KÄRCHER

New Unit Information

BR/BD 75/140 R
BR/BD 90/140 R

1.246- . . .

New Unit Information 03.2003

Drive unit system

– 3-wheel running gear with front wheel steering and front wheel-hub motor with electro-magnetic brake.
– Forwards and reverse drive unit with one drive pedal, changeover with selector button on the instrument panel.
– Machine brakes automatically, if the driver moves away (removes weight) from the seat (seat contact switch) or if the drive pedal is released. On removing weight from the seat the brake function takes place with approx. 1.5 seconds delay.
– When not in operation, an electromagnetic brake on the wheel-hub motor prevents the unit from rolling away.
– Drive unit operates with a 24 Volt block batteries (low-maintenance or maintanance-free).
– Battery monitoring with deep-discharge protection.

Brush system

– Brush head with two brush rollers or two disc brushes (two drive motors each).
– Brush rollers rotate from below towards; each other disc brushes rotate together at the front.
– Coarse dirt pan for coarse dirt picked up at the brush head (BR version only).
– Brush head contact pressure is adjustable.
– Brushes can be changed without tools.
– Brush head with lateral sealing strips to limit water distribution.

Water system

– Fresh-water tank in the front of the unit housing.
– Dirty water tank with float switch.
– Water feed to brush head with water pump.
– Water flow control with electric metering valve, 10 positions.
– Bleeder valve for quick bleeding of the water hose at the brush head (only BR head).

Vacuum system

– Suction motor (long life) vacuums the dirty water into the dirty water tank.
– If the dirty water tank is full the electric float switch switches off the suction motor with a time delay of 20 seconds.
– Suction bar available in a straight or curved version.
– On switching the suction motor On / Off the suction bar is lowered / raised. The suction motor continues running for approx. 10 seconds.
– Rubber strips on the suction bar can be replaced without tools.
– Angle of tilt of the suction bar can be adjusted without tools.

Electrics

– The main control printed circuit board is located behind the metal cover to the left next to the footrest.
– The instrument panel printed circuit board is located underneath the instrument panel.

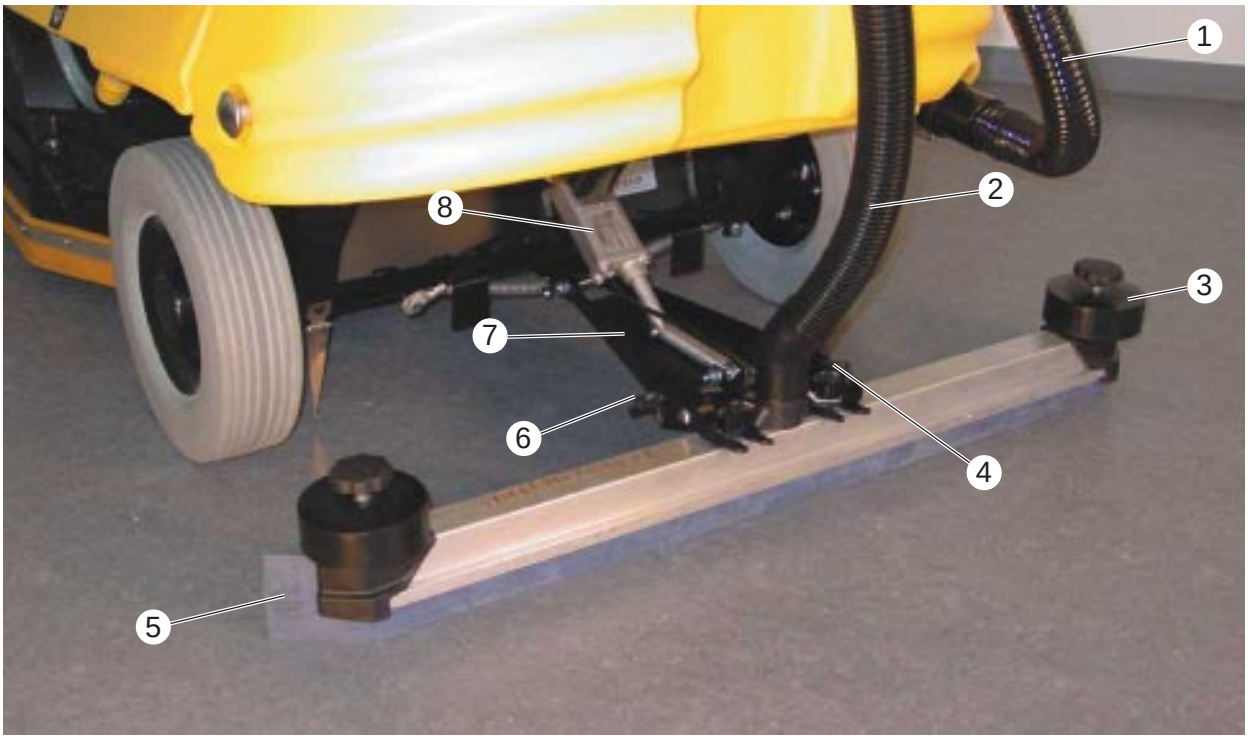
View from front (BR-Version)

1 Steering wheel
2 Control panel
3 Cap, fresh-water tank
4 Fresh-water tank
5 Cover, main control printed circuit board
6 Central battery connector (X1)
7 Drive unit pedal
8 Front wheel, wheel hub motor
9 Lateral sealing strip, spring-loaded
10 Brush head, BR version
11 Coarse dirt pan (BR version only)
12 Seat

View from rear (BR-Version)

1 Cover, main control printed circuit board
2 Brush head, BR version
3 Lateral sealing strip, spring-loaded
4 Coarse dirt pan (BR version only)
5 Supporting castor for suction bar, optional
6 Suction bar, straight version
7 Deflector wheel, suction bar
8 Drain hose, dirty water tank
9 Suction hose
10 Dirty water tank
11 Cover, dirty water tank
12 Instrument panel

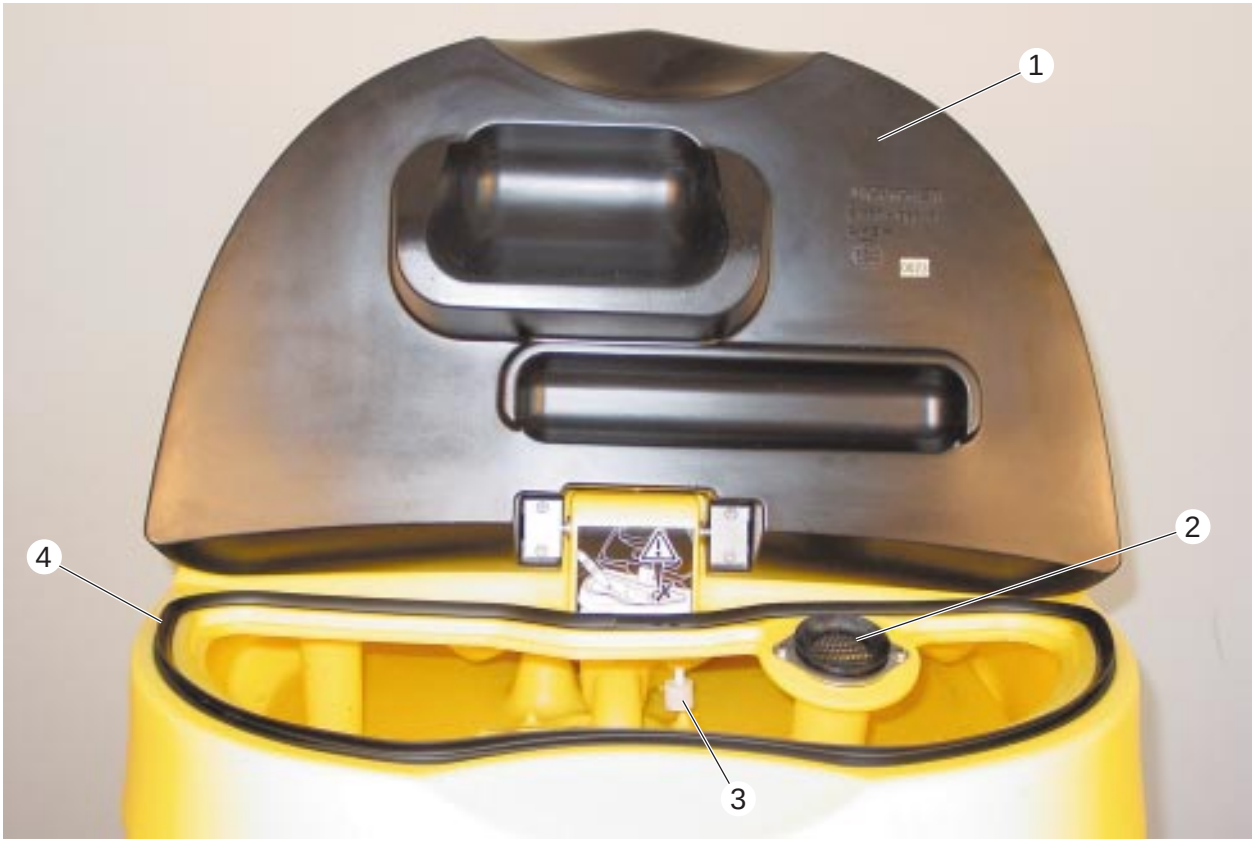
Suction bar



1 Drain hose, dirty water
2 Suction hose
3 Deflector wheel with star handle for replacing/rotating the rubber strips
4 Star handle, for installing/adjusting the suction bar angular position
5 Rubber strip
6 Wing nut, for adjustment of suction bar inclination
7 Bracket, suction bar
8 Lifting motor (M30) for suction bar, lower/raise

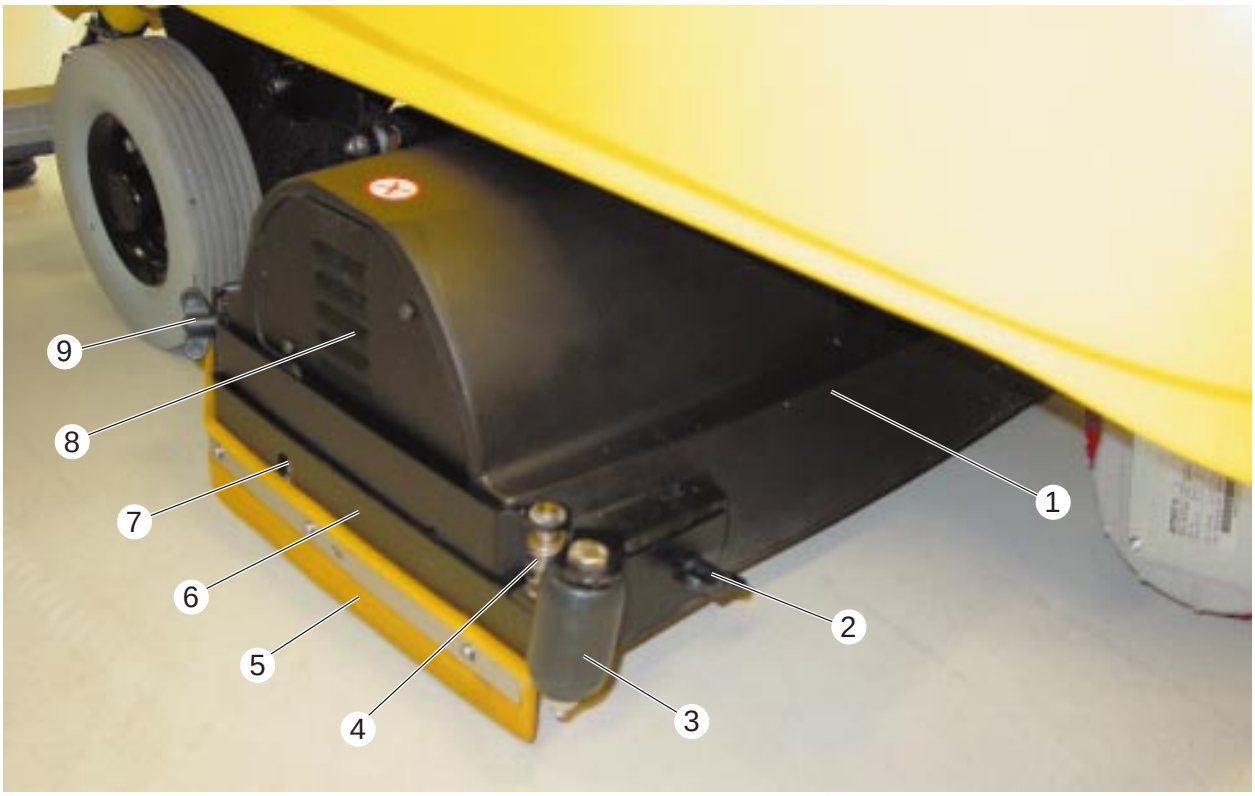
Note:
As a standard, the front rubber strip is grooved and the rear one is smooth. In case of wear, both rubber strips can be rotated to extend their application life.

Dirty water tank



1 Tank cover
2 Fluff strainer, air intake suction motor
3 Float switch (S17)
4 Seal, tank cover

Brush head (BR-Version)



1 Brush head (BR version)
2 Front wing nut, for fixing the mounting plate
3 Deflector wheel
4 Spring for mounting plate
5 Lateral sealing strip
6 Mounting plate for sealing strip, spring-loaded
7 Adjusting screw, brush pattern
8 Cover for brush drive unit assembly
9 Rear wing nut, for installing the mounting plate

Battery

1 Connecting terminal plus pole
2 Connecting terminal minus pole
3 Connection cable
4 Battery (G1)
5 Central battery connector (X1)
6 Air outlet hose, suction motor
7 Suction motor (M3, EC long life)
8 Dirty water tank

Note:
The dirty water tank (8) can only be lifted if the dirty water has been drained.

Central battery connector

1 Upper central battery connecotr (X1) with handle
2 Connecting cables to battery block
3 Connecting cable to control panel key switch, EMERGENCY STOP (see also control panel, view reverse side)
4 Connecting cables to main control printed circuit board (A1)
5 Lower central battery connector (X1)

EMERGENCY STOP function

All electrical components of the unit are connected to the battery block through the central battery connector, when the upper and lower connectors are pulled apart the entire unit is without voltage. In addition the central connector functions also as an EMERGENCY STOP.

When the central connector is pulled apart the main control printed circuit board interprets this as if the key switch is in the 0 position.

The electromagnetic brake is activated immediately and stops the unit EMERGENCY STOP function.

This function is shown in the circuit diagram on page 1, ladder 4, X1/S32.

Note:
The external charger is connected to the upper central battery connector (1).

Instrument panel

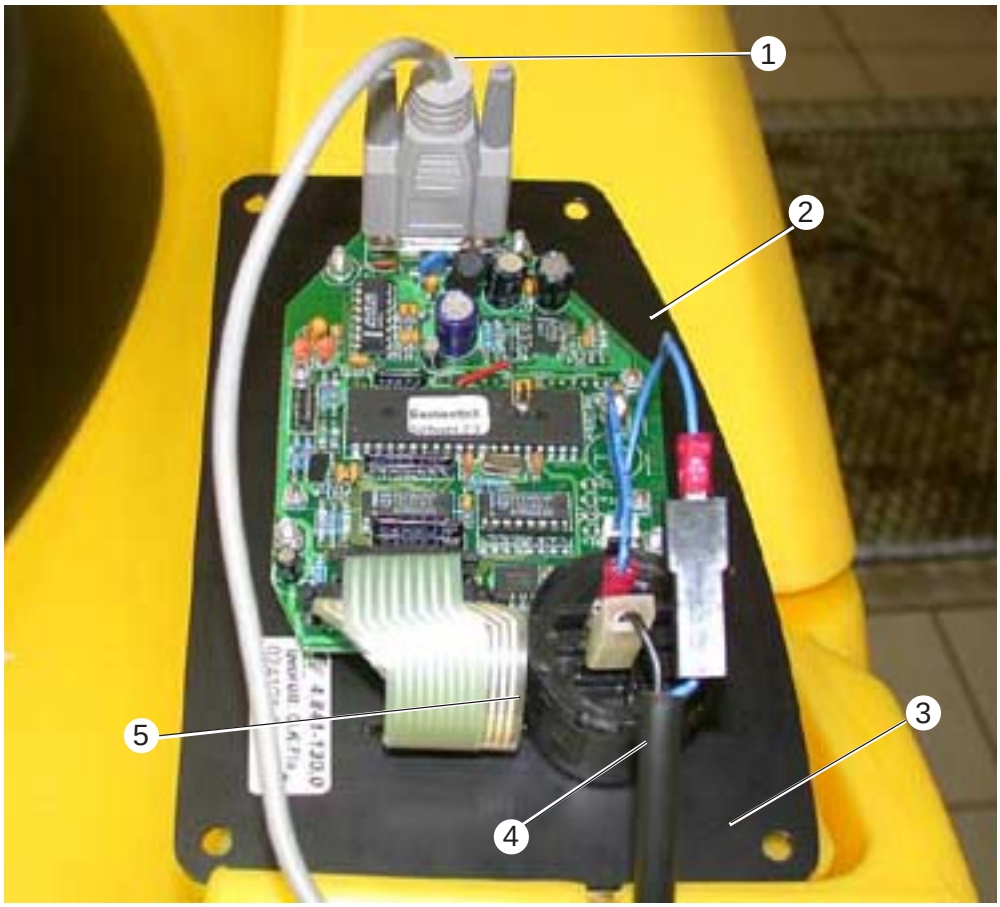
Instrument panel

Item	Name	Function
1	Indicator light (green)	Lights up when warning beacon light is switched on.
2	Indicator light (green)	Lights up if working lights are switched on.
3	"Working light" push-button (optional)	Switches working light ON/OFF.
4	"Warning beacon light" button (optional)	Switches warning beacon light ON/OFF.
5	Indicator light (red)	Lights up if brush pressure too high, brushes are switched off after 4 sec.
6	Indicator light (red)	Lights up if dirty water tank full.
7	"Suction motor" push-button	– Switches the suction motor ON/OFF and simultaneously lowers/ raises the suction bar. – Suction motor continues to run for approx. 10 sec after being switched off.
8	"Increase brush pressure" push-button	Increases the brush pressure.
9	"Brush motor" push-button	Activates the brush motors. The brush motors only start up if the drive pedal is pressed.
10	Indicator light (green)	– Flashes if brush motors are activated. – Lights up if brush motors are running.
11	"Reduce brush pressure" push button	Reduces the brush pressure.
12	"Memory" push-button	Starts/ends pre-selected functions of brush motors, suction motor, water pump.
13	"Forward drive unit" push-button	Activates forward movement.
14	Indicator light (green)	Lights up if forward movement is activated.
15	Indicator light (green)	Lights up if reverse movement is activated.
16	"Horn" push-button	Acoustic alarm sound signal.
17	"Reverse drive unit" push-button	Activates reverse movement.
18	Key switch	Activates the unit's power supply.
19	"Information" push-button	Shown in display: – Current operating voltage. – Hours-run meter (hh.mm). As soon as the operating hours counter starts a "+" symbol appears behind the minute display.
20	"Reduce water flow" push-button	Reduces the quantity of water by adjusting the metering valve.
21	Indicator light (green)	– Flashes if water function is activated. – Lights up if water pump is running and metering valve is open.

Instrument panel

Item	Name	Function
22	"Water pump" push-button	Activates water pump and metering valve. The water pump does not start unless the drive pedal has first been pressed and the brush motors are activated.
23	Display	2-line, 16 characters/line.
24	"Increase water flow" push-button	Increases the quantity of water by adjusting the metering valve.
25	Indicator light (green)	– Lights up if suction motor is running. – Flashes during the after-running time.
26	Indicator light (red)	Lights up if magnet brake is activated.
27	Indicator light (red)	– Flashes, if battery voltage has fallen to 1 Volt above the set end-point voltage. In addition, a one-time acoustic alarm signals. – Lights up, if battery voltage has dropped below the deep-discharge protection voltage.
28	"Wall-Floor-Ceiling Nozzle" push-button	Switches water pump and suction motor on for wall-ceiling-floor nozzle. Function can only be selected when unit is at a standstill.
29	Indicator light (green)	Lights up if push-button 28 is activated.
–	Drive pedal, forward drive	If the drive pedal is pressed the following functions are activated (if pre-selected): – Brush motors are switched on. – Brush head lowers. – Suction motor is switched on. – Suction bar lowers. – Water pump is switched on. – Metering valve opens. – Indicator lights (10), (14), (21) and (25) continuously light up.
–	Drive pedal, reverse drive	If the drive pedal is pressed the following functions are activated (if pre-selected): – Suction bar rises. – Indicator lights (10), (15), (21), (25) continuously light up. – Acoustic alarm sound signal.

Instrument panel printed ciruit board, view reverse side



1 Connection cable, to main control printed circuit board
2 Instrument panel printed circuit board (A2)
3 Connecting wire EMERGENCY STOP to central battery connector (X1)
4 Key switch (S1)
5 Flat cable, connection to plastic foil

Main control printed circuit board

Main control printed circuit board

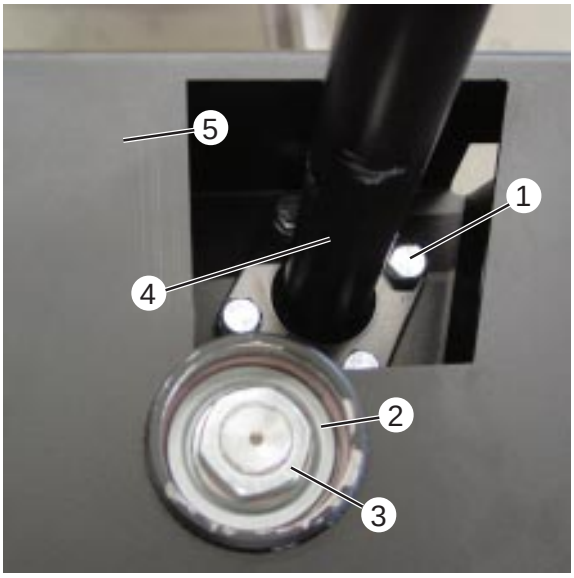
1 Connection instrument panel printed circuit board (X2)
2 Terminal strip (X11)
3 Processor
4 Terminal strip (X1)
5 Terminal strip (X9)
6 Terminal strip (X10)
7 Terminal strip (X5)
8 Fuse - controls (F1)
9 Fuse - suction motor (F4)
10 Electric connection - suction motor (X14) “+”
11 Electric connection - suction motor (X15) “–”
12 Fuse - drive unit motor (F2)
13 Electric connection - battery (X19) “–”
14 Electric connection - drive motor (X13)
15 Electric connection - drive motor (X12)
16 Electric connection - battery (X18) “+”
17 Electric connection - brush motors (X17)
18 Electric connection - brush motors (X16)
19 Fuse - brush motor (F3)
20 Terminal strip (X6)
21 Terminal strip (X7)

Note:
For connections on terminal strips concerned and fuse values see circuit diagram 0.088-555

Tightening torques for:

Item 10, 11, 17, 18 (M6) = 3.9 Nm
Item 13, 16 (M8) = 9 Nm

Steering

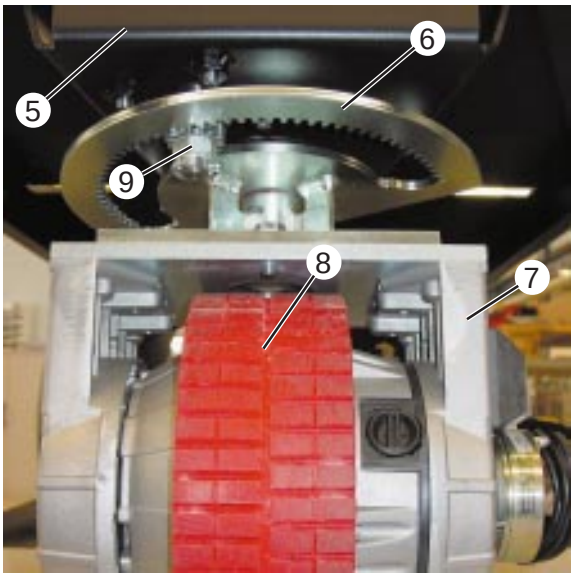


Steering column with steering bearing

Steering column

The steering column (4) with internal steering rod (9) is fixed to the base frame (5) by four retaining bolts (1).

The steering movement of the steering wheel is transferred via the steering rod (9) to the steering head (7) via the ring gear (9).



Drive wheel

Steering head and wheel-hub motor

The steering head (7) is mounted to the steering rod bearing (2) by a fastening nut (3).

Drive whell with electromagnetic brake

1 Retaining bolts, steering column
2 Steering rod bearing
3 Fastening nut, steering head, wrench size 36 mm
4 Steering column
5 Base frame
6 Ring gear
7 Steering head
8 Front wheel
9 Steering rod with toothed wheel
10 Electromagnetic brake (Y1)
11 Wheel-hub motor M1)
12 Free-roll lever for manual release of the electromagnetic brake

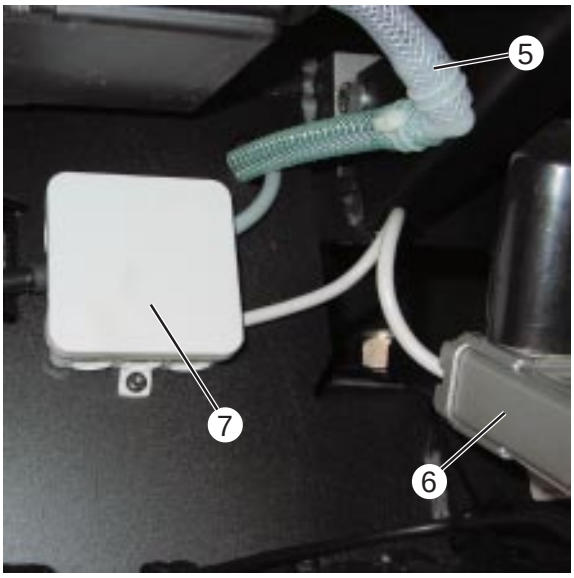
Seat contact switch, junction box

Drivers' seat, view from below

Seat contact switch

The seat contact switch (1) is located on the underside of the drivers' seat (2). To get to the seat contact switch (1), the seat (2) must be lifted at the rear and pushed back with a jolt. The seat released from its latch and can be tilted to one side.

Note:
The seat contact switch (1) is operated from a weight of 10 kg upwards. In case of danger the operator can use it as a safety switch. The drive motor brakes the unit to a stop if the operator leaves the seat for longer than 1.5 sec while the unit is moving.



View of unit from the rear, underneath

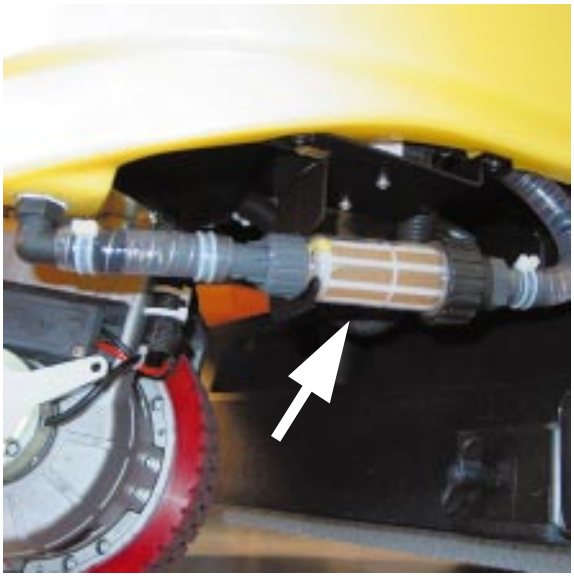
Junction box

The cables of the electrically controlled components are connected in the junction box (6) (see circuit diagram EXT.X3).

The junction box (6) is located at the rear beneath the dirty water tank.

1 Seat contact switch (S16)
2 Seat
3 Terminal strip (circuit diagram EXT.X1)
4 Connecting wire, float switch
5 Fresh-water hose to brush head
6 Lifting motor suction bar
7 Junction box (circuit diagram EXT.X3)

Water system

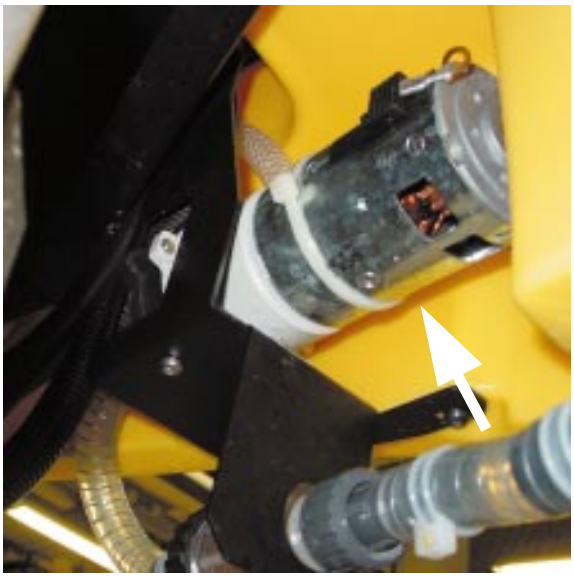


Water filter

Water filter

The water filter removes contaminations from the fresh-water to protect the water pump.

It is located at the front, on the left-hand side beneath the fresh-water tank.

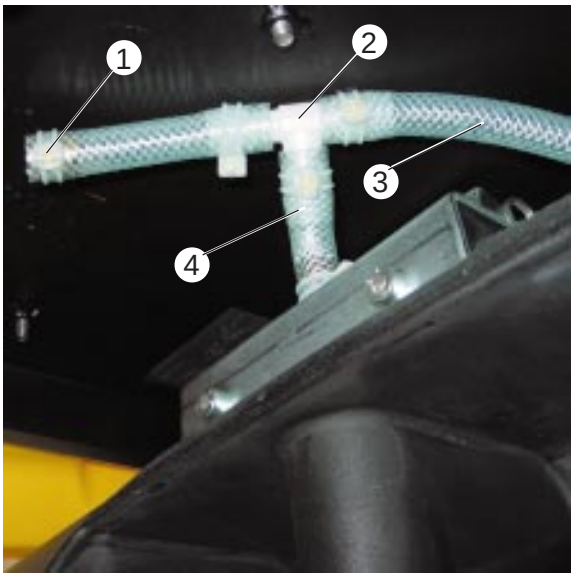


Water pump (M4)

Water pump (M4)

The water pump transports the fresh-water to the brush head.

The water pump is located at the front beneath the fresh-water tank.



Bleeder valve

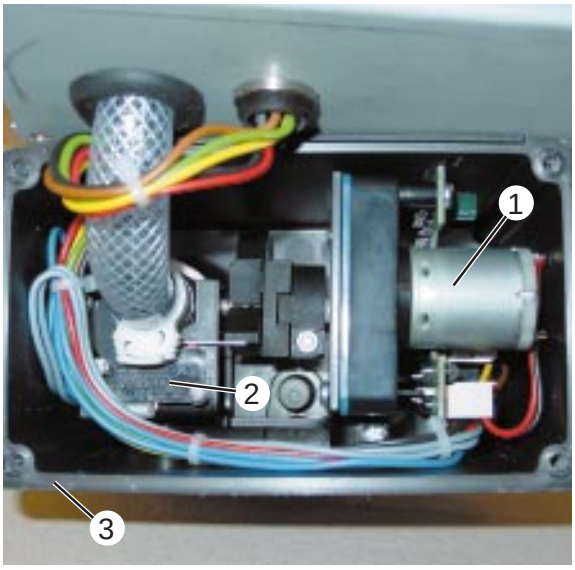
Bleeder valve (only BR-Kopf)

If the water pump is switched off and the metering valve is closed the bleeder valve (4) opens and assows the quantity of water to drain from the bleeder valve (4) to the distribution tube at the brush head. This reduces dribbling at the brush head to a minimum.

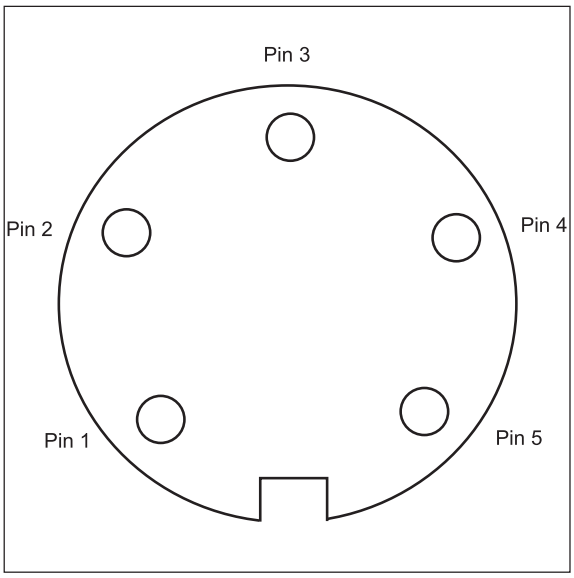
The bleeder valve (4) is located on top of the brush head.

1 Bleeder valve
2 T-piece
3 Hose from the water pump
4 Hose to the brush head

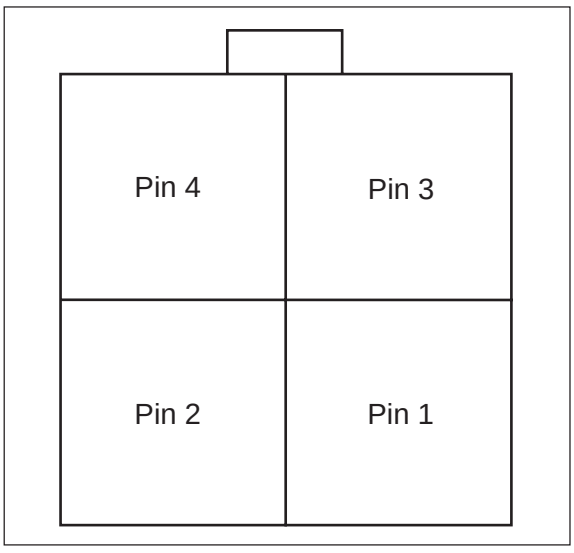
Water system



Metering valve



Round connector, 5 pin plug (old)



Block connector, 4 pin plug (new)

Metering valve (Y2)

The metering valve is located at the back beneath the dirty water tank.

The servo motor (1) only opens the metering valve only if the following conditions are fulfilled:

– Water pump is switched on (instrument panel key)
– Brush head is lowered (instrument panel key)
– Driving operation forwards or reverse (instrument panel key)
– Drive unit pedal pressed

The two micro switches (2) switch off the servo motor (1) in the end travel positions. They are not adjustable. The keys on the instrument panel can be used to steplessly adjust the metering valve with the variable-speed motor.

The metering valve is with round 5 pin plug or block 4 pin plug connected to the main control printed circuit board (see circuit diagram Y2).

Pin 1: Battery voltage 24 V (+)
Pin 2: 24 V when the water pump is switched ON
0 V when the water pump is switched OFF
Pin 3 Ground (-)
Pin 4: Control voltage for the servo motor
1,8 V metering valve max opened
3,8 V metering valve min opened
Increments of 0,2 V
Pin 5: not used

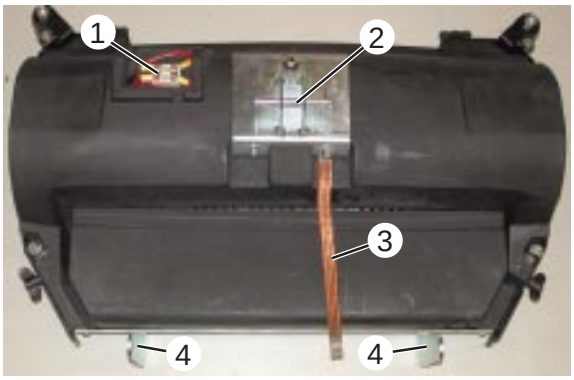
Each time the push-button is actuated at the instrument panel the voltage increment is charged by 0,2 V.

Total 10 increments each 0,2 V possible.

Adapter plug from old to new: 5.820-075

1 Servo motor
2 Micro switch
3 Metering valve housing

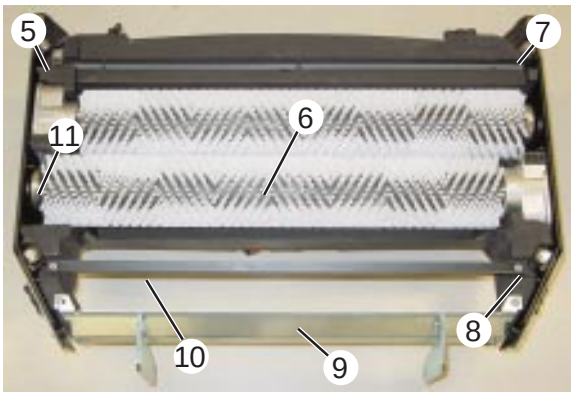
Brush head - BR version



Brush head from above

Brush head from above

1 Terminal strip brush motors (EXT.X2)
2 Brush head, top bracket
3 Ground strip
4 Brush head, rear bracket



Brush head from below

Brush head from below

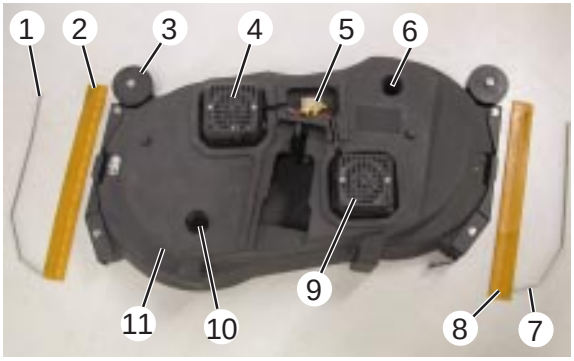
5 Lateral sealing strip
6 Brush roller, rear
7 Lateral sealing strip
8 Drive unit, front brush roller
9 Fresh-water distribution tube
10 Brush roller, front
11 Drive unit, back brush roller

Fresh-water distribution tube

Fresh-water distribution tube

The distribution tube (9) is located in front of the front brush roller. It must be installed so that the holes are facing slightly to the rear.

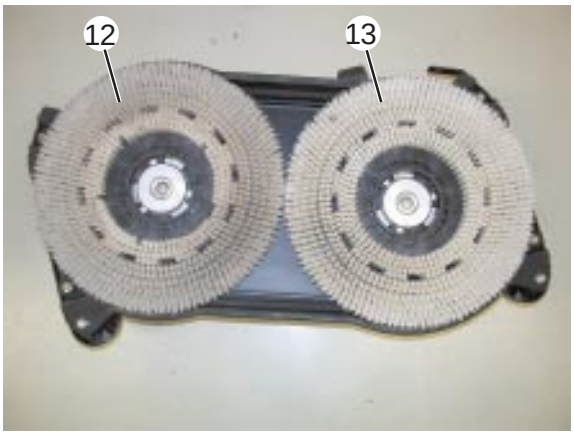
Brush head BD version



Brush head from above

Brush head from above

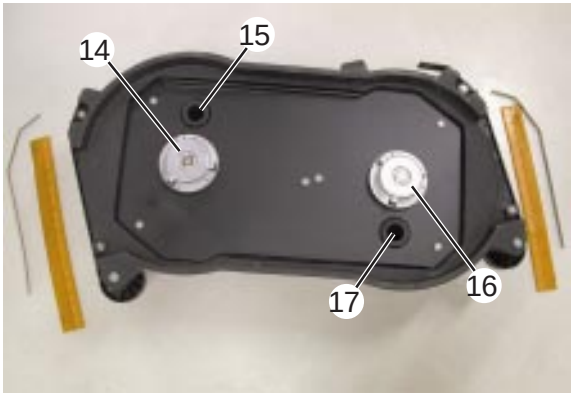
1 Retainer plate, sealing strip left
2 Sealing strip, left
3 Deflector wheel
4 Drive motor (M2), disc brush left
5 Terminal strip, brush motors (EXT.X2)
6 Fresh-water inlet, right
7 Retainer plate, sealing strip right
8 Sealing strip, right
9 Drive motor (M2.1), disc brush right
10 Fresh-water inlet, left
11 Brush head, BD version



Brush head from below with disc brushes

Brush head from below, with disc brushes

12 Disc brush left
13 Disc brush right

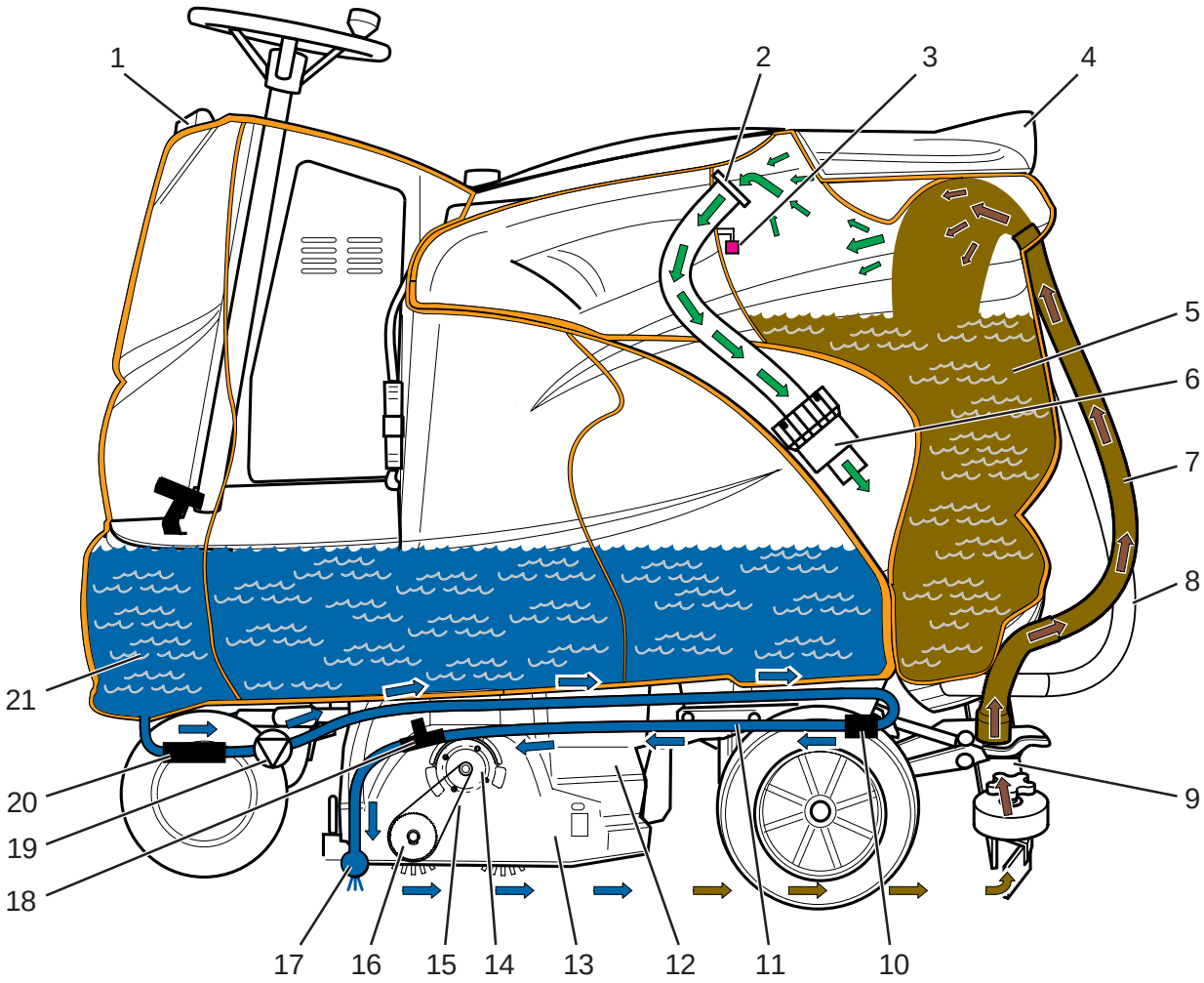


Brush head from below without disc brushes

Brush head from below, without disc brushes

14 Adaptor, disc brush left
15 Fresh-water outlet, left
16 Adaptor, disc brush right
17 Fresh-water outlet, right

Functional diagram



1 Lid, fresh-water tank
2 Fluff strainer
3 Float switch (S17), electric
4 Cover, dirty water tank
5 Dirty water tank
6 Suction motor (M3), longlife
7 Suction hose
8 Drain hose, dirty water
9 Suction bar
10 Metering valve (Y2)
11 Fresh-water hose to brush head
12 Coarse dirt pan (BR version only)
13 Brush head
14 Brush motor (M2)
15 Drive belt
16 Brush rollers (2x) (rotation in opposite directions)
17 Water distribution tube
18 Bleeder valve
19 Water pump (M4)
20 Water filter, fresh-water
21 Fresh-water tank

Test mode

	**Access to test mode** The user can use test mode to check the function of all the sets separately from each other. The item numbers given for the push-buttons refer to the illustration of the instrument panel. Turn the key switch to position "I" and then within 2 seconds press the "warning beacon light" (4) and "working light" (3) push-button at the same time. "Test Mode" and the installed control version no. appear on the display. The connected working light or warning-beacon light is automatically switched on. Switch them back off by pressing the relevant push-button again.
Press the "water pump" (22) push-button	Indicator light (21 green) lights up. Water pump switches on. The water-metering valve opens to its maximum.
Press the "water pump" (22) push-button again	Indicator light (21 green) goes off. Water pump switches off. Water metering valve closes completely.
Press "reduce water flow" (20) push-button	Suction bar lowers as long as the push-button is pressed, the suction motor must be switched off with push-button (7).
Press "increase water flow" (24) push-button	Suction bar rises as long as the push-button is pressed, the suction motor must be switched off with push-button (7).
Press the "suction motor" (7) push-button	Indicator light (25 green) lights up. Suction motor switches on. If the direction of travel "F" (13) is also selected, the suction bar lowers at the same time.
Press the "suction motor" (7) push-button again	Indicator light (25 green) flashes while the suction motor continues running. Indicator light (25 green) goes off if the suction motor is off. If the direction of travel "F" (13) is also selected, the suction bar rises at the same time.
Press the "brush motor" (9) push-button	Indicator light (19 green) lights up. Both brush motors run.

Test mode

Press the "brush motor" (9) push-button again	Indicator light (19 green) goes off. Both brush motors switch off.
Press the "Memory" (12) push-button	This push-button has no function in test mode.
Press the "Info" (19) push-button	Development-specific information. No information for the service department.
Press the "Increase brush pressure" (8 +) push-button	Brush head rises as long as the push-button is pressed.
Press the "Reduce brush pressure" (11 –) push-button	Brush head lowers as long as the push-button is pressed.
Press the "Wall-floor-ceiling nozzle" (28) push-button	Indicator light (29 green) lights up. Suction motor switches on. Indicator light (25 red) lights up. Water pump switches on. Indicator light (21 green) lights up. Suction bar rises. Metering valve remains closed. Pre-selected direction of travel is switched off. Indicator light (14/15) goes off.
Press the "Wall-floor-ceiling nozzle" (28) push-button again	Indicator light (29 green) goes off. Suction motor switches off after the after-running time. Indicator light (25 red) goes off. Water pump switches off. Indicator light (21 green) goes off. Suction bar remains in upper position. Metering valve remains closed.
Press the "warning beacon light" (4) push-button	Indicator light (1 green) lights up. Warning beacon light switches on, if available.
Press the "warning beacon light" (4) push-button again	Indicator light (1 green) goes off. Warning beacon light switches off, if available.
Press the "working light" (3) push-button	Indicator light (2 green) lights up. Working light switches on, if available.
Press the "working light" (3) push-button again	Indicator light (2 green) goes off. Working light switches off, if available.

Test mode

Press "forward drive unit " (13) push-button. Seat contact switch must be closed by loading (sitting on) the seat.	Indicator light (14 green) lights up. Magnetic brake is released. Indicator light (26 red) goes off. Unit moves forwards if the pedal is pressed.
Press "reverse drive" (17) push-button.	Indicator light (15 green) lights up. Magnetic brake releases. Indicator light (26 red) goes off. Unit moves reverse if the pedal is pressed. Pulsating signal sounds from the horn.
Press "horn" (16) push-button.	Horn on.

The test mode is terminated by switching off the unit. If the unit is switched back on using the key switch, „traction dir.“ appears on the display, if the lifting motors were not moved to their end position during test mode. The basic setting is reached again by pressing a direction of travel push-button.

Setup menu

Access to setup menu

The user can use the setup menu to change the basic settings. The information in ( ) refer to the illustration of the instrument panel.

1. Turn key switch (18) to position “I”.
2. Press the “INFO” (19) push-button and forward drive (13) push-button at the same time and keep them pressed until “end use back” or “settings - end with jolt” appears on the display (23).
3. Release both push-buttons again.

Select menu

Use the “increase water flow” (24) push-button to page forwards in the menu. Press the “reduce water flow” (20) push-button to page reverse in the menu.

Change settings

Press the “Increase brush pressure” (8) push-button to increase the settings.

Press the “Reduce brush pressure” (11) push-button to reduce the settings.

Save settings

Press the “reverse drive” (17) push-button to save the settings. The display then automatically switches back to operating mode. If the unit is switched off using the key switch before the push-button “reverse drive” (17) has been pressed, the settings will not be saved. When switched back on, the unit then changes back to the old basic settings.

The settings made become effective immediately. For example, if the working speed is increased in the menu while the unit is moving, the increase can be observed directly.

Deep-discharge protection

The deep-discharge protection is set to 18.0 Volt in the factory. It cannot be changed. If the battery voltage drops to the level of the deep-discharge protection, all the functions are completely switched off.

Menu	Factory setting	Possible settings	Explanations
Language	German	German or English	Display the texts in German or English.
Battery end point voltage	21.6 Volt Low-maintenance battery 21.1 Volt Maintenance free battery	20,0 - 24,0 Volt Increment 0.1 Volt	Unit can be driven but not used for cleaning.
Working speed	80%	45 - 90% Increment 5%	The % values given refer to the max. travel speed (6 km/h).
"After-running" time - i.e. time taken until brushes stop	3 sec	1 - 5 sec Increment 1 sec	After running time for the brush rollers when unit comes to standstill.
Hardware Type	1	0 or 1, Modification as of control version 2.5/2.9 possible (see Test Mode)	Part no. Metering valve 4.580-599 (old) = 0 4.580-605 (new) = 1

Troubleshooting

Faults could occur in the unit, with or without a text display. You should always proceed as follows:

1. Turn key switch to position “0” (switch off unit).
2. Wait until the text on the display disappears.
3. Turn the key switch back to setting “I” (switch unit back on).
4. If the fault occurs again, carry out the appropriate repair work in the given sequence (see corrective measure in the table below). Before carrying out any service work on the unit always turn the key switch to the position “0” and pull the central battery connector.
5. If the fault persists despite the repair measures carried out, the main control printed circuit board or the instrument panel printed circuit board will have to be replaced, depending on the type of fault.

Faults <u>with no text</u> in the display	**Corrective measures**
Unit will not start	– Check/replace fuses F1 and F2. – Insert/check/replace battery connector. – Check/replace key switch. – Replace main control printed ciruit board.
Not enough water	– Fill fresh-water tank. – Check water hose to brush head and remove any blockage/ kinks, especially by BD-version. – Check/clean water filter. – Check function of metering valve and replace if necessary (see chapter Water system).
Suction too low	– Check/clean/replace the seal on the dirty water tank lid. – Clean fluff strainer in the dirty water tank. – Clean/replace/rotate rubber strips on the suction bar. – Check/replace suction hose. – Check/adjust the suction bar settings.
Dirty water tank overflow	– Check/replace the float switch. – Check cable connections to the printed circuit board for interruptions/breaks and correct the fault. – Replace the main control printed circuit board.
Poor cleaning result	– Check the brush rollers for foreign bodies and remove if necessary. – Check/adjust brush pattern. – Adjust the contact pressure to the brush rollers.

Troubleshooting

Faults with text in the display	Corrective measures
Seat switch	– Load seat (at least 10 kg). Display must disappear after. 4 sec. – Check/replace seat contact switch. – Check cable connections to the printed circuit board for interruptions/breaks and correct the fault.
Tank full	– Empty dirty water tank. – Check float switch for freedom of movement. – Check installed position of the float and correct if necessary.
Error! **limit switch**	– Check cable connections to the main control printed circuit board for interruptions/breaks and correct any faults. – Replace suction bar lifting motor (not adjustable).
Overload **traction motor**	The max permissible gradient travelled along is 10%! – Check front wheel brake for blockage/adjust as necessary. – Check drive motor for blockage and adjust as necessary (see chapter Drive sensor/Electromagnetic brake adjustment).
Error! **Travel U< XX**	The two-digit code (XX) provides information about the cause of the fault/fault. XX = 0C, 00, 11, 20, 21, 22, 23, 24, 32, 33, 44: – Replace printed circuit board. XX = 31: – Check/replace the carbon brushes in the drive unitmotor. – Check/replace the carbon brush connections. – Check cable connections to the main control printed circuit board for interruptions/breaks and correct any defects. XX = 10: – Check/replace fuse F2. XX = 40, 41, 42, 43: – Malfunction and correction identical to "Gas Pedal" display. XX = 01 and 02: – Switch the unit off and then back on using the key switch. If the display does not change, replace the main control printed circuit board.
overload **traction U>**	The supply voltage to the electronics is above 29.2 Volt. This situation occurs if the central battery connector is pulled while the unit is travelling downhill. The front wheel brake brakes the unit until it comes to a standstill. – Insert the battery connector and move the unit to a level place.

Troubleshooting

Faults with text in the display	Corrective measures
Error! **Incorrect start**	– Remove your foot from the drive pedal before switching on the key switch. – With the pedal in the "off" position, check the sensor voltage at connector X6 on the main control printed circuit board between the Contacts 1 and 3. Specified value see chapter drive sensor.
Overload **brush motor**	– Check for blockage in the brush drive assembly and remove if necessary. – Check cable connections to the main control printed circuit board for interruptions/breaks and correct any faults. – Check the function of both brush motors/replace as necessary.
Error! **Brush I>**	The power consumption of the brush motors was above 80 A for longer than 4 sec. – Reduce contact pressure to brushes. – Check brushes for blockage/remove as necessary. – Check the function of both brush motors/replace as necessary.
Error! **Brush I<**	– Check/Replace fuse F3. – Check cable connections to the main control printed circuit board for interruptions/breaks and correct any faults. – Check the function of both brush motors and their carbon brushes replace any defective parts brushes as necessary.
Error! **brush lift**	– Check for blockage in the brush head and remove as necessary. – Check/Adjust micro switches on the lifting motor. – Check/Replace lifting motor.
Error! **squeegee**	– Check/Remove any blockages at the suction bar. – Check/Replace lifting motor.
overload **vacuum motor**	– Check cable connections to the main control printed circuit board for interruptions/breaks and correct any faults. – Check/replace suction motor.
overload **water pump**	– Check cable connections to the main control printed circuit board for interruptions/breaks and correct any faults. – Check/replace water pump.
Overload **front light**	– Check working light/replace halogen lamp. – Check cable connections to the main control printed circuit board for interruptions/breaks and correct any faults.
Overload **rotating beacon**	– Check warning beacon light/replace halogen lamp. – Check cable connections to the main control printed circuit board for interruptions/breaks and correct any faults.
Overload **Brake**	– Check/adjust front wheel brake. – Check cable connections to the main control printed circuit board for interruptions/breaks and correct any faults.
Select **traction dir.**	– Select the required direction of travel/movement.

Troubleshooting

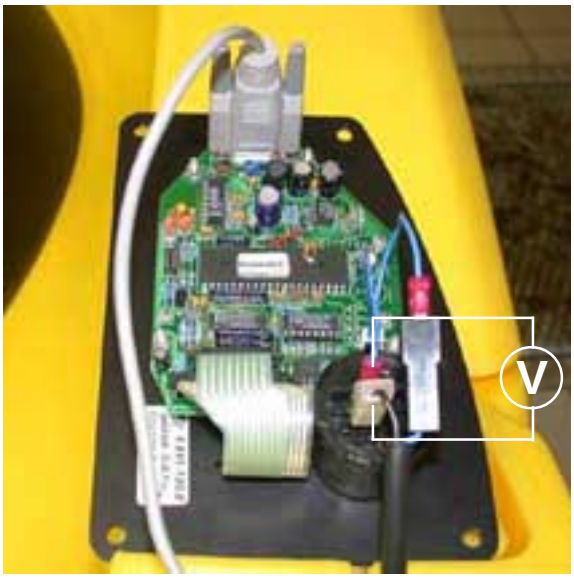
Faults with text in the display	Corrective measures
Accelerator yy	The two-digit code (yy = 01 or 02) provides information about the cause of the fault. The following apply in both cases: – Check the voltage supply to the drive sensor at connector X6 on the main control printed circuit board between the contacts 1 and 2. Specified value see chapter drive sensor. – With the pedal at rest, check the sensor voltage at the connector X6 between the contacts 1 and 3. Specified value see chapter drive sensor. – Check connector for good contact/replace if necessary. – Check/replace drive sensor.
Error! **Watchdog**	– Remove test connector on the printed circuit board. – Replace the main control printed circuit board.
EMERGENCY STOP **EMERGENCY STOP**	The fault display only appears if the key switch is turned to position "0" while the unit is moving or the battery connector is pulled out. – Turn key switch to position "1". – Insert battery connector.
battery **empty -> charge!**	The deep discharge protection voltage has been reached. The cleaning operation cannot be started up. Drive motor, lighting and horn are still ready for operation. – Move unit to the charger and charge the battery.
Battery **critically low!!**	More than the permissible battery capacity has been extracted. The entire unit is switched off. The unit can no longer be operated. – Unlock the front wheel brake manually and push the unit to the battery charger. – Charge the battery.
Error! **Dashboard**	When switching on the key switch the machine automatically checks whether the instrument panel printed ciruit board is functional or whether a push-button is depressed while switching on. – Do not press any of the push-buttons when switching the unit on with the key switch. – Replace the instrument panel printed circuit board if the display text remains the same.
RAM?	– Switch the unit ON and OFF using the key switch. – Replace the instrument panel printed circuit board if the display text remains the same.
ROM? xxxx yyyy	– Switch the unit ON and OFF using the key switch. – Replace the instrument panel printed circuit board if the display text remains the same.

Unit does not operate

Central battery connector (X1)

Insert/Check/Replace central battery connector (X1)

Use the voltmeter to check the central battery connector (2), replace any defective parts.



Check key switch (S0)

Check/Replace key switch (S0)

– Switch on key switch (1).

– Use the voltmeter to measure the voltage at the cable contacts (see middle picture).

– Measured value = battery voltage.

If no measured value is displaced, the key switch (1) must be replaced. The connection cables (2) must also be checked.

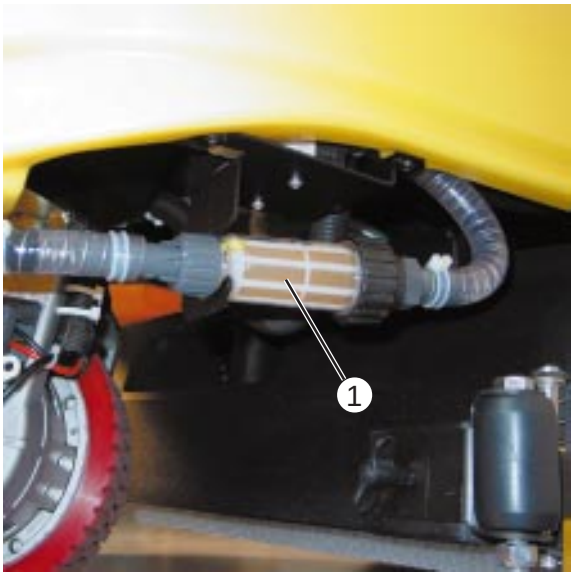
Instrument panel, view from above

Check/Replace fuse F1 and F2

Check fuses F1 and F2, replace defective fuses. The fuses are located on the main control printed circuit board.

1 Key switch (S1)
2 Central battery connector (X1)

Not enough water / Suction not adequate



Fresh-water filter

Dirty water tank cover open

Metering valve (Y2)

Fill fresh-water tank

– Open the fresh-water tank cap and fill with fresh-water and cleaning agent.

Check/Clean water filter

– Unscrew the water filter (1) at both ends of the hose.
– Clean if dirty.

Check water hose to brush head for blokkages/kinks and remove as necessary

Check the water hose from the tank to the brush head for blockages. Remove any kinks in the hose. Ensure that the hose is correctly installed and positioned.

Check/clean/replace the seal at the dirty water tank cover

Check the dirty water tank seal (2) for damage and dirty, clean/replace as necessary.

Clean fluff strainer in the dirty water tank

The fluff strainer (3) can become blocked, depending on how the unit is used and how dirty the surfaces to be cleaned are.

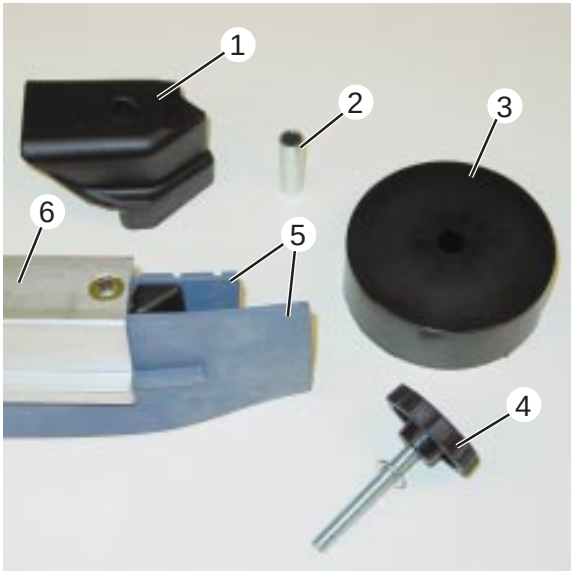
– Unscrew the retaining screws at the fluff strainer (3).
– Remove the fluff strainer (3) from the bracket and clean.

Check function of metering valve (Y2) and replace as necessary

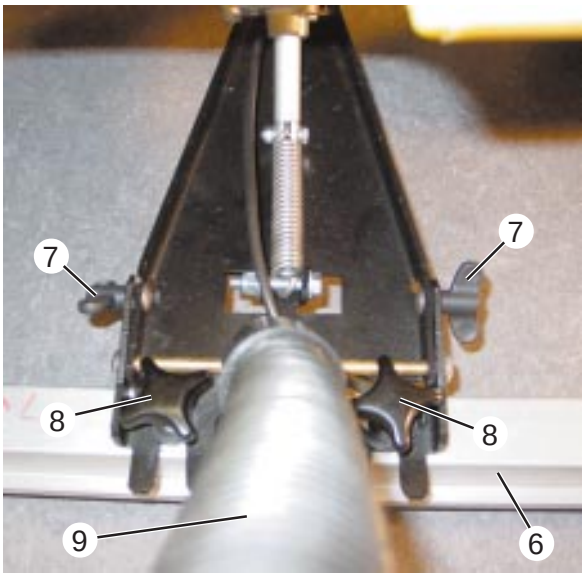
Check function of metering valve, replace if necessary (see also chapter water system).

1 Water filter
2 Seal, dirty water tank
3 Fluff strainer

Suction not adequate



Suction bar - individual parts



Suction bar - adjusting screws

1 Rubber strip retainer
2 Metal spacer
3 Deflector wheel
4 Retainer bolt
5 Rubber strips
6 Suction bar
7 Wing nuts, suction bar inclination adjustment
8 Star handle, for installing/adjusting the suction bar angular position
9 Suction hose

Clean/replace the rubber strips on the suction bar

Clean the rubber strips (5) on the suction bar and check for damage. Rotate/Replace if necessary.

– Unscrew the retaining bolts (4).
– Remove the deflector wheel (3) with metal spacer (2).
– Pull off the rubber strip retainer (1) from the side of the suction bar (6).
– Pull out the rubber strips (5) from the guide grooves at one side, install new rubber strips in reverse order.

Check/replace the suction hose

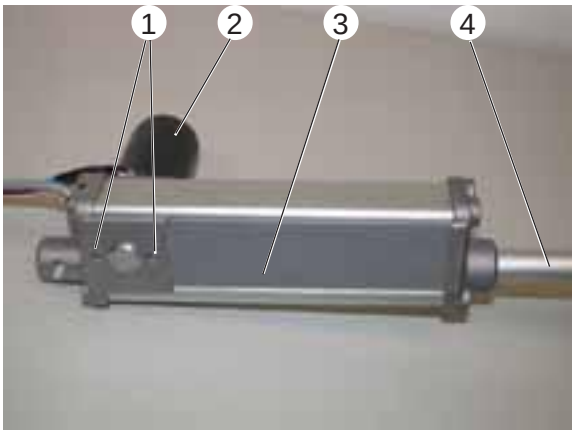
– Check suction hose (9) for leaks. Replace if necessary.

Check/adjust suction bar setting

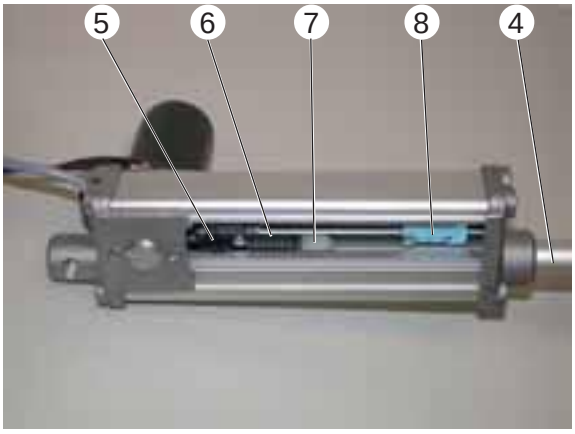
– Loosen star handle (8).
– Align suction bar (6).
– Screw the star handle (8) tight.
– Loosen wing nuts (7).
– Align suction bar (6).
– Screw wing nuts (7) tight.

Note:
The front and rear rubber strips can be rotated by 180°.

Suction beam lifting motor



Lifting motor with cover



Lifting motor cover removed

Micro switch adjustment

If the suction beam does not reach the most upper or lower position and/or has no movement, the micro switches must first be checked before replacing the lifting motor.

- Using a screw driver lift the cover (3) at the sides and remove it. The cover is inserted and held in place at both ends.
- Both micro switches (5 and 8) are mounted on a guide rails. The micro switch (5) must be positioned all the way to the left, the micro switch (8) must be positioned all the way to the right. In this position the lifting motor has it's full movement.

1 Mounting screws, lifting motor
2 Lifting motor
3 Cover
4 Piston
5 Micro switch left, suction beam lifted
6 Threaded shaft
7 Switching cam on the piston
8 Micro switch right, suction beam lowered

Dirty water tank overflows

Float switch (S17), dirty water tank open

Check/Replace float switch (S17)

The float switch (1) must be replaced if it fails to switch off when the max. level of the dirty water tank is reached.

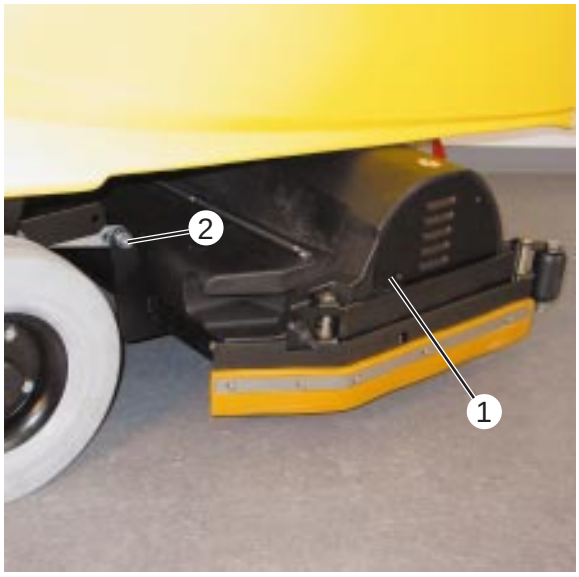
– Check float switch (1) for freedom of movement.
– Unscrew the retaining screw at the float switch (1).
– Remove float switch (1) from the bracket and check/replace.

Check cable connections to main control printed circuit board for interruptions/ breaks and correct any faults as necessary

The float switch (1) is connected to the terminal strip (EXT.X1) under the seat.

1 Float switch (S17)

Poor cleaning results

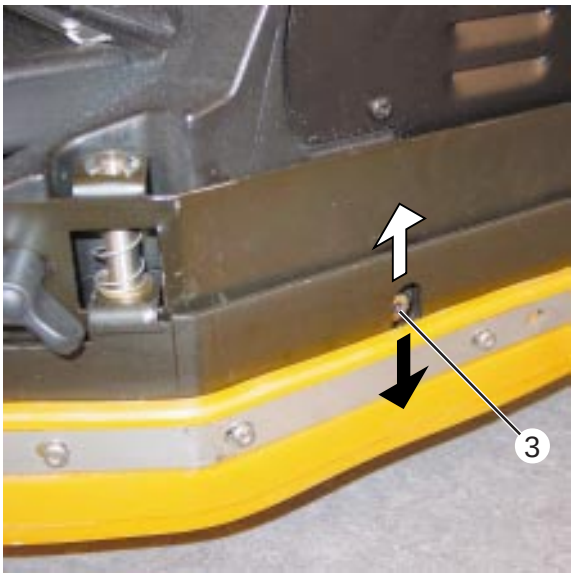


Brush head (BR-Version)

Check/Remove brush head for foreign matter

When foreign matter is on the brush roller this can influence the cleaning result.

– Remove all foreign matter.



Adjusting screw, brush pattern

Adjust the brush pattern

The adjusting screws (2) are used to adjust the brush head so that both brush rollers uniformly lie on the floor.

The adjusting screws (3) are used to adjust the brush rollers so that the brushes are parallel.

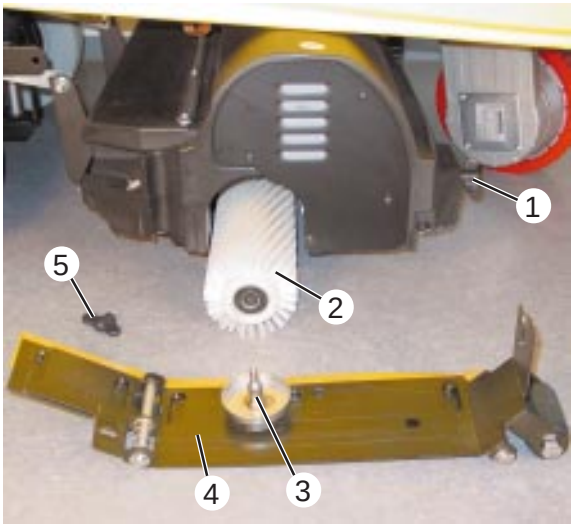
Brush pattern, adjusted correctly

– Draw a chalk area on a level floor surface and drive over it with the unit.
– Lower the brush head (1) in test mode and allow the brushes to run for approx. 3 sec.
– Raise the brush head (1) and drive the unit back.

The brush pattern of both brush rollers must be equally wide and parallel.

1 Brush head
2 Adjusting screw brush head, right and left
3 Adjusting screw brush roller, right and left

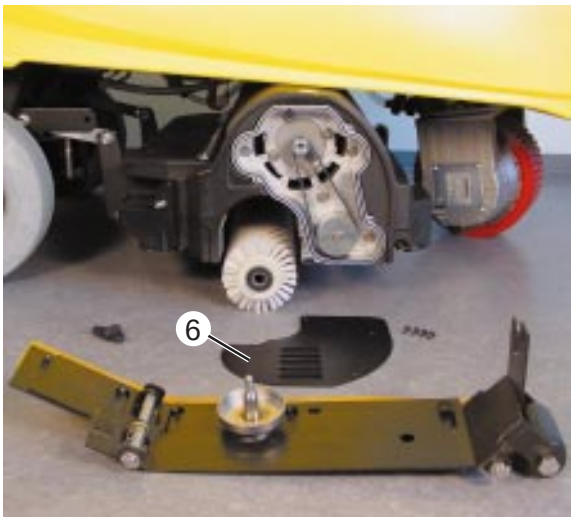
Poor cleaning results



Replace brush roller

Replace the brush rollers (BR version)

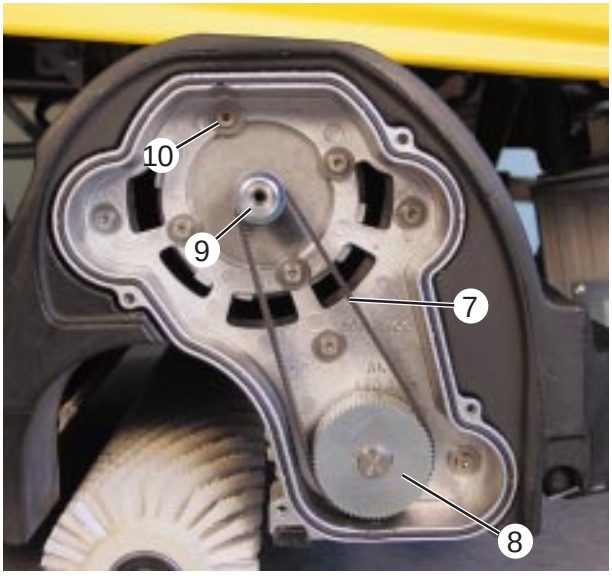
– Loosen the wing nut (1), remove the wing nut (5) and pull off the cover (4).
– Pull the brushes (2) out at the side and check for wear, replace as necessary.
– Slide new brushes onto the drive shaft of the motor and reinstall the cover (4).



Brush head opened from the side

Replace drive belt (BR version)

– Loosen wing nut (1).
– Remove wing nut (5).
– Remove cover (4).
– Remove cover (6).
– Loosen the 4 retaining screws (10) on the motor.
– Remove the drive belt (7).
– Install new drive belt, increase the belt tension and tighten the retaining screws (10) on the motor. The V-belt tension is determined by the location of the Motor shaft (9).

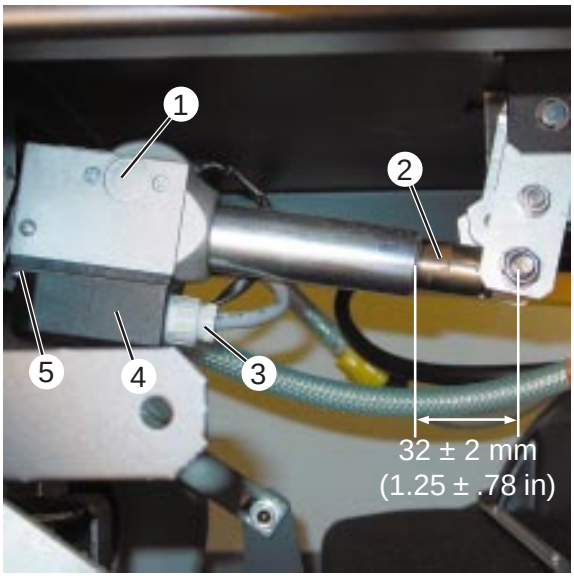


Brush head drive system

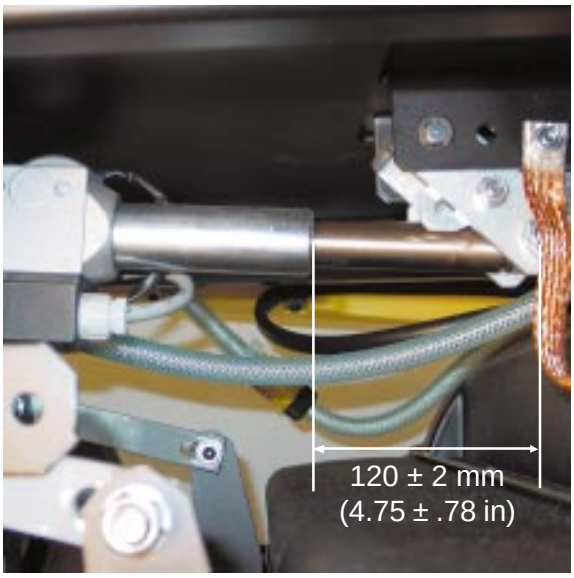
Note:
The drive belt (7) must be tightened so that it only gives by 5 mm max. if it is pressed firmly with the thumb.

1 Wing nut, front
2 Brush roller
3 Holding arbor
4 Cover, brush roller
5 Wing nut, rear
6 Cover, drive belt
7 Drive belt
8 Driving gear, brush roller
9 Motor shaft
10 Retaining screws, motor (4x)

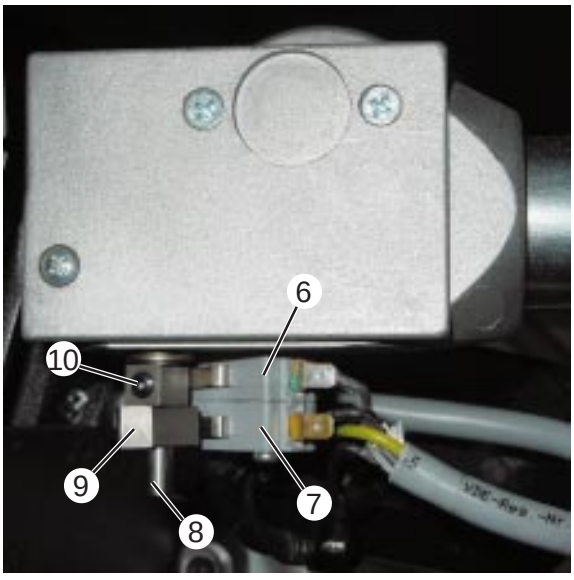
Poor cleaning results



Brush head raised



Brush head lowered



Micro switches and cams

Adjust the contact pressure to the brush rollers

– Loosen the screwed cable gland (3), unscrew and remove the retaining screws (5) of the cover (4) and remove it.
– Move piston (2) of the the lifting motor (1) in the test mode to 32 ± 2 mm (1.25 ± .078 in). (Brush head lowered, see test mode.)
– Adjust the cam (9) for activating the micro-switch (7) to this setting.
– Extend the piston (2) of the lifting motor (1) to 120 ± 2 mm (4.75 ± .078 in). (Brush head raised, see test mode.)
– Adjust the cam (10) for activating the micro-switch (6) to this setting.
– When setting the cams ensure that the piston overshoot is approx. 2-3 mm (.78-1.18 in).

The cams (9) and (10) are fixed to the shaft (8) of the variable speed motor by means of set screws. When adjusting, note the rotational direction of the shaft (8).

Note:
The adjustment of the lifting motor (1) must be done outside the unit.

We recommend that you extend the piston (2) to approx. 75 mm when changing the brush head. In this setting the brush head can be easily removed.

1 Lifting motor (M20)
2 Piston, lifting motor
3 Connection cable screwed cable gland
4 Cover, micro switches, cams
5 Retaining screws, cover
6 Micro switches, piston extended 120 ± 2 mm (4.75 ± .078 in)
7 Micro switches, piston retracted 32 ± 2 mm (1.25 ± .078 in)
8 Shaft, lifting motor (1)
9 Cam for micro switch (7)
10 Cam for micro switch (6)

Poor cleaning results

Brush head (BD version)

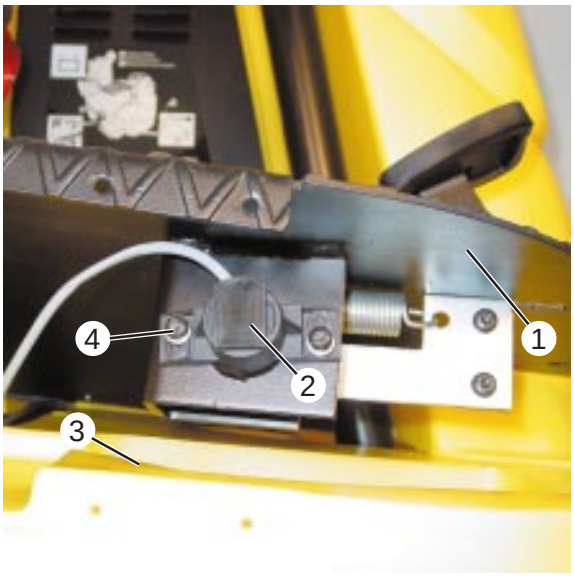
1 Brush head, BD
2 Disc brush

Check/replace disc brushes (BD version)

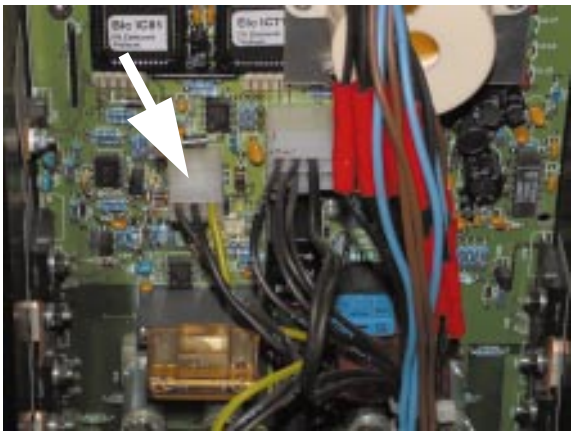
– Raise the brush head.
– Lift up the disc brushes (2), rotate then by approx. 45 degrees and then remove them from below.
– Install the new disc brush in the reverse order.

The brush pattern of the disc brushes cannot be adjusted.

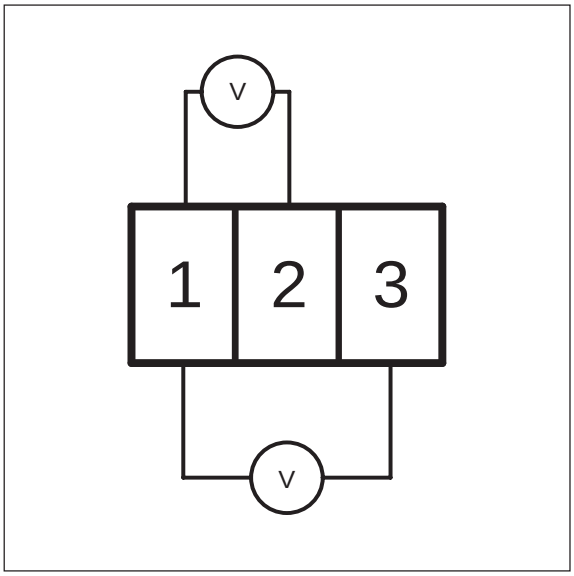
Drive sensor



Drive unit sensor (B1)



Main control printed circuit board, terminal X6



Voltage measurement at terminal X6

Adjust drive sensor (B1)

– Remove the retaining screws of the floor panel (1) and lift up the floor panel.
– Remove the cover of the main control printed circuit board.
– Switch unit on.
– Connect the voltmeter to terminal X6 connection 1 and 2 (see diagram below) and measure the supply voltage.
– If the value exceeds the tolerance of ± 0.25 V the main control printed circuit board must be replaced.
– Connect the voltmeter on the main control printed circuit board at connector X6, attach terminal 1 and terminal 3 (see diagram below).
– If the voltage value is above the nominal value, the message „Error! Incorrect start“ appears in the display of the instrument panel.
– Loosen the adjusting screws (4) and adjust the drive sensor (2) by rotating it until the nominal value is displayed at the voltmeter.
– Retighten the retaining screws (4).

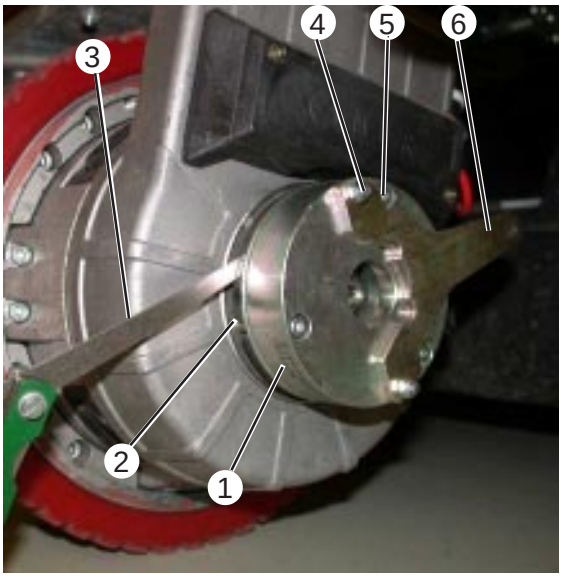
Note:
When installing the floor panel (1) ensure that the wires are not clamped or pinded to the drive sensor.

Nominal value:

1-3 Neutral voltage	= 0,3 ± 0,05 V
1-2 Supply voltage	= 5 ± 0,25 V

1 Floor panel
2 Drive sensor (B1)
3 Unit housing
4 Adjusting screws, drive sensor

Electromagnetic brake Y1 adjustment



Check adjustment

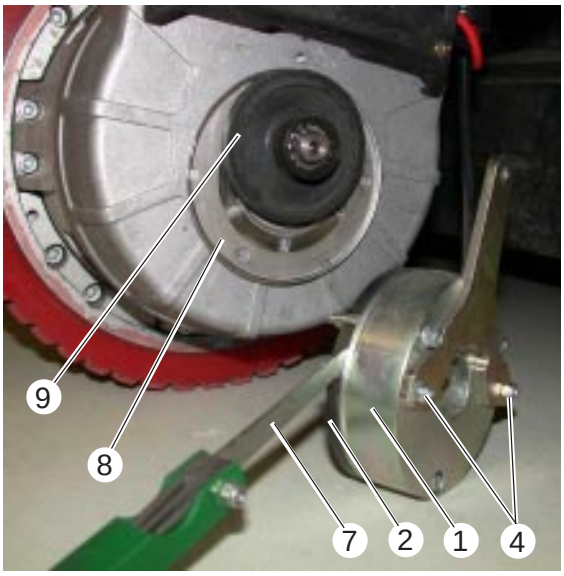
Check adjustment

The tolerance between the magnet coil (1) and the pressure plate (2) must be 0,3 mm / .012 in.

– Switch the unit off at the key switch (S0).

– Check the gap between the pressure plate (2) and the magnet coil (1) with a feeler gauge.

The gap can only be adjusted when the magnet coil (1) is removed.



Brake adjustment

1 Magnet coil
2 Pressure plate
3 Feller gauge (0,3 mm / .012 in)
4 Brake lever retainer bolts (2x)
5 Mounting bolts, magnet brake Torx 15 (3x)
6 Brake lever, to release the brake
7 Feeler gauge (0,8 mm / .032 in)
8 Steel plate
9 Brake disc

Remove the magnet coil and adjust the brake

The tolerance between the magnet coil (1) and the pressure plate (2) must be 0,8 mm / .032 in when removed.

– Unscrew the mounting bolts (5) and remove the magnet coil (1).

– Check the gap between the pressure plate (2) and the magnet coil (1) with the feeler gauge.

– Make an even adjustment using the retaining bolts (4).

Note:
If the gap between the pressure plate (2) and the magnet coil (1) is 0,8 mm / .032 in when removed, this will be automatically 0,3 mm / .012 in when installed.

The brake must hold the unit on a 10 % inclination at full load. If the braking action after adjustment is not adequate replace the brake disc (9).

Safety checks

Seat contact switch (S16)

The seat contact switch (S16) should be checked every 100 hours.

1. Turn key switch to position “1”.
2. Select the direction of travel.
3. Do **NOT** load the seat.
4. Lightly press on the drive pedal.

The unit must not move. If it does, check the function of the seat switch (S16), replace if necessary.

Parking brake

The parking brake in the front wheel should be checked each time before using the unit.

1. Load the seat.
2. Turn the key switch to position “1”.
3. Select the direction of travel.
4. Lightly press on the drive pedal.

The Parking brake must audibly unlock and the indicator light on the instrument panel must go out. If it doesn’t, check the voltage supply to the magnetic brake and the connection cable to the main control printed circuit board. If necessary adjust the magnetic brake, replace the carbon brushes of the drive motor or change the main control printed circuit board.

Braking function

If the mechanical brake in the front wheel fails the motor brake acts automatically, so that in the worst case with maximum speed 2.4 km/h the unit rolls down an incline with a constant speed (slow walking pace).

The central battery connector must never be pulled as otherwise the brake wont work.

Allow the unit to roll to a horizontal level and then adjust the brake.

Safety checks

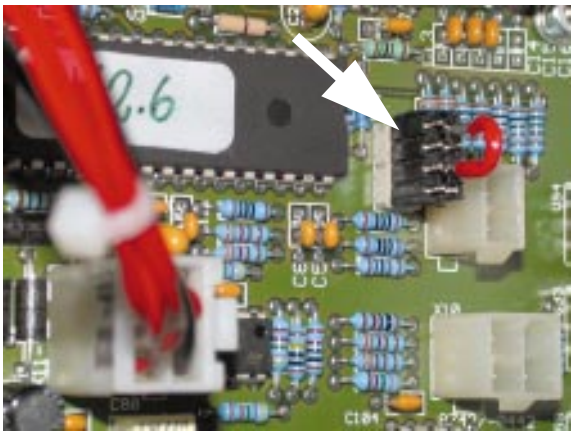
Watchdog error message

“Watchdog” fault message

The “Watchdog” function monitors the entire control function of the unit. It should be checked every 100 operating hours. You will need a test connector (special tool) to do this.

1. Turn key switch to position “0”.
2. Pull out the central battery connector.
3. Remove the cover panel and safety cover of the main control printed circuit board.
4. Reinsert the central battery connector.
5. Turn key switch to setting “I”.
6. Attach the test connector to the 7-pin terminal strip X1 (next to the main processor). The connector is pin coded. Do not connect it with force!

After approx. 3 sec the error message “Watchdog” must appear on the display. You must not be able to activate any of the drive functions. If you can, the main control printed circuit board must be replaced.



Test connector attached to terminal strip X1

Following successful check:

1. Turn the key switch to position “0”.
2. Pull out the central battery connector.
3. Pull off the test connector.
4. Reinstall the safety cover and the cover of the main control printed circuit board.

Test connector

Working time needed to replace important parts

Components Modules	Working time (Min.)	Note
Battery	30	Exchange only with a lift possible. Tightening torque of the polls 23 Nm ± 1
Fuses F1-F4	10	Main control printed circuit board
Central battery connector including EMERGENCY-STOP	30	Disconnect the battery before replacing the central battery connector and EMERGENCY-STOP. The EMERGENCY-STOP wire is routed under the floor panel, behind the main control printed circuit board cover to the instrument panel.
Key switch	15	instrument panel
Main control printed circuit board	30	Use a antistatic-wristband during dis-assembly. The wire plugs are coded, they can not be incorrectly pluged in Tightening torque, wire connections M 6 nuts = 3,9 Nm M 8 nuts = 9,0 Nm
Waterpump	20	Empty the fresh water tank or plug the inlet to the pump before replacing.
Metering valve	45	Dissconect the hose kuppling and wire connector The wire tie on the inlet hose must be replaced after removing it. Both micro switches are non-adjustable. See tech. data for flow volume.
Dirty water tank seal and fluff strainer	10	Dirty water tank

Working time needed to replace important parts

Components Modules	Working time (Min.)	Note
Dirty water tank float switch	15	Dirty water tank
Seat switch	15	Seat
Suction bar lifting motor	30	Micro switches are adjustable
Drive motor carbon brushes	30	Drive motor
Roller brush drive motor	60	Extend the piston of the lifting motor to approx. 75 mm/2.95 in. In this position the brush head is resting on the floor. Open the terminal strip box on the brush head and disconnect the wires. Disconnect the brush head from the brackets and pull it out to the side. Remove the brush motor.
Roller brush drive belt	30	Remove side drive belt cover. Loosen motor retaining screws. Replace drive belt and tighten.
Disc brush drive motor	60	Extend the piston of the lifting motor to approx. 75 mm/2.95 in. In this position the brush head is resting on the floor. Open the terminal strip box on the brush head and disconnect the wires. Disconnect the brush head from the brackets and pull it out to the side. Remove the disc brushes from the brush head. Remove the brush motor.

Working time needed to replace important parts

Components Modules	Working time (Min.)	Note
Disc brush drive belt	45	See analog disc brush drive motor
Replace roller brush, disc brush, drive motor carbon brushes	20	See analog roller brush, disc brush drive motor
Brush head lifting motor	60	Extend the piston of the lifting motor to approx. 75 mm/2.95 in. In this position the brush head is resting on the floor. The micro switches for adjusting the lifting motor are soldered to the wires. If the lifting motor has to be replaced, carry out the adjustments before installing.
Suction motor	30	The wires must be separated from the suction motor when replaced.
Drive pedal assembly	15	Note: When installing the floor panel ensure that the wires are not clamped or pinched to the drive pedal assembly.
Instrument panel	15	The ribbon cable is pluged in.
Fresh water tank	180	Fresh water tank
Dirty water tank	40	Dirty water tank
Drive motor	90	Block the rear wheels, and place the jack on the frame next to the steering head.
Steering rad bearing	150	Replacement can only be carried out when first the brush head and drive motor have been removed. Tightening torque: 25 Nm
Rear wheels	15	Place the jack on the frame
Steering wheel	15	Steering column

Technical specifications

Unit Type	Unit No.	Circuit diagram	Operating instructions	Maintenance booklet	Spare parts list
BR 75/140 R 24 V	1.246-101	0.088-555	5.960-442	5.950-583	5.958-942
BR 75/140 R Pack 24 V	1.246-121	0.088-555	5.960-442	5.950-583	5.958-942
BD 75/140 R 24 V	1.246-201	0.088-555	5.960-442	5.950-583	5.958-942
BD 75/140 R Pack 24 V	1.246-221	0.088-555	5.960-442	5.950-583	5.958-942
BR 90/140 R 24 V	1.246-301	0.088-555	5.960-442	5.950-583	5.958-942
BR 90/140 R Pack 24 V	1.246-321	0.088-555	5.960-442	5.950-583	5.958-942
BD 90/140 R 24 V	1.246-401	0.088-555	5.960-442	5.950-583	5.958-942
BD 90/140 R Pack 24 V	1.246-421	0.088-555	5.960-442	5.950-583	5.958-942

The technical data sheets and the circuit diagrams are located on the next issue of the spare parts CD-ROM (DISIS) and in the Intranet.

Technical data sheets :File “Central / Service Info Int’l / Technical Specifications”

Circuit diagrams: File “Central / Service Info Int’l / Circuit Diagram”

The operating instructions and the spare parts lists can be ordered as a paper copy as required from the spare parts service by quoting the relevant part number.

Special Tools

Steering wheel puller	2.860-166
Multimeter	6.603-022
Test connector (Watchdog error message)	6.648-858
Torque wrench 2 - 25 Nm	6.815-090

Tightening torques

Printed circuit module,	
retaining screw M6	3,9 Nm
retaining screw M8	9,0 Nm