. Obtain the warning instructions on the basis of the order number from the dealer.

A warning instructions consists of 2 pictograms:

(1) Pictogram describing the danger

The pictogram illustrates the danger, surrounded by a triangular safety symbol.

(2) Pictogram for avoiding the danger

The pictogram illustrates the instruction how to avoid the danger..

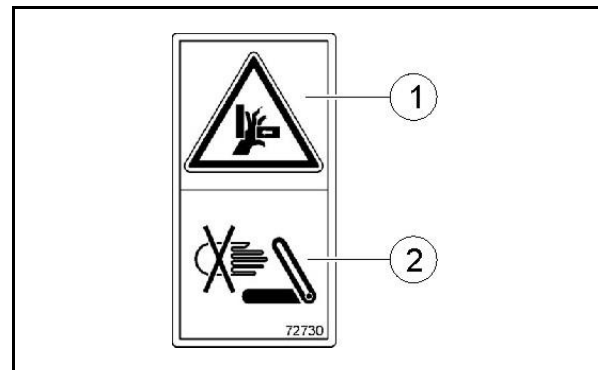


Fig. 2.1

Notes on the warnings

The following list contains:

- in the right column all warnings fixed to the sweeper,
- In the left column the information relative to the warning shown on the right:
 1. Order number.
 2. Description of danger, e.g. "Danger of crushing for finger or hand caused by accessible, movable parts of the sweeper."
 3. The consequences of non-observance of the instruction(s) for avoiding the danger, e.g. "This danger can cause serious injury with loss of limbs."
 4. The statement(s) for avoiding the hazard, e.g. "Never reach into the danger area as long as the engine of the vehicle is running with hydraulic system connected. Instruct people to leave the danger zone around the sweeper before moving any parts of the sweeper."

Order number and explanation

Warning instructions

40000340

Read and observe the operating manual and safety instructions before using the sweeper.



40000342

When lowering the vehicle, keep at a sufficient distance!

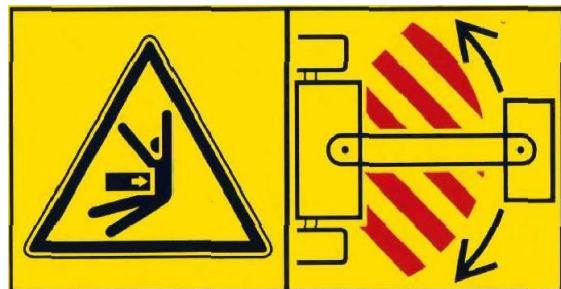
- Instruct persons and animals to leave the hazard area.
- Wait until all movable parts of the sweeper are inactive before reaching into the danger point.



40000343

Do not enter the slewing area during operation!

- Warn persons and animals out of the hazard area.
- Wait until all movable parts of the sweeper are inactive before reaching into the danger point.



40000338

Danger of cutting or loss of finger and hand caused by accessible, moving working tools!

This danger can result in serious injuries with loss of body parts.

- Never reach into the danger point as long as the engine is running with hydraulic system connected.
- Wait until all movable parts of the sweeper are inactive before reaching into the danger point.



3 Product description



This chapter contains:

- Comprehensive information on the construction of the sweeper.
- The names of the individual components.

If possible, read this chapter in the immediate vicinity of the sweeper.
This is the best way to familiarize yourself with the sweeper.

3.1 Overview – Components

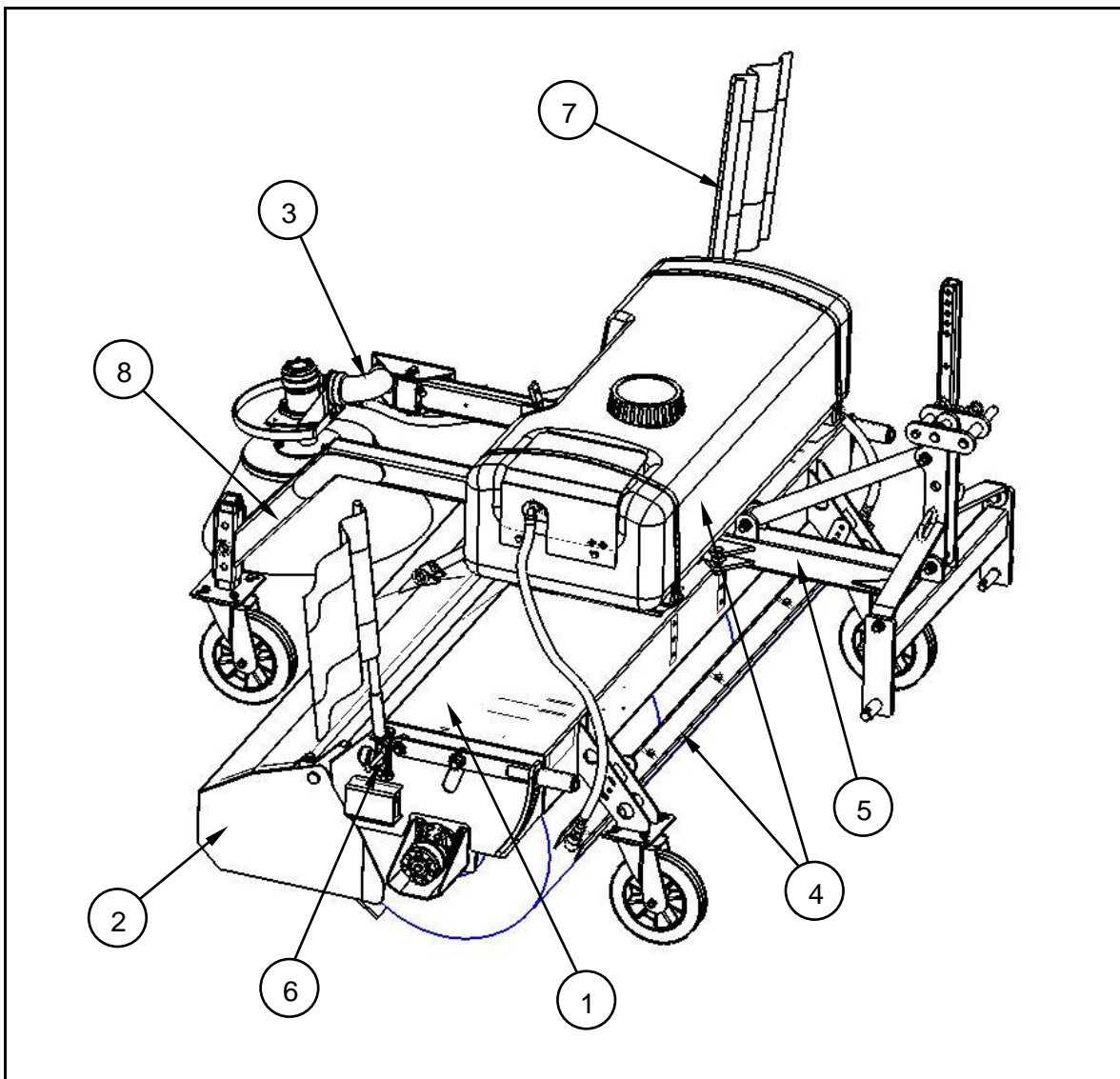


Fig. 3.1

- 1) Sweeper chassis
- 2) Dirt hopper
- 3) Side brush
- 4) Water tank with sprayer
- 5) Attachment system (three-point linkage)
- 6) Side marker lights, prescribed for driving on public roads
- 7) Warning flags
- 8) 3rd support wheel

3.1.1 Description of product and accessories

- The Sweeper PLUS 590 permits dirt collection as well as simple sweeping operations. The simple sweeping operation can be carried out without having to disassemble the dirt hopper.
- The chassis consists of a robust, distortion-free welded structure.
- The main cylinder brush is freely suspended in the frame with a lever system. The brush setting is adjusted by means of a spacing bar. By pushing the spacer lever (leverage effect) the main cylinder brush can be adjusted as required ensuring a consistently good sweeping result.
- A powerful external hydraulic motor with a impact protection directly drives the main cylinder brush. The speed of rotation of the main cylinder brush depends on the oil flow and the operating equipment of the carrier vehicle.
- The main cylinder brush is provided as standard with 100% PP-Beeline brush rings. The brush ring diameter is 590 mm.
- The opening and closing of the dirt hopper is carried out by operating a hydraulic cylinder. The controls are operated from the carrier vehicle. A wear-resistant PU-sealing strip is attached along the whole length of the lower edge of the dirt hopper so as to guide the hopper edge evenly and without damage.
- The Sweeper PLUS 590 is appropriately equipped for the different kinds of carrier vehicles, via a direct attachment system. The relevant version allows attachment via three-point linkage, an A-frame or onto municipal vehicles, farm loaders as well as wheeled loaders.
- Pendicular compensation ensures level balance in operation, even on rough, uneven ground.
- With the aid of the mechanical or (optionally hydraulic) slant adjustment it is possible to swing the Sweeper PLUS 590 20° to the right or the left.

3.2 Add-on parts

- **Water-spray system:**
For dust binding with 100 or 200 litre water tank and 12 V (24 V) glanded pump.
- **Hydr. lateral adjustment:**
Angled positioning of Sweeper PLUS 590 by means of hydraulic cylinders. A double-acting hydraulic control circuit is required on the carrier vehicle.
- **Hydr. side brush**
Sweeping close to the edge, with control of rotation speed.
- **Road traffic equipment:**
Consisting of warning flags and/or side-marker lights. Both are prescribed and to be used in public road traffic according to the regulations of the StVZO.(German Road Traffic Authority)
- **Dirt hopper:**
Hydraulic emptying by means of a hydraulic cylinder with shut-off valve for simple sweeping mode (without removing the dirt hopper).

3.2.1 Main brush

The brush diameter is 590 mm.
With brush rings.
Optimised sweeping contact angle (1).

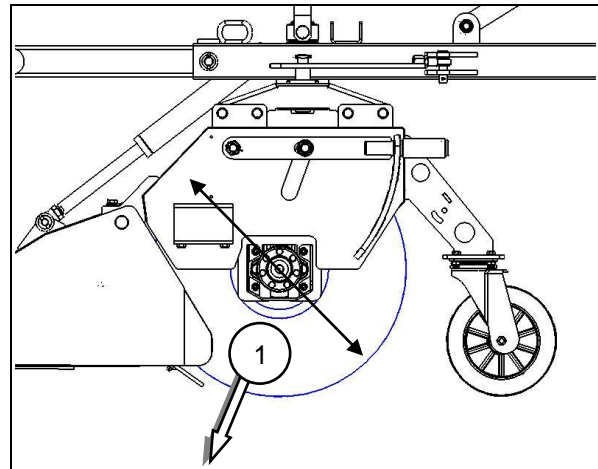


Fig. 3.2

3.2.2 Guide rollers

The size of the guide rollers is
250 x 50 mm.
Optionally also 250 x 80 mm.

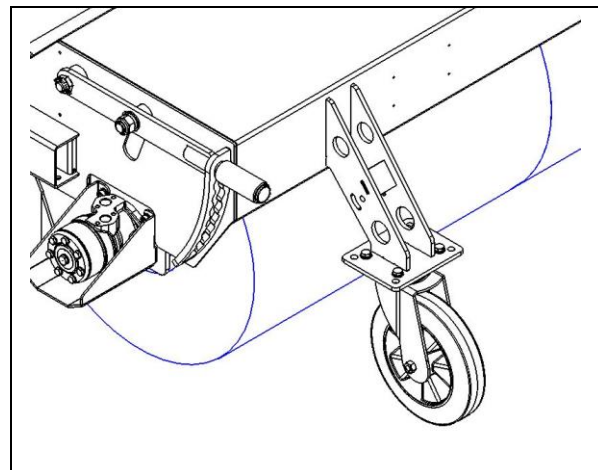


Fig. 3.3

3.2.3 Lateral adjustment

The lateral adjustment occurs via a
double-acting hydraulic cylinder or
mechanical lever.
The Sweeper PLUS 590 can thus be
slewed 20° to the left or right.

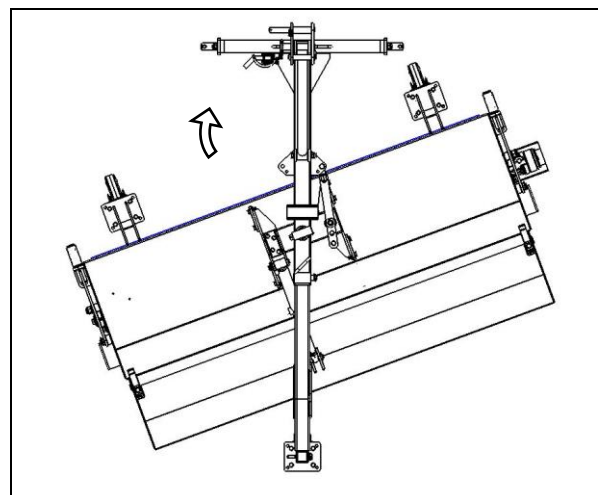


Fig. 3.4

3.2.4 3rd Support wheel

3rd support wheel for an equalised guidance over the ground, height adjustable.

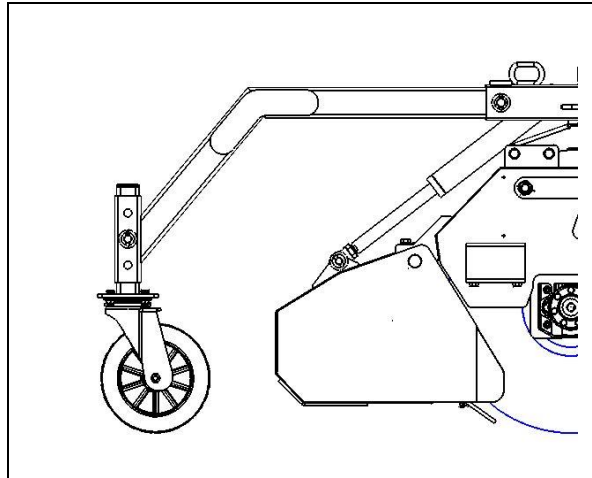


Fig. 3.5

3.2.5 Road traffic equipment

Road traffic equipment with 12 or 24 volts.

Warning flags with holders and/or side-marker lights with LED illumination.

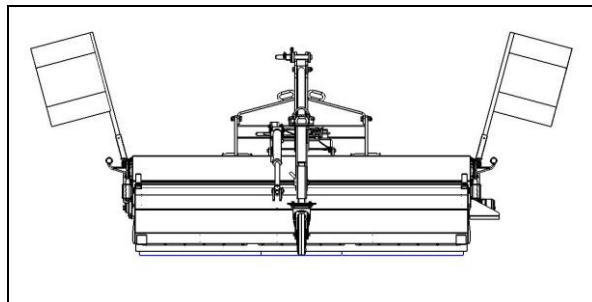


Fig. 3.6

3.2.6 Water-spray system:

With 100 or 200 litre tank.

Water pump (12 or 24 Volts).

Spray jets also for side brushes.

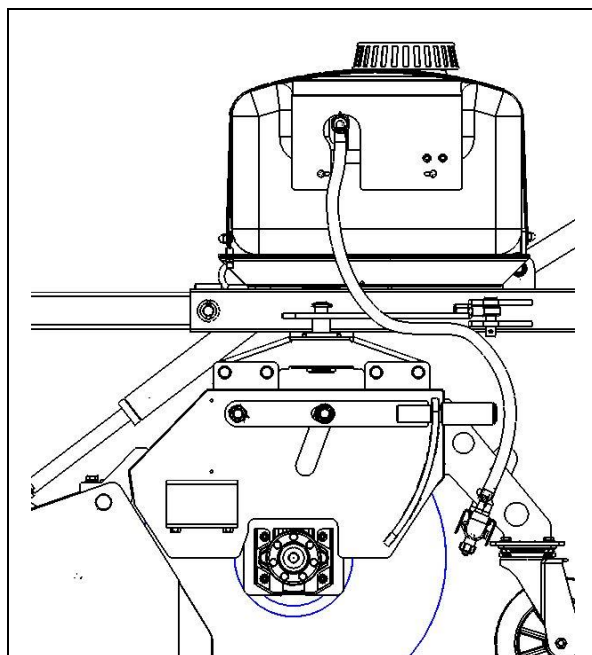


Fig. 3.7

4 Coupling and uncoupling the sweeper



- When coupling and uncoupling the sweeper also take note of the Chapter "Safety-oriented working", page 2-7.
- With each coupling and uncoupling check the sweeper for obvious defects. In this take into account the Chapter "Obligations of the operator", page 2-8

WARNING



Danger of crushing or impact of persons in the lifting region of the three-point hydraulics of the vehicle when coupling and uncoupling the sweeper.

Activate the operating lever for the three-point hydraulics of the vehicle:

- Only from the particular defined working place,
- Never when persons are present in the hazard area between the vehicle and the sweeper.
- Never when you are in the hazard area between the vehicle and the sweeper.

WARNING



Danger of crushing or impact of persons can occur if the vehicle and sweeper inadvertently starts or rolls during coupling and uncoupling.

Ensure that the vehicle is protected against inadvertent starting and rolling before entering the hazard area between the vehicle and the sweeper for coupling and uncoupling, see page 2-4.

4.1 First installation onto carrier vehicle



- In the first installation of the Sweeper PLUS 590 with water spray system or lighting equipment, it is necessary to install the switch box in a suitable position inside the carrier vehicle.

- Insert plug (1) into the dashboard socket or connect directly to the battery.
- Socket (2) for electrical connection cable of Sweeper PLUS 590.
- Fuse (3)
- On / Off switch (4)

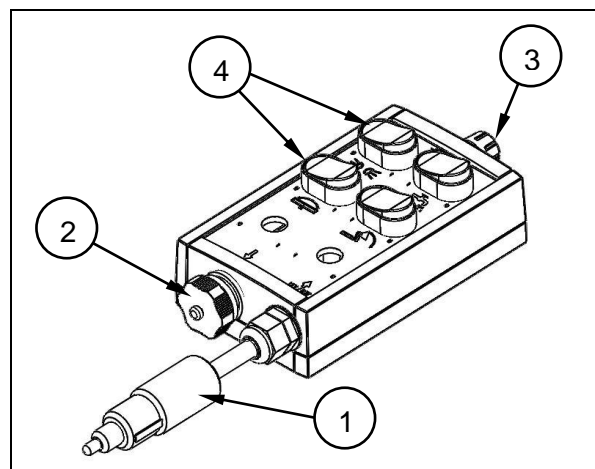


Fig. 4.1

4.2 Installation of Sweeper PLUS 590

WARNING



Danger of crushing or impact of persons can occur if persons are present between vehicle and sweeper during coupling and uncoupling.

Instruct persons to leave the danger area between the vehicle and the sweeper before moving in front of the sweeper.

Any helpers present may only be positioned next to carrier vehicle to give directions and are only allowed to step between vehicle and sweeper when both have come to a full standstill.

WARNING



Danger through failure of the energy supply between vehicle and sweeper can occur due to damaged supply lines.

Pay attention to the run of the supply lines when coupling the lines. The supply lines:

- must easily adapt to all movements without tension, bending or rubbing,
- must not rub against other parts.

WARNING



Danger due to crushing, dragging -in, catching and impact for persons can occur if the sweeper inadvertently separates from the vehicle.

- Note the maximum permissible support loads, towing and axle loads of the vehicle.
- Make proper use of the equipment provided for connecting vehicle and sweeper.
- Before starting to move with the sweeper coupled, check whether the quick-release unit of the four-point mounting frame is correctly locked.

4.2.1 Three-point linkage - "front mounting"



- The safety regulations from chapter 4.2 apply.
- Undertake work on the sweeper only with engine switched off and after depressurising the hydraulics. Remove the ignition key, secure carrier vehicle against inadvertent starting up or rolling.
- Check three-point hitch for contamination and clean if necessary.

- Move carrier vehicle up to 300 mm distance to the Sweeper PLUS 590
- Insert pin diameter (1) or (2) according to the trailer load category of the vehicle manufacturer and secure with spring cotter pin (3).

➔ Fit upper link and secure according to the manufacturer's instructions.
The adjustment of the upper link must be undertaken so that the sweeper attachment unit is vertical to the ground.

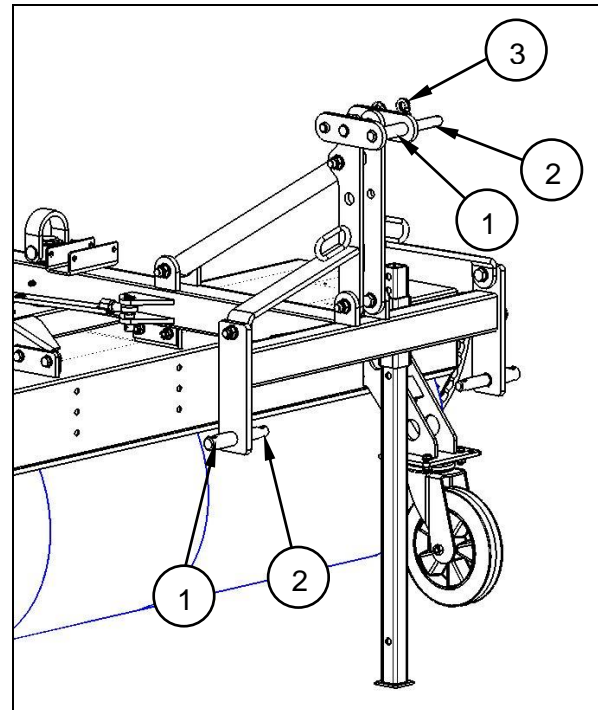


Fig. 4.2

- Pull out cotter pin (4) and locking bolt (5), then pull the parking stand (6) upwards and secure it again via the bottom hole.
- Connect hydraulic hoses according to the instructions of the vehicle manufacturer.
- Connect electrical cables for water-spray system or lighting to the switch box inside the carrier vehicle.
- Raise sweeper and carry out a function test.

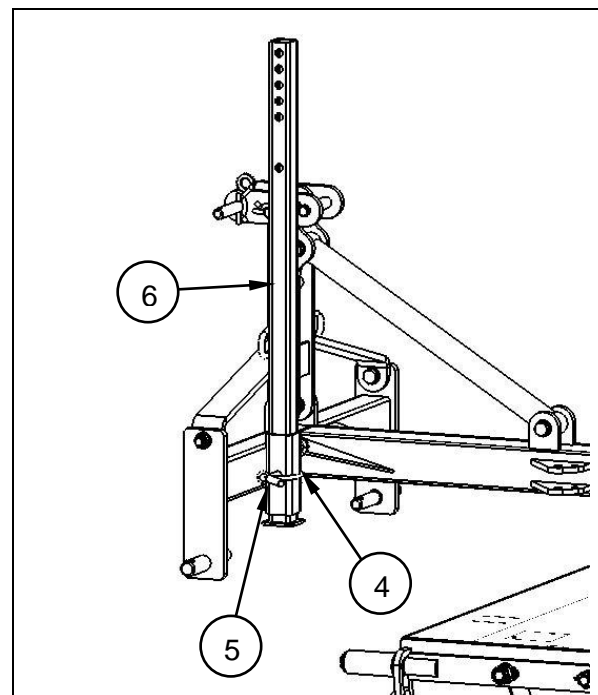


Fig. 4.3

4.2.2 Three-point linkage - "rear mounting"



- The safety regulations from chapter 4.2 apply.
- Undertake work on the sweeper only with engine switched off and after depressurising the hydraulics. Remove ignition key, secure carrier vehicle against inadvertent starting up or rolling.

- Remove hydraulic hoses out of the loops from the three-point linkage.
- Dismantle the linch pin (7) and bolt (8).
- Swing the slant adjustment bar (9) or respectively the slant cylinder to the side.
- Dismantle the cotter pin (10) and bolt (11) from the central bolt.
- Disconnect bushing (12) from the central pin (13).

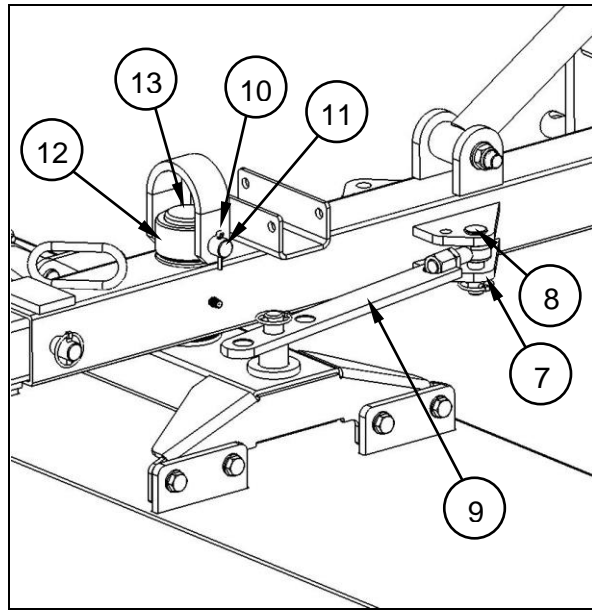


Fig. 4.4

- Remove the three-point linkage from the central bolt, rotate 180 ° and put it back into place.
- Push bushing (12) back into place and secure with bolt (11) and new cotter pin.
- Mount the slant adjustment bar (9) or slant cylinder again with the bolt (8) and linch pin (7) on the three-point linkage.
- Hook the hydraulic hoses back into the loop of the three-point linkage.
- Check the routing of the power cable.
 - ➔ **Check the routing of the hydraulic hoses, as they can be damaged through catching or pinching.**
 - ➔ **Carry out the steps for rear mounting in the same order as provided in the instructions for front mounting above.**

4.2.3 A-frame



- The safety regulations from chapter 4.2 apply.
- Undertake work on the sweeper only with engine switched off and after depressurising the hydraulics. Remove ignition key, secure carrier vehicle against inadvertent starting up or rolling.
- Check attachment system for contamination and clean if necessary.

- Compare connecting height of the carrier vehicle's attachment with that of the sweeper's attachment.
- To re-locate the attachment system, unscrew the screws (1) on either side; adjust the perforated bar (2) and secure with the screws and new locknuts.
- Insert front attachment into the A-frame and lock.

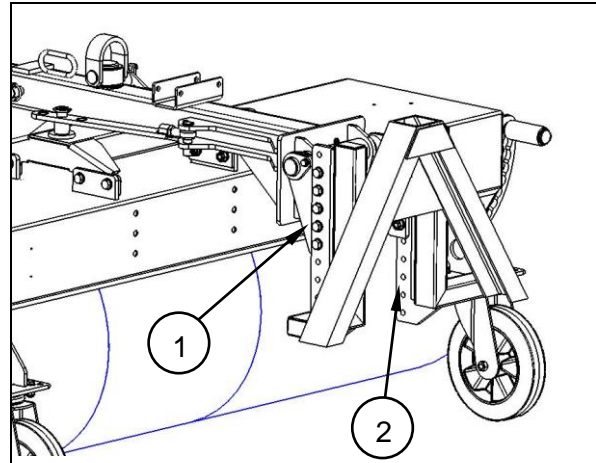


Fig. 4.5

→ Check the correct fitting of the hitch!

- Connect hydraulic hoses according to the instructions of the vehicle manufacturer.
- Connect electrical cables for water-spray system or lighting to the switch box inside the carrier vehicle.
- Raise sweeper and carry out a function test.

4.2.4 Wheel loader attachment system



- The safety regulations from chapter 4.2 apply.
- Undertake work on the sweeper only with motor switched off and depressurised hydraulics. Pull out ignition key, secure carrier vehicle against inadvertent starting up and rolling.
- Check for contamination and clean if necessary.

- Lower the attachment system of carrier vehicle below the attachment aperture of the Sweeper PLUS.
- Guide attachment unit of carrier vehicle into the attachment system and lock as described in the user manual of the carrier vehicle.

➔ ***Check correct seating of the attachment and the locking mechanism!***

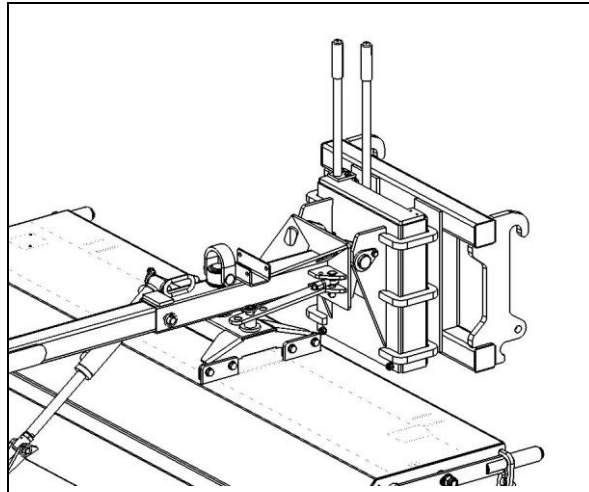


Fig. 4.6

- Connect hydraulic hoses according to the instructions of the vehicle manufacturer.
- Connect the power cables for water-spray and / or lighting system in the carrier vehicle.
- Raise sweeper and carry out a function test.

4.2.5 Fork-arm attachment



- The safety regulations from chapter 4.2 apply.
- Check fork-arm attachment and fork arms for contamination and clean if necessary.
- The distance between the forks must be set before approaching it to the carrier vehicle.

- Pull the knob (1) on both sides of the fork-bar attachment towards the curved guard (2) and swing it upwards until it locks in the groove (3). The safety bracket (4) now points towards the ground.
- Guide the fork arms fully into the attachment.
- Put safety bracket (4) back into horizontal position.

➔ **The lever ratchets back into the hole (Click).**

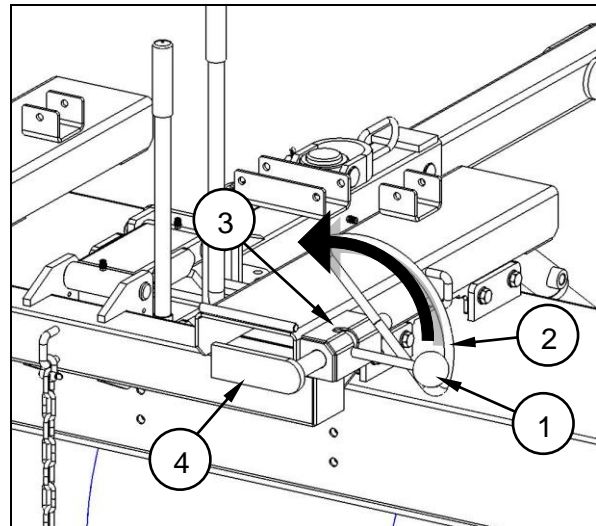


Fig. 4.7

- Adjust distance (A) to the width of the fork arms:
- Remove screws (5) on both sides. Adjust the safety bracket (4) to required width. Screw the screws back in, from the bottom into one of the holes (6) and re-tighten.
- In addition, the fork-arm attachment must be secured by a chain (7):
- The chain must be passed tightly through the loop on attachment (8) and on the slider on the carrier vehicle and secured with the snap hook.

➔ **The chain must not come into contact with the guides of the lifting frame.**

➔ **Check correct locking of the safety bracket behind the fork arms.**

➔ **Ensure the tight seating of the chain.**

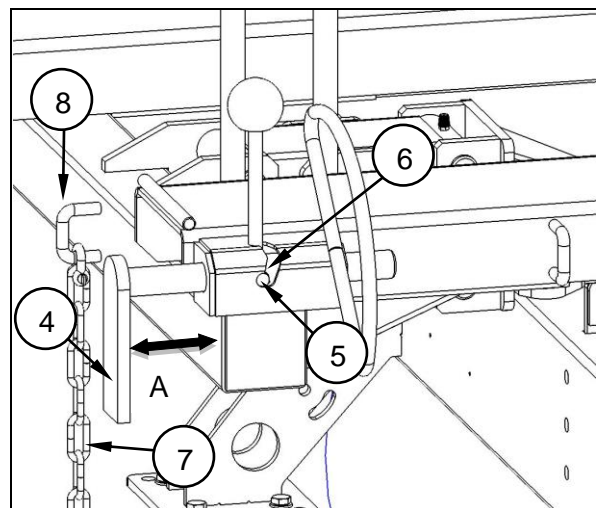


Fig. 4.8

4.3 Operation



- First read chapter 4.2 and attach Sweeper PLUS 590.

4.3.1 Transport



- Observe the safety instructions from Chap. 2.3.

➔ **Carry out transport only with empty dirt hopper.**

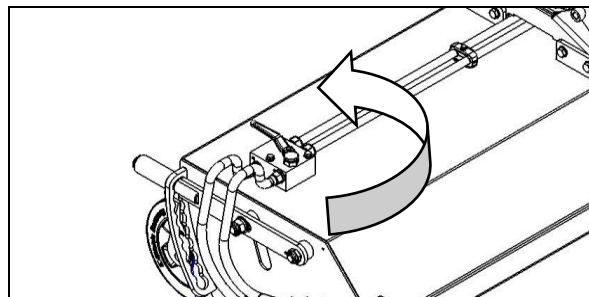


Fig. 4.9

- Close the shut-off valve to the side brush hydraulic motor (Fig. 4.9)
- and close the hydraulic cylinders for the collection hopper (Fig. 4.10).

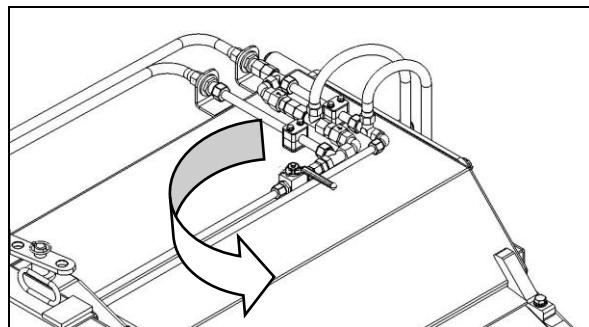


Fig. 4.10

- Swing side brush (Fig. 4.11) upwards and secure it in place (1).
- Set vehicle in straight-line position (see Chapter 4.3.7)

Transport with sweeper attached

- Raise Sweeper PLUS 590 and secure the sweeper operating lever in the carrier vehicle against inadvertent activation.

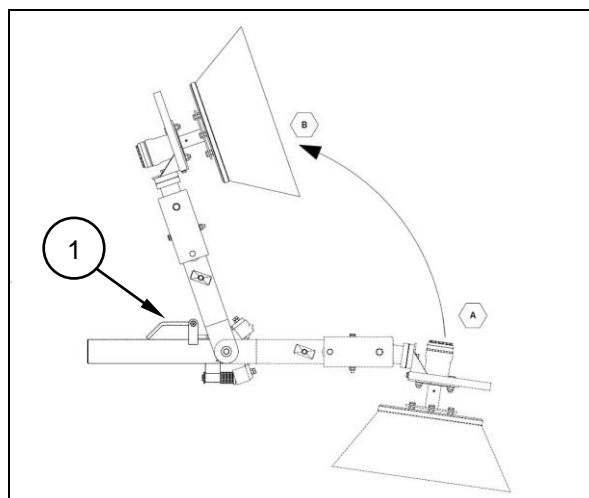


Fig. 4.11

4.3.2 Start-up



- The safety regulations from chapter 4.2 apply.

- In case of sweeping without dirt hopper, move the two parking stand legs (Fig. 4.12) upwards and secure with the positioning bolt.

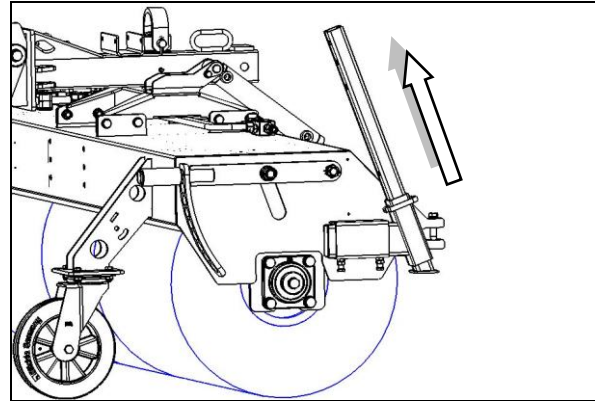


Fig. 4.12

- **Maximum driving or sweeping speed is 6 km/h.**

- Open shut-off valve to the hydraulic motor of the side brush (Fig. 4.13) and the hydraulic cylinders of the collection hopper (Fig. 4.14).

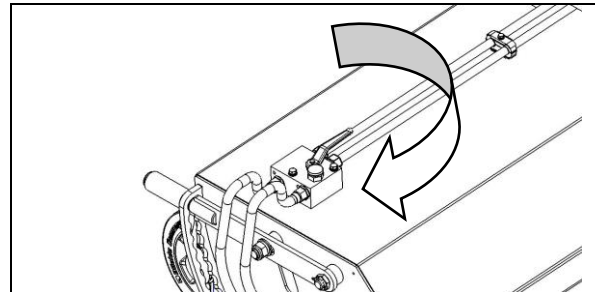


Fig. 4.13

- During the operation of the sweeper there is a swept profile of 6 to 10 cm (see Chapter 4.3.8 for setting sweeping profile).
- Lay hydraulic hoses and electrical wiring to avoid danger of crushing. (See section 3.2).

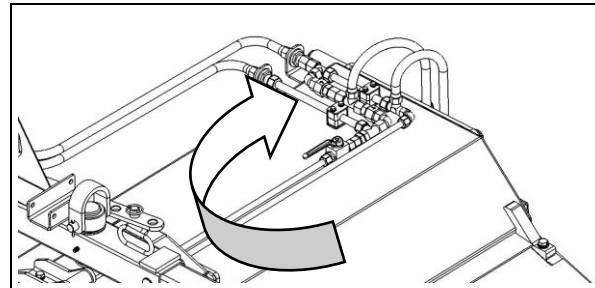


Fig. 4.14

Swivel side brush into working position

- Pull lever (2) out of the locked position (3), then swivel the side brush from B to A (Fig. 4.15).

➔ **Be aware of the actual weight of the side brush itself!**

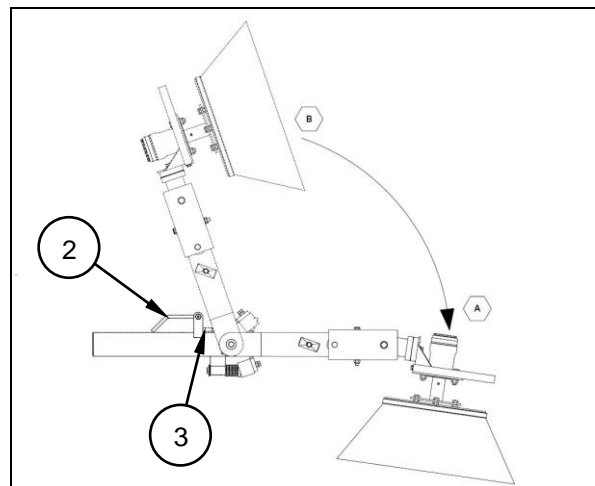


Fig. 4.15

Position of the sweeper when in use in front of the carrier vehicle

- Lower sweeper until the two or three guide rollers (4) make contact with the ground.
- The attachment device must be vertical to the ground. (Attachment device should stand plumb-vertical to the ground when between the roller guide.)

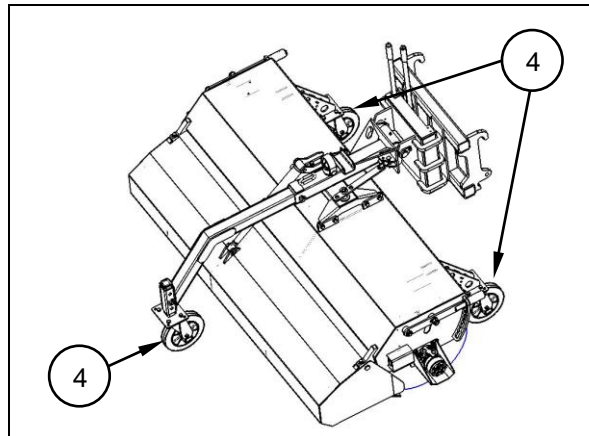


Fig. 4.16

- Raise or lower the device carrier of the vehicle until the attachment unit (5) with the support roll carrier is situated in the middle of the roller guide (6). Height indicators with the green caps (7) should be at the same height (= 0).
- Once again check that the height indicator of the attachment system and the height indicator of the swivelling section are at the same angle (0°) to each other (can be better seen from the side of the sweeper); tilt device carrier in or out if necessary.

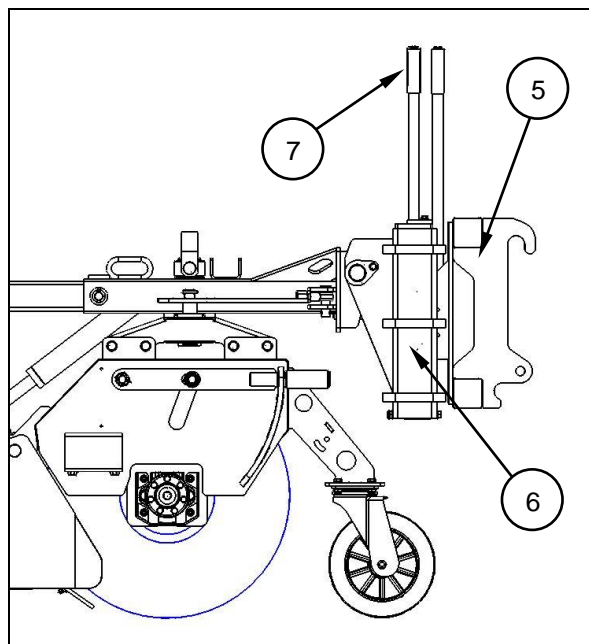


Fig. 4.17

4.3.3 Set / adjust side brush



- The safety regulations from chapter 4.2 apply.

➔ **Take the actual weight of the side brush itself into account when adjusting.**

- The cantilever arm (1) lies on the pin (2) when the sweeper is 3-6 cm above the ground.
- Adjustment: Remove the cotter pin (3), pull out the pin (2) and remove some of the spacer washers (4). In this way the side brush is adjusted downwards.

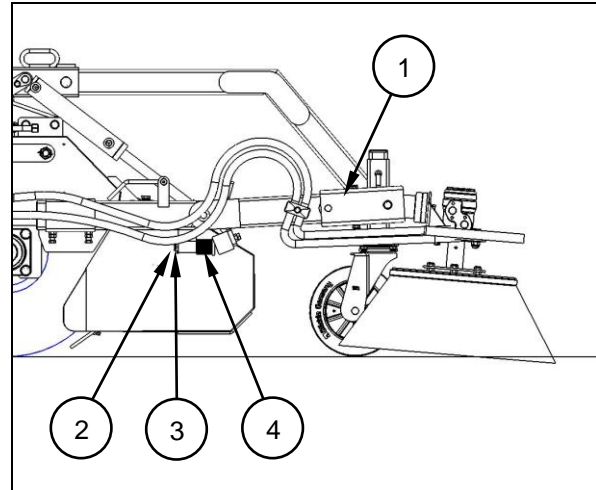


Fig. 4.18

Adapt working width

- Loosen bolt connection (5) and adjust side brush at the lengthwise slot.
- Move the bolt connection (6) from the stop.

The side brush moves further inwards or outwards (7).

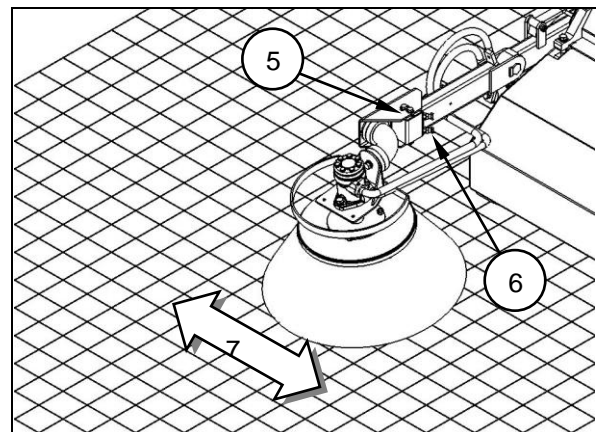


Fig. 4.19

Side brush - adjusting contact point

- The side brush should sweep the side edge in clockwise region from 12 o'clock to 3 o'clock (see arc (7))
- Move clamping discs (8). Slope (9) is adjusted.
- Move clamping plates (10). Angle of attack (11) is set.
- Carry out function test.

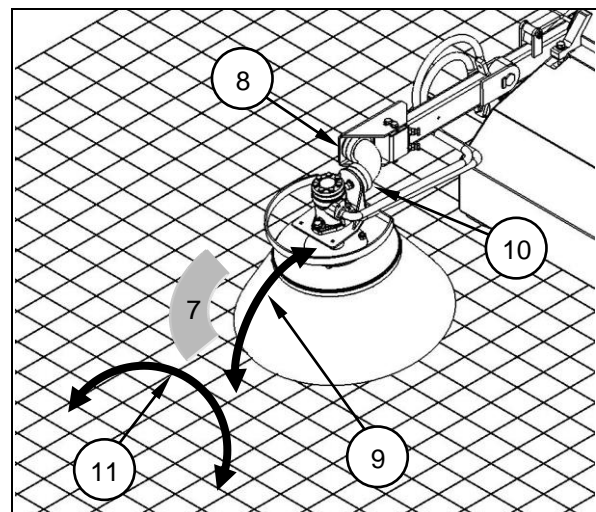


Fig. 4.20

➔ **Check all bolt connections for tight seating.**

4.3.4 Rotation speed adjustment



- The safety regulations from chapter 4.2 apply.

Brush shaft

In the case of sweepers with direct connection with the hydraulic motor, the adjustment of the speed of revolution is achieved through the oil feed from the carrier vehicle. This depends on the type of carrier vehicle and its equipment.

The adjustment of the main brush of the Sweeper PLUS 590 with a 3-way flow control valve and feed-back control is achieved at the set-screw (1) of the flow control valve (2).

(In clockwise direction = acceleration, anticlockwise direction = deceleration).

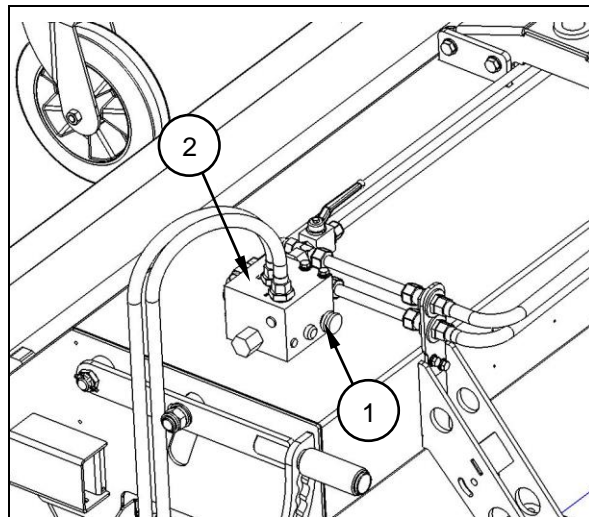


Fig. 4.21

Side brush

The speed adjustment of the side brush is achieved at the set screw (3) of the side brush control unit (4).

(In clockwise direction = acceleration, anticlockwise direction = deceleration).

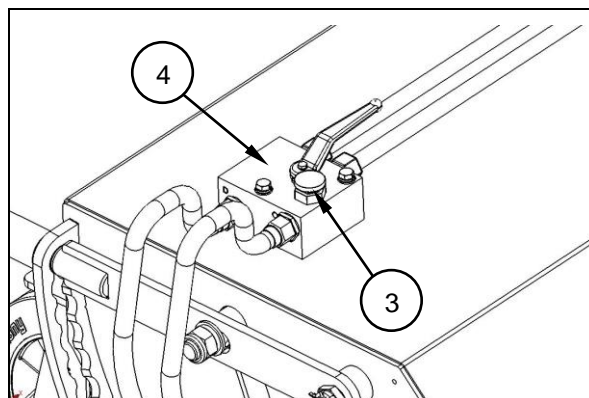


Fig. 4.22

4.3.5 Emptying the dirt hopper



- The safety regulations from chapter 4.2 apply.

The dirt hopper can be opened via the hydraulic cylinder (1). The shut-off valve (2) for the emptying process must be open.

- As an option, there is a filling height flap variably mounted inside the dirt hopper (3). This filling height flap increases the fill capacity. When emptying the dirt hopper this filling height flap moves upwards or downwards from the filling region.
- Raise the Sweeper PLUS 590.

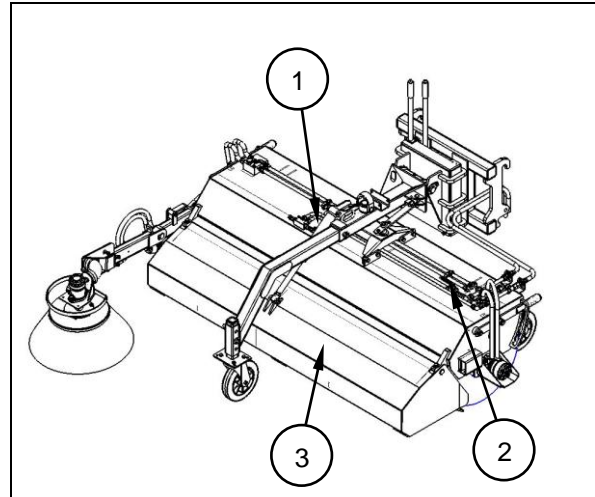


Fig. 4.23

- ➔ **While emptying, no person must be under the sweeper.**
- Switch the control lever for the sweeper hydraulics inside the carrier vehicle. The flow direction is changed and the dirt hopper is opened.
 - ➔ **Open the dirt hopper ONLY in the raised position.**
- Close the dirt hopper by switching back the above-mentioned control lever inside the carrier vehicle.
 - ➔ **Close the dirt hopper ONLY in the raise position.**
- If the swept material is wet, it makes sense to briefly press the control lever repeatedly in order to make emptying easier.

4.3.6 Simple-sweeping mode



- The safety regulations from chapter 4.2 apply.

In the simple-sweeping mode, the Sweeper PLUS 590 can be operated for simple sweeping, without having to dismount the dirt hopper.

For this purpose, just open the dirt hopper and secure it in position by using the shut-off valve.

- Raise the Sweeper PLUS 590 and keep it close to the ground.
- Switch the corresponding control lever for the sweeper hydraulics inside the carrier vehicle. The direction of flow is changed. Open the dirt hopper (3) completely.
- Lower the Sweeper PLUS 590 until all guide rollers are in contact with the ground and the sweeper is in a horizontal position with respect to the ground to be cleaned.

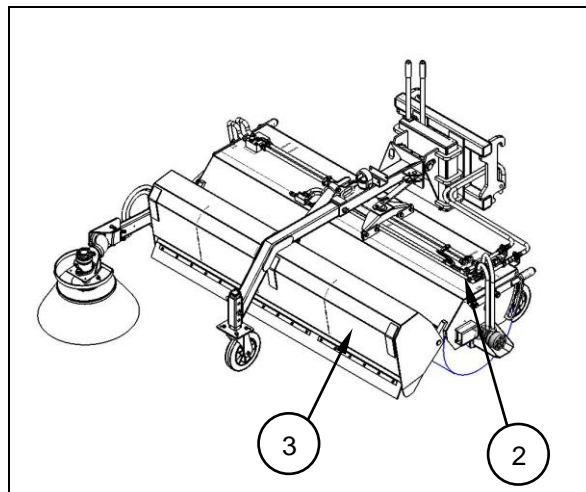


Fig. 4.24

- Close supply line to the hydraulic cylinder of the dirt hopper. The shut-off valve (2) points towards the sweeper.
- Lock the opened dirt hopper by turning the control lever (remains open).
 - ➔ **For position when operating the sweeper in front of the carrier vehicle, see Chapter 4.3.2 Start-up.**

4.3.7 Lateral adjustment for simple-sweeping use



- The safety regulations from chapter 4.2 apply.

In the application for simple sweeping by Sweeper PLUS 590, or in the simple-sweeping mode, a lateral adjustment to the edge of the road should be introduced (sweeping angle / swept material pushed to the left or right).

Mechanical lateral adjustment

The lateral adjustment occurs via the adjustment bar (1) at the swivel point of the sweeper.

- Raise sweeper slightly.
- Switch engine off and remove ignition key.
- Secure the carrier vehicle against inadvertent start-up.

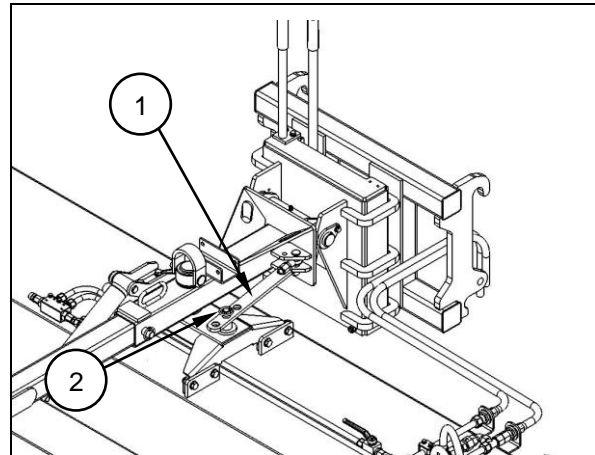


Fig. 4.25

- Remove safety pin (2). Raise adjustment bar (1) and then turn the sweeper to the left or the right; the desired sweeping angle is achieved by rotating the vehicle around the pivot point.
- After setting the sweeping angle, resecure the adjustment bar (1) with the safety pin.

Hydraulic lateral adjustment

The lateral adjustment is achieved via the hydraulic cylinder (2) between swivel bracket and the sweeper frame.

- Raise vehicle slightly.
- Operate the control lever for the second double-acting control circuit. The sweeper swivels to the right or the left.

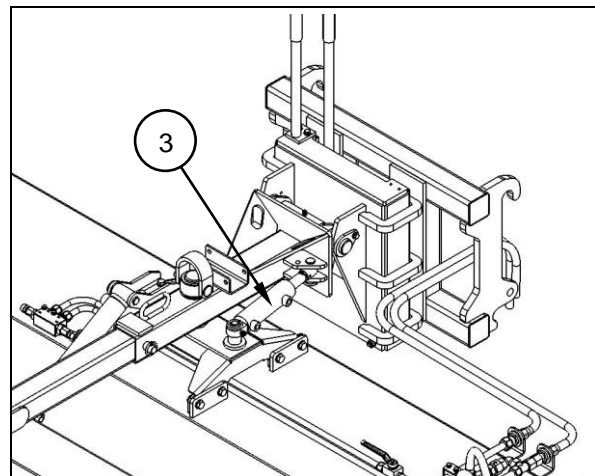


Fig. 4.26

4.3.8 Readjustment of sweeping profile



- The safety regulations from chapter 4.2 apply.

During operation of the Sweeper PLUS 590 there should be a swept profile of $a = 6 - 10$ cm (i.e. when raising the sweeper the width of the cleaned surface should be 6 - 10 cm).

➔ **Check swept width on level ground!**

If no sufficient width is still available, or if the ground contact pressure is too low, then the main brush must be adjusted evenly on both sides by using the adjusting-lever system.

➔ **Take account of the actual weight of the main brush itself.**

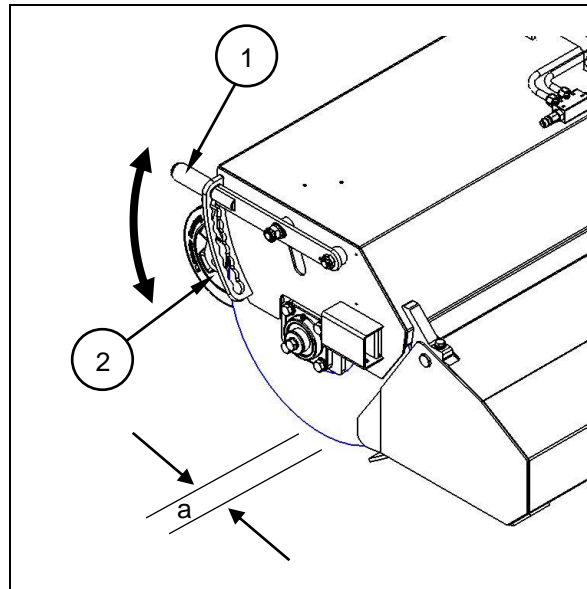


Fig. 4.27

➔ **Ensure twist and kink-free run of the hydraulic hose lines.**

- Raise sweeper but keep close to ground.
- Pull the locking lever (1) of the adjustment grid - to the rear.
- Set the locking lever to the desired position on the adjustment grid (2).
- Carry out the adjustment of the main brush equally on both sides.

4.4 Dismounting from vehicle



- The safety regulations from chapter 4.2 apply.
- Undertake work on the sweeper only with engine switched off and after depressurising the hydraulics. Remove the ignition key, secure carrier vehicle against inadvertent starting up or rolling.
- Place sweeper on a solid and even surface in a dry and clean place and keep it secure against rolling away.
- Danger of accident. Ensure safe positioning of the Sweeper PLUS 590.

➔ **If the Sweeper PLUS 590 is not to be used straight away, after removal from carrier vehicle, please take note of chapter "Storage" (Section 4.5)!**

- Lower sweeper until the guide rollers make contact with the ground. The guide rollers should face the carrier vehicle.
- Remove sweeper with hopper closed and empty.
- Close shut-off valve for the hydraulic cylinder of the dirt hopper (1).
- Close shut-off valve to hydraulic motor of the side brush (2). Swivel side brush upwards and secure it in position (see Chapter 4.3.1 Transport).
- In case of simple sweeping (i.e. without dirt hopper), set the two parking stand legs (3) down and secure them with the positioning bolts.
- Disconnect the hydraulic hose lines and electric cables at the vehicle.
 - ➔ **Close hydraulic plug-in connections with dust caps. Contamination leads to damage of the hydraulic system.**

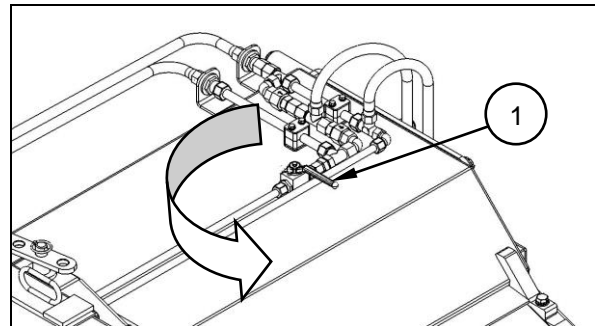


Fig. 4.28

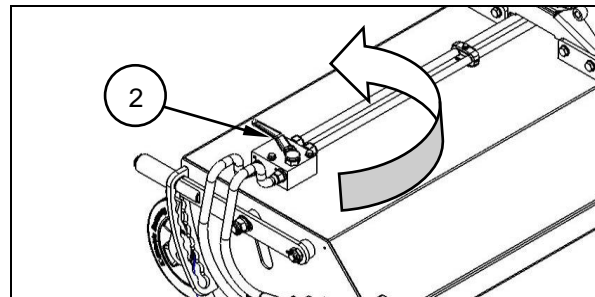


Fig. 4.29

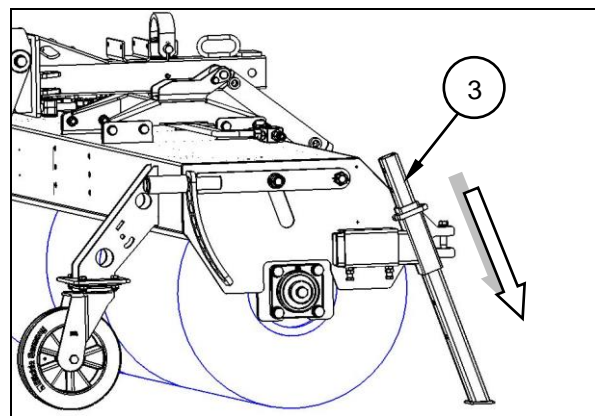


Fig. 4.30



- Danger of accident! Do not place hydraulic hoses and electric cables on the ground - they can cause risk of tripping. Position the hoses and cables above the Sweeper PLUS 590.

4.4.1 Quick-hitch attachment system



- The safety regulations from chapter 4.2 apply.

- Release the hydraulic lock (4) of the attachment unit by activating the corresponding control lever inside the carrier vehicle.
- Release the mechanical lock (4) of the attachment unit by removing the corresponding safety pins.
- Lower the lifting frame until the attachment pins are situated below the openings on the attachment unit (5).
- Ensure that the driving area is free in the reversing direction.
- Move vehicle backwards.

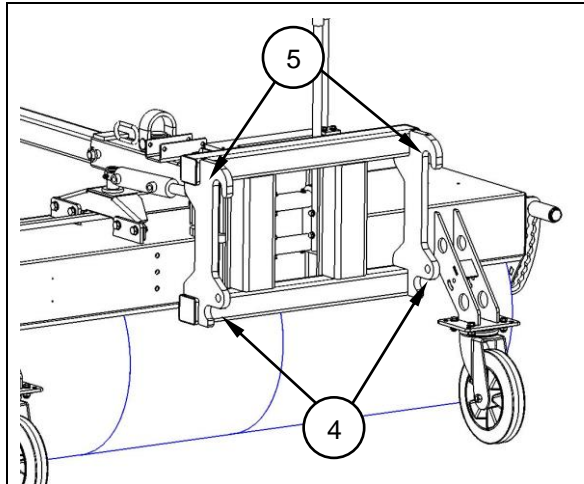


Fig. 4.31

4.4.2 Three-point linkage



- The safety regulations from chapter 4.2 apply.

- Unlock the upper and lower guides according to the instructions of the vehicle manufacturer. See the operating instructions of the carrier vehicle.
- Lower the upper- and lower-guide until they are completely extended and free up the attachment pins (6).
- Ensure that the reversing area is free behind the vehicle.
- Move the carrier vehicle backwards away from the sweeper.

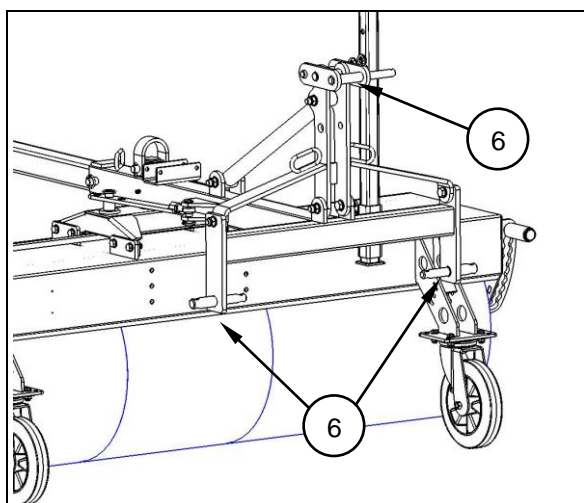


Fig. 4.32

4.4.3 Fork-arm attachment



- The safety regulations from chapter 4.2 apply.

- Move safety bracket downwards (in reverse sequence from that as described for attachment in Chapter 4.2.3).
- **The lever latches into the hole (Click); carry out steps 4-7, Chapter 4.2.3.**
- Release the safety chain from the carrier vehicle and place above the roof of the vehicle.
- Move fork arms from the attachment opening of the fork arm attachment.
- Move vehicle backwards.

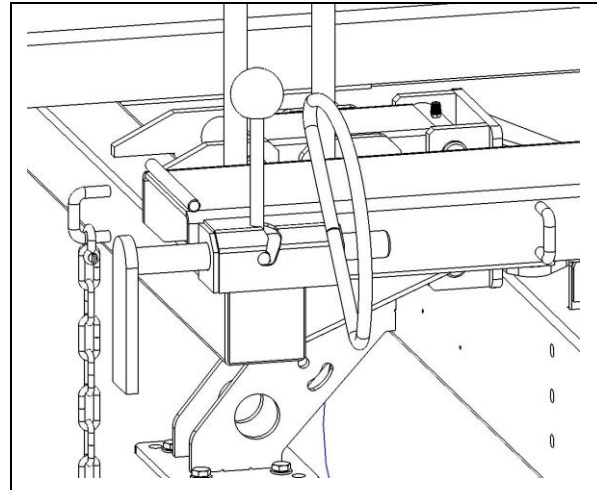


Fig. 4.33

4.5 Storage



- The safety regulations from chapter 4.2 apply.

- Place sweeper on solid, even ground and in a clean, dry place.

➔ ***Danger of accident! Ensure the Sweeper PLUS 590 is standing safely.***

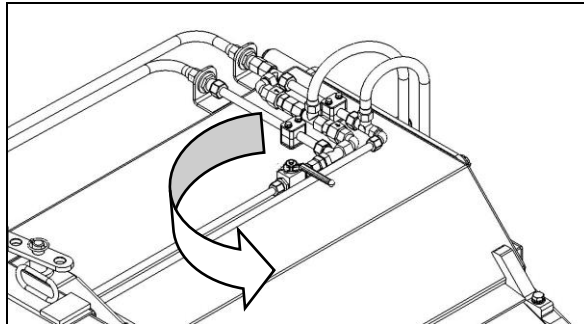


Fig. 4.34

- Close the shut-off valves to the hydraulic cylinder of the dirt hopper's emptying function (Fig. 4:34) and also the side brush hydraulic motor (Fig. 4.35).

- The support wheels (1) must face the rear.

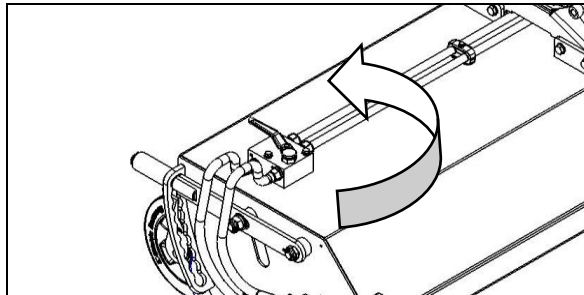


Fig. 4.35

Relieve ground contact pressure of the main brush

- Pull the handles (2) of the adjusting-lever system on both sides of the machine one after the other and set the levers into the adjustment grid to the uppermost position.

➔ ***Be careful of the actual weight of the main brush itself when moving it.***

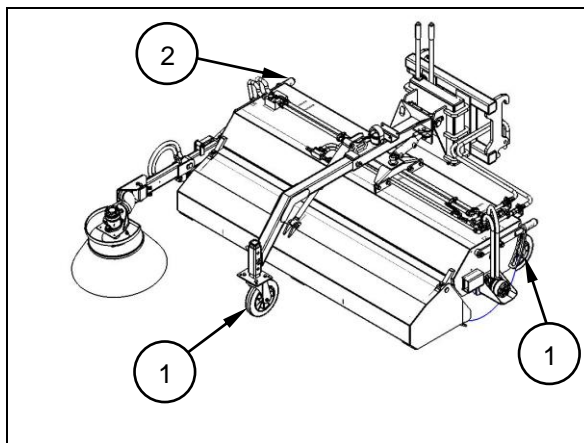


Fig. 4.36

Sweeper PLUS 590 without dirt hopper

- In case of simple sweeping sweeper move out the parking stand legs (3) towards the ground and secure with pins.

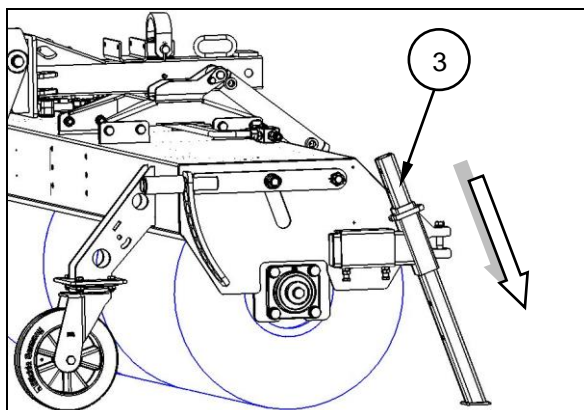


Fig. 4.37

Swiveling the side brush out of the working area

- Move the side brush from position A to position B.
 - Lever (4) locks the side brush by means of the latching bar (5)
- ➔ **The lever (4) must be fully latched into place (5).**

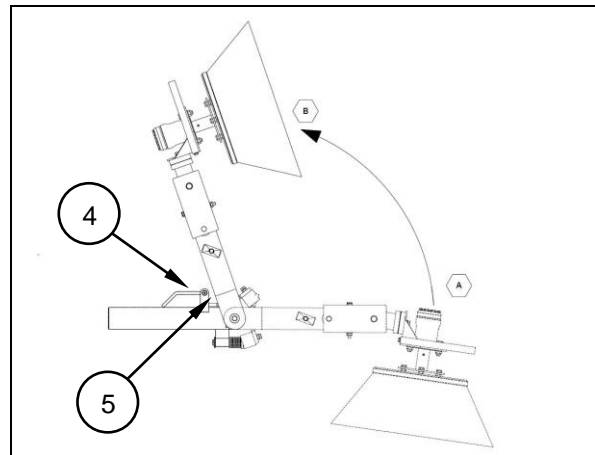


Fig. 4.38

Water-spray system:

- Empty the water tank (6). Open drain plug (7) (underside of tank).
- If there is danger of frost, allow pump of the water-spray system to run for 10 to 15 seconds until there is no water remaining in the pipe.

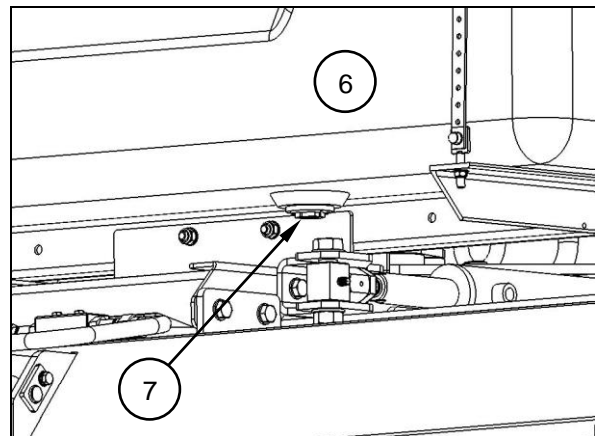


Fig. 4.39



- Danger of accident. Hydraulic hoses and electrical cables on the ground can cause risk of tripping. Place these over the sweeper PLUS 590.
- Close hydraulic plug connectors with dust cap.

- If necessary, clean sweeper thoroughly. Dirt attracts moisture and leads to rusting.
- Thoroughly lubricate the Sweeper PLUS 590.
- Repair damage to paintwork if necessary.

5 Hydraulic system

The hydraulic system consists of the following assemblies:

- Two single-acting hydraulic cylinders.

The hydraulic system is ready for operation when the hydraulic system of the sweeper is coupled with the hydraulic system of the carrier vehicle.

5.1 Hydraulic hoses

WARNING



Danger of infection for persons can occur when hydraulic oil escapes under high pressure and enters the body.

When coupling and uncoupling the hydraulic hose lines ensure that the hydraulic system at the vehicle and at the sweeper is depressurised. Move all the operating levers of the working hydraulics of the vehicle several times in both directions.

In the event of injury from hydraulic oil, contact a doctor immediately.

5.1.1 Coupling hydraulic hoses

WARNING



Danger for persons due to crushing, cutting, catching, dragging-in and impact can arise if malfunctions occur as a result of incorrectly connected hoses.

- When coupling the hydraulic hoses, pay attention to the coloured markings on the hydraulic plug connectors.
- Check arrangement of the hydraulic hose lines to the individual hydraulic components on the sweeper, in case the coloured markings (dust covers) are missing:
 - P = Pressure line
 - T = Return line



- Note the maximum permissible operating pressure of the hydraulic oil of 180 bar.
- Only couple clean hydraulic plug connectors.
- Ensure when coupling and uncoupling the hydraulic hoses that no oil spills into the surrounding area.
- Insert the hydraulic plug connector as far as possible into the hydraulic socket until the plug is noticeably locked.
- Check the coupling points of the hydraulic hose lines for proper and tight seating.
- Coupled hydraulic hose lines:
 - must easily adapt to all movements for driving round curves without tension, bending or rubbing,
 - must not rub against other parts.

1. Pull the parking brake of the vehicle into the “on” position..
2. Switch engine of vehicle off and remove ignition key.
3. Move all the operating levers of the working hydraulics of the vehicle several times in both directions.
 - The hydraulic system is now depressurised.
4. Clean the hydraulic plug connectors of the hydraulic hose lines before coupling them into the hydraulic sockets.
5. Couple all hydraulic hoses of the sweeper to the quick-acting couplers of the vehicle.

5.1.2 Uncoupling hydraulic hoses

1. Pull up the parking brake of the vehicle into the “on” position
2. Switch engine of vehicle off and remove ignition key.
3. Move all the operating levers of the working hydraulics of the vehicle several times in both directions.
 - The hydraulic system is now depressurised.
4. Release the hydraulic plug connectors from the hydraulic sockets.

6 Cleaning, servicing and maintenance



When carrying out cleaning, servicing and maintenance, observe the instructions of the Chapters:

- "Obligations of the user", on pages 2-8,
- "Qualifications of the persons", on page 2-9,
- "Fundamental safety instructions", from pages 2-11,
- "Warning instructions and instructions", from page 2-16.

Observing these chapters further ensures your safety.

WARNING



Danger due to crushing, shearing, cutting, severing, catching, winding, dragging-in and impact for persons can occur when:

- **The raised and unsecured sweeper inadvertently sinks or is inadvertently lowered.**
- **Vehicle inadvertently starts and rolls.**
- Secure the raised sweeper against inadvertent lowering before working in the area of the raised sweeper.
- Secure the vehicle against inadvertent starting and rolling before cleaning, servicing or maintaining the sweeper connected to the vehicle. For this purpose see Chapter "Securing the vehicle against inadvertent starting and rolling", page 2-15.
- Wait for the sweeper to come to a stop before entering the hazard area of the sweeper.

WARNING



Danger due to crushing, shearing, cutting, severing, catching, winding-on, pullingdragging--in and impact for persons can occur when danger areas are unprotected.

- Re-fit any protective equipment that has been removed for cleaning, servicing or maintenance of the sweeper.
- Replace defective protective equipment items with new ones.

WARNING



Dangerous conditions can arise when load-bearing parts break during mechanical work on frame components.

The following are categorically prohibited:

- Drilling on the frame or chassis.
- The widening of holes in the frame or chassis.
- Welding on load-bearing parts.

6.1 Cleaning



- Clean the sweeper regularly and thoroughly. Dirt attracts moisture and leads to rusting.
- After cleaning, lubricate the sweeper. Avoid moisture when cleaning. Blowing moisture off is usually sufficient.
- Observe the legal regulations for the handling and disposal of cleaning agents.
- Repair damage to paintwork if necessary.
- Monitor the hydraulic hose lines particularly carefully.
- Never treat hydraulic hoses with petrol, benzene, petroleum or mineral oils.
- If the sweeper is not used for a longer time period, then, after cleaning, it should be lubricated, sprayed with oil and the piston rods of the hydraulic cylinder greased.

Cleaning with high-pressure cleaner / steam spray



- Pay special attention to the following points if a high-pressure or steam spray is used for cleaning.
- Never direct the cleaning spray from the cleaning jet from a high-pressure cleaner / steam spray directly onto lubrication and bearing surfaces.
 - Always keep a minimum jet distance of 300 mm between the high-pressure cleaner / steam spray and the sweeper.
 - Observe the safety regulations when handling high-pressure cleaners.

6.2 Replacing wearing parts



- Maintenance, repair and replacement works on the Sweeper PLUS 590 must only be carried out after switching off the hydraulic drive and uncoupling the hydraulic connections. Secure the carrier vehicle against inadvertent starting, rolling or lowering.
- Do not enter or work under the raised sweeper.

WARNING



- Always secure the opened dirt hopper by operating the shut-off valve. Additional mechanical means of prevention against closing the hopper is necessary.
- Renew brush rings only when sweeper is attached to the carrier vehicle.

6.2.1 Replacing brush rings



The safety regulations from chapter 4.2 apply.

- Raise the sweeper (approx. 200 mm) and open dirt hopper.

➔ **Secure sweeper and carrier vehicle against inadvertent starting, rolling or lowering.**

- Close shut-off valve (1) for the emptying- cylinder (Fig. 6.1) (must face the rear support wheel).

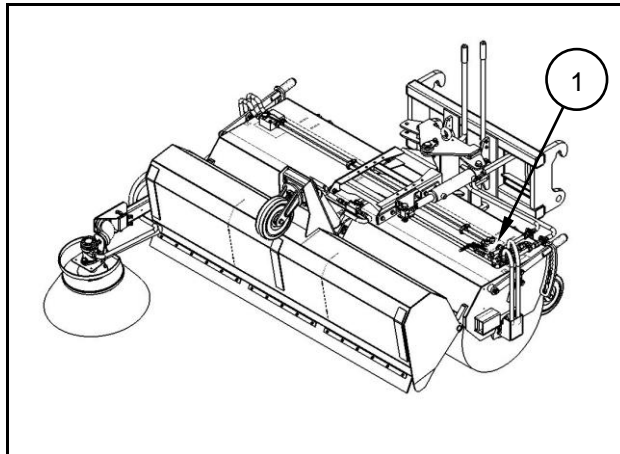


Fig. 6.1

- Set the adjustment-lever system (2) on both sides to the lowest position (Fig. 6.2).

- Lower sweeper until the complete brush shaft is on the ground.

➔ **Depressurise the sweeper hydraulic lines from the carrier vehicle.**

- Loosen the screws (3) of the hydraulic motor (4) and the bearing (5) and remove (Fig. 6.3.)

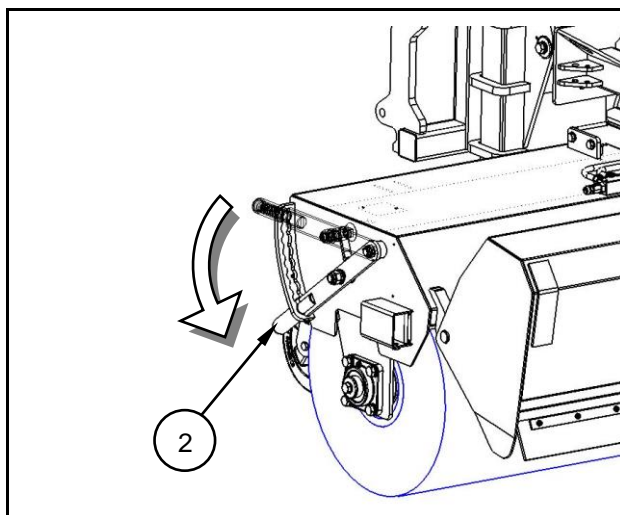


Fig. 6.2

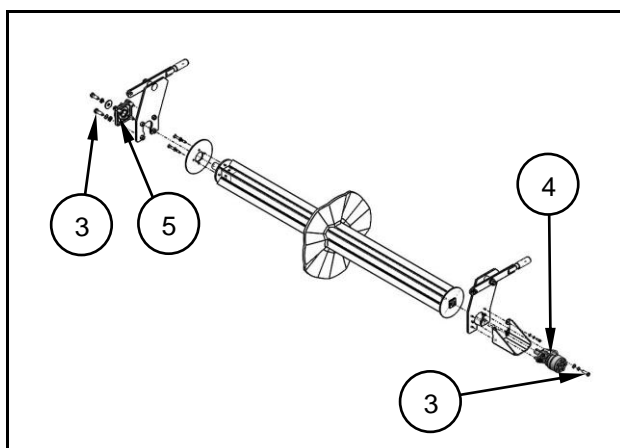


Fig. 6.3

- Set adjustment-lever system (2) on both sides to the uppermost position.
 - Raise sweeper frame (6) until the brush shaft is completely free (be careful with the hydraulic hoses!).
- ➔ **Damage can occur in the event of hooking or crushing hydraulic hoses.**

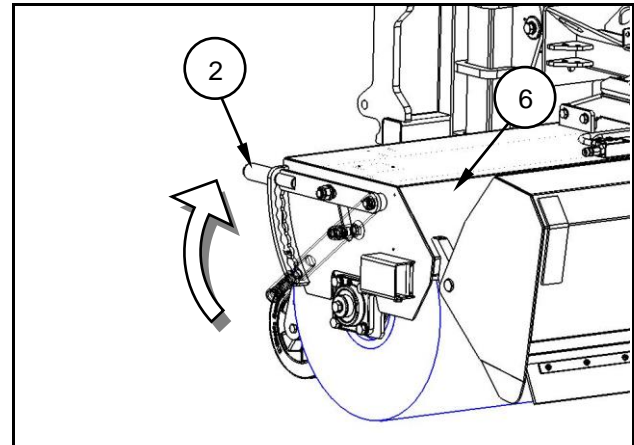


Fig. 6.4

- ➔ **Mechanical locking arrangement is necessary to prevent lowering of the collector. (Location with danger of crushing between the side parts of sweeper frame and collector.)**
- ➔ **Secure sweeper and carrier vehicle against inadvertent starting, rolling or lowering.**

- Pull hydraulic motor (7) away from the roller shaft (8).
- Pull away the roller shaft (8) from under the sweeper.
- Lower sweeper frames (6) and place it on the rear support rollers.
- Unscrew four countersunk bolts (9) and remove the retention plate (10).

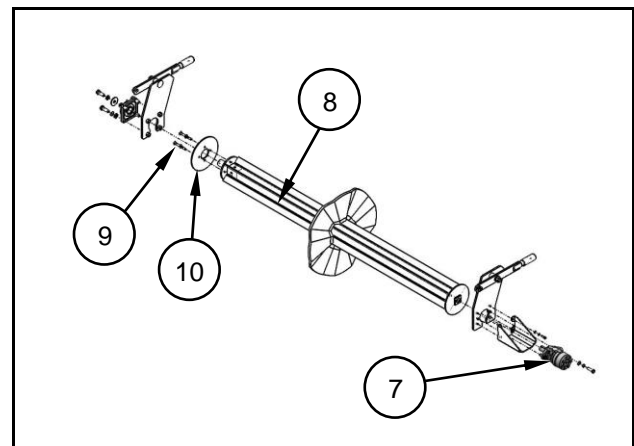


Fig. 6.5

- Replace worn brush rings (11) (for quantity of brush rings see spare parts list. Brush bristle material, Snowline, Sunline, Beeline, mixed Beeline and 50% Sunline with 50 % corrugated wire possible.
- Before assembly clean all parts and replace as necessary.
- Assembly and installation of the brush shaft in reverse order of the disassembly.

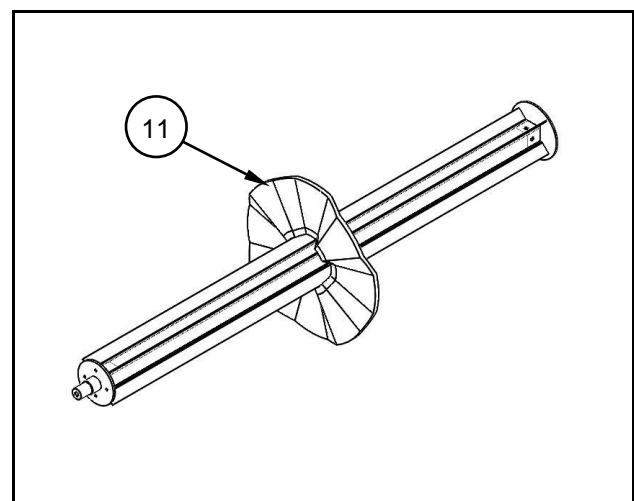


Fig. 6.6

6.2.2 Replacing disc brush for the side-brushes



Replacement work on the Sweeper PLUS 590 must only be carried out after switching off the hydraulic drive and uncoupling the hydraulic connections. Secure carrier vehicle against inadvertent starting or rolling.

- Swing the side brush up (from Pos. A to Pos. B) and click lever (1) into place (2) (see Chap. 4.3.1)
- Remove three hexagon nuts (3).

➔ **Be careful of the actual weight of the disc brush.**

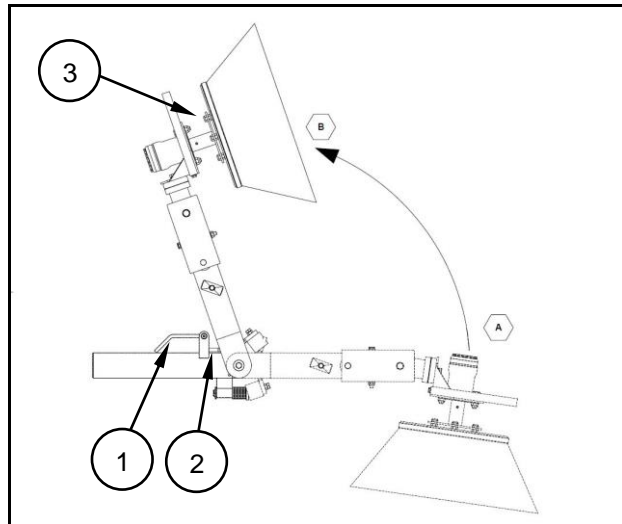


Fig. 6.7

- Remove the old disc brush (4).
- Drill attachment -holes in the new disc brush corresponding to the flange (5).
- Secure disc brush with new locknuts.
- Swing side brush into the working position and adjust in accordance with Chapter 4.3.2.

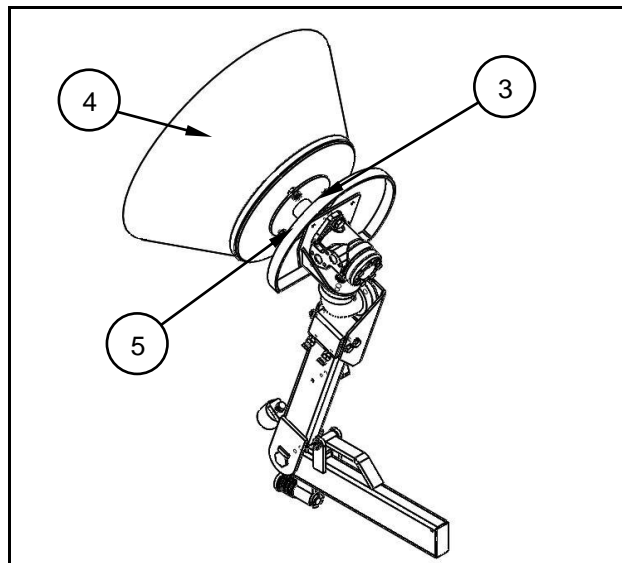


Fig. 6.8

- In the case of hydraulic swinging side brush the disc brush must be raised in the up position. The replacement of the disc brush is similar to that for the mechanically swinging side brush.

6.2.3 Replacing PU strip



The safety regulations from chapter 4.2 apply.

- ➔ **Renew PU strip only when sweeper is attached to carrier vehicle and raised.**
- ➔ **The dirt hopper must be empty and completely open.**



- Do not enter or work under the raised sweeper.
- Secure sweeper and carrier vehicle against inadvertent starting, rolling or lowering.
- Always secure the opened dirt hopper by operating the shut-off valve. Additional mechanical locking arrangement is necessary to prevent closing of the hopper.
- Be careful of the actual weight of the bumper bar and PU-strip.

- Loosen the fastening nuts (3) and bolts (4) along the whole length of the PU-strip (1).
- Remove the bumper bar (2) and the old PU-strip (1).
- Renew the PU-strip (1).
- ➔ **For re-assembly carry out these steps in reverse sequence.**

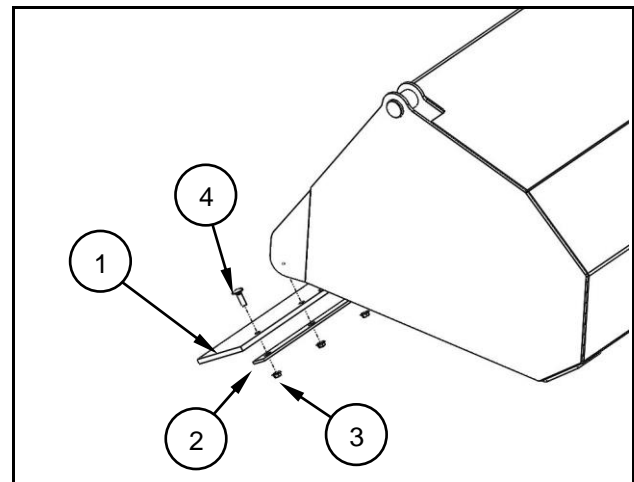


Fig. 6.9

6.2.4 Replacing fuse



The safety regulations from chapter 4.2 apply.

- Unscrew the fuse holder (1).
- Insert a new fuse.
- Screw the fuse holder closed again (1).

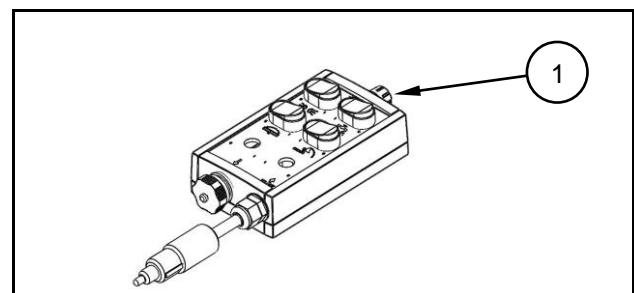


Fig. 6.10

6.3 Cleaning of water-spray system



The safety regulations from chapter 2.1 apply.

➔ **You will find the water filter on the inward suction hose (4) inside the water tank (1).**

- Unscrew the water tank cap (2).
- Pull the suction hose (4) out of the water tank opening. Unscrew the housing cover (7).
- Clean filter sieve (6) with water.
- Screw housing cover (7) with filter sieve (6) onto the housing (5).
- Place suction hose (4) into the water tank (1) again and screw the water tank cover (2) back on .

➔ **The condition of the filter sieve must be checked every 50 operating hours and cleaned if necessary.**

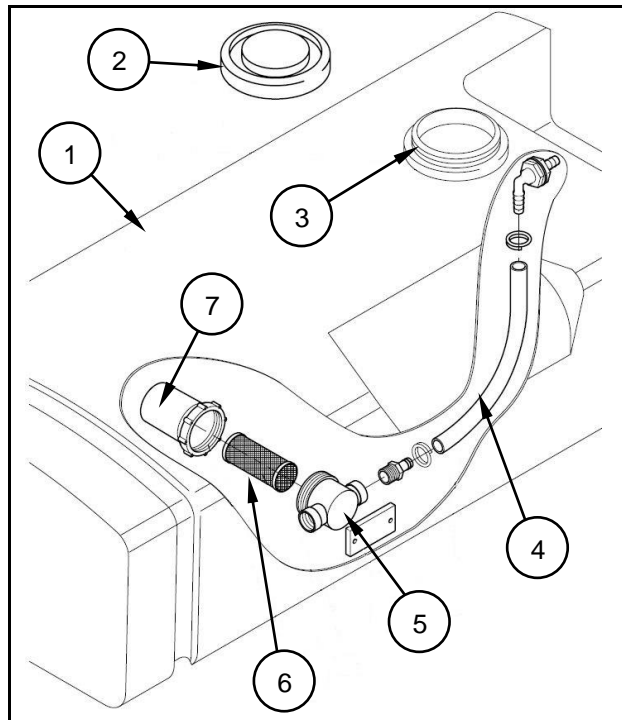


Fig. 6.11

6.4 Lubrication - Overview



- Lubricate all bearings and lubricating points according to the lubrication plan.
- Remove dirt from the lubrication nipples.
- Use environmentally friendly biodegradable oil and greases where lubricants can enter into any animal feed or the ground. Find out more at your specialist for agricultural machinery.
- Lubricate bearing points weekly with grease according to DIN 51502 (e.g. Gresalit 2 of the company Westfalen).

Lubrication points on sweeper and accessories



= Grease weekly!

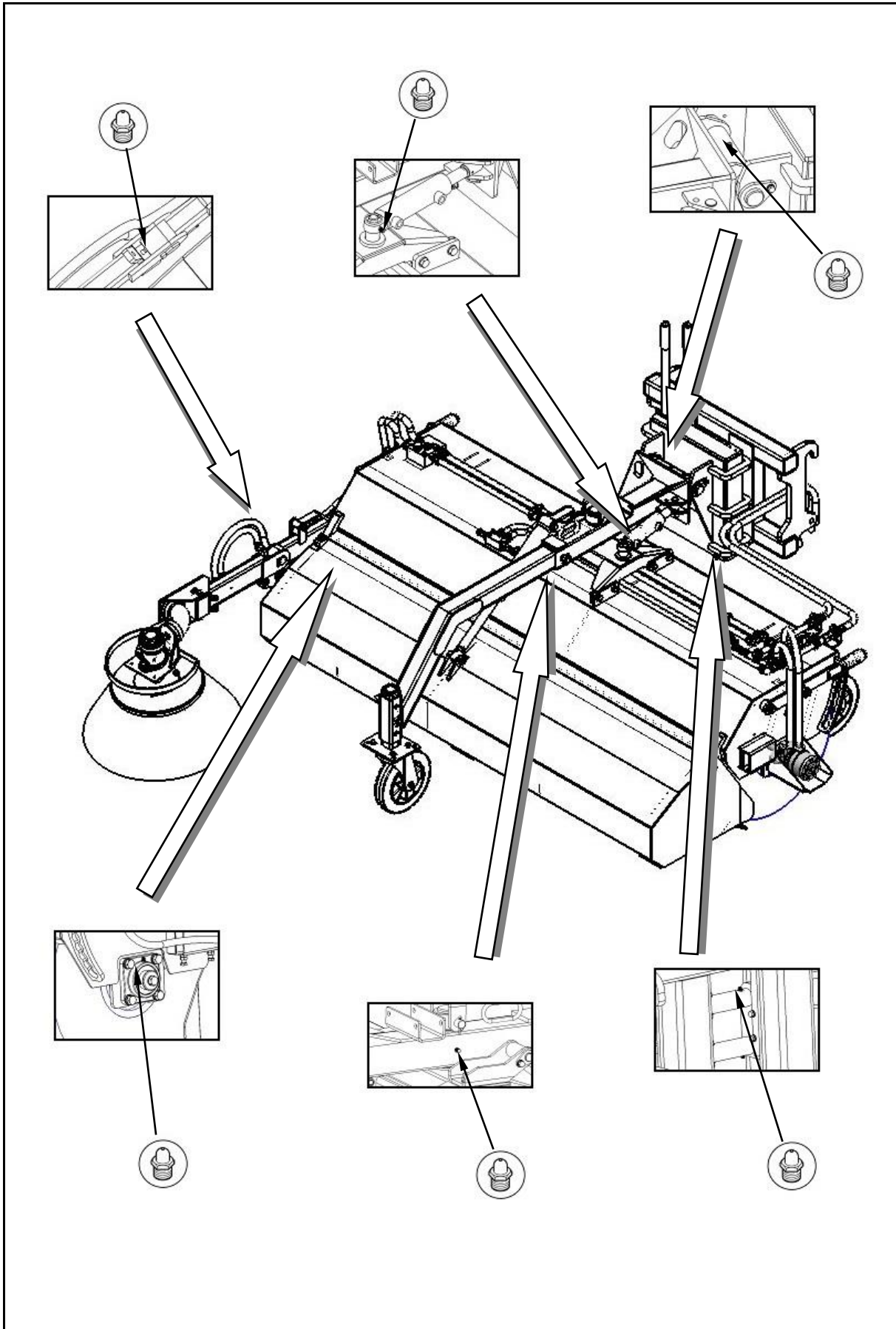


Fig. 6.12

6.5 Faults: Causes and remedies

Fault	Cause	Remedy
1. Sweeping shaft does not rotate	<ul style="list-style-type: none"> • Incorrect hydraulic connections • Too little pressure or volume flow • Defective hydraulic motor • Setting of control valve not correct/as specified 	<ul style="list-style-type: none"> • Check connections • Consult specialised workshop • Consult specialised workshop • Unscrew threaded joint at dirt hopper
2. Dirt hopper does not swing upwards	<ul style="list-style-type: none"> • Closed supply line • Incorrect hydraulic connections • Defective hydraulic cylinder 	<ul style="list-style-type: none"> • Switch position of 2-way valve • Check connections • Consult specialised workshop
3. Water spray system does not function	<ul style="list-style-type: none"> • Empty Water tank • Defective fuse in control box • Blocked water filter • Blocked jets 	<ul style="list-style-type: none"> • Fill with water • Replace fuse • Clean water filter • Clean jets
4. Side brush does not rotate	<ul style="list-style-type: none"> • Closed supply line • Incorrect hydraulic connections • Incorrect setting of regulating valve • Defective hydraulic motor 	<ul style="list-style-type: none"> • Switch position of 2-way valve • Check connections • Check settings on current regulating valve • Consult specialised workshop
5. Poor sweeping results	<ul style="list-style-type: none"> • Incorrect brush setting • Brush revolution speed too fast / slow 	<ul style="list-style-type: none"> • Regulate brush via adjustment -lever system • Adjust brush rotation speed
6. Lighting does not work	<ul style="list-style-type: none"> • Incorrect electric lines • Defective fuse in control box • Cable broken 	<ul style="list-style-type: none"> • Check connections • Replace fuse • Consult specialised workshop

6.6 Hydraulic system

WARNING



Danger of infection for persons can occur when hydraulic oil escapes under high pressure and enters the body.

- Only an expert workshop may carry out work on the hydraulic system.
- Depressurise the hydraulic system before starting work on the hydraulic system.
- Make sure to use suitable aids when searching for leaks.
- Never attempt to seal leaking hydraulic hose lines with the hand or fingers.
- Because of the high pressure, fluids (hydraulic oil) can penetrate the skin and enter the body and cause serious damage.
- In the case of injury from hydraulic oil, contact a doctor immediately. Danger of infection!



- When coupling and uncoupling the hydraulic hose lines to the hydraulic system of the vehicle, ensure that the hydraulic system is depressurised.
- Ensure correct connection of the hydraulic hose lines.
- Regularly check all hydraulic hose lines and couplings for damage and contamination.
- Have the hydraulic hoses checked for working safety and condition at least once a year by an expert.
- Replace hydraulic hoses in case of damage and ageing. Use only manufacturer's original hydraulic hoses.
- The period of use of the hydraulic hoses must not exceed six years including a possible storage time of at most two years.
- Hoses and hose connectors are subject to natural ageing even with proper storage and permissible level of use; so that their storage time and period of use is limited. However, the period of use can be determined according to experience, especially when taking the danger potential into account. Other guidelines may apply for hoses and hose lines of thermoplastics.
- Store oil safely, out of the reach of children.
- Ensure that no hydraulic oil enters the ground or water.

6.6.1 Marking of hydraulic hose lines

The marking on the valve (Fig. 6.13) provides the following information:

- (1) Mark of the manufacturer of the hydraulic hose line (A1HF)
- (2) Manufacture date of the hydraulic hose line (04 / 02 = year / month = Feb. 2004).
- (3) Maximum operating pressure (210 BAR)

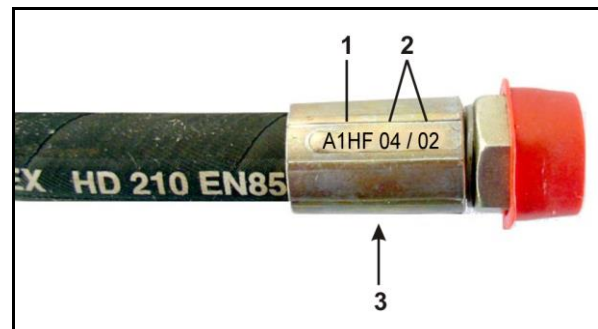


Fig. 6.13

6.6.2 Servicing intervals

After the first 10 operating hours and then every 50 operating hours.

1. Check all components of the hydraulic system for leaks.
2. If necessary, retighten the screw connections.

Before every start-up:

1. Check the hydraulic hose lines for obvious defects.
2. Correct any worn areas on hydraulic lines and pipes.
3. Immediately replace worn or damaged hydraulic hose lines.

6.6.3 Inspection criteria for hydraulic hose lines



For your own safety:

Replace hydraulic hose lines immediately you observe one of the following defects:

- Damage to the outer layer down to the reinforcement (e.g. from rubbing points, cuts, tears).
- Brittleness of the outer layer (recognisable by crack formation of the hose material).
- Unnatural deformations of the hydraulic hose lines, e.g. layer separation, bubble formations, areas of crushing or kinking.
- Leaks.
- Damage, deformation or leaks of the hose fittings. Slight surface damage is not grounds for replacement.
- Detachment of the hose from the fittings.
- Corrosion of the valve/fitting that can impair its function and strength.
- Unprofessionally laid hydraulic hose lines, e.g. bending radii not adhered to, positioning over sharp edges.



- The period of use of 6 years is exceeded.

The period of use is calculated from the date of manufacture of the hydraulic hose line plus 6 years.

Example (Fig. 6.13): The date of manufacture of hydraulic hose line is indicated on the valve, for example, (07/10 = year / month = October 2007). The period then ends in October, 2013.

6.6.4 Installation and removal of hydraulic hose lines



Make sure to observe the following instructions in the installation and removal of hydraulic hose lines:

- Use only hydraulic hose lines from the manufacturer.
- Ensure cleanliness.
- It is necessary to install hydraulic hose lines in such a manner that in all operating conditions:
 - tensile loading does not occur except as a result of inherent weight,
 - there is no axial compression load along short lengths,
 - external mechanical influences on the hydraulic hose lines are prevented.

Prevent rubbing of the hydraulic hose lines on components or against one another by proper arrangement and fastening. If necessary, protect the hose lines by means of protective covers. Cover sharp-edged components.
 - the permissible bending radii are not made smaller than allowed.
- When connecting to moving parts it is required that the hose lengths of a hydraulic hose line, are dimensioned such that:
 - In the overall moving area the smallest permissible bending radius is not below what is allowed.
 - The hydraulic hose line is not subjected to tensile force.
- Fix the hydraulic hose line to the defined fastening points. Avoid additional hose supports that impair the natural movement and changes of length of the hydraulic hose lines.
- Painting of the hydraulic hose line is prohibited.

6.7 Bolt torques

Thread A=Ø	Spanner gap [mm]	Torque [Nm] depending on the bolt / nut quality classification		
		8.8	10.9	12.9
M 8	13	25	35	41
M 8x1		27	38	41
M 10	16 (17)	49	69	83
M 10x1		52	73	88
M 12	18 (19)	86	120	145
M 12x1.5		90	125	150
M 14	22	135	190	230
M 14x1.5		150	210	250
M 16	24	210	300	355
M 16x1.5		225	315	380
M 18	27	290	405	485
M 18x1.5		325	460	550
M 20	30	410	580	690
M 20x1.5		460	640	770
M 22	32	550	780	930
M 22x1.5		610	860	1050
M 24	36	710	1000	1200
M 24x2		780	1100	1300
M 27	41	1050	1500	1800
M 27x2		1150	1600	1950
M 30	46	1450	2000	2400
M 30x2		1600	2250	2700

- Check the bolts and nuts for tight seating for the first time after 5 operating hours, then regularly (approx. every 50 operating hours); tighten up if required.

A = Thread size (tensile strength classification found on bolt head)

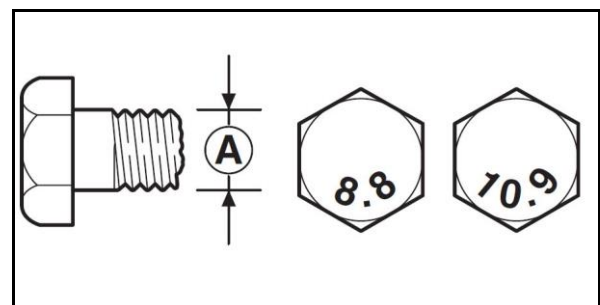


Fig. 6.14

7 Appendix

7.1 Hydraulic circuit diagrams

Hydraulic lateral adjustment

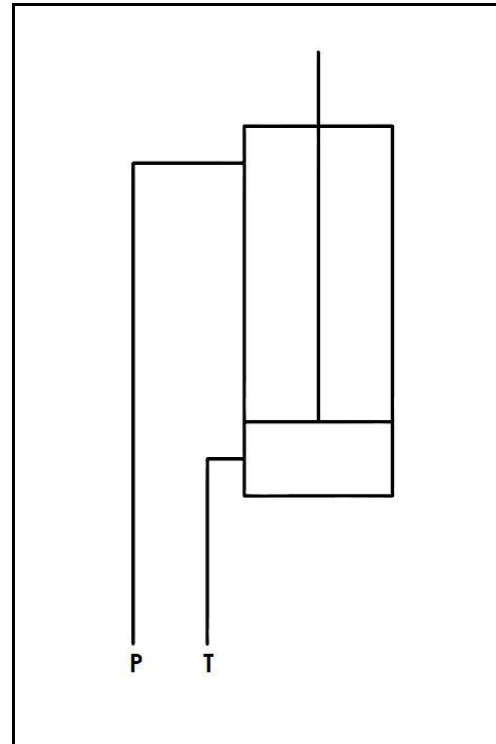


Fig. 7.1

Hydraulic emptying of dirt hopper

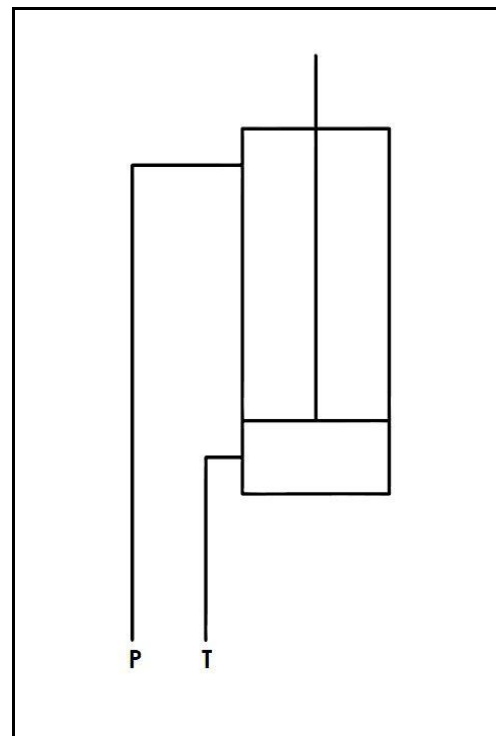


Fig. 7.2

