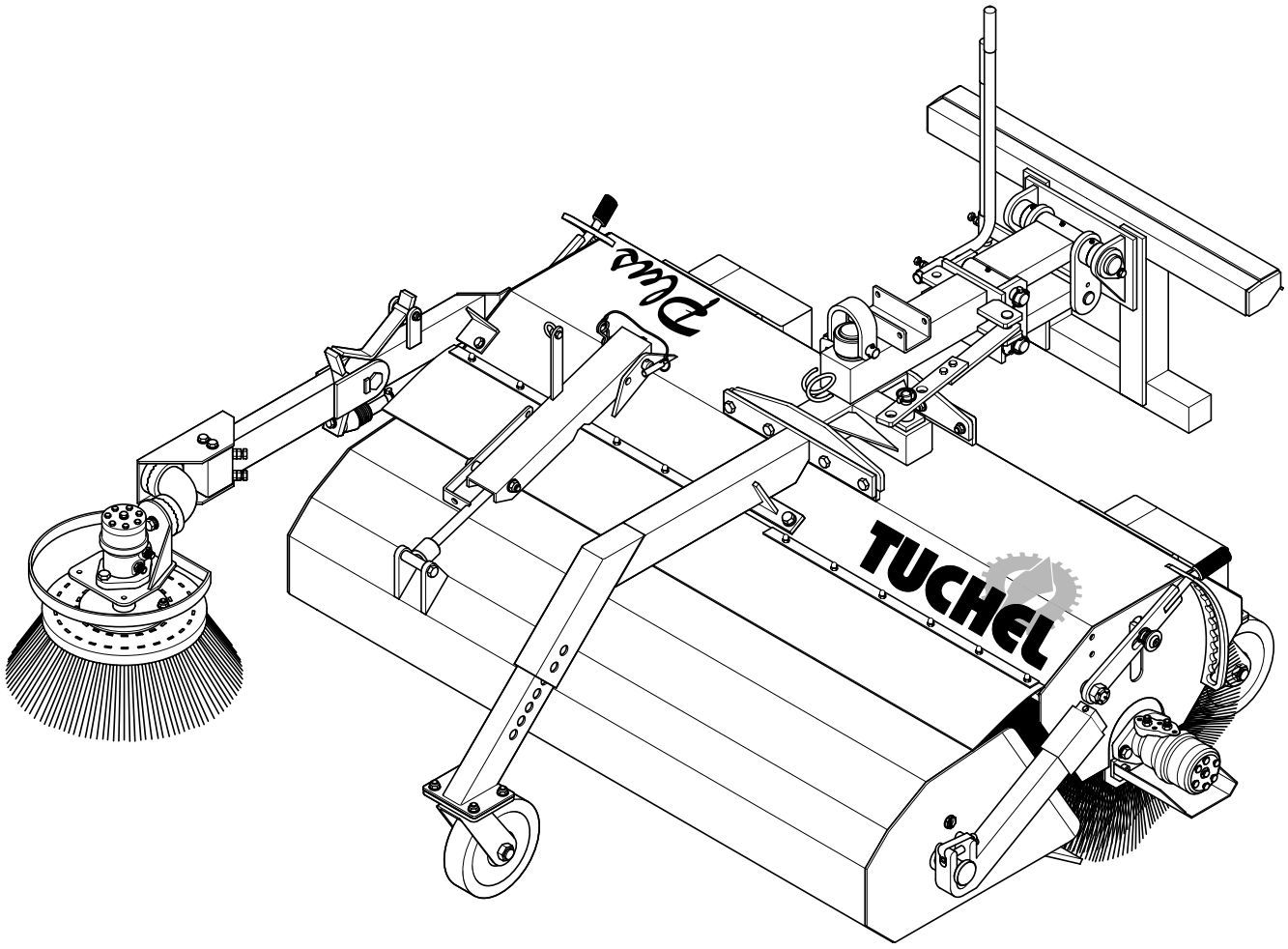
TUCHEL
MASCHINENBAU GmbH

# Operating Manual




## *Plus* - Sweeping Machine P1

# Preface

Dear Customer,

with the Plus sweeping machine, you have purchased a product that has been manufactured according to the highest quality standards.

This operating manual contains information and notes that are necessary, important and useful for the operational safety and reliability of your Plus sweeping machine as well as for maintaining its value.

Its contents familiarise with the use of the machine and its service and maintenance. The manual also helps you to avoid dangers and damage.

We wish you optimum results with your Plus sweeping machine.

Tuchel Maschinenbau GmbH

State: 05/2002

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# 1 General

## 1.1 Purpose

The Plus sweeping machine of the HD series is intended for installation on a 3-point linkage, series HG for

installation with fork arms, series HK for installation on a coupling triangle, series HH for the installation on yard loaders, and series HU for the installation on local government vehicles. Because of its robust construction and the various operating widths, this sweeping machine is suitable for the use on streets and squares of any size.

The attachment of the Plus sweeping machine takes place via the mechanically or hydraulically operated quick change receptacle of the carrier vehicle in question, the drive-in of a pallet fork into fork arm pockets, or via a coupling triangle or via attachment to a 3-point linkage.

Through the simple removal of the large-volume dirt collection vessel, the Plus sweeping machine may also be used as an open sweeping machine to sweep large sealed surfaces.

Various optional equipment permits the Plus sweeping machine to be adapted to different work environments. This optional equipment includes, e.g., the hydraulic emptying of the collection vessel, the water spraying device to bind dust, a side broom to sweep close to edges, a hydraulic side adjustment to ease the work, or reinforced castors, etc.

## 1.2 Product Specifications

### 1.2.1 General

This operating manual applies to the Plus sweeping machine series P1 HD 560, P1 HG 560, P1 HK 560, P1 HH 560 and P1 HU 560.

### 1.2.2 Manufacturing Address

Tuchel Maschinenbau GmbH
Holsterfeld 15
D-48499 Salzbergen
Telephone +49 5971 9675 - 0
Fax +49 5971 9675 - 30
E-mail info@tuchel.com

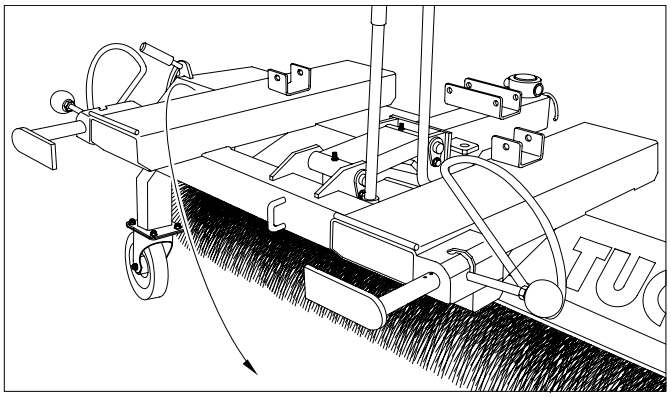
### 1.2.3 Type Label

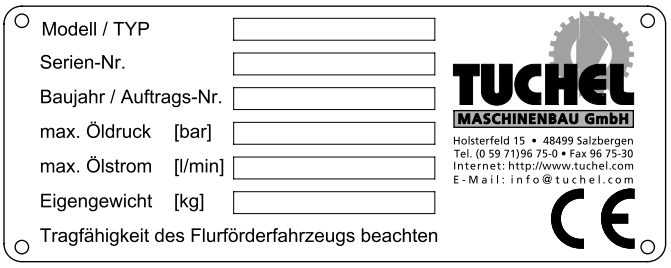
P1 200 HH 560

- Brush diameter in mm
- Attachment options
  - H = yard loader receptacle
  - G = fork arm receptacle
  - U = attachment plate for front appliances to local government vehicles
  - K = coupling triangle category I/II according to ISO 730 - 1
  - D = 3-point category I/II according to ISO 730
- Type of drive
  - H = hydraulic
- Operating width in cm
- Front sweeping machine Type Plus

## 1.2.4 Labelling

The labelling takes place via the type label.






| | |
|---|---|
| Model | |
| Serial no. | |
| Year of construction/ order no. | |
| Maximum oil pressure [bar] | |
| Maximum oil flow [l/min] | |
| Net weight [kg] | |

**NOTE** The entire labelling (type label, safety label, etc.) constitutes a certificate and must not be altered or made illegible. It must be replaced if it is damaged or missing.

## 1.2.5 Declaration of conformity

The compliance of this attachable sweeper with the “basic safety and health requirements” of the machine directive 98/37 EWG entitles it to bear the CE label.

During the development of the attachable sweeper, the harmonised European standards DIN EN 292 1+2, DIN EN 982 and DIN pr EN 1553 were also applied. This is documented in the EU declaration of conformity.

## 1.2.6 Specifications for enquiries and orders

When ordering spare parts or accessories, please specify the type label, serial number and the year of construction of the Plus sweeping machine.

**NOTE** The use of accessories or spare parts of other manufacturers is only allowed after consultation with the manufacturer.
Original accessories / original spare parts and accessories authorised by the manufacturer provide safety.

**NOTE** The use of other accessories / spare parts invalidates the liability for the consequences thereof.

## 1.2.7 Maximum load specifications

Maximum operating pressure at continuous load: **175** bar

## 1.2.8 Connections

**Design of the Plus sweeping machine with:**
- hydraulic operation

=> one single-acting control circuit

**Design of the Plus sweeping machine with:**
- hydraulic operation
- side broom

=> one single-acting control circuit

**Design of the Plus sweeping machine with:**
- hydraulic operation
- hydraulic emptying of the collection vessel

=> one double-acting control circuit

**Design of the Plus sweeping machine with:**
- hydraulic operation
- side broom
- hydraulic emptying of the collection vessel

=> one double-acting control circuit

**Design of the Plus sweeping machine with:**
- hydraulic operation
- hydraulic emptying of the collection vessel
- hydraulic side adjustment

=> two double-acting control circuits

**Design of the Plus sweeping machine with:**
- hydraulic operation
- hydraulic emptying of the collection vessel
- hydraulic side adjustment
- side broom

=> two double-acting control circuits

## 1.2.9 Energy consumption

| | |
|---|---|
| Type of drive: | hydraulic |
| Oil quantity required: | 25 - 60 l/min |
| Oil pressure required: | 160 bar |
| Type of oil: | hydraulic oil according to ISO VG 46 DIN 51524 (e.g., Vitam GF 46, manufactured by Aral) |

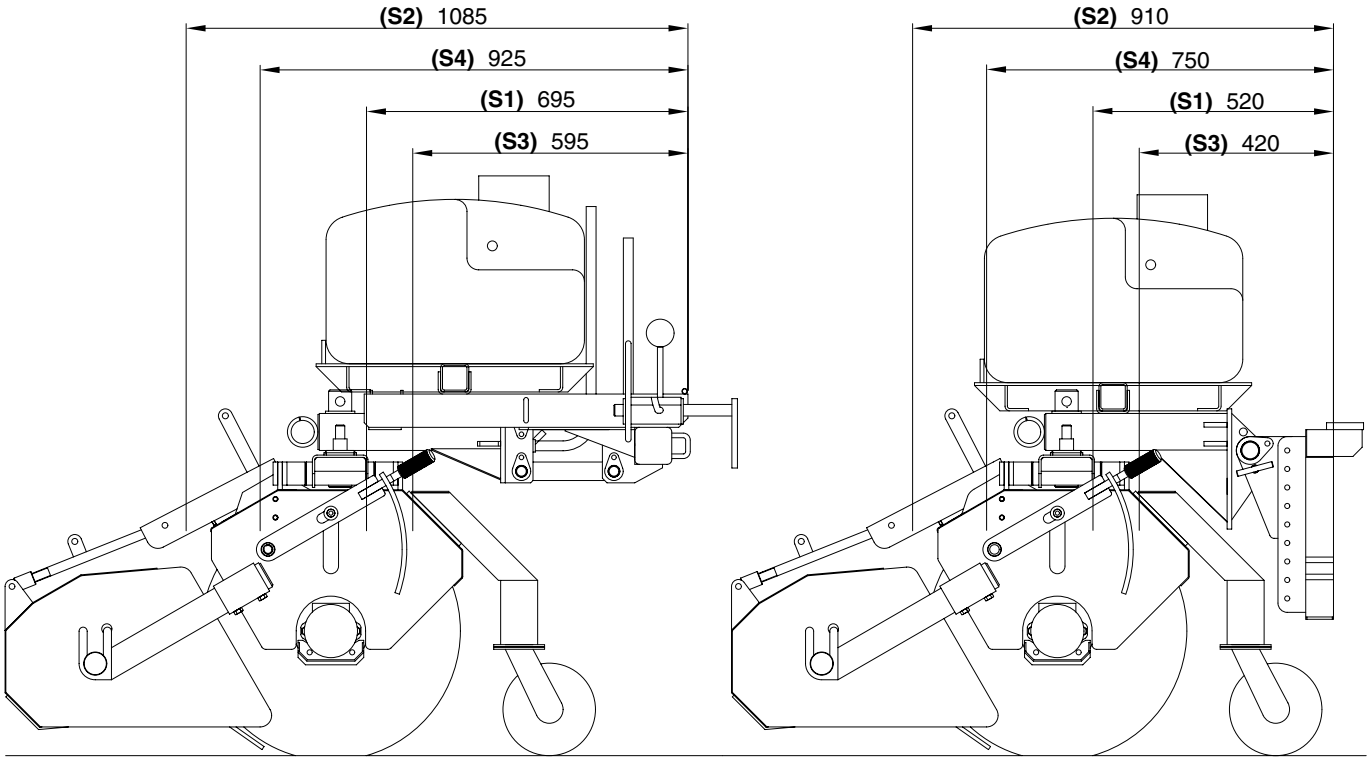
## 1.2.10 Intended usage

The Plus sweeping machine P1 is a machine that is set in motion via a hydraulic circuit and through the attachment to a carrier vehicle. It is used to sweep sealed surfaces with average soiling.

If the machine is used for a purpose different from the one above, we, as the manufacturer, do not take any responsibility for the safety; the risk in this respect rests entirely with the user.

The intended usage includes the adherence to our requirements regarding, operation, service and maintenance.

## 1.2.11 Technical data sheet




| Plus sweeping machine | P1 | 120 | 135 | 150 | 165 | 180 | 200 | 230 | 260 | 290 |
|---|---|---|---|---|---|---|---|---|---|---|
| Maximum oil pressure at continuous load | bar | 175 | | | | | | | | |
| Maximum oil flow at continuous load | l/min | 60 | | | | | | | | |
| Revolutions main sweeping drum rpm | U/min | 80-150 | | | | | | | | |
| Operating width | mm | 1200 | 1350 | 1500 | 1650 | 1800 | 2000 | 2300 | 2600 | 2900 |
| Operating width if positioned at an angle | mm | 1125 | 1265 | 1405 | 1545 | 1685 | 1870 | 2155 | 2435 | 2715 |
| Diameter of sweeping drum | mm | 560 | | | | | | | | |
| Diameter of side broom | mm | 600 | | | | | | | | |
| Total width in case of external engine | mm | 1520 | 1670 | 1820 | 1970 | 2120 | 2320 | 2570 | 2820 | 3220 |
| Total width in case of internal engine | mm | 1395 | 1545 | 1695 | 1845 | 1995 | 2195 | 2445 | 2695 | 3095 |
| Total height excluding water spraying device | mm | 790 (with 3-point linkage 1300) | | | | | | | | |
| Total height including water spraying device | mm | 1205 | | | | | | | | |
| Volume of dirt collection vessel | L | 145 | 162 | 180 | 200 | 215 | 238 | 267 | 296 | 342 |
| Volume of dirt collection vessel | kg | 218 | 243 | 270 | 300 | 323 | 357 | 400 | 444 | 513 |
| **Weight / centre of mass:** | | | | | | | | | | |
| S1 sweeping machine open sweeping | kg | 170 | 178 | 186 | 193 | 203 | 215 | 221 | 244 | 264 |
| S2 sweeping machine + filled collector vessel | kg | 454 | 491 | 530 | 570 | 608 | 659 | 715 | 789 | 890 |
| S3 sweeping machine + water spraying device 200l | kg | 370 | 378 | 386 | 393 | 403 | 415 | 421 | 444 | 464 |
| S4 sweeping machine + filled collector vessel + water spraying device 200l | kg | 654 | 691 | 730 | 770 | 808 | 859 | 915 | 989 | 1090 |

**The weights are approximate values only, since the machine's equipment and the receptacle type are not included.**

**ATTENTION: Use the weights to check compliance with the maximum allowed axle load of the carrier vehicle!**

We reserve the right to incorporate changes resulting from further technical development.

# 2 Safety

This operating manual contains fundamental instructions that must be followed during the attachment, operation and maintenance. Thus, the personnel must read this operating manual under all circumstances before operation and commissioning. The personnel must always have access to the manual.

Safety notices that must be followed include not only the general safety notices in this section on safety, but also the specific safety notices that are included in other sections.

## 2.1 Labelling of notices in the operating manual

The safety notices in this operating manual whose nonobservance may be hazardous for persons are highlighted with a general danger symbol

Safety sign according to DIN ISO 9244

when warning about injuries resulting from squashing.

when warning about injuries resulting from cuts.

Safety notices whose nonobservance may be hazardous for the machine and its functions, have the word

**ATTENTION**

attached.

Notes are labelled as follows:

**N O T E**

Notes that are directly attached to the machine must definitely be adhered to and must be kept in a fully legible state.

## 2.2 Qualification and training of personnel

The Plus sweeping machine must only be used, serviced and maintained by persons that are familiar with the machine and are informed about its dangers. The area of responsibility, competence and the supervision of the personnel must be directed in detail by the operator. If the personnel does not have the necessary knowledge, it must be trained and instructed. Furthermore, the operator must ensure that the personnel fully understands the contents of the operating manual.

Maintenance work that is not described in this operating manual must only be conducted by authorised qualified workshops.

## 2.3 Dangers in the case of nonobservance of the safety notices

The nonobservance of the safety notes may cause hazards for both persons and the environment as well as the machine. The nonobservance of the safety notices may result in the loss of any claims for damage whatsoever.

In detail, nonobservance may, **for example**, lead to the following hazards:

– hazards to persons due to non-secured work areas

– failure of important machine functions

– failure of prescribed methods for service and maintenance

– hazards to persons due to mechanical and chemical influences

– hazards to the environment due to leakage of hydraulic oil

## 2.4 Safety-oriented working

The safety notes listed in this operating manual, current national accident avoidance regulations as well as company-internal regulations governing work, operation, and safety that may apply must be followed.

The accident insurance regulations governing safety at work and accident avoidance are binding.

The safety notices of the vehicle manufacturer must be followed.

When operating on public roads, the appropriate legal regulations (in the Federal Republic of Germany the StVZO and StVO) must be complied with. Furthermore, the permitted axle loads of the respective vehicle manufacturer must be adhered to.

## 2.5 Safety notes for the operator/user

– Before starting work, familiarise yourself with all equipment, operating elements and their functions. During operation, it is too late for this.

– The clothing of the operators shall fit tightly. Avoid loosely fitting clothes.

– Depending on the attachment type, the attachment receptacle and its interlocking mechanisms must be checked for tight fit and possible damage prior to start-up. The positioning of the hydraulic hoses must also be checked, as damages occur easily if hydraulic hoses get entangled or squashed.

– During attachment and detachment, the supports must be put into their respective position.

– Observe permitted axle load, gross weight, and transport dimensions.

– Check and attach transport equipment - such as, e.g., illumination, warning equipment and possible protective equipment.

– If lighting that is part of the standard carrier vehicle is obscured in the transport position, additional illumination devices must be attached.

– Check the immediate area before starting to drive and before start-up (children). Ensure that there is sufficient visibility.

– No passengers may be carried on the machine during operation and transport.

– For the transport, the hydraulic equipment for operating and lowering the Plus sweeping machine must be secured against accidental operation.

– Never leave the driving seat during driving.

– The driving speed must be adapted to suit the respective road and traffic conditions. Avoid sudden turns during uphill and downhill driving and when driving parallel to a slope.

– Pay attention to the influence of the attached Plus sweeping machine on driving behaviour and steering and braking ability.

– Start the Plus sweeping machine only if all safety equipment is attached and in protection position.

– No person may be present in the area of operation.

– The swivel mechanism must only be operated if no persons are present in the area of rotation.

– Squashing and shear points are present on hydraulically operated parts.

– Before leaving the carrier vehicle, lower the Plus sweeping machine to the ground, pull the ignition key and secure the carrier vehicle against unintended start-up and rolling away!

– After switching off the device there is danger due to the continued movement of the centrifugal mass. Do not approach the machine during this time period. Wait until it has come to a complete standstill.

– Hydraulic system may be under pressure.

– Liquids (hydraulic oil) escaping under high pressure may penetrate the skin and can cause severe injuries. In case of injuries, see a doctor immediately. Danger of infection!

– Connect the hydraulic hoses only in the pressure-free state of the vehicle hydraulics.

– Hydraulic hoses must be replaced no later then after 6 years of usage (including storage time of at most 2 years).

– Regularly check the hydraulic hoses and replace them in case of damage and ageing. The replacement hoses must comply with the technical requirements of the manufacturer.

– Leakages represent a danger to the environment and must be removed immediately.

– When searching for leaks, use suitable equipment to avoid injuries.

## 2.6 Safety notices for carrying out service, inspection and installation work

The operator must ensure that all service, inspection and assembly work is carried out by authorised and qualified personnel that has sufficiently informed itself through detailed study of the operating manual.

Work on the machine must in principle only be carried out during standstill. The machine's halting procedure described in the operating manual must be observed under all circumstances.

When carrying out maintenance on the lifted device, always secure it with suitable supports.

Use suitable tools and gloves when exchanging the sweeping drum and sweeping rail.

Lawfully dispose of oils and grease.

Directly after finishing work, all safety and protection equipment must be reattached or made functional.

Before restarting, the points listed in the sections on start-up must be adhered to.

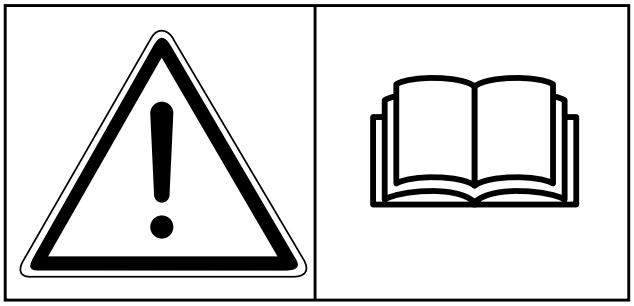
## 2.7 Unauthorised conversion and spare parts manufacturing

Conversion of or changes at the machine are only permitted after consultation with the manufacturer. Original spare parts and accessories authorised by the manufacturer provide safety. The use of other parts invalidates the liability for the consequences thereof.

## 2.8 Modes of operation that are not permitted

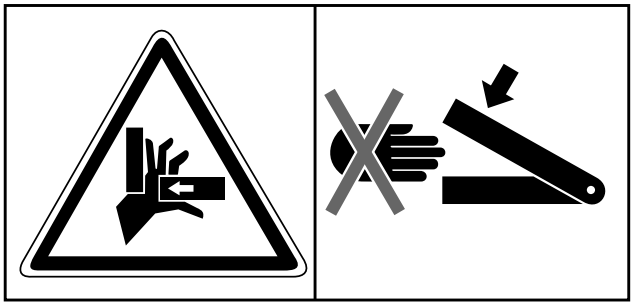
The operational safety of the machine supplied is only warranted if used as intended according to Chapter 1 - General – of the operating manual. The limits specified in the data sheets must not be exceeded under any circumstances.

## 2.9 Warning images on the machine according to ISO 11684



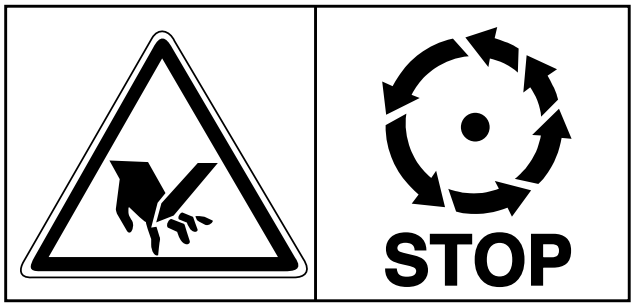
Part no. 00.KC.00100

Read the operating manual and adhere to the safety notices before start-up.



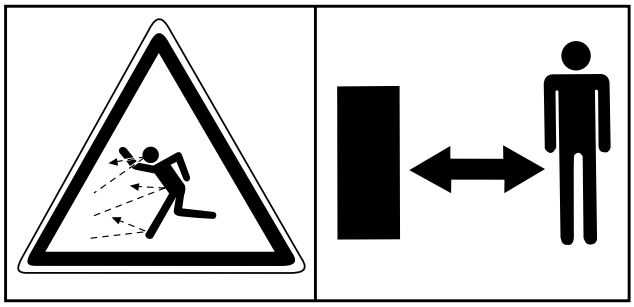
Part no. 00.KC.00101

Never reach into the squashing hazard area as long parts may move there.



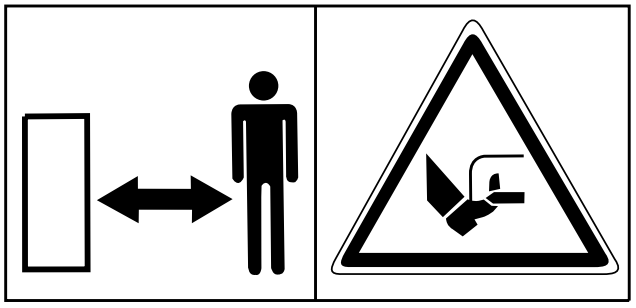

Part no. 00.KC.00102

Do not touch any moving machine parts. Wait until they have come to a complete standstill.



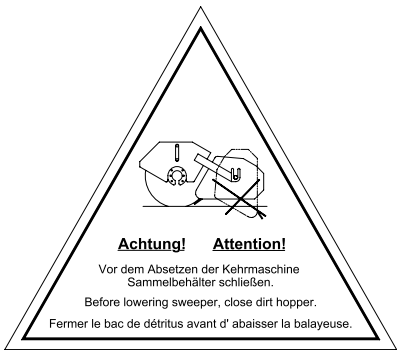
Part no. 00.KC.00107

Danger of parts flinging away while engine is running - keep a safe distance.



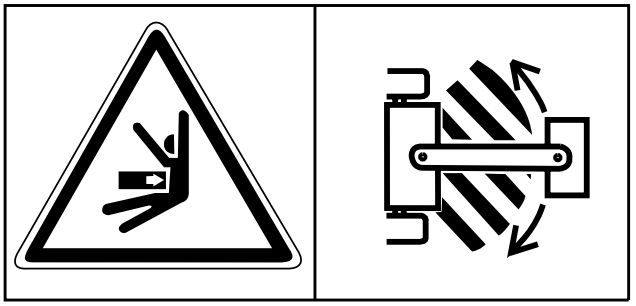
Part no. 00.KC.00103

When lowering the Plus sweeping machine, keep sufficient distance.




Part no. 00.KC.00105

Close the collector vessel before lowering the sweeping machine.



Part no. 00.KC.00104

Do not stand in the rotation area during operation.

**NOTE** The notice signs attached to the machine must be kept in a clearly legible state. Replace notice signs that are no longer legible.

**NOTE** When ordering new notice signs, specify the article number listed.

# 3 Plus Sweeping Machine

## 3.1 Description of the product and accessories

The sweeping machine is designed for both pickup and open sweeping usage. By unmounting the dirt collection vessel, the machine is converted to the open sweeping mode.

The frame is made of a robust and torsion-free welded construction.

The sweeping drum is suspended freely in the frame using a lever system. The brush adjustment is carried out via a raster rail. Through the lever action, the sweeping drum may be adjusted via the raster level when necessary, which thus ensures a continuously satisfactory sweeping result.

An external, high-powered hydraulic motor, equipped with a collision protector, or optionally an internal, high-powered hydraulic motor, fully protected by the integration into the drum shaft, directly drives the sweeping drum. The revolution speed of the sweeping drum depends on the oil flow and on the equipment of the carrier vehicle.

The sweeping drum is fitted with Beeline plastic brush rings as series equipment. The brush rings are 560 mm in diameter.

The opening and closing of the dirt collection vessel is accomplished via a bowden control or by operating a hydraulic cylinder. This is controlled from the carrier vehicle. An abrasion-proof Vulkollan rail is connected to the lower edge of the dirt collection vessel across the entire length in order to lead the collection vessel's lower edge evenly and without damage along the ground.

The Plus sweeping machine is equipped with a direct attachment option that matches the carrier vehicle. The respective attachment type is connected to the machine frame via a swivel construction.

The pendulum compensation ensures a level-compensating usage, even on uneven ground.

With the mechanical or hydraulic side adjustment, the sweeping machine may be rotated by 20.5° to the right or to the left.

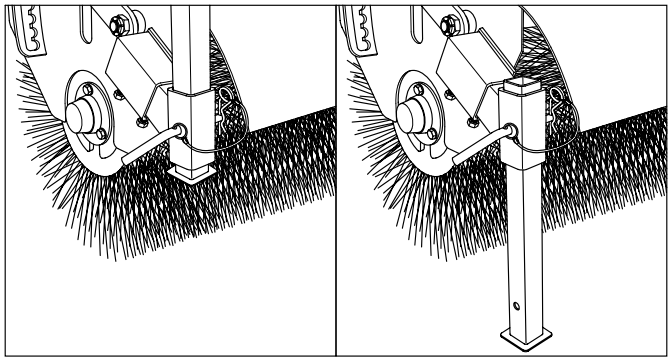
## Accessories

- dirt collection vessel with Vulkollan rail and mechanical emptying.
- high-level filling flap for the extension of the filling volume of the dirt collection vessel.
- hydraulic collection vessel emptying
- 3rd support wheel for even ground guidance
- water spraying device to bind dust, optionally 100 l or 200 l water tank, with a 12 V (24 V) dry-running pump.
- hydraulic side broom
  sweeping close to edges with rpm regulation and adjustment via raster disks to achieve a large number of working positions.
- protected hydraulic motor, positioned inside the drum shaft.
- hydraulic side adjustment: inclination of the sweeping machine using a hydraulic cylinder. This requires a double-acting control valve on the carrier vehicle.
- more durable castors in various designs.
- StVZO equipment, consisting of contour illumination equipment which according to StVZO is required and must be used when driving on public roads.

## 3.2 Storage

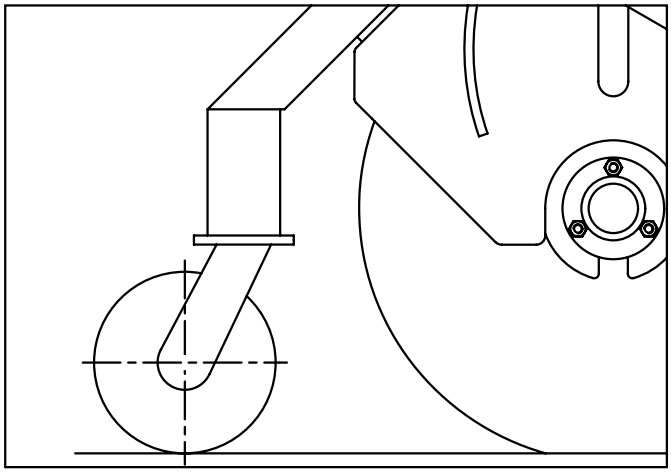
Park sweeping machine on a firm and level surface in a dry and clean place.

Accident hazard!
Ensure a secure standing of the sweeping machine.



- for the open sweeping Plus sweeping machine, move the supports downwards and secure them.

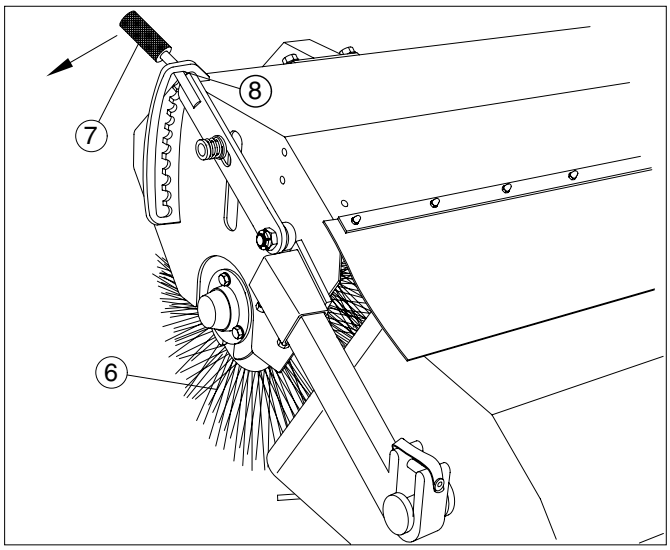
- support wheels must point towards the back.



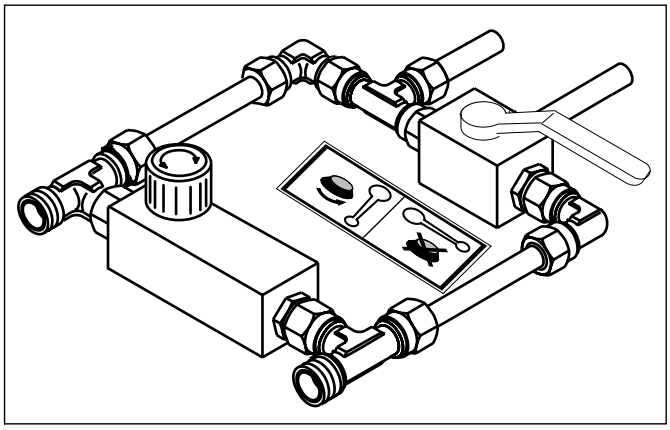
- relieve the ground pressure of the sweeping drum (6), pull the handles of the raster lever (7) to the outside.

Take the sweeping drum's own weight into account

- Let them latch into the uppermost position (8) of the adjustment raster. (do this evenly on both sides).

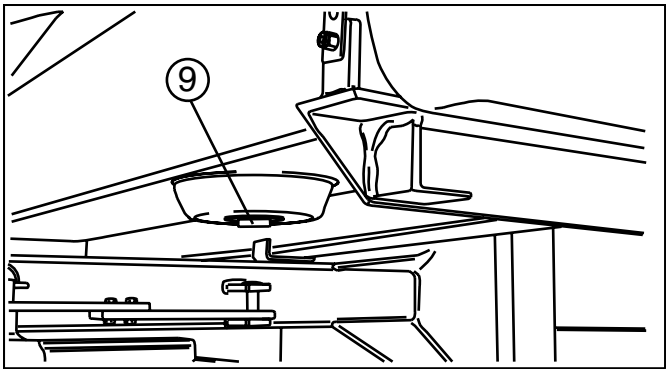


- in the case of a Plus sweeping machine with a side broom, close the tap of the side broom.



- tilt the side broom upwards and unplug it. (see Chapter 3.4.1)

- empty the water tank. Loosen the drainage bolt (9) (bottom side of the tank).




- if there is danger of frosts, activate the pump of the water spraying device for 10-15 sec. until no more residual water remains in the hoses.

Accident hazard!
Hydraulic hoses, electric connection cable and the bowden control are a tripping hazard on the ground.
Put the hydraulic hoses and the electric connection cable across the sweeping machine.

**ATTENTION** Close the hydraulic connector with the dust cap. Soiling leads to damage on the hydraulic system.

If necessary, clean the sweeping machine thoroughly. Dirt attracts humidity and leads to the formation of rust.

- lubricate the sweeping machine.
- if necessary, repair paint damage.

## 3.3 Attachment

The Plus sweeping machine must be attached to or coupled to the intended carrier vehicle using the supplied attachment device

The attachment device itself must not be changed or modified.

The permitted support loads, axle relief, axle loads, gross weight and transport dimensions must be taken from the manufacturer's information about the carrier vehicle and must be checked before start-up.

If a ballast weight is required, attach it as prescribed to the intended attachment points of the carrier vehicle before attaching the sweeping machine.

During attachment or coupling, special caution must be exercised.

Carry out maintenance, repair work and modifications on the Plus sweeping machine only if the hydraulic drive is switched off and the hydraulic connections are decoupled. Secure the carrier vehicle against unintended start-up and rolling away!

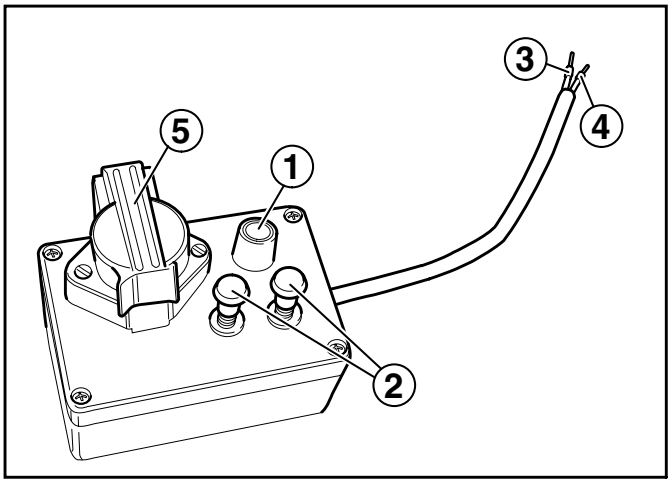
**NOTE** ***During the attachment, follow the operating manual of the carrier vehicle's manufacturer! Only one example is described and shown here for each case.***

**ATTENTION** Verify the correct attachment and its safeguards.

**NOTE** The positioning of the electric connection and the hydraulic hoses must be checked, as damage occurs easily if they get entangled or squashed.

**NOTE** **Initial attachment**

During the initial attachment of the sweeping machine with water spraying device or illumination devices, the switchbox must be mounted at a suitable position in the carrier vehicle.



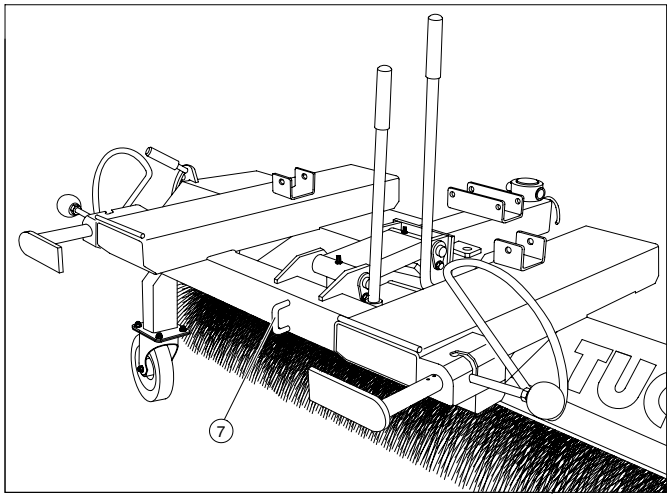

- Connect cable (3) to the battery (-).
- Connect cable (4) to the parking light terminal.
- Socket (5) for the electric connection of the Plus sweeping machine.
- (1) fuse.
- (2) Off -On switch.

## 3.3.1 Fork arm receptacle

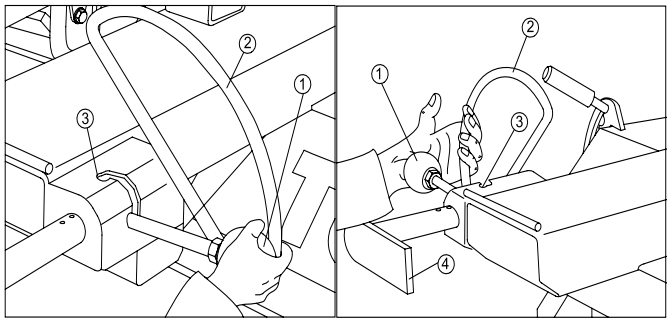
The safety notices of Chapter 3.3 apply

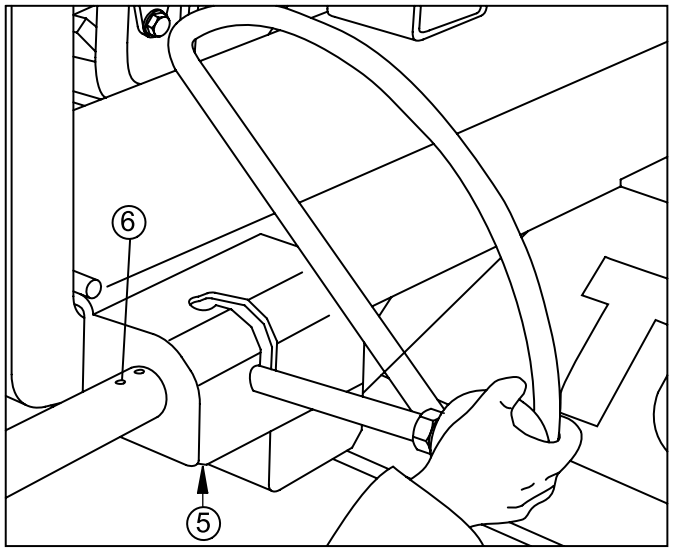
**ATTENTION** Check fork arm receptacle and fork arms for soiling and clean if necessary.

**N O T E** The distance between the fork arms must be adjusted on the carrier vehicle before they are driven into the receptacles!



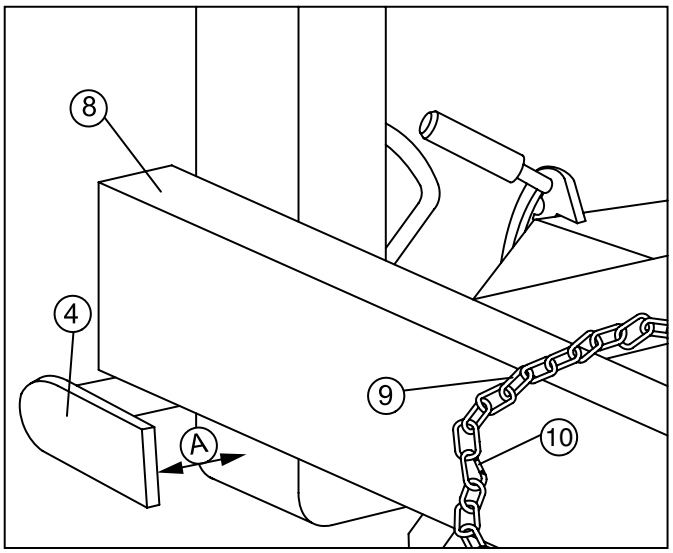

- On both sides of the fork arm receptacle, pull the knob (1) towards the protection bracket (2) and tilt it upwards until it snaps into the groove (3). The locking bracket (4) now points towards the ground.
- Drive the fork arms fully into the receptacle.
- Move the locking brackets (4) back into a horizontal position.
- Adjust the distance (A) to the width of the fork arms.
- Unscrew the screw (5) on both sides. Shift the locking brackets (4) to the appropriate width. Reinsert the screw through one of the holes (6) from the underside and tighten it.
- In addition, the fork arm receptacle must be secured with a chain (9).
- The chain must be pulled tightly through the loop (7) and the slide carriage (8) of the carrier vehicle and must be secured with the spring hook (10).




**ATTENTION** The chain (9) must not touch the guide rails of the lifting gear.

**ATTENTION** Check for the correct locking of the locking bracket behind the fork arms. Ensure a tight fit of the chain (9).

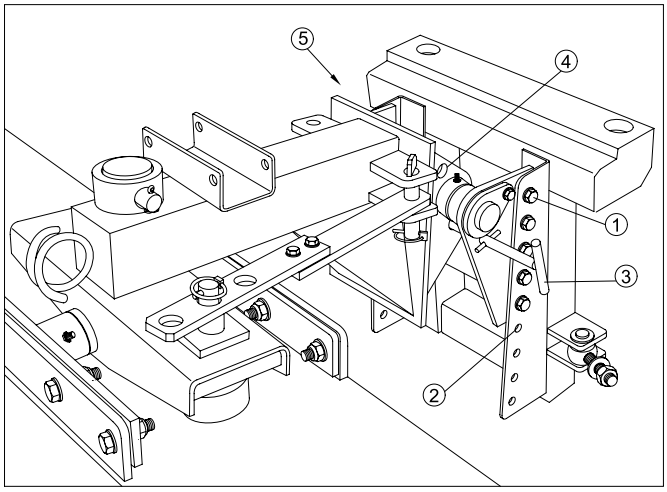



- Connect the hydraulic lines according to the instructions of the vehicle manufacturer.
- Connect the electric connection cable for the water spraying device or illumination devices to the cabinet in the carrier vehicle.
- Lift the sweeping machine and carry out a functionality check.

## 3.3.2 Receptacle on local government vehicle

The safety notices of Chapter 3.3 apply

**ATTENTION** Check the receptacle for soiling. Clean if necessary.



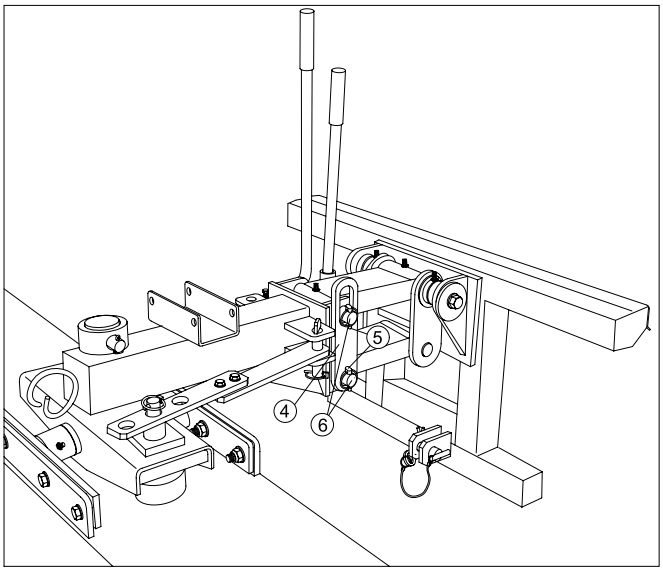

- Drive the carrier vehicle towards the sweeping machine until a distance of 300 mm remains.
- Compare the interface height of the carrier vehicle's receptacle with the receptacle of the Plus sweeping machine.
- To shift the receptacle, unscrew the screws (1) on both sides, move it along the perforated rail (2) and re-secure it with the screws and new locking nuts.
- Insert the receptacle of the carrier vehicle into the receptacle of the sweeping machine and lock it as described in the operating manual of the carrier vehicle.

**ATTENTION** Verify the correct seating of the receptacle and its lock.

- Remove the positioning bolt (3) by pulling the linchpin (5), insert it into the intended hole (4) and secure with linchpin (5).
- Connect the hydraulic lines according to the instructions of the vehicle manufacturer.
- Connect the electric connection cable for the water spraying device or illumination devices to the cabinet in the carrier vehicle.
- Lift the sweeping machine and carry out a functionality check.

## 3.3.3 Quick change receptacle yard loader

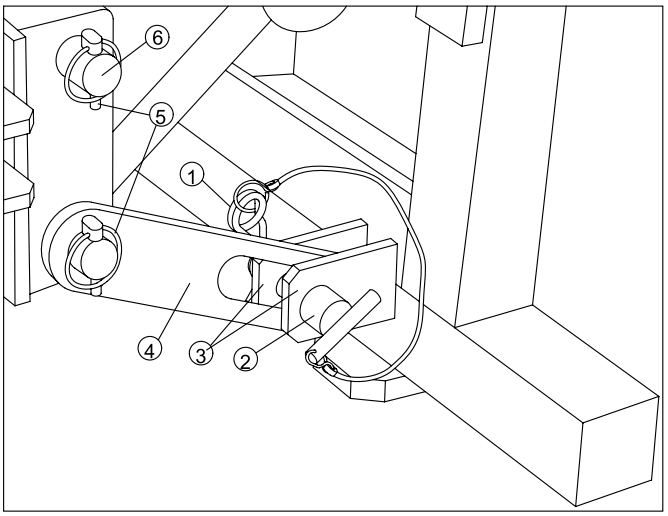
The safety notices of Chapter 3.3 apply




**ATTENTION** Check the receptacle for soiling. Clean if necessary.

- Lower the receptacle of the carrier vehicle below the receptacle opening of the Plus sweeping machine.
- Insert the receptacle of the carrier vehicle into the receptacle and lock it as described in the operating manual of the carrier vehicle.

**ATTENTION** Verify the correct seating of the receptacle and its lock.




- Pull out the spring plug (1) and bolt (2).
- Transport lock (4) tilts downwards. Replug the bolts (2) and spring plugs (1) into the brackets (3).
- Pull the linchpins (5), plug the transport lock (4) onto the shaft (6) and lock again with the linchpins (5).
- Connect the hydraulic lines according to the instructions of the vehicle manufacturer.
- Connect the electric connection cable for the water spraying device or illumination devices to the cabinet in the carrier vehicle.
- Lift the sweeping machine and carry out a functionality check.

## 3.3.4 Rear attachment to 3-point linkage (or front attachment)

The safety notices of Chapter 3.3 apply

**ATTENTION** Check the receptacle for soiling. Clean if necessary.

**NOTE** Adjust the width of the attachment receptacle to the 3-point linkage rods category I or II of the carrier vehicle.

- Adjustment of the draft link hook rods of the 3-point linkage to the width of the carrier vehicle: unscrew the screw connection (1) on the left side below the rod receptacle, adjust the width and tighten the screw connection.
- Select the bolt diameter (2) or (3) according to the attachment category and hook and lock the draft link hook rods.
- Use the bolt diameter (4) according to the attachment category and lock with upper hook.

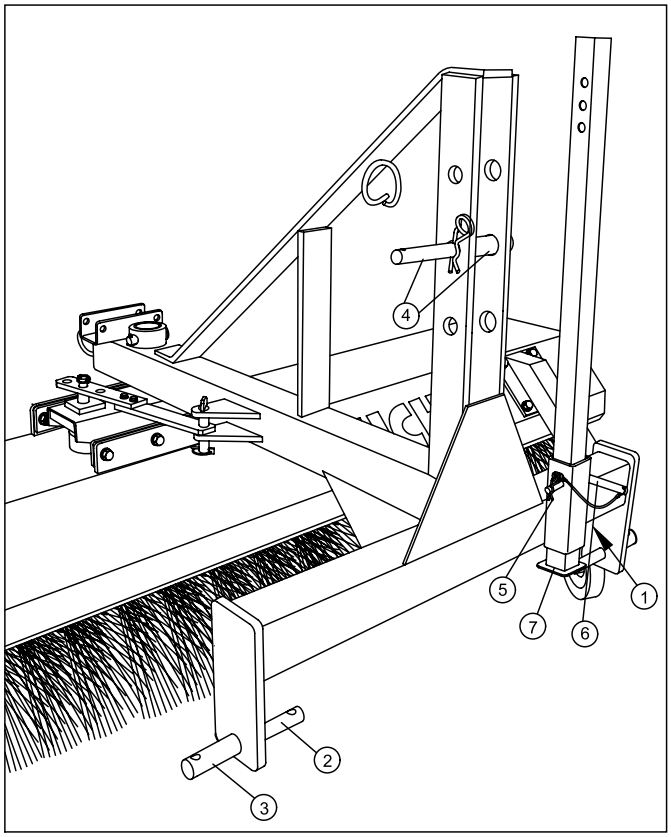
**NOTE** The upper hook must be adjusted so that the attachment receptacle is perpendicular to the ground. (See operating manual of the carrier vehicle)

**ATTENTION** Verify the correct seating of the attachment receptacle.

- Pull out the spring plug (5) and locking bolt (6), pull up the support (7) and re-secure through the bottom hole.
- Connect the hydraulic lines according to the instructions of the vehicle manufacturer.
- Connect the electric connection cable for the water spraying device or illumination devices to the cabinet in the carrier vehicle.
- Lift the sweeping machine and carry out a functionality check.

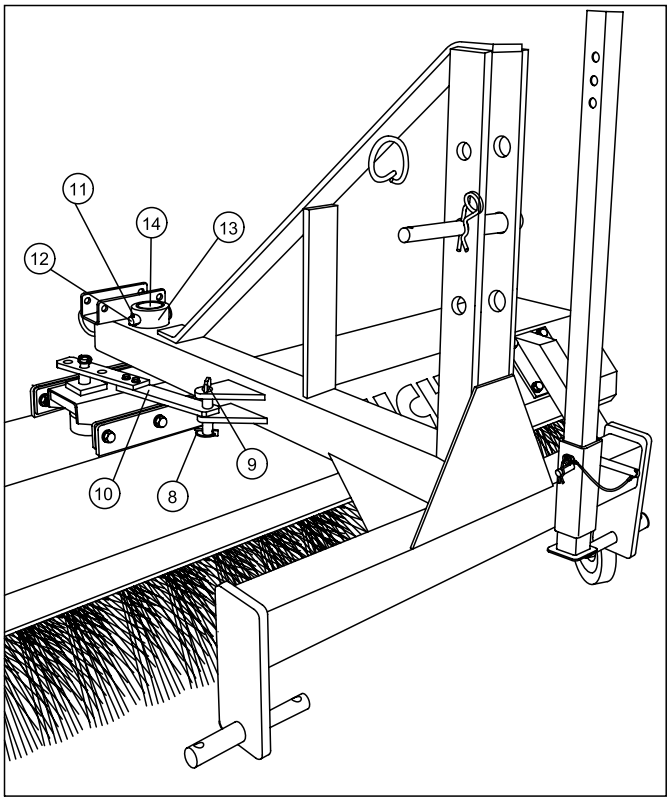
**NOTE** Using this 3-point linkage, the Plus sweeping machine can be attached to the front or rear. This may mean that the receptacle, the pitch rod/pitch control cylinder and the mechanic collection vessel emptying system must be converted.

(conversion see next page)



## Conversion for front attachment

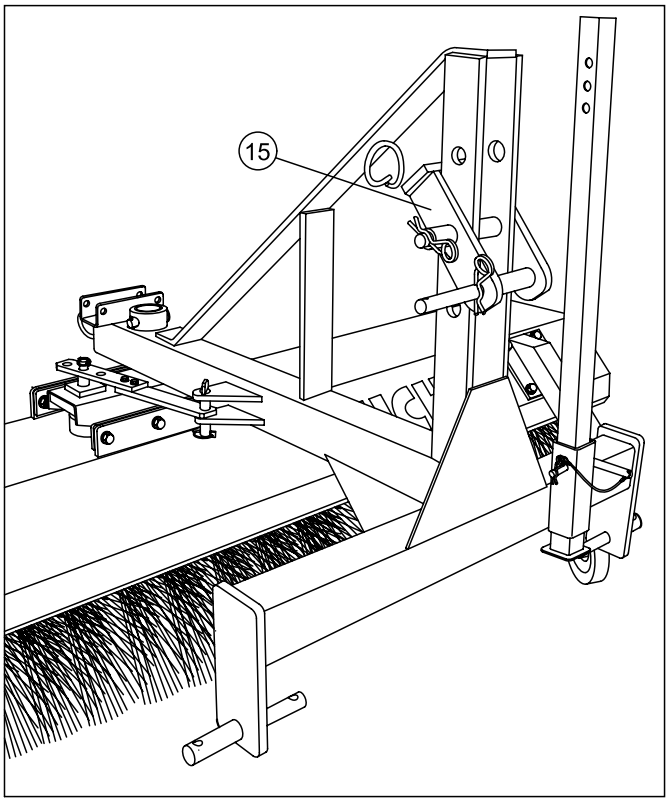
Accident hazard!
Ensure a secure standing of the sweeping machine.




- Remove linchpin (8) and bolt (9).
- Move the pitch rod (10) or pitch control cylinder to the side.
- Remove splint (11) and bolt (12).
- Pull the barrel (13) off the central bolt (14).
- Remove the 3-point linkage from the central bolt, rotate by 180°, and attach again.
- Push barrel (13) on and secure with bolt and splint pin.
- Reinstall the pitch rod (10) or pitch control cylinder on the 3-point linkage, using the bolt (9) and linchpin (8).
- Move the rope of the collector vessel emptying system by moving the spring hook.
- The positioning of the electric connection and the hydraulic hoses must be checked, as damage occurs easily if they get entangled or squashed.

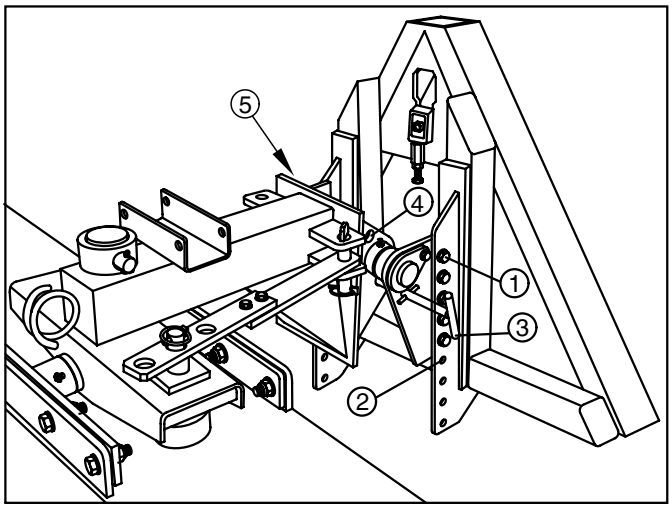
**N O T E** The procedure for front attachment is the same as for the rear attachment. (See previous page)

**ATTENTION** In the case of front attachment with 3-point linkage and a third support wheel, the joint bearing (15) is installed between the upper hook and the 3-point linkage (see image on the lower right).



## 3.3.5 Front attachment with coupling triangle

The safety notices of Chapter 3.3 apply




**ATTENTION** Check coupling triangle and opposing triangle for soiling, and clean if necessary.

- Compare the interface height of the carrier vehicle's receptacle with the receptacle of the sweeping machine.
- To shift the receptacle, unscrew the screws (1) on both sides, move it along the perforated rail (2) and re-secure it with the screws and new locking nuts.
- Insert front receptacle into the coupling triangle and lock it.

**ATTENTION** Verify the correct seating of the attachment receptacle.

- Remove the linchpin (5), put the positioning bolt (3) through the hole (4) and secure it with the linchpin (5).
- Connect the hydraulic lines according to the instructions of the vehicle manufacturer.
- Connect the electric connection cable for the water spraying device or illumination devices to the cabinet in the carrier vehicle.
- Lift the sweeping machine and carry out a functionality check.

## 3.4 Operation

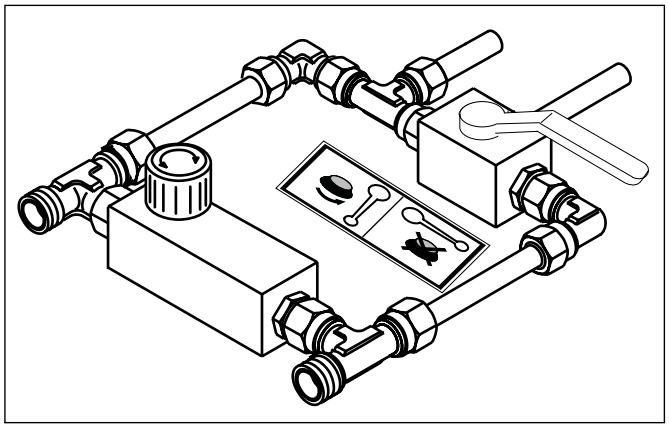
The safety notices of Chapter 3.3 apply

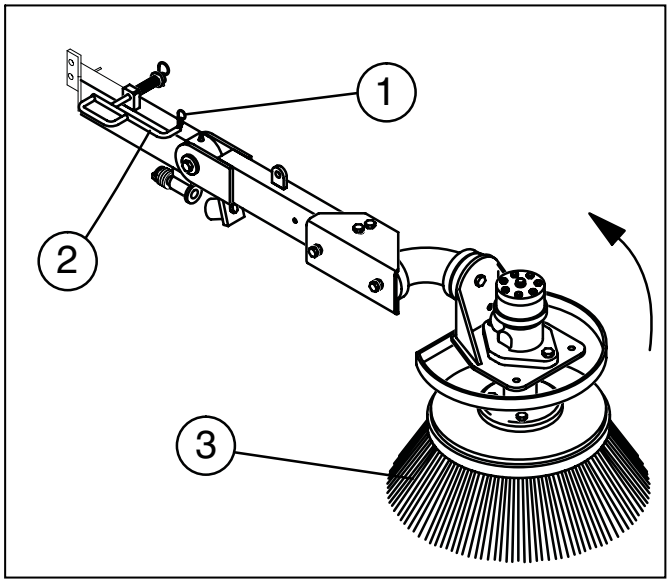
Carry out maintenance, repair work and modifications on the Plus sweeping machine only if the hydraulic drive is switched off and the hydraulic connections are decoupled. Secure the carrier vehicle against unintended start-up and rolling away!

### 3.4.1 Transport trips

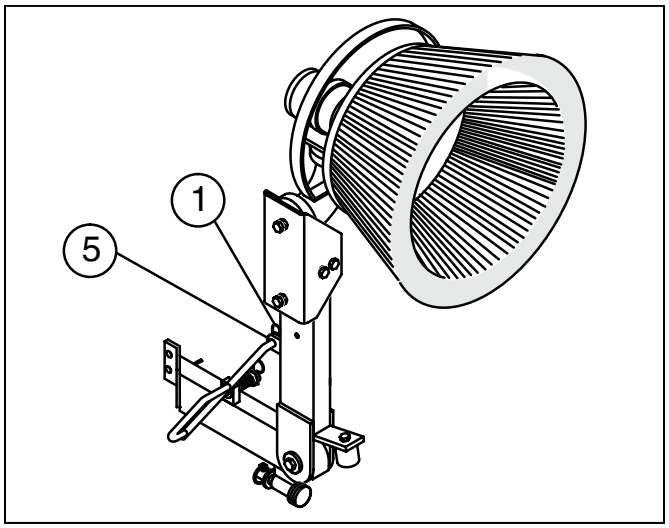
**NOTE** Transport trips may only be made with an empty dirt collection vessel.

- If used as an open sweeping machine, the machine must be put into a straight position. (Chapter 3.4.7)
- Secure the side broom in the top position using the bolt.
- Shut the tap of the side broom, as shown on the label on the machine.






- Pull out the spring plug (1).
- Pull lever (2) to the outside and tilt the side broom (3) to the top.
- Insert the lever (2) into the intended hole (5).
- Secure the lever (2) using the spring plug (1).



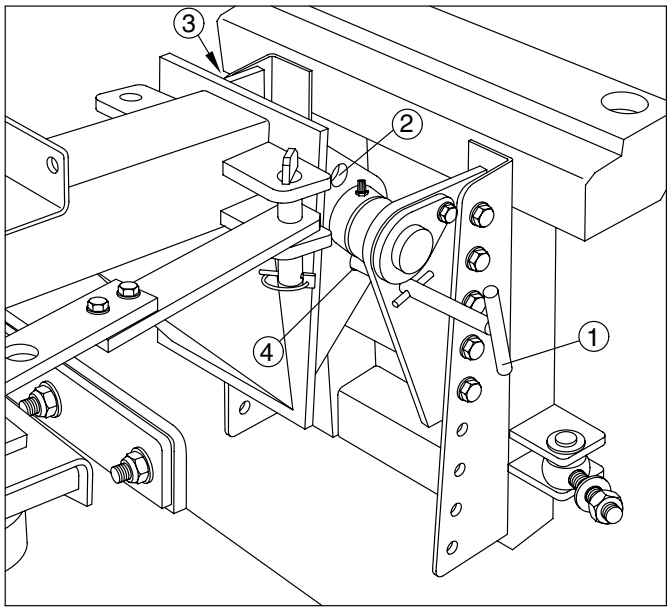

**Observe the following points for the various types of receptacles:**

### 3.4.1.1 Transport trip Local government vehicle

The safety notes of Chapter 3.3 apply

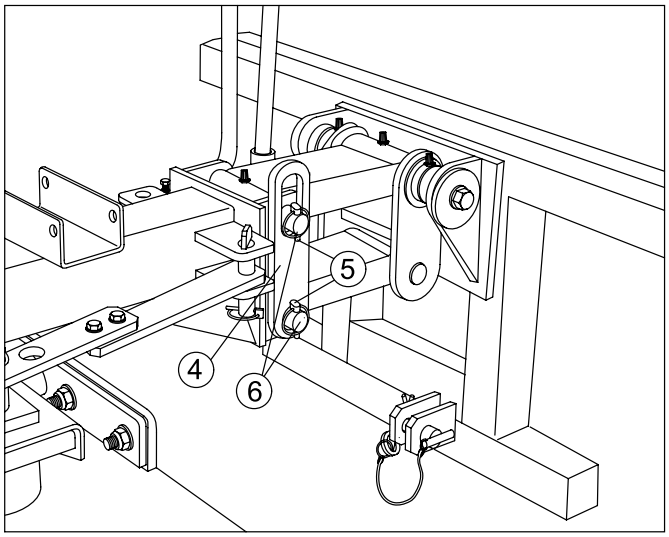
- The positioning bolt (1) must be moved from hole (2) to hole (4).
- Pull the linchpin (3), move the bolt (1), and re-secure.

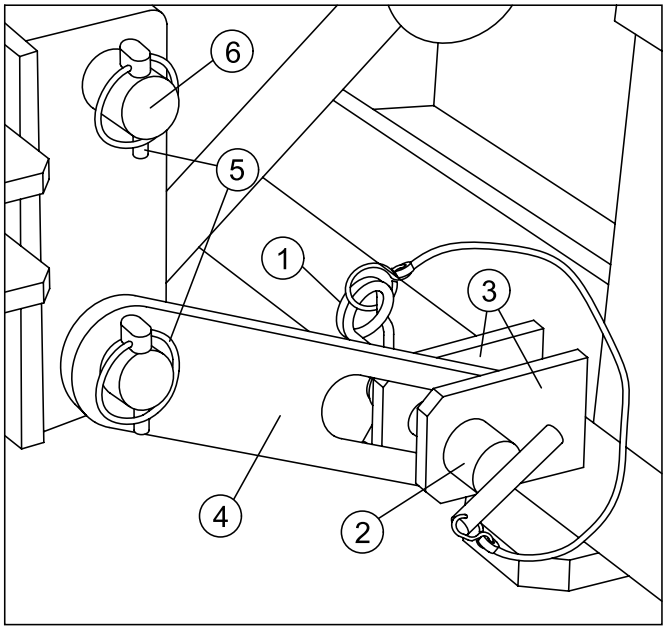
**ATTENTION** Lift the sweeping machine. Secure the controls for the sweeping machine against unintended use.




### 3.4.1.2 Transport trips: quick change receptacle for yard loaders

The safety notices of Chapter 3.3 apply



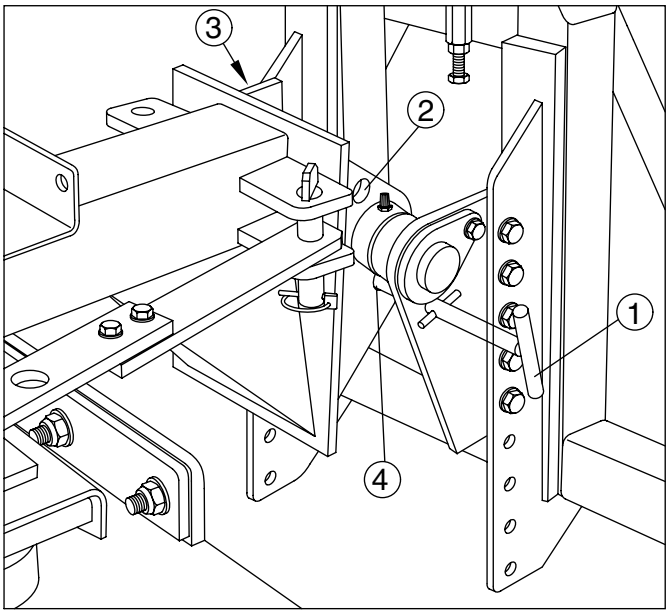




- Transport lock (4) must be shifted.
- Pull the linchpin (5) from the shafts (6).
- Secure the transport lock (4) between the brackets (3) using the bolts (2) and spring plugs (1)
- Reinsert the linchpins (5) through the shafts (6)

**ATTENTION** Lift the sweeping machine. Safeguard the operating elements for the sweeping machine against unintended use.

### 3.4.1.3 Transport trips: front attachment with coupling triangle

The safety notices of Chapter 3.3 apply



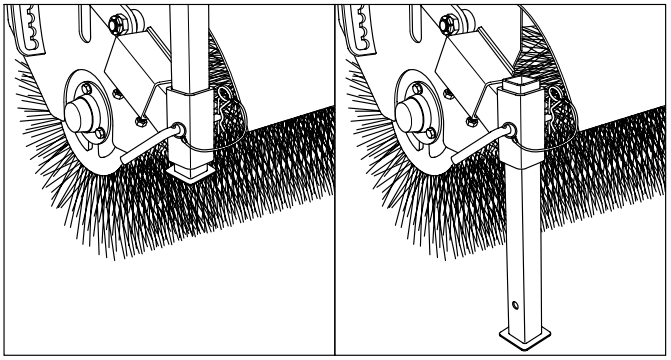

- The positioning bolt (1) must be moved from hole (2) to hole (4).
- Pull the linchpin (3), move the bolt (1), and re-secure.

**ATTENTION** Lift the sweeping machine. Safeguard the operating elements for the sweeping machine against unintended use.

## 3.4.2 Start-up

The safety notices of Chapter 3.3 apply

Carry out maintenance, repair work and modifications on the Plus sweeping machine only if the hydraulic drive is switched off and the hydraulic connections are decoupled.
Secure the carrier vehicle against unintended start-up and rolling away!



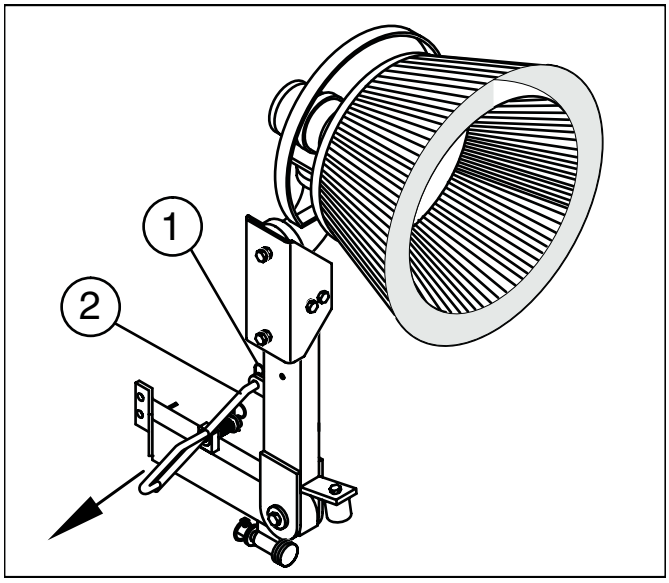
- for the open sweeping Plus sweeping machine, shift the two supports upwards and secure them.
- The ideal driving and sweeping speed is 6 km/h.
- When operating the Plus sweeping machine, a sweeping profile of 6 – 10 cm appears. (adjustment of the sweeping profile, see Chapter 3.4.9)
- The adjustment of the sweeping profile of the side broom is explained in Chapter 3.4.3
- Hydraulic hoses and electric cabling must be positioned without danger of getting squashed (see initial attachment in Chapter 3.3).

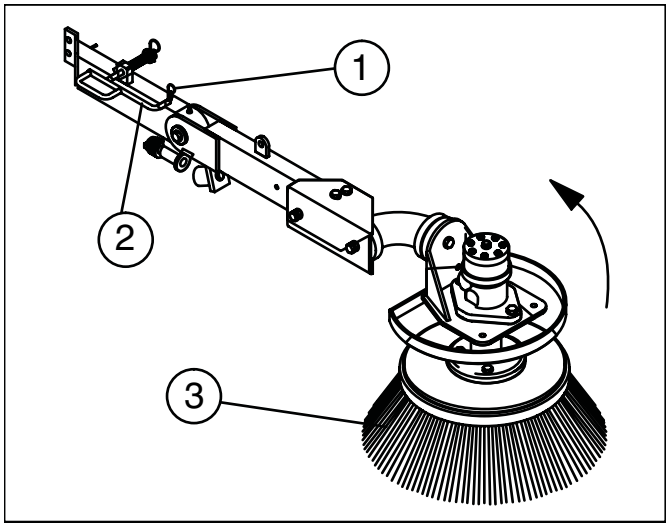
**Position of the sweeping machine when operated in front of the carrier vehicle**

- Lower the sweeping machine until the two (or three) castor wheels touch the ground
- The receptacle structure must be perpendicular to the ground.

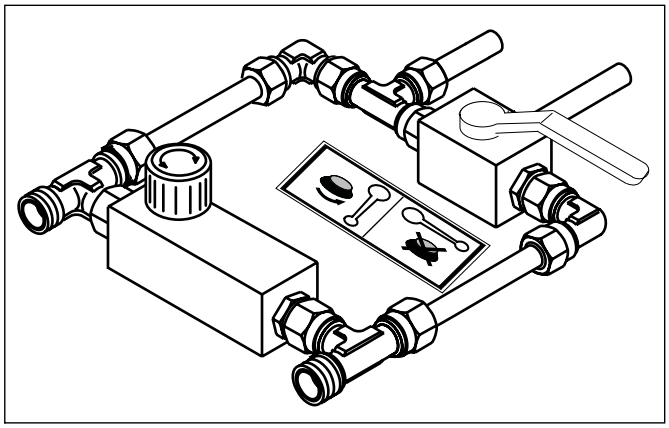
**Move side broom into working position.**

- Remove the spring plug (1) on the lever (2) and pull the lever back.

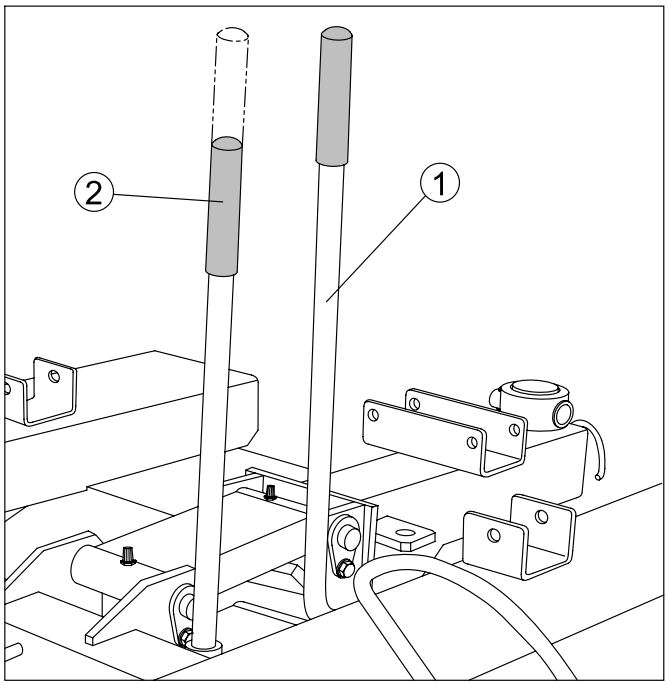



- Move the side broom (3) down.
- Reinsert the spring plug (1) into the hole on the lever (2).
- Open the tap of the side broom on the machine's cover.

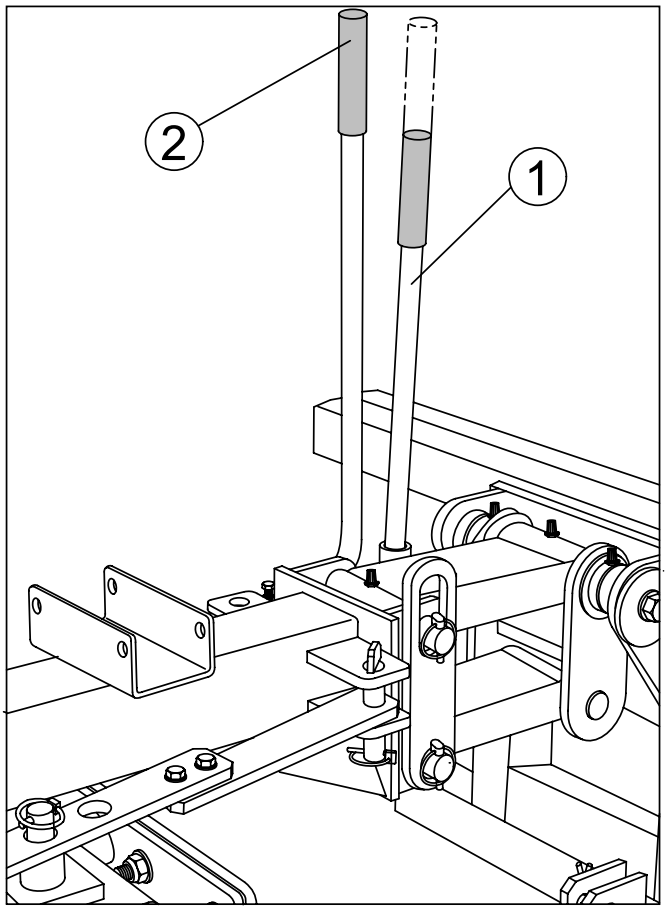


**Position of the sweeping machine when operated in front of the carrier vehicle with fork arm receptacle:**




- Level the fork arm horizontally (height indicator (1) parallel).
- Move the fork arms vertically until the green caps (2) are parallel, i.e., at the same height.

**Position of the sweeping machine when operated in front of the carrier vehicle with yard loader receptacle**



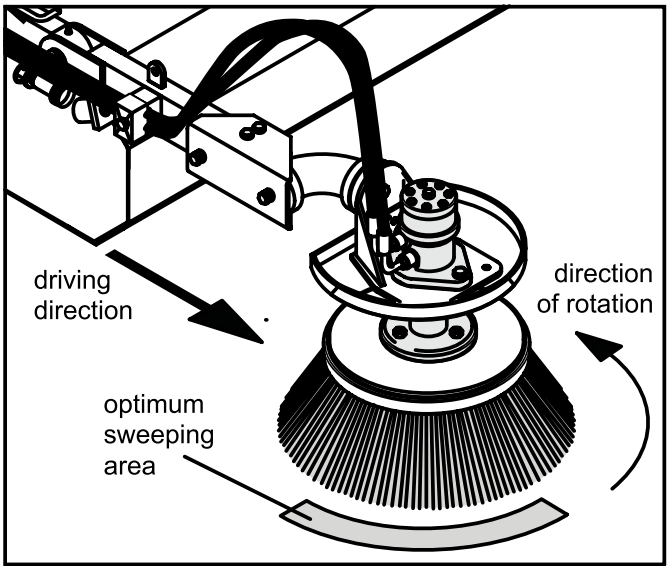

- Level the yard loader receptacle horizontally (height indicator (1) parallel).
- Move the receptacle vertically until the green caps (2) are parallel, i.e., at the same height.

## 3.4.3 Adjusting/readjusting the side broom

The safety notices of Chapter 3.3 apply

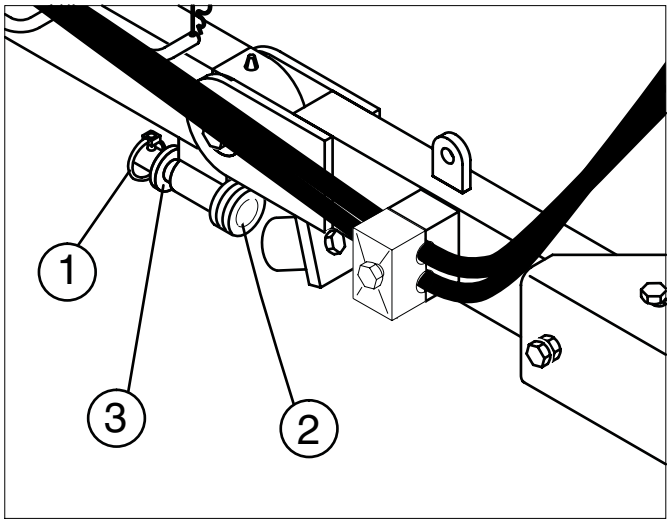
The side broom must still touch the ground even if the sweeping machine floats 6 - 10 cm above the ground. When the line between the rear castor wheels and the front castor wheel is in parallel to the ground, the bolt (6) should touch the stopper.

During operation, the side broom should sweep the side between a 12 o'clock and a 3 o'clock position.



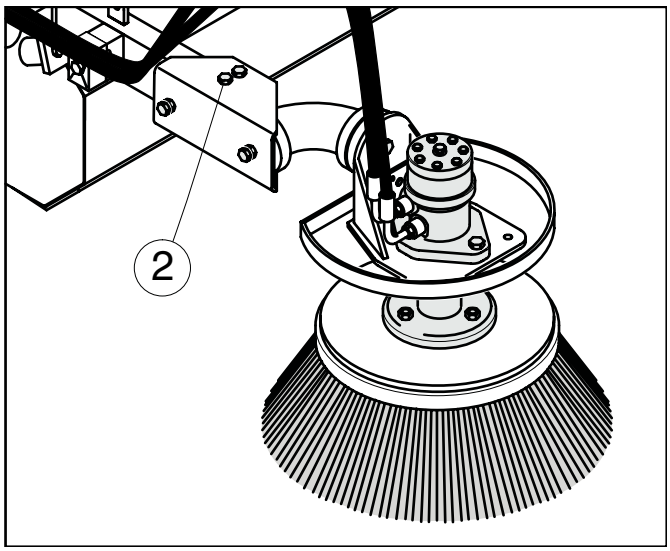

The following describes possible adjustments and readjustments:

**Adjustment of the inclination**



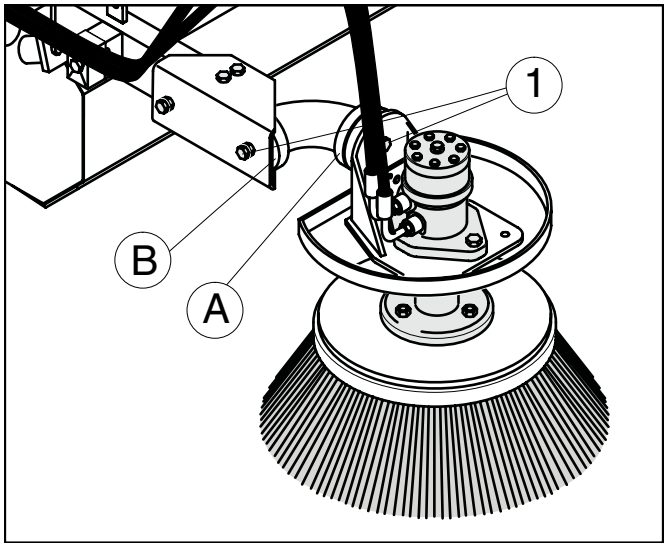

- Tilt the side broom upwards (see Chapter 3.4.1)
- Remove splint (1) and pull the bolt (2) out.
- Remove the U-disks (3) at the front, reinsert the bolt, and push the disks back on again at the back and lock with splint (1).
- Tilt the side broom into working position.

**Operating width adjustment**




- Loosen the connecting screw (2) (connection swivel bracket with swivel arm).
- Shift the side broom in the longhole of the swivel sheet.
- Secure the adjustment by tightening the connecting screw (2).

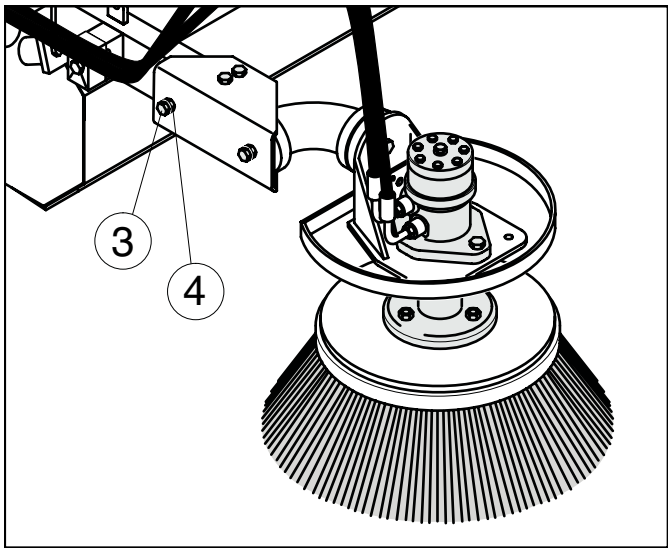
**Height and efficiency setting**




- Loosen the locking screws (1) on the raster disks.
- Carry out adjustment by turning the raster disks.

  Example: Changing the raster disk pair (A) to the left by one notch, and then changing the raster disk pair (B) to the right by one notch.
- Secure the adjustment by tightening the locking screws (1).

**Stopper adjustment**

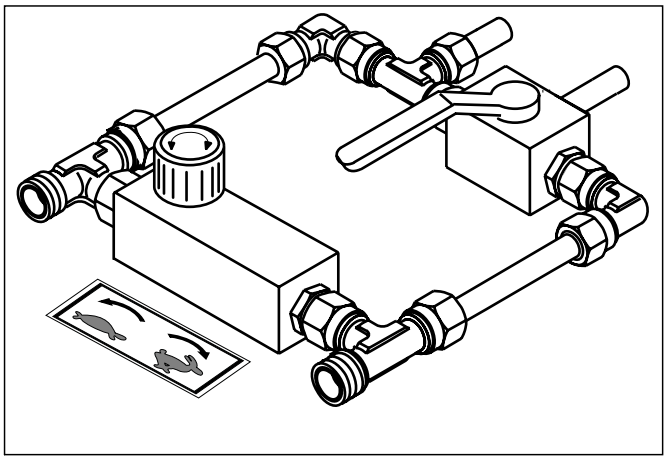



- Loosen the locknut on the screw (3) for the rubber buffering on the swivel sheet.
- Turn the screw inwards or outwards.
- Secure the adjustment by tightening the locknut (4).

## 3.4.4 Rpm adjustment

The rpm adjustment of the sweeping machine is carried out via the oil power that is supplied by carrier vehicle. This depends on the type of the carrier vehicle and its equipment.

The rpm adjustment of the side broom is carried out via the adjustment screw of the one-way restrictor.



## 3.4.5 Emptying the dirt collection vessel

The dirt collection vessel is opened via a hydraulic cylinder or a bowden control (depending on the equipment of the Plus sweeping machine).

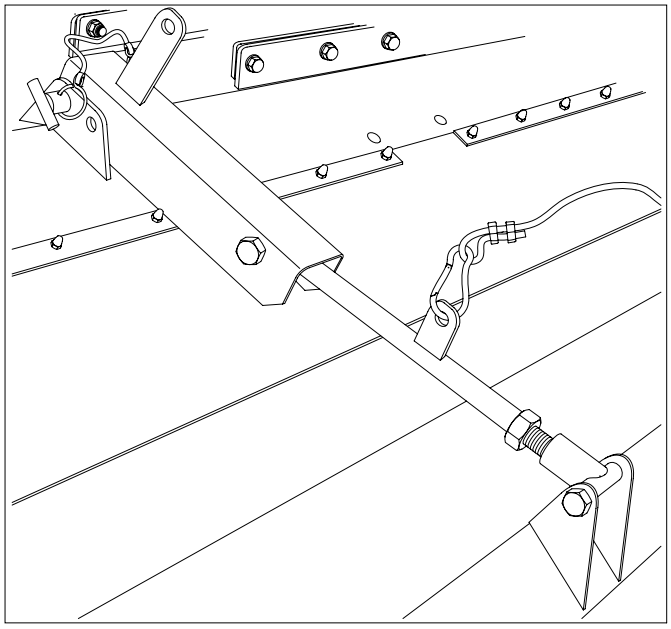
### 3.4.5.1 Mechanically

The dirt collection vessel is opened via a bowden control. During the initial attachment, the rope has already been pulled through to the cabin of the carrier vehicle.

- Lift the sweeping machine.
- Pull the bowden control with vigour and the dirt collection vessel opens through the mechanic system on the collector vessel.
- The dirt collection vessel contains a suspended high-level filling flap, if present. During emptying, the flap swings away from the dumping area.

**ATTENTION** While the dirt collection vessel is emptied, no person must be located below the machine.

- Before lowering the sweeping machine, pull the bowden control vigourously for a second time in order to close the collector vessel.



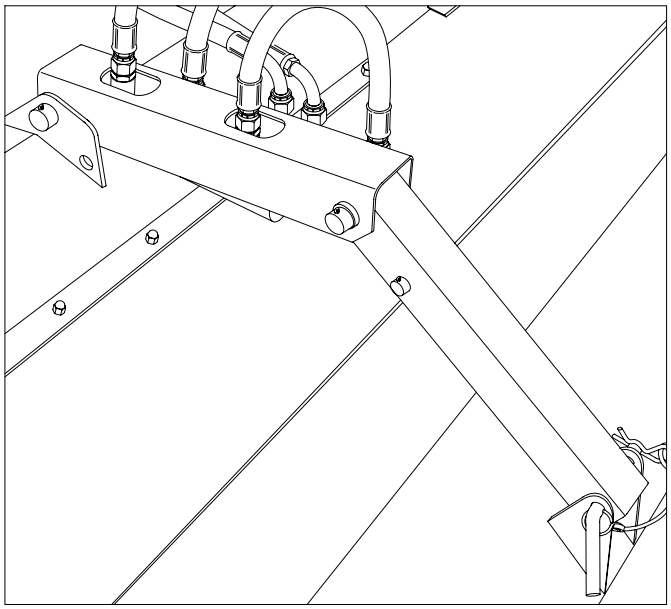
### 3.4.5.2 Hydraulic

The dirt collection vessel is opened via the hydraulic cylinder.

- Switch off the hydraulic circuit for the hydraulic motors, using the control lever in the carrier vehicle.
- Lift the sweeping machine.
- Shift the appropriate control lever of the hydraulic system in the carrier vehicle. (flow direction changed)
- The dirt collection vessel contains a suspended high-level filling flap, if present. During emptying, the flap swings away from the dumping area.

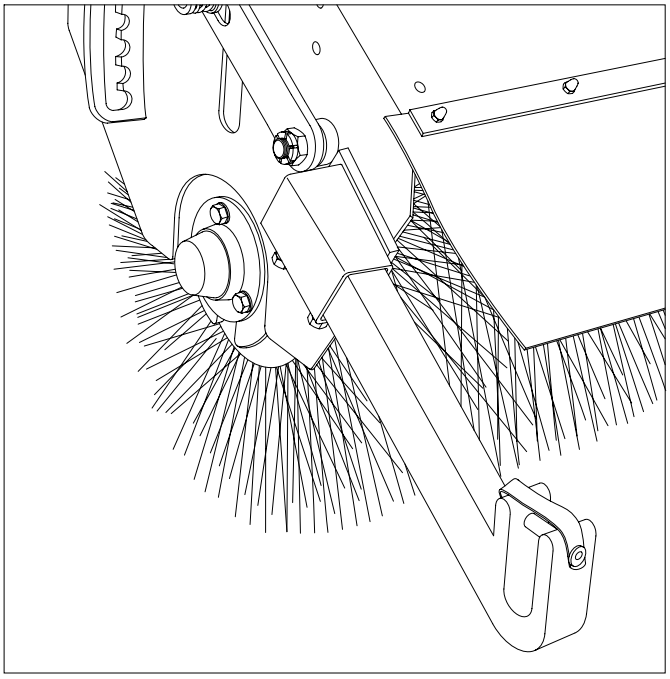
**ATTENTION** While the dirt collection vessel is emptied, no person must be located below the machine.

- Before lowering the sweeping machine to the ground, close the collector vessel. This is done by shifting the appropriate control lever in the carrier vehicle. (flow direction changed)



## 3.4.6 Conversion to the open sweeping Plus-sweeping machine

- The Plus sweeping machine can be used as an open sweeping machine. For this, the collector vessel must be removed.



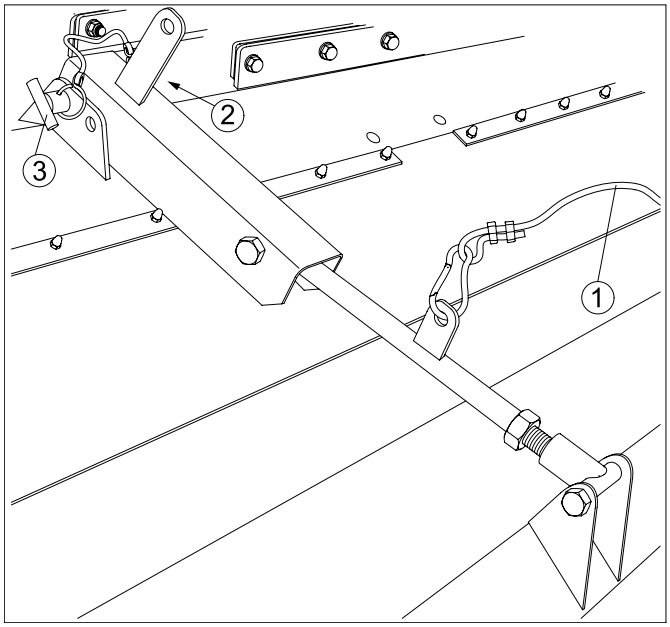
Carry out maintenance, repair work and modifications on the Plus sweeping machine only if the hydraulic drive is switched off and the hydraulic connections are decoupled. Secure the carrier vehicle against unintended start-up and rolling away!

Only remove the dirt collection vessel if it is empty.

Only remove the dirt collection vessel while the Plus sweeping machine is attached to the vehicle.

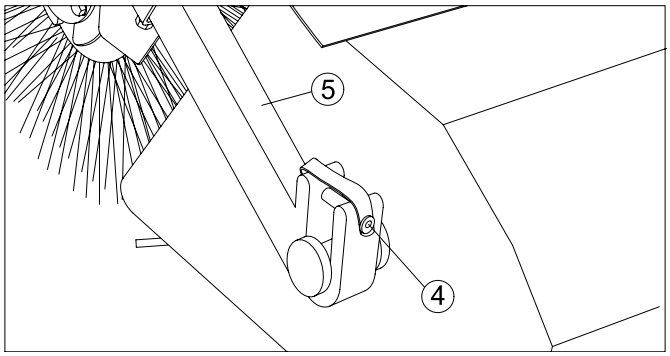
- Tilt the side broom upwards and secure it, see Chapter 3.4.1 Transport trips.

## 3.4.6.1 Conversion with mechanical emptying




The safety regulations of Chapter 3.3 apply

- Remove the bowden control (1) from the cabin of the carrier vehicle.
- Pull out the spring plug (2) and bolt (3) of the mechanical emptying mechanism on the machine's cover.
- Put the collecting vessel emptying mechanism onto the dirt collection vessel.
- Re-plug the bolt (3) through the emptying mechanism and secure with the spring plug (2).




- Remove the spring plug bolts (4) on both bearer arms (5).
- Lift the dirt collection vessel out of the bearer arms.
- Install the spring plug bolts (4) on the bearer arms (5).
- Put down the dirt collection vessel on a level, dry and clean area.

Accident hazard!
The bowden control is a tripping hazard on the ground. Put the bowden control into the dirt collection vessel.

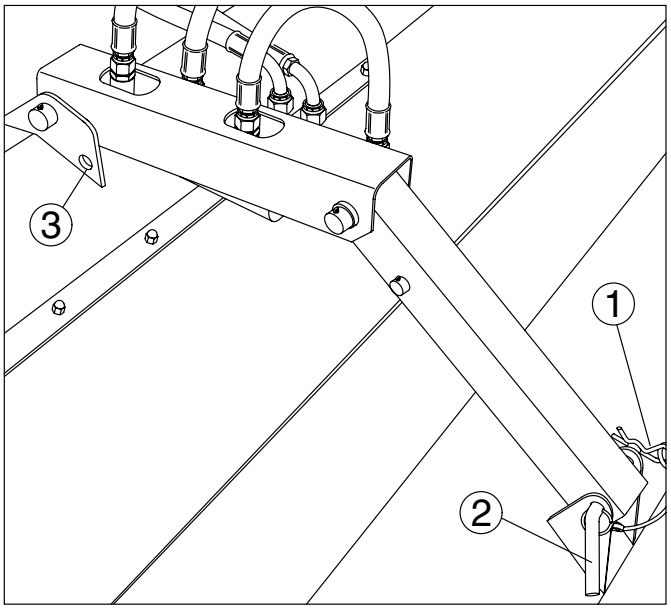
Clean the dirt collection vessel thoroughly, if necessary. Dirt attracts humidity and leads to the formation of rust.

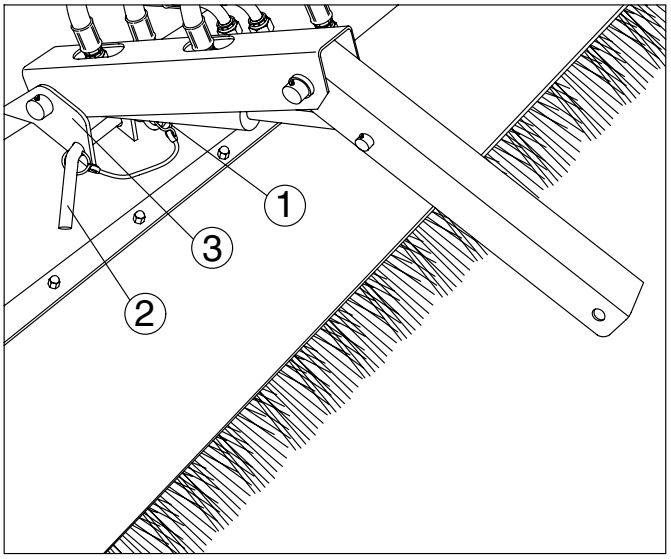
- If necessary, repair paint damage.

## 3.4.6.2 Conversion with hydraulic emptying

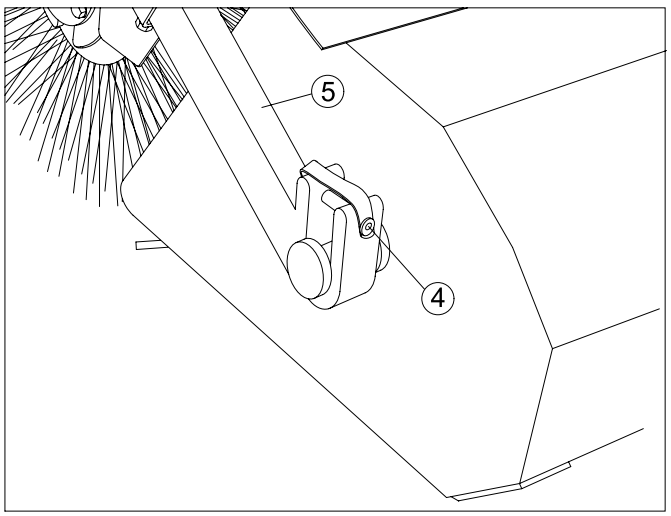
The safety regulations of Chapter 3.3 apply

- Pull out the spring plug (1) and bolt (2) of the hydraulic emptying mechanism on the collection vessel.
- Tilt the collection vessel emptying mechanism upwards, re-plug the bolt (2) at upper bracket (3) and secure it with the spring plug (1).




- Remove the spring plug bolts (4) on both bearer arms (5).
- Lift the dirt collection vessel out of the bearer arms.
- Install the spring plug bolts (4) on the bearer arms (5).
- Put down the dirt collection vessel on a level, dry and clean area.




Clean the dirt collection vessel thoroughly, if necessary. Dirt attracts humidity and leads to the formation of rust.

- If necessary, repair paint damage.

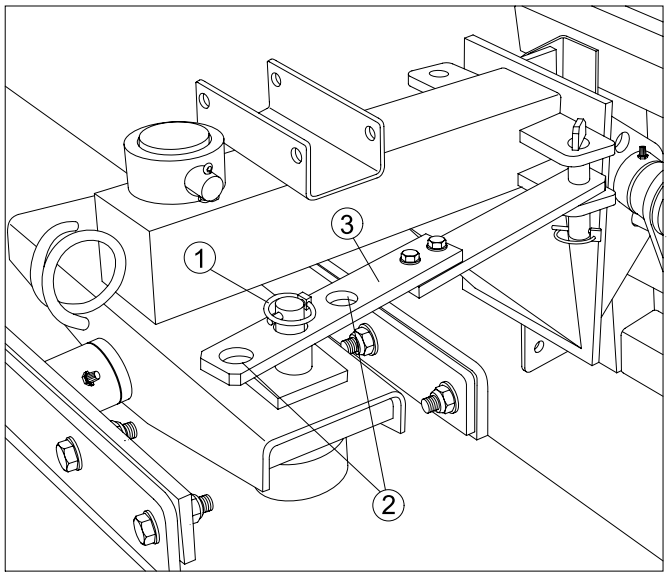
## 3.4.7 Side adjustment for open sweeping usage

**NOTE** When used as an open sweeping machine, a side adjustment in relation to the side of the road must be carried out.

### 3.4.7.1 Mechanic operation

**ATTENTION** Lift sweeping machine up or out, but keep it close to the ground.

- Remove linchpin (1).
- Pull the pitch rod (3) upwards.
- Tilt the sweeping machine towards the desired angle of the sweeping direction (material to be swept up to the left or to the right) and put the pitch rod onto the appropriate hole (2).
- Insert and secure the linchpin (1).




### 3.4.7.2 Hydraulic operation

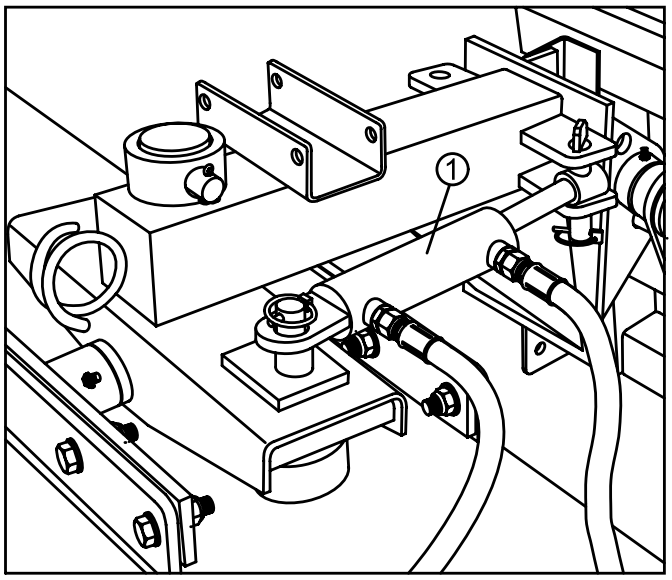
The tilting of the Plus sweeping machine is carried out by a hydraulic cylinder (1).

- The second hydraulic circuit of the carrier vehicle is used to operate the pitch control cylinder.
- Lift the sweeping machine slightly.
- Operate the appropriate control lever of the hydraulic system in the carrier vehicle.
- The Plus sweeping machine now tilts to the left or right.

**ATTENTION** While the sweeping machine is tilted, no person must be present close to the machine.

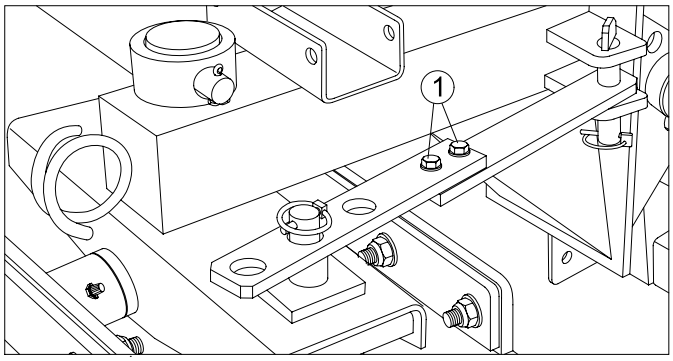
- Lower the sweeping machine.

Secure the operating element for the second control circuit of the vehicle's hydraulic system against unintended operation.



## 3.4.8 Overload protection

**N O T E** To secure the vehicle against overload when driving into an obstacle, the two pitch rods are connected via two shear bolts (1) (thread size M8 of property class 8.8).




**ATTENTION** When replacing the shear bolts (1), use only screws of property class 8.8.

## 3.4.9 Readjustment of the sweeping profile

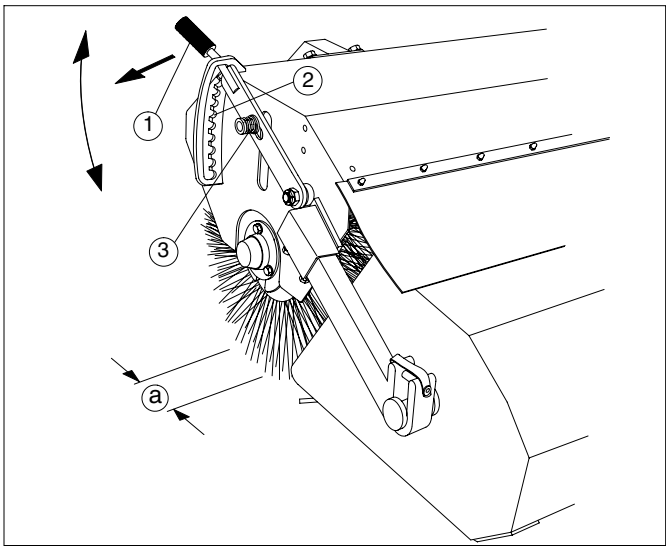
**N O T E** When operating the Plus sweeping machine, a sweeping profile of width **a** = 6 - 10 cm should appear (when lifting the sweeping machine, the width of the area swept should be 6 - 10 cm).

If the width is no longer sufficient or the pressure onto the ground is too low, the suspension of the sweeping drum must be readjusted evenly via the shaft lifting lever system (1).

Carry out maintenance, repair work and modifications on the Plus sweeping machine only if the hydraulic drive is switched off and the hydraulic connections are decoupled.
Secure the carrier vehicle against unintended start-up and rolling away!

**ATTENTION** Take the sweeping drum's own weight into account

- Lift the sweeping machine and keep it close to the ground.
- Pull the raster level (1) of the raster setting outwards against the force of the spring (3)
- Latch the raster level into the desired position on the adjustment raster (2).
- Carry out the raster setting of the sweeping drum evenly on both sides.
- Check that the width of the sweeping profile is **a** = 6 - 10 cm.



## 3.5 Detachment

During attachment or coupling, special caution must be exercised.

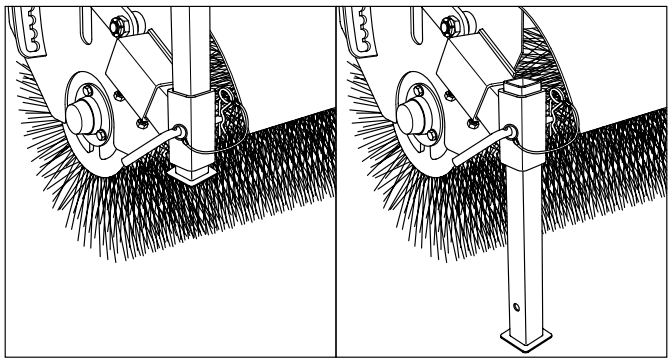
Carry out maintenance, repair work and modifications on the Plus sweeping machine only if the hydraulic drive is switched off and the hydraulic connections are decoupled. Secure the carrier vehicle against unintended start-up and rolling away!

**NOTE** ***During the detachment, follow the operating manual of the carrier vehicle's manufacturer! Only one example is described and shown here for each case.***

- Close the tap of the side broom. Tilt the side broom upwards and secure it, see Chapter 3.4.1 Transport trips.
- Place the sweeping machine on the ground, with the dirt collection vessel closed and empty. The castor wheels must point backwards towards the carrier vehicle.
- Park the sweeping machine on a firm and level surface in a dry and clean place and secure it against rolling away.

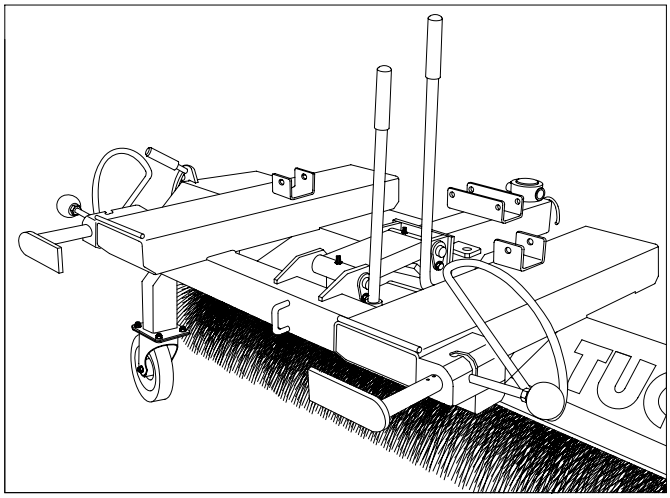
Accident hazard!
Ensure a secure standing of the sweeping machine.

- for the open sweeping Plus sweeping machine, shift the two supports downwards and secure them.



### 3.5.1 Detachment in the case of a fork arm receptacle

The safety regulations of Chapter 3.5 apply



- Disconnect hydraulic hoses and electrical leads at the vehicle and put them onto the sweeping machine, together with the bowden control

Accident hazard!
Do not put hydraulic hoses, the electrical lead or the bowden control onto the ground as they represent a tripping hazard. Put the hydraulic hoses and the electric connection cable across the sweeping machine.

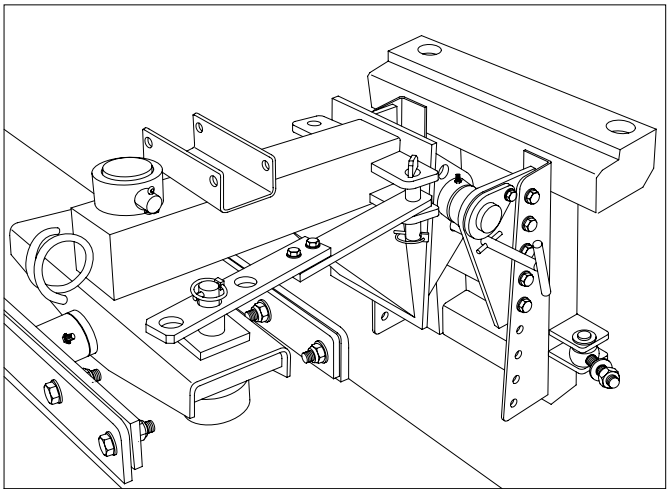
**ATTENTION** Seal hydraulic connector barrels with dust caps. Soiling leads to damage on the hydraulic system.

- Lower the Plus sweeping machine until all castor wheels touch the ground.
- Shift the locking brackets, as described for the attachment (brackets point to the ground).
- Move the fork arms out of the receptacle openings of the fork arm receptacle.

## 3.5.2 Detachment for local government vehicles

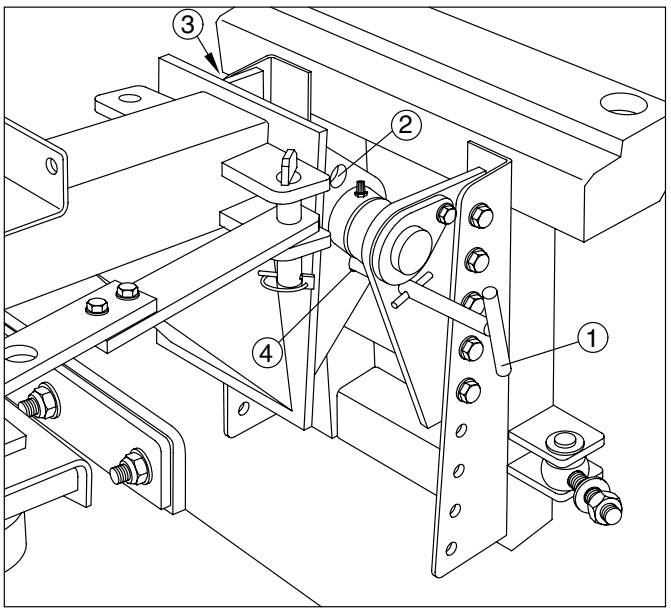
The safety regulations of Chapter 3.5 apply

- Disconnect hydraulic hoses and electrical leads at the vehicle and put them onto the sweeping machine, together with the bowden control



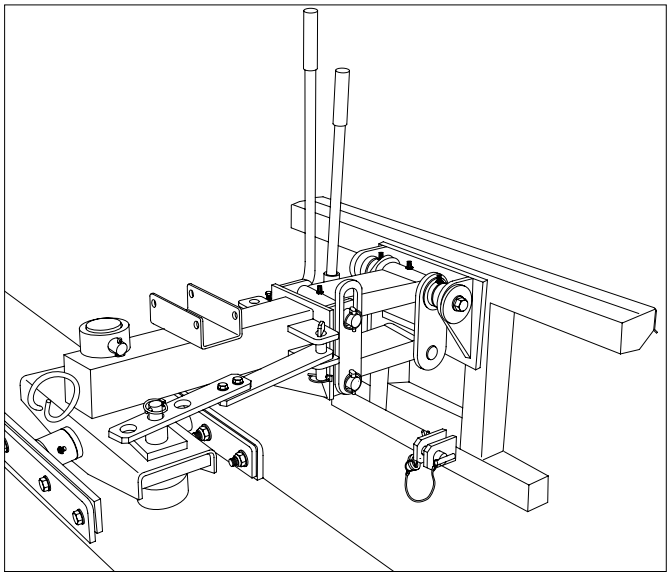
Accident hazard!
Do not put hydraulic hoses, the electrical lead or the bowden control onto the ground as they represent a tripping hazard. Put the hydraulic hoses and the electric connection cable across the sweeping machine.

**ATTENTION** Seal hydraulic connector barrels with dust caps. Soiling leads to damage on the hydraulic system.




- Lower the Plus sweeping machine until all castor wheels touch the ground.
- The positioning bolt (1) must be moved from hole (2) to hole (4).
- Pull the linchpin (3), move the bolt (1), and re-secure.
- Unlock the receptacle as described in the carrier vehicle's operating manual.
- Drive vehicle backwards.

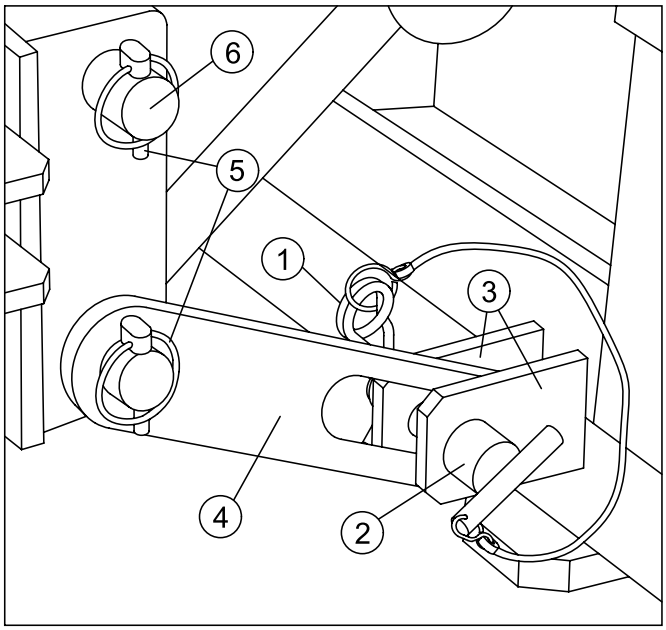
## 3.5.3 Detachment for the quick change receptacle on the yard loader



The safety regulations of Chapter 3.5 apply

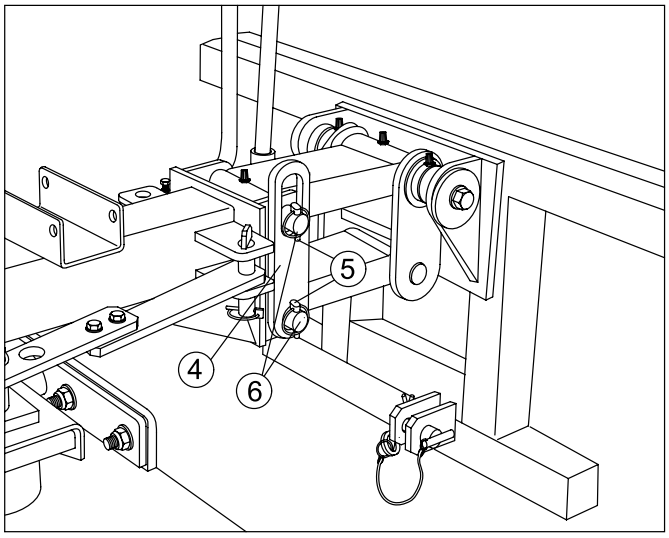
- Disconnect hydraulic hoses and electrical leads at the vehicle and put them onto the sweeping machine, together with the bowden control

Accident hazard!
Do not put hydraulic hoses, the electrical lead or the bowden control onto the ground as they represent a tripping hazard. Put the hydraulic hoses and the electric connection cable across the sweeping machine.




**ATTENTION** Seal hydraulic connector barrels with dust caps. Soiling leads to damage on the hydraulic system.

- Lower the Plus sweeping machine until all castor wheels touch the ground.
- Transport lock (4) must be shifted.
- Pull the linchpin (5) from the shafts (6).
- Secure the transport lock (4) between the brackets (3) using the bolts (2) and spring plugs (1).
- Reinsert the linchpins (5) through the shafts (6)
- Unlock the receptacle as described in the carrier vehicle's operating manual.
- Drive vehicle backwards.



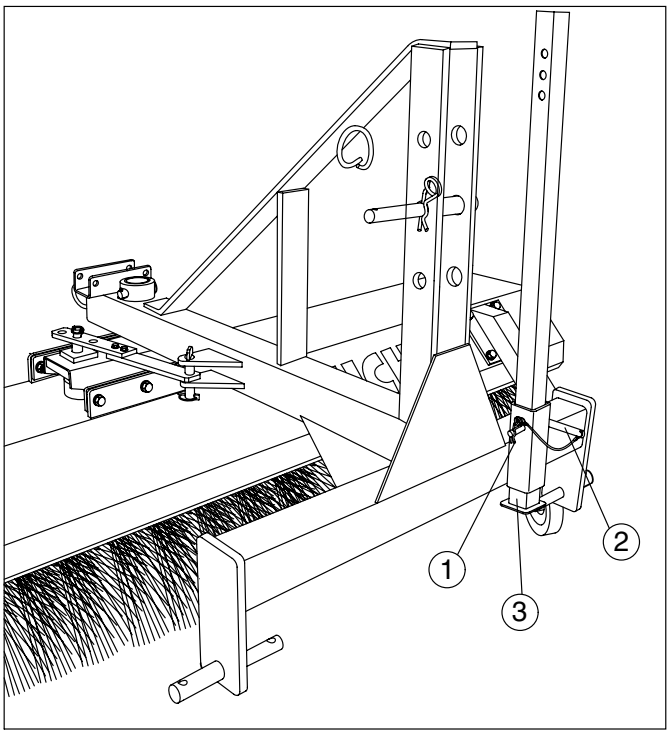
## 3.5.4 Detachment for 3-point linkages

The safety regulations of Chapter 3.5 apply

- Disconnect hydraulic hoses and electrical leads at the vehicle and put them onto the sweeping machine, together with the bowden control

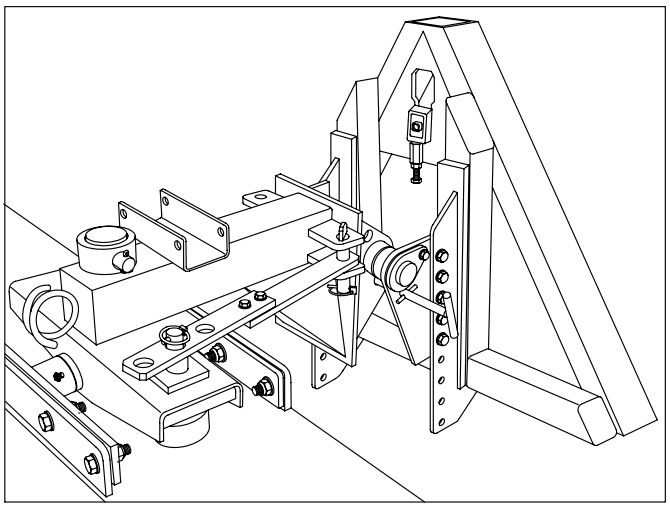
Accident hazard!
Do not put hydraulic hoses, the electrical lead or the bowden control onto the ground as they represent a tripping hazard. Put the hydraulic hoses and the electric connection cable across the sweeping machine.

**ATTENTION** Seal hydraulic connector barrels with dust caps. Soiling leads to damage on the hydraulic system.




- Lower the Plus sweeping machine until all castor wheels touch the ground.
- Pull out bolt (2) and spring plug (1) of the support (3).
- Place the support on the ground and secure it with the bolt (2) and spring plug (1).
- Remove the 3-point linkage rods from the carrier vehicle on the 3-point linkage of the sweeping machine.
- Drive carrier vehicle backwards. (or move it forward in the case of rear attachment)

## 3.5.5 Detachment in the case of a coupling triangle

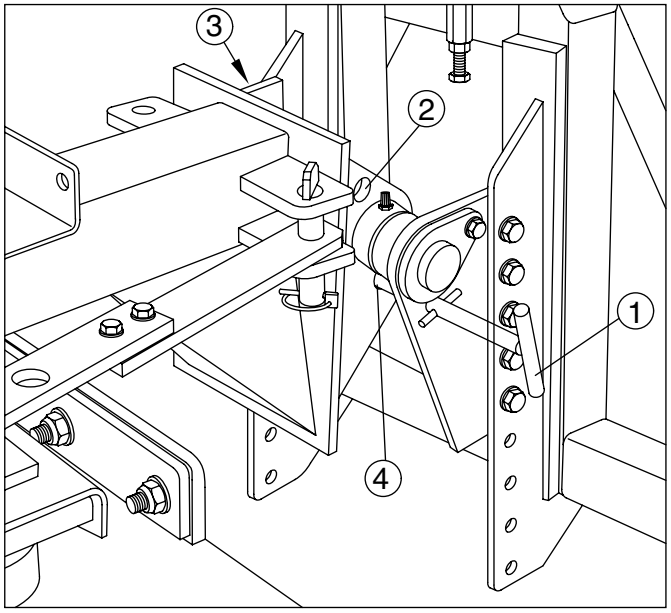


The safety regulations of Chapter 3.5 apply

- Disconnect hydraulic hoses and electrical leads at the vehicle and put them onto the sweeping machine, together with the bowden control

Accident hazard!
Do not put hydraulic hoses, the electrical lead or the bowden control onto the ground as they represent a tripping hazard. Put the hydraulic hoses and the electric connection cable across the sweeping machine.

**ATTENTION** Seal hydraulic connector barrels with dust caps. Soiling leads to damage on the hydraulic system.




- Lower the Plus sweeping machine until all castor wheels touch the ground.
- The positioning bolt (1) must be moved from hole (2) to hole (4).
- Pull the linchpin (3), move the bolt (1), and re-secure.
- Unlock the lock and lower the coupling triangle from the carrier vehicle.
- Drive vehicle backwards.

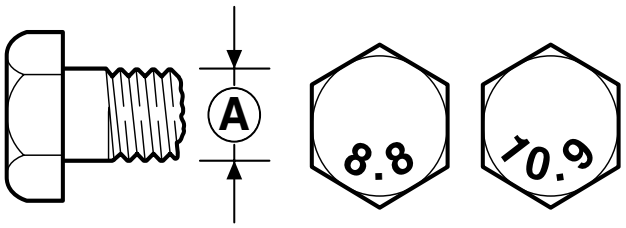
# 4 Service and maintenance

## 4.1 General

Carry out maintenance, repair work and modifications on the Plus sweeping machine only if the hydraulic drive is switched off and the hydraulic connections are decoupled. Secure the carrier vehicle against unintended start-up and rolling away!

- Check screws and nuts for tight fit after the first 5 operating hours and then regularly (about every 50 operating hours), and tighten if necessary.

**A** = thread gauge
(property class visible on screw head)



Kl1schr

| A | 3.6 | 5.6 | 6.8 | 8.8 | 10.9 | 12.9 |
|---|---|---|---|---|---|---|
| ø | $M_A$(Nm) | | | | | |
| M 6 | 3.43 | 4.51 | 8.73 | 10.3 | 14.71 | 17.65 |
| M 7 | 5.59 | 7.45 | 14.22 | 17.16 | 24.52 | 28.44 |
| M 8 | 8.24 | 10.79 | 21.57 | 25.50 | 35.30 | 42.17 |
| M 10 | 16.67 | 21.57 | 42.17 | 50.01 | 70.61 | 85.32 |
| M 12 | 28.44 | 38.25 | 73.55 | 87.28 | 122.58 | 147.10 |
| M 14 | 45.11 | 60.8 | 116.7 | 135.27 | 194.17 | 235.36 |
| M 16 | 69.63 | 93.16 | 178.46 | 210.84 | 299.1 | 357.94 |
| M 18 | 95.13 | 127.40 | 245.17 | 289.3 | 411.88 | 490.34 |
| M 20 | 135.33 | 180.44 | 348.14 | 411.88 | 576.50 | 669.26 |
| M 22 | 162.4 | 245.17 | 470.72 | 558.98 | 784.45 | 941.44 |
| M 24 | 230.46 | 308.91 | 598.21 | 710.99 | 1000.28 | 1196.42 |

Self-locking nuts must be replaced after each unscrewing.

All torques $M_A$ are approximate values for metric standard threads according to DIN 13.
Friction coefficient 0.14 - new screw, not lubricated. These values have been recommended as approximate values by various screw manufacturers. We cannot accept liability for their application.

- Regularly check the hydraulic hoses.
- Hydraulic hoses must be replaced no later then after 6 years of usage (including storage time of at most 2 years).
- Replace hydraulic hoses that are damaged or aged.
- The replacement hoses must meet the technical requirements of the manufacturer (see list of spare parts).

## 4.2 Replacing brush rings

### 4.2.1 Replacing brush rings, external motor

The safety regulations of Chapter 4.1 apply

Do not step or work below the suspended machine.

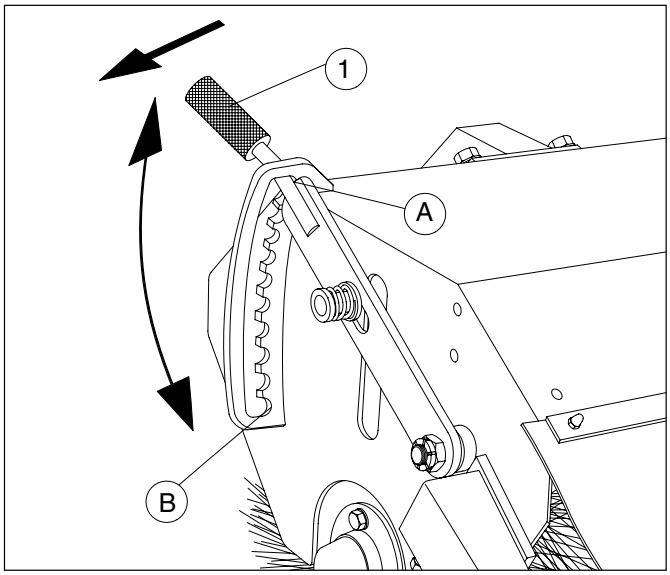
**ATTENTION** Replace brush rings only when the sweeping machine is attached to the vehicle.

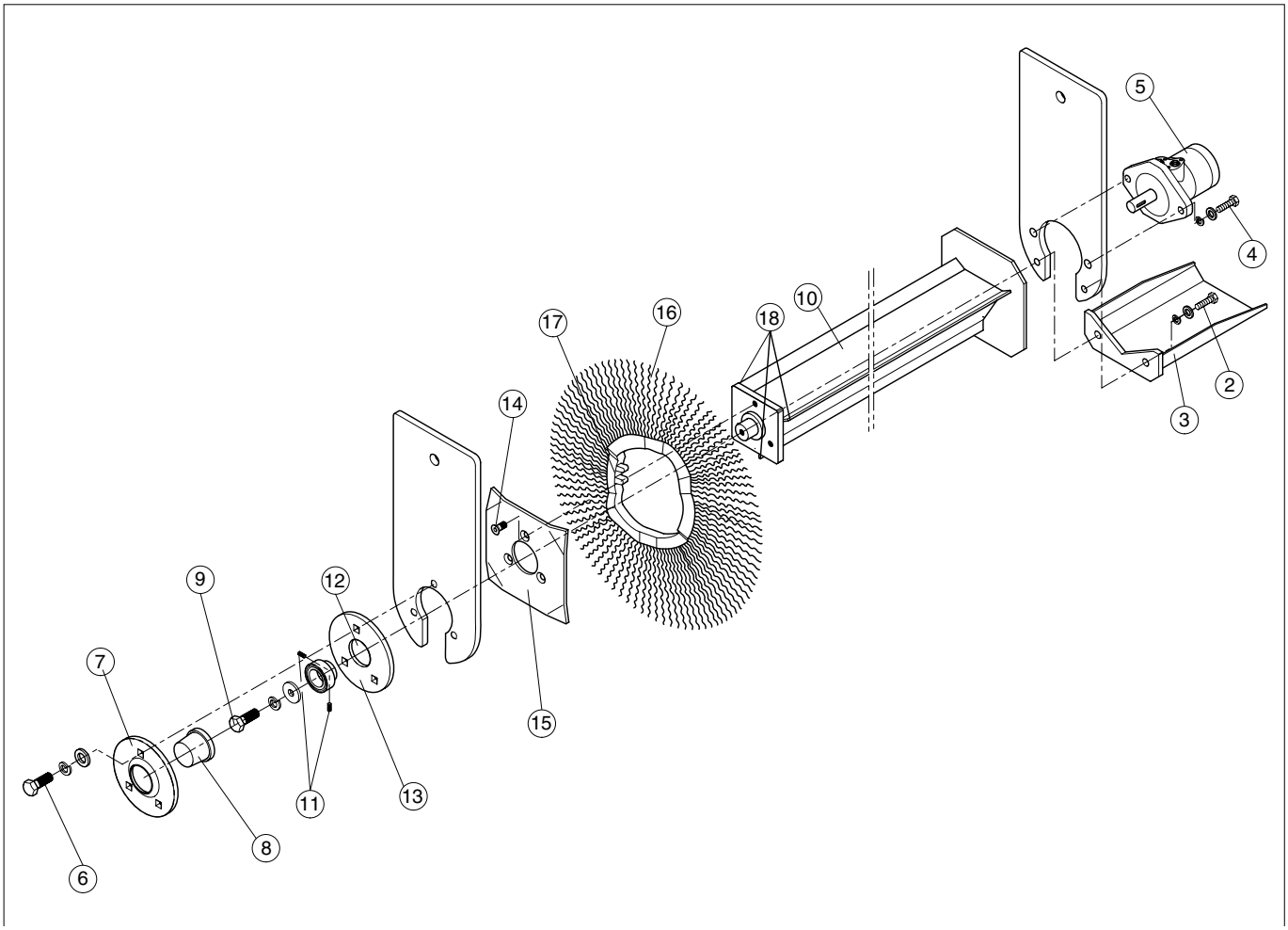
**ATTENTION** To replace the brush rings, the dirt collection vessel must be detached.

**N O T E** See Chapter 3.4.6 for detaching the dirt collection vessel:

- mechanical emptying system 3.4.6.1
- hydraulic emptying system 3.4.6.2

- lift sweeping machine out.
- Pull raster lever system (1) on both sides to the outside and latch into the bottom position (B).



- lower the sweeping machine until the entire brush shaft lies on the ground.

**ATTENTION** Turn off the pressure on the hydraulic hoses of the Plus sweeping machine in the carrier vehicle.

Secure sweeping machine and carrier vehicle against unintended start-up, lowering and rolling away!

- Unscrew the attachment screws (2) of the motor guard (3).
- Unscrew the attachment screws (4) of the hydraulic motor (5).
- Unscrew the attachment screws (6) on the outer bearing shell I (7).
- Remove outer bearing shell I (7) and protection cap (8).
- Remove the attachment screws (9) on the drum shaft (10).
- Loosen the two threaded bolts (11) in the bearing (12).
- Pull off the bearing (12) and bearing shell II (13) from the drum shaft (10).
- Pull raster lever system (1) on both sides to the outside and latch into the top position (A).
- Lift the frame of the sweeping machine to the point where the drum shaft (10) with the brush rings (16) lies in the open.

Caution: hydraulic hoses!

- Turn the drum shaft with the brush rings by 180°, around the hydraulic motor and away from the carrier vehicle.
- Place the frame of the sweeping machine onto the support wheels.
- Unscrew the countersink screws (14) and remove the holding plate (15).
- Pull off worn-out brush rings.
- Slide the new brush rings onto the drum shaft, such that a honeycomb-like structure appears.
- The brushes must be pushed onto the drum shaft (10) in such a way that the groove (17) sits on the drivers (18).
- Before assembly, clean all parts and replace if necessary.
- The assembly of the brush shaft is carried out in the opposite order to the disassembly.
- When operating the Plus sweeping machine, a sweeping profile of width a 6 - 10 cm should appear (when lifting the sweeping machine, the width of the area swept should be 6 - 10 cm).

**NOTE** See Chapter 3.4.9 for adjusting the sweeping profile

## 4.2.2 Replacing brush rings, internal motor

The safety regulations of Chapter 4.1 apply

Do not step or work below the suspended machine.

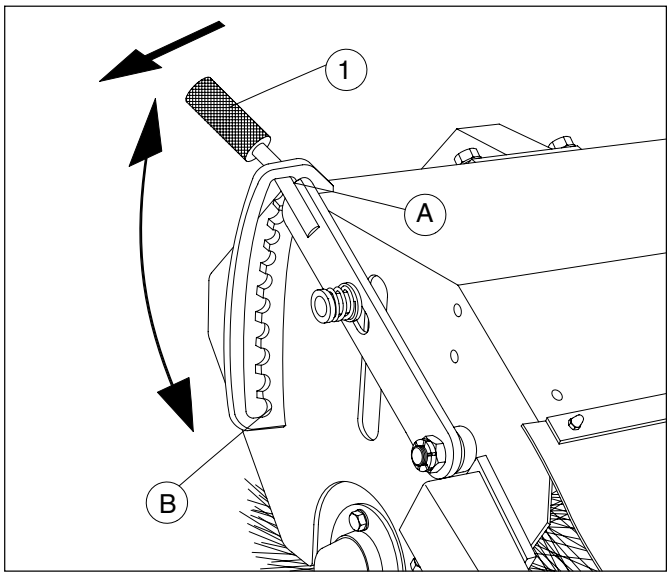
**ATTENTION** Replace brush rings only when the sweeping machine is attached to the vehicle.

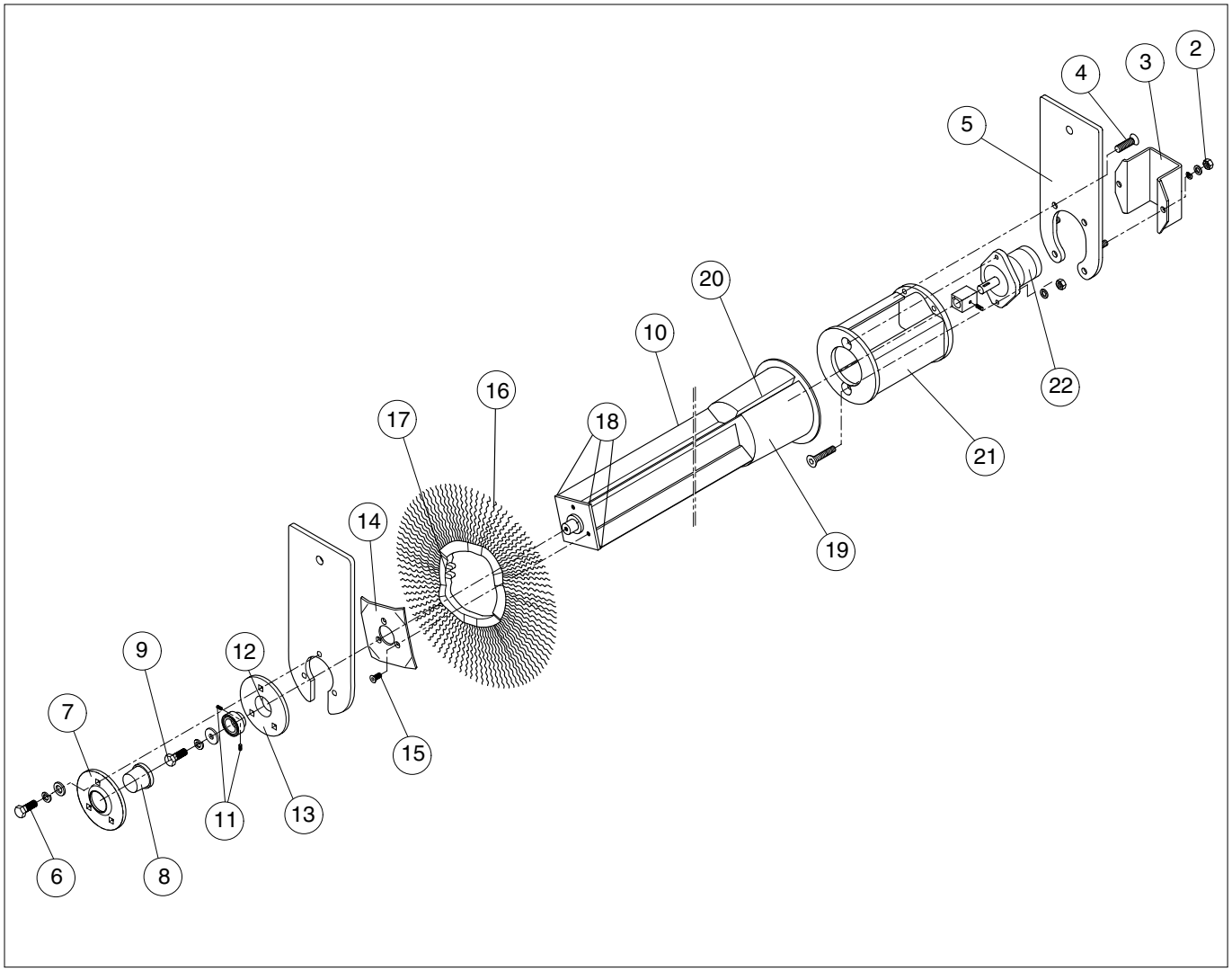
**ATTENTION** To replace the brush rings, the dirt collection vessel must be detached.

**N O T E** See Chapter 3.4.6 for detaching the dirt collection vessel:

- mechanical emptying system 3.4.6.1
- hydraulic emptying system 3.4.6.2

- Lift sweeping machine out.
- Pull raster lever system (1) on both sides to the outside and latch into the bottom position (B).



- lower the sweeping machine until the entire brush shaft lies on the ground.

**ATTENTION** Turn off the pressure on the hydraulic hoses of the Plus sweeping machine in the carrier vehicle.

Secure sweeping machine and carrier vehicle against unintended start-up, lowering and rolling away!

- Unscrew the attachment nuts (2) of the hose guard (3).
- Unscrew the countersink screws (4) on the shaft guide (5) and motor bearer (20).
- Unscrew the attachment screws (6) on the outer bearing shell I (7).
- Remove outer bearing shell I (7) and protection cap (8).
- Remove the attachment screws (9) on the drum shaft (10).
- Loosen the two threaded bolts (11) in the bearing (12).
- Pull off the bearing (12) and bearing shell II (13) from the drum shaft (10).
- Pull raster lever system (1) on both sides to the outside and latch into the top position (A).
- Lift the frame of the sweeping machine to the point where the drum shaft (10) with the brush rings (16) lies in the open.

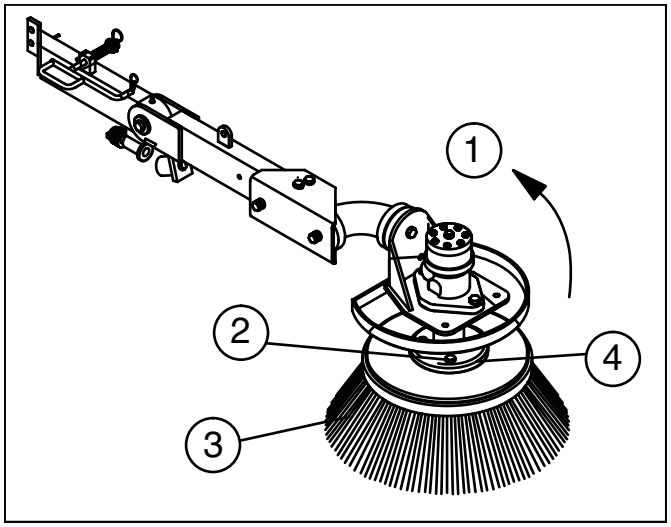
Caution: hydraulic hoses!

- Pull motor bearer (21) with the hydraulic motor (22) out of the drum shaft (10).
- Pull drum shaft away from the carrier vehicle.
- Place the frame of the sweeping machine onto the support wheels.
- Unscrew the countersink screws (15) and unmount the holding plate (14).
- Pull off worn-out brush rings (16).
- Slide the new brush rings onto the drum shaft, such that a honeycomb-like structure appears.
- The brushes must be pushed onto the drum shaft (10) in such a way that the groove (17) sits on the drivers (18).
- On the new brush rings that are placed close to the drum shaft's cylinder (19), a tongue must be removed or cut off.
- Slide the drivers of the new brush rings close to the drum shaft's cylinder (19) into the groove (20).
- Before assembly, clean all parts and replace if necessary.
- The assembly of the brush shaft is carried out in the opposite order to the disassembly.
- When operating the Plus sweeping machine, a sweeping profile of width a 6 - 10 cm should appear (when lifting the sweeping machine, the width of the area swept should be 6 - 10 cm).

**NOTE** See Chapter 3.4.9 for adjusting the sweeping profile

## 4.3 Replacing the plate broom

The safety regulations of Chapter 4.1 apply




- Tilt side broom (1) upwards and secure it as described under Chapter 3.2 Storage.
- Unscrew the 3 hexagonal nuts (2).

Take the plate broom's own weight into account.

- Remove the old plate broom (3).
- Drill a hole through the new plate broom to suit the flange (4).
- Install the new plate broom, using new self-securing nuts.
- Swing the side broom (1) into work position and readjust as described in Chapter 3.4.3.

## 4.4 Replacement of the Vulkollan rail

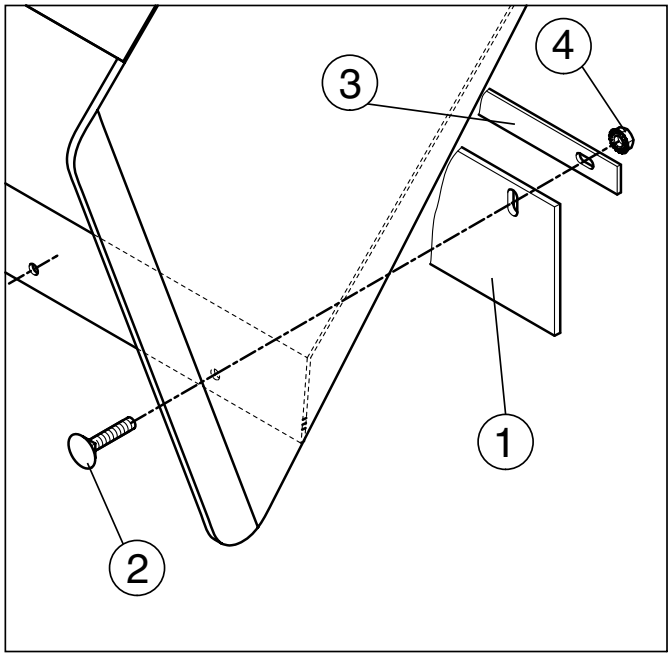
The safety regulations of Chapter 4.1 apply

**ATTENTION** Replace the Vulkollan rail only if the sweeping machine is lifted or attached to the vehicle.

**ATTENTION** When replacing the Vulkollan rail, the dirt collection vessel must be empty and open.

Do not step or work below the suspended machine.

Secure sweeping machine and carrier vehicle against unintended start-up, lowering and rolling away!




- Loosen the attachment screws (2) with the locking tooth nuts (4) along the entire length of the Vulkollan rail (1) and remove the old Vulkollan rail (1) together with the impact rail (3).

Take into account the weight of the impact rail and the Vulkollan rail.

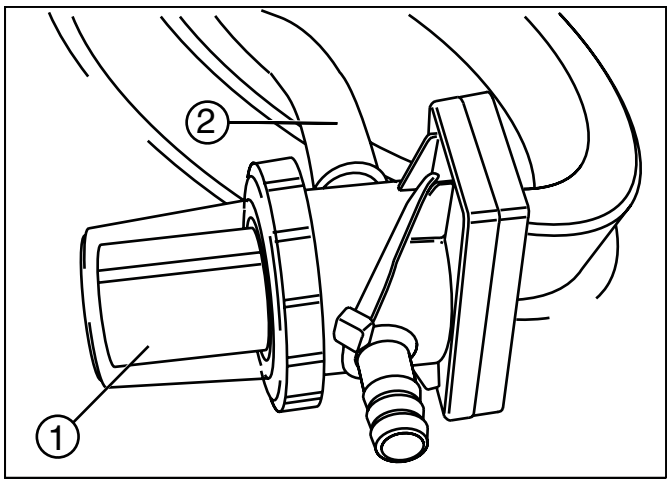
- Replace the Vulkollan rail (1).

**NOTE** The installation is carried out in the opposite order.

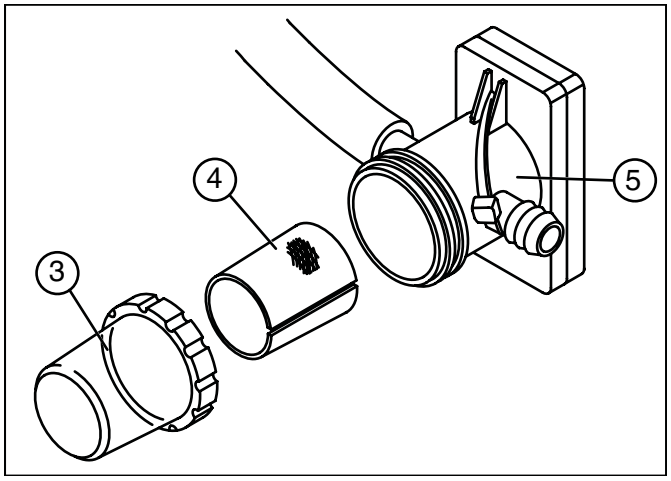
## 4.5 Water spraying device

The safety regulations of Chapter 4.1 apply

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



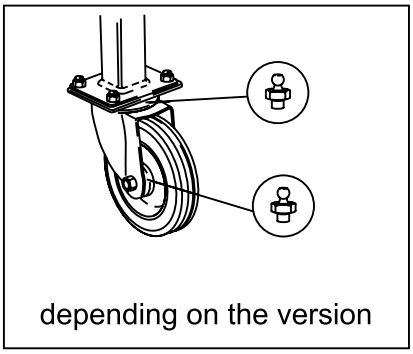

- Screw off the lid of the water tank.
- Pull the suction hose (2) out of the water tank.
- The water filter (1) is located on the suction hose (2) of the water pump.
- Screw off the cover of the housing (3).
- Clean the filter sieve (4) with water.
- Screw the housing cover (3) with the filter sieve (4) onto the housing (5).
- Put the suction hose (2) into the water tank.
- Screw on the lid of the water tank.



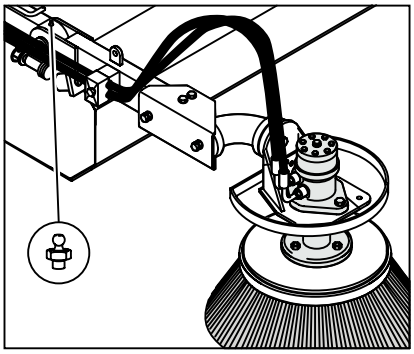
## 4.6 Lubrication plan

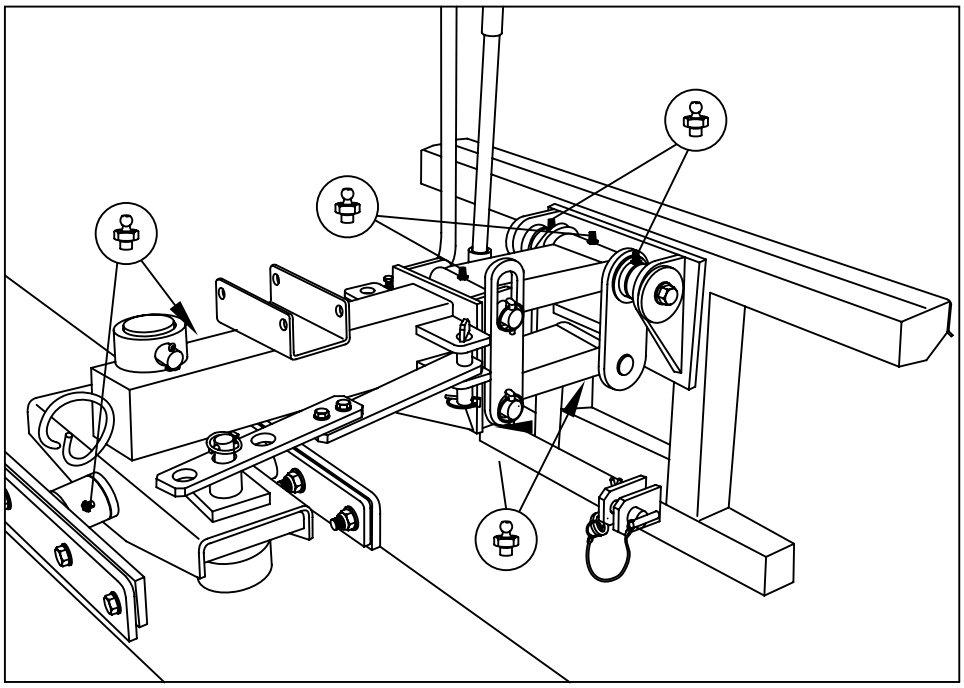
**N O T E** Grease the bearings weekly. Use grease according to DIN 51502 (e.g., Gresalit 2 by Westfalen).

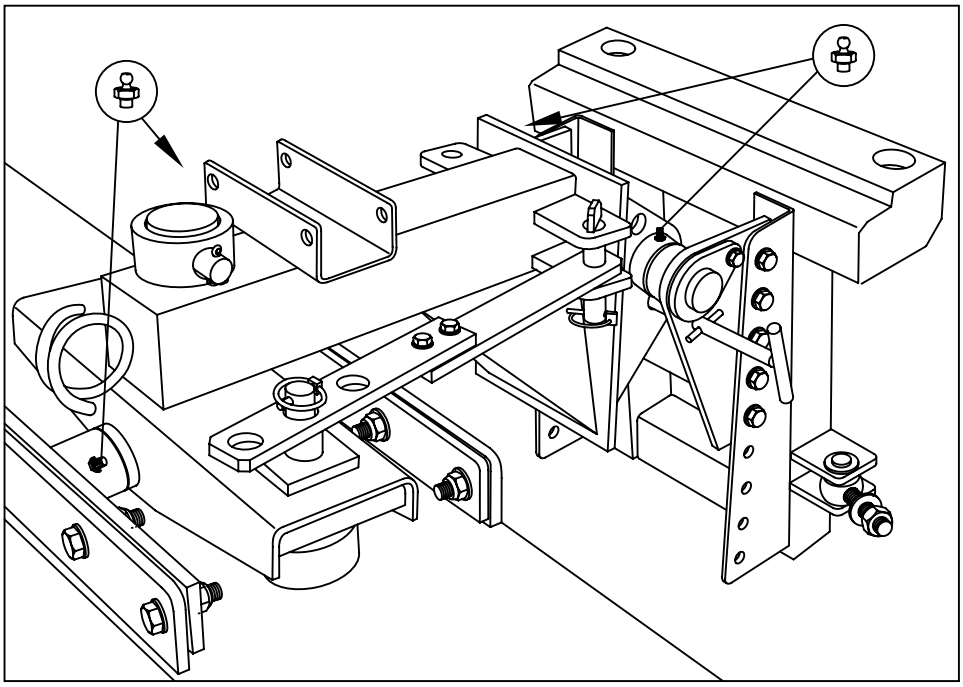
Grease weekly!



depending on the version



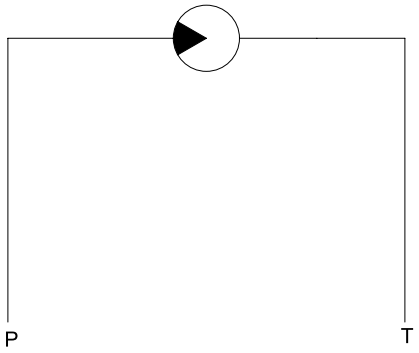




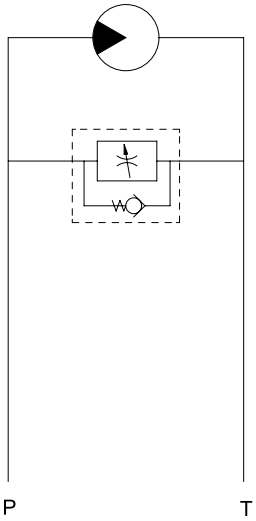
## 4.7 Malfunctions; causes and rectification

| Malfunction | Cause | Correction |
|---|---|---|
| 1. Sweeping drum does not turn | - hydraulic connections not correct | - check connectors |
| | - pressure or volume current too low | - ask a qualified workshop |
| | - hydraulic motor defective | - ask a qualified workshop |
| 2. Dirt collection vessel does not tilt up (hydr.) | - hydraulic connections not correct | - check connectors |
| | - hydraulic cylinder defective | - ask a qualified workshop |
| 3. Water spraying device defective | - water tank empty | - top up water |
| | - fuse in the cabinet defective | - replace fuse |
| | - water filter clogged | - clean water filter |
| | - nozzles clogged | - clean nozzles |
| 4. Side broom does not operate | - intake hose closed | - turn the 2-way-tap |
| | - hydraulic connections not correct | - check connectors |
| | - one-way restrictor | - adjust or close one-way restrictor |
| | - hydraulic motor defective | - ask a qualified workshop |
| 5. Sweeping result unsatisfactory | - broom adjustment | - adjust the broom via the raster lever system |
| | - broom rotation too fast/slow | - adjust the broom rpm |
| 6. Hydraulic side adjustment does not function | - hydraulic connectors not correct | - check connectors |
| | - pressure or volume current too low | - ask a qualified workshop |
| | - hydraulic cylinder defective | - ask a qualified workshop |

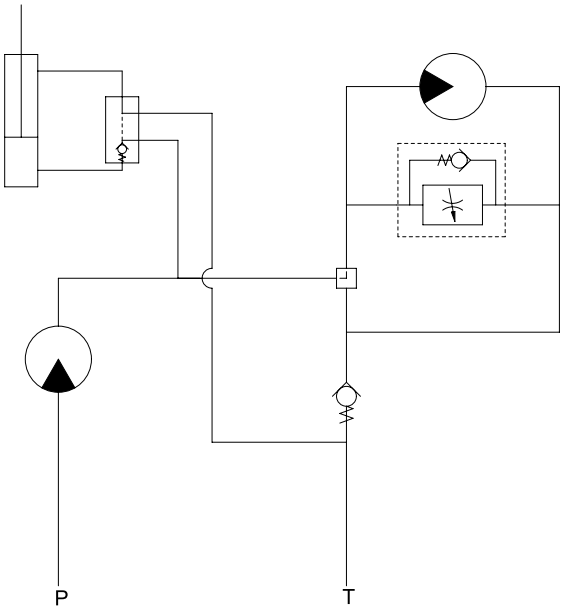
## 4.8 Hydraulic circuit diagrams



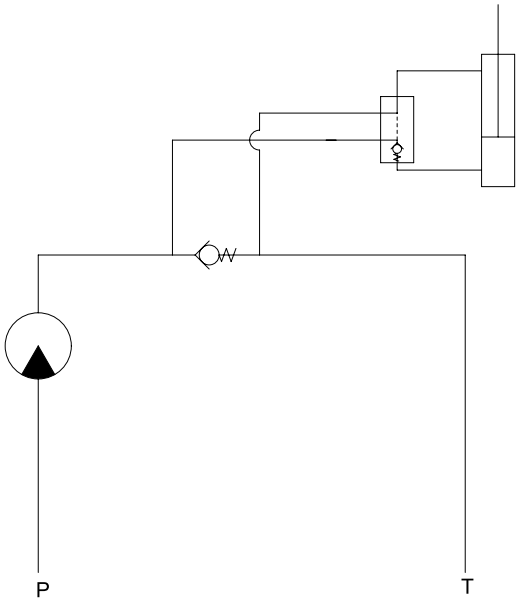

Drum drive



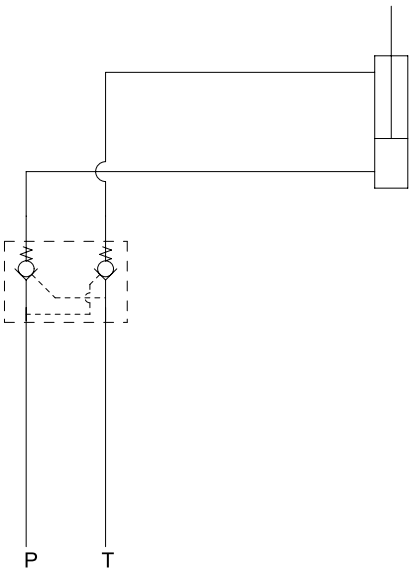

Hydraulic drive side broom



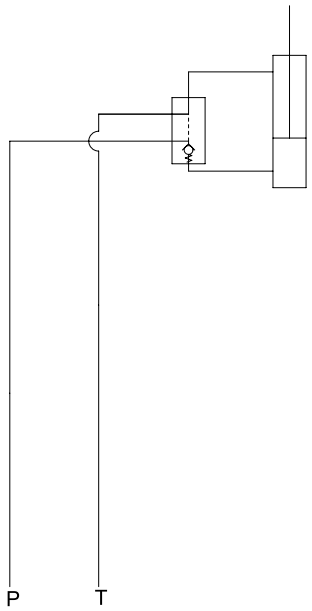

Drum drive with hydraulic emptying of the collector vessel and side broom drive



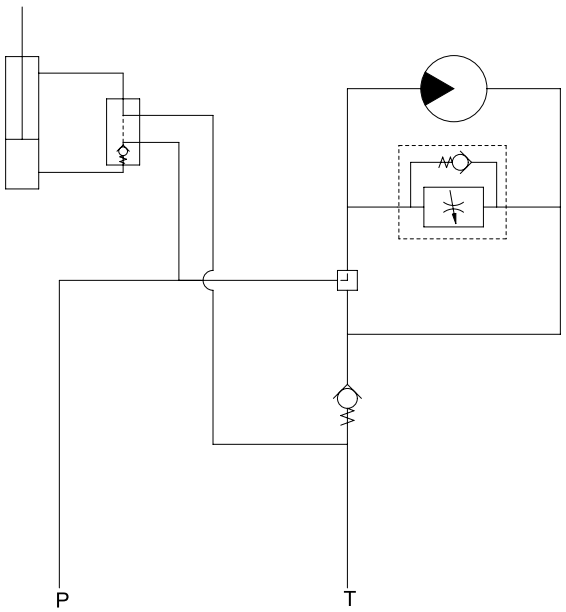

Drum drive and hydraulic emptying of the collector vessel



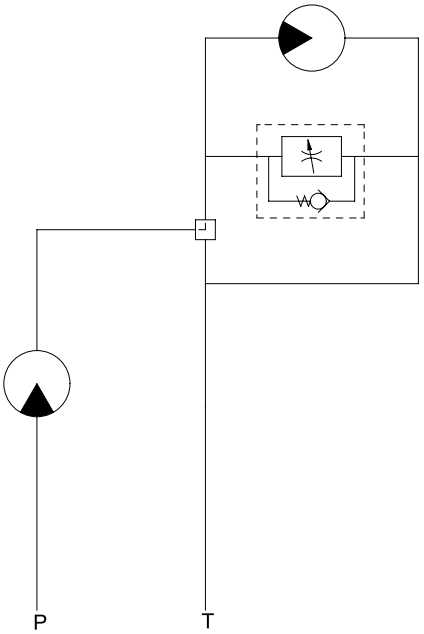

Hydraulic side adjustment




Hydraulic emptying of the collector vessel

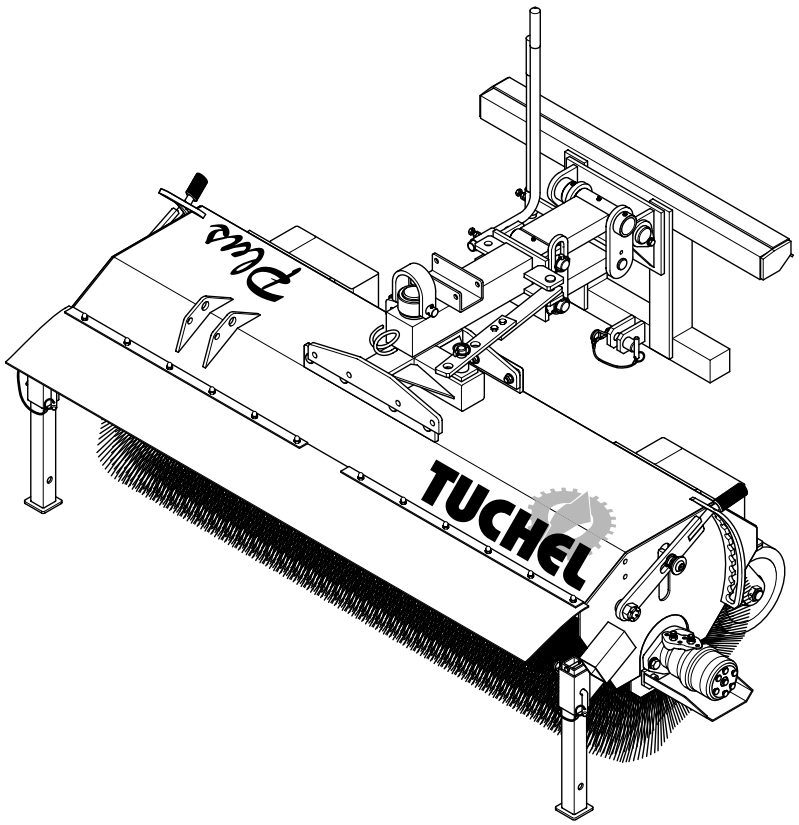



Hydraulic emptying of the collector vessel
and side broom drive




Drum drive and side broom drive

## Notes:

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