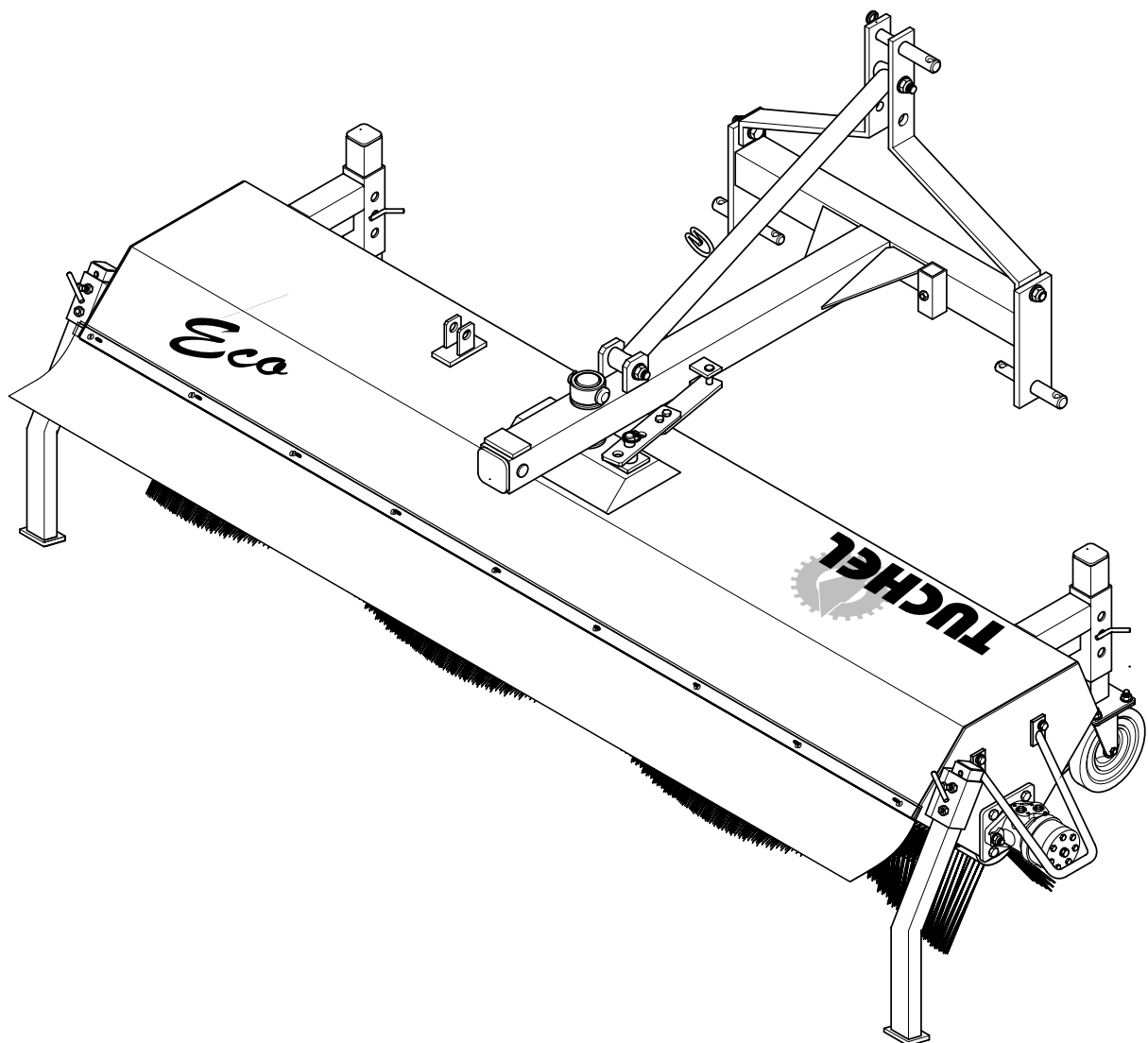




Operating Manual



Eco Sweeping Machine

Preface

Dear Customer,

with the Eco 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 Eco sweeping machine as well as for maintaining its value.



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

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 Eco sweeping machine.

Tuchel Maschinenbau GmbH

This operating manual is current as of April 2004

NOTE

Our continuous efforts towards an improvement of the Eco sweeping machine may lead to changes in detail. The introduction of improvements does not, however, oblige us to carry out these improvements on a Eco sweeping machine already delivered.

NOTE

If the improvements lead to minor changes, they are not covered by the operating manual. Thus, no claims may be derived from this manual.

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1 General

1.1 Purpose

The Eco sweeping machine is intended for the usage on tractors, yard loaders and small fork lifters. Due to its robust construction and the variety of operating widths, the sweeping machine is suitable for use on roads, paths and yards. It is designed for the quality- and cost-conscious farmer.

The basic equipment includes height-adjustable notched support wheels, the mechanical side adjustment including shear-off protection, a universally deployable sturdy PP drum brush, and the 3-point linkage. The conversion from front to rear attachment with 3-point linkage is easy and does not require additional parts.

The machine may be attached via coupling triangle, yard / front loader attachment, or fork arm receptacle, all including level compensation, permitting perfect attachment to tractors, yard loaders and forklifts.

Various additional equipment permits adaptation to a wide range of work environments (see list).

The additional equipment consists of:

- hydraulic side adjustment for easier working. In open sweeping, the Eco sweeping machine is placed at an angle to the surface to be cleaned.
- the dirt collection vessel, optionally with Vulkollan rail, for sweeping with dirt collection. The dirt tray is opened and locked from the driver's seat via bowden control and levers. Optionally, the collector vessel can also be emptied hydraulically.
- the third support wheel in front of the collector vessel ensures consistent guidance across the ground.
- extra robust wheels.

1.2 Product Specifications

1.2.1 General

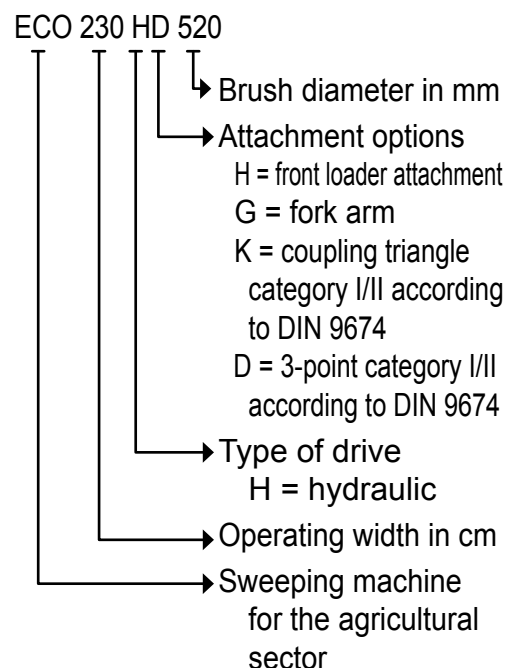
This operating manual applies to the Eco sweeping machine series.

1.2.2 Manufacturing Address

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

1.2.3 Type Label

See example on the right for the ECO 230 HD 520



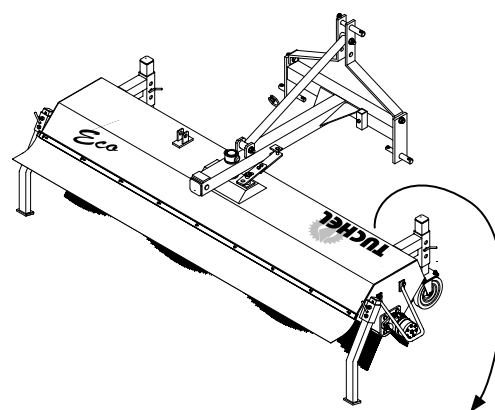
1.2.4 Labelling



This information is found on the type label.

NOTE Please enter your data here so you always have it at hand.

Model / Type	<input type="text"/>
Serial no.	<input type="text"/>
Year of construction / order no.	<input type="text"/>
Maximum oil pressure [bar]	<input type="text"/>
Maximum oil flow [l/min]	<input type="text"/>
Net weight [kg]	<input type="text"/>

NOTE The entire labelling (type label, safety label, etc.) constitutes a certificate and must not be altered or made illegible. Damaged or missing labels must be replaced.



○ Modell / TYP	<input type="text"/>	 <p>TUCHEL MACHINENBAU GmbH Holtorf 15 • 48499 Salsbergen Tel. 0 59 71396 75-0 • Fax 0 59 75-30 Internet: http://www.tuchel.com E-Mail: info@tuchel.com</p> 
○ Serien-Nr.	<input type="text"/>	
○ Baujahr / Auftrags-Nr.	<input type="text"/>	
○ max. Betriebsdruck [bar]	<input type="text"/>	
○ max. Ölstrom [kg]	<input type="text"/>	
○ Eigengewicht [kg]	<input type="text"/>	
○ Tragfähigkeit des Flurförderfahrzeugs beachten!		

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, DIN pr EN 1553, and DIN EN 474 1+2 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 model name, serial number, and the year of construction of the Eco sweeping machine for which the spare part is intended.

NOTE Original spare parts and accessories provide safety.

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

1.2.7 Maximum load specifications

Maximum operating pressure at continuous load: 175 bar

Maximum oil flow at continuous load: 60 l/min

1.2.8 Connections

The basic machinery of the Eco sweeping machine requires a single action control circuit of the carrier vehicle's hydraulic system. If accessories are used, the number of control circuits changes, see table.

Control circuits required for respective equipment	hydraulic drive	collector vessel	Side broom	hydraulic inclination	SA = single acting control circuit DA = double acting control circuit
Eco with	X				1 SA
Eco with	X	X			1 DA
Eco with	X	X	X		1 DA
Eco with	X		X		1 SA
Eco with	X			X	1 SA, 1 DA
Eco with	X	X		X	2 DA
Eco with	X	X	X	X	2 DA

1.2.9 Energy consumption

Type of drive:	hydraulic
Required oil quantity:	25 l/min (Eco 150 and 180); 30 l/min (Eco 230)
Oil pressure required:	160 bar
Type of oil:	hydraulic oil according to ISO VG 68 DIN 51524 (e.g., Vitam GF 46 by Aral)

1.2.10 Intended usage


The Eco sweeping machine is a machine that is set in motion via a hydraulic circuit and through the attachment to a suitable carrier vehicle. Used for cleaning sealed surfaces with normal soiling (see also Chapter 1.1 Purpose)

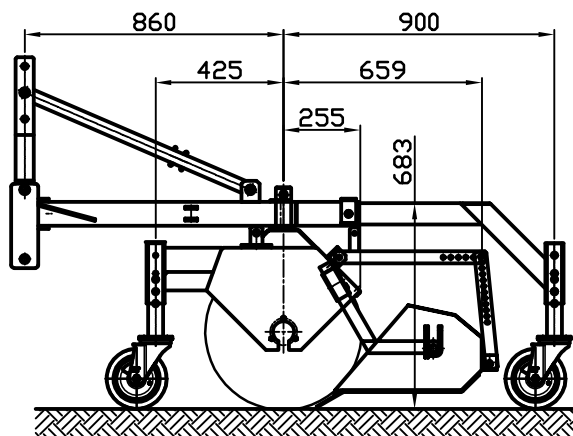
The intended usage includes the adherence to the manufacturer's requirements regarding operation, service and maintenance as well as the connected conditions.

Any other use is defined as not intended. The manufacturer does not accept any liability for damage arising from incorrect use; the risk rests solely with the user.

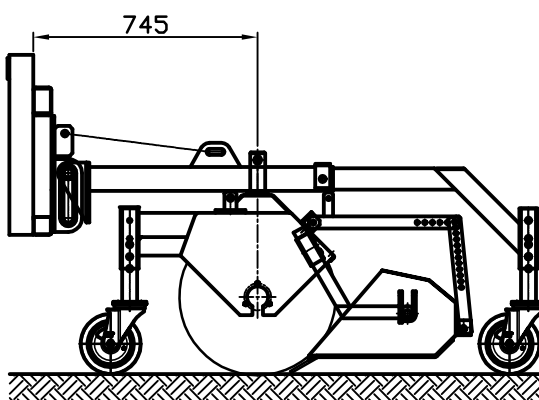
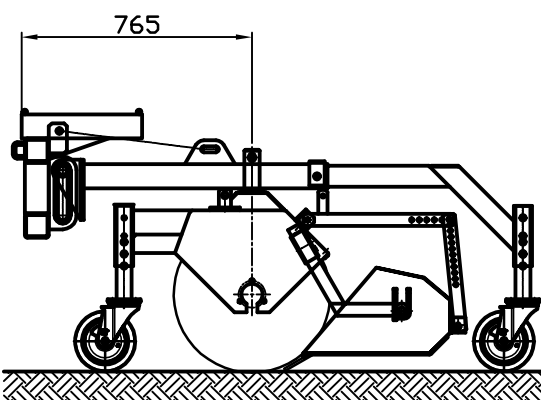
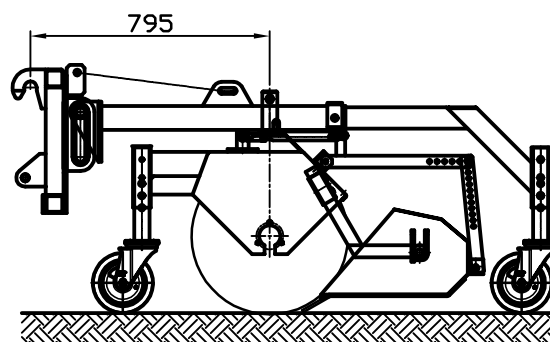
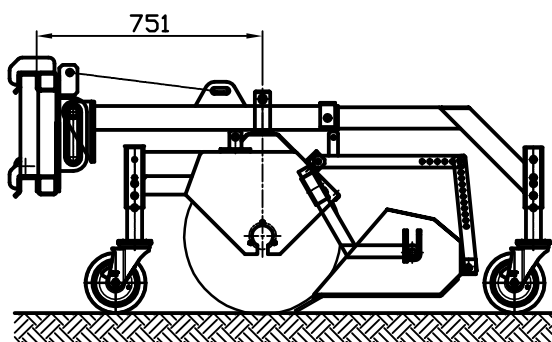
1.2.11 Technical data sheet

NOTE The weights are for guidance only since the equipment of the machines varies.

 Use the weights to check compliance with the maximum allowed axle load of the carrier vehicle.



Diameter of main sweeping drum	520mm
Maximum operating pressure at continuous load	175 bar
required operating pressure	160 bar
RPM of main sweeping drum	80 to 150 rpm
Maximum oil flow at continuous load	60 l/min
Sound pressure level (depends on the carrier vehicle)	<72dB(A)



Due to further technical development, dimensions and weights are subject to change without notice!

Technical data of the sweeping machine	Eco	150	180	230
Operating width	mm	1500	1800	2300
Operating width if positioned at an angle of 20°	mm	1410	1690	2160
Total width / total width at 20° with collector vessel	mm	1852 / 1947	2152 / 2229	2602 / 2652
Volume of collector vessel	litres / kg	135 / 202	161 / 241	200 / 299
Weight of Eco sweeping machine:				
with collector vessel and 3-point linkage	kg	220	245	273
required oil quantity	l/min	25-30	25-30	30-40
Sweeping capacity at 6 km/h	m ² /h	9000	10800	13800

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 is hazardous for persons are marked with the 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 non-observance create hazards for the machine and its functionality have the word

ATTENTION

attached.

Notices are labelled as follows:

NOTE

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 Eco 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 results in the loss of all claims for damage whatsoever.

In detail, nonobservance, **for example**, leads 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 work

The safety notices listed in this operating manual, current national accident avoidance regulations as well as company-internal regulations governing work, operation, and safety that 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

- The clothing of the operators must fit tightly.

Start-up

- Before starting work, familiarise yourself with all equipment, operating elements and their functions.
- 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 if hydraulic hoses get entangled or squashed.
- During detachment, the supports must be put into their respective position.
- Observe permitted axle load, gross weight, and transport dimensions.
- Check the immediate area before starting to drive and before start-up (children). Ensure that there is sufficient visibility.

Transport / transport trips

- Check and attach transport equipment
 - such as, e.g., illumination and warning equipment (e.g. reflective tape).
- If lighting that is part of the standard carrier vehicle is obscured in the transport position, additional illumination devices must be attached.
- No passengers may be carried on the machine during operation and transport.
- For the transport, the hydraulic levers for operating and lowering the sweeping machine must be protected against accidental operation (secured).

Operation

- Never leave the driving seat while 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 sweeping machine on driving behaviour and steering and braking ability.
- No person may be present in the area of operation.
- After switching off the device there is danger due to the continued movement of the brush. Do not approach the machine during this time period. Wait until it has come to a complete standstill. (depends on the carrier vehicle)

Hydraulic equipment

- The hydraulic 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.
- Connect the hydraulic hoses only in the pressure-free state of the vehicle hydraulics.
- Only work on the Eco sweeping machine if the vehicle hydraulics are depressurized. Liquids (hydraulic oil) escaping under high pressure penetrate the skin and can cause severe injuries. In case of injuries, see a doctor immediately. Danger of infection!
- Hydraulic hoses must be replaced no later than 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 must be removed immediately as they represent a danger to the environment.
- When searching for leaks, use suitable equipment to avoid injuries.

Detachment

- During detachment, the supports must be put into their respective position.
- Before leaving the carrier vehicle, lower the sweeping machine to the ground. Pull the ignition key and secure the carrier vehicle against unintended restart and movement!

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.

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

Use suitable tools and gloves when exchanging machine parts.

Lawfully dispose of oil and grease.

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

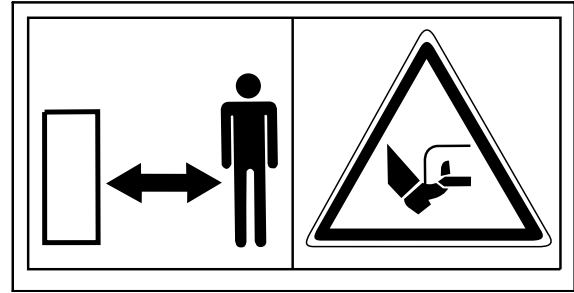
Before restarting, the points listed in the sections on start-up must be adhered to.

2.7 Unauthorised conversion and spare parts manufacturing

Conversion of or changes to 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

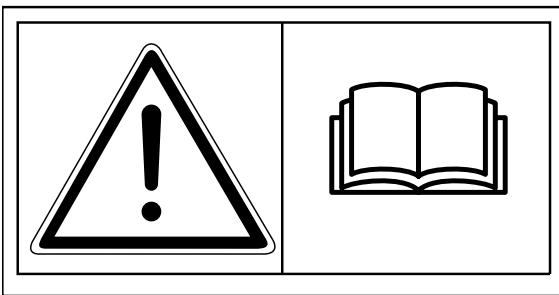
The operational safety of the machine supplied is only warranted if used as intended according to Chapter 1 - General – of the operating manual. The limits specified in the data sheets must not be exceeded under any circumstances.



Artikel-Nr.
00.KC.00103

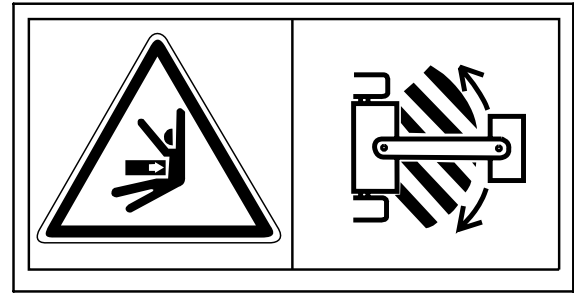
When lowering the sweeping machine, keep sufficient distance.

2.9 Notice signs on the machine



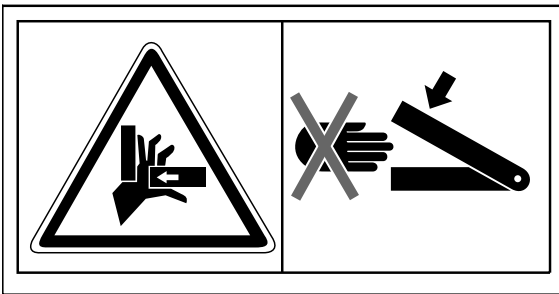
Artikel-Nr.
00.KC.00100

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



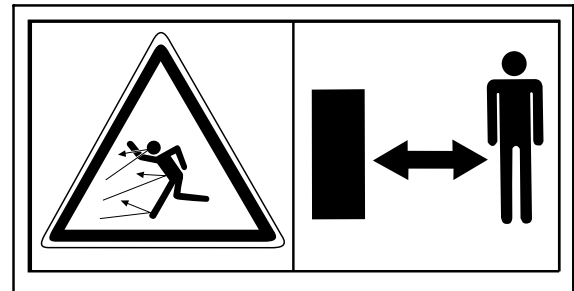
Artikel-Nr.
00.KC.00104

Do not stand in the rotation area during operation.



Artikel-Nr.
00.KC.00101

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



Artikel-Nr.
00.KC.0010

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



Artikel-Nr.
00.KC.00102

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

NOTE The notice signs attached to the Eco sweeping machine must be kept in a clearly legible state. Missing or damaged notice signs must be replaced.

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

3 Eco 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 brushes are adjusted via the height-adjustable support wheels.

An external, high-powered hydraulic motor, equipped with a collision protector, 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 standard equipment includes a PP drum brush with a diameter of 520 mm.

An abrasion-proof Vulkollan rail is connected to the lower edge of the dirt collection vessel across its entire length. It is intended for improved dirt collection. This way, the collector vessel is guided evenly and without damage across the ground.

The opening and closing of the dirt collection vessel is accomplished from the carrier vehicle. It is operated via a bowden control or by operating a hydraulic cylinder.

The Eco 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 swivelled by 20° to the right or to the left.

Accessories

- extra sturdy castor wheels
- dirt collection vessel with mechanical emptying.
- Vulkollan rail on the dirt collection vessel for improved guidance across the ground.
- hydraulic emptying of the collection vessel
- 3rd support wheel for even ground guidance, height-adjustable
- hydraulic side adjustment, inclination of the sweeping machine using a hydraulic cylinder. This requires a double-acting control valve on the carrier vehicle.

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.

- support wheels (1) and third support wheel (2) must point backwards towards the carrier vehicle. (Exception: 3-point linkage rear receptacle!)

ATTENTION

If stored for longer, the sweeping machine must be placed so that the bristles of the sweeping drum do not carry any load.

Take the ground pressure off the sweeping drum



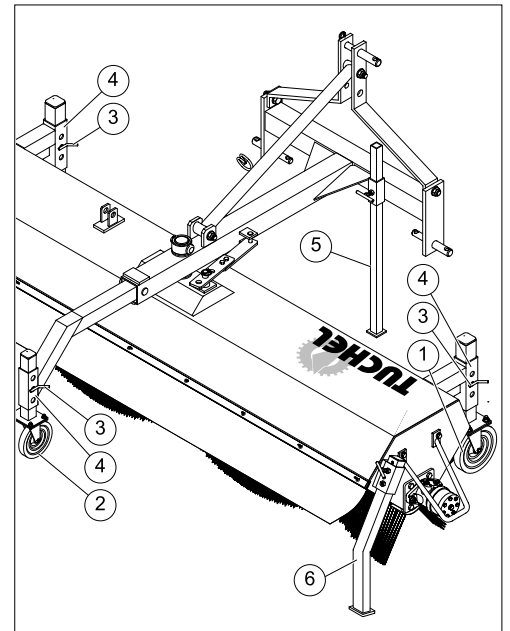
Take the sweeping machine's own weight into account.

- Remove the bolts (3) of the support wheel receptacle (4), slide the support wheels out and secure them again using the bolt (3).

NOTE

Carry out the setting evenly on both sides.

- Fully extend the support (5) of the 3-point linkage, if present.
- Bristles of the sweeping drum must no longer touch the ground.



Sweeping machine without collector vessel

- For the open sweeping Eco sweeping machine, shift the supports (6) downwards and secure them.

General storage



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

ATTENTION

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

NOTE

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

- If necessary, repair paint damage.

3.3 Attachment



The Eco sweeping machine must be attached or coupled only 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 and modifications on the Eco sweeping machine only if the hydraulic drive is switched off. Pull the ignition key and secure the carrier vehicle against unintended restart and movement!

NOTE

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

NOTE

Install the bowden control for emptying the dirt collection vessel into the carrier vehicle's cabin.

ATTENTION

Verify the correct attachment and its safeguards.



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

ATTENTION

Damaged hydraulic hoses must be replaced immediately.

Mounting before initial attachment



Before the initial attachment can take place, individual parts, if present, must be installed at the Eco sweeping machine and checked for firm attachment.

NOTE

Individual parts are only present if several sweeping machines are stacked on top of each other on delivery.

NOTE

Please request the respective installation manual from Tichel Maschinenbau GmbH. Please specify the type label, serial number, and the year of construction of the Eco sweeping machine in your request.

3.3.1 3-point linkage rear attachment



The safety instructions in Chapter 3.3 are mandatory!

Check the receptacle for soiling. Clean if necessary.

- Drive the carrier vehicle towards the sweeping machine.
- Select the bolt diameter (1) according to the attachment category, hook and lock the draft link hook rods.
- Use upper hook bolts (2) according to the attachment category and lock with upper hook.

NOTE

Adjust the upper hook so that the attachment receptacle is perpendicular to the ground. (See also operating manual of the carrier vehicle)

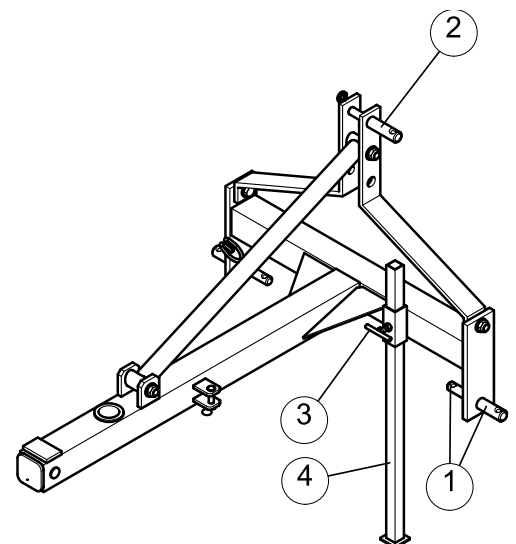
ATTENTION

Verify the correct seating of the attachment receptacle.

- unscrew clamping T-bolt (3) and shift the support (4) upwards and secure it again, if it exists.
- Connect the hydraulic lines according to the instructions of the vehicle manufacturer.
- Lift the sweeping machine and carry out a functionality check.

NOTE

The Eco sweeping machine with 3-point linkage can also be attached at the front. Conversion see next page!



Conversion for front attachment



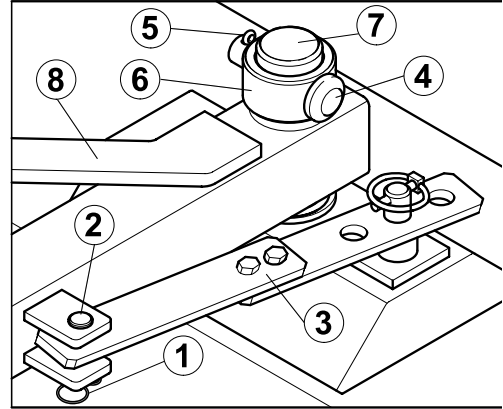
The safety instructions in Chapter 3.3 are mandatory!



Accident hazard!

Pay attention to a safe placement of the Eco sweeping machine. If necessary, secure the sweeping machine in additional ways.

- Remove the hydraulic hoses from the loop of the 3-point linkage.
- Detach the spring plug (1) and bolt (2).
- Move the pitch rod (3) or pitch control cylinder to the side.
- Unmount bolt (4) using the splint pin (5) and pull the barrel (6) off the central bolt (7).
- Lift the 3-point linkage from the central bolt and set down rotated by 180 degrees.



NOTE

Take the 3-point linkage's own weight into account. If necessary, shift the support upwards.

- Reinstall the barrel (6) together with the bolt (4) and the splint pin (5) on the central bolt.
- Secure the pitch rod (3) or pitch control cylinder, using the bolt (2) and spring plug (1).
- Hang the hydraulic hoses back into the loop of the 3-point linkage.

ATTENTION

The positioning of the hydraulic hoses must be checked, as damage occurs if they get entangled or squashed.

NOTE

For the Eco sweeping machine with dirt collection vessel, the emptying mechanism must be converted.

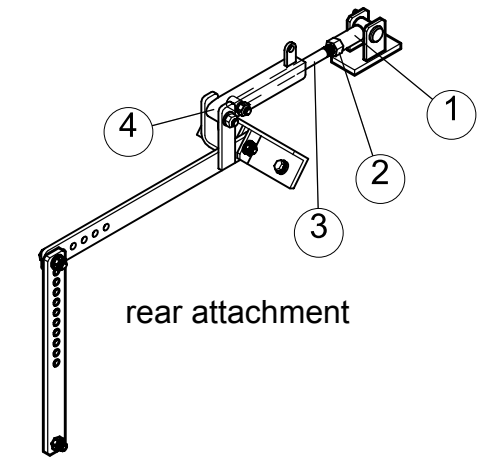
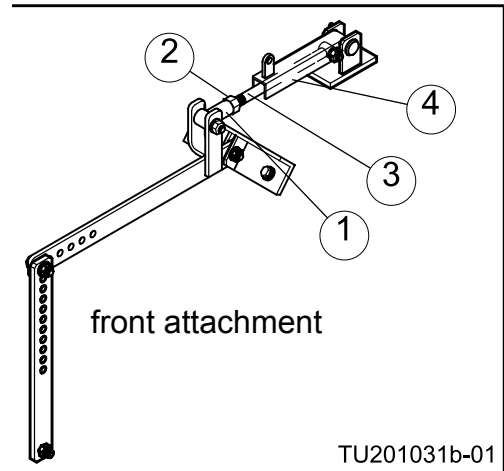
- Convert parts (1), (2), (3), and (4) according to the attachment version and secure again (see diagram).

NOTE

Replace self-locking nuts after each unscrewing!

NOTE

The attachment sequence for the frontal attachment is the same as for the rear attachment (see previous page).



3.3.2 Yard loader - Attachment



The safety instructions in Chapter 3.3 are mandatory!

NOTE

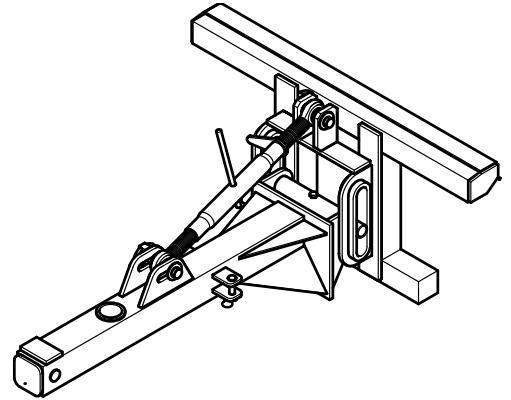
Check the receptacle for soiling. Clean if necessary.

- Lower the receptacle of the carrier vehicle below the receptacle of the Eco 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.

- Connect the hydraulic lines according to the instructions of the vehicle manufacturer.
- Lift the sweeping machine and carry out a functionality check.



3.3.4 Fork arm - Attachment



The safety instructions in Chapter 3.3 are mandatory!

NOTE

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

ATTENTION

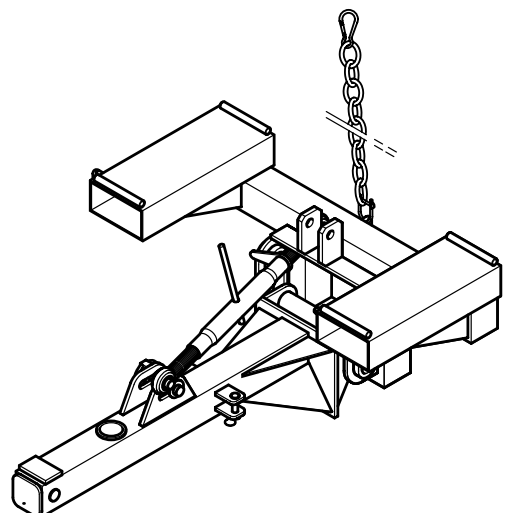
The distance between the fork arms must be adjusted on the carrier vehicle before they are driven into the receptacles!

- Drive the fork arms fully into the receptacle.
- The fork arm receptacle must be secured with a chain.
- The chain must be pulled tightly through the loop and the slide carriage of the carrier vehicle and must be secured with the spring hook.

ATTENTION

The chain must not touch the guide rails of the lifting gear. Ensure a tight fit of the chain.

- Connect the hydraulic lines according to the instructions of the vehicle manufacturer.
- Lift the sweeping machine and carry out a functionality check.



3.3.3 Front attachment - coupling triangle



The safety instructions in Chapter 3.3 are mandatory!

NOTE

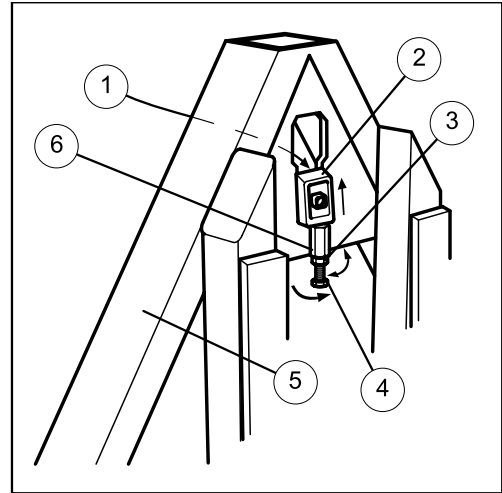
Check coupling triangle and opposing triangle for soiling, and clean if necessary.

- Compare the interface height of the carrier vehicle's receptacle with the receptacle of the sweeping machine.
- Insert front receptacle into the coupling triangle and lock it.

ATTENTION

Compensating the wear and tear of the locking tongue at the device triangle.

- Loosen the countersunk screw (1) in order to be able to move the locking handle (2).
- Turn check nut (3) of the adjustment screw (4) towards the screw head.
- Readjust the locking handle (2) using the adjustment screw (4) (see also operating manual of the carrier vehicle).
- You must move the locking handle (2) upwards until the locking tongue securely connects the opposing triangle (5) again.
- Tightly turn the check nut (3) against the barrel (6).
- Tighten the countersunk screw (1) at the locking handle (2).
- Insert the receptacle triangle into the device triangle and lock it.



ATTENTION

Verify the correct seating and the lock of the attachment receptacle.

- Connect the hydraulic lines according to the instructions of the vehicle manufacturer.
- Lift the sweeping machine and carry out a functionality check.

3.4 Operation



The safety instructions in Chapter 3.3 are mandatory!



Carry out modifications on the sweeping machine only if the hydraulic drive is switched off. Pull the ignition key and secure the carrier vehicle against unintended restart and movement!

3.4.1 Transport trips



The safety instructions in Chapter 3.3 are mandatory!

NOTE

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

ATTENTION

Safeguard the operating elements for the sweeping machine against unintended use.

- For open sweeping usage, the sweeping machine must be positioned straight, see Chapter 3.4.7 Side adjustment for open sweeping.
- Lift sweeping machine out.

3.4.2 Start-up

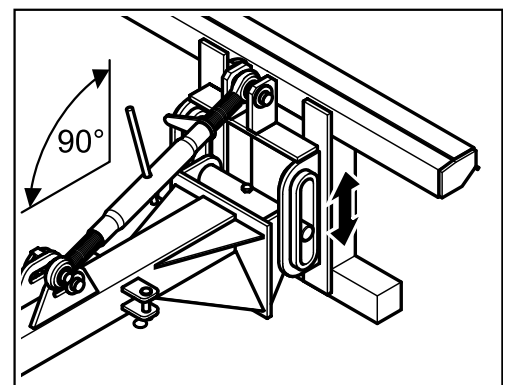


The safety instructions in Chapter 3.3 are mandatory!

- For open sweeping usage, shift the two supports at the sweeping machine frame upwards and secure them.
- The maximum driving and sweeping speed is 6 km/h.
- When operating the sweeping machine, a sweeping profile of 6 - 10 cm appears. (for adjustment of the sweeping profile see Chapter 3.4.8).
- Hydraulic hoses must be positioned without danger of getting squashed (see initial attachment in Chapter 3.3).

Sweeping machine - Position in front of the carrier vehicle

- Lower the sweeping machine until the two (or three) castor wheels touch the ground.
- Place the receptacle structure perpendicular to the ground.
- All attachments, except for the 3-point linkage, are delivered with level compensation.
- Vertically move the sweeping machine with level compensation until the attachment is in the middle of the height compensation.



3.4.3 Rpm adjustment

The revolution speed is adjusted via the oil power of the carrier vehicle. This depends on the type of the carrier vehicle and its equipment.

3.4.4 Emptying the dirt collection vessel



The safety instructions in Chapter 3.3 are mandatory!

- Lift the sweeping machine.



No person must be present below the machine during emptying.

NOTE

If a high-level filling flap is mounted, it swings away from the dumping area during emptying.

Mechanic operation

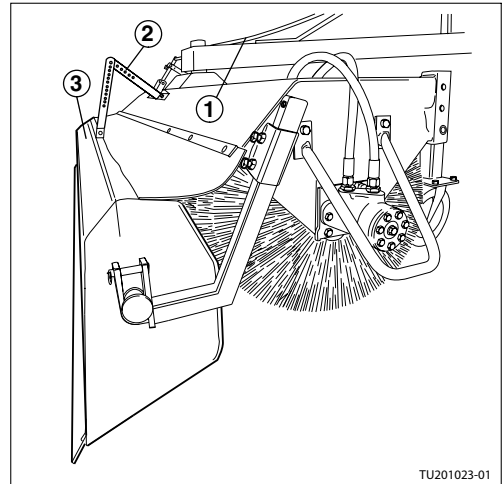
The dirt collection vessel is opened via the bowden control (1) that was installed into the cabin.

- Pull on the bowden control and the dirt collection vessel (3) is opened by the levers (2) for emptying and closes itself.

Hydraulic operation

The dirt collection vessel is opened via a hydraulic cylinder.

- Flip the respective control lever for the sweeping machine hydraulics in the carrier vehicle. The flow direction of the working hydraulics changes and the collector vessel opens.
- Close collector vessel by flipping back the previously mentioned control lever. (flow direction changed again)
- Lower the sweeping machine.



3.4.5 Conversion to the open sweeping Eco sweeping machine



The safety instructions in Chapter 3.3 are mandatory!

NOTE

Empty the dirt collection vessel before deinstallation.

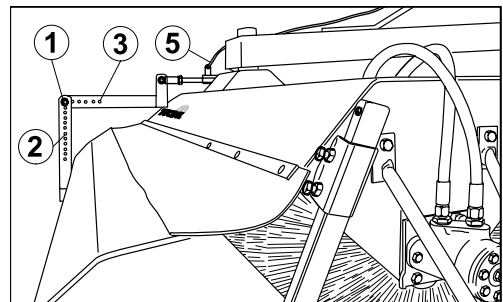


Only remove the dirt collection vessel while the sweeping machine is attached to the vehicle.



Carry out conversions only if the hydraulic drive is switched off. Pull the ignition key and secure the carrier vehicle against unintended restart and movement!

- Remove the attachment screw (1) from the perforated rails (2) and (3).



- Remove both spring plug bolts (4).

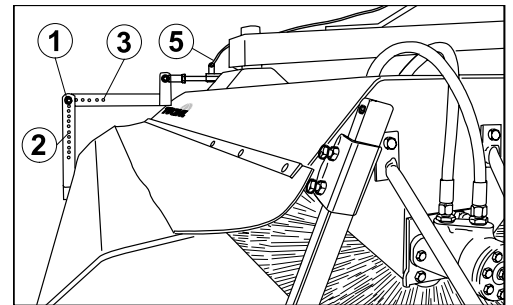
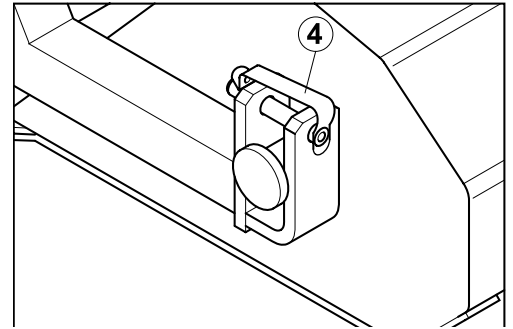
NOTE

Mechanical vessel emptying: Remove the bowden control from the carrier vehicle, place it into the collector vessel and remove the spring hook (5).



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

- Lift out the dirt collection vessel and put it down on a level, dry and clean area.
- Clean the collector vessel thoroughly. Dirt attracts humidity and leads to the formation of rust. If necessary, repair paint damage.



3.4.6 Inclination for open sweeping



The safety instructions in Chapter 3.3 are mandatory!

NOTE

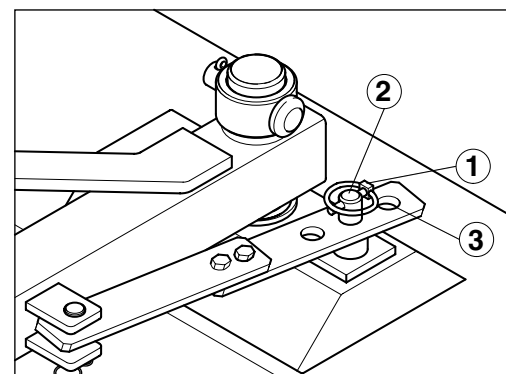
Side adjustment towards road shoulder for open sweeping usage.



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

Mechanic operation

- 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).



Hydraulic operation

The tilting of the Eco sweeping machine is carried out by a hydraulic cylinder. This requires an additional double acting control circuit.

- Operate the appropriate control lever of the hydraulic system in the carrier vehicle.



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

- The Eco sweeping machine tilts to the right or left.
- Lower the sweeping machine.

ATTENTION

Secure the operating lever for the second control circuit in the carrier vehicle against unintended operation.

3.4.7 Overload protection



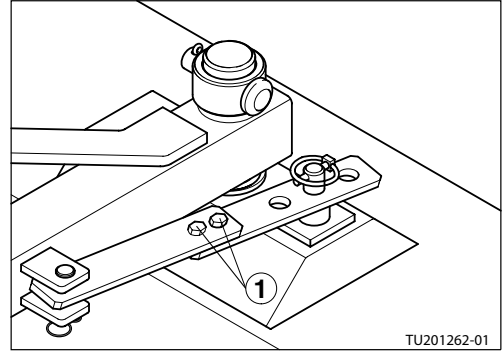
The safety instructions in Chapter 3.3 are mandatory!

NOTE

To secure the vehicle against overload when driving into an obstacle, the two pitch rods are connected via two shear bolts (1).

NOTE

When replacing the shear bolts (1), use only screws of thread size M8 and property class 8.8.



3.4.8 Readjustment of the sweeping profile

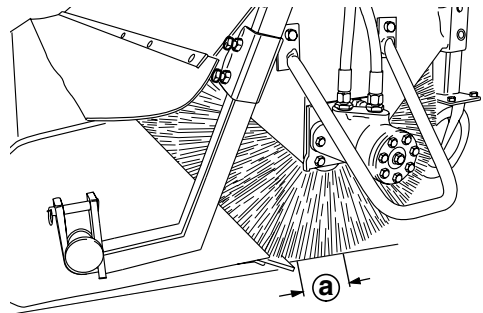


The safety instructions in Chapter 3.3 are mandatory!

ATTENTION

When operating the sweeping machine, a sweeping profile of $a = 6 - 10$ cm width should appear. (lift sweeping machine, the swept area should have a width of 6-10 cm).

- The wear and tear of the broom bristles is compensated by adjusting the support wheels and the dirt tray.
- With the carrier vehicle standing still and the sweeping machine lowered, carry out the adjustment so that a sweeping profile of 6 - 10 cm width appears .
- Given the arrangement of the perforated rails (2) and (1) , the height of the support wheels (3) can be adjusted in 2 cm steps.



ATTENTION

Evenly adjust the two wheels and the third support wheel, if they exist.



Carry out modifications on the sweeping machine only the hydraulic drive is switched off. Pull the ignition key and secure the carrier vehicle against unintended restart and movement!



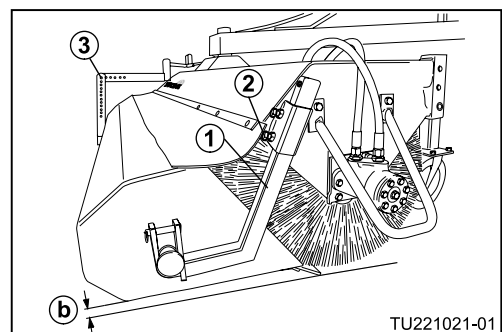
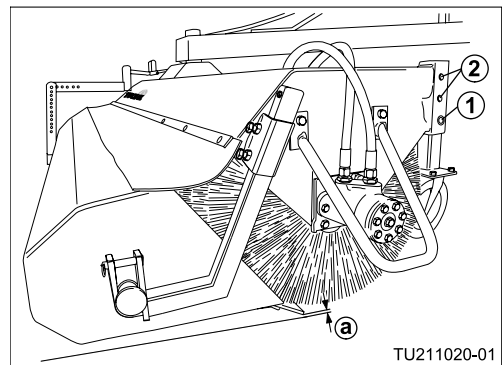
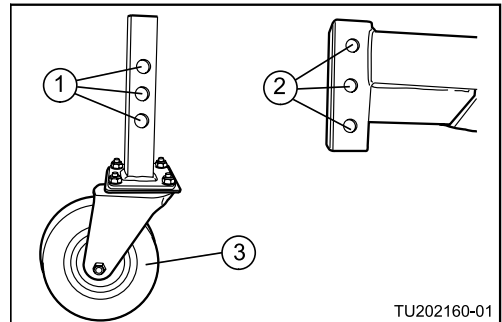
Take the sweeping machine's own weight into account!

- Remove the locking of the bolt (1).
- Remove bolt (1) and change the height of the support wheel.
- Insert bolt (1) into the hole exposed in the perforated rail (2) and secure it again.
- Keep the distance (a) from the sweeping rail to the ground small.

NOTE

The horizontal and vertical positioning of the dirt tray with respect to the broom is adjusted via the arm (1) and the screw connection (3). Adjust so that a distance (b) = 50 mm to the ground is achieved.

- Adjust the perforated rail (3) for the emptying mechanism, too.



3.5 Detachment



During detachment or decoupling, special caution must be exercised.



Carry out modifications on the sweeping machine only the hydraulic drive is switched off. Pull the ignition key and secure the carrier vehicle against unintended restart and movement!

ATTENTION

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

- Only detach the sweeping machine with the dirt collection vessel closed and empty.
- 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.

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



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

ATTENTION

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

- Lower the Eco sweeping machine until all castor wheels touch the ground.
- For open sweeping machines, place the two supports on the sweeping machine frame onto the ground and secure with the clamping T-bolt.

3.5.1 3-point linkage - Detachment

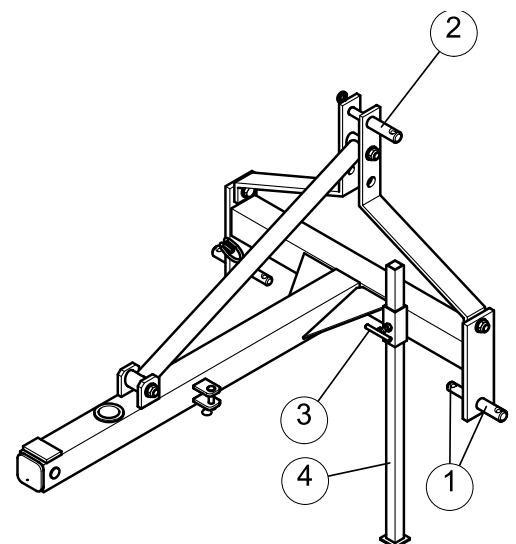


The safety instructions in Chapter 3.5 are mandatory!

- Pull out the clamping T-bolt (3) of the support (4). Place the support onto the ground and secure it with the clamping T-bolt (1), if present.
- Remove the 3-point linkage rods from the carrier vehicle on the 3-point linkage of the sweeping machine.

NOTE

Drive carrier vehicle away, backwards in the case of frontal attachment and forward in case of rear attachment.

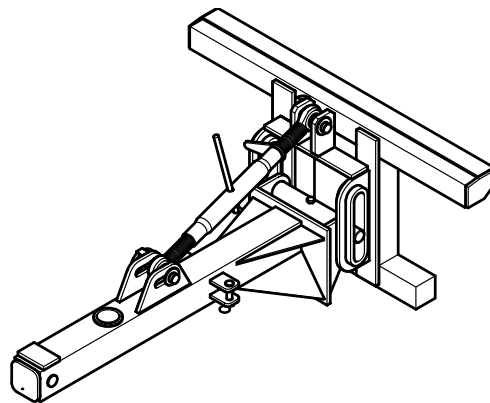


3.5.2 Yard loader - Detachment



The safety instructions in Chapter 3.5 are mandatory!

- Unlock the receptacle as described in the carrier vehicle's operating manual.
- Drive vehicle backwards.

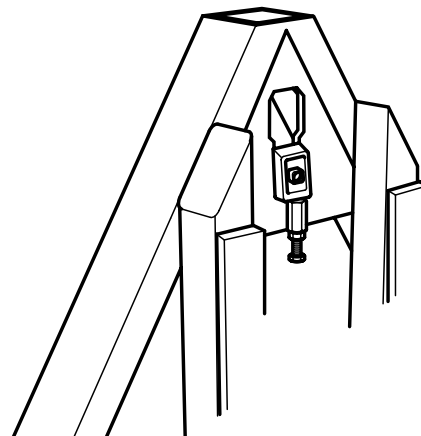


3.5.3 Coupling triangle - Detachment



The safety instructions in Chapter 3.5 are mandatory!

- Undo the lock and lower the coupling triangle from the carrier vehicle.
- Drive vehicle backwards.

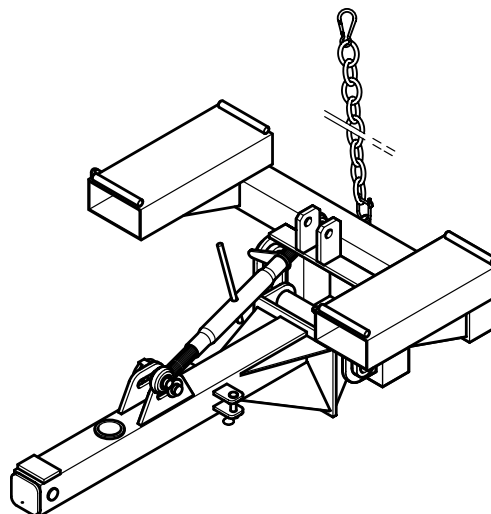


3.5.4 Fork arm receptacle - Detachment



The safety instructions in Chapter 3.5 are mandatory!

- Disconnect the safety chain from the carrier vehicle and place across the machine's cover.
- Move the fork arms out of the receptacle openings of the fork arm receptacle.



4 Service and maintenance

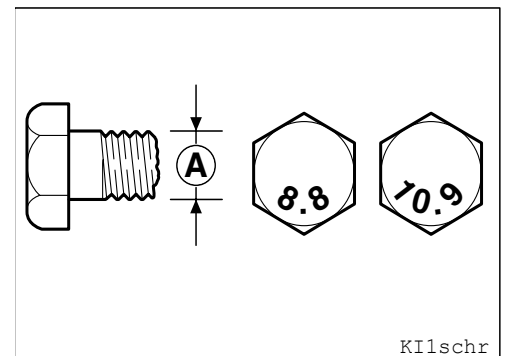
4.1 General



Carry out maintenance and modifications on the Eco sweeping machine only if the hydraulic drive is switched off. Pull the ignition key and secure the carrier vehicle against unintended restart and movement!

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 size (property class on screw head)



A	3.6	5.6	6.8	8.8	10.9	12.9
∅	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

ATTENTION Replace self-locking nuts after each unscrewing.

All torques M_A are approximate values for metric standard threads according to DIN13. Friction coefficient 0.14 - new screw, not lubricated. These values have been recommended as approximate values by various screw manufacturers. We do not accept liability for their application.

- Regularly check the hydraulic hoses.
- Hydraulic hoses must be replaced no later than 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.

4.2 Replacing sweeping drums



The safety instructions in Chapter 4.1 are mandatory!



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

NOTE

Uninstall the collector vessel before replacing the brush rings. (see Chapter 3 Conversion to the open sweeping Eco sweeping machine)

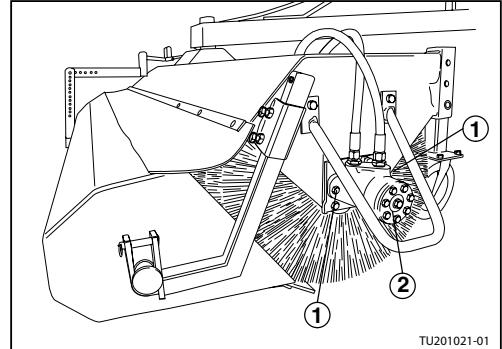
NOTE

Replace attachment nuts each time after they are unscrewed.

NOTE

Turn off the pressure on the hydraulic hoses of the Eco sweeping machine in the carrier vehicle.

- Remove attachment nut (1).
- Pull the hydraulic motor (2) back until the sweeping drum is exposed.



- Unscrew attachment screws (1).
- Remove bearing shell I (2) with bearing protection (3).
- Unscrew attachment screws (4).
- Loosen threaded bolt (5) and unmount with bearing (6).
- Unmount bearing shell II (7).
- Lift sweeping machine out.

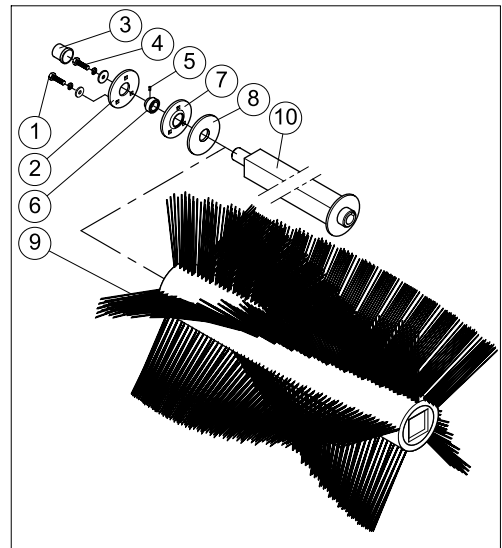


Do not walk, move or work underneath the lifted sweeping machine.



Secure sweeping machine and carrier vehicle against unintended restart, sagging and movement!

- Roll sweeping drum away.
- Remove the holding plate (8) from the brush shaft.
- Pull off worn-out sweeping drums.
- Push the new sweeping drums (9) onto the brush shaft.
- 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.



NOTE

See Chapter 3 for adjustment of the sweeping profile

4.5 Replacement of the Vulkollan rail



The safety instructions in Chapter 4.1 are mandatory!



Replace Vulkollan rail only when the sweeping machine is attached to the carrier vehicle and lifted.



Do not move underneath the lifted machine.



The dirt collection vessel must be empty and completely open.



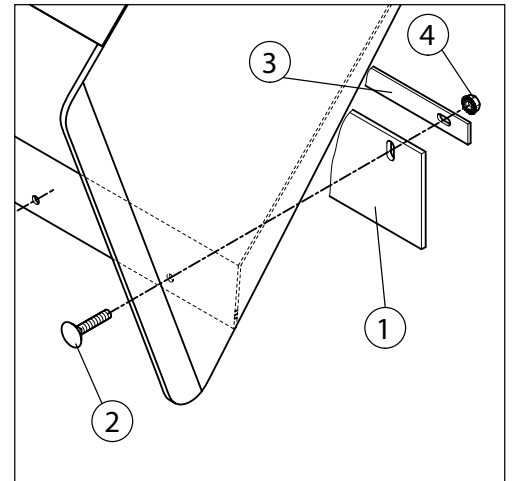
Secure sweeping machine and carrier vehicle against unintended restart, sagging and movement! Pull the ignition key.

- Unscrew 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) and the impact rail (3).



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

- Attach the Vulkollan rail (1). The installation is carried out in the opposite order.

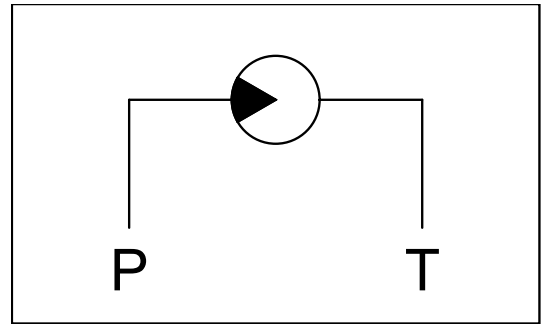


4.7 Malfunctions; causes and rectification

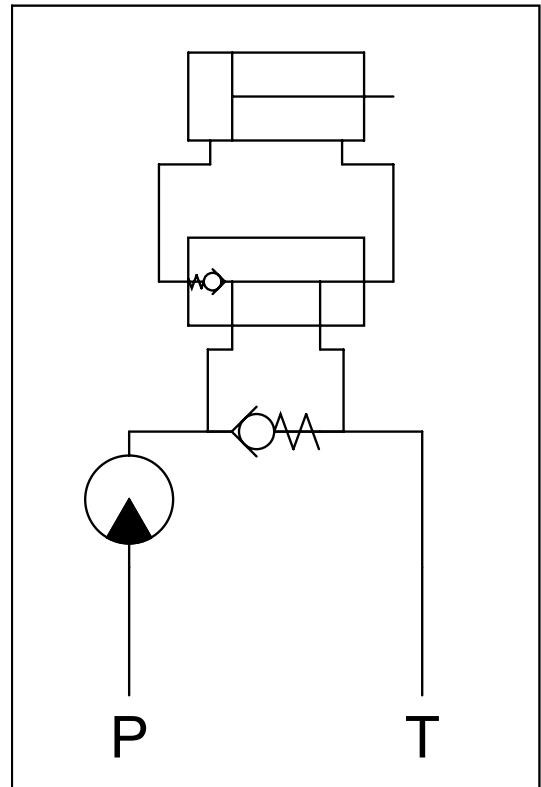
Malfunction	Cause	Rectification
1. Sweeping drum does not turn	<ul style="list-style-type: none"> - Hydraulic connections not correct - Pressure or volume flow too low - Hydraulic motor defective 	<ul style="list-style-type: none"> - Check connections - Ask a qualified workshop - Ask a qualified workshop
2. Dirt collection vessel does not pivot upwards (mechanically)	<ul style="list-style-type: none"> - Rope at the emptying mechanism is attached incorrectly 	<ul style="list-style-type: none"> - Attach rope correctly, see Chapter 3.4.5 Emptying the dirt collection vessel, mechanically
3. Dirt collection vessel does not tilt upwards (hydraulically)	<ul style="list-style-type: none"> - Hydraulic connections not correct - Hydraulic cylinder defective 	<ul style="list-style-type: none"> - Check connections - Ask a qualified workshop
6. Sweeping result unsatisfactory	<ul style="list-style-type: none"> - Broom adjustment 	<ul style="list-style-type: none"> - Readjust broom
7. Hydraulic side adjustment without functionality	<ul style="list-style-type: none"> - Hydraulic connections not correct - Pressure or volume flow too low - Hydraulic cylinder defective 	<ul style="list-style-type: none"> - Check connections - Ask a qualified workshop - Ask a qualified workshop

4.8 Hydraulic circuit diagrams

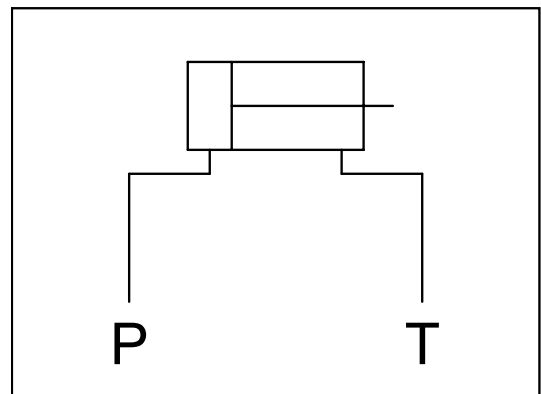
Hydraulic circuit diagram for Eco



Hydraulic circuit diagram for Eco with hydraulic vessel emptying



Hydraulic circuit diagram for Eco hydraulic tilting



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Notizen:

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