

Handbook General part

valid for all sweeping machine types

Specific descriptions for the individual products can be found
in
"Operation and Maintenance".

Translation template: German version

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1 Declaration of Conformity

EC Declaration of Conformity according to Machinery Directive 2006/42/EG Appendix II 1.A

The Manufacturer / Marketer

bema GmbH
Maschinenfabrik
Recker Straße 16
49599 Voltlage-Weese

hereby declares that the following product

Product description: Sweeping machine
Make: Information on type plate
Serial number: Information on type plate
Serial / Type Designation: Information on type plate

conforms to all relevant provisions of the above mentioned directive and all other applied directives (following) – including the amendments that were valid at the time of the declaration.

The following harmonised norms were applied:

EN 13019:2001+A1:2008 Machines for road surface cleaning - Safety requirements
EN 13021:2003+A1:2008 Winter service machines - Safety requirements
EN 982:1996+A1:2008 Safety of machinery — Safety requirements for fluid power systems and their components — Hydraulics

The following national or international standards (or their sections/articles) and specifications were applied:

DIN EN ISO 12100-1 Safety of machinery -- Basic concepts, general principles for design -- Part 1: Basic terminology, methodology
DIN EN ISO 12100-2 Safety of machinery -- Basic concepts, general principles for design -- Part 2: Basic terminology, methodology

Name and address of the person which is authorised to compile the technical documentation:

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Date: 11/12/2011

Günther Berens, business manager

1.1 Instruction of Personnel for Machine Operation and Maintenance

This operating and maintenance manual has been compiled for the operator, the maintenance, service and operating personnel. It contains all information required for the operation and maintenance. It is therefore important that the personnel will read this operating manual prior to use and commissioning and that it is accessible at all times to the personnel.

	<p>The manual must be carefully read before initial operation by every person who carries out activities on the machine. The operating company must ensure that the content of the operating manual has been understood by the personnel and that the task, principle of operation and limitations described herein are heeded/observed. Non-observance can lead to injuries and damages to the environment due to misconduct and will void all claims for warranty. Instructions and information relevant to safety that are contained in the manual as well as on the machine are illustrated by pictograms.</p>
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1.2 Pictograms

1.2.1 Pictogram manual

	Note	This sign indicates operational and maintenance instructions, which e.g. explain processes and make them easier to understand.
	Warning	Warning against activities that, without safety precautions, may result in personal injuries and/or mechanical breakdown.

1.2.2 Pictograms on the Machine

	Warning of rotating rollers	Risk of being caught exists in the marked areas during operation. Prior to performing any tasks in these areas, ensure that the sweeping machine is disconnected from the power source.
	Warning of crushing	During operation, third persons must not stay in these indicated areas. Prior to performing any work in these areas, ensure that the machine is stable and disconnected from the energy source.

In addition, you find pictograms and explanations attached to the machine, which describe the operating elements and functions. These instructions must be complied with.

1.3 Type plate information

	<p>For further enquiries and ordering spare parts please provide the data on the type plate. The type plate contains information about the machine type, serial number and charge weight.</p>
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1.4 Description of Machine

Power sweepers are intended for the absorption and the removal of dirt and debris (crushed stones, sand, dust, etc.). The installation of a sweeping machine can basically occur on all towing vehicles (e.g. wheel type loaders, fork lifts, haulers). The machine functions sweeping roller drive, dirt collecting bin emptying and side sweeping brush drives are done via the hydraulic control circuit of the carrier vehicle.

Different machine versions are offered for different installation possibilities and applications. The installation can be done at the rear as well as the front.

Different applications and sweep debris determine the selection of the matching sweeping roller equipment to achieve the best possible sweeping result.

The absorption of sweeping debris is done in a debris collecting bin or can be swept sideways into ditches, road sides etc. by tilting the sweeping machine sideways.

In order to clean curbs or also building abutments, we also offer a side sweeping brush that can be connected upon need. To bind the raised dust during the sweeping, the sweeping machine can be equipped with a water spray system. Optional equipment

The following optional equipment is available:

- Mounting system for different carrier vehicles
- Water sprayer with electrical pressure pump (12/24V), spray pipe with flat spray nozzle
- Water sprayer for side sweeping brushes
- Hydraulic side sweeping brushes
- Lighting equipment according to national traffic regulations
- Flag holder and warning marks
- Hydraulic pivot device

This list is only an excerpt of the possible extra equipment. For further equipment please contact your bema dealer.

1.5 Intended Use / Maintenance

The power sweeping machine is intended for the absorption and the removal of dirt and debris (crushed stones, sand, dust, etc.). The manufacturer is not liable for damages resulting from improper use of the machine (e.g. levelling, load transport, etc.). It will void all warranty claims.

1.6 Warranty claim

The machine must be immediately decommissioned if a damage or defect is detected and the manufacturer/dealer must be informed. In warranty cases the manufacturer must be provided with the possibility to perform improvements.

- Unauthorized repair of faults and defects will void all warranty claims.
- Only parts procured from the manufacturer or original manufacturer parts shall be used for any required maintenance.
- Any modifications to the sweeping machine shall be agreed with the manufacturer.
- Using third party parts or components will void any warranty claim.

A warranty claim may only be made for faulty components or faulty assembly of the component. Faults and defects arising from improper use is are not subject to a warranty claim.

1.7 Accident Prevention



The operation of the sweeping machine entails dangers that may be actively countered by you as licensee, maintenance, or operating personnel. The operating company must heed the respective, applicable occupational safety and health regulations.

If carefully observed, the safety instructions will ensure your safety and that of other persons and will prevent damage to your equipment.

1.8 Driving on public traffic routes



Consider other traffic participants!

Heed all the applicable regulations when driving on public roadways.

1.8.1 Lighting and warning signs

Mounted working equipment must be provided with lighting, if it is required due to visibility or if the carrier vehicles lighting is covered.

For further details refer to the national regulations.

2 Maintenance

After a downtime of more than 4 weeks, the sweeping machine requires maintenance.

The sweeping machine must be checked by an expert

1. prior to commissioning
2. at appropriate intervals (every two weeks)
3. after modifications or repairs

to ensure its safe condition and proper function.

2.1 Maintenance List

The items listed here are general information for maintenance and might not be applicable for all sweeping machine versions. These will be explained in the respective chapters for the individual components/sweeping machines.

- Check all bolts for tight fit and retighten, if required.
- Weld seams of heavily stressed components must be checked for tears and repaired, if required.
- Through visual check the hydraulic system must be checked for leakages.
- Check all safety elements for their completeness and correct attachment.
- Visual check of the mounting guide; clean depending on degree of dirt.
- Regular lubrication of the bogie wheel (every 30 h)
- Regular lubrication of the sweeping roller shaft bearing, check for easy movement of the castor wheels

- Function check of electrical devices.
- Visual check for damages on the hydraulic hoses and lines.
- Check the vacuum and pressure lines of the water spraying equipment for leakage.

2.2 Hydraulic fluid and lubricants

2.2.1 Hydraulic fluid

Ex-factory a hydraulic oil on a mineral basis is used and can also be mixed, to some extent, with other hydraulic fluids that are mineral oil based.



If a hydraulic oil or fluid is used that is not mineral oil based then it must be ensured that the different oils are compatible since this could cause damages to the sweeping machine hydraulic or the carrier vehicle.

2.2.2 Lubricants

Ex-factory a multi-purpose grease is used for lubrication, which has a temperature application range of -35 to +120°C. The use of other lubricants is permitted as long as they have the same temperature application range as the multi-purpose lubricant used ex-factory.

2.3 Hydraulic hoses

The operating company must ensure that the hose lines are replaced in appropriate time intervals, even if there are no safety-related defects visible on the hose lines. The period of usage for the hose lines should not exceed six years. The date of manufacture and the permissible dynamic operational pressure is indicated on the hose cladding.

To replace the hydraulic hose lines only use manufacturer approved or manufacturer provided types. Any legal claim during bodily injury or property damages will become void if third-party parts are used.

3 Power rating

3.1 Hydraulic power






Hydraulic operational pressure max.	160 bar (constant)	
Oil requirement (min.)	20 l/min	
Oil operational temperature	+20° to +60° Celsius	max. +75° Celsius

Information is approximate and non-binding



Leakages and damages to the hydraulic system and the hydraulic components can occur if the oil temperature is not heeded.

3.2 Load capacity of the castor wheels

Castor wheels	Load capacity	Lubrication possibility
 \varnothing 200 x 50 mm light model	per 205 kg	not available
 \varnothing 200 x 50 mm standard model	per 400 kg	not available
 \varnothing 200 x 50 mm heavy duty model	per 450 kg	castor wheel
 \varnothing 200 x 80 mm industrial model	per 600 kg	Swing bearing / castor wheel
 \varnothing 250 x 80 mm industrial model	per 750 kg	Swing bearing / castor wheel

Information is approximate and non-binding

3.3 Operating speed

The operating speed depends on the type of the material to be swept. To obtain a clean sweeping result a speed of 6 to max. 10 km/h should not be exceeded.

3.4 Sweeping roller rotation speed

The sweeping machine can be equipped with different sweeper rolls for different applications. To obtain a proper sweeping result, the sweeping roller rotation speed must be heeded. The minimum rotation speed value (**80-120 rpm**) must be reached when using a new brush. The more a sweeping roller changes in diameter due to wear, the higher the rotation speed should be to ensure the spinning effect of the brushes. The wear depends on the application or usage frequency and the ground that is being swept. New sweeping rollers must be installed if a sweeping roller can no longer be adjusted.

3.4.1 Sweeping roller equipment types

Equipment type	Usage	Advantage	Limitation
PPN	universal during light contamination	good cleaning performance	suitable in a limited manner for coarse dirt
Steel / PPN	coarse dirt	aggressive cleaning performance long downtime	not suitable for animal husbandry
Snow sweeping roller PPN	snow and leaves	high spinning effect	ideal for sweeping work
PPN Spiral mix equipment	fine dust smooth flooring and interior cleaning	high spinning effect good self-cleaning properties	suitable in a limited manner for exterior cleaning

4 Mounting the sweeping machine to the carrier vehicle

The installation of the sweeping machine to the carrier vehicle can be done without using tools due to the mounting elements on the sweeping machine (mounting fixture of the respective carrier vehicle).



- When connecting the hydraulic hoses to the carrier vehicle, make sure that they are not twisted or have kinks and be protected against damage from the outside.
- The mounting elements must not be modified or replaced without the consent of bema. Only original bema mounting elements must be used.
- The sweeping machine must be levelled to obtain the ideal sweeping operation.
- After the mounting check all bolts for tight fit.
- The driving behaviour of the carrier vehicle can be effected due to the mounting of the sweeping machine.

4.1 Mounting to municipal haulers and vehicles

The sweeping machine is equipped with the necessary counter plates and mounting possibilities for mounting. The manufacturer regulations of the carrier vehicle must be observed during the mounting in order to ensure a safe operation.

4.2 Three-point mount (rear or front)

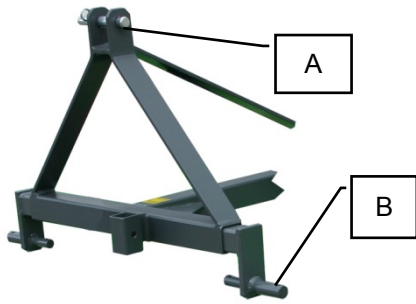


Figure 1: Three-point mounting

1. Loosen the lower link mount (B) and adjust the lower link arms to size.
2. Bolt down the lower link mount
3. Secure the lower link using a linch pin
4. Connect/hang the upper link in the upper link mount (A) and secure with a cotter pin

The design of the three-point mount varies depending on machine type. The mounting points for the upper link and lower link bolts are however always arranged the same.

4.3 Fork lift mount

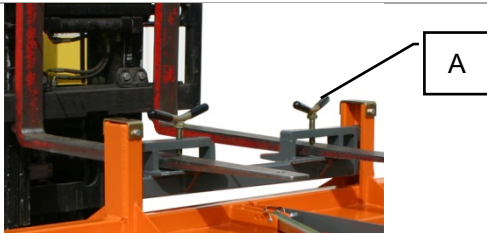


Figure 2: Fork lift mount open

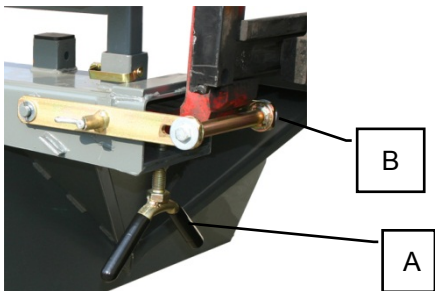


Figure 3: Toothed locking

1. Adjust the forklift forks to the mounting size
2. Clamp the fork lift forks into the mount using a toggle screw (A)

When mounting with closed forks the toggle screw must latch into the toothed locking (B)

The toggle screw (A) and the toothed locking (B) prevent slipping of the mount in cases of the carrier vehicles heavy braking!

- The mount must be able to operate freely in its guide!
- Check toggle screws (A) for tight fit!

4.4 Quick-change mount



Figure 4: SWE mounting plate

During this mounting option the procedure instructions of the carrier vehicle manufacturer must be heeded.

A spanner is required to adjust any available stop bolts. The counter nut must first be loosened to set the stop length of the screws.

4.5 Winter service plate / Unimog mount

The mounting plate is equipped with tail hooks that are connected (hung) into the winter service plate at the carrier vehicle. In addition, the mount is connected to the winter service plate using screws. The tilt setting screws must be turned on the base plate to obtain a level machine position.



- The machine must be secured against sagging during the transport using transport securing devices.
- The machine must be secured during the transport using pivot securing devices.
- After dismantling the sweeping machine from the carrier vehicle a secure stand must be ensure by folding down the support legs.

5 Power Supply

5.1 Hydraulic connection

Single-acting and double-acting control circuit connections are required to operate a sweeping machine. The connection from the control device must be designed for the continuous operation of a mounting device. Here, it must be ensured that continuously a max. 90 l/min supply performance at a max. oil temperature of 75 degrees is available for the mounting device. The oil output depends on the consumer installed in the mounting device.



The hydraulic connection is equipped, as a standard, with a SVK connector of size 3.

5.2 hydraulic

The hydraulic plug connections attached to the hydraulic hoses must be connected to the carrier vehicle. If the sweeping roller turns in the wrong direction, change the hydraulic plugs around. On a double-acting control device the flow direction must be reversed.



- It must be ensure that the hydraulic hoses are not twisted or have kinks.
- Damages can occur on the hydraulic motors due to immediate full sweeping loads and hot hydraulic oil. It is therefore important to break-in the sweeping machine during operation.
- damaged oil seals can leak hydraulic oil into the environment and damage it. The operating company must immediately decommission the machine and have it serviced by an expert if oil leakage is detected in the system.

5.3 electrical

The electrical plug connections of the water spray system and/or lighting system must be plugged into the counter part on the carrier vehicle.

5.4 PTO shaft drive



Figure 5: Drive shaft

The power transmission between the carrier vehicle and the machine is via a PTO drive shaft.

The initial use and use areas of the drive shaft can be found in the manufacturer's instructions.

The documentation is enclosed with the drive shaft.



Prior to initial use the drive shafts must be adjusted to the linear dimension of the working machine. The process is described in the manufacturer documentation and must be heeded.

6 Machine function

6.1 Sweeping function

6.1.1 Sweep collecting the dirt

A dirt/debris collecting bin is provided to take up (collect) debris and place at a suitable location (e.g. road side or trash container). Emptying is done using a pull rope or hydraulically (depending on model and sweeping machine type).



A specific description can be found under "Operation and maintenance"

6.1.2 Sweeping

Next to sweeping to collect debris the machine can also be used to sweep clear. For this the debris must be pushed to the side. The machine can be freely pivoted to the side via mechanical and hydraulic pivot equipment.

Depending on the design of the machine, different possibilities are provided:

- Removal of the debris collecting bin with just a few moves
- Folding up of the debris collecting bin (hydraulic)



A specific description can be found under "Operation and maintenance"

6.2 Drive

The drive of the main sweeping roller is done via a hydraulic motor, however it can also be done on some machine version mechanically via a PTO shaft equipped with chain transmission.

A combination of hydraulic drive with chain transmission is also possible.

6.3 Water spray system

The water spray system is intended to prevent the dust development during sweeping. It is done either via direct moistening of the sweeping roller or via the installation of a rod. The water spray system of the side sweeping brush can be separately connected or disconnected. A filter is located in the water tank, which protects the system from pollution. The emptying of the water tank is done via a drain plug at the bottom side of the water tank.



To avoid damages to the water spraying system during the winter, the spraying agent must be mixed with an anti-freeze.

6.3.1 Arrangement of the spray nozzles

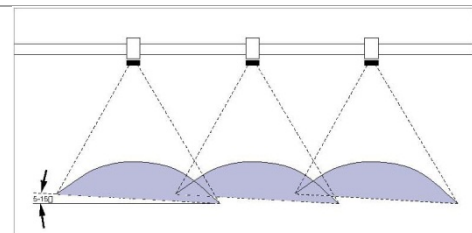


Figure 6: Arrangement of the spray nozzles

To obtain an even spray surface the jet width should overlap. To avoid disturbing the water jets/nozzles, the nozzles should be tilted perpendicular to the pipe axis.

6.4 Side sweeping brushes

The side sweeping brush is only used for cleaning building abutments and kerbstone.

The propulsion is done via the hydraulic motor and can be switched on or off via a shut-off cock. An automatic height and side adjustment is provided during the operation due to the construction. Depending on wear, the brush plate must be readjusted.



If the sweeping roller is readjusted then the wear of the brush plate should be checked and if required readjusted.

7 Components and connections

7.1 Hydraulic components

7.1.1 Hydraulic motor



Figure 7: Hydraulic motor

The hydraulic motor is adjusted to the respective litre performance of the carrier vehicle. The motor size and litre output should be aligned in a manner that max. during half power setting of the carrier vehicle the maximum speed of 120 rpm is present on the sweeping roller. The ideal sweeping roller rotation speed is at about 80-100 rpm. The rotation speed depends on the debris to be swept and the sweeping roller type.

7.1.2 Control block



Figure 8: Control block

A hydraulic control block is installed to control the hydraulic functions of the sweeping machine. In this control block all switching functions and valves such as run on system, valve or pressure relief valve installed. Due to its compact construction a retrofitting is possible easily, to allow further hydraulic functions of the sweeping machine, since all connections are available in the control block.

7.1.3 6/2 electrical control valve



Figure 9: 6/2 control valve

It is possible to use an available double-acting control circuit for two hydraulic functions using a 6/2 control valve. An electrical connection is required to control the valve.

7.1.4 Hydraulic flow regulating valve



Figure 10: Flow regulating valve

At an output of more than 60 l/min. from the carrier vehicle, the use of a flow regulating valve in the hydraulic circuit is recommendable to avoid overload (due to to high of an oil output) of the sweeping machines hydraulic system. The output amount controls the max. obtainable sweeping roller rotation speed. The rotation speed of the sweeping rollers should be max. 80 - 120 rpm (recommended factory setting). Ex-work installed valves are pre-set.

8 Electrical components

8.1 Fuses of electrical connections



The pump should be connected to a permanently switched electric circuit using a 10 A fuse. The switch must be able to interrupt the current flow on the positive (red) line.

8.2 Water pump



Figure 11: Water pump

The water pumps are designed to provide an even water flow in any operational range. The electrical voltage is 12V or 24V each. The pump motor is equipped with a thermal circuit breaker. The pump pressure can be adjusted using a setting screw on the pump head.

8.3 Marker lights



Figure 12: Marker lights

Marker lights are lights that clearly indicate the width across the vehicle. You should provide marker lights and rear position light on certain vehicles and steer the attention to special vehicle shapes.

8.4 Phase allocation of electrical connecting plugs

Different connecting plugs are available to connect the electrical components.



Figure 13: 2-pole connector



Figure 14: 3-pole connector



Figure 15: 4-pole connector



Figure 16: 7-pole connector

The connectors are connected ex-factory with the following configuration.

Connection 31 = earth
 Connection 54 and 54G = water pump
 Connection 58 and 58L = lighting
 Connection 58R = electrical valves

9 Transport

The following safety information must be observed when transporting a sweeping machine:

- The sweeping machine must only be transported in a lifted and secure state.
- A transport speed of more than 25 km/h is not permissible.
- The debris collecting bin must be emptied prior to transport.
- The sweeping machine must be secured during transport against slipping.
- Heed all the applicable national traffic regulations when driving on public roadways.

10 Disconnecting the sweeping machine

When disconnecting the sweeping machine from the carrier vehicle, precede as follows:

- Ensure a solid and level ground as support base
- To set down the machine use the available support legs on the machine
- Check for stable position
- Disconnect from the power supply (hydraulic, mechanical and electrical)
- Decoupling of the carrier vehicle
- Ensure that the sweeping machine is on a solid base and that the support legs are used. Select solid ground to set down the machine. All power supply must be disconnected from the sweeping machine, prior to decoupling the carrier vehicle.

11 Safety



During the operation and when handling the sweeping machine heed the following points:

- The general applicable occupational safety regulations apply.
- Operators of the sweeping machine must wear tight fitting work clothes to prevent being caught by rotating parts.
- Any setting and maintenance work must only be done when the machine is in standstill. The power supply must be connected prior to this.
- No unauthorised persons may be in the working vicinity during operation.
- It is prohibited for persons to be within the working vicinity during the sweeping process.
- After completion of the work check all bolts for tight fit and retighten, if required.
- Secure the sweeping machine against sliding or tilting during longer transports. The side sweeping brush must be tilted up and latched.

12 Disposal



The national regulations for waste disposal must be observed, if used parts require disposal after repair or service work.



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**Our company is
certified according to**

