

**KÄRCHER**

makes a difference

# B 250 R (Fleet) Service Manual



<b>Safety instructions</b>	<b>8</b>
Hazard levels	8
<b>Description in this service manual</b>	<b>9</b>
Service groups	9
Functional group structure	9
Textual description	9
<b>Technical Features</b>	<b>10</b>
General	10
Tools used	10
Field of application	10
Safety installations	11
Main switch/EMERGENCY OFF	11
Safety switch/ seat contact switch	11
Limit switch lifting motors	11
Signal generator reversing	11
Float switch of waste water tank	11
Type plate	12
<b>Overview of the appliance</b>	<b>13</b>
Pre-sweeping system B 250 RI	13
Operator console	14
Program selection switch	15
Info button	15
Operations menu	16
<b>Overview over the service and functional groups</b>	<b>17</b>
AB Setup	17
AC Control panel	18
AF suction system	19
AH Appliance electronics	19
AO steering	20
AN running gear	21
AM Cleaning head suspension	21
AD Fresh water system	22
MG Detergent dosing unit (DOSE)	23
AE Tank system	23
<b>AB Service group setup</b>	<b>24</b>
010 Safety information	24
020 Overview	24
030 Function	25
040 Service activities	26
ABFS Uninstall / install driver seat with seat rails	26
ABAB Uninstall/install battery cover	27
ABSS Uninstall/install battery cover hinges	28
ABAFA Uninstall/install footwell cover	28
ABST Uninstall/install battery cover support	29
ABAV Uninstall / install bumper wheels in the front	30
050 Maintenance and inspection	30
060 Error diagnosis	30
070 Peculiarities/ others	30
<b>AC Service group control unit</b>	<b>31</b>
010 Safety information	31
020 Overview	31
030 Function	32
Description of the display	32
040 Service activities	33

ACBF Uninstall / install the control panel	33
ACBS Uninstall / install control panel switch	33
ACHS Uninstall / install main switch	34
ACCP Uninstall / install head CPU	35
ACFR Uninstall / install travel direction switch and signal horn button	35
ACPW Uninstall / install programme selector switch	35
050 Maintenance and inspection	36
060 Error diagnosis	36
070 Peculiarities/ others	37
Check the programme selector switch	37
Check the control panel	37
<b>AH Service group appliance electronics</b>	<b>40</b>
010 Safety information	40
020 Overview	40
030 Function	41
Module networking	42
Module system B 250 R	44
Emergency operation (driving)	45
Troubleshooting	46
Checking the data lines (bus cable)	46
040 Service activities	48
AHFM Uninstall / install Fleet module	48
AHFN Uninstall / install Fleet module antenna	49
AHLU Uninstall / install fan	50
Checking / replacing appliance electronics	51
AHMC Uninstall / install clean module	51
AHMF Uninstall / install drive module	52
AHMG Uninstall / install lifting module 1	52
AHMH Uninstall / install lifting module 2	52
AHMZ Uninstall / install accessory module	53
AHSC Uninstall / install contactor	53
AHHF Uninstall / install main fuse	54
AHHV Uninstall / install horn	54
AHLR Uninstall / install flashing beacon lamp	55
AHAL Uninstall / install work light	55
050 Maintenance and inspection	57
Charger for formation and desulphation charge	57
Connect the service module	61
060 Error diagnosis	64
070 Peculiarities/ others	64
Use of the spacers with module fastening	64
<b>AO Service group steering</b>	<b>66</b>
010 Safety information	66
020 Overview	66
030 Function	66
040 Service activities	67
AOLR Uninstalling/ installing steering wheel	67
AOZL Uninstall / install gear rim steering	68
050 Maintenance and inspection	71
060 Error diagnosis	71
070 Peculiarities/ others	71
<b>AN service group running gear</b>	<b>72</b>
010 Safety information	72
020 Overview	72
030 Function	74
040 Service activities	75
ANBE - Uninstall / install electromagnetic brake of the propulsion motor	75
ANBC - Uninstall / install brake disk of the propulsion motor	76

ANFM - Uninstall / install propulsion motor	76
ANRR - Uninstall / install tyre of propulsion motor	78
ANFS Uninstall / install sensor ring (encoder) for the engine	80
ANFP Uninstall / install sensor for accelerator pedal	81
ANMF Uninstall / install microswitch for the accelerator pedal	81
ANRF - Uninstall / install rotor of propulsion motor	82
ANRW - Uninstall / install shaft seal of rotor of propulsion motor	83
ANDA - Uninstall / install seal of the connection cover of the propulsion motor	84
ANRH - Uninstall / install wheels in the back	86
ANBS - Uninstall / install brake drum in the back	86
ANBA - Uninstall / install brake pad in the back	87
ANHA - Uninstall / install rear axle	87
050 Maintenance and inspection	88
Adjusting the rear-wheel brake	88
060 Error diagnosis	89
070 Peculiarities/ others	89
<b>AJ Service group for cleaning head R</b>	<b>90</b>
010 Safety information	90
020 Overview	90
030 Function	90
040 Service activities	90
AJBW Uninstall/ install cleaning head	90
050 Maintenance and inspection	92
Setting the brush head	92
070 Peculiarities/ others	93
<b>AK Service group cleaning head D</b>	<b>94</b>
010 Safety information	94
020 Overview	94
030 Function	95
070 Peculiarities/ others	95
<b>AF Service group suction system</b>	<b>96</b>
010 Safety information	96
020 Overview	96
030 Function	96
040 Service activities	97
AFAS Uninstalling/installing suspension of the suction bar	97
AFHU Uninstall / install lifting motor suction bar	97
AFSB Uninstall/ install suction bar	98
AFSD Uninstall / install suction turbine	99
060 Error diagnosis	99
070 Peculiarities/ others	99
<b>AM Service group cleaning head suspension</b>	<b>100</b>
010 Safety information	100
020 Overview	100
030 Function	101
Function of brush head lifting motor	101
040 Service activities	102
AMAA - Uninstall / install axle of lifting unit	102
AMHM Uninstall / install lifting motor of lifting unit	103
Checking the microswitch of the lift motor	104
AMLA - Uninstall / install bearing of lifting unit	104
AMZA Uninstall / install tension spring of lifting unit	105
050 Maintenance and inspection	105
060 Error diagnosis	106
070 Peculiarities/ others	106
<b>AD service group fresh water system</b>	<b>107</b>

010 Safety information	107
020 Overview	107
030 Function	108
040 Service activities	109
ADAF Completely uninstall / install auto fill-in	109
ADFF Uninstall / install fresh water filter insert	110
ADFÜ Uninstall / install fresh water level gauge	111
ADKU Uninstall / install electric ball valve	112
ADWP Uninstall / install water pump	114
050 Maintenance and inspection	115
060 Error diagnosis	116
070 Peculiarities/ others	116
<b>AE Service group tank system</b>	<b>117</b>
010 Safety information	117
020 Overview	117
030 Function	118
040 Service activities	119
AEDS Uninstall / install cover of the waste water tank	119
AEFR Uninstall / install fresh water tank on the right	119
AEFS Uninstall / install flat fold filter of the waste water tank	120
AESD Uninstall / install seal of the cover of the waste water tank	120
AESC Uninstall /install float of foam stop	120
AESS Uninstall / install float switch of the waste water tank	121
AEST Uninstall / install waste water tank	122
050 Maintenance and inspection	123
060 Error diagnosis	123
070 Peculiarities/ others	123
<b>MG Service group detergent dosing unit</b>	<b>124</b>
010 Safety information	124
020 Overview	124
030 Function	124
040 Service activities	125
MGRD Uninstall / install detergent dosing pump	125
MGCS Uninstall / install dosing hose	126
MGDR Uninstall / install, clean flow meter	127
MGSL Uninstall / install, clean suction lance	128
050 Maintenance and inspection	129
060 Error diagnosis	129
070 Peculiarities/ others	129
<b>Software diagrams and parameter overview</b>	<b>130</b>
Summary and standard setting for key menu, version 1.4	130
Operating elements	131
Factory setting	131
Function overview: Intelligent Keys	132
Function overview of the yellow intelligent key	132
Function overview of the grey intelligent key	134
Function overview of red intelligent key	136
Key menu	138
Standard setting	140
Test mode menu	141
Maintenance counter	143
Brush head	145
Travel speed	146
Stopping times	147
Switch menu	148
Language	149

Factory settings	150
Counter	151
Error memory	151
Error messages for the user	151
Fault messages and warning messages for head CPU A1	152
Fault messages and warning messages error in driving module A2	157
Fault messages and warning messages for cleaning module 1	161
Fault messages and warning messages for cleaning module 2	162
Fault messages and warning messages for lifting module 1	165
Fault messages and warning messages for lifting module 2	168
Accessory module faults and warnings	171
<b>Technical Documentation</b>	<b>173</b>
Technical specifications	173
Technical data of individual consumers	174
Special tools	175
Torques	175
Circuit diagram	175

## Preface

Good service work requires extensive and practice-oriented training as well as well-structured training materials. Hence we offer regular basic and advanced training programmes covering the entire product range for all service engineers.

In addition to this, we also prepare service manuals for important appliances - these can be initially used as instruction guides and later on as reference guides.

Apart from this, we also regular information about product enhancements and their servicing.

If you should require supplements, have corrections or questions regarding this document, please address these citing the following subject to:

*international-service @de.kaercher.com*

Subject:	<b>Fall 122360</b>
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The responsible product specialist will take care of your issue.

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## Safety instructions

Service and maintenance tasks may only be performed by qualified and specially trained specialists.

**Observe safety information in the chapters!**

 **DANGER**

*First pull out the plug from the mains before carrying out any tasks on the machine.*

 **CAUTION**

*Risk of damage by electrostatic discharge (ESD)! Take suitable measures for discharging electrostatic charge prior to performing work on the appliance electronics.*

## Hazard levels

 **DANGER**

*Immediate danger that can cause severe injury or even death.*

 **WARNING**

*Possible hazardous situation that could lead to severe injury or even death.*

 **CAUTION**

*Possible hazardous situation that could lead to mild injury to persons or damage to property.*

**Note**

Indicates useful tips and important information.

## Description in this service manual

### Service groups

#### Example:

Install/uninstall ANRA wheel axle

AN	RA	Install/uninstall wheel axle
Service group	Component	Activity

Observe the allocation of service groups to the appliance components in the overview diagram in Chapter "Overview over the service and functional groups".

### Functional group structure

010	Safety instructions
020	Overview
030	Function
040	Service activities
050	Maintenance and inspection
060	Error diagnosis
070	Peculiarities/ others
080 - 100	Not assigned

### Textual description

- ➔ Instruction
- *Preparatory operations*

1  
2 Key numerical

A  
B Key alphanumerical  
– Enumeration / General list

#### ⚠ Safety note

Pointer to hazards, sources of errors.

## Technical Features

### General

- The appliance is used for the wet cleaning or polishing of level floors. You can adjust the machine to suit the cleaning task by modifying the settings for water quantity, contact pressure and the speed of the brushes, the quantity of cleaning agent as well as the driving speed.
- In B 250 RI models, loose dirt is picked up through a sweeping mechanism before actual cleaning.
- A working width of 1,000 mm or 1,200 mm and a capacity of 250 l each of the fresh and dirt water reservoirs enable an effective cleaning even when the machine is used for long duration.
- The device is self-moving; the drive motor is feed by a trough battery.
- The batteries can be charged using a charger connected to a 230 V socket.
- Depending on the package type, battery and charger are included.
- The appliance may only be used for the cleaning of hard surfaces that are not sensitive to moisture and polishing operations.
- The application temperature ranges from +5°C to +40°C.
- The appliance is not suited for the cleaning of frozen grounds (e.g. in cold stores).
- The appliance may only be equipped with original accessories and spare parts.
- The appliance must not be operated without the flat folded filter in the lid of the waste water tank.
- The appliance has been developed for cleaning floors inside rooms and roofed areas. With respect to other applications the usage of alternative brushes (and also the use of the sweeping mechanism in the B 250 RI models) must be checked.
- B 250 RI (with sweeping mechanism): Only drive over steps with maximum 2 cm height.
- The appliance is not intended for the cleaning of public traffic routes.
- The machine should not be used on surfaces that are sensitive to pressure. Please consider the allowed load per surface unit of the floor. Details of load per surface unit can be found in the technical data.
- The appliance is not suited for the use in potentially explosive environments.
- The machine should not be used to suck in inflammable gases, undiluted acids or solvents. This includes petrol, thinning agents or hot oil that can form an explosive mixture when it comes in contact with sucked air. Do not use acetone, undiluted acids and solvents as they are aggressive towards the materials from which the appliance is made.
- Vmax can be set to 7.5 km/h.
- In the IR version, it is possible to just sweep without having to scrub.
- It is possible to run in test mode in order to measure the power consumption in the brush motors.

### Tools used

- Screwdriver T15 - 30
- Screwdriver PZ / PH
- Screwdriver flat (electric)
- Socket set
- Plastic hammer
- Open-ended spanner set
- Flat pliers
- Circlip pliers

### Field of application

This service manual applies to the following appliances:

B 250 R Fleet + R100 + DOSE + 630AH + SB	0.300-303.0
B 250 R Fleet + R120 + DOSE + 630AH	0.300-301.0
B 250 R Fleet + R100 + DOSE + 630AH + SB	0.300-302.0
B 250 R	1.480-231.2

## **Safety installations**

Safety devices serve to protect the user and must not be rendered in operational or their functions bypassed.

**Observe safety information in the chapters!**

### **Main switch/EMERGENCY OFF**

To put all functions out of operation immediately: Press emergency-stop button.

- The machine comes to a sudden halt when you press the emergency-stop button.
- The emergency-stop has a direct effect on all machine functions.
- The display continues.

### **Safety switch/ seat contact switch**

Switches off the appliance functions with a delay of 1.5 seconds if the operator leaves the seat during operation or driving.

A warning message is shown on the display.

### **Limit switch lifting motors**

The lifting motors for vacuum bar, cleaning head and sweeping system have mechanical limit switches in order to protect the lifting spindle against damage due to incorrect control signals.

### **Signal generator reversing**

An acoustic warning signal sounds during reversing.

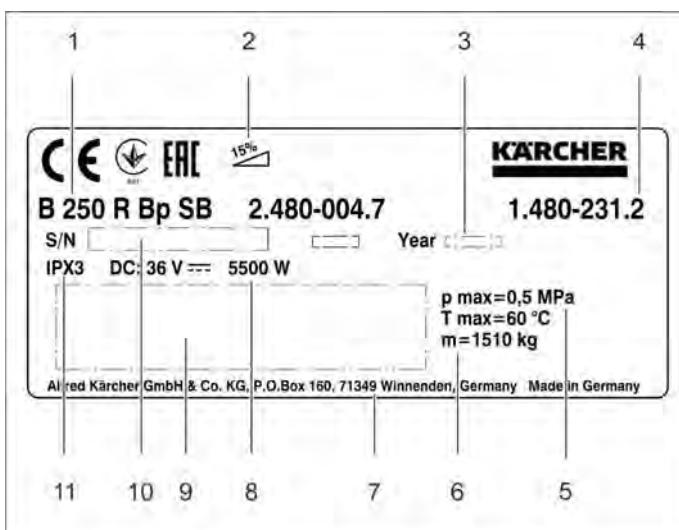
The horn installed in the appliance is used as a signal generator, the volume is not adjustable. The signal generator must not be damped or made inoperative by other measures.

### **Float switch of waste water tank**

A float switch is built into the waste water tank. The float switch switches off the suction turbine after a time delay when the waste water tank is full, in order to protect the turbine against damage from penetrating humidity.

A warning message is shown on the display.

## Type plate



The type plate is located on the bottom rear of the appliance frame.

- 1 Appliance description
- 2 Max. working range incline
- 3 Year of manufacture
- 4 Part number
- 5 Admissible temperature range
- 6 Specifications
- 7 Address of manufacturer
- 8 Performance data
- 9 Bar code. Contains part and serial number.
- 10 Serial number
- 11 IP rating/ protection class

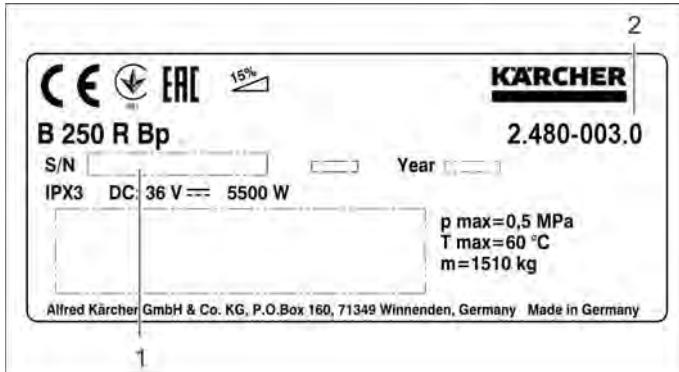
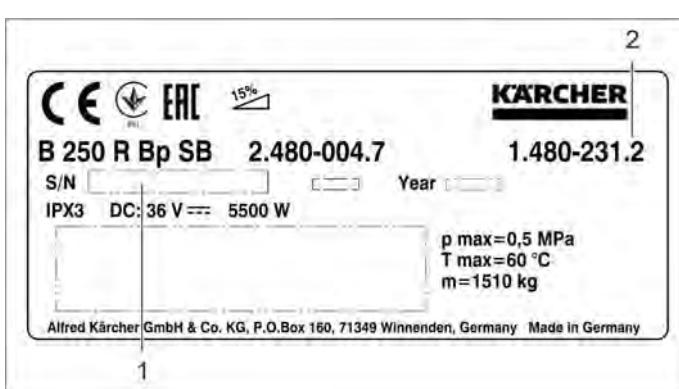
The type plate shows whether the appliance was configured or confectioned.

- 1 Serial number
- 2 Part number

### Type plate configured

The appliance was manufactured in the plant according to customer specifications.

The part number is issued automatically during the configuration process.

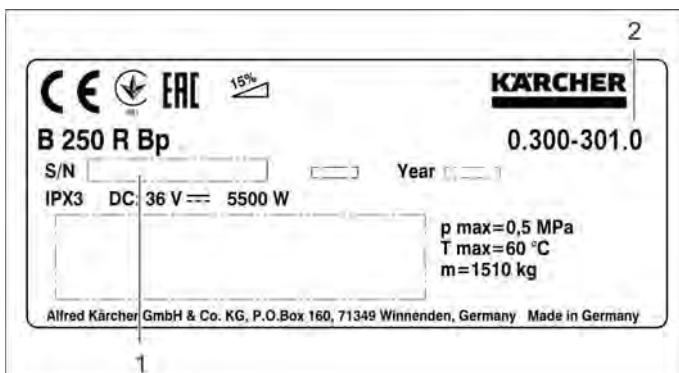


- 1 Serial number
- 2 Part number

### Type plate confectioned

The appliance consists solely of a pump unit. The appliance can be assembled with the different assemblies on site.

The serial number relates to the part number.



- 1 Serial number
- 2 Part number

### Type plate material model

Complete appliances as requested by the market are pre-produced under this part number.

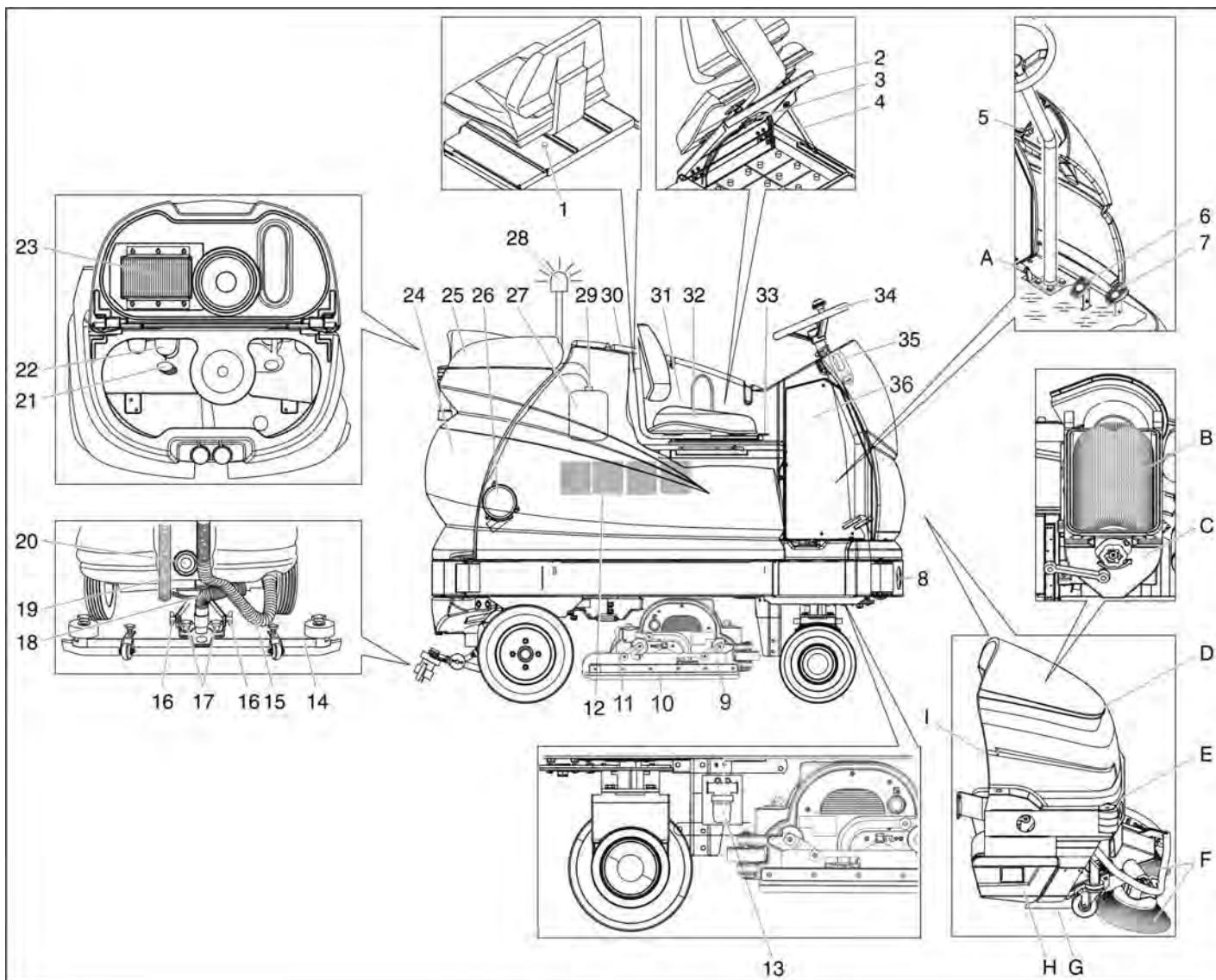
The serial number relates to the part number.

The part number 0.3xx-xxx.x and the serial number S/N are required for technical enquiries.

### DISIS

Base appliance 2.xxx-xxx.x must be entered into the search box of the DISIS.

## Overview of the appliance



- |   |   |
|---|---|
| 1 Screw of seat stopper                   | 19 Drainage hose for fresh water              |
| 2 Seat bracket                            | 20 Cleaning opening of the waste water tank   |
| 3 Battery socket                          | 21 Recycling filter                           |
| 4 Support of seat bracket                 | 22 Float                                      |
| 5 Adjustment of steering wheel            | 23 Flat fold filter                           |
| 6 Brake pedal                             | 24 waste water tank                           |
| 7 Drive pedal                             | 25 Cover waste water tank                     |
| 8 Light                                   | 26 Suction turbine                            |
| 9 Cleaning head                           | 27 Canister for detergent (optional)          |
| 10 Wiping flap                            | 28 Overall lamp                               |
| 11 Waste container (only BR)              | 29 Suction hose for detergent                 |
| 12 Battery                                | 30 Fresh water tank cover                     |
| 13 Fresh water filter                     | 31 Changeover recycling/fresh water operation |
| 14 Vacuum bar                             | 32 Seat (with seat contact button)            |
| 15 Dirt water discharge hose              | 33 Lever for seat adjustment                  |
| 16 Wing nuts for tilting the vacuum bar   | 34 Steering wheel                             |
| 17 Wing nuts for fastening the vacuum bar | 35 Automatic filling system fresh water tank  |
| 18 Suction hose                           | 36 Electronics/control                        |

### Pre-sweeping system B 250 RI

- |                              |  |
|------------------------------|--|
| A Pedal of bulk waste flap   | G Roller brush   |
| B Dust filter                | H Waste container left/right                                 |
| C Filter casing              | I Lock the hood of the sweeping mechanism (unlock = turn in) |
| D Hood of sweeping mechanism |  |
| E Sweeping mechanism         |  |
| F Side brushes               |  |

## Operator console



- 1 Main switch/ emergency stop
- 2 KIK holder
- 3 Sweeping ON/OFF switch, side brushes option or sweeping mechanism for B 250 RI
- 4 Detergent solution ON/OFF switch
- 5 Horn
- 6 Driving direction selector switch
- 7 Display
- 8 Info button
- 9 Program selection switch

## Program selection switch



### 1 Off

Appliance switched off.

### 2 Transport mode

Driving to the Place of Use.

### 3 Eco mode

Wet clean the floor (with reduced brush speed) and vacuum up wastewater (with reduced suction).

### 4 Normal mode

Wet clean the floor and vacuum up dirt water.

### 5 Increased brush contact pressure

Wet clean the floor (with increased brush contact pressure) and vacuum up dirt water.

### 6 Intense mode

Wet clean the floor and allow the detergent to react.

### 7 Vacuum mode

Suck in the dirt fleet.

### 8 Polishing mode

Polishing the floor without the application of liquid.

## Info button



### 1 Info button

Use the Info button to select the menu items and do the settings.

#### Note

Info button, display and indicator lamps (LED) are integral parts of the head CPU/ warning info module (A1) and cannot be individually replaced. If one component is defective, the entire head CPU must be replaced.

- Turning the button to the right/left scrolls through the menus forward/ backward.
- Pushing the button confirms a selected setting.

## Operations menu

You can make the settings for the different cleaning programs in the operator menu. Different parameters can be set based on the cleaning program. The settings are done using the Info button.

This procedure can be carried out in each switch menu.

Parameters set using the grey Intelligent Key remain unchanged until the appliance is restarted.

- Turn the programme selection switch to the desired cleaning programme.
- Press the Info button.  
The switch menu is displayed (see "Operation")
- Turn the Info button.  
The first adjustable parameter is displayed.
- Press the Info button - the set value flashes.
- Set the desired value by turning the Info button.
- Confirm the changed setting by pressing the Info button or wait until the set value is automatically accepted after 10 seconds.
- Select the next parameter by turning the Info button.
- After changing all required parameters, turn the Info button until "Exit menu" is displayed.
- Press the Info button - the menu is exited.

Parameter changes made in the individual cleaning programmes during operation are reset to the standard setting after the appliance has been switched off.

### To execute the standard setting:

- Turn the Info button until "Standard setting" is displayed.
- Press the Info button.
- Turn the Info button until the required cleaning programme is displayed.
- Press the Info button.
- Turn the Info button until the required parameter is displayed.
- Press the Info button - the set value flashes.
- Set the desired value by turning the Info button.
- Press the Info button.

### Note

If the selected parameter is not changed for 10 seconds, the display switches back to the standard view.

The same cleaning parameter can have individual settings for each cleaning program.

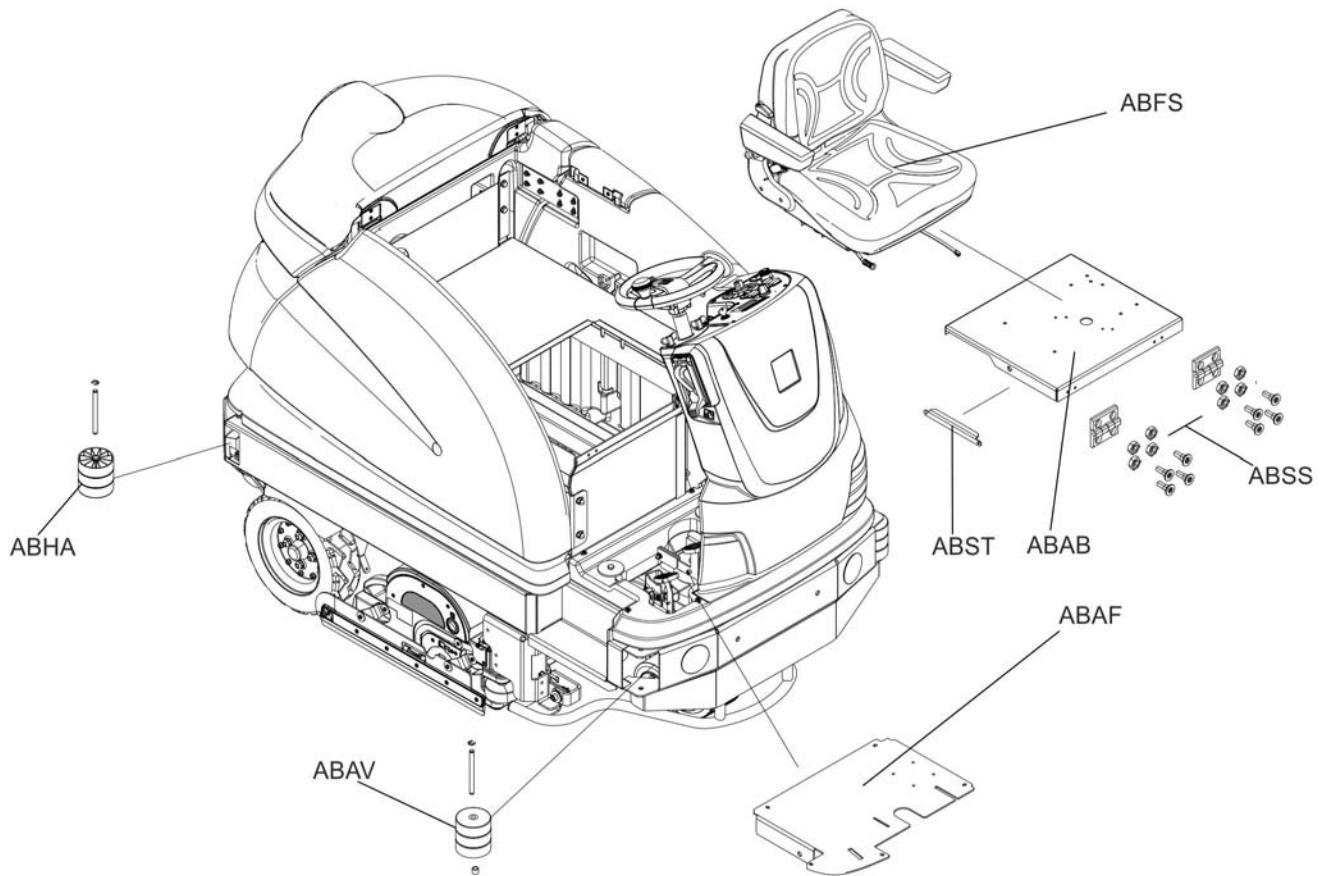
The brush contact pressure can be adjusted in the programmes for scour vacuuming, wet scrubbing, polishing and polish vacuuming.

All settings are saved in the powerless state of the machine.

A software and parameter overview can be found at the end of this service manual.

## Overview over the service and functional groups

### AB Setup



## AC Control panel

ACHS

ACBF

ACBS

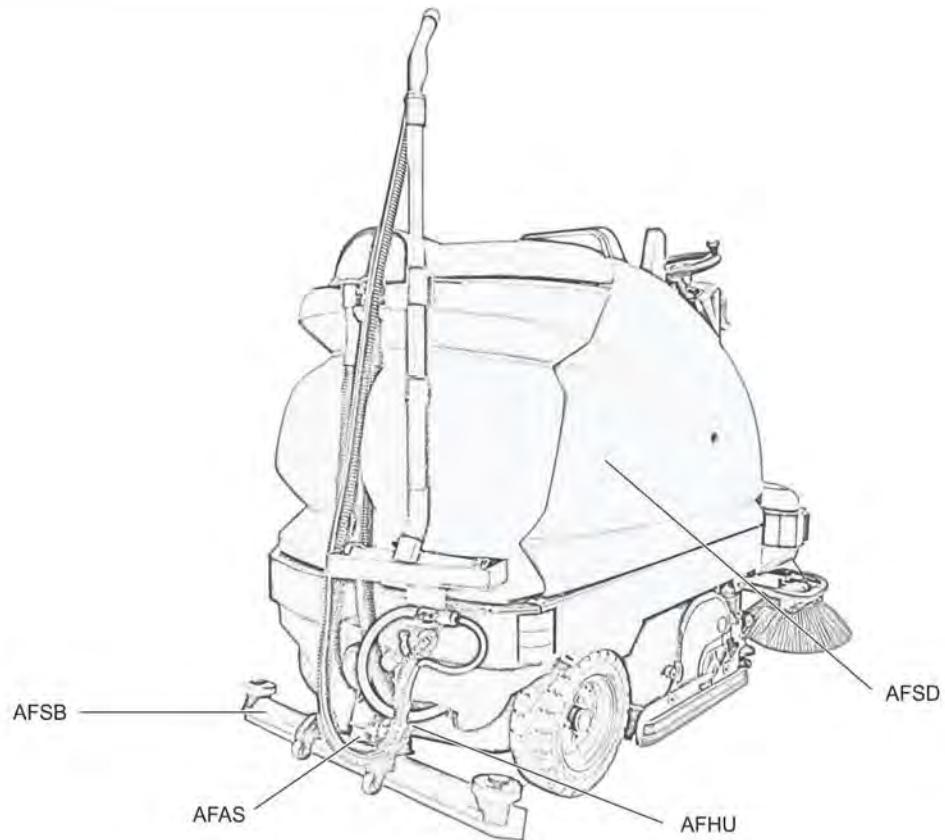
ACFR

ACCP

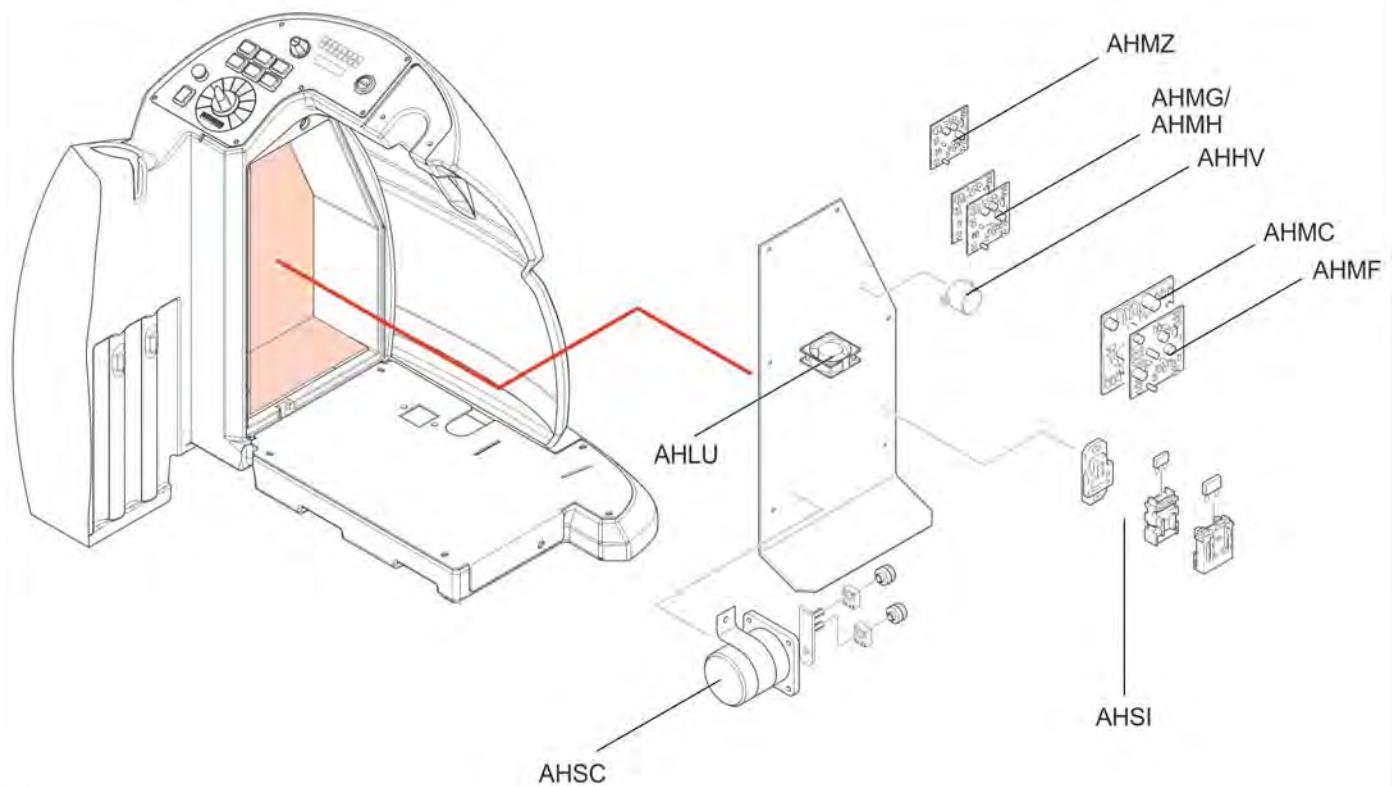
ACPW



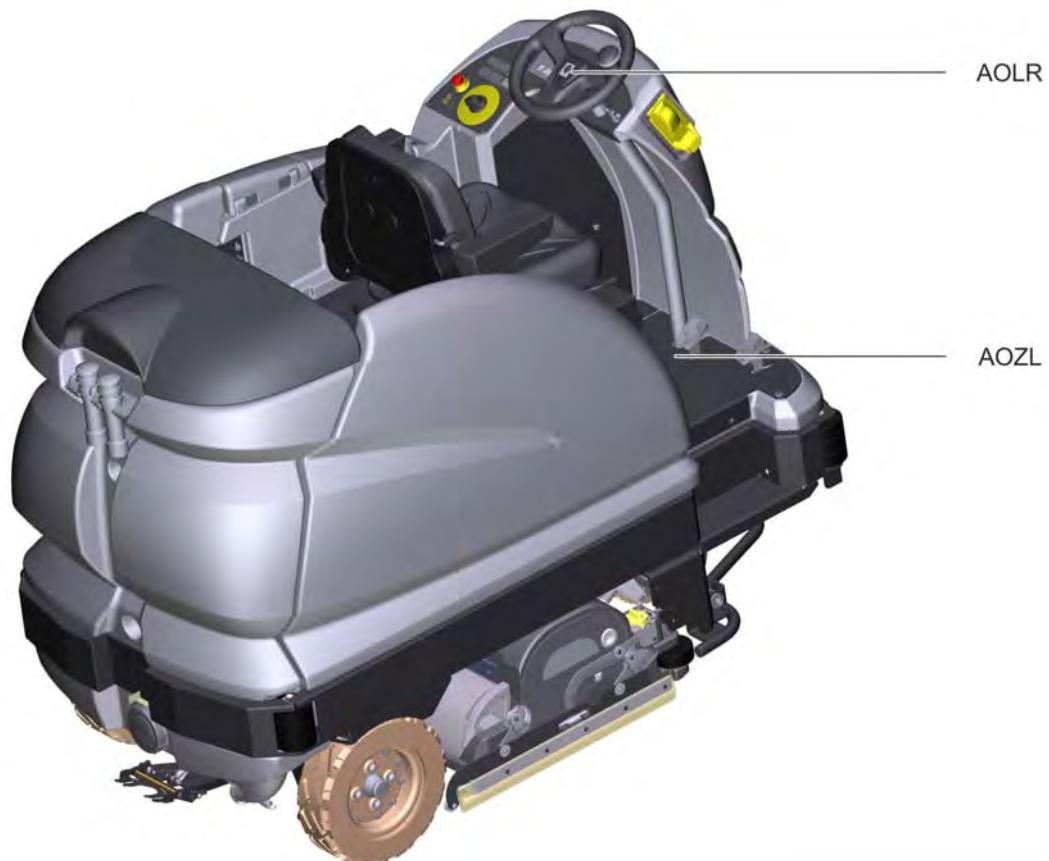
## AF suction system



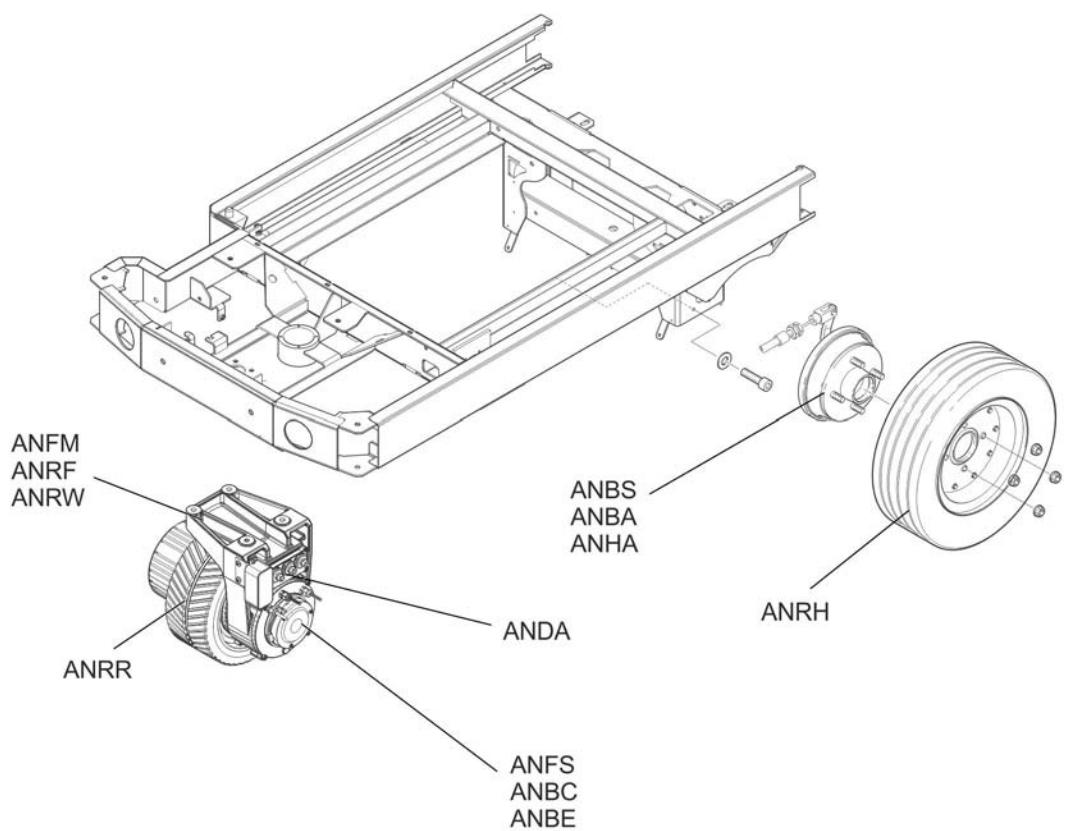
## AH Appliance electronics



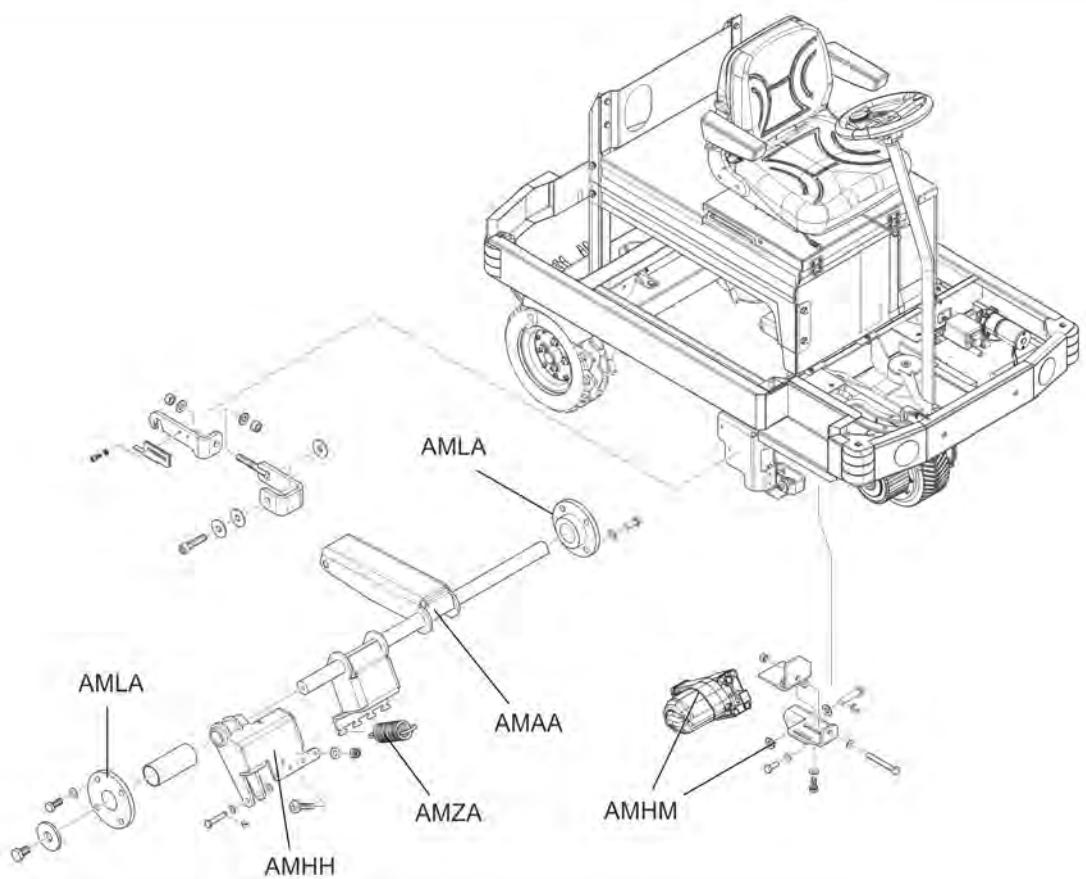
## AO steering



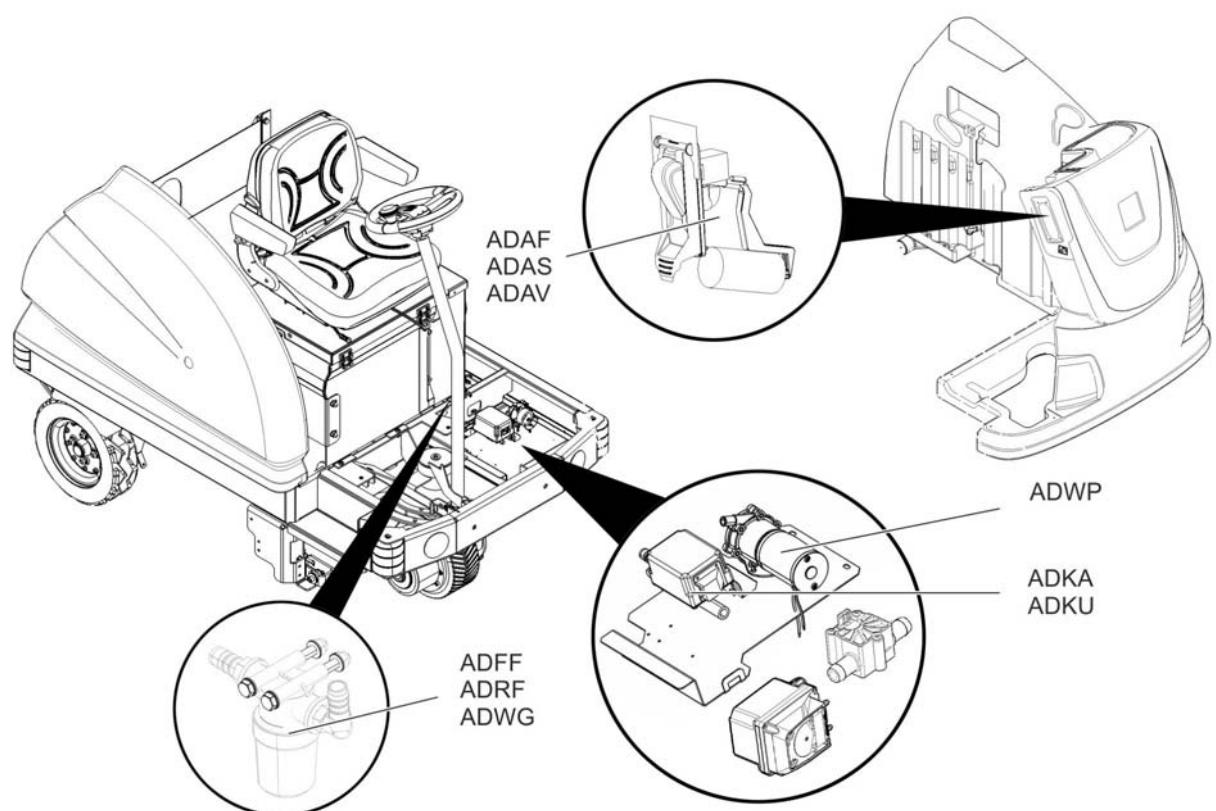
## AN running gear



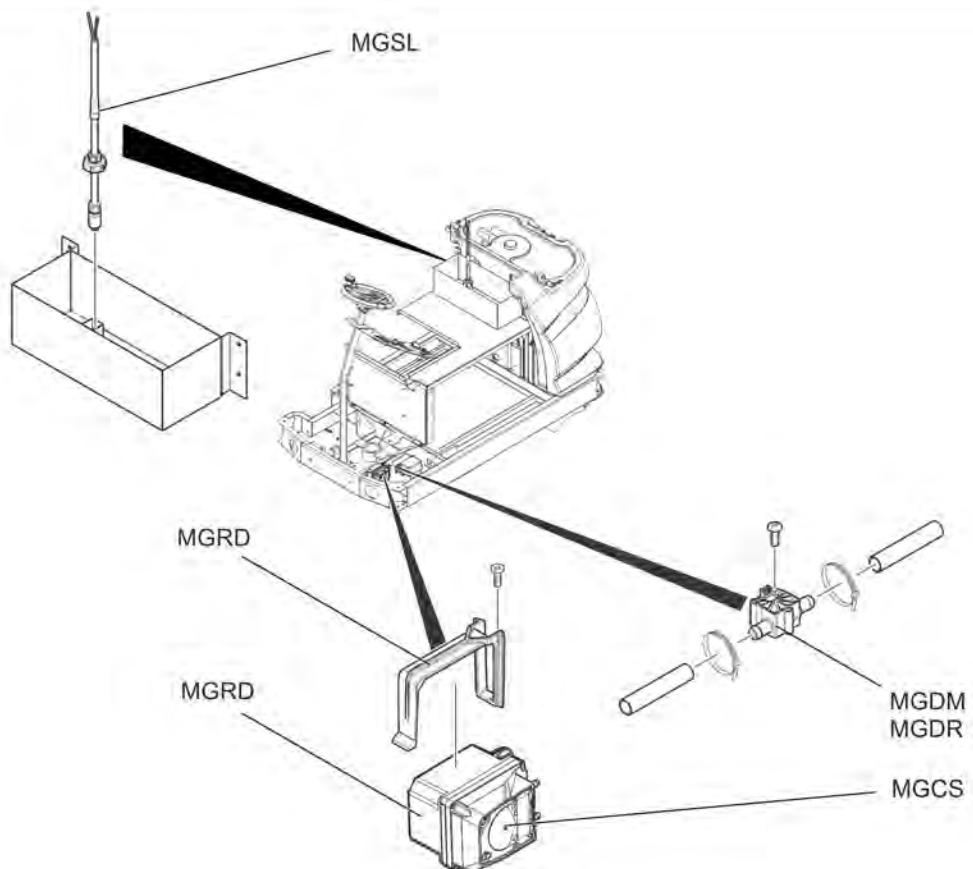
## AM Cleaning head suspension



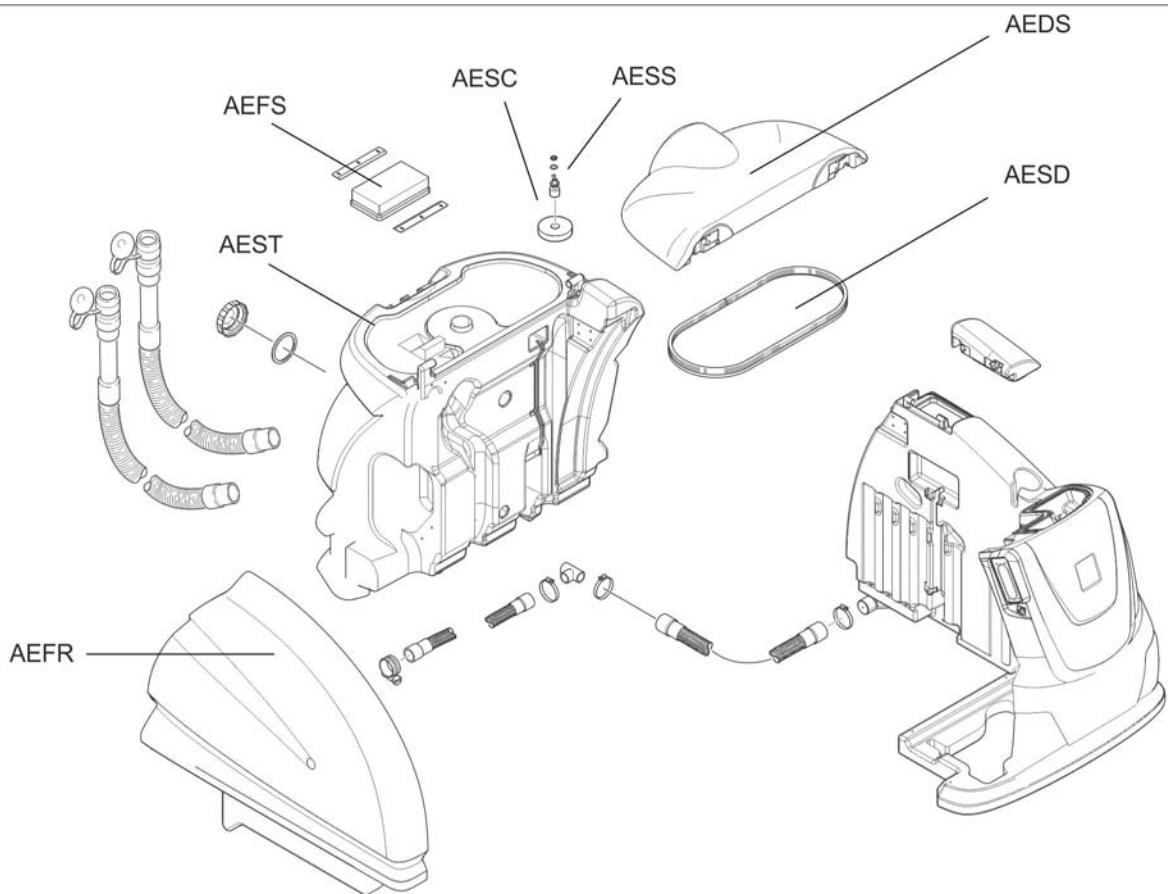
## AD Fresh water system



## MG Detergent dosing unit (DOSE)



## AE Tank system



## AB Service group setup

### 010 Safety information

#### ⚠ WARNING

Switch off the appliance on the key switch and secure it against rolling away.

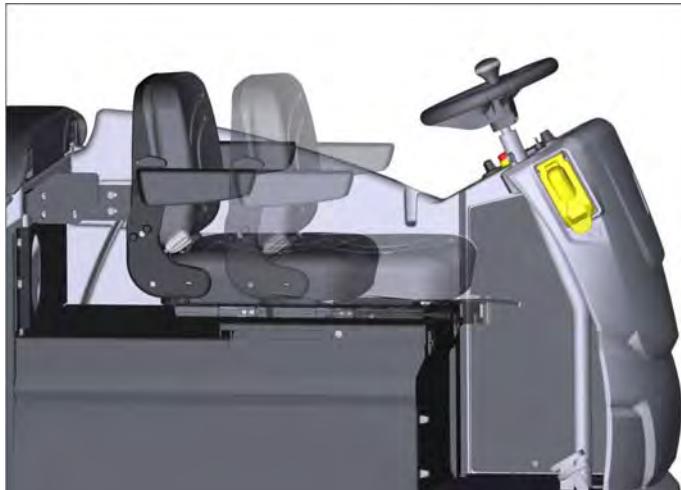
Disconnect the connection cable of the battery.

Observe general safety information!

### 020 Overview



## 030 Function



The driver seat can be adjusted.  
A seat contact switch is installed in the driver seat.  
The seat console is mounted on the battery cover.



The seat and the battery cover can be tilted forwards, the battery becomes accessible.  
The appliance plug is secured on the battery cover.



The appliance is equipped with 4 bumper wheels in the frame.  
The bumper wheels consist of 3 disks each that can be replaced individually.



Under the footwell insulation panel

- Pedals
- Steering bearing and steering
- Lifting motors
- Accelerator sensor
- Brake wire

are installed.

## 040 Service activities

### ABFS Uninstall / install driver seat with seat rails

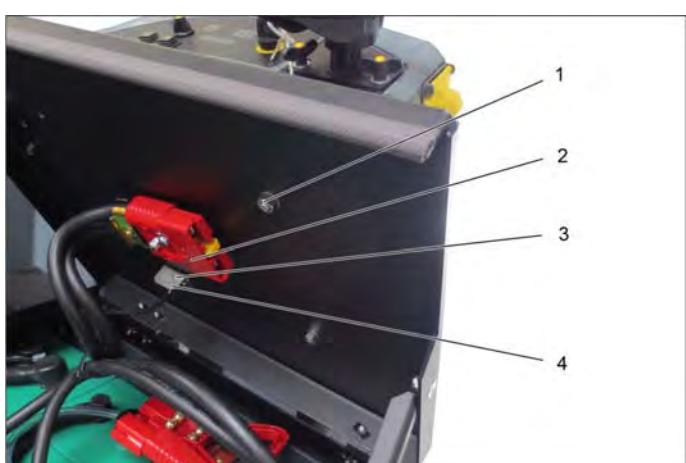


- 1 Console rail
- 2 Lock
- 3 Seat rail
- 4 Adjustment lever
- 5 Connection cable seat contact switch

- Check the seat switch.
- Load the seat with more than 50 kg.
- Measure the microswitch resistance.

**Note**

Target: smaller than 1 ohm.



- 1 Nut console rail
- 2 Battery socket
- 3 Plug for seat contact switch
- 4 Holder plug seat contact switch

- Tilt the battery cover forward.
- Pull the seat contact switch plug out of the holder.
- Unscrew the nuts of the console rails.
- Remove the driver seat from the battery cover.

**Note**

If the driver seat is only to be dismantled, the console rails can remain on the battery cover.

When replacing the driver seat, the console rails must be replaced as well.

## ABAB Uninstall/install battery cover

- *ABFS Uninstall / install driver seat with seat rails*
- *ABST Uninstall/install battery cover support*



- 1 Appliance plug
- 2 Nut
- 3 Cable tie

→ Sever the cable tie.  
→ Loosen the mounting nuts.  
→ Remove the appliance plug from the cover.



→ Unscrew the screws.  
→ Remove the battery cover from the appliance.



- 1 Cable tie

### Installation information

After the driver's seat has been installed, reconnect the battery cables using the cable ties.  
When closing the battery cover, make sure that no cables are jammed.

## ABSS Uninstall/install battery cover hinges

■ *ABAB Uninstall/install battery cover*

→ Unscrew the screws.

→ Remove the hinge from the battery cover.



## ABAFO Uninstall/install footwell cover

1 Screws

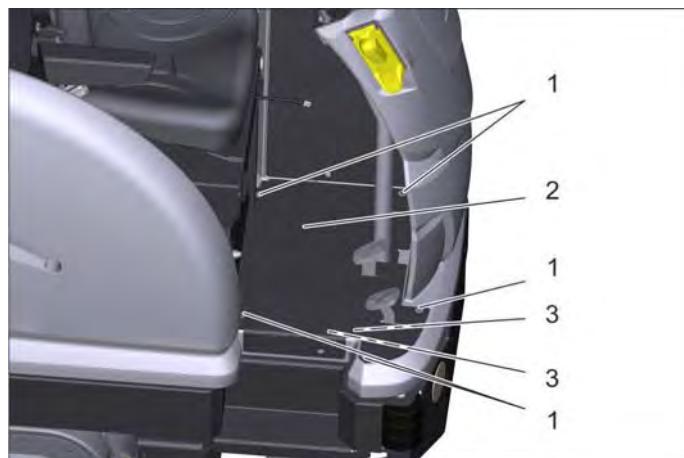
2 Footwell cover

3 Electric socket plug connections

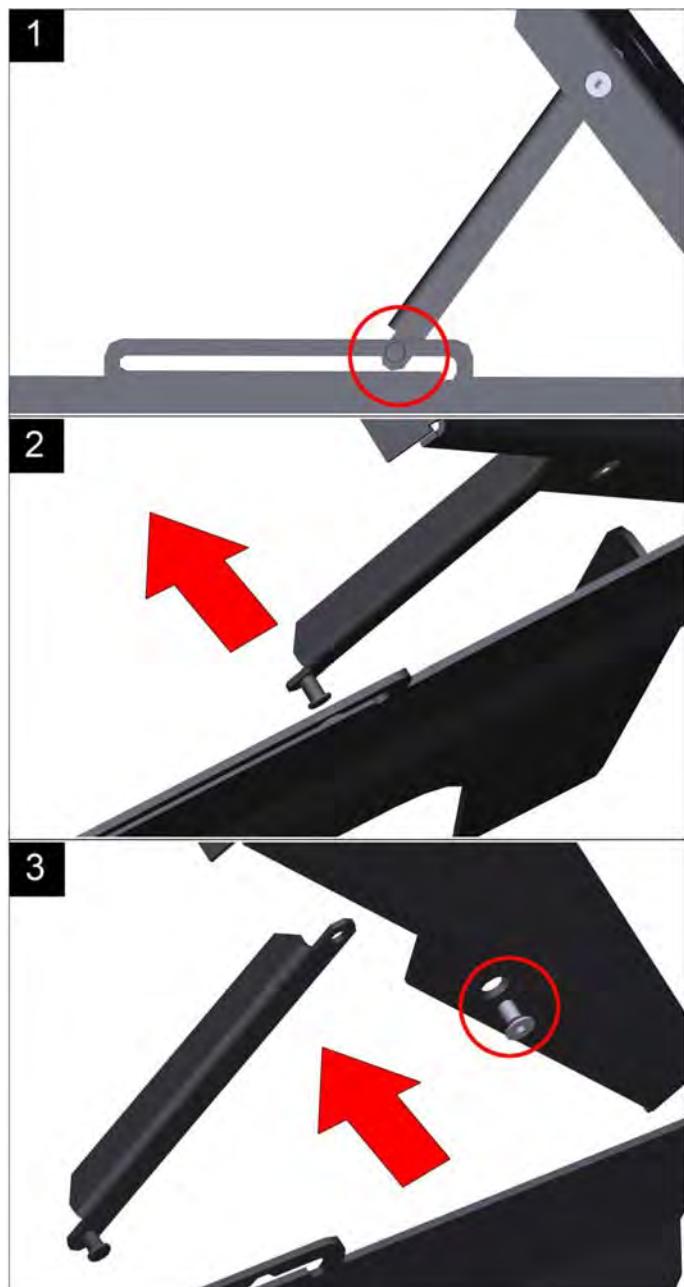
→ Unscrew the screws.

→ Remove the cover from the appliance.

→ Separate the electric connectors.



## ABST Uninstall/install battery cover support



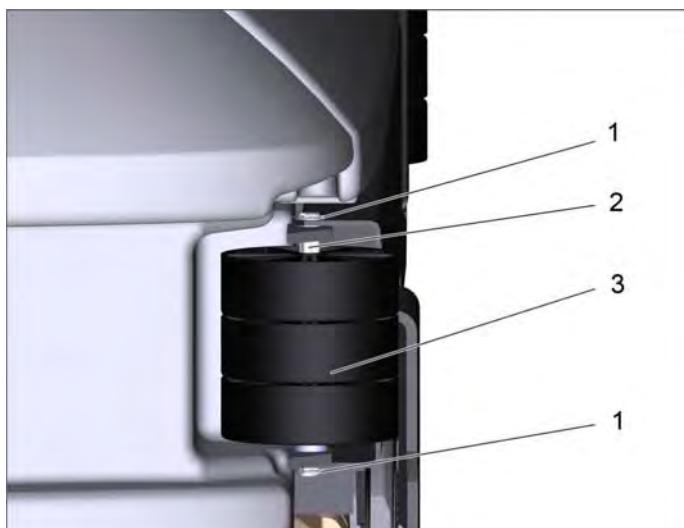
→ Tilt the seat to the front.

### ⚠ WARNING

*Risk of crushing! Without a support the driver seat falls backwards. Fixate the driver seat on the steering wheel using a strap retainer prior to dismantling the support.*

- 1 Place the support in the middle notch of the guide rail.
- 2 Push the support out of the rail in this position.
- 3 Unscrew the screw, remove support.

## ABAV Uninstall / install bumper wheels in the front



- 1 Safety ring
- 2 Washers
- 3 Axle



- Remove the retaining ring from the axle.
- Remove the axle from the appliance towards the bottom.
- Remove the individual disks of the bumper wheel from the appliance.

## 050 Maintenance and inspection

Service group does not contain any maintenance and inspection points.

## 060 Error diagnosis

The service group does not contain any error diagnosis.

## 070 Peculiarities/ others

The service group does not contain any peculiarities.

# AC Service group control unit

## 010 Safety information

### ⚠ WARNING

Switch off the appliance at the power switch and secure against rolling away!

Disconnect the connection cable of the battery.

Observe general safety information!

### ⚠ CAUTION

Risk of damage by electrostatic discharge (ESD)! Take suitable measures for discharging electrostatic charge prior to performing work on the appliance electronics.

## 020 Overview



- 1 Main switch/ emergency stop
- 2 KIK support
- 3 Sweeping ON/OFF (side brushes option or sweeping mechanism for B 250 RI)
- 4 Cleaning solution ON/OFF
- 5 Horn
- 6 Driving direction selector switch
- 7 Display
- 8 Info button
- 9 Program selection switch

## 030 Function



The control panel contains the control elements for the appliance functions.

The main switch switches the appliance on/off and is used as an EMERGENCY off.

The display shows information about filling levels, appliance functions and errors detected by the control.

Settings are made via the info button.



### Description of the display



- 1 Brake is applied
- 2 Detergent dosing unit selected
- 3 Filter vibrator for presweep facility
- 4 Presweep facility or side brush function selected
- 5 Detergent solution switched off
- 6 Waste water tank full
- 7 Detergent empty.

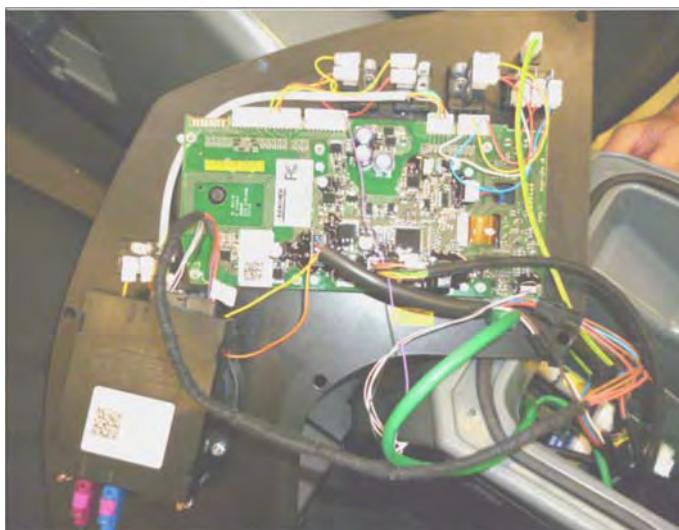
## 040 Service activities

### ACBF Uninstall / install the control panel



- 1 Screws
- 2 Operating field

→ Unscrew the screws.  
→ Remove the control panel.



#### Note

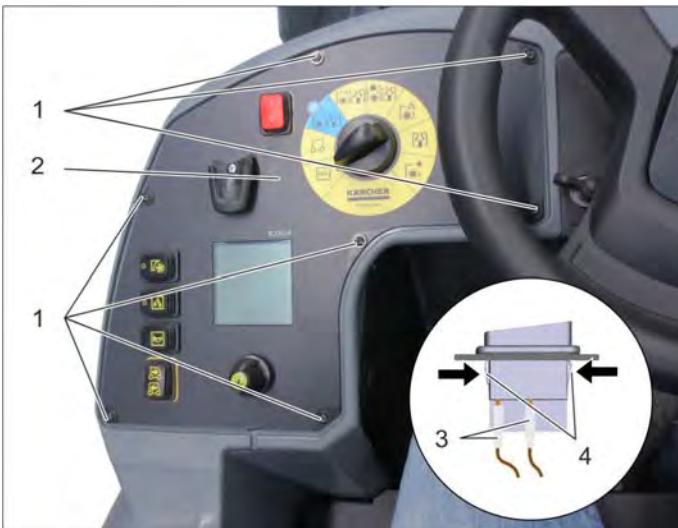
To disconnect the electrical connections, set down the operating module on the appliance.  
Mind the correct seating of the seal upon reinstallation!

### ACBS Uninstall / install control panel switch

#### ■ ACBF Uninstall / install the control panel

- 1 Sweeping ON/OFF (side brushes option or sweeping mechanism for B 250 RI)
- 2 Cleaning solution ON/OFF
- 3 Horn





- 1 Screws
- 2 Operating field
- 3 Electric socket plug connections
- 4 Locks

- Unscrew the screws.
- Remove the control panel.
- Separate the electric connectors.
- Unlock the locks.
- Pull the switch out of the console.

**Note**

Mind internal cables.

### ACHS Uninstall / install main switch

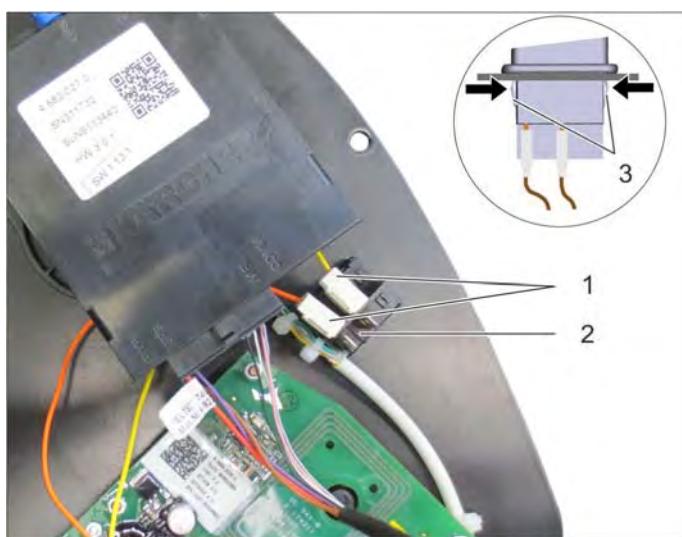


- 1 Screws
- 2 Operating field

- Unscrew the screws.
- Remove the control panel.

**Note**

Mind internal cables.



- 1 Electric socket plug connections
- 2 Main switch
- 3 Locks

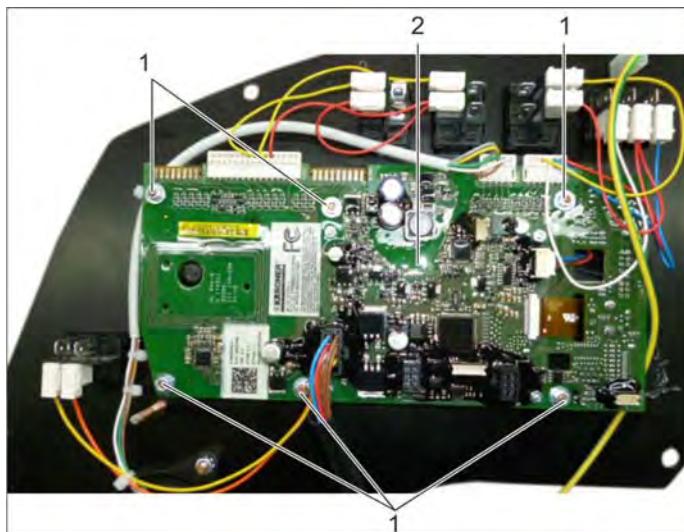
- Separate the electric connectors.
- Unlock the locks.
- Remove the main switch.

## ACCP Uninstall / install head CPU

### ■ ACBF Uninstall / install the control panel

- 1 Stud bolt / nut  
2 Head CPU

→ Disconnect plug-in connections on the electronics.  
→ Unscrew nuts of the stud bolt.  
→ Remove the electronics from the mounting frame.  
→ Pay attention to tight plug connections during installation.



## ACFR Uninstall / install travel direction switch and signal horn button

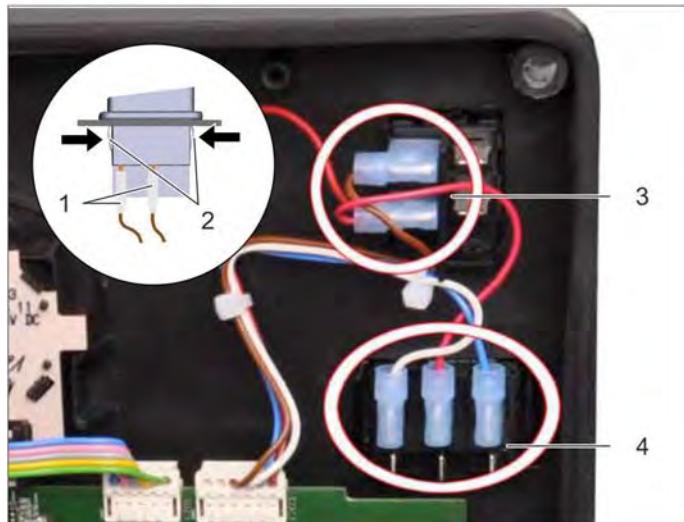
### ■ ACBF Uninstall / install the control panel

- 1 Electric socket plug connections  
2 Locks  
3 Signal horn button  
4 Driving direction switch

→ Separate the electric connectors.  
→ Unlock the locks.  
→ Pull the switch out of the console.

#### Note

Upon installation, ensure that the alignment of the switch corresponds to the direction of travel.

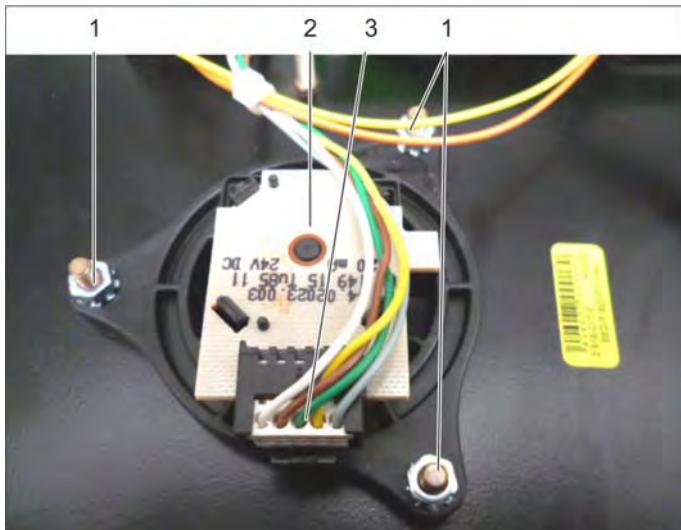


## ACPW Uninstall / install programme selector switch

### ■ AHFM Uninstall / install Fleet module

→ Pull off the rotary handle.  
→ Loosen screws.





- 1 Stud bolt / nut
- 2 Program selection switch
- 3 Electric connectors

- Separate the electric connectors.
- Unscrew nuts of the stud bolt.
- Remove the switch from the carrier plate.

## 050 Maintenance and inspection

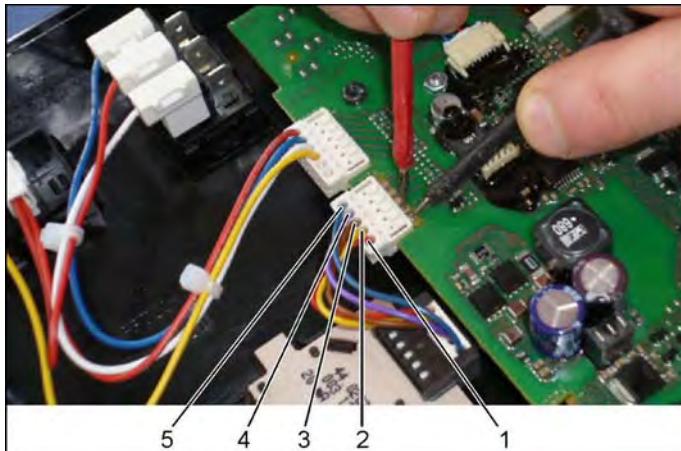
Service group does not contain any maintenance and inspection points.

## 060 Error diagnosis

Findings	Possible cause	Correction
Appliance cannot be started	Battery plug unplugged at the appliance.	Insert battery plug.
	Battery dead	Charge battery.
	KIK key or emergency off switch defective	Check/exchange the KIK key and emergency off switch
	Fuse F1 / F2 defective.	Check fuses / replace defective fuse.
	Emergency stop pushbutton pushed / defective.	Turn to unlock / check / replace emergency stop pushbutton.
Consumer without function	Switch for the consumer defective	Test the switch in the control panel test or in the service programme, or check electrically using the measuring device. In the event of a defect, replace. Test the consumer in test mode.
One or more cleaning programmes do not function.	Programme selector switch faulty.	Test the switch in the control panel test or in the service programme, or check electrically using the measuring device. In the event of a defect, replace.
Main board A1 defective	Intrusion of water, short circuit	Identify cause, replace main board A1.
Faults with display		See table for troubleshooting.

## 070 Peculiarities/ others

### Check the programme selector switch



#### ■ ACBF Uninstall / install the control panel

- Push the plug back slightly.
- Connect the resistance measurement device to the plug connections.
- Measure resistance. See table for reference values:

Switch setting	Resistance measurement between		Nominal value in Ohm
OFF	1		—
Transport mode	1	2	<50
Eco mode	1	2	<50
		3	
Normal mode	1	3	<50
Increased brush contact pressure	1	3	<50
		4	
Intense mode	1	2	<50
		3	
		4	
Vacuum mode	1	2	<50
		3	
		4	
Polishing mode	1	4	<50

### Check the control panel



- 1 Display
- 2 Main switch
- 3 Horn button
- 4 Driving direction switch
- 5 Switch for side brushes or presweep unit
- 6 Switch for detergent solution
- 7 Program selection switch
- 8 Info button
- 9 Intelligent Key



Check the following on the control panel:

1. Display contrast
2. Display pixel test
3. Main switch
4. Horn button
5. Driving direction switch
6. Switch for side brushes or presweep unit
7. Switch for detergent solution
8. Program selection switch
9. Info button
10. Intelligent Key

### **Check procedures**

- Turn on the main switch.
- Plug in the Intelligent Key.
- Keep the horn button pressed and turn the programme selector switch from Off to transport
- Test routine panel launches up.
- Push the Info button.

#### **1. Set the display contrast**

- You can adjust the display contrast by turning the Info button.
- Press the Info button again to save.
- Keep the horn and Info button pressed to reset to the factory settings.
- Next test starts.

#### **2. Pixel test display**

- The upper half of the display is black.
- Push the Info button.
- The lower half of the display is black.
- Push the Info button.
- Next test starts.

#### **Testing the main switch**

- Switch the main switch off and on

#### **4. Test the horn button**

- Press and release the horn button

#### **5. Test the travel direction switch**

- Move the travel direction switch forwards and backwards
- If both directional states are recognised at the same time, the error "X" appears and the test is interrupted.

#### **6. Switch for side brushes or presweep unit**

- Switch the switch for side brushes or presweep unit on/off

#### **7. Switch for detergent solution**

- Switch the switch for detergent solution on/off

#### **8. Test the programme selection switch**

- Turn the programme selector switch from Transport to Polish

## **9. Test the Info button**

- Rotate the Info button all the way to the left
- Rotate the Info button all the way to the right
- Push the Info button.
- Next test starts.

## **10. Test the Intelligent Key**

- If no intelligent key is inserted, the intelligent key symbol will appear in the display.
- Once a valid intelligent key is inserted, the colour of the intelligent key will appear in the display.
- "RFID tag" appears if the intelligent key is not recognised
- Push the Info button.
- Next test starts.
- Push the Info button.

## **End tests**

- The display backlighting switches between yellow and white.
- The operating panel test is now complete.
- Push the Info button.

## 010 Safety information

### ⚠ WARNING

Switch off the appliance on the key switch and secure it against rolling away.

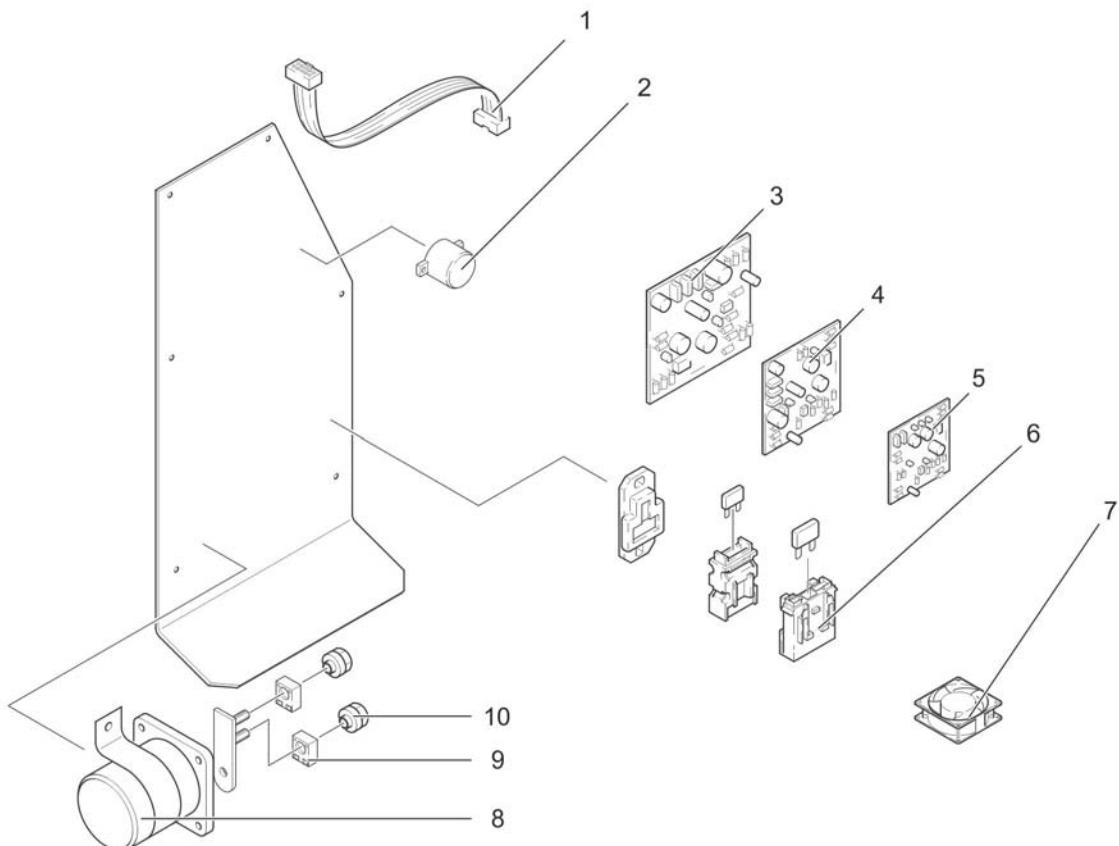
Disconnect the connection cable of the battery.

Observe general safety information!

### ⚠ CAUTION

Risk of damage by electrostatic discharge (ESD)! Take suitable measures for discharging electrostatic charge prior to performing work on the appliance electronics.

## 020 Overview



1 Data cable (bus cable)

2 Horn

3 Drive module

4 Clean module

5 Lift module

6 Appliance fuses

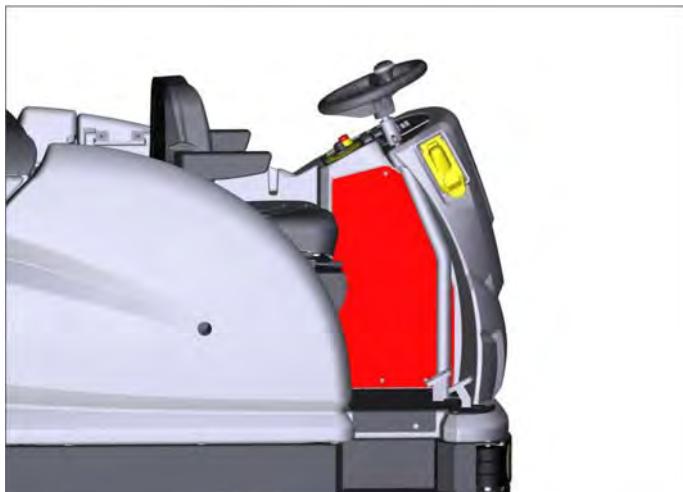
7 Fan

8 Main relay

9 Fuses

10 Nut with flange

## 030 Function



The appliance electronics is located underneath the cover, at the side of the work station.

The appliance electronics consists of

- Drive module
- Clean module
- Lift module
- Accessory module

Moreover,

- Horn
- Main relay
- Fan
- Fuses

are accommodated.

The main relay switches on the power electronics after a successful self-test.

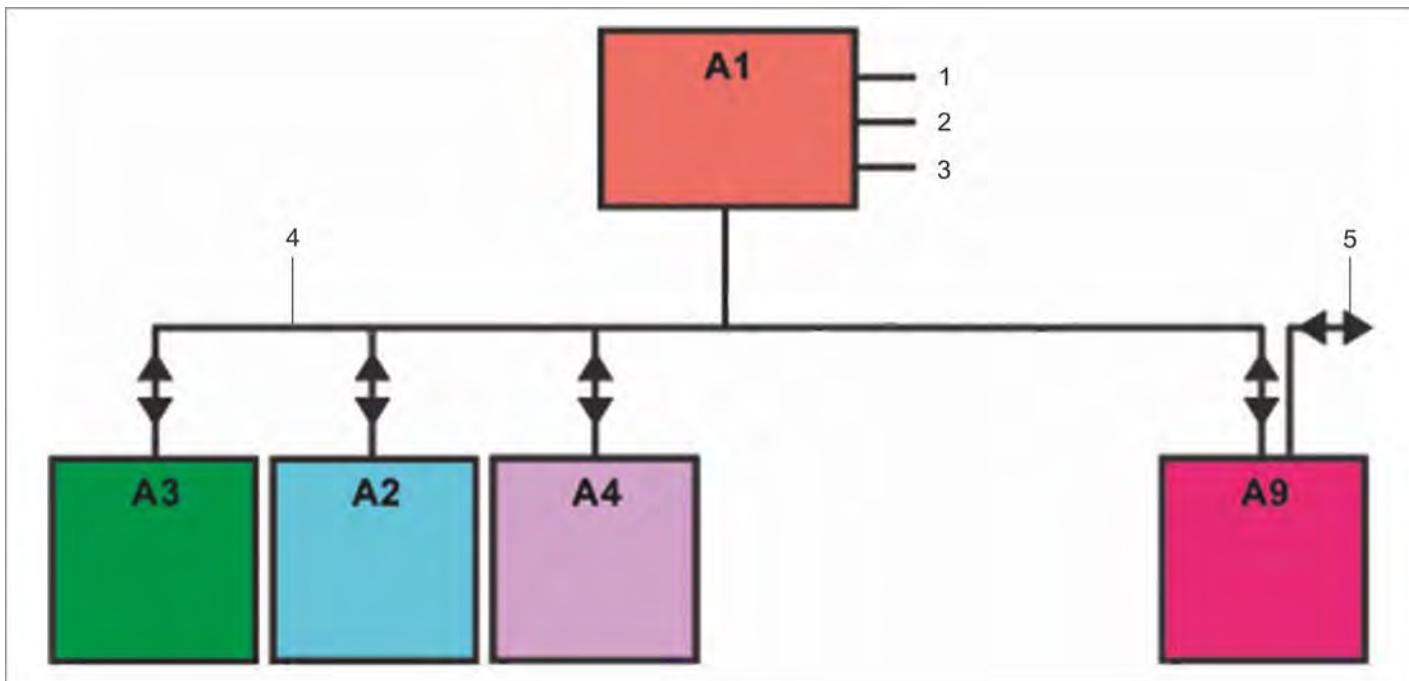
The fan runs continuously after switching on the appliance and cools the modules of the appliance electronics.

The modules of the appliance electronics are connected to one another via a data cable (bus cable).

A detailed representation of the module interconnectedness can be found in the "Module interconnectedness" chapter and in the circuit diagram.

*Module networking*

## Module networking



- 1 Operating System  
 2 Machine procedures  
 3 Error diagnosis  
 Correction

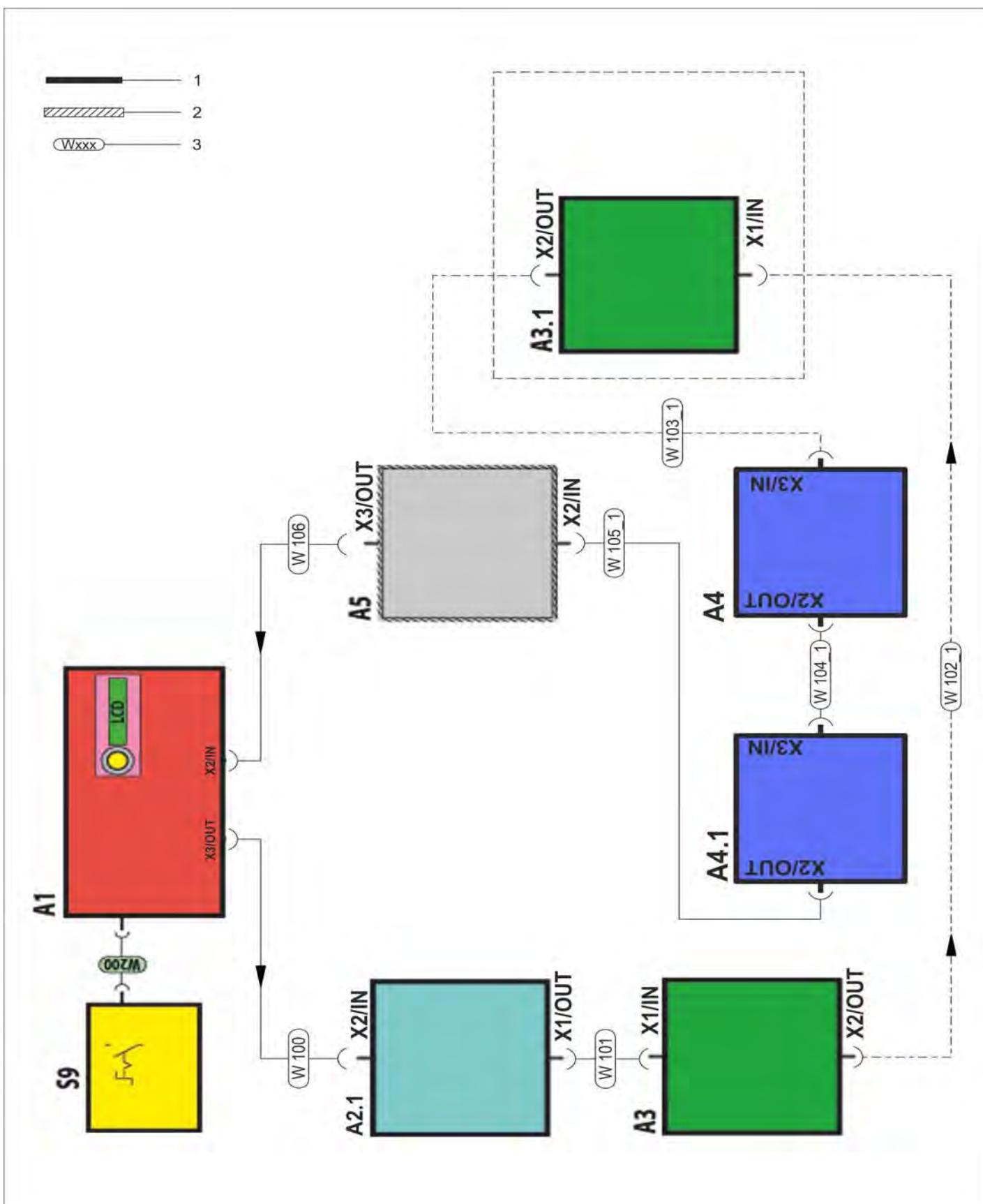
- 4 Extendible serial network cable bus)  
 5 Personal Computer

A1	Head CPU	<ul style="list-style-type: none"> <li>- Fan</li> <li>- Direction of travel</li> <li>- Relay</li> <li>- Main switch</li> <li>- Horn button</li> <li>- Program selection switch</li> <li>- TCU</li> </ul>
A2	Drive module	<ul style="list-style-type: none"> <li>- Driving operations</li> <li>- Electromagnetic brake</li> <li>- Horn</li> <li>- Seat switch</li> <li>- Drive pedal</li> <li>- Direction switch</li> <li>- Engine encoder</li> <li>- Engine resistor</li> </ul>
A3	Clean module	<ul style="list-style-type: none"> <li>- Brushes</li> <li>- Vacuum device</li> <li>- Detergent dosing</li> <li>- Float switch</li> <li>- Water pump</li> <li>- Water valve</li> <li>- Level sensor</li> <li>    Fresh water</li> <li>- Swimmer switch</li> <li>    Chemicals tank</li> <li>- Micro switch</li> <li>    Wastewater</li> </ul>
A3/1	Cleaning module for side brushes	<ul style="list-style-type: none"> <li>- Roller brush</li> <li>- Suction blower</li> <li>- Filter cleaning</li> </ul>
A4	Lift module	<ul style="list-style-type: none"> <li>- Lifting motors</li> <li>- End switch</li> </ul>

A4/1	Lifting module for side brushes	<ul style="list-style-type: none"> <li>- Side brushes</li> <li>- Lifting motor</li> <li>- End switch</li> </ul>
A4/2	Lifting module for presweep facility	<ul style="list-style-type: none"> <li>- Side brushes</li> <li>- Lifting motor</li> <li>- End switch</li> </ul>
A5	Accessory module	<ul style="list-style-type: none"> <li>- Work light</li> <li>- Spraying valve for presweep unit</li> <li>- Overall lamp</li> </ul>
A9	Service module	<ul style="list-style-type: none"> <li>- Diagnosis</li> <li>- Parameterization</li> <li>- Display adjustment</li> <li>- Firmware download</li> </ul>

- Modules are interconnected via the Kärcher bus system.
- After a predefined process, the bus protocol secures the logical consistency of the module parameters.
- Module parameters are saved in the head CPU and the modules concerned.
- Head CPU compares the parameters with the other modules after the machine is switched on.
- The following runs during the self-test:
  - 1 Head CPU has valid module parameters which differ from the parameters of the modules. Head CPU parameters are added to the other modules.
  - 2 Head CPU does not have any valid module parameters (parameter memory is empty or inconsistent). Head CPU adopts the parameters from the other modules.
  - 3 Head CPU has the same parameters as other modules.

## Module system B 250 R

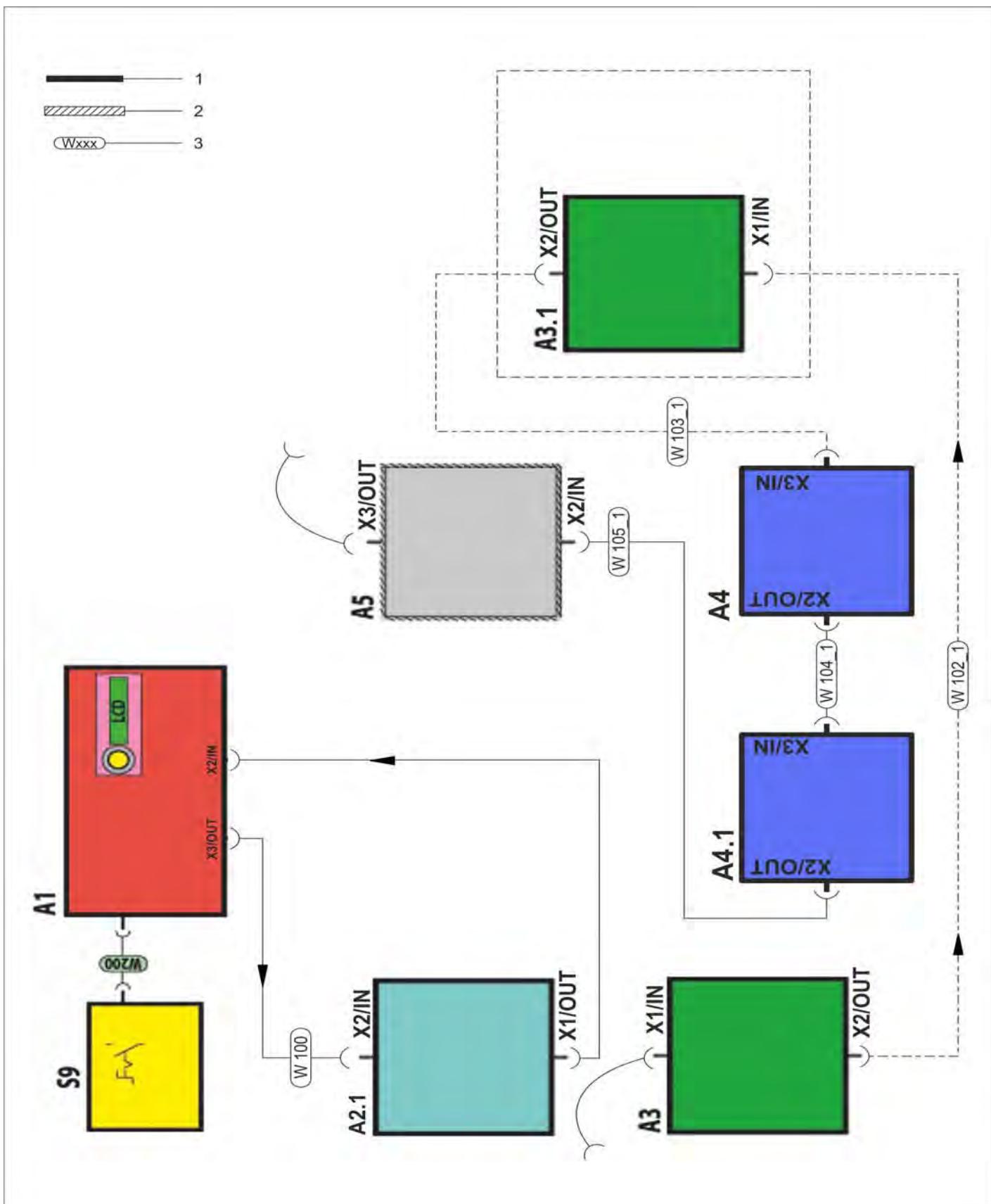


A1	Head CPU
A2	Drive module
A3	Clean module
A3.1	Cleaning module for side brushes
A4	Lift module
A4.1	Lifting module 2, option

A5	Accessory module
S9	Program selection switch

- 1 Basic unit
- 2 Accessories
- 3 Kärcher Bus cable 1:1,(6-pin, with integrated RS 485 Bus system)

## Emergency operation (driving)



A1	Head CPU
A2	Drive module
A3	Clean module
A3.1	Cleaning module for side brushes
A4	Lift module
A4.1	Lifting module 2, option

A5	Accessory module
S9	Program selection switch

- 1 Basic unit
- 2 Accessories
- 3 Kärcher Bus cable 1:1,(6-pin, with integrated RS 485 Bus system)

## Troubleshooting

To identify faulty modules or bus cables, disconnect all modules from the bus.

### ■ Emergency operation (driving)

- Connect the drive module to the head CPU and test the drive function.
- If the test has been passed, integrate one module / bus cable after another in the bus and test until the defective component can be determined.

## Checking the data lines (bus cable)

The bus cables can be checked.

Each module has a bus input and a bus output.

Different voltages are fed on six lines which go through all of the modules.

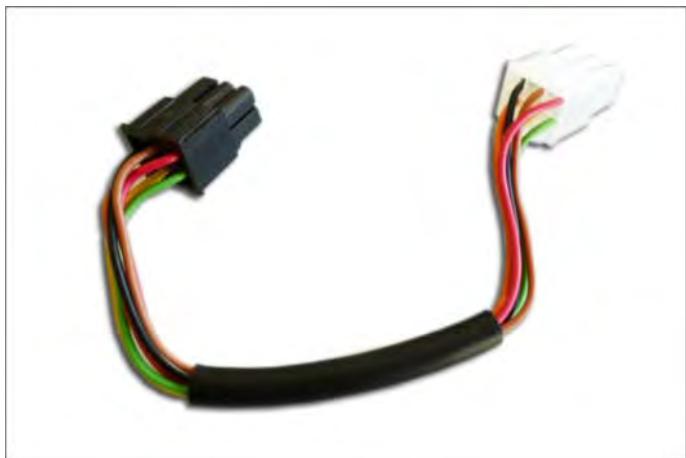
If there is no longer any voltage across an output of a module, it can be assumed that the module is damaged or the module bus plug contacts were poorly assembled or damaged.

Bus cable in = white slot

Bus cable out = black slot

## Bus Connector in/ out

		Line	Measuring result between line and negative	
Pin 1	13 V	Black	~13	Volt
Pin 2	RS 485 A	Brown	~2,5	Volt
Pin 3	UBAT-BUS	Red	~36	Volt
Pin 4	GS-IN	Orange	~36	Volt
Pin 5	RS 485 B	Yellow	~2,5	Volt
Pin 6	ATTN-IN	Green	~10	Volt



A bus cable that is defective or not properly plugged in generates an error message.

Another source of errors are defective plug connections (bent plug contacts).

### Colour coding plug

Black: OUT

White: IN



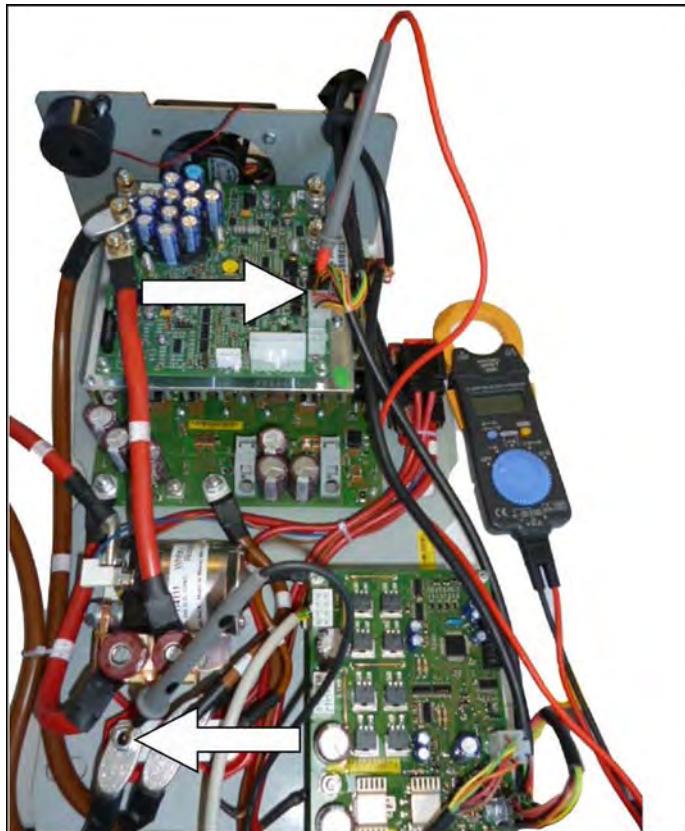
→ Connect the negative cable of the measuring device to the central earth point.

→ Measure the individual bus cables with the positive wire of the measuring device.

#### Note

The appliance must be switched on for the measurement, but no consumer may be active.

Perform the measurement at the input jack of the module. Observe the reference values in the following table!



## 040 Service activities

### AHFM Uninstall / install Fleet module

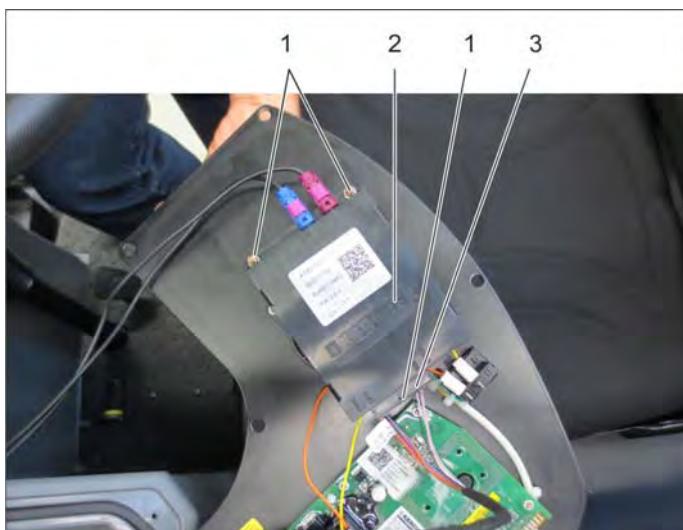


- 1 Cover with driver seat
  - 2 Battery socket
- Raise the driver's seat cover.  
→ Pull out the battery plug.

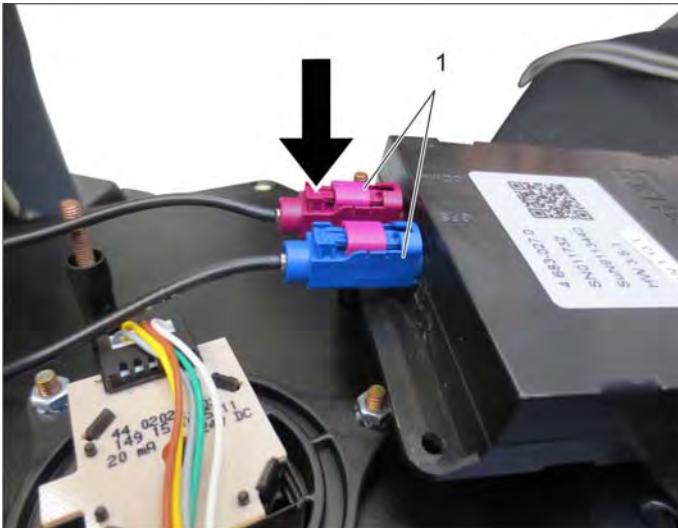


- 1 Screws
  - 2 Operating field
- Unscrew the screws.  
→ Remove the control panel.

**Note**  
Mind internal cables.



- 1 Nuts
  - 2 Fleet module
  - 3 Electric connectors
- Unscrew the nuts.  
→ Separate the electric connectors.



## 1 Electric socket plug connections

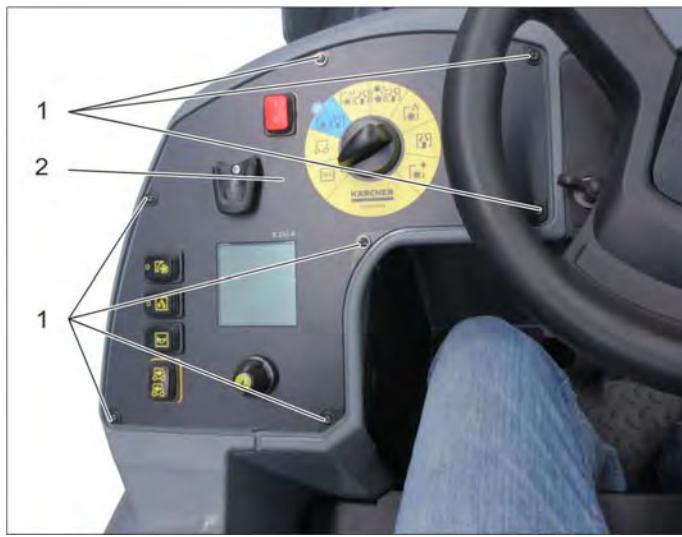
- Unlock the electric socket plug connections.
- Separate the electric connectors.
- Remove the Fleet module.

### AHFN Uninstall / install Fleet module antenna



- 1 Cover with driver seat
- 2 Battery socket

- Raise the driver's seat cover.
- Pull out the battery plug.

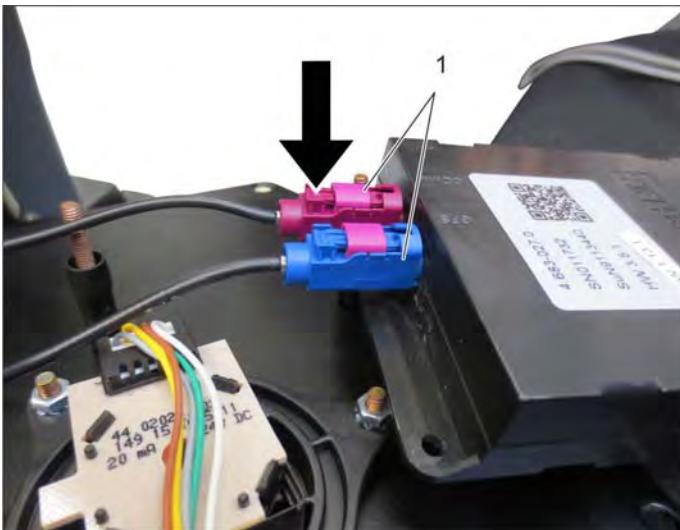


- 1 Screws
- 2 Operating field

- Unscrew the screws.
- Remove the control panel.

#### Note

Mind internal cables.



#### 1 Electric socket plug connections

- Unlock the electric socket plug connections.
- Separate the electric connectors.



#### 1 Fleet module antenna

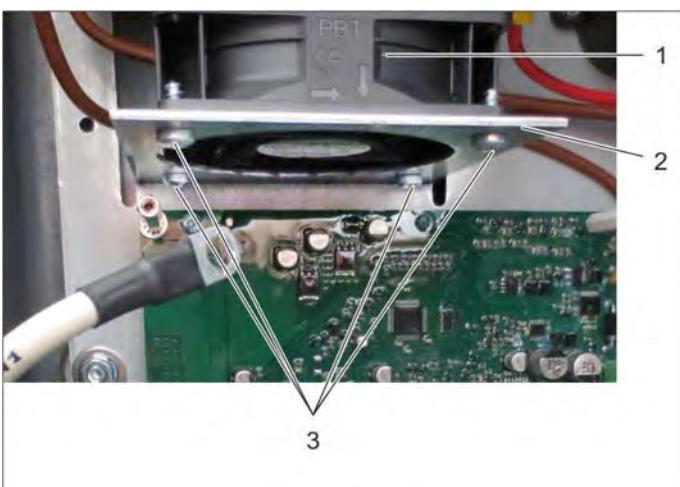
- Remove the Fleet module antenna.

#### Note

Fleet module antenna is glued in.

### AHLU Uninstall / install fan

- ACBF Uninstall / install the control panel
- Uninstall/install appliance electronics cover
- AHMF Uninstall / install drive module
- AHMC Uninstall / install clean module

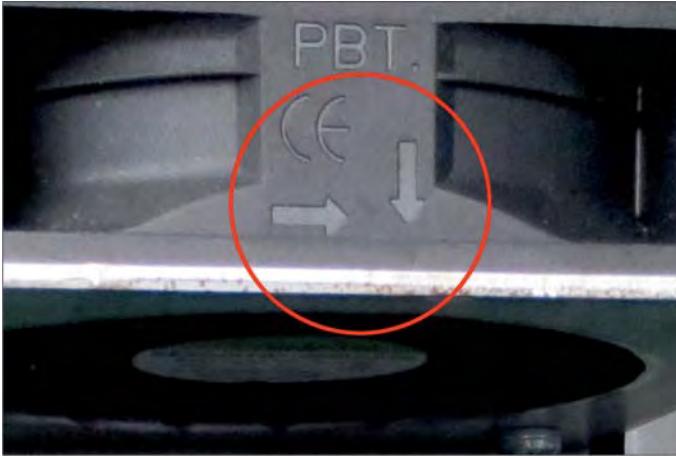


1 Fan

2 Support

3 Screws

- Disconnect the plug connection on the head CPU.
- Take the cable down to the fan
- Unscrew the screws.
- Take the fan off the holder.



#### Note

Upon installation of the fan, mind the arrows for the direction of flow.

### Checking / replacing appliance electronics

#### Note

The factory settings must be loaded prior to replacing the control or the charger.

Please check the device as to whether this measure has solved the fault.

- Disconnect the battery for 1 minute and then reconnect the battery (reset).
- Check battery voltage under load.
- Check the voltage input to the control electronics under load.
- Transfer the current software to the control electronics and the control panel board.

### AHMC Uninstall / install clean module

- *Uninstall/install appliance electronics cover*
- *AHMF Uninstall / install drive module*



- 1 Spacer metal
- 2 Spacer plastic
- 3 Clean module
- 4 Support plate

- Disconnect electrical connections.
- Unscrew the screws.
- Remove the electronics from the appliance.
- Installation in reverse order, ensure the correct position of the connections and spacers.

#### Note

If the electronics is to be replaced by another one, the spacers must be taken over.

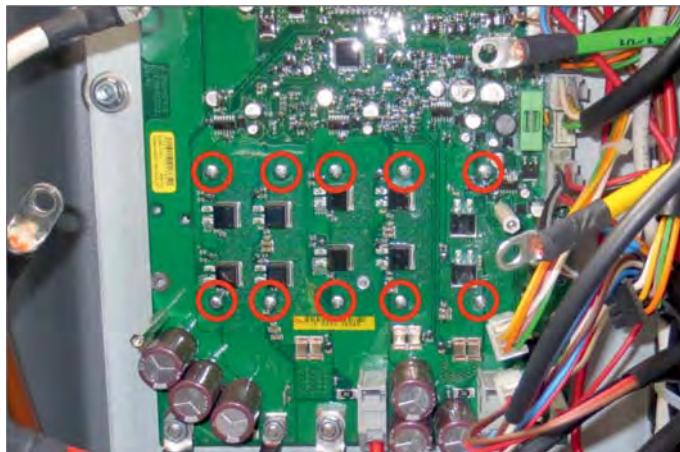
- Unscrew the spacers from the board.
- Mount the spacers onto the new board.

#### Note

For mounting the spacers see "070 Peculiarities / others" at the end of the chapter.

#### Note

Do not unscrew the marked screws during disassembly! They hold the heat sink of the module.



## AHMF Uninstall / install drive module



## AHMG Uninstall / install lifting module 1



## AHMH Uninstall / install lifting module 2



### ■ *Uninstall/install appliance electronics cover*

- Disconnect electrical connections.
- Loosen the mounting nuts.
- Remove the electronics from the appliance.
- Installation in reverse order, ensure the correct position of the connections.

#### Note

For mounting the spacers see "070 Peculiarities / others" at the end of the chapter.

### ■ *Uninstall/install appliance electronics cover*

#### Note

Two lifting modules are installed on top of each other in the appliance.

- Disconnect electrical connections.
- Unscrew the screws.
- Remove the electronics from the appliance.
- Installation in reverse order, ensure the correct position of the connections.

#### Note

When replacing the lower lifting module, take the spacers over to the new electronics.

#### Note

For mounting the spacers see "070 Peculiarities / others" at the end of the chapter.

### ■ *AHMG Uninstall / install lifting module 1*

- 1 Spacer
- 2 Lifting module 2

- Unscrew the spacer.
- Disconnect all electrical connections.
- Remove lifting module 2

#### Note

Observe the connection diagram.

## AHMZ Uninstall / install accessory module

- *Uninstall/install appliance electronics cover*
- *AHMH Uninstall / install lifting module 2*

### Note

Dismantle both lifting modules.

1 Accessory module

→ Disconnect electrical connections.

→ Unscrew the screws.

→ Remove the electronics from the appliance.

→ Installation in reverse order, ensure the correct position of the connections.

### Note

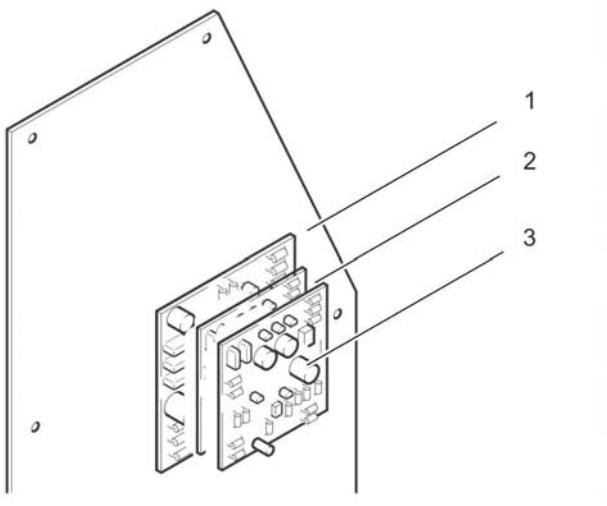
For mounting the spacers see "070 Peculiarities / others" at the end of the chapter.



1 Accessory module

2 Lifting module 2

3 Lifting module 1



## AHSC Uninstall / install contactor

- *Uninstall/install appliance electronics cover*



1 Fuses / fuse carrier

2 Contactor (main relay)

3 Diode

4 Control cable

5 Connection cable battery

→ Disconnect control line.

→ Disconnect electrical connection.

→ Unscrew the nut of the fuse carrier.

→ Remove the fuse carrier from the main relay.

→ Unscrew the screws of the retaining clamp.

→ Remove the retaining clamp.

→ Installation in reverse order.

### ⚠ WARNING

*Fire hazard due to electric arc! Check the screwed cable glands for tight seating.*

### Note

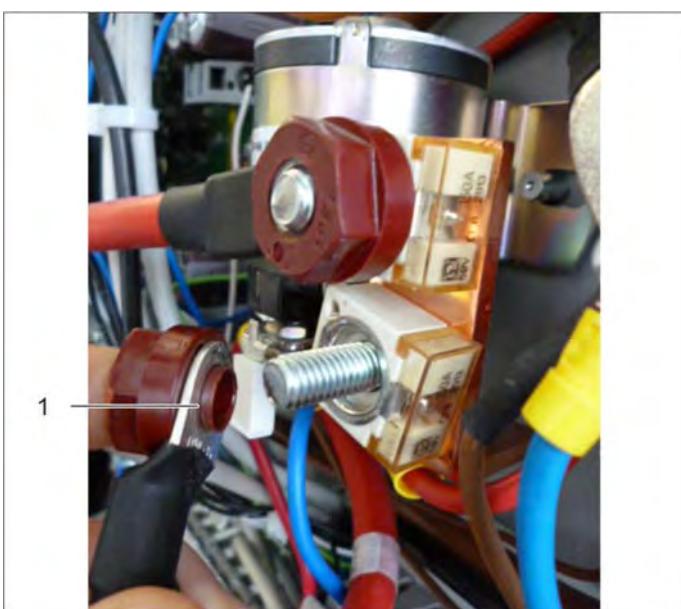
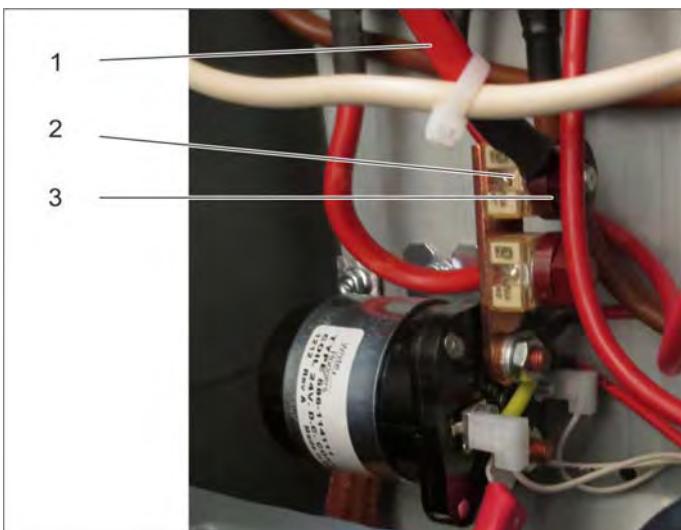
The diode is a component of the contactor.

## AHHF Uninstall / install main fuse

### ■ Uninstall/install appliance electronics cover

- 1 Connecting cable
- 2 Main fuse
- 3 Nut

→ Loosen the nut.  
→ Remove the connecting cable.  
→ Take out the main fuse.



- 1 Collar

### ⚠ CAUTION

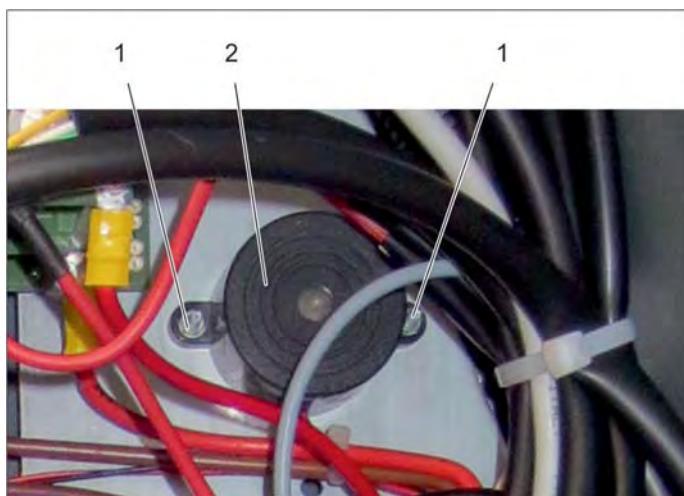
The fastening nut must be checked prior to installing the fuse. The collar must not be damaged, as otherwise the fuse is inoperative. The collar must also not be damaged when the fastening nut is being screwed tight.

## AHHV Uninstall / install horn

### ■ Uninstall/install appliance electronics cover ■ ACBF Uninstall / install the control panel

- 1 Nut
- 2 Horn

→ Unplug the connection cable on the driving module.  
→ Pull the connection cable out of the appliance.  
→ Loosen the mounting nuts.  
→ Take the horn out of the appliance.



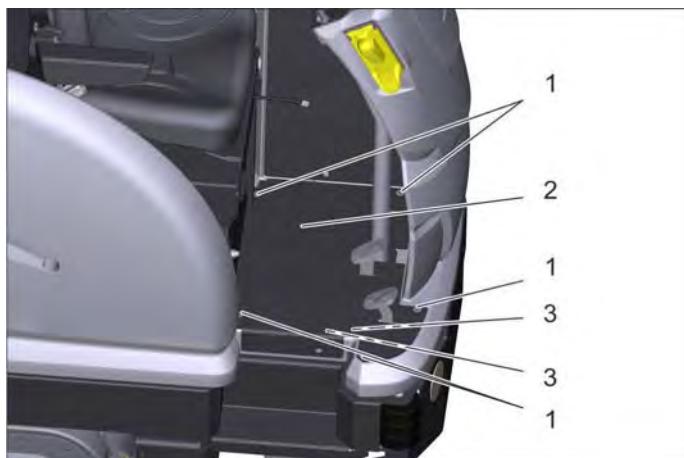
## AHLR Uninstall / install flashing beacon lamp



### Note

LED light with orange coloured lamp. The lamp cannot be replaced.

## AHAL Uninstall / install work light



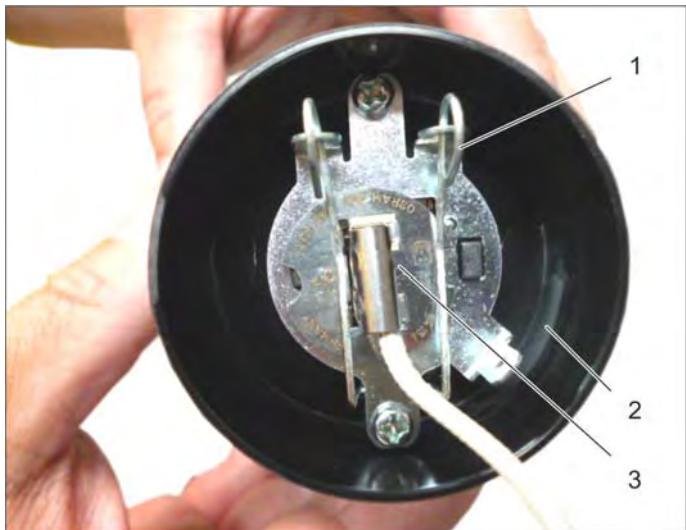
- 1 Screws
- 2 Footwell cover
- 3 Electric socket plug connections

→ Unscrew the screws.  
→ Lift the cover.  
→ Separate the electric connectors.  
→ Remove the cover from the appliance.



- 1 Screws
- 2 Bracket
- 3 Electric socket plug connections

→ Separate the electric connectors.  
→ Unscrew the screws.  
→ Remove support.

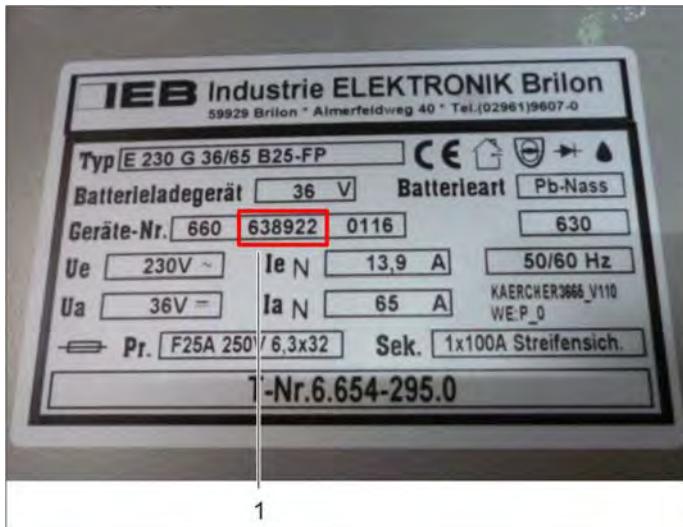


1 Bow  
2 Work light  
3 Illuminant

- Open the bow.
- Remove the illuminant.

## 050 Maintenance and inspection

### Charger for formation and desulphation charge



#### 1 Appliance number

##### Note

The software for charger 6.654-295.0/-283.0/ 4.035-191.0 was supplemented by a formation and desulphation charge. Starting from appliance number 638911, the charger can be used to perform a formation and desulphation charge, if needed.

#### Formation charge

The formation charge is only carried out in the event a new battery is used, so that it can provide the maximum capacity with immediate effect.

Notify the customer that this special charge takes 2-7h longer than the standard charge.

The seat needs to be pivoted up during the charging process. Make sure there is enough ventilation.

The formation can be activated for gel and wet batteries with a IUIa characteristic.

- After the formation has been carried out correctly three times, it will be automatically reset. The requirement is that the battery has been discharged above 50% of the available capacity. If smaller discharges are used, the formation charge may drag on for more than three charges.

#### 1 Buttons



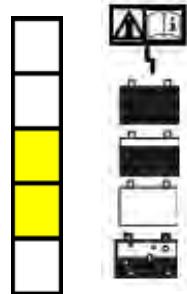
### Activate the formation charge

1. Start display

or

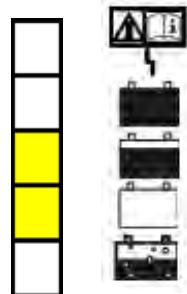


2. Briefly press the button 1x during standby (battery not connected) or within the first 5 seconds after starting the charge.



Slow flashing 1x per second.

3. Keep the button depressed for 2 seconds. The formation is activated; this will be displayed by quick flashing (4x per second).



Quick flashing 4x per second.

4. After 5 seconds, or after pressing the button briefly, you will return to the start display (the formation is activated).

or



## Desulphation charge

Desulphation can be carried out if the battery blocks have progressed to > 0.05 V apart.

Notify the customer that this specific charge takes 21h.

- ➔ Desulphation can only be activated for wet batteries.
- ➔ After desulphation has been carried out correctly, it will be automatically reset.

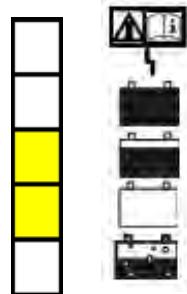
### Activate the desulphation charge

1. Start display

or

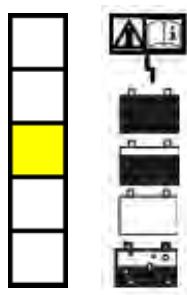


2. Briefly press the button 2x during standby (battery not connected) or within the first 5 seconds after starting the charge.



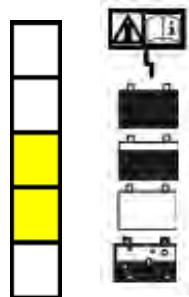
Slow flashing 1x per second.

then



Slow flashing 1x per second.

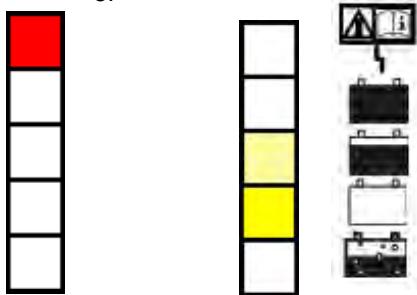
3. Keep the button depressed for 2 seconds. Desulphation is activated; this will be displayed by quick flashing (4x per second).



Quick flashing 4x per second.

4. After 5 seconds, or after pressing the button briefly, you will return to the start display (the desulphation charge is activated).

or



During desulphation, the LED illuminates permanently "< 80%" and the LED flashes "> 80%".

## Connect the service module

### Note

The requirement is service programme software 8.2 or higher.

The current service programme software is available in Kärcher Inside or in the service section of Kärcher InfoNet.

The A9 service module needs to be updated with the latest version of the service module software. Service module 4.683-066.0 or service module 6.682-895.0 can be used in combination with the connection cable for service interface 4.822-866.0.

Please always use the most current software version.



- Turn off the appliance.
- Open the interface cover on the equipment electronics.
- Connect the A9 service module with the machine.
- Connect the PC/laptop with the A9 service module via the USB interface.
- **Insert the red Intelligent Key.**
- Set the programme selection switch on the machine to position 1.
- Start the service programme.
- Execute autoscanning so that the unit can be detected automatically.
- If the unit is not detected, then repeat the selection.
- Prior to repeating, disconnect the service module from the machine and PC/laptop.
- Turn the device off and end the service program.

The LED on the service module flashes; the following functions are available:

- Display module bus
- Request error archive
- Sensor / actuator test
- Configuration upgrade kits
- Parameterization
- Factory settings
- Update display texts
- Update software

### Special functions:

- Archive / restore operating hours counter
- Master module (A1) delete parameter memory
- Reset maintenance counter
- Enter machine number and serial number for Fleet management

### Note

If access to the machine is not possible, a check should be made as to whether the correct interface has been selected for the service module. Only the com ports between 2 and 15 can be used.

### Software update

Watch out for the following when transferring the new software:

- Select the update software in the service programme. Select the current software, transfer it to the appliance and go along with the programme. The start of the software update must be confirmed on the appliance using the I button.



## Do not pause the download!

### Note

The appliance display is switched off during the transferring of the software. The successfully transferred software can be displayed on the appliance in the module bus.

After the software has been transferred, all texts, images and icons need to be loaded in the "Update display texts" menu. After this is done, the following settings must be made using the grey or red KIK key:

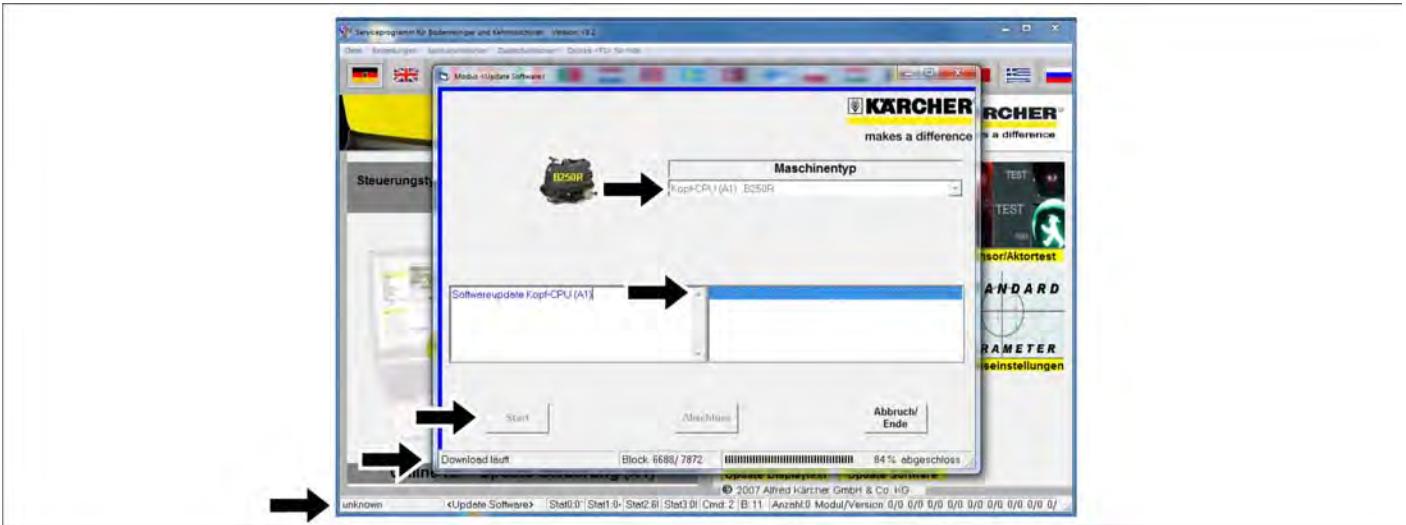
- Load the factory settings.
- Adjust the used brush head to "R or D".
- Switch the appliance off and on again.

After all settings have been made, the appliance can be started up again.

### B 250 R TCU - software update cancelled

If a software update in the head CPU (A1) is paused or not fully completed, then the software will be ruined. Automatic unit recognition using the service programme is no longer possible. The display flashes in red and the appliance will not operate. In order to restore the software, you will need to proceed as follows:

- Disconnect the service module from the appliance and PC/laptop.
- Switch off the appliance and close the service programme.
- Connect the service module to the appliance and PC/laptop.
- Start the service programme.
- Turn on the machine.
- Execute autoscanning => The unit is not detected and "unknown" is displayed in the service programme.
- Select the update software.
- Select unit type B 250 R.
- Select the software, and start => Download is running.
- Confirm completion after the software has been transferred.



### Service programme for floor cleaners and sweepers



## 060 Error diagnosis

Findings	Possible cause	Correction
Fan does not rotate.	No voltage supply, fan defective.	Check voltage and plug connections, replace fan.
Main relay does not respond	No voltage supply, fuse defective, programme selector switch defective, main relay defective. Diode defective.	Check voltage, check programme selector switch, check fuse, check main relay. Replace defective components
Modules without function.	Fuse F2, F3, F4, F6, F8 defective.	Check fuses / replace defective fuse.
	Data cable (bus cable)	Check plug connections of the data cable (bus cable). Check plug contacts.
	Module not logged on in the information menu.	Check data cable (bus cable).
Module defective	Water on the board	Replace module, investigate the cause for the intrusion of water.
Horn without function	Connector	Check and plug in plug connection.
	Sound transducer defective	Replace horn.

## 070 Peculiarities/ others

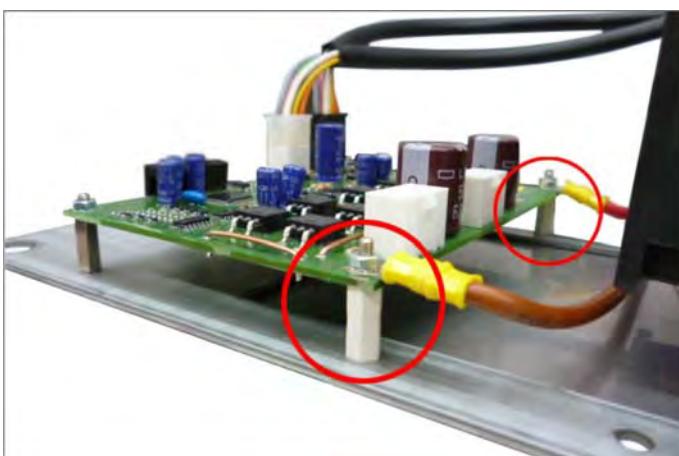
### Use of the spacers with module fastening

For the fastening of the individual function modules varying spacers are used:

- Made of plastic (insulating)
- Made of metal

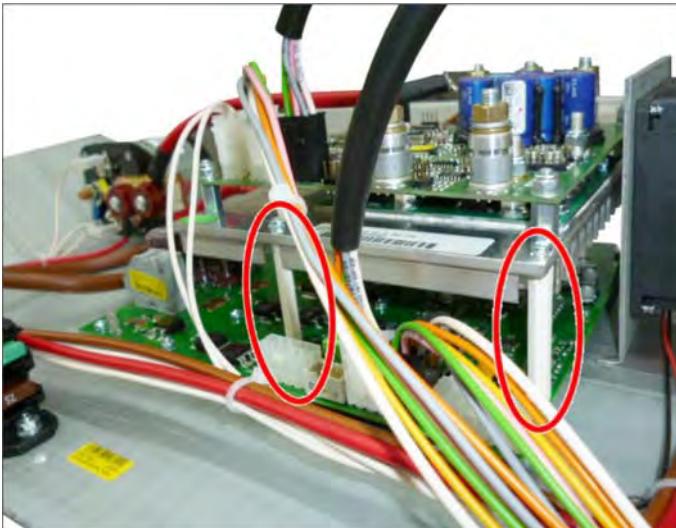
#### ⚠ WARNING

*Fire hazard due to short circuit! Ensure the use of the correct spacers upon installation.*



#### Lift module

The lifting module is secured under the positive / negative terminal by means of two plastic spacers.  
The other spacers are made of metal.



#### Drive module

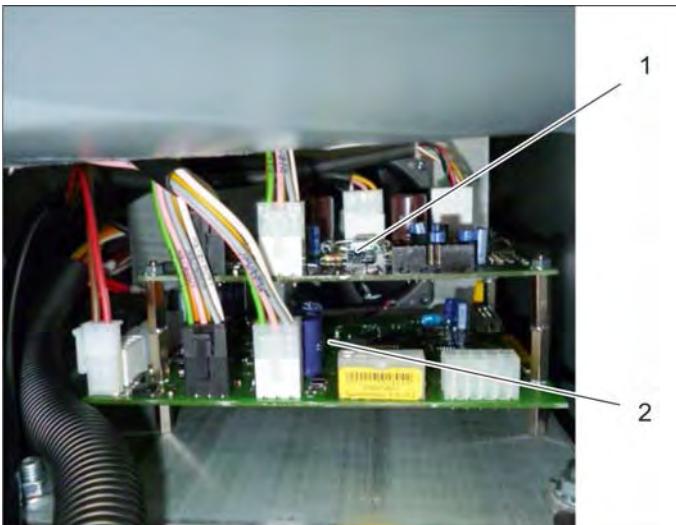
The drive module is attached to the clean module with two plastic spacers.

The other spacers are made of metal.



#### Clean module

The clean module is attached to the carrier plate with metal spacers.



#### Accessory module

- 1 Lift module
- 2 Accessory module

An accessory module is installed under the lifting module. The accessory module is secured under the positive / negative terminal on the carrier plate with two plastic spacers. The other spacers are made of metal.

Another lifting module for the side brush is attached to the lifting module 1 with 4 plastic spacers.

The power supply of the side brush module is then effected via the connection cables.

A second lifting module, which is installed between the first lifting module and the accessory module, is required for the side brushes option. The spacers are made of metal.

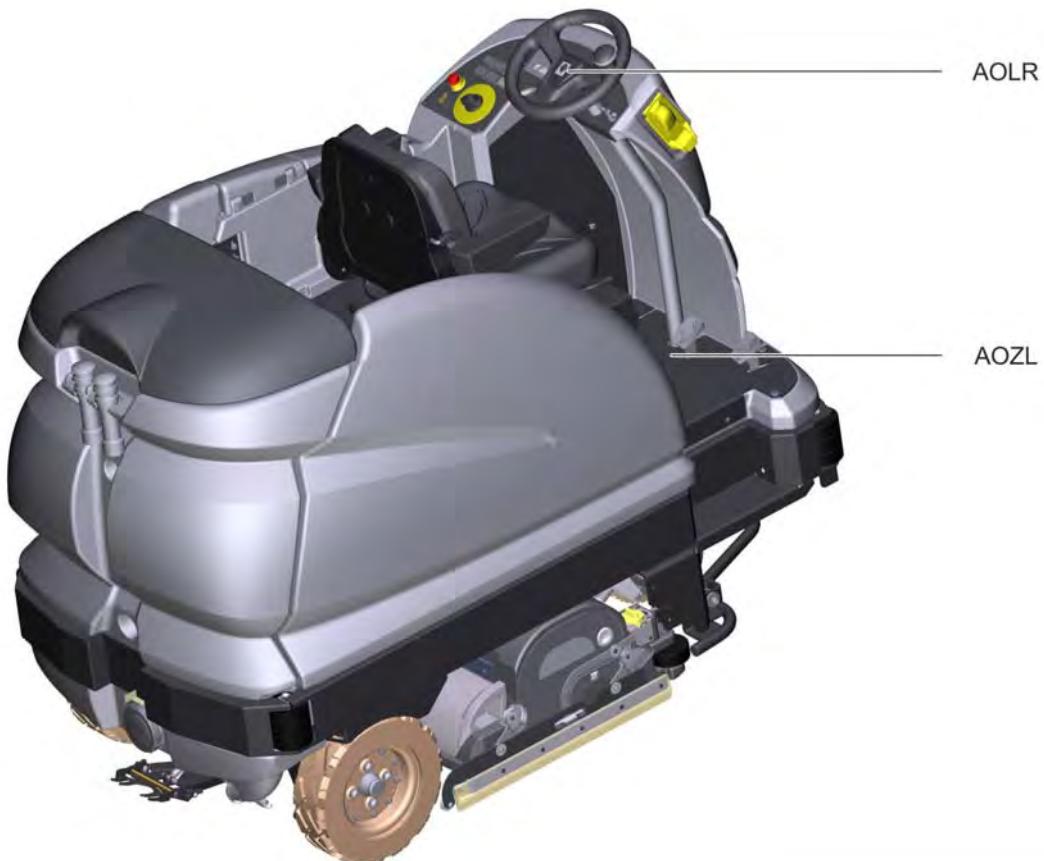
## AO Service group steering

### 010 Safety information

Observe general safety information!

Service and maintenance tasks may only be performed by qualified and specially trained specialists.

### 020 Overview



*AOLR Uninstalling/ installing steering wheel*

*AOZL Uninstall / install gear rim steering*

### 030 Function

No special functional characteristics.

## 040 Service activities

### AOLR Uninstalling/ installing steering wheel



#### Note

For the removal of the steering wheel a special puller tool is required (see special tools).



→ Lift the cover of the steering wheel with a screw driver.



→ Loosen the nut.



- Remove the disc in the steering wheel hub using a magnetic probe.
- Position the puller tool and remove the steering wheel from the steering column.

#### AOZL Uninstall / install gear rim steering

- ABAF Uninstall/install footwell cover
- ANFM - Uninstall / install propulsion motor

- 1 Screw
- 2 Cover, appliance electronics

- Unscrew the screw.
- Remove the cover for the equipment electronics.

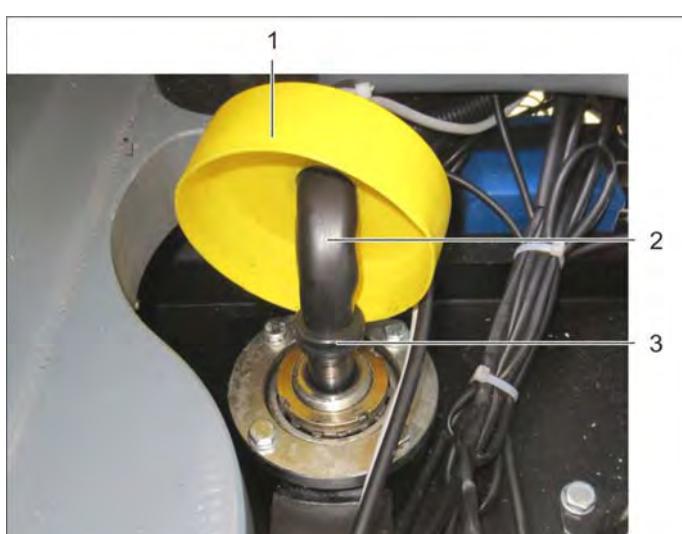


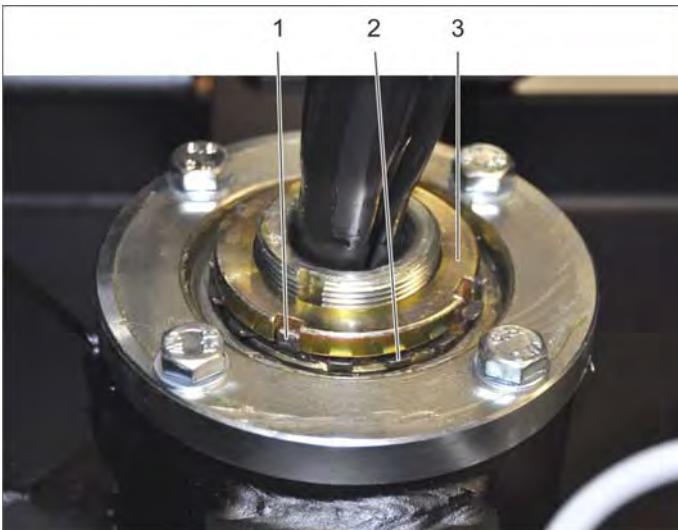
- 1 Cover
- 2 Cable harness
- 3 Rubber grommet

- Pull up the cover.
- Pull the rubber grommet upwards.
- Disconnect the necessary electrical connections on the driving module.
- Thread the harness out of the appliance.

#### Note

A pull wire needs to be attached before the harness is threaded out through the steering head bearing.



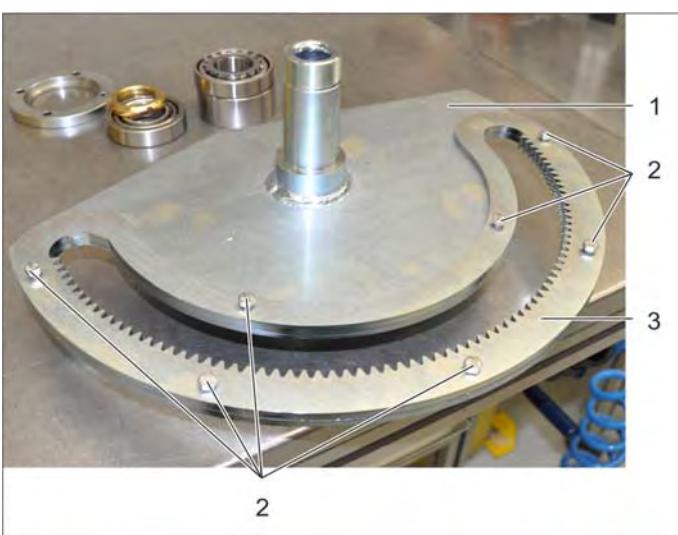


- 1 Securing piece
- 2 Safety disc
- 3 Nut

**Note**

Support the sprocket from below.

- ➔ Bend down the securing piece.
- ➔ Unscrew the nut.
- ➔ Remove the sprocket in a downward direction.



- 1 Mounting for sprocket
- 2 Screws
- 3 Toothed crown

- ➔ Unscrew the screws.
- ➔ Remove the sprocket.

## Removing/installing the bearing

→ Carefully knock out the bearing from its mounting.

## Installation



1 Bearing assembly

→ Pull the bearing assembly into the frame with the threaded rod and large washer.



1 Toothed crown

2 Groove nut

→ Tighten the sprocket with the slotted nut.

→ Secure the slotted nut with the lock washer.

### Note

After installing the mounting, tighten the sprocket with the slotted nut so that the bearings are free from play. Use the lock washer to secure the slotted nut.

### Note

Grease the toothed segments.



## **050 Maintenance and inspection**

Service group does not contain any maintenance and inspection points.

## **060 Error diagnosis**

<b>Findings</b>	<b>Possible cause</b>	<b>Correction</b>
Steering bearing play present	Bearing fitted loosely	Reduce the bearing play using the nut

## **070 Peculiarities/ others**

The service group does not contain any peculiarities.

## AN service group running gear

### 010 Safety information

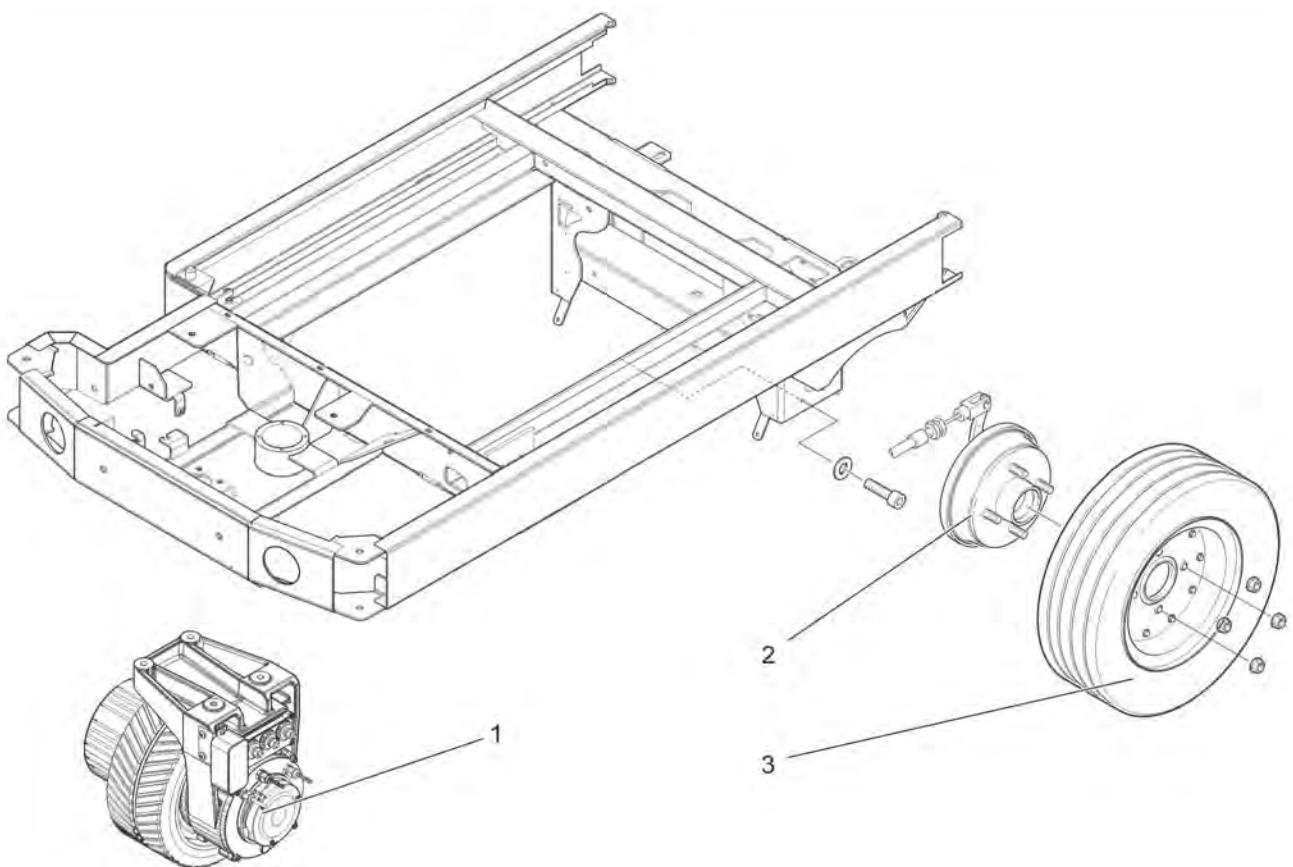
#### ⚠ WARNING

Switch off the appliance on the key switch and secure it against rolling away.

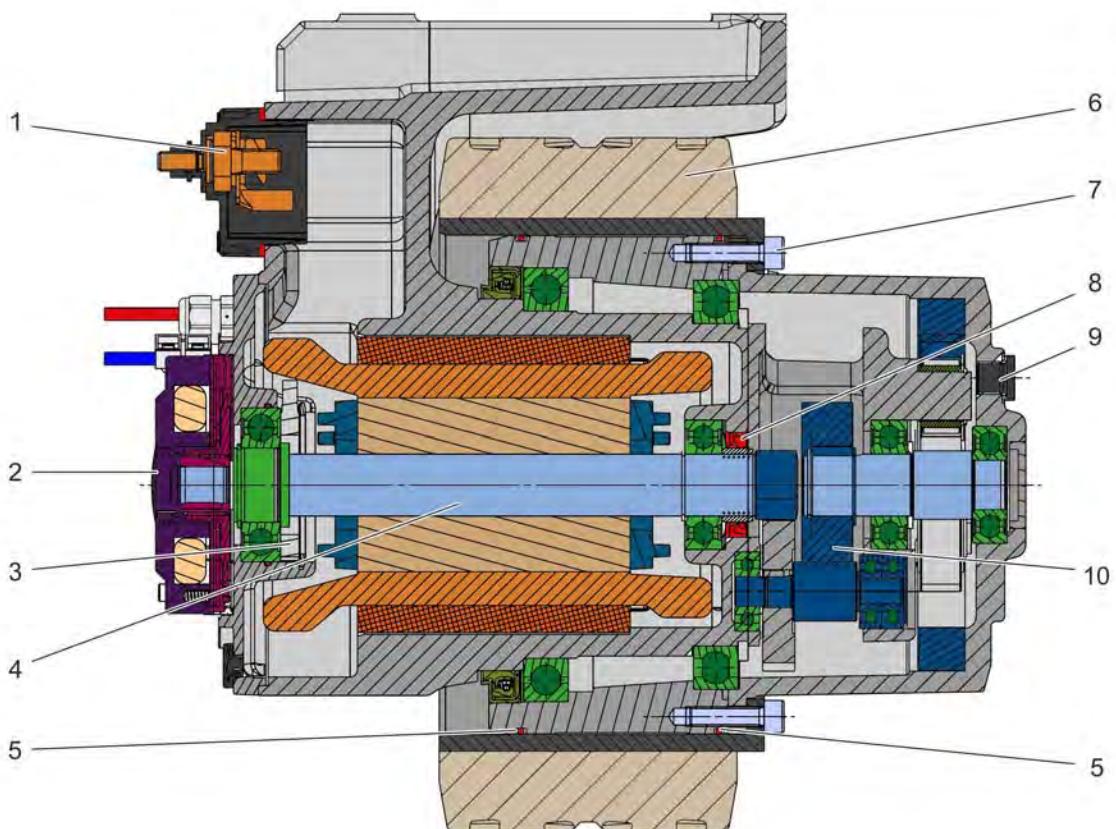
Disconnect the connection cable of the battery.

Observe general safety information!

### 020 Overview

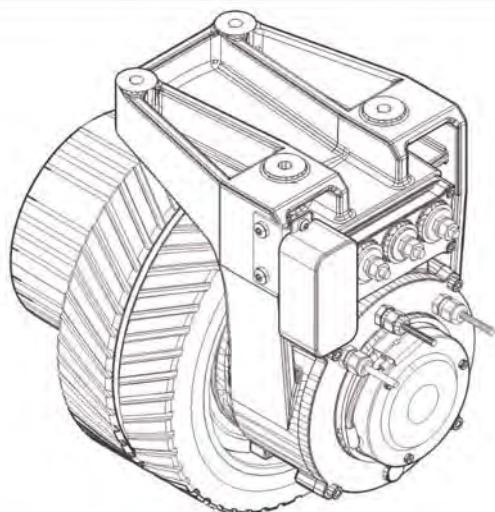


- 1 Propulsion motor with brake
- 2 Drum brake
- 3 Rear wheel



- 1 Connection terminals
- 2 Electromagnetic brake
- 3 Sensor ring
- 4 Rotor
- 5 Sealing rings
- 6 Tyre / rim
- 7 Wheel lugs
- 8 Shaft seal ring
- 9 Stopper
- 10 Epicyclic gear

## 030 Function



The traction motor M1 (three-phase asynchronous motor) drives the appliance via a transmission.

The driving speed changes proportional to the voltage applied to the propulsion motor.

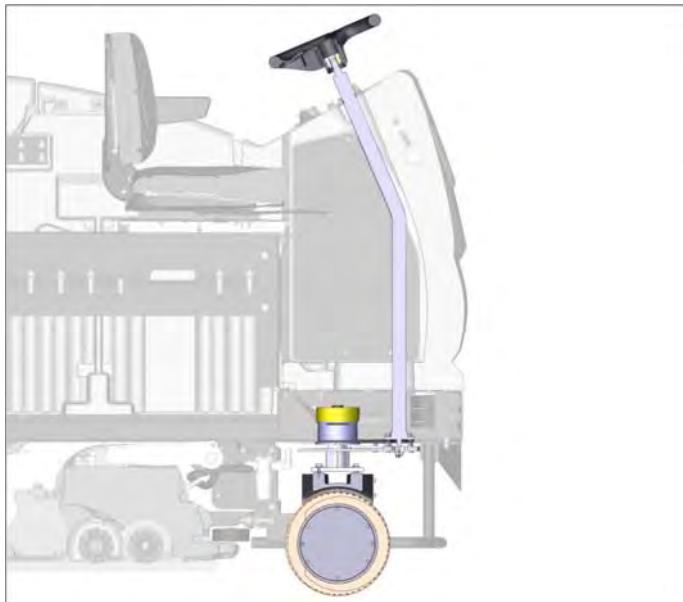
The acceleration and braking torque is proportional to the rotary field difference between motor winding and rotor.

The tyre is mounted on the transmission hub.

The electromagnetic brake acts on the transmission.

The electromagnetic brake is an almost maintenance-free parking brake that is activated upon a standstill of the appliance.

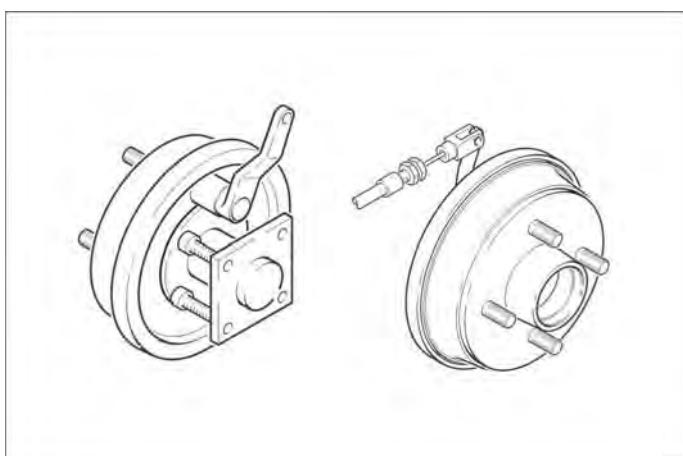
Switching the brake on and off is clearly audible ("clicking" sound).



Motor / transmission are screwed together with the gear rim of the steering. The steering column engages in the gear rim.

The steering bearing is press-fitted in the frame.

Connection cables of the motor are taken through the gear rim and the steering bearing into the appliance.



The appliance is equipped with additional rear-wheel brakes (drum brakes).

The brakes are operated via the brake pedal and Bowden cables.

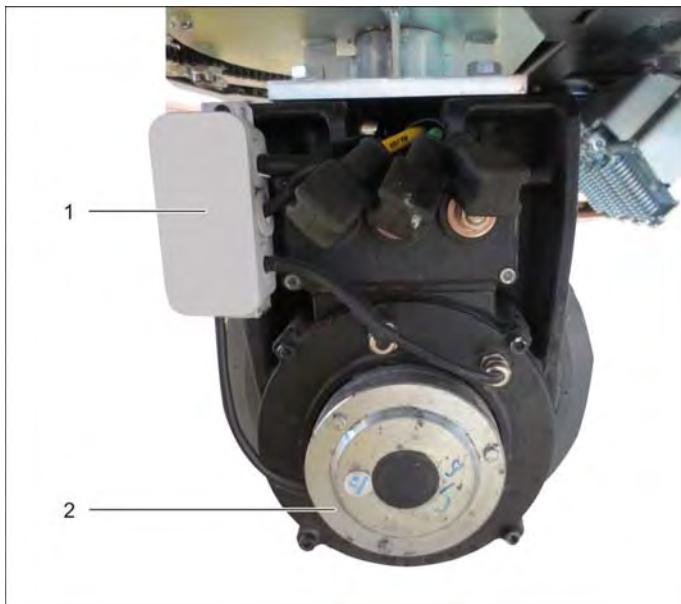
The rear-wheel brakes are no parking brakes.

**Note**

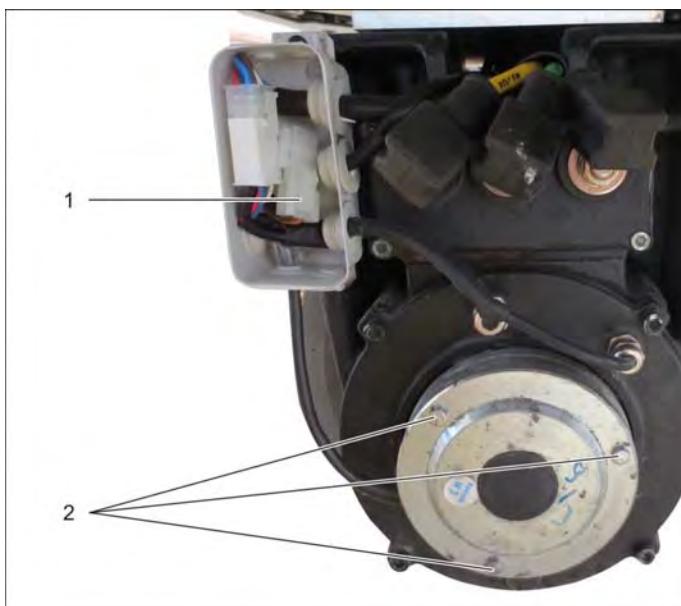
The Bowden cables for the left and right brake have different lengths. Both wheels must brake equally. Observe during installation!

## 040 Service activities

### ANBE - Uninstall / install electromagnetic brake of the propulsion motor



- 1 Cap junction box  
2 Electromagnetic brake propulsion motor Y1  
→ Remove the cap of the junction box.



- 1 Connector  
2 Screws  
→ Disconnect the connector.  
→ Disconnect the plug contacts of the connection cables from the plug casing.  
→ Pull the connection cable out of the junction box.  
→ Unscrew the screws.  
→ Remove the electromagnetic brake of the propulsion motor.



- 1 Adjustment screw brake pressure  
2 Washer ring  
→ Clean the sealing ring and reuse it.  
→ Perform a function test.

#### Note

Do not misadjust the adjustment screws. Brake pressure pre-set.

Clean seat and seal faces. Lightly grease the sealing ring prior to installation.

Pay attention to the correct fitting position during reinstallation.

## ANBC - Uninstall / install brake disk of the propulsion motor

- ANBE - Uninstall / install electromagnetic brake of the propulsion motor

- 1 Brake disc
- 2 Pressure plate

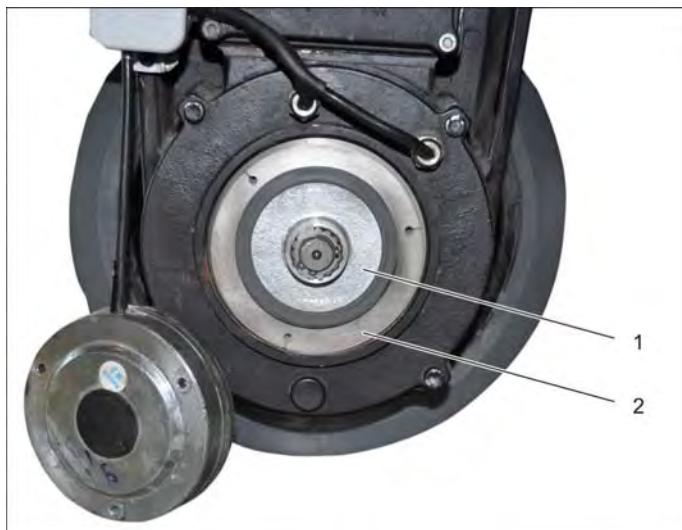
→ Remove brake pad and pressure plate.

### Note

Clean the intake and sealing areas.

Pay attention to the correct fitting position during reinstallation.

→ Perform a function test after assembly.



## ANFM - Uninstall / install propulsion motor

- ABAF Uninstall/install footwell cover
- AJBW Uninstall/ install cleaning head

→ Raise machine using vehicle jack.

→ Support the appliance and secure it against tipping over.

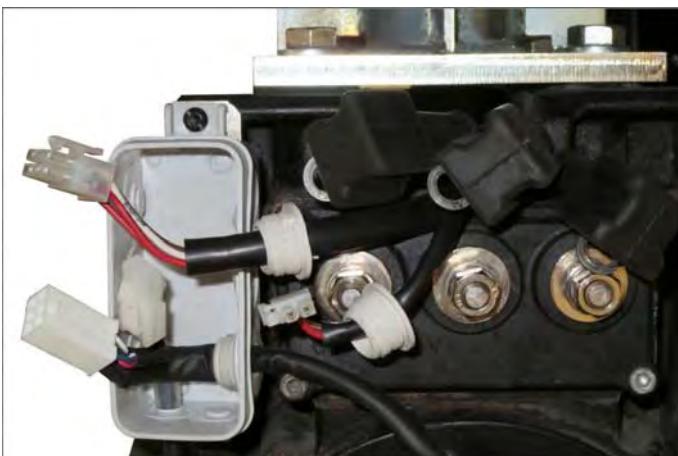


- 1 Covers
  - 2 Connection cover
- Pull off covers.





→ Dismount all three connection cables.



→ Open junction box.  
→ Disconnect the plug connection to the cable harness.  
→ Unscrew the screwed cable glands.  
→ Pull the cable of the travel sensor out of the junction box.



→ Unscrew the screws on the engine support.



→ Tilt the motor backwards.  
→ Remove the motor from the appliance towards the back.  
**⚠ WARNING**  
*Risk of crushing! Motor is heavy! When tilting, hold it on the tyre and move it carefully.*



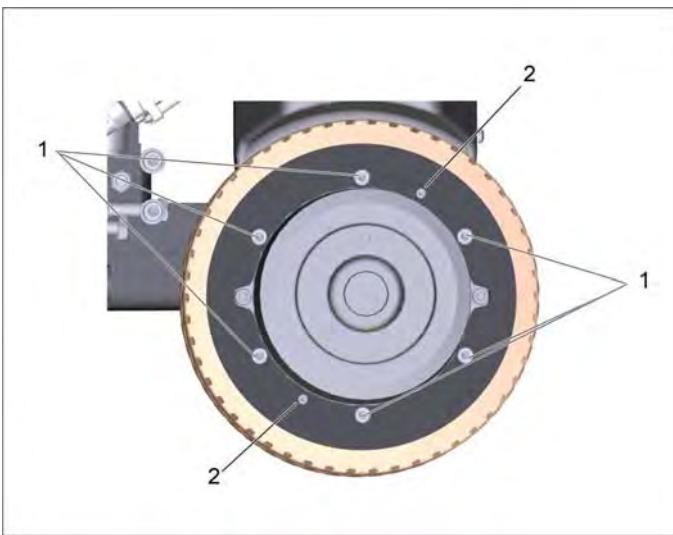
#### Note

Make sure that no cables are squeezed upon installation.

#### ANRR - Uninstall / install tyre of propulsion motor



- Raise machine using vehicle jack.
- Support the appliance and secure it against tipping over.



- 1 Wheel bolts
- 2 Thread M8 (closed with threaded pin)
- Unscrew the wheel lugs.
- Screw out the threaded pin.



- Screw the M8 screws in the threads.
- Screw in the screws evenly and push the wheel over the sealing rings.



→ Finally, knock the tires off the hub using a plastic mallet.



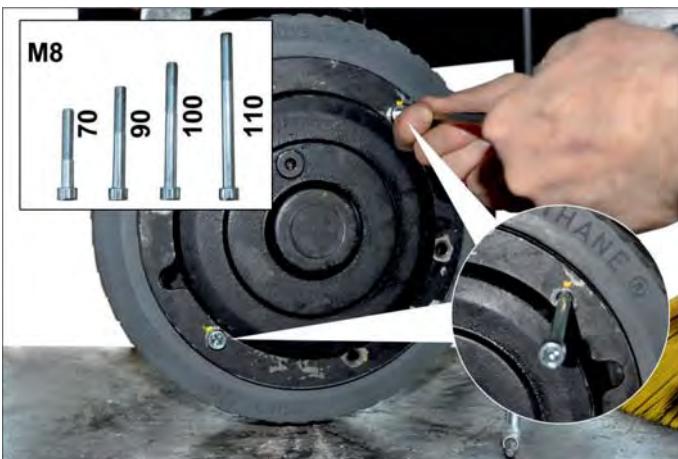
#### Installation:

##### Note

Clean the intake and sealing areas.

Check the seal rings for damage.

→ Apply copper paste to the sealing rings and surrounding seating.



→ Screw the mounting screws into two opposite threads of the wheel bolts (start with the longest).

→ Put the tyres on the hub.

→ Use the next smaller screw when the screw is completely screwed in. Observe thread length.

##### If the tyre is completely put on the hub:

→ Unscrew mounting screws.

→ Slightly screw in the wheel bolts.

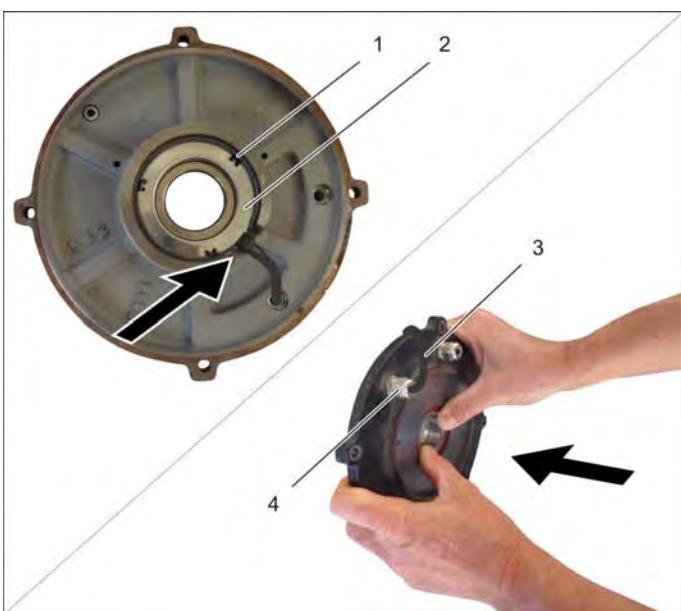
→ Tighten wheel bolts crosswise.

→ Insert threaded pins.

→ Screw in threaded pins until they are flush.

## ANFS Uninstall / install sensor ring (encoder) for the engine

■ ANRF - Uninstall / install rotor of propulsion motor



- 1 Spacer ring
- 2 Sensor ring
- 3 Connection cable
- 4 Screw connections

- Loosen the screw connection.
- Pull the connection cable through the screw connection on the bearing cover.
- Push out the sensor ring with the spacer ring.

### Note

Clean the intake and sealing areas.

Assembly in reverse order

Pay attention to the correct fitting position during reinstallation.

### Checking the sensor ring (encoder) B3

Measure 13V impulse for sensor ring B3 between X4/6 and X4/12 on driving module A2.

If the voltage is missing, the machine moves slowly forwards and backwards. A fault is not displayed.

### Voltage measurement:

Voltage measurement: Measurement carried out between X4/6 and X4/12

Result:

With full throttle: 6.5 VDC

With throttle pedal not activated:  
13V or 0V depending on engine position

### Frequency measurement:

Frequency measurement: Measurement carried out between X4/6 and X4/12

Result:

With full throttle: 5 KHZ

With half throttle: 2.5 KHZ

### Note

For measurements on the engine, the engine is supposed to rotate freely. To do so, jack up the appliance.

## ANFP Uninstall / install sensor for accelerator pedal

■ ABAF Uninstall/install footwell cover

- 1 Screws
- 2 Sensor for accelerator pedal

→ Unscrew the screws.

→ Remove the sensor for the accelerator pedal.

### Note

When the sensor is being installed, the screws in the middle of the slotted hole need to be secured.

The sensor must then be calibrated.

If the calibration is faulty, then the accelerator pedal sensor needs to be turned a little. To do so, use the red KIK key to call up the test mode, and set the driving controller to the value "17-20" in the "Release throttle pedal" menu. If the throttle pedal is fully depressed, there need to be 75 increments in between.

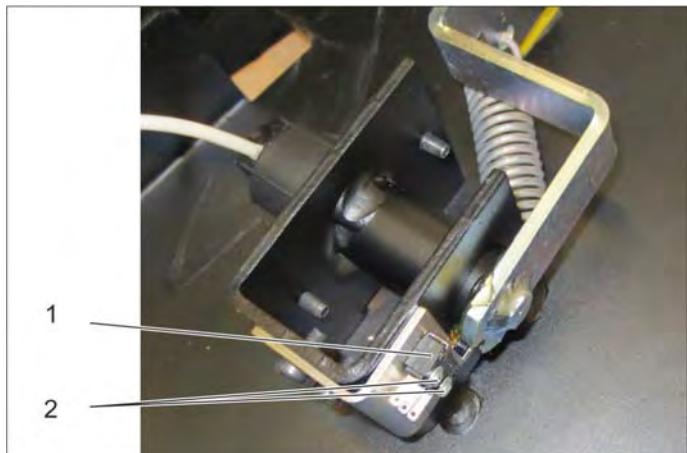
## ANMF Uninstall / install microswitch for the accelerator pedal

■ ABAF Uninstall/install footwell cover

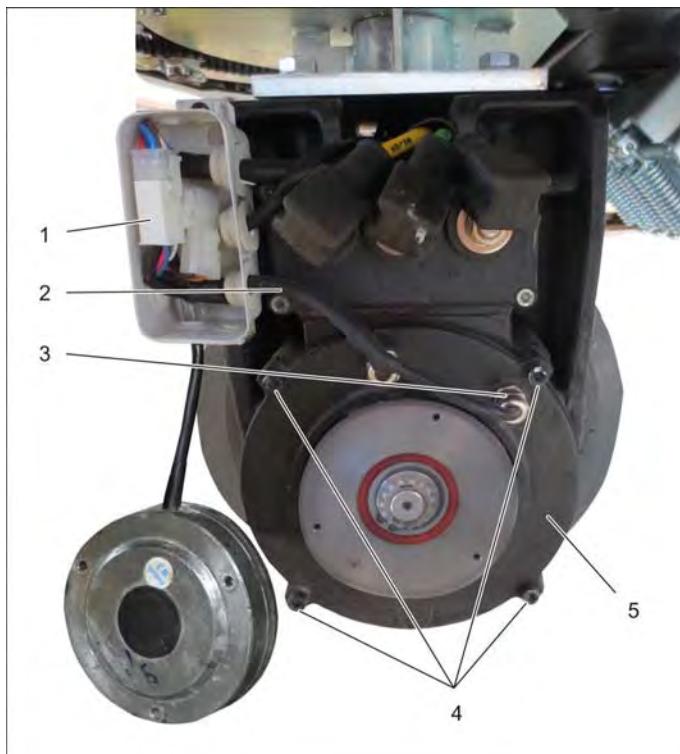
- 1 Microswitch for accelerator pedal
- 2 Screws

→ Unscrew the screws.

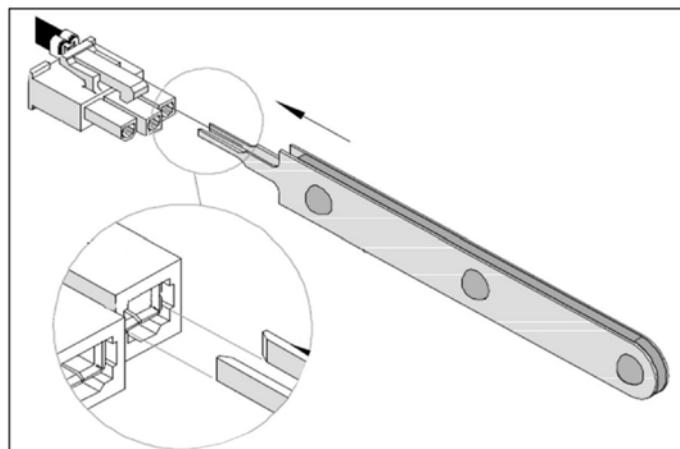
→ Remove the microswitch for the accelerator pedal.



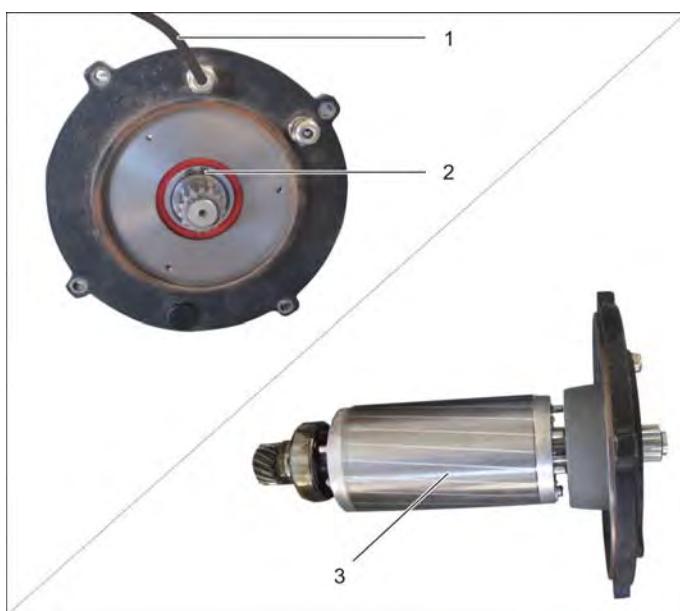
## ANRF - Uninstall / install rotor of propulsion motor



- 1 Connector
  - 2 Connection cable
  - 3 Screw connections
  - 4 Screws
  - 5 Bearing lid
- Disconnect the connector.

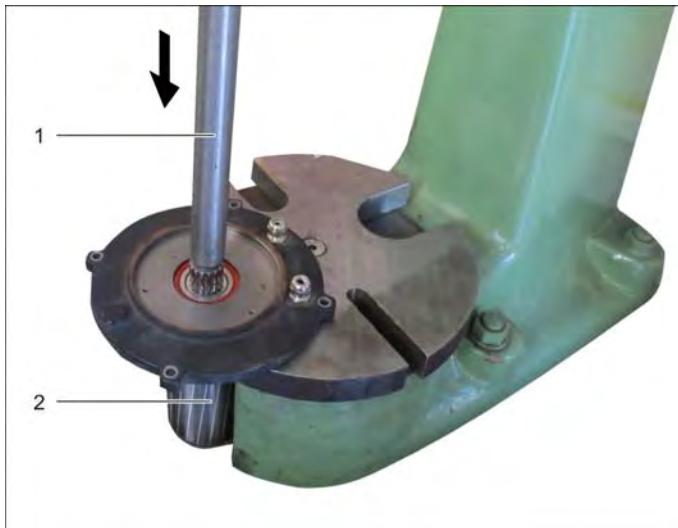


- Disconnect the plug contacts of the connection cables from the plug casing.
- Pull the connection cable out of the cable box.
- Loosen the screw connection.
- Unscrew the screws.
- Remove bearing lid.
- Separate the jacket of the connection cables.
- Pull the connection cable through the screw connection on the bearing cover.



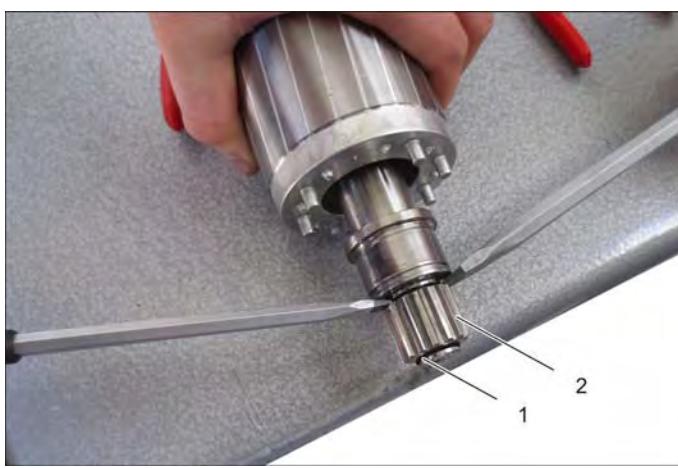
- 1 Connection cable sensor ring
- 2 Safety ring
- 3 Rotor

→ Remove the retaining ring.



- 1 Press out device
- 2 Rotor

→ Press out rotor.



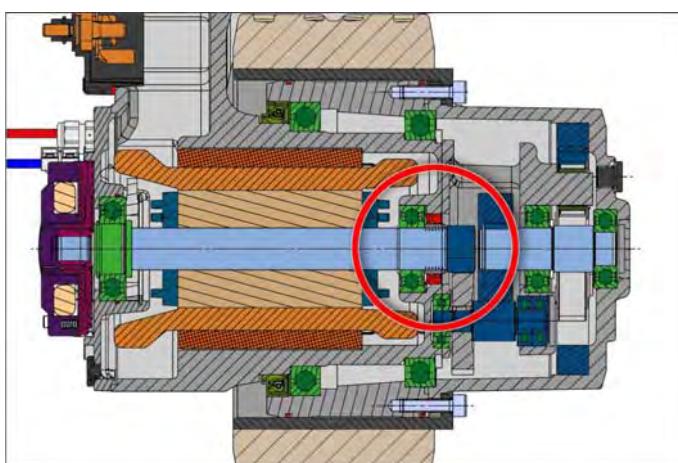
- 1 Safety ring
- 2 Toothed gear

→ Remove the retaining ring.  
→ Press off gearwheel.  
→ Installation in reverse order.

#### ANRW - Uninstall / install shaft seal of rotor of propulsion motor

##### ■ ANRF - Uninstall / install rotor of propulsion motor

The shaft seal protects the electric motor (rotor / windings) against intruding grease from the epicyclic gear.



→ Remove the shim from the motor.  
→ Carefully push the shaft seal into the transmission using a wide screwdriver.

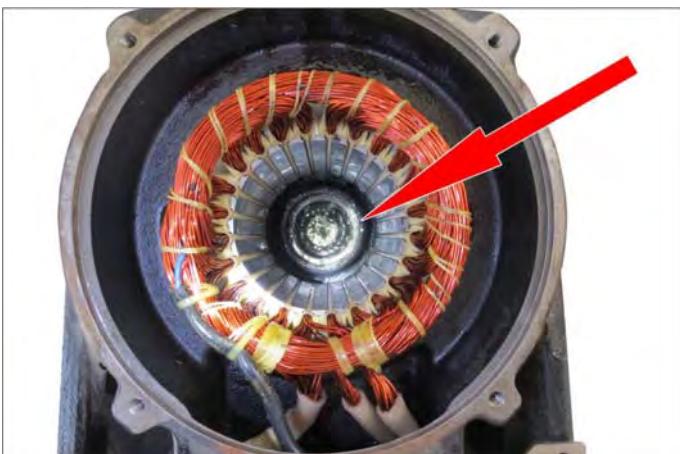




→ Remove defective shaft seal from the transmission using a hook.

**⚠ CAUTION**

*Risk of damage! Do not damage the windings upon removal.*



→ Remove intruded grease from the drilled hole.

→ Lightly grease new shaft seal.

→ Insert new shaft seal, ensure correct position.

→ Insert shim in the motor.

→ Clean the rotor shaft and lightly grease it in the area of the shaft seal.

→ Install the rotor as described in ANRF - Uninstall / install rotor of the propulsion motor.



**Installation aid shaft seal:**

→ Lightly grease new shaft seal.

→ Put the shaft seal on a socket wrench SW32. Due to the grease the shaft seal sticks to the socket wrench.

→ Push the shaft seal into the motor casing using the socket wrench.

**Note**

Ensure the correct position upon installation. The spring inserted in the shaft seal points towards the transmission.

**ANDA - Uninstall / install seal of the connection cover of the propulsion motor**



1 Covers

2 Connection cover

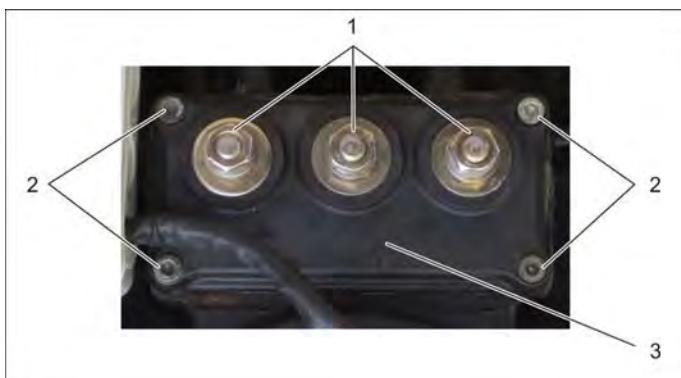
→ Pull off covers.

→ Dismount connection cables.



- 1 Nuts
- 2 Screws
- 3 Connection cover

→ Loosen the mounting nuts.  
→ Unscrew the screws.  
→ Remove connection cover.

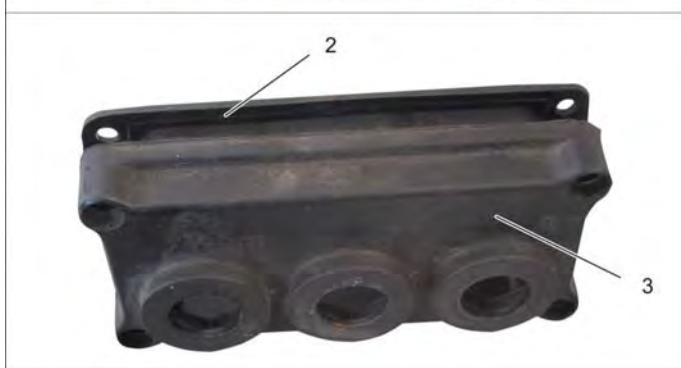
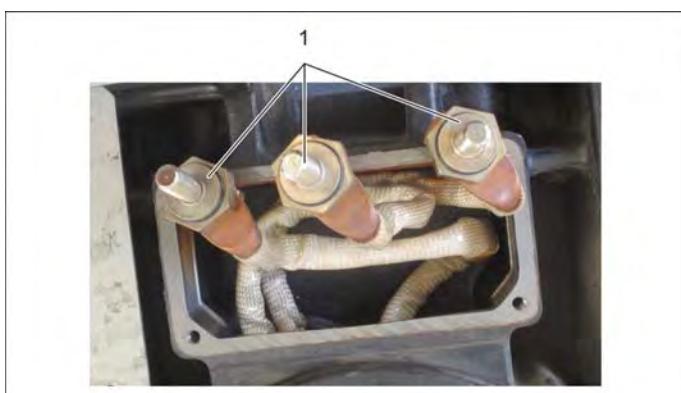


- 1 Connection cables
- 2 Seal
- 3 Connection cover

→ Loosen connection cables from the cover.  
→ Remove the seal.

**Note**

Clean the intake and sealing areas.  
Installation in reverse order.  
Check the seal rings for damage.



## Testing resistor R2



- Open the connection box (distribution box).
- Separate the electric connectors.
- Measure the resistance using an ohmmeter.

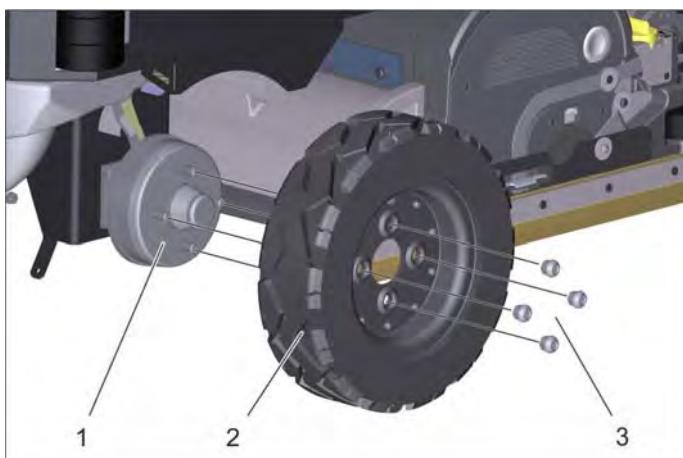
### Target:

At 20 °C 550 - 610 ohms.

At 30 °C 599 - 652 ohms.

The resistance increases when the temperature gets higher.

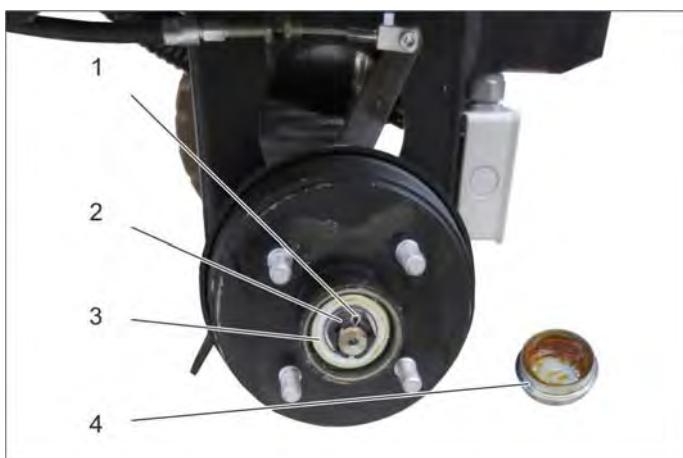
## ANRH - Uninstall / install wheels in the back



- 1 rear axle
- 2 Rear wheel
- 3 Wheel nuts

- Loosen wheel nuts.
- Lift the appliance and secure it against tipping over.
- Unscrew wheel nuts.

## ANBS - Uninstall / install brake drum in the back



### ■ ANRH - Uninstall / install wheels in the back

- 1 Safety splint
- 2 Crown nut
- 3 Ball bearing
- 4 Grease cap

- Remove the grease cap.
- Pull out and dispose of the safety cotter.
- Unscrew castellated nut.



→ Take the ball bearing out of the brake drum, it will be re-used.

**Note**

When installing the brake drum, use a new safety cotter. Fill the grease cap with grease prior to fitting it.

#### ANBA - Uninstall / install brake pad in the back

- ANRH - Uninstall / install wheels in the back
- ANBC - Uninstall / install brake disk of the propulsion motor
- 1 Holding pin
- 2 Spring
- 3 Brake pad

→ Unhook the spring.

→ Remove the brake pad from the brake.

**Note**

Always replace both brake pads.

Replace damaged springs.

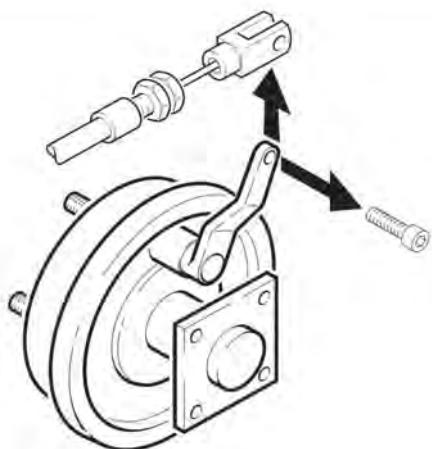


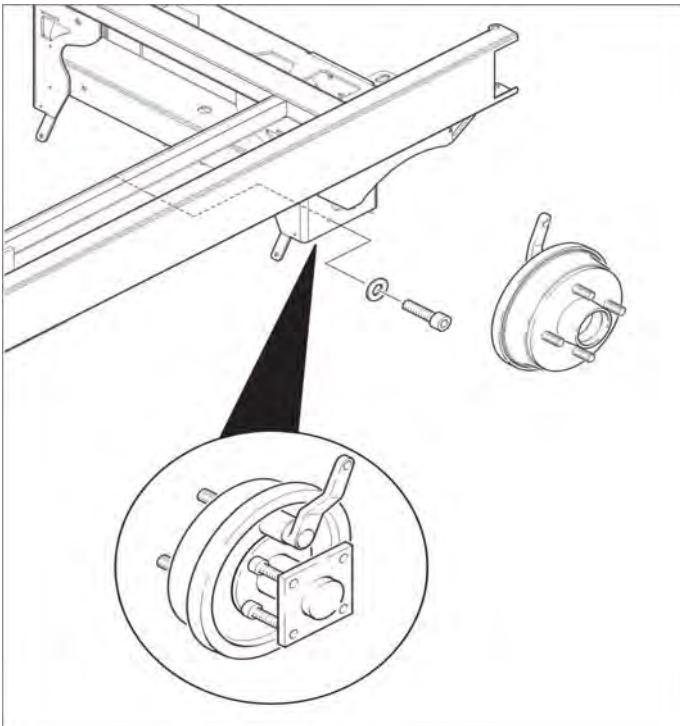
#### ANHA - Uninstall / install rear axle

- ANRH - Uninstall / install wheels in the back

→ Unscrew the screw on the clevis.

→ Remove brake cable.





- Unscrew nuts, support plate.
- Remove the rear axle from the appliance.

## 050 Maintenance and inspection

### Adjusting the rear-wheel brake

- ABAF Uninstall/install footwell cover

**The rear-wheel brake is a service brake.**

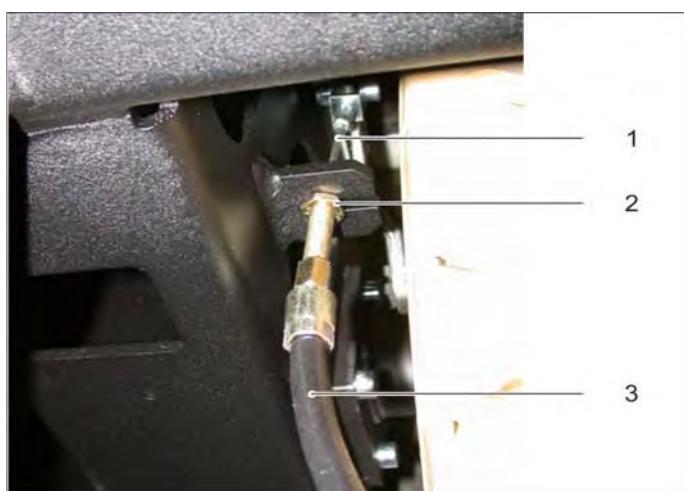
**⚠ DANGER**

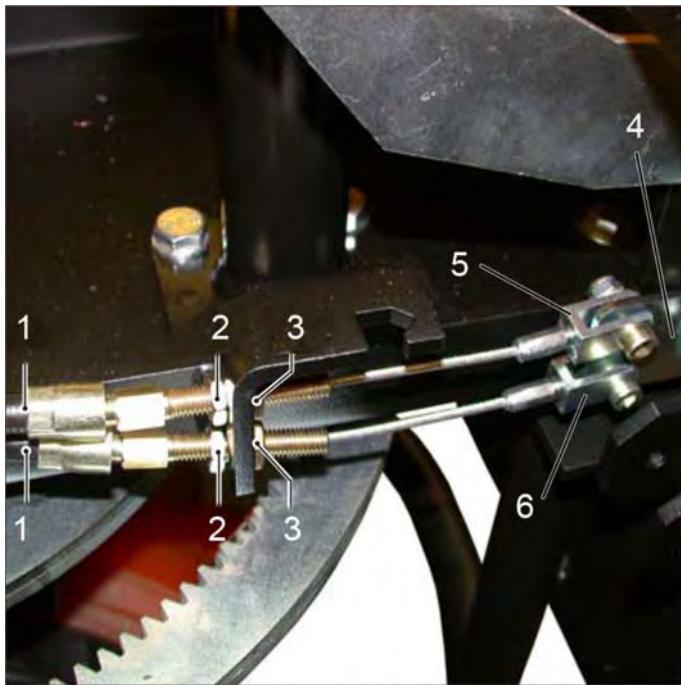
*Mortal danger due to inadequate braking effect! Regularly check brake. The brake must safely hold the appliance at inclinations up to 15% and maximum load capacity.*

- 1 Bowden traction cable
- 2 Brake lever
- 3 Drum brake



- 1 Brake lever
- 2 Locknut
- 3 Bowden cable





- 1 Bowden cable
- 2 Adjusting screw
- 3 Locknut
- 4 Lever brake pedal
- 5 Bowden cable left brake
- 6 Bowden cable right brake

#### Note

The wheels must brake uniformly and symmetrically when operating the brake pedal.

- Loosen the locknut.
- Adjust the Bowden cable on the adjustment screws.
- Tighten the locknut.
- Check braking effect.

## 060 Error diagnosis

Findings	Possible cause	Correction
Noises in the area of the propulsion motor.	Brake does not open.	Check voltage / replace brake.
Brake does not open.	Socket plug connection	Check electrical connection / replace brake.
Propulsion motor without function.	Magnetic sensor - accelerator pedal defective.	Check in the test mode, replace in case of findings.
	Propulsion motor defective.	Check in the test mode, replace in case of findings.
	Travel direction switch defective.	Check switch, replace in case of findings.
	Drive module defective.	Check module, replace in case of findings.
	Data cable (bus cable)	Check data cable (bus cable).
Propulsion motor - only slow speed possible.	Encoder B3 defective.	Check/replace encoder B3.
Rear-wheel brake brakes single-sided.	Brake pad worn.	Replace brake pad.
	Brake soiled.	Clean brake.
	Bowden cable	Check Bowden cable for adjustment, damage and ease of movement. Adjust or replace in case of findings.
Appliance skids during braking.	Rear wheel brake braking on one side.	Adjust the rear wheel brake.

## 070 Peculiarities/ others

The service group does not contain any peculiarities.

## AJ Service group for cleaning head R

### 010 Safety information

For this service group there is no special safety information.

**Observe general safety information!**

### 020 Overview



1 Cleaning head

### 030 Function

No special functional characteristics.

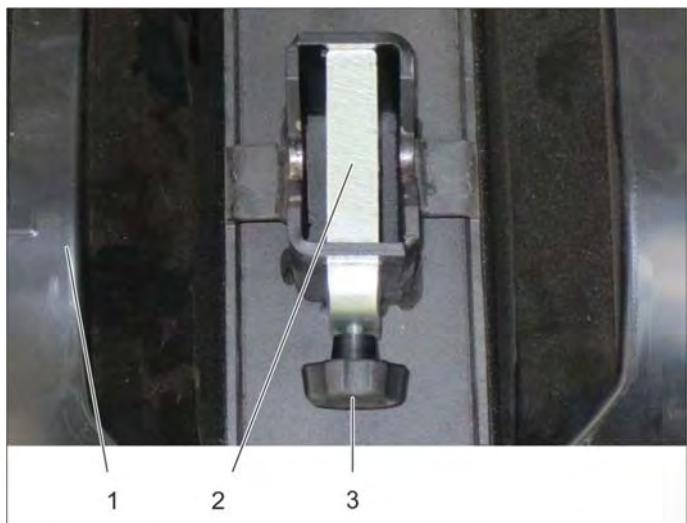
### 040 Service activities

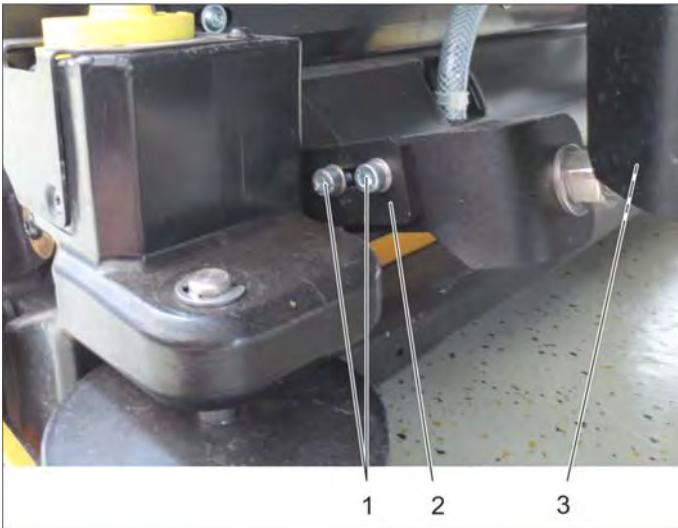
#### AJBW Uninstall/ install cleaning head

■ Lower the cleaning head completely.

- 1 Cleaning head
- 2 Bow
- 3 Knurled head screw

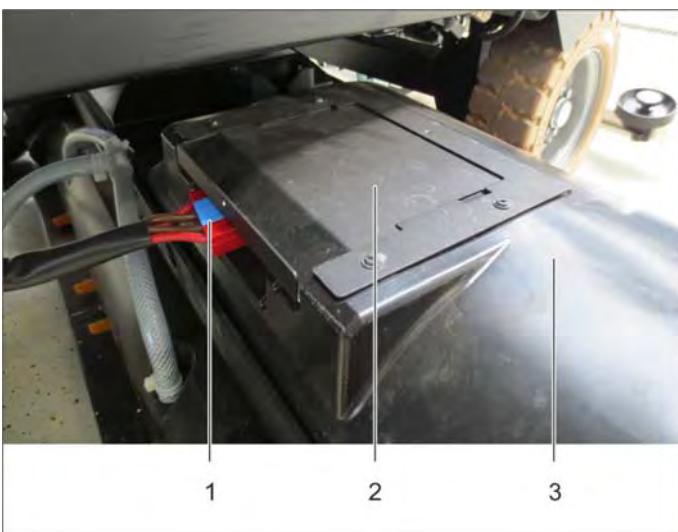
- ➔ Unscrew the knurled-head screw.
- ➔ Pull out the bow.
- ➔ Raise the cleaning head lifting device.





- 1 Screws
- 2 Drawbar lock
- 3 Drawbar

→ Loosen the screws.  
→ Open the drawbar lock.  
→ Unhinge pull rod.  
→ Pull out the cleaning head.



- 1 Electric socket plug connections
- 2 Cover
- 3 Cleaning head

→ Pull out the cover.  
→ Separate the electric connectors.

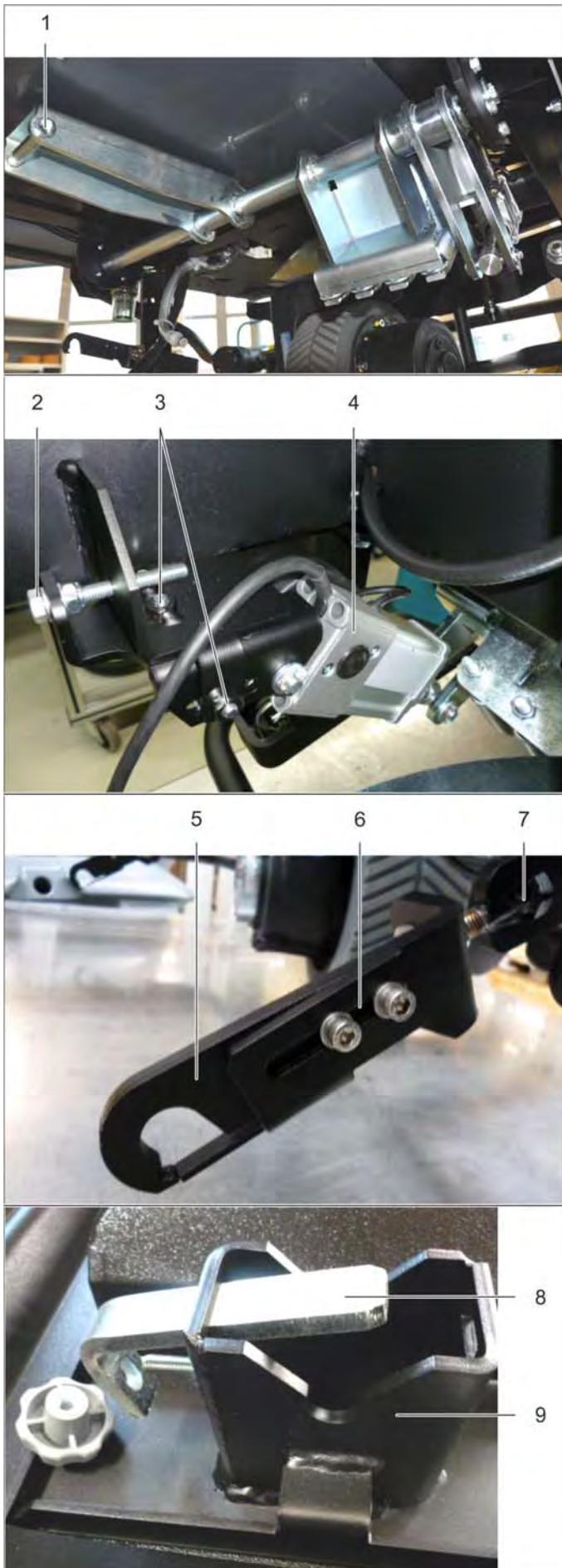


- 1 Hose coupling

→ Disconnect the hose coupling.

## 050 Maintenance and inspection

### Setting the brush head



- 1 Lever
- 2 Adjustment screw
- 3 Screws
- 4 Lifting motor
- 5 Drawbars
- 6 Lock
- 7 Counter-nut
- 8 Locking
- 9 Intake

- Open the lock on the brush head.
- Place the brush head underneath the appliance in the correct position.
- Hook in the drawbars in the brush head.
- Close the lock and screw it in tight.
- Move the lever downwards with the lifting motor so that the brush head slightly touches the mounting.
- Close the lock and screw it in tight.
- Screw down the drawbars on the appliance (so as to be free of play) and secure using lock nuts.

#### Note

The threaded rods are supposed to protrude evenly on both sides.

- Check the direction of rotation of the roller brushes.
- Check the length of the brush bundle (at least 10 mm).
- Check the brush mirror with the new roller brushes on a level floor, and correct the setting, if necessary.
- Move the brush head up and check the brush head elevation.

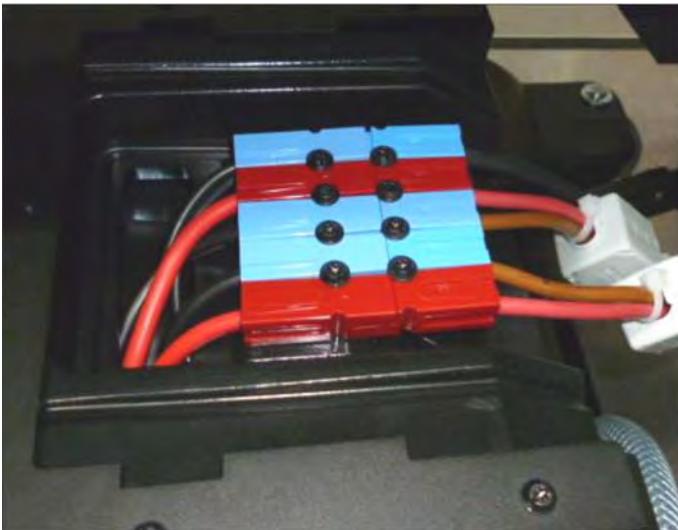
#### Note

The brush head is supposed to slightly touch the frame on both sides.

- On the lifting motor holder, the position of the lifting motor can be moved, meaning the brush head can be height adjusted.
- Undo the screws and use the adjusting screw to move the lifting motor in the required direction.
- Tighten the screws.
- Connect up the electrical system.
- Connect up the water hose.

#### Note

Adjust the drawbars if the roller brushes (at the front and back) are unevenly worn if an R head is used.



**Note**

Make sure that the connection sequence is correct.

## 070 Peculiarities/ others

For service tasks and further information observe separate service manual.

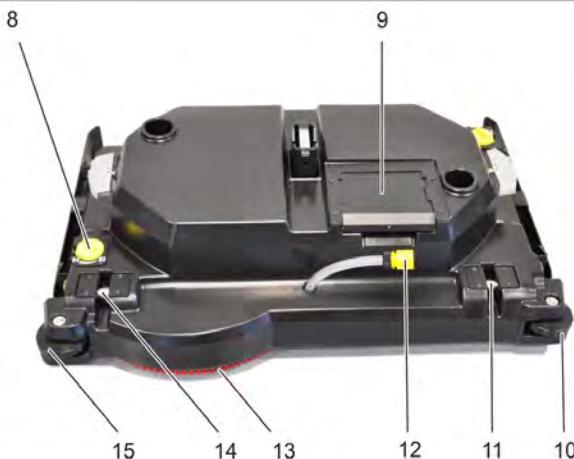
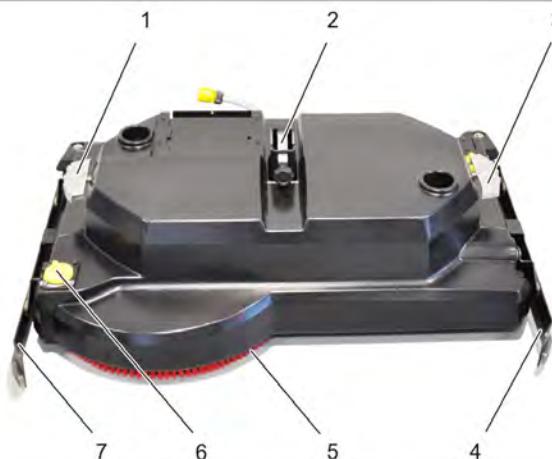
# AK Service group cleaning head D

## 010 Safety information

For this service group there is no special safety information.

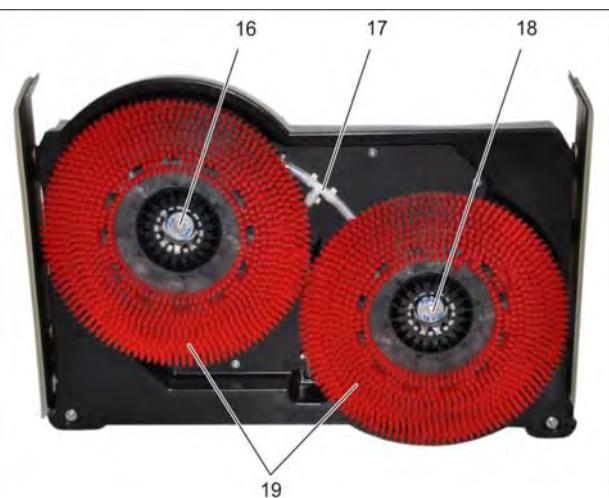
**Observe general safety information!**

## 020 Overview



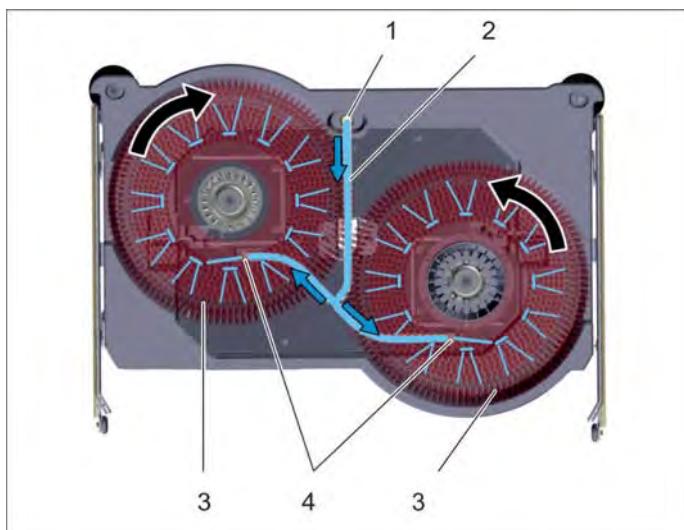
- 1 Pedal for changing brushes, left
- 2 Retainer cleaning head
- 3 Pedal for changing brushes, right
- 4 Wiping flap
- 5 Disc brush
- 6 Adjustment wheel for wiping flap\*
- 7 Wiping flap

- 8 Adjustment wheel for wiping flap\*
- 9 Lid, plug for mains connection
- 10 Left scraper roller
- 11 Retainer pull rod
- 12 Water connection
- 13 Disc brush
- 14 Retainer pull rod
- 15 Right scraper roller



- 16 Transmission/ disc brush retainer
- 17 Water inlet
- 18 Transmission/ disc brush retainer
- 19 Disc brush

## 030 Function



- 1 Hose coupling
- 2 Water inlet
- 3 Disc brush
- 4 Reduction sleeve

## 070 Peculiarities/ others

For service tasks and further information observe separate service manual.

## AF Service group suction system

### 010 Safety information

For this service group there is no special safety information.

**Observe general safety information!**

### 020 Overview



- 1 Vacuum bar
- 2 Suspension suction bar
- 3 Lifting motor vacuum bar
- 4 Suction turbine

### 030 Function



- 1 Vacuum bar
- 2 Suspension suction bar
- 3 Lifting motor vacuum bar

The lifting motor suction bar controls the height of the suction bar. It lowers and raises the suction bar via a tension spring.

The upper and lower position is switched off respectively using a microswitch. When the appliance is reversing, the suction bar lifts automatically.

The suction bar sucks up the water emitted by the cleaning head and leads it through a hose line into the waste water tank.

The suction bar is secured in a suspension that embeds it flexibly so it can swivel during cornering. The water sucked up by the suction bar is collected in the waste water tank; if this tank is full, it must be emptied via the waste water drain hose.

When the appliance is reversing, the suction bar is lifted automatically

## 040 Service activities

### Note

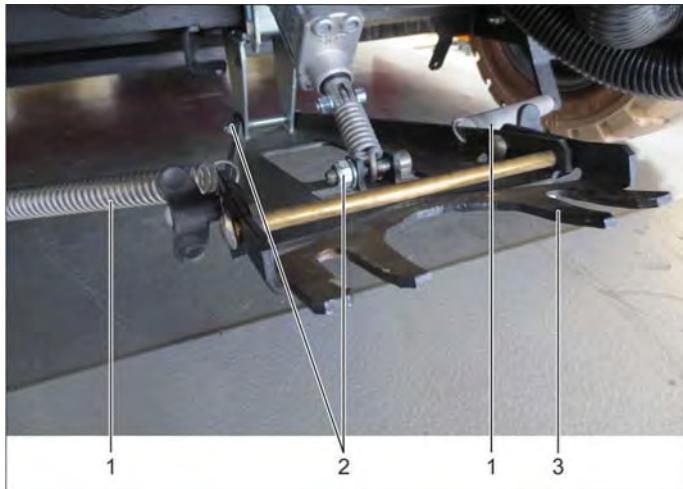
Unless otherwise described, the installation takes place in reverse order.

### AFAS Uninstalling/installing suspension of the suction bar

#### ■ AFSB Uninstall/ install suction bar

- 1 Springs
- 2 Screws
- 3 Suspension suction bar

- Unhook the springs.
- Disconnect screw connections.
- Remove the suction bar suspension.

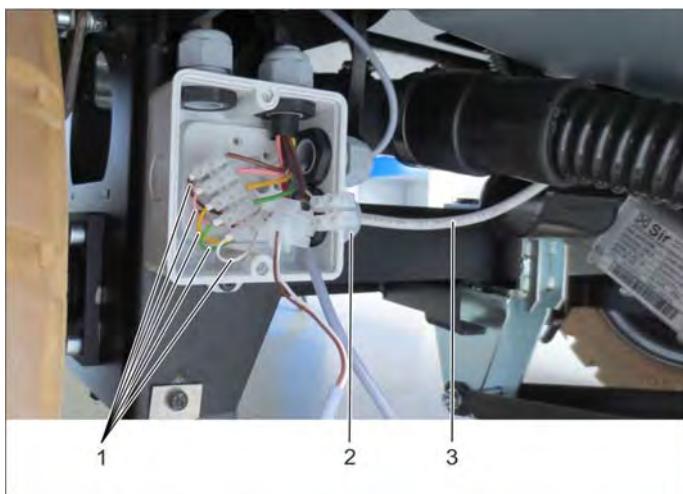
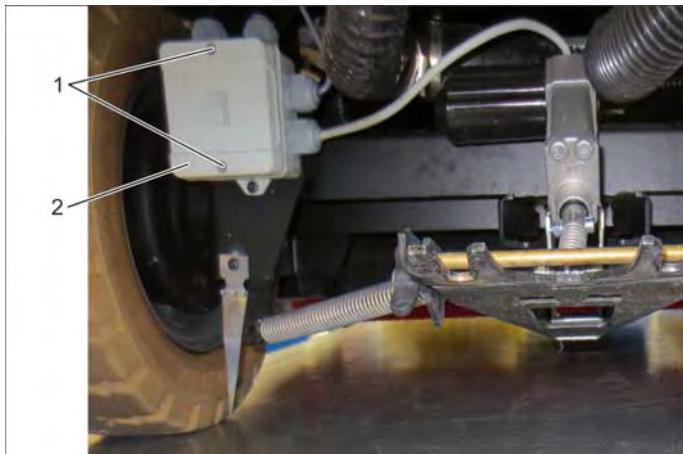


### AFHU Uninstall / install lifting motor suction bar

#### ■ AFSB Uninstall/ install suction bar

- 1 Screws
- 2 Lid for cable box

- Unscrew the screws.
- Remove the lid for the cable box.



- 1 Electrical connections
- 2 Screw connections
- 3 Connection cable

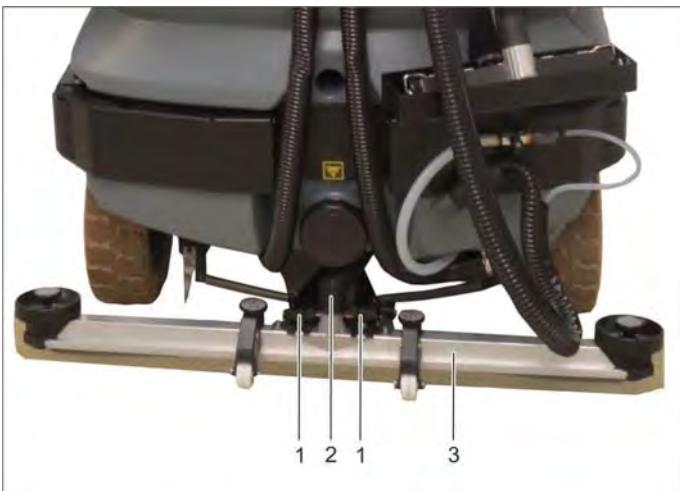
- Undo the electrical connections.
- Loosen the screw connection.
- Pull the connection cable out of the cable box.



- 1 Lifting motor
- 2 Screw connections
- 3 Springs

→ Unhook the springs.  
→ Disconnect screw connections.  
→ Remove the lifting motor.

#### AFSB Uninstall/ install suction bar



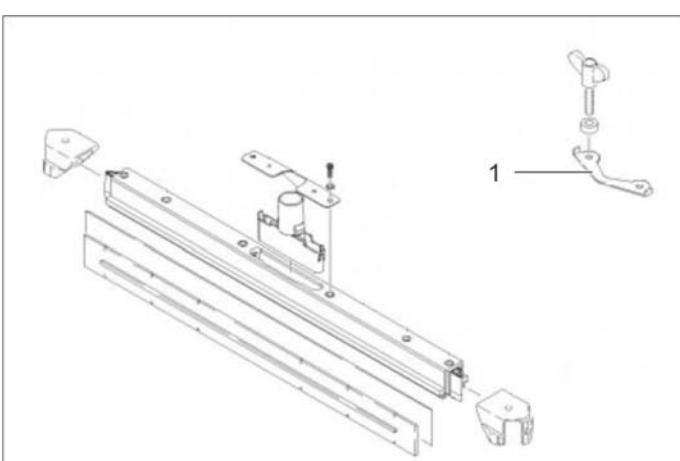
- 1 Screws
- 2 Suction hose
- 3 Vacuum bar

→ Pull out the suction hose from the vacuum bar.  
→ Loosen the screws.  
→ Remove the vacuum bar.

- 1 Plate

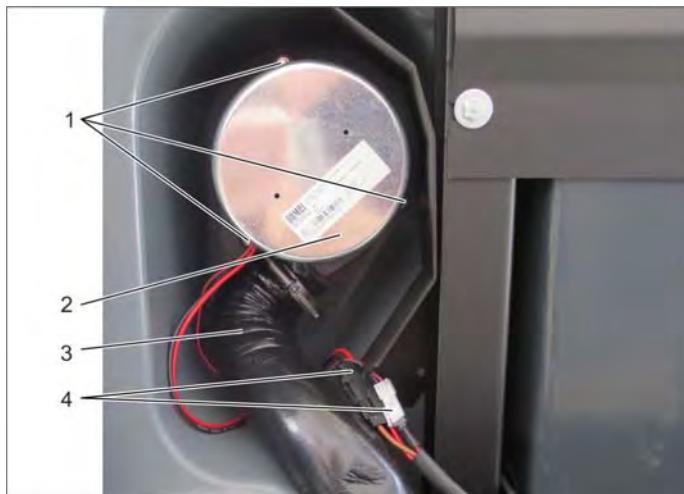
#### Note

When the suction bar is being installed, make sure that the plate is mounted.



## AFSD Uninstall / install suction turbine

### ■ AEFR Uninstall / install fresh water tank on the right



- 1 Screws
- 2 Suction turbine
- 3 Noise insulation flexy tube
- 4 Plug connections

- Disconnect the connectors.
- Unscrew the screws.
- Remove the suction turbine.
- Pull off the noise insulation flexy tube.

## 060 Error diagnosis

Findings	Possible cause	Correction
Suction turbine not working	Suction turbine defective.	Replace suction turbine, check cable connection
Suction is too low	Suction hose clogged/leaking. Drain hose leaking/defective Suction bar poorly set Suction lips defective. Flat-fold filter blocked. Cover gasket defective Suction turbine clogged with dirt	Clean/replace suction hose. Replace drain hose Adjust suction bar. Replace suction lips. Clean/replace flat fold filter. Replace cover gasket Replace suction turbine Check float switch for proper functionality.

## 070 Peculiarities/ others

The service group does not contain any peculiarities.

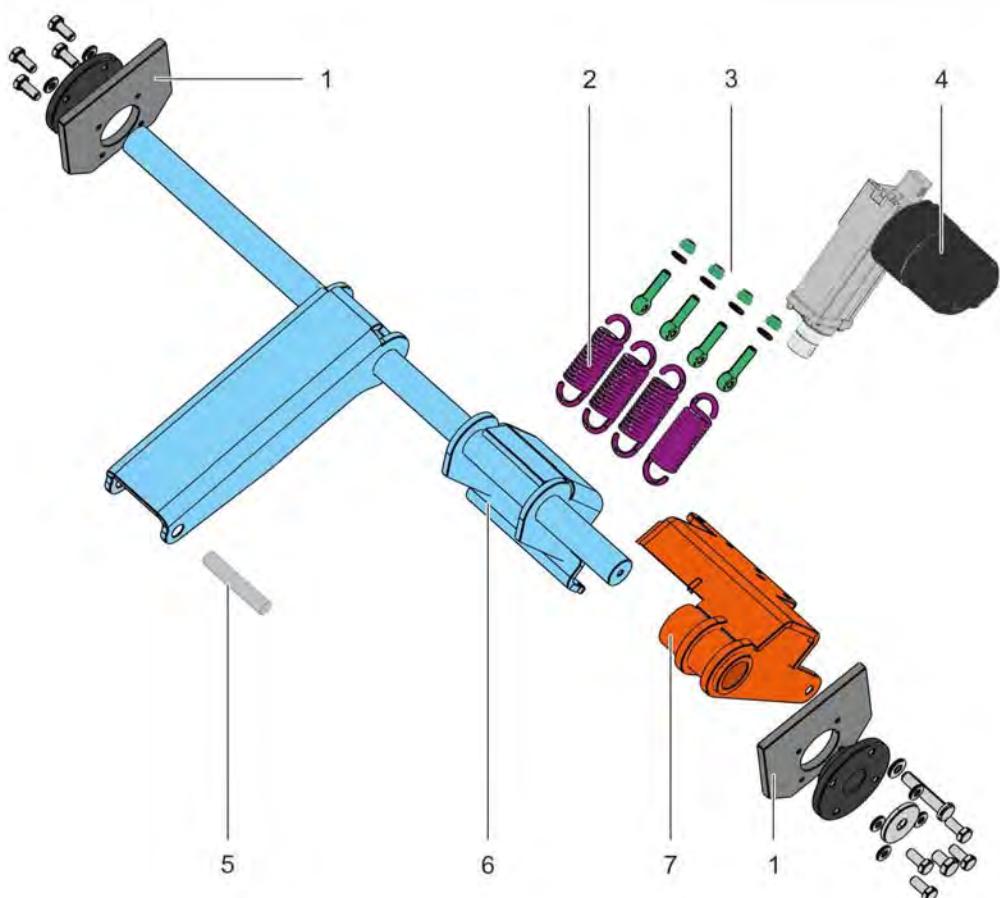
# AM Service group cleaning head suspension

## 010 Safety information

For this service group there is no special safety information.

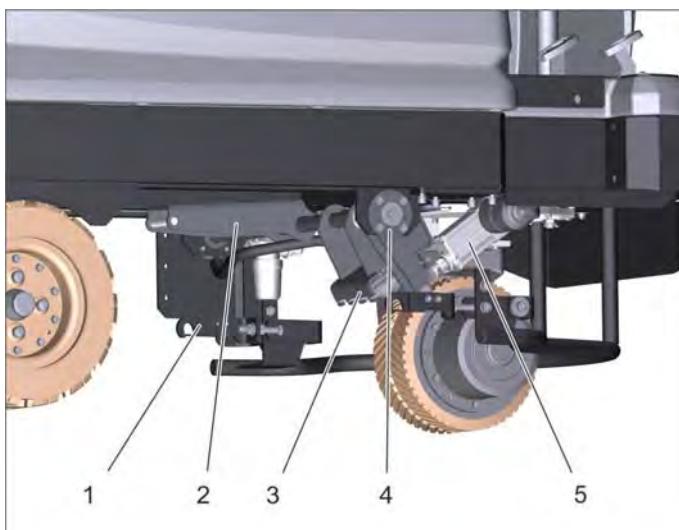
**Observe general safety information!**

## 020 Overview



- 1 Bearing lifting unit
- 2 Tension spring lifting unit
- 3 Eye screw
- 4 Lifting motor lifting unit
- 5 Bolt of the holder of the cleaning head
- 6 Axle lifting unit
- 7 Angle bracket lifting motor

## 030 Function



- 1 Drawbar
- 2 Hookup of cleaning head
- 3 Spring element / damper
- 4 Bearings
- 5 Lifting motor (M20)

The lifting motor moves the lever of the spring element. The spring element is linked to the axle of the lifting unit. The suspension mounted to the axle of the lifting unit lowers and raises the cleaning head. The spring element / damper protects the lifting motor against strokes of the cleaning head that occur when driving over bumps on the ground.

### Function of brush head lifting motor

#### Lower the brush head

- The brush head moves downwards a few centimetres at a quick speed.
- The electronics switch over to brush drive current measurement, and the lifting motor speed is substantially reduced.
- The lifting motor continues to move the brush head downwards for as long as it takes until the set brush contact pressure is reached. This is done using the current measurement for the brush drive.
- In case the microswitch is reached beforehand (brush head all the way down), the lifting motor switches off independently of the brush drive current.

#### Raise the brush head

- The lifting motor moves the brush head upwards at fast speed up to the microswitch. If the microswitch fails to switch off due to a defect, then the lifting motor will switch off via the electronics.

In test mode, it is possible to check the power in both brush motors. Firstly, you need to switch on the brush drive. After this is done, you can actuate the brush head lifting motor. When the brushes have reached the floor, the power will increase. Both motors are supposed to have the same power consumption; where applicable, the brush mirror needs to be adjusted if an R head is used.

#### Note

The brush mirror must be set with new roller brushes.

#### Test mode operation:



Brush drive

Brush head

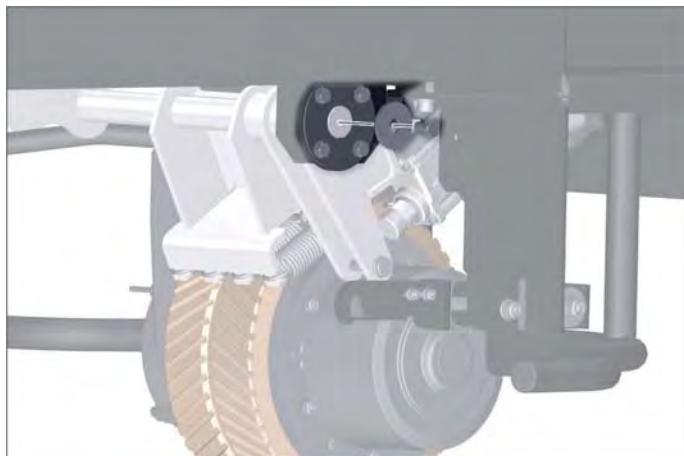


## 040 Service activities

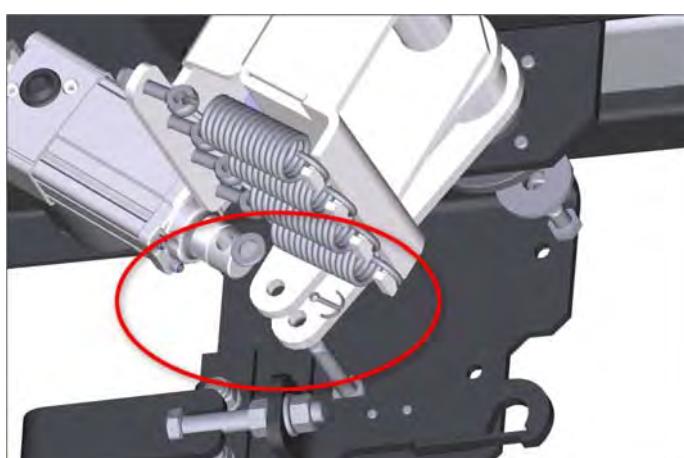
### AMAA - Uninstall / install axle of lifting unit

■ AJBW Uninstall/ install cleaning head

→ Unscrew the screw of the axle locking device on the right bearing of the lifting unit.

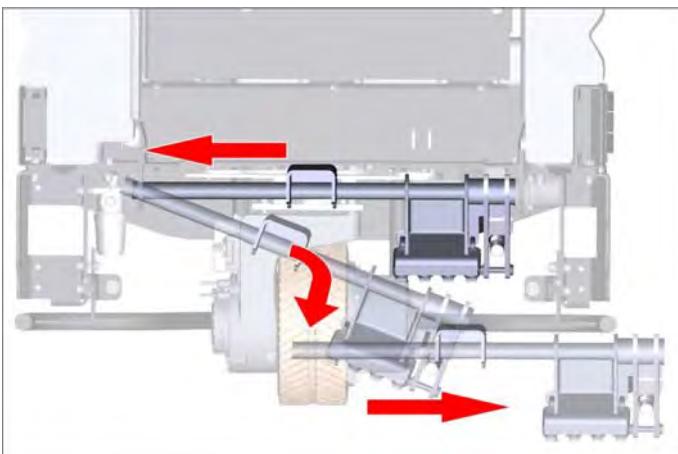


→ Pull the cotter out of the bolt.  
→ Pull the bolt out of the retainer.  
→ Tilt the lifting motor downwards.



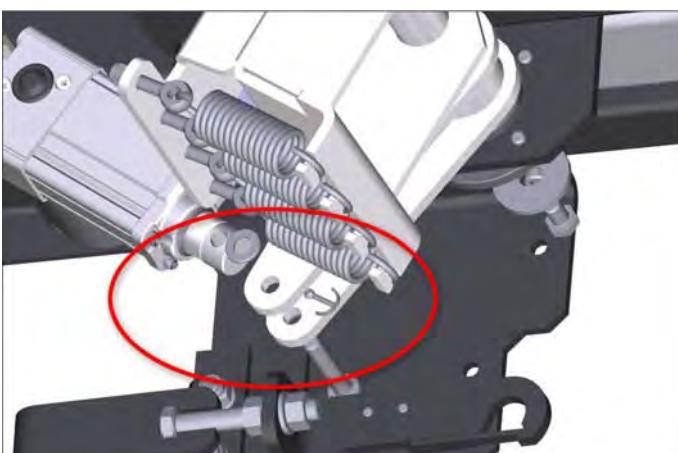


- Unscrew the screws on the left bearing.
- Pull the bearing out of the holder.

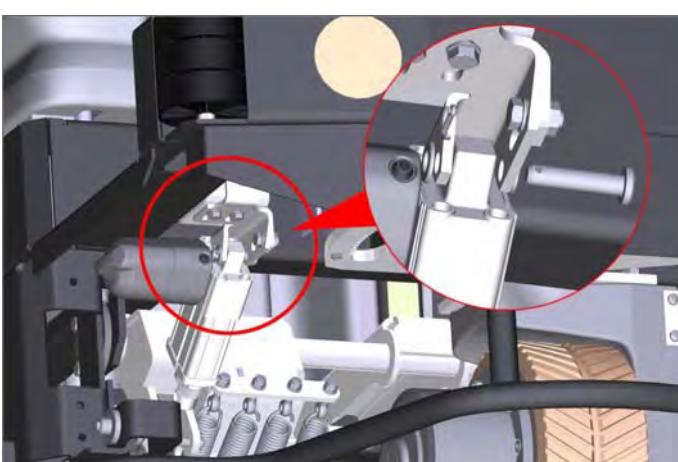


- Push the axle of the lifting unit to the left.
- Tilt the axle of the lifting unit down.
- Pull the axle of the lifting unit out of the appliance towards the right.

#### AMHM Uninstall / install lifting motor of lifting unit



- Pull the cotter out of the bolt.
- Pull the bolt out of the retainer.
- Tilt the lifting motor downwards.

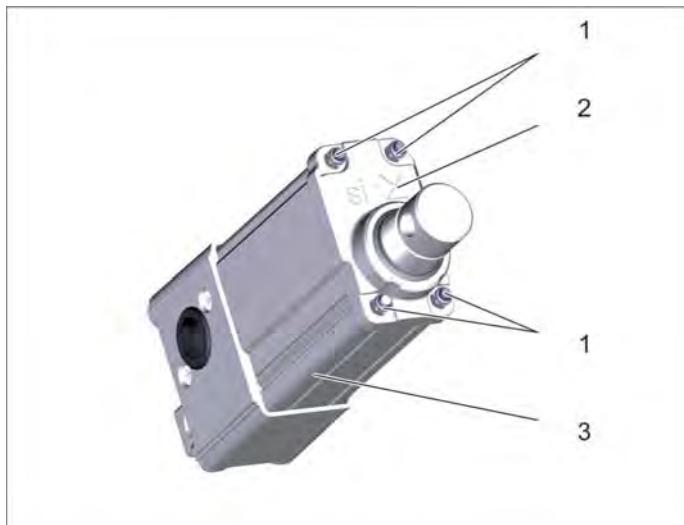


- Disconnect the electrical connection on the lifting motor.
- Pull the cotter out of the bolt.
- Remove the lifting motor from the appliance.

#### Note

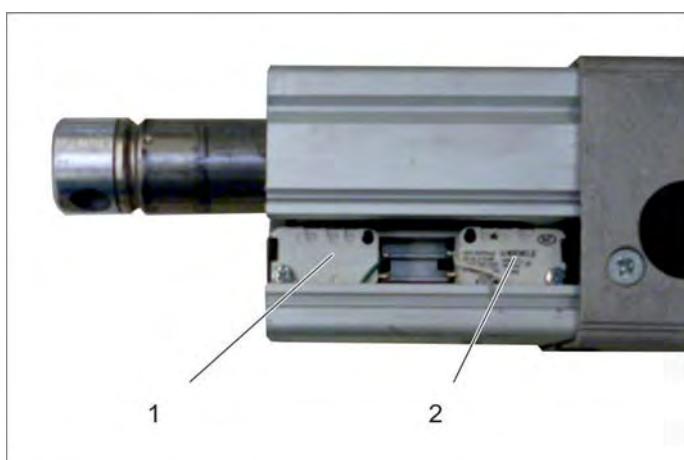
Usually a new lifting motor must not be adjusted. If adjustment is necessary for once, loosen the screws on the holder, move the holder and adjust the path.

## Checking the microswitch of the lift motor



- 1 Nuts
- 2 Cover
- 3 Casing lifting motor

→ Unscrew the nuts.  
→ Remove the lid.  
→ Remove lateral cover.



- 1 Microswitch end position extended.
- 2 Microswitch end position retracted.

→ Check / adjust microswitch.

### Note

The microswitches are permanently set at the factory and do not normally need to be adjusted.

## AMLA - Uninstall / install bearing of lifting unit

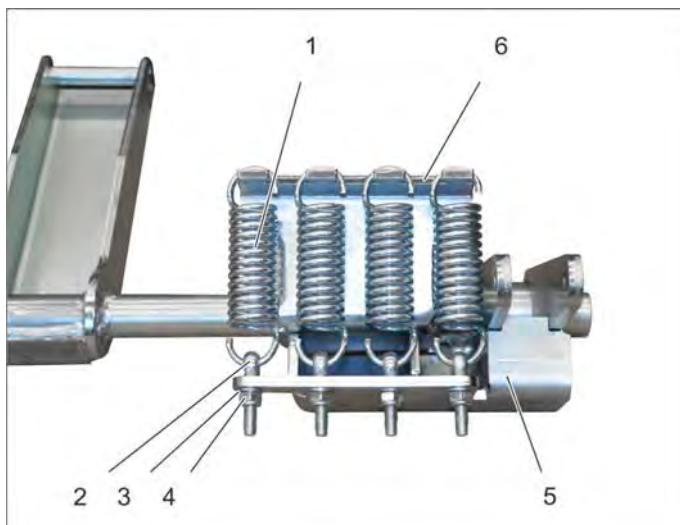


### ■ AMAA - Uninstall / install axle of lifting unit

→ Unscrew the screws.  
→ Pull the bearing out of the frame.

## AMZA Uninstall / install tension spring of lifting unit

### ■ AMAA - Uninstall / install axle of lifting unit

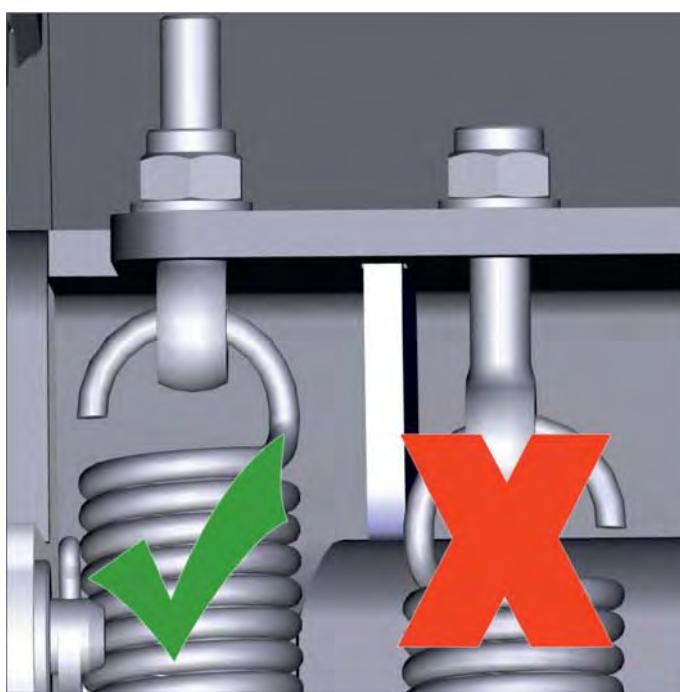
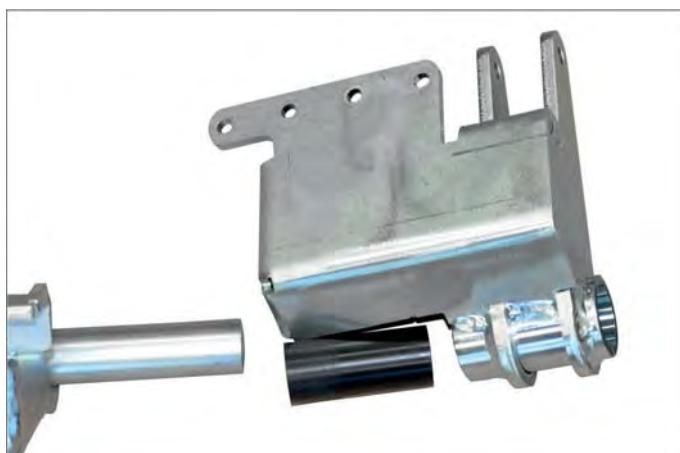


- 1 Draw spring
- 2 Eye screw
- 3 Disc
- 4 Nut
- 5 Lever spring element
- 6 Spring holder axle lifting unit

- Loosen the mounting nuts.
- Remove washers.
- Pull the eyebolts out of the lever.
- Unhook the tension springs at the spring holder.
- Pull the tension springs out of the eyebolts.
- Pull the lever of the spring element off the axle of the lifting unit.

#### Note

A plastic sleeve is inserted in the lever of the spring element. Check this for damage prior to assemblage.  
Replace damaged plastic sleeve.  
Check welding seams on the lever for damage (visual inspection).  
Replace damaged lever



#### Adjusting the tension spring

- Hook the tension springs into the eyebolts and spring holders.
- Insert eyebolts into the lever.
- Slide the washers on the eyebolts and screw on self-locking nuts.

#### Note

The spring element is correctly adjusted if all nuts are completely screwed in and the rings of the eyebolts are in contact with the metal sheet of the lever.

## 050 Maintenance and inspection

Service group does not contain any maintenance and inspection points.

## 060 Error diagnosis

Findings	Possible cause	Correction
No lifting / lowering of the cleaning head	Lifting motor defective	Check lifting motor, check electrical connection, check control voltage, replace in case of findings.
Cleaning head jumps during cleaning	Bearing axle lifting unit damaged	Check bearing, replace in case of findings.
	Spring element damaged	Check spring element, repair in case of findings.
	Brush rollers flattened	Replace brush rollers.
	Tension springs damaged	Check tension springs, replace in case of findings.
	Roller brush worn. (the bristle length must be 10mm)	Replace brush head.

## 070 Peculiarities/ others

The service group does not contain any peculiarities.

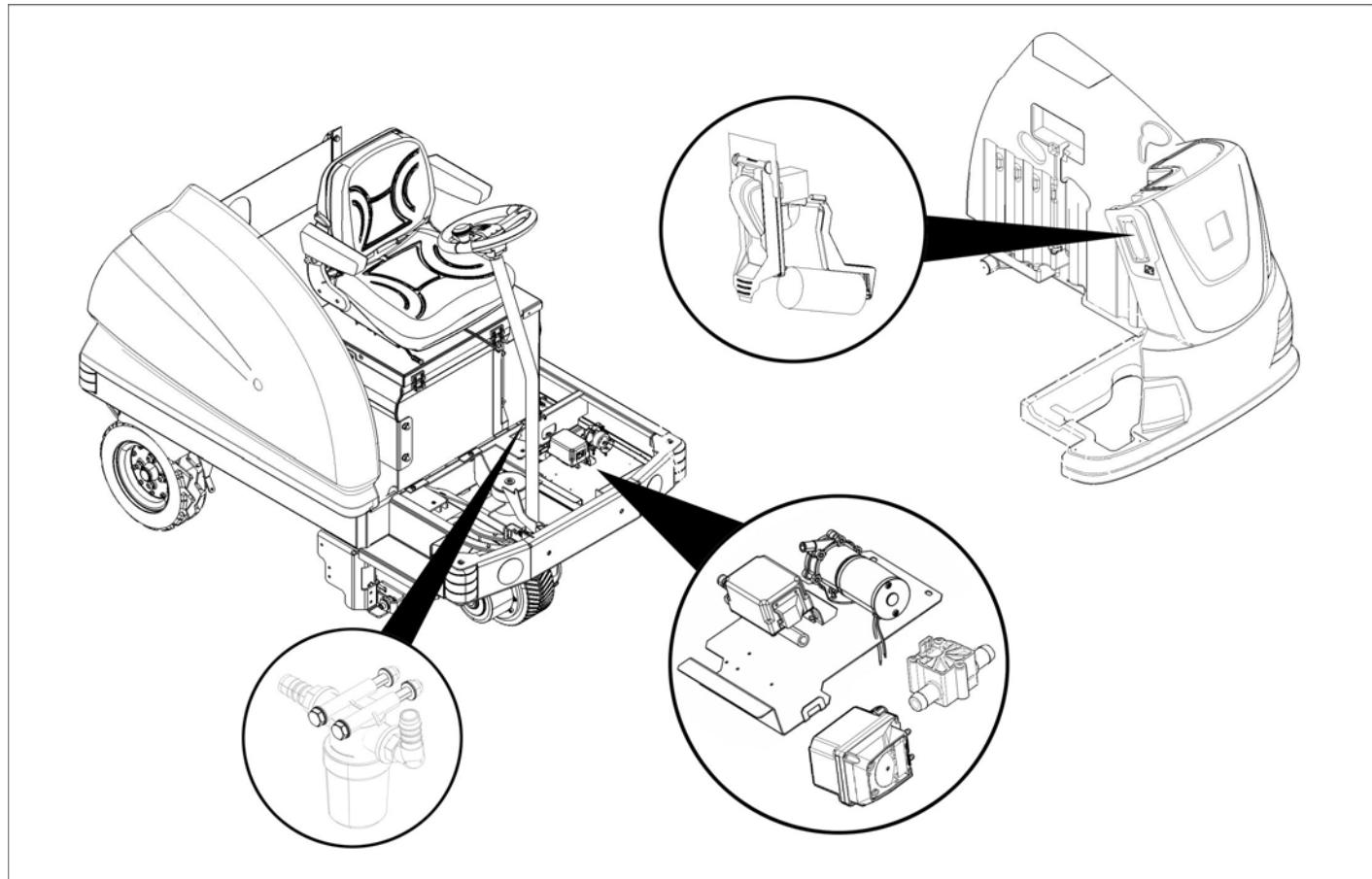
## AD service group fresh water system

### 010 Safety information

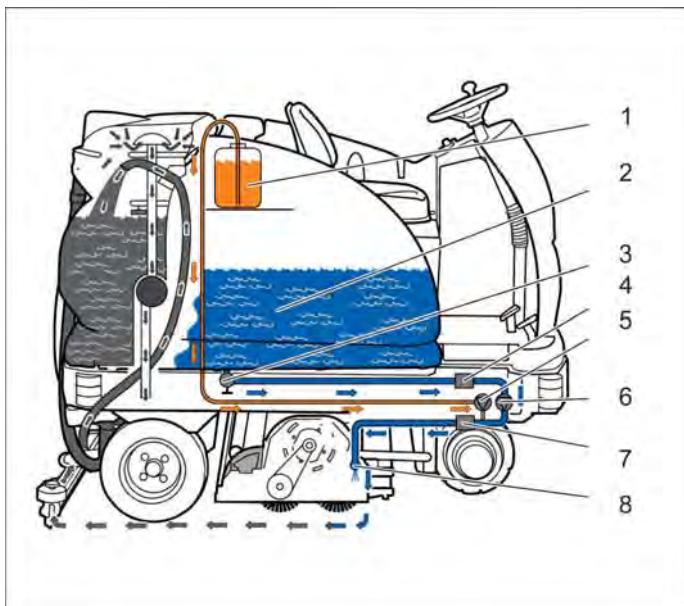
For this service group there is no special safety information.

**Observe general safety information!**

### 020 Overview



## 030 Function



- 1 Cleaning agent container
- 2 Fresh water tank
- 3 Stop valve for the fresh water tank (recycling option)
- 4 Water filter
- 5 Detergent dosing pump
- 6 Water pump
- 7 Electric ball valve
- 8 Water hose of the cleaning head

The fresh water flows from the fresh water tank through the water filter to the water pump.

A stop valve (recycling option) is installed downstream of the fresh water tank.

The detergent is drawn out of the detergent container by the detergent dosing pump and added to the fresh water - depending on the dosage selected by the user.

The detergent solution is dosed by the electric ball valve - depending on the water volume selected by the user.

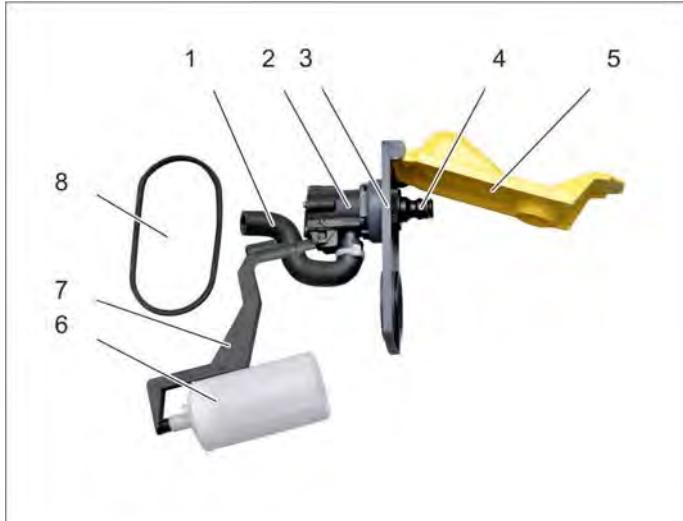
The detergent solution flows from the electric ball valve through the water hose to the cleaning head.

In the cleaning head the detergent is brought onto the brushes via the water distribution bar (R-cleaning head) or the water nozzles (D-cleaning head).

The water level in the fresh water tank is monitored by means of a level gauge.

## 040 Service activities

### ADAF Completely uninstall / install auto fill-in



- 1 Form hose
- 2 Valve
- 3 Front plate
- 4 Quick coupling
- 5 Cover
- 6 Float
- 7 Float linkage
- 8 O-Ring

→ Unscrew the screws of the auto fill.

→ Pull the auto fill-in out of the fresh water tank.

#### Note

The preformed hose must not be kinked during installation.

The preformed hose must be taken passed the lever on the right. If the preformed hose is not installed, water squirts out of the overflow opening during filling.

During installation, ensure that the float can move freely.



The water filter in the valve cannot be replaced. Operate the valve for cleaning and rinse with clear water.

**Note**

The valve cannot be opened or repaired. Replace stiff or clogged valve.

#### ADFF Uninstall / install fresh water filter insert

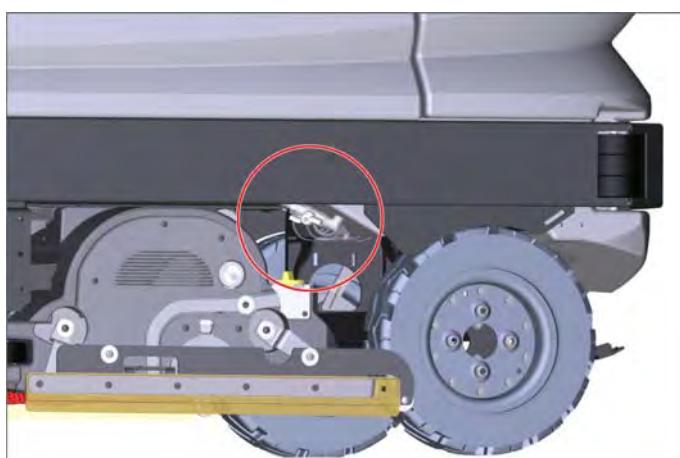


- 1 Screw connections
- 2 Water connection / inlet
- 3 Water filter casing
- 4 Filter pot
- 5 Filter inlay

- Close the fresh water tank stop valve.
- Unscrew the filter cup from the filter casing.
- Remove and clean filter insert.

**Note**

If the filter insert is excessively soiled, it must be replaced. A damaged filter insert (tears/ holes in the filter fabric) must also be replaced.



## ADFÜ Uninstall / install fresh water level gauge

### ■ ACBF Uninstall / install the control panel

The level gauge of the fresh water tank is installed underneath the control panel.



- 1 Screw
  - 2 Level gauge
  - 3 Connection plug
- Pull out the connecting plug.  
→ Unscrew the screws.  
→ Pull out the level gauge towards the top.

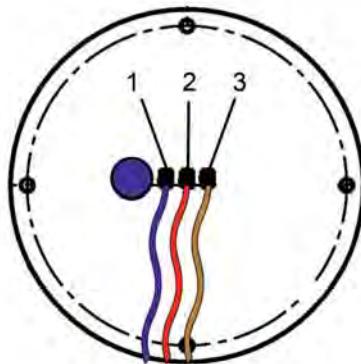
- Check the level gauge.  
→ Replace the defective level gauge.

**Note**

Observe pin assignment during installation:

- 1 Output signal
- 2 Positive (+) battery
- 3 negative (-) battery and earth fresh water tank

X 7/11 : X 7/2	0.1 - 4.7 V (depending on water level)
----------------	--





### 1 Central minus point

#### Note

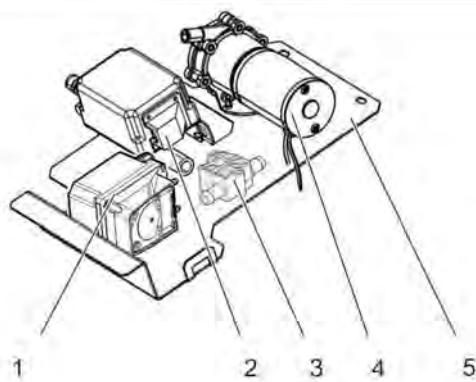
The fresh water tank is connected to the central minus point so that the filling level is displayed correctly.

### ADKU Uninstall / install electric ball valve

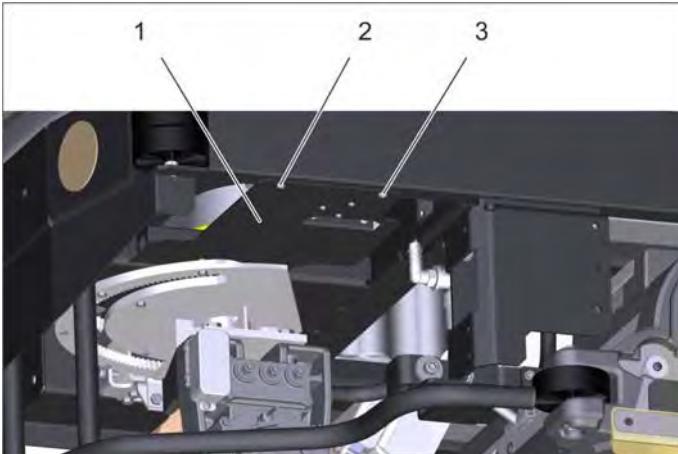


The electric ball valve is mounted on a carrier together with the water pump, the detergent dosing pump and the flow meter.

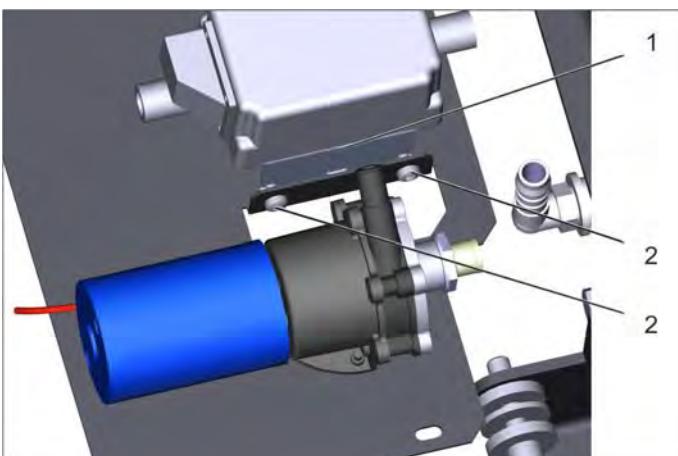
The carrier can be tilted down for improved accessibility.



- 1 Detergent dosing pump
- 2 Electric ball valve
- 3 Flowmeter
- 4 Water pump
- 5 Support plate



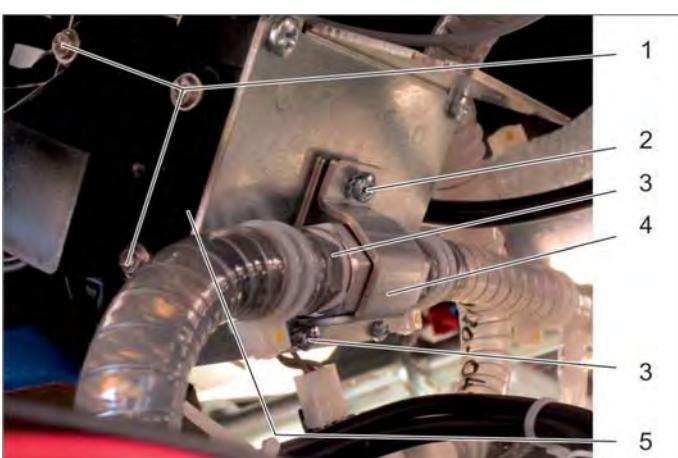
- 1 Support plate
  - 2 Screw
- Unscrew the screws.  
→ Tilt the carrier plate down.  
→ Pull the carrier plate out of the retainer towards the front.  
→ Place the carrier plate onto the hoop guard.



- 1 Angle bracket
- 2 Screw



- Loosen screws.  
→ Remove the electric ball valve from the carrier plate.



- 1 Screws of the cover of the electrical connection
  - 2 Screws of retaining clamp of the ball valve
  - 3 Ball tap
  - 4 Holding bow
  - 5 Drive
- Unscrew the screws of the cover of the electrical connection.  
→ Remove cover.  
→ Disconnect electrical connection.  
→ Unscrew the screws of the retaining clamp of the ball valve.



- Remove ball valve from the drive.
- Check ball valve for foreign objects, clean if necessary.

**Note**

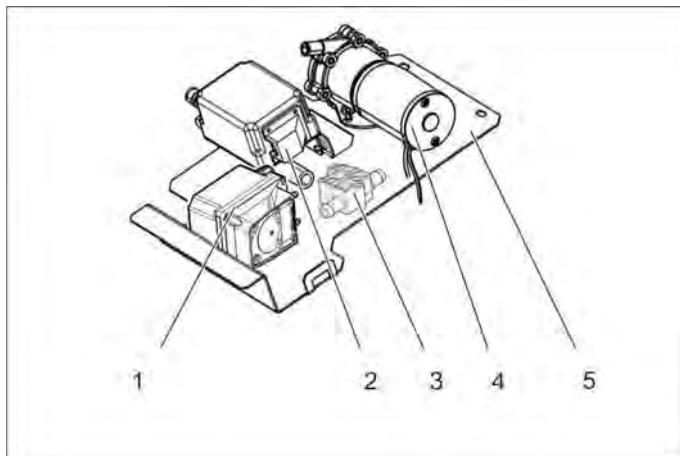
The electric ball valve does not contain any replaceable parts and can only be completely exchanged in case of a defect.

#### ADWP Uninstall / install water pump

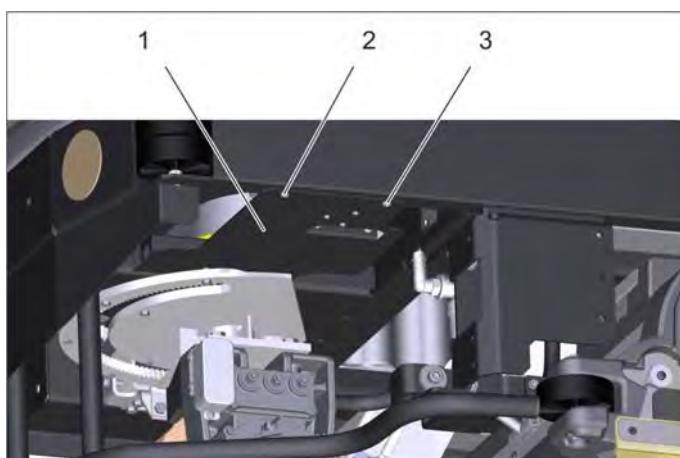


The water pump is mounted on a carrier together with the electric ball valve, the detergent dosing pump and the flow meter.

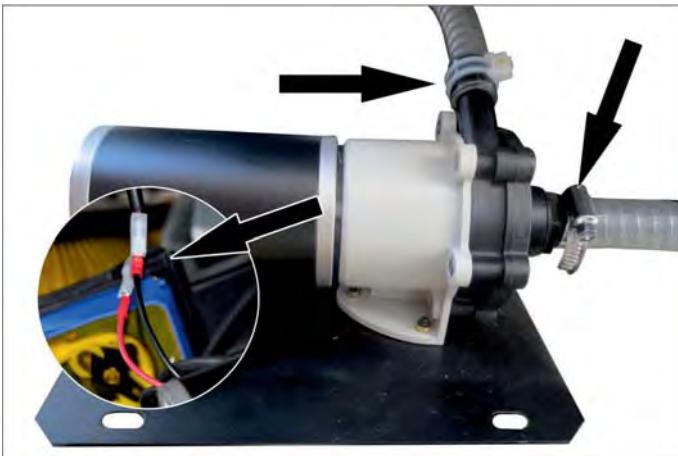
The carrier can be tilted down for improved accessibility.



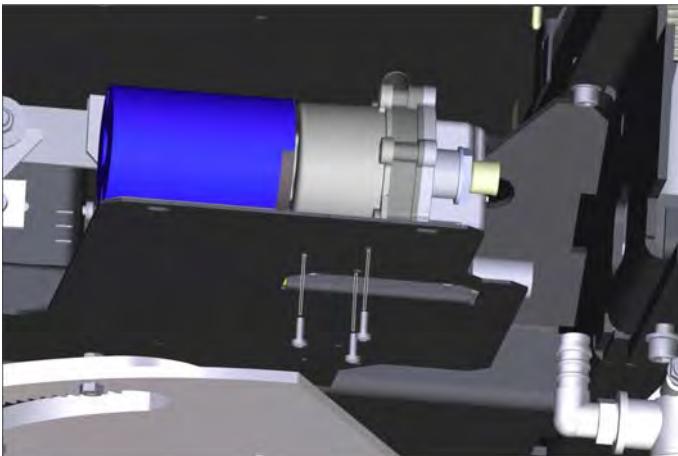
- 1 Detergent dosing pump
- 2 Electric ball valve
- 3 Flowmeter
- 4 Water pump
- 5 Support plate



- 1 Support plate
  - 2 Screw
- Unscrew the screws.
  - Tilt the carrier plate down.
  - Pull the carrier plate out of the retainer towards the front.
  - Place the carrier plate onto the hoop guard.



- ➔ Disconnect water connection.
- ➔ Disconnect electrical connection.



- ➔ Unscrew the screws.
- ➔ Remove the water pump from the carrier plate.

**Note**

The water pump does not contain any replaceable parts and can only be completely exchanged.

A dry running water pump generates loud noises.

**Note**

If the water pump is running dry, it will make substantial noise.

## 050 Maintenance and inspection

Service group does not contain any maintenance and inspection points.

## 060 Error diagnosis

Findings	Possible cause	Correction
Auto fill-in does not switch off	Float blocked	Dismantle auto fill-in, check float, renew in case of findings.
Upon filling with the auto fill-in, water squirts out of the overflow opening.	Preformed hose not properly installed	Dismantle auto fill-in, check preformed hose, renew in case of findings.
Upon filling with the auto fill-in, water drips at the side of the appliance.	Seals of auto fill-in damaged.	Dismantle auto fill-in, check seals, renew in case of findings.
Water pump does not deliver water	Water filter clogged. Stop-cock fresh water tank closed. Hose lines clogged or damaged. Water pump defective	Clean water filter, replace the filter insert in case of heavy soiling. Open stop-cock. Check hose lines, clean or renew in case of findings. Check water pump, renew in case of findings.
No water at the cleaning head, even though the water pump delivers.	Electric ball valve defective.	Check electric ball valve, clean or renew in case of findings.
The content of the fresh water tank is indicated incorrectly.	Level sensor connected incorrectly.	Check terminal assignment.
Water volume too low.	Water filter clogged. Water pump is running in the wrong direction of rotation. Water distribution strip clogged. Electric ball tap difficult to move.	Clean water filter. Change polarity. Clean the water distribution strip (just R cleaning head). Check electric ball tap.
Fresh water sensor indicates no filling quantity.	Fresh water sensor incorrectly wired. Fresh water tank has to be connected to minus.	Check wiring.

## 070 Peculiarities/ others

The service group does not contain any peculiarities.

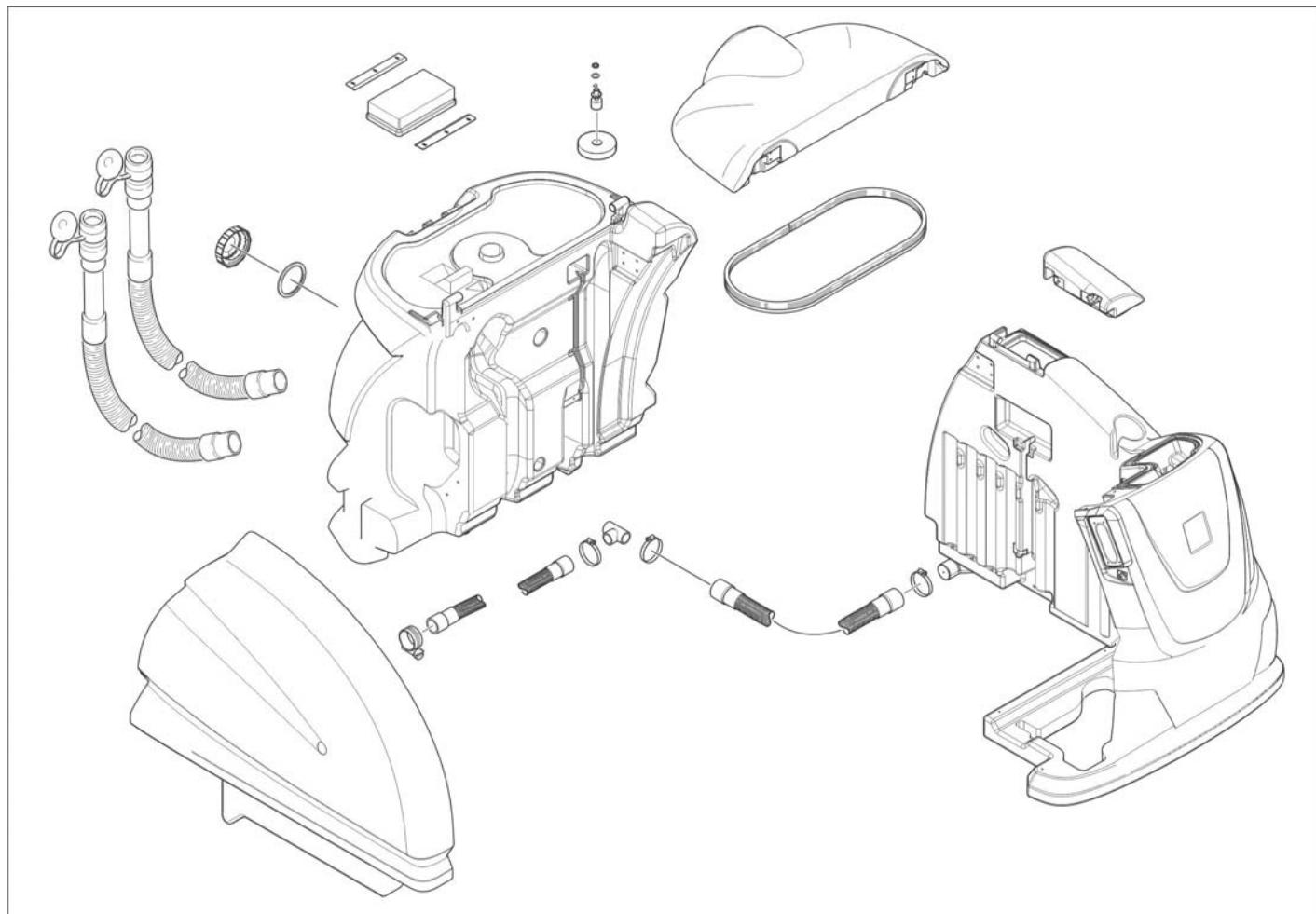
# AE Service group tank system

## 010 Safety information

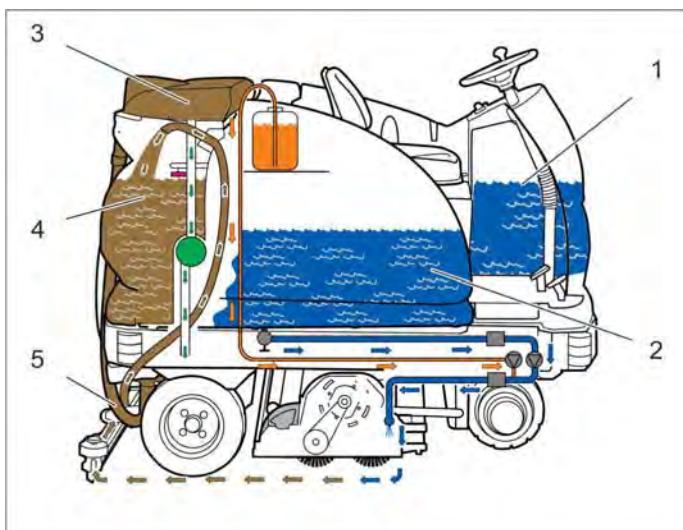
Completely drain the tank system prior to any work!

Observe general safety information!

## 020 Overview



## 030 Function



- 1 Fresh water tank on the left
- 2 Fresh water tank on the right
- 3 Cover waste water tank
- 4 waste water tank
- 5 Dirt water drain hose

The appliance has two fresh water tanks that are connected to each other via a compensation hose.

Both tanks have an identical fresh water level, the water level is indicated in the display by the level gauge.

Water is filled in the left fresh water tank and drawn from there.

The fresh water tanks can be emptied via a drain hose. The appliance is equipped with a waste water tank.

A float switch and a froth stop float are installed in the waste water tank. Float switch and froth stop float switch off the suction turbine (in the event of a full tank) after a time delay of 10 seconds in order to avoid damage. The suction turbine can be started up again after the waste water tank has been emptied.

A flat fold filter that filters the exhaust air and protects the suction turbine from dirt particles is installed in the cover of the waste water tank.

The waste water tank can be emptied via a drain hose.

All three tanks can be individually replaced in case of service.

## 040 Service activities

### AEDS Uninstall / install cover of the waste water tank



- 1 Cover waste water tank
- 2 Halting plate
- 3 Screw

→ Unscrew the screws.  
→ Remove the retaining plate.  
→ Remove the cover from the waste water tank.

### AEFR Uninstall / install fresh water tank on the right



→ Unscrew the screws.

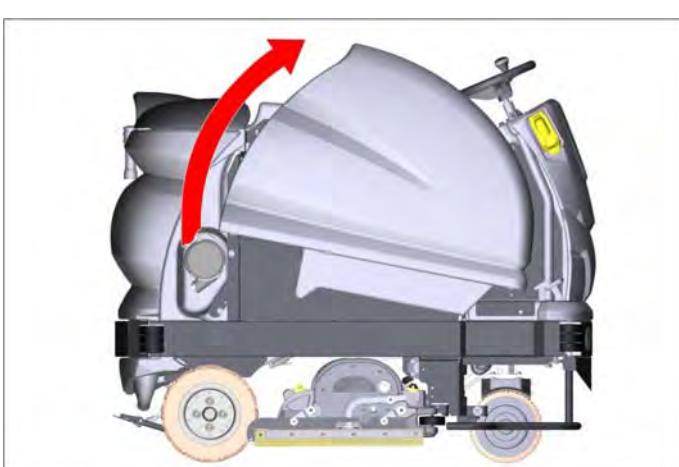


- 1 Hose nipple fresh water tank
- 2 Compensation hose
- 3 Hose clip

→ Loosen the hose clip.  
→ Pull the compensation hose off the hose nipple.

**Note**

Check if the fresh water tank is completely drained prior to disassembly.



→ Lift the fresh water tank.  
→ Tilt the fresh water tank forward.  
→ Remove the fresh water tank from the appliance.

**△ CAUTION**

*Risk of injury! Tank is heavy. A second person or a suitable crane is required for disassembly.*

## AEFS Uninstall / install flat fold filter of the waste water tank

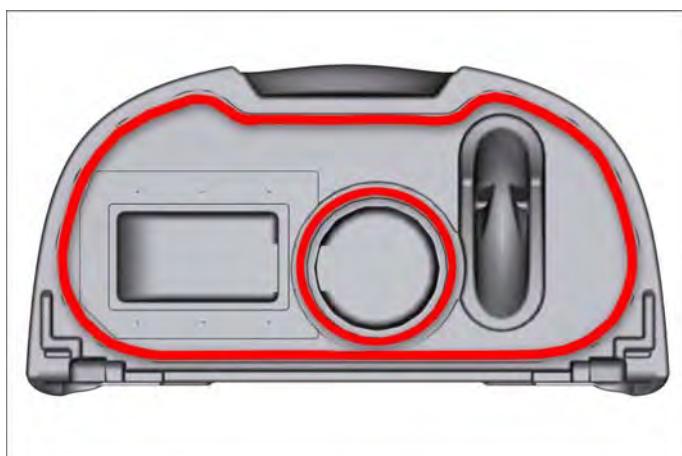


- 1 Halting plate
- 2 Screws
- 3 Flat fold filter



- Open the cover of the waste water tank.
- Loosen the screws.
- Slide the retaining plates up and down in the elongated holes.
- Remove the flat fold filter from the holder.

## AESD Uninstall / install seal of the cover of the waste water tank



### Note

For better visibility, the seal is shown in red in this illustration.

- Open the cover of the waste water tank.
- Pull the seal out of the groove.
- Insert new seal in the groove and press on firmly.

## AESC Uninstall /install float of foam stop



- Open the cover of the waste water tank.
- Remove the foam disk from the float.
- Glue a new foam disk onto the float.

### Note

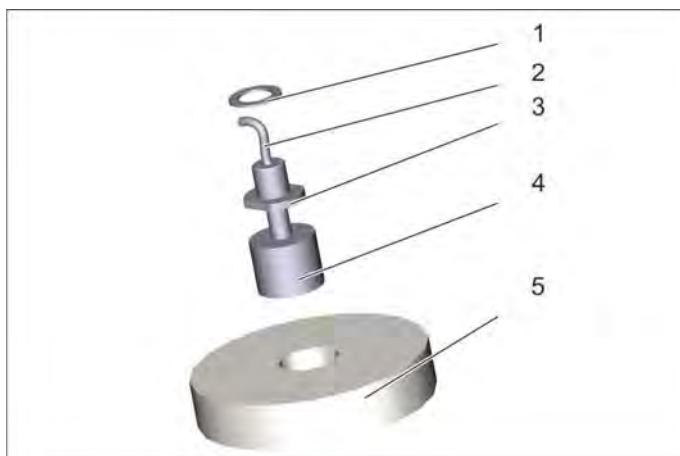
Clean the float and remove grease prior to gluing on the foam disk. Apply plastic adhesive to the float and immediately press on the foam disk.

- Check float for ease of movement.

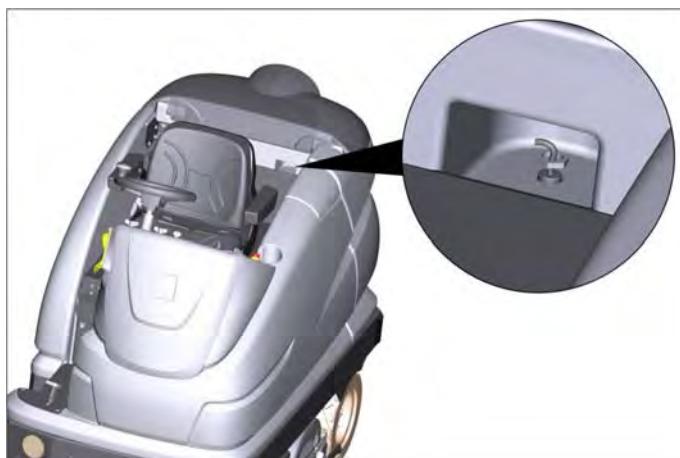
### Note

When installing, watch out for the installation position of the float. The float switch can work as an N/C contact or N/O contact depending on the alignment. After installation, check the ease of movement of the float.

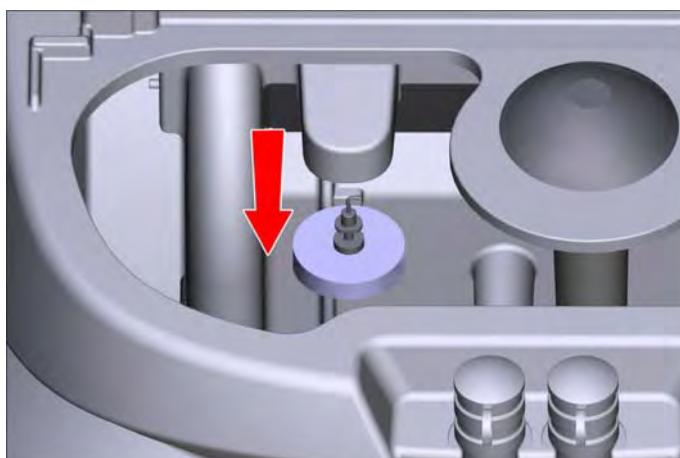
## AESS Uninstall / install float switch of the waste water tank



- 1 Seal disc
- 2 Connecting cable
- 3 Locknut
- 4 Float switch
- 5 Foam disk



- Disconnect electrical connection.
- Unscrew the locknut.



- Pull the float switch out of the retainer towards the bottom.
- Remove the foam disk from the float.
- Pull cable through the opening.

### Note

During installation, ensure that the gasket of the float switch fits closely.

Pay attention to the fitting position during installation. The float switch can work as a NC contact or NO contact depending on the orientation.

Check ease of movement of the float after installation.

Waste water tank full (float switch actuated)	< 2 Ω
Float switch not actuated	> 1 MΩ

## AEST Uninstall / install waste water tank

- AEDS Uninstall / install cover of the waste water tank
- AFSD Uninstall / install suction turbine
- AEES Uninstall / install float switch of the waste water tank
- ABAV Uninstall / install bumper wheels in the front



- 1 waste water tank
- 2 Frame rear part
- 3 Fresh water discharge hose
- 4 Dirt water drain hose
- 5 Upgrade kit spray suction



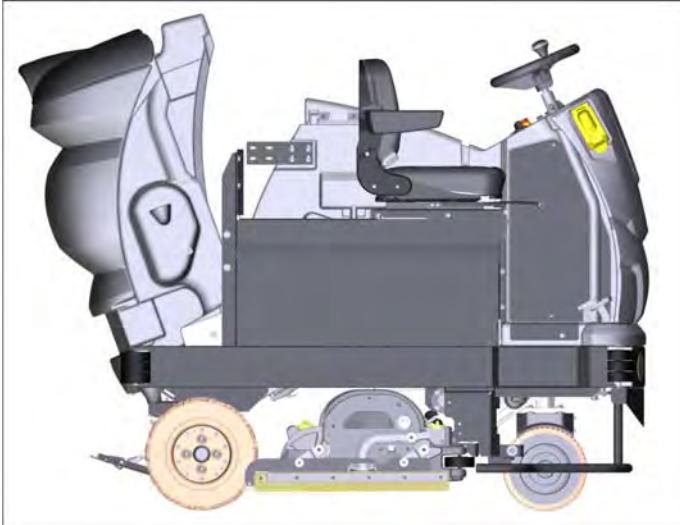
- 1 waste water tank
  - 2 Scraper roller
  - 3 Axle
  - 4 Frame rear part
- Remove the fresh water drain hose and place it under the appliance.  
→ Remove rear part of the frame.

**Note**

If a spray suction upgrade kit is installed in the appliance, the holder and the stop valve must be dismantled first.

→ Unscrew the screws on the holder.





→ Lift the waste water tank and tilt it backwards out of the appliance.

**⚠ CAUTION**

*Risk of injury! Tank is heavy. A second person or a suitable crane is required for disassembly.*

## 050 Maintenance and inspection

Service group does not contain any maintenance and inspection points.

## 060 Error diagnosis

Findings	Possible cause	Correction
Message "Waste water tank full" even though the waste water tank is empty.	Float switch blocked	Check float switch, clean / renew in case of findings.
	Float switch installed the wrong way.	Uninstall float switch, turn by 180° and reinstall.
Poor suction performance	Flat fold filter clogged	Clean /replace flat fold filter.

## 070 Peculiarities/ others

The service group does not contain any peculiarities.

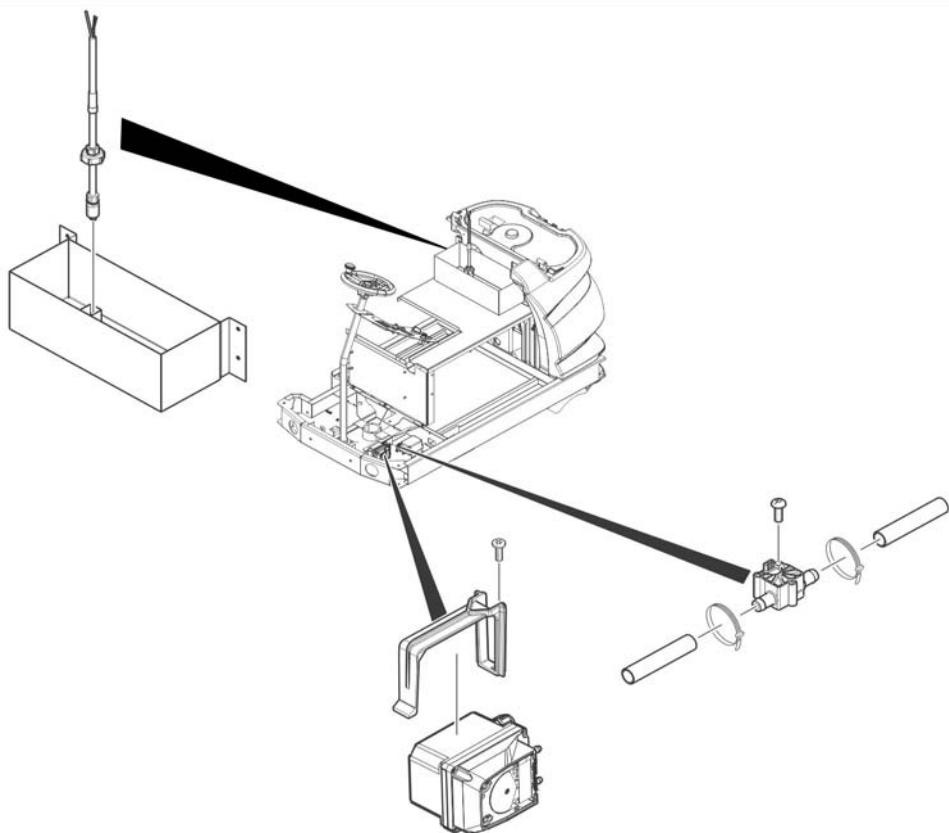
# MG Service group detergent dosing unit

## 010 Safety information

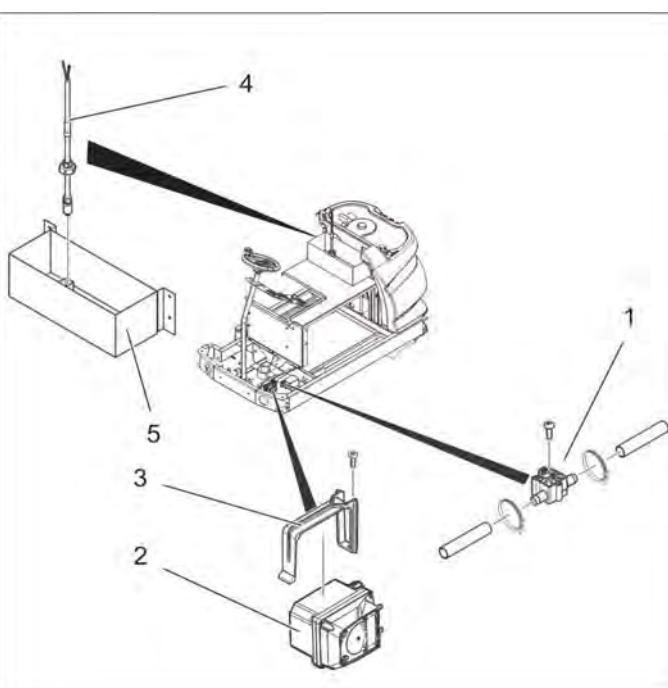
For this service group there is no special safety information.

**Observe general safety information!**

## 020 Overview



## 030 Function



**The detergent dosing system (DOSE) is an optional accessory and not installed in all machines. An upgrade kit for later installation is offered.**

- 1 Flowmeter
- 2 Detergent dosing pump
- 3 Holding bow
- 4 Suction lance

The detergent is drawn out of the detergent container through the suction lance by the detergent dosing pump and added to the fresh water - depending on the dosage selected by the user.

The detergent dosing pump is a peristaltic pump (displacement pump).

The rotor has two rollers.

The dosing hose is a wear part.

The filling quantity of the detergent container is monitored with a float on the suction lance.

The flow meter measures the dispensed water volume and controls the delivery rate of the detergent pump.

If the detergent container is empty, the detergent dosing pump is switched off. A message is shown on the display.

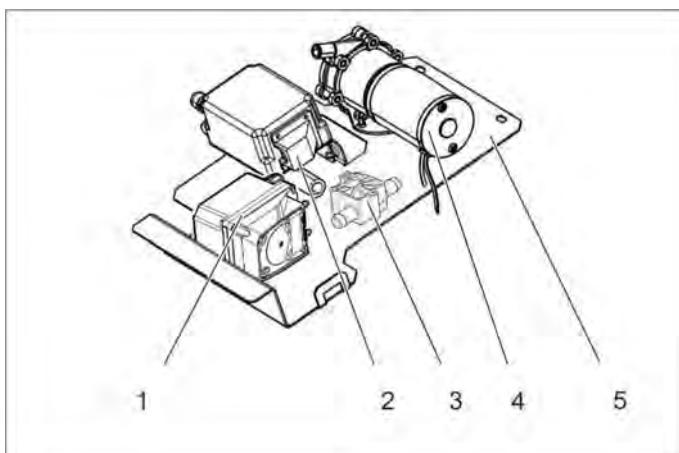
## 040 Service activities

### MGRD Uninstall / install detergent dosing pump

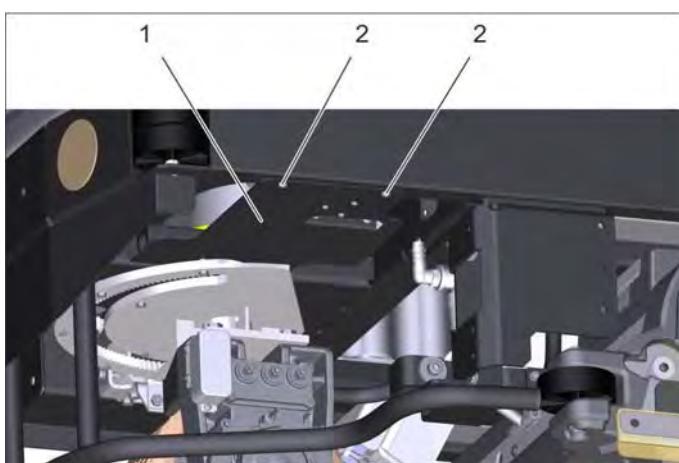


The detergent dosing pump is mounted on a carrier together with the electric ball valve, the water pump and the flow meter.

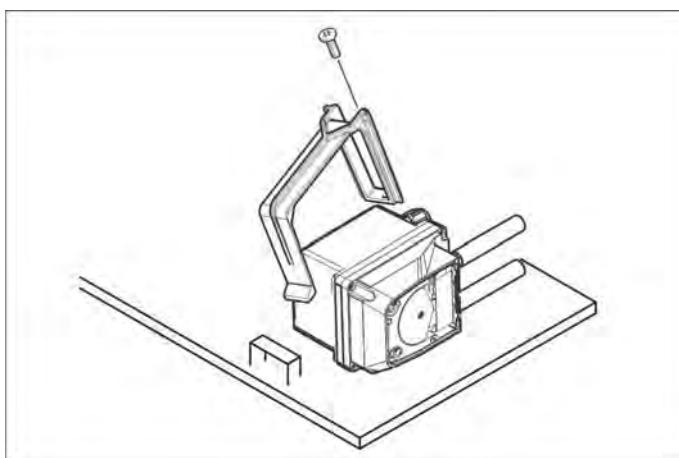
The carrier can be tilted down for improved accessibility.



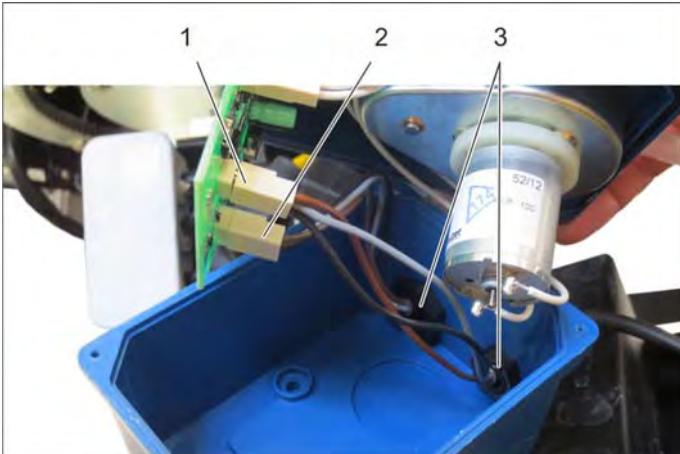
- 1 Detergent dosing pump
- 2 Electric ball valve
- 3 Flowmeter
- 4 Water pump
- 5 Support plate



- 1 Support plate
  - 2 Screw
- Unscrew the screws.  
→ Tilt the carrier plate down.  
→ Pull the carrier plate out of the retainer towards the front.  
→ Place the carrier plate onto the hoop guard.

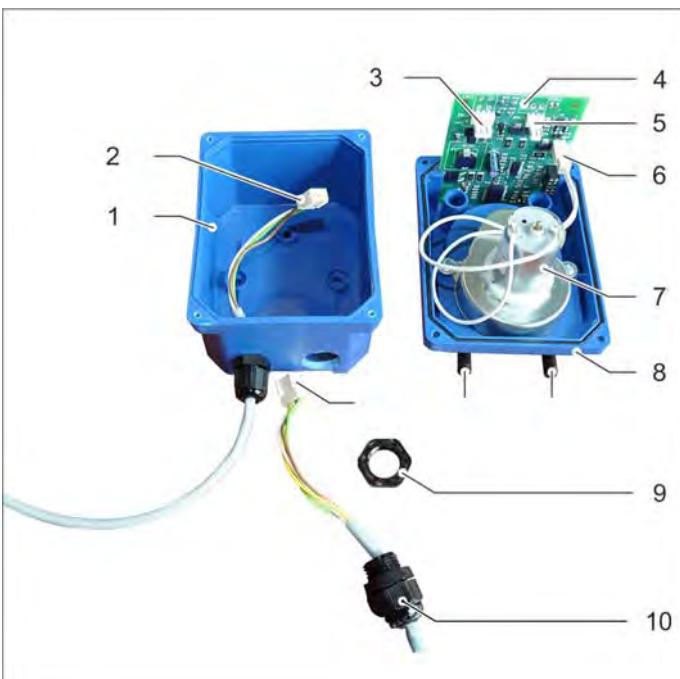


- Unscrew the screw.  
→ Tilt the clamp back and pull it out of the holder.  
→ Open the hose clamps.  
→ Remove the detergent hoses.  
→ Unscrew the screws of the casing.  
→ Separate the casing halves.



- 1 Power supply
- 2 Control cable
- 3 Cable screw connection

- Remove the plug of the voltage supply and the control line.
- Loosen the cable screw connection.
- Pull the cable out of the casing, carefully take the plug through the opening.



- 1 Casing bottom
- 2 Signal cable from flowmeter
- 3 Plug-in contact supply/control cable
- 4 Control chip
- 5 Plug contact signal cable
- 6 Motor connection
- 7 Motor
- 8 Housing top
- 9 Cable screw connection, nut
- 10 Cable screw connection
- 11 Hose connection, detergent hose from the detergent container
- 12 Hose connection, detergent hose to the fresh water hose
- 13 Supply/control cable

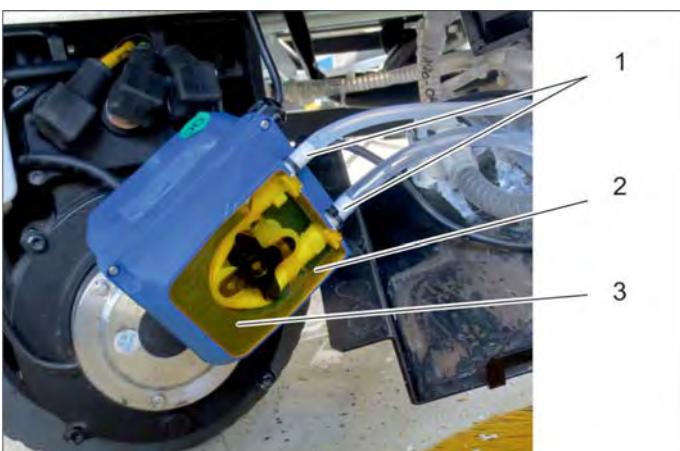
## MGCS Uninstall / install dosing hose

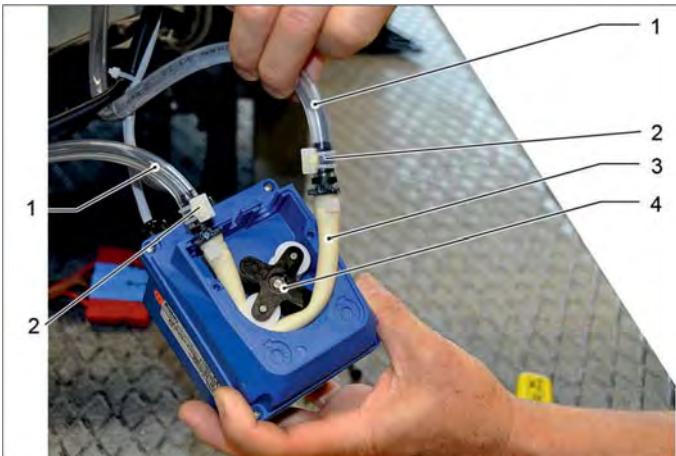
### ■ MGRD Uninstall / install detergent dosing pump

- 1 Detergent hose
- 2 Pump chamber
- 3 Cover pump chamber

**Note**

It is not mandatory to dismantle the detergent dosing pump, it can remain on the carrier if the cover of the pump chamber is accessible.

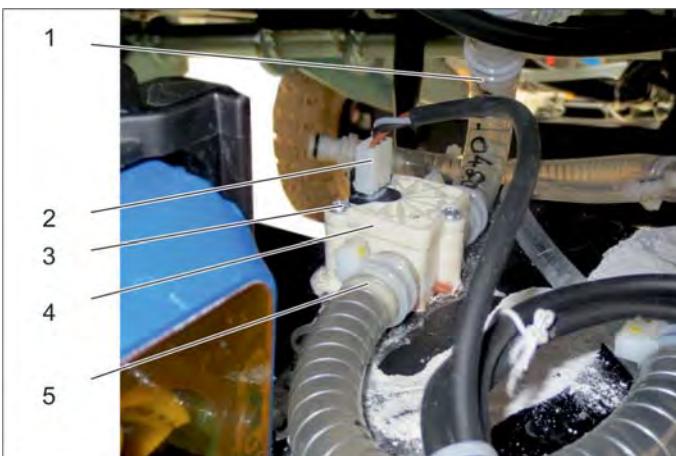




- 1 Detergent hose
- 2 Cable connector
- 3 Pump hose
- 4 Rotor

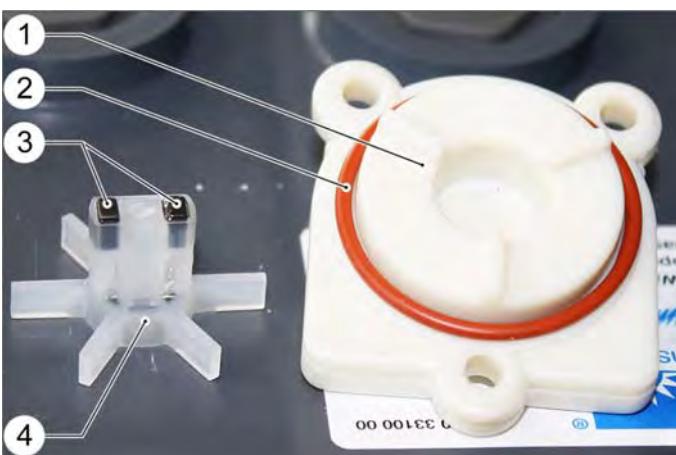
→ Remove the cover of the pump chamber.  
 → Remove the pump hose from the rotor.  
 → Remove the cable ties.  
 → Remove the pump hose.  
 → Install the new pump hose.  
 → Check the function of the pump.

#### MGDR Uninstall / install, clean flow meter



- 1 Fresh water hose from the fresh water tank
- 2 Cable plug
- 3 Screws
- 4 Casing cover flow meter
- 5 Fresh water hose to the brush head

→ Remove the cable plug.  
 → Unscrew the screws.



- 1 Lid, flowmeter
- 2 Seal ring
- 3 Magnets
- 4 Rotor

→ Remove the lid and the rotor from the flowmeter.



- 1 Rotor axis

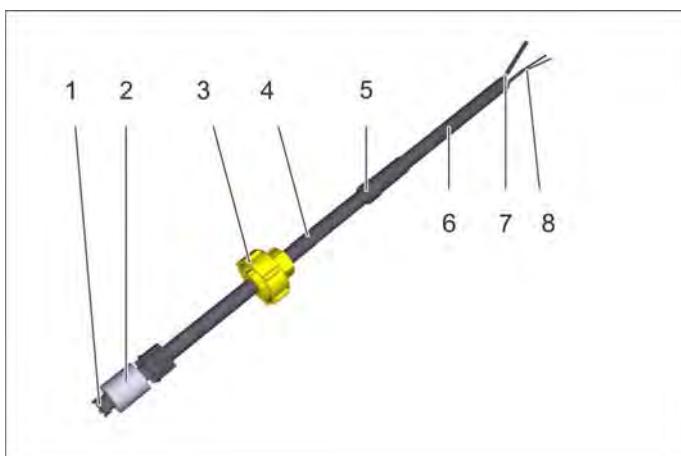
→ Clean the rotor axle and the interior.

## M GSL Uninstall / install, clean suction lance

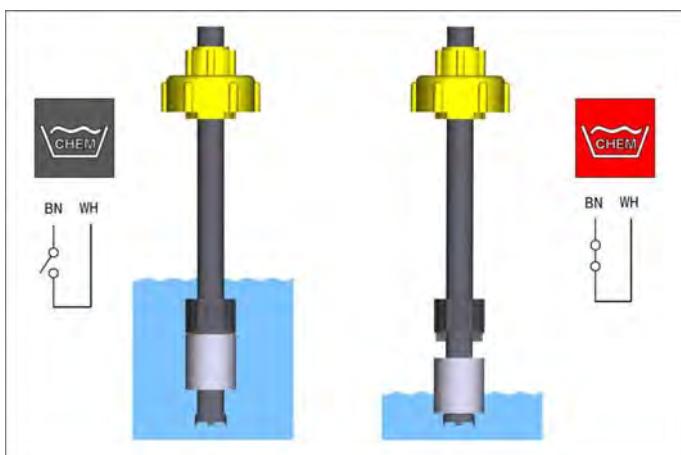


The suction lance is directly put into the detergent can, the screw cap fits all common 5- and 10-litre cans.  
The length of the suction lance can be adjusted.  
The suction lance is detergent resistant in the range PH 2...PH 12.  
IP rating IP 67 (IEC529)

- 1 Supply line (detergent hose and control cable)
- 2 Suction lance
- 3 Screw cover
- 4 Detergent canister



- 1 Back up valve
- 2 Float
- 3 Screw cover
- 4 Suction tube
- 5 Shrinkable hose
- 6 Corrugated pipe
- 7 Hose to the detergent dosing pump
- 8 Connection cable for float switch

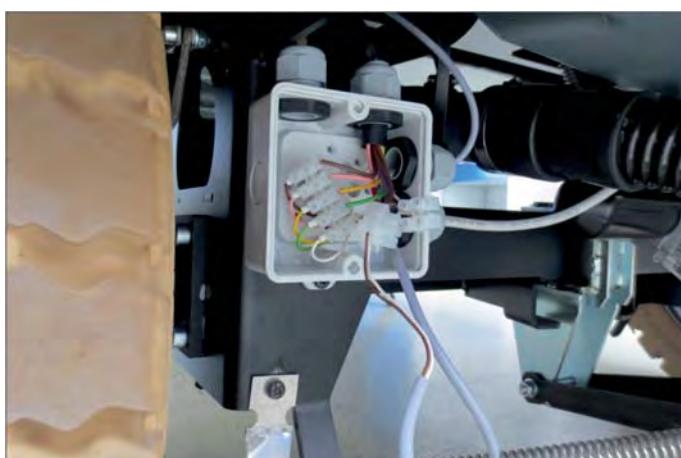


### Operating principle of the float switch:

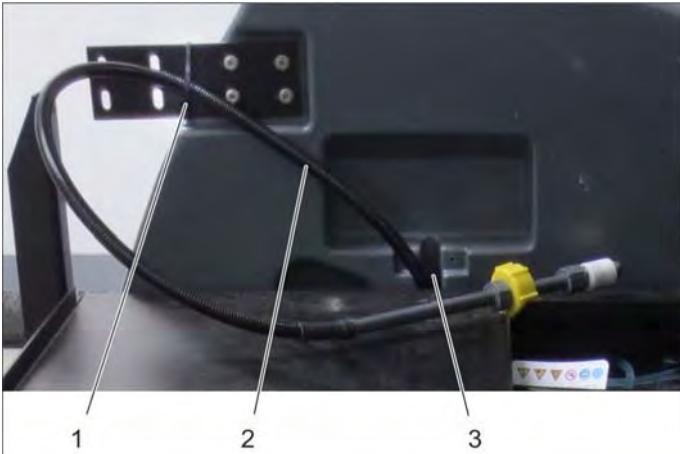
Filling level	Float	Switch
Sufficient	Up	opened
Empty	Down	closed

### Note

The float switch is permanently installed in the suction pipe. The suction lance can only be replaced as a whole.



- Open electric casing.
- Replace the connecting cable.
- Take the cable through the screwed cable gland.
- Pull the connection cable out of the appliance towards the top.
- Pull off the detergent hose at the detergent pump.



- 1 Cable connector
  - 2 Corrugated pipe
  - 3 Performance
- Remove the cable ties.  
→ Pull the corrugated pipe with detergent hose and connection cable out of the bushing.

#### Note

Prior to removal, check the float switch for correct functioning.

If the float switch is defective, replace the suction lance. If the display is incorrect, check if the float got caught. Clean gummed up float.

## 050 Maintenance and inspection

Service group does not contain any maintenance and inspection points.

## 060 Error diagnosis

Findings	Possible cause	Correction
Empty message for the detergent shown on the display even though the detergent container is full	Float suction lance blocked	Check float , clean / renew in case of findings.
No empty message for the detergent shown on the display, even though the detergent container is empty.	Float switch suction lance defective	Check float switch, renew suction lance in case of findings.
Detergent pump does not deliver detergent	Detergent hose clogged. Dosing hose clogged. Check valve suction lance clogged. Flow meter does not provide a signal	Clean detergent hose, replace in case of heavy soiling. Clean / replace dosing hose. Clean / replace suction lance. Check flow meter, clean / renew in case of findings.
Detergent pump does not convey enough detergent.	Suction hose to suction lance is kinked.	Remove kink point Replace suction hose.

## 070 Peculiarities/ others

The service group does not contain any peculiarities.

## Software diagrams and parameter overview

### Summary and standard setting for key menu, version 1.4

Program	Transport			Eco programme			Scrubbing suction			Heavy programme		
	Key			Key			Key			Key		
	yellow	grey	red	yellow	grey	red	yellow	grey	red	yellow	grey	red
<b>Switch menu</b>	x	x	x	x	x	x	x	x	x	x	x	x
<b>Counter</b>	x	x	x									
<b>Maintenance counter</b>	x	x	x									
<b>Module bus</b>	x	x	x									
<b>Machine type</b>	x	x	x									
<b>Brush head D/R</b>		Roll	Roll									
<b>After-running time</b>		x	x									
<b>Attachment kits</b>			x									
<b>Driving speed</b>		x	x									
<b>Language</b>		x	x									
<b>Key menu</b>		x	x									
<b>Factory settings</b>	x	x										
<b>Test mode</b>			x									
<b>Water quantity</b>				30%	30%		50%	50%		70%	70%	
<b>Working speed</b>				6 km/h	6 km/h		4 km/h	4 km/h		4 km/h	4 km/h	
<b>RM dosing</b>				0,5%	0,5%		1,0%	1,0%		3,0%	3,0%	
<b>Contact pressure</b>				40%	40%		60%	60%		80%	80%	
<b>Brush speed</b>				Whis-per	Whis-per		Power	Power		Power	Power	
<b>Vacuum device</b>				Low	Low		High	High		High	High	
<b>Basic settings</b>	x	x		x	x		x	x		x	x	
<b>Finish exit menu</b>	x	x	x	x	x	x	x	x	x	x	x	x

Program	Scrubbing			Vacuuming			Polishing		
	Key			Key			Key		
	yellow	grey	red	yellow	grey	red	yellow	grey	red
<b>Switch menu</b>	x	x	x	x	x	x	x	x	x
<b>Counter</b>									
<b>Maintenance counter</b>									
<b>Module bus</b>									
<b>Machine type</b>									
<b>Brush head D/R/S</b>									
<b>After-running time</b>									
<b>Attachment kits</b>									
<b>Driving speed</b>									
<b>Language</b>									
<b>Key menu</b>									
<b>Factory settings</b>									
<b>Test mode</b>									
<b>Water quantity</b>		70%	70%						
<b>Working speed</b>		4 km/h	4 km/h		4 km/h	4 km/h		4 km/h	4 km/h
<b>RM dosing</b>		3,0%	3,0%						
<b>Contact pressure</b>		60%	60%					30%	30%
<b>Brush speed</b>		Power	Power					Power	Power
<b>Vacuum device</b>					High	High			
<b>Basic settings</b>		x	x		x	x		x	x
<b>Finish exit menu</b>	x	x	x	x	x	x	x	x	x

## Operating elements

	The selection of the individual modes is effected by turning the programme selection switch. → Turn the programme selection switch to select the modes.
	The menu is navigated via the information button (info button). <b>⚠ Note</b> The menus displayed relative to the selected mode. Not all menus are available in every mode.
	→ Rotate the info button to select the parameter.
	→ Press the info button to confirm the selection.

## Factory setting

The factory settings can be restored in the menu of the grey and red intelligent key.

### NOTICE

*Many faults result from incorrect settings. Load the factory settings for troubleshooting!*

After loading the factory settings, switch off the programme selector switch so that the new parameters can be applied.

After that, the following parameters must be set up:

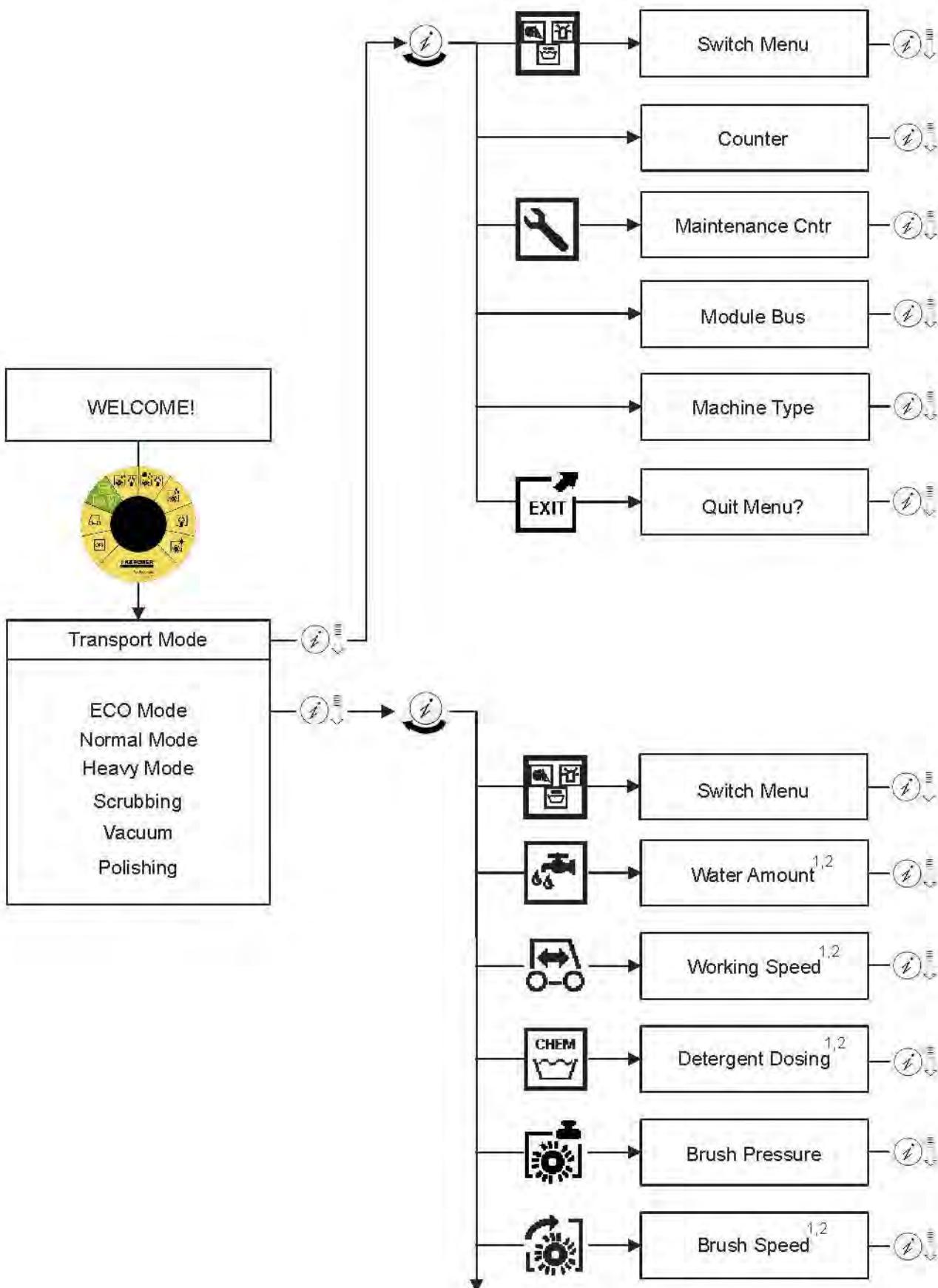
- the language
- Basic settings
- Check battery selection and charging curve
- Check the selection of the brush head

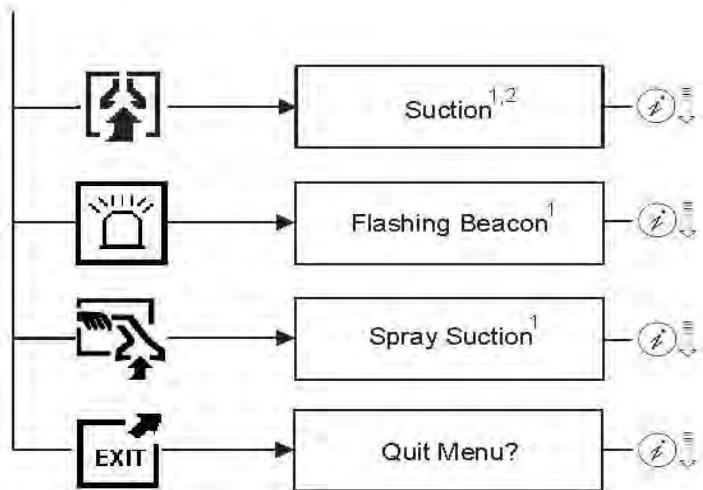
## Function overview: Intelligent Keys

### Note

The menus displayed relative to the selected mode. The diagram shows all available menus as an overview.

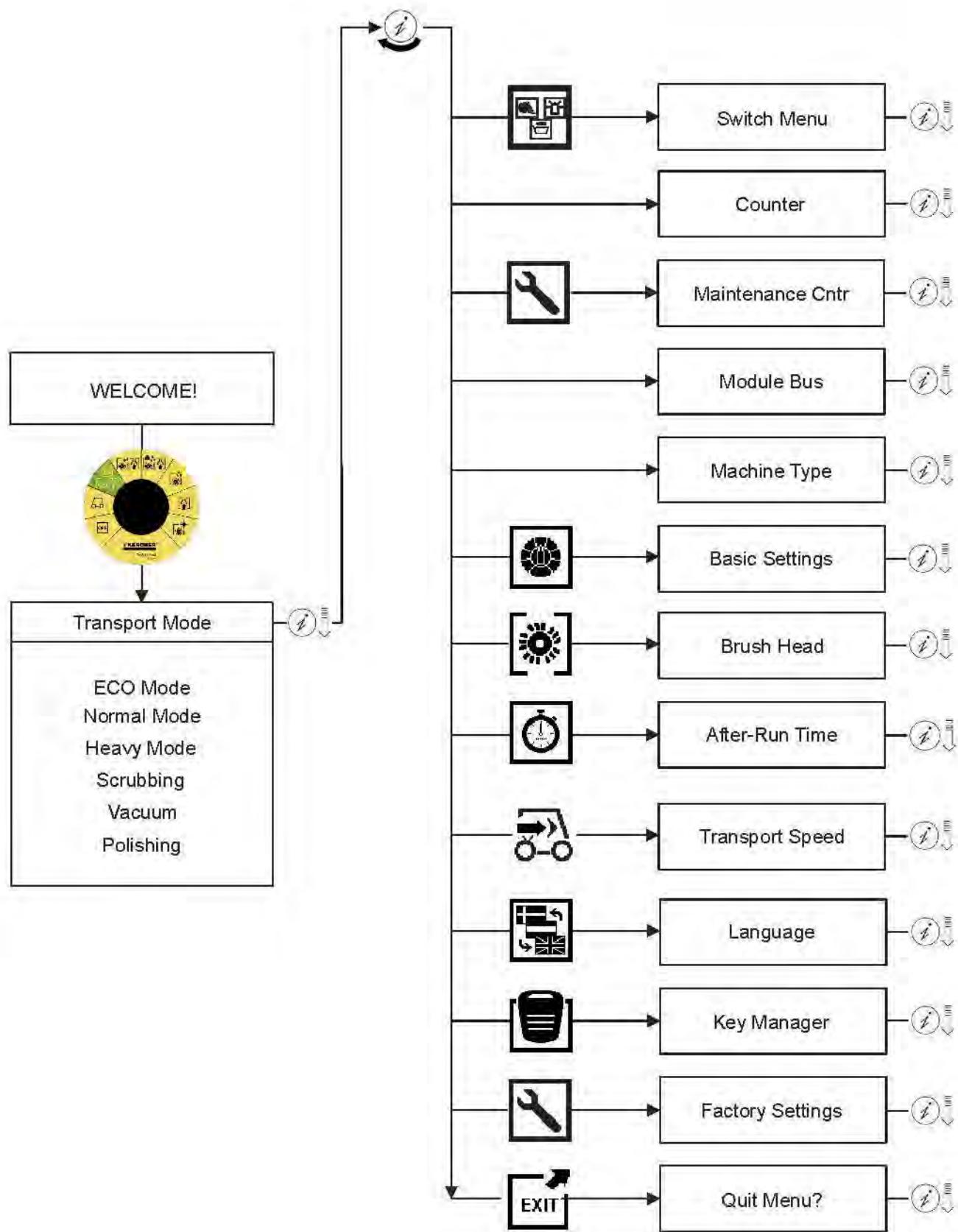
### Function overview of the yellow intelligent key

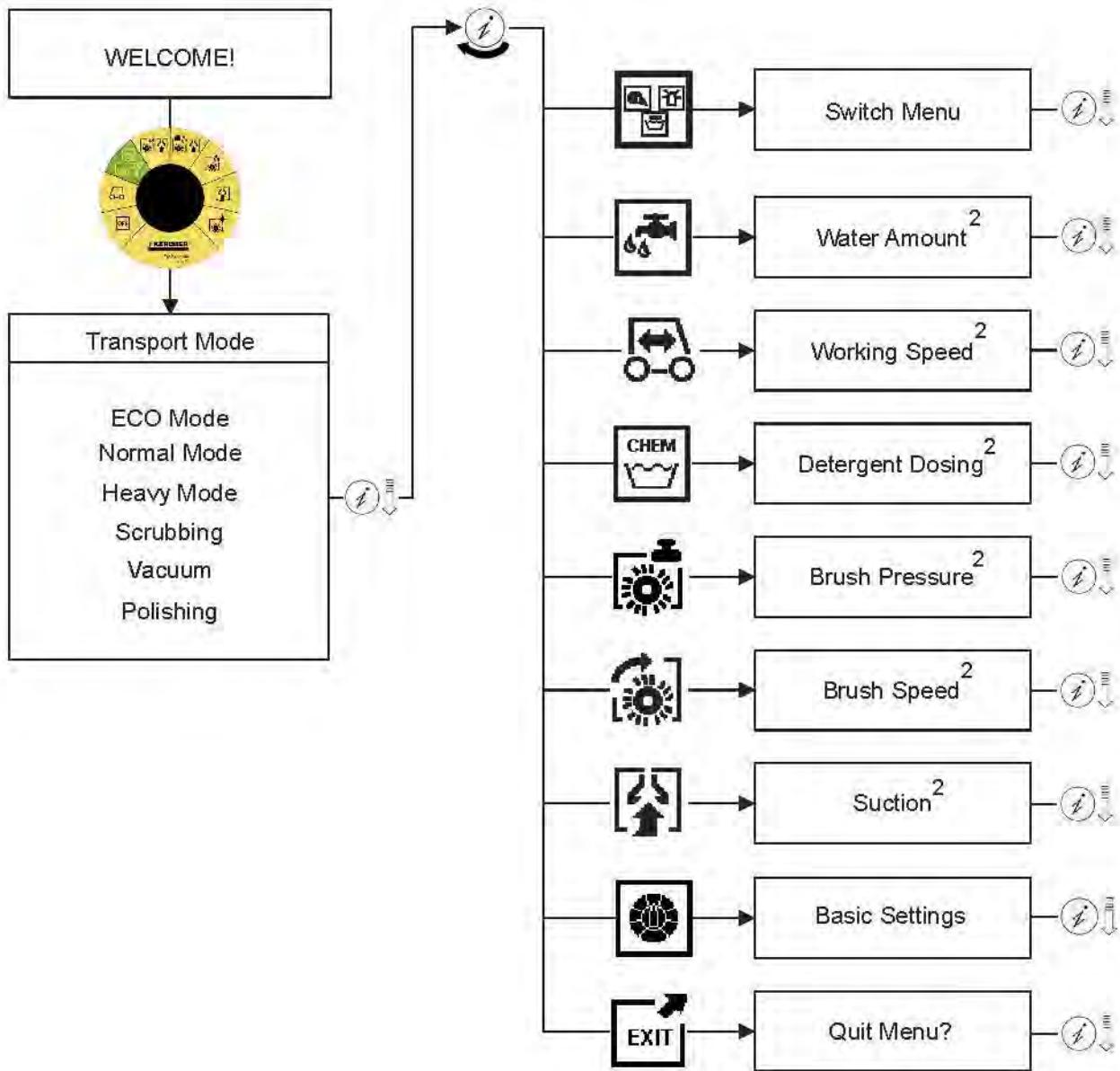




- 1 Those menus must be enabled in the key menu.
- 2 Selection not permanent. The setting will be lost if the program selection switch is adjusted.

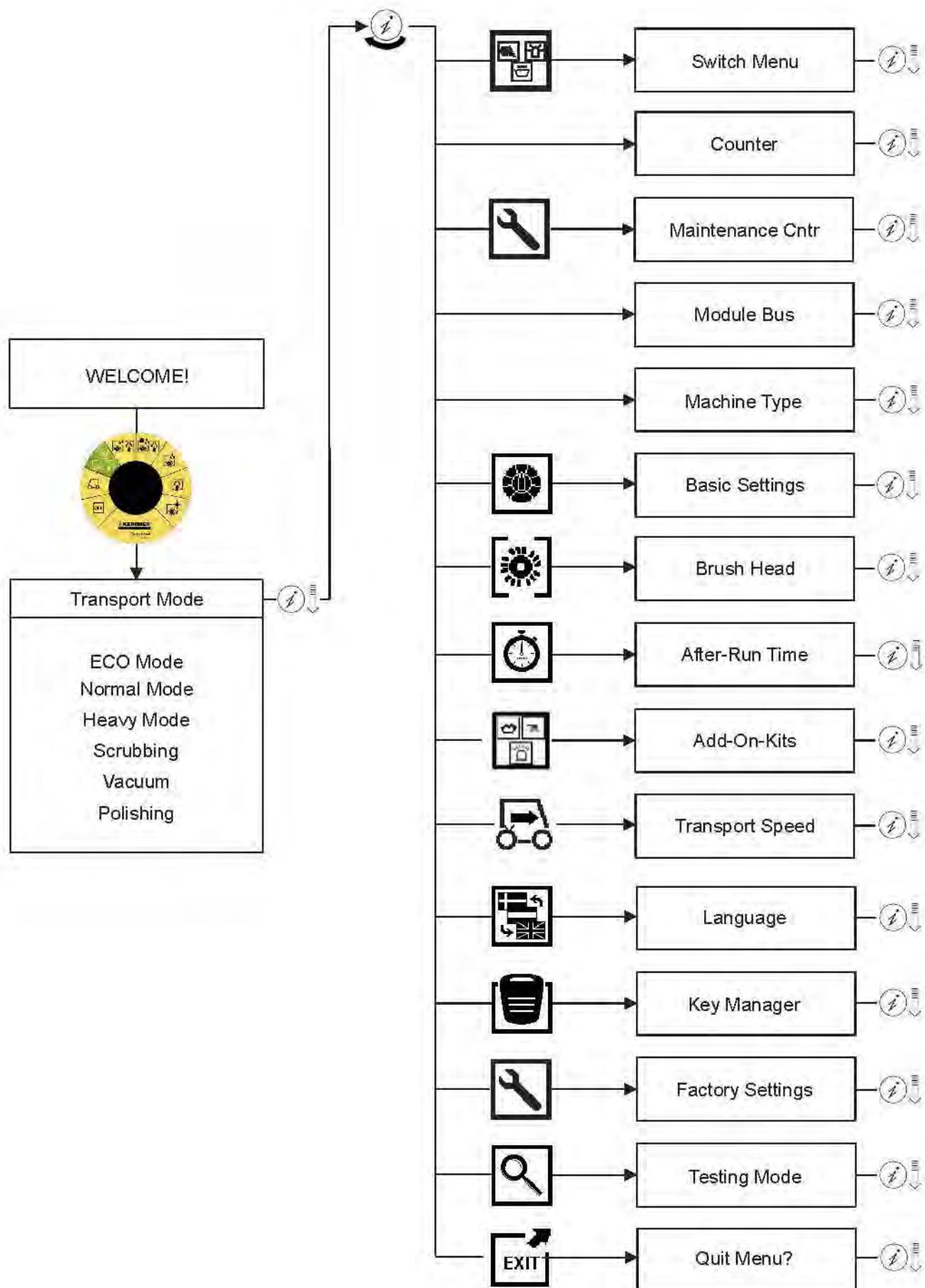
## Function overview of the grey intelligent key

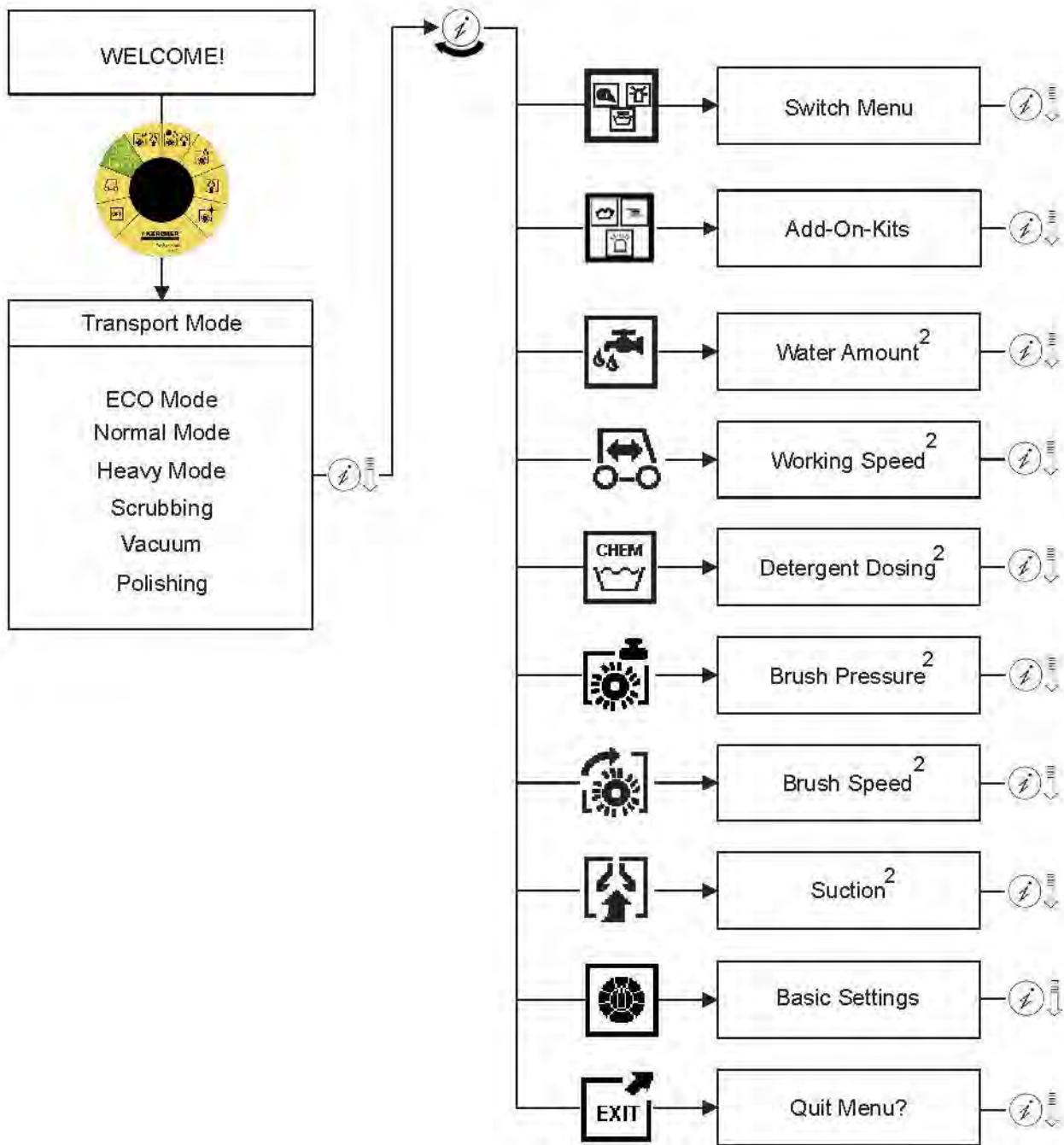




- 2 Selection not permanent. The setting will be lost if the program selection switch is adjusted.

## Function overview of red intelligent key

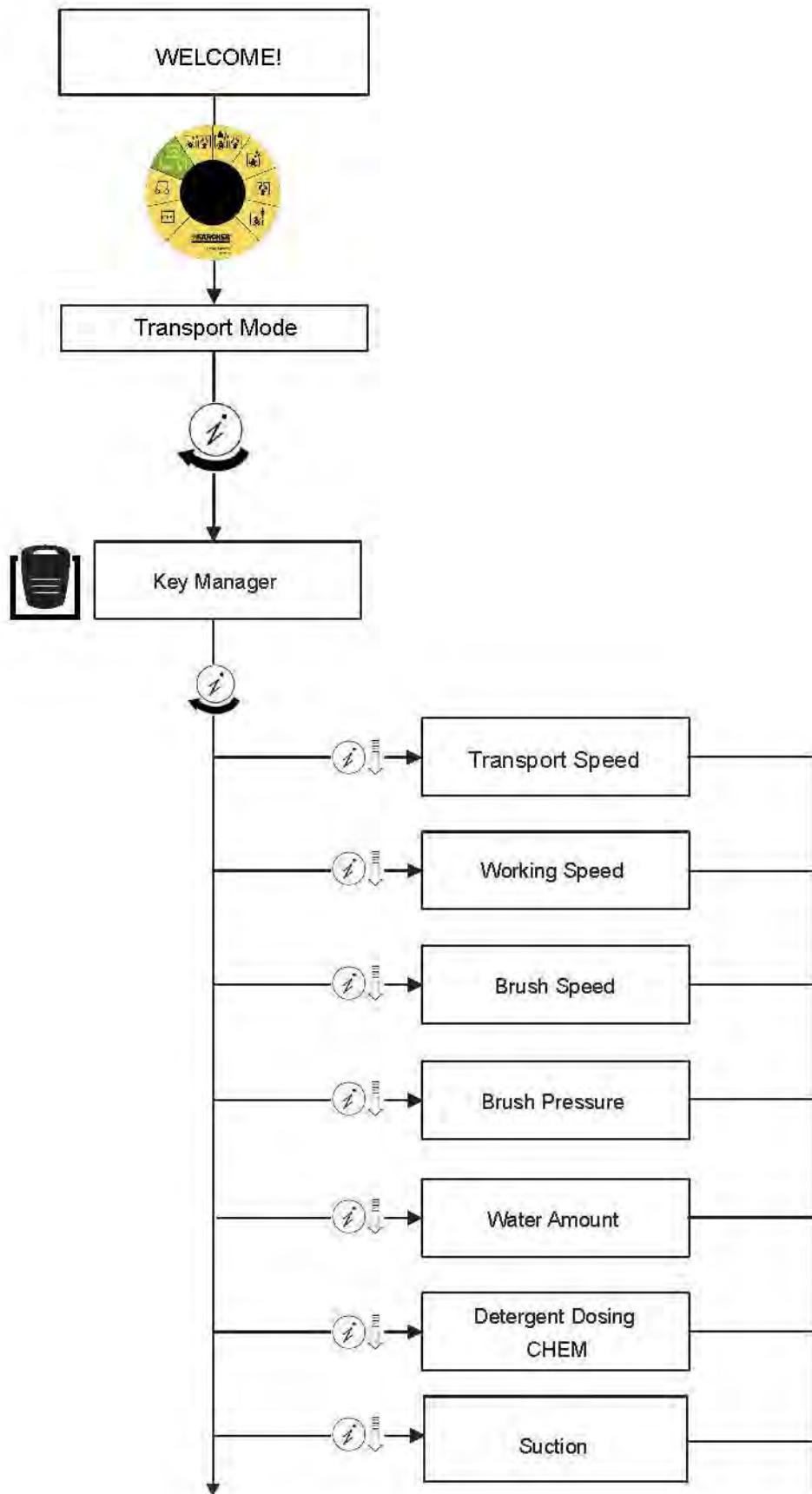


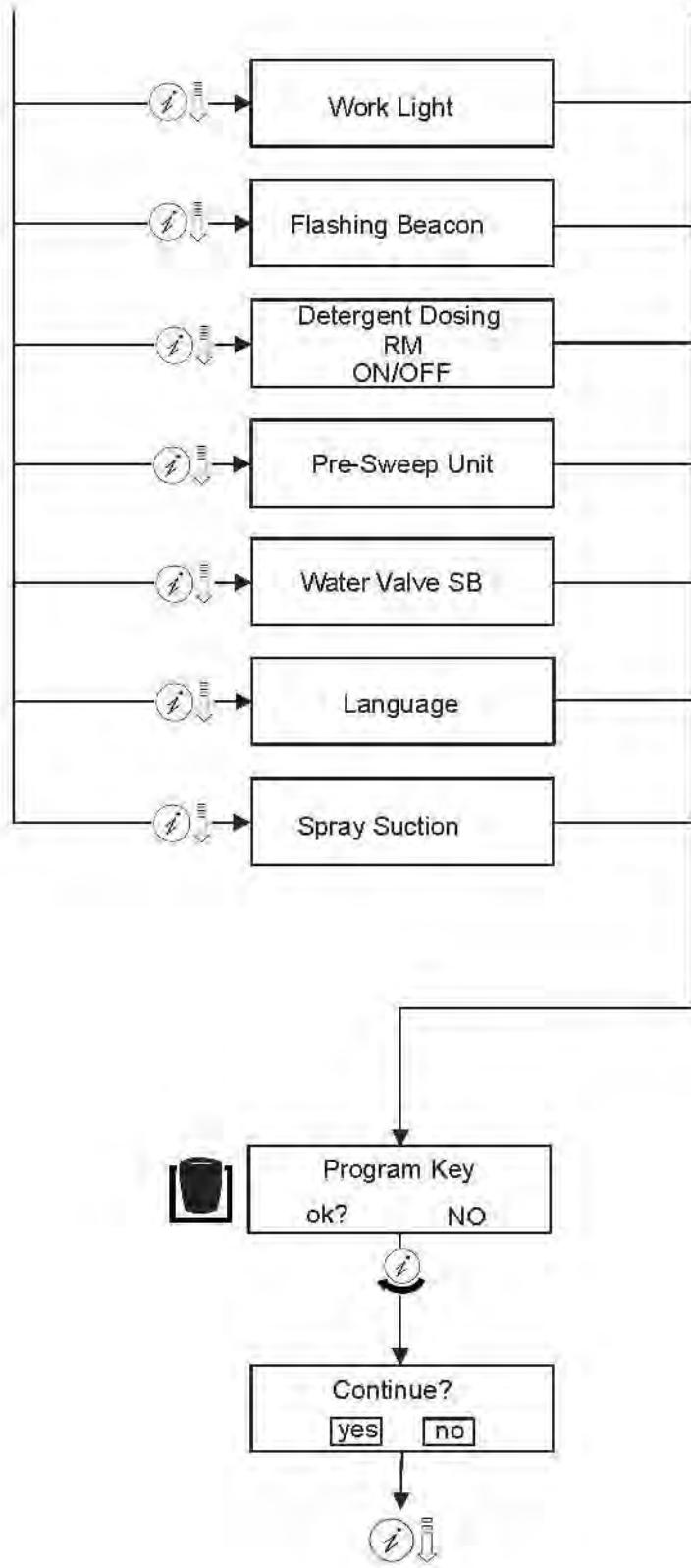


- 2 Selection not permanent. The setting will be lost if the program selection switch is adjusted.

## Key menu

In the key menu, these functions can be released on the yellow KIK key. The user then has the option to change parameters for the individual functions, if needed.



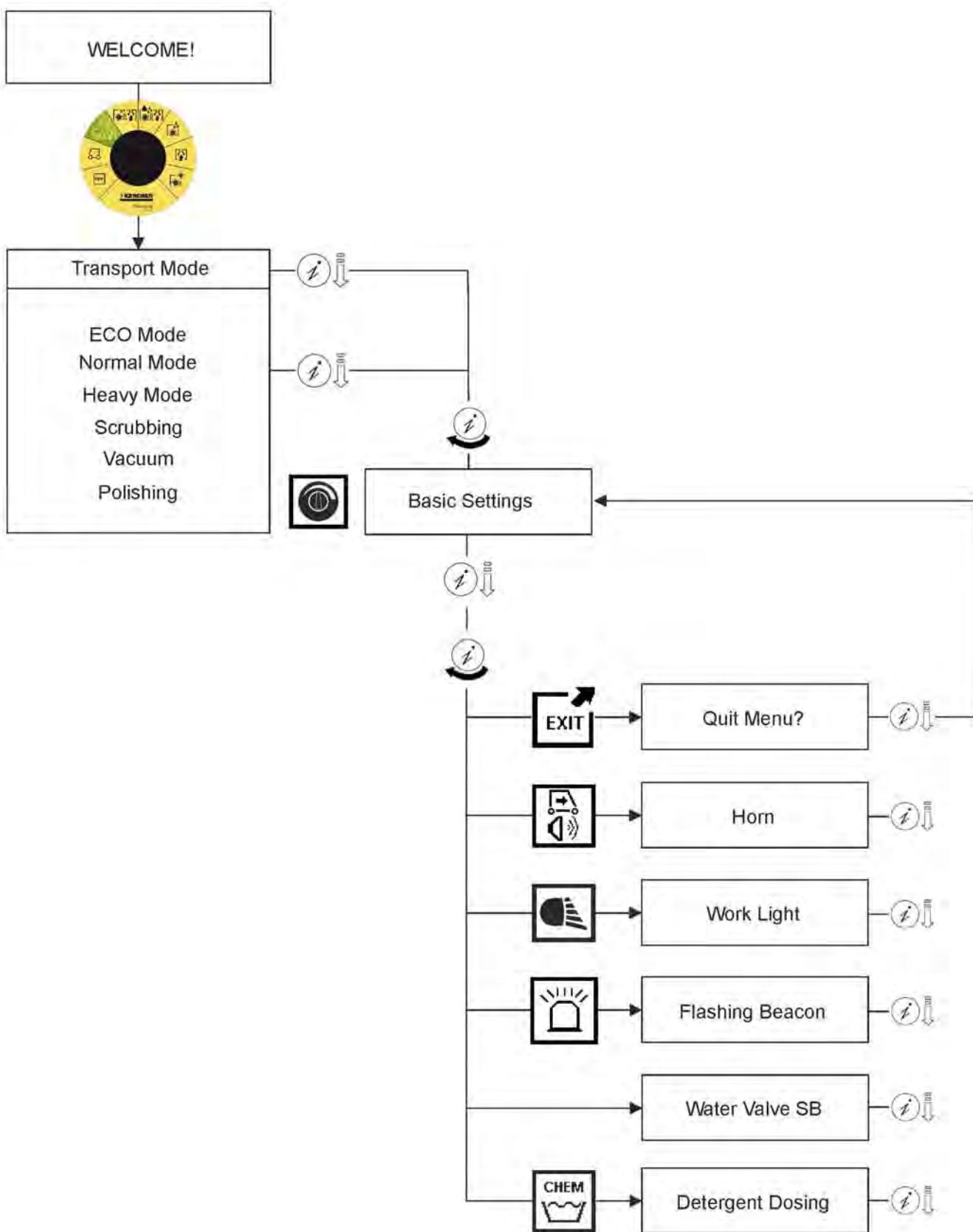


#### Note

The device switches off completely at the end of the key menu.

## Standard setting

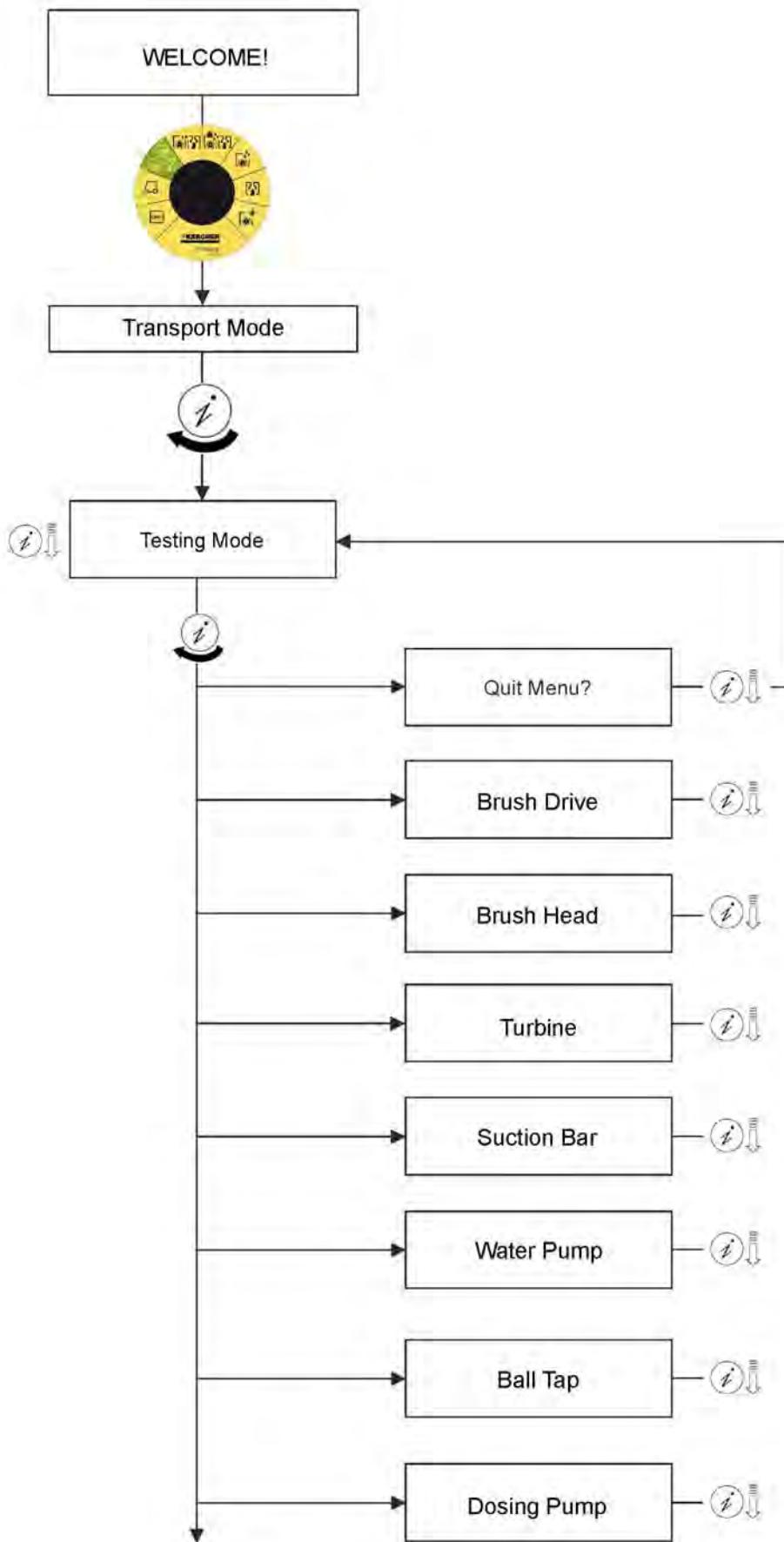
In the standard settings, these functions are permanently released.

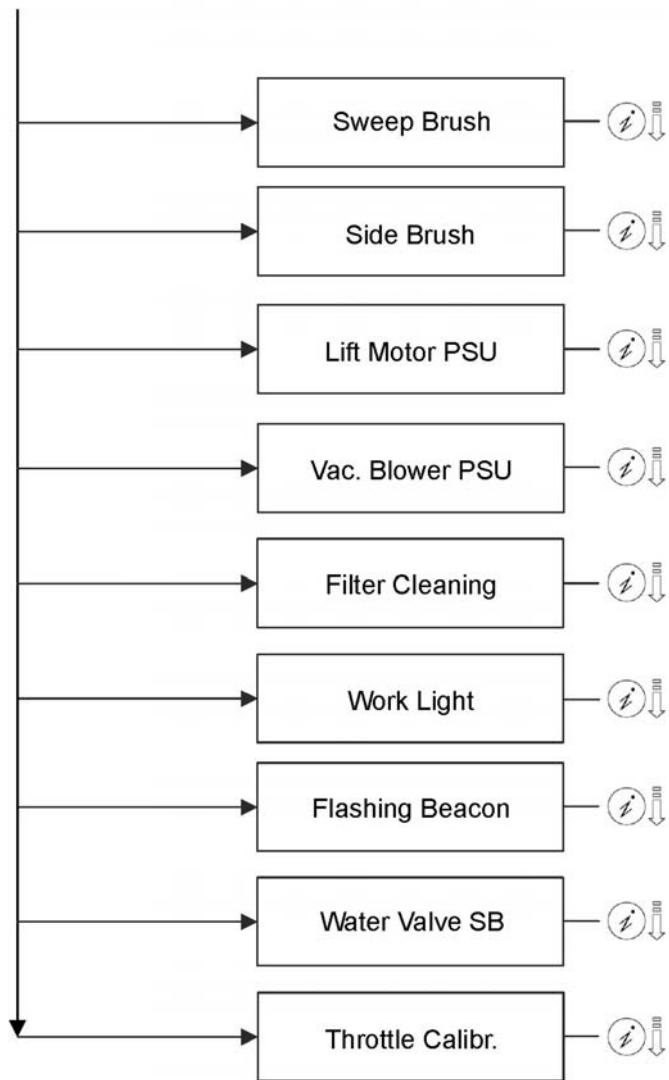


## Test mode menu

All listed units for the test can be switched on and off in the test mode. The brush motor currents are displayed. Both motors are supposed to absorb approximately the same amount of current in cleaning mode so that the roller

brushes are evenly worn. The throttle pedal must be recalibrated when the throttle pedal sensor or the drive control is replaced.

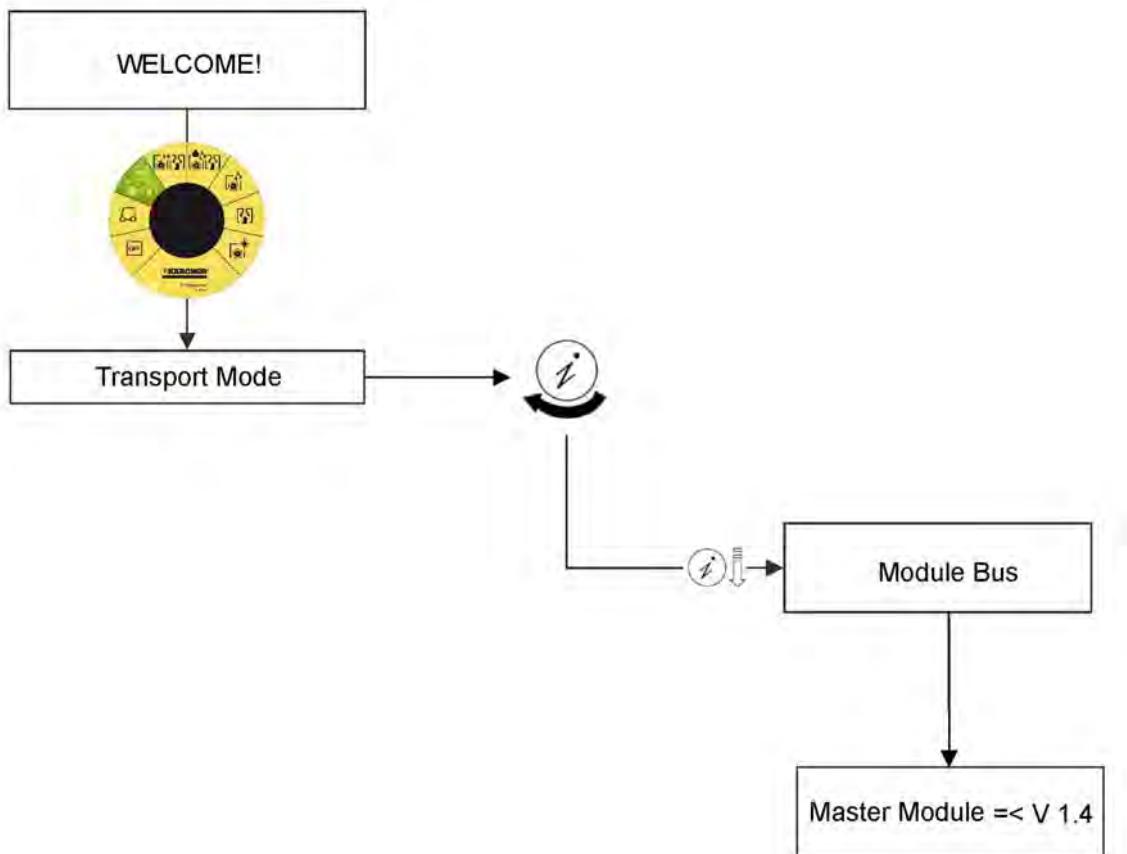




## Maintenance counter

### NOTE

After varying operating hours, the appliance generates (as of head CPU software version V1.4) a message that is supposed to remind the customer of various maintenance activities.



For example:

- Service suction bars after 20 operating hour counter (check, clean suction bar)
- Service brush head after 100 operating hour counters (clean and check brush head).  
Check the lateral squeegee blades and roller brushes.  
If worn, replace.
- Service suction lips after 100 operating hour counters (clean and check brush head)
- Service turbine strainer after 50 operating hours (clean turbine strainer or replace)
- Service fresh water filter after 50 operating hours (clean fresh water filter, check or replace)

If a maintenance counter has expired, the message "Service xxx" will be given in the display.

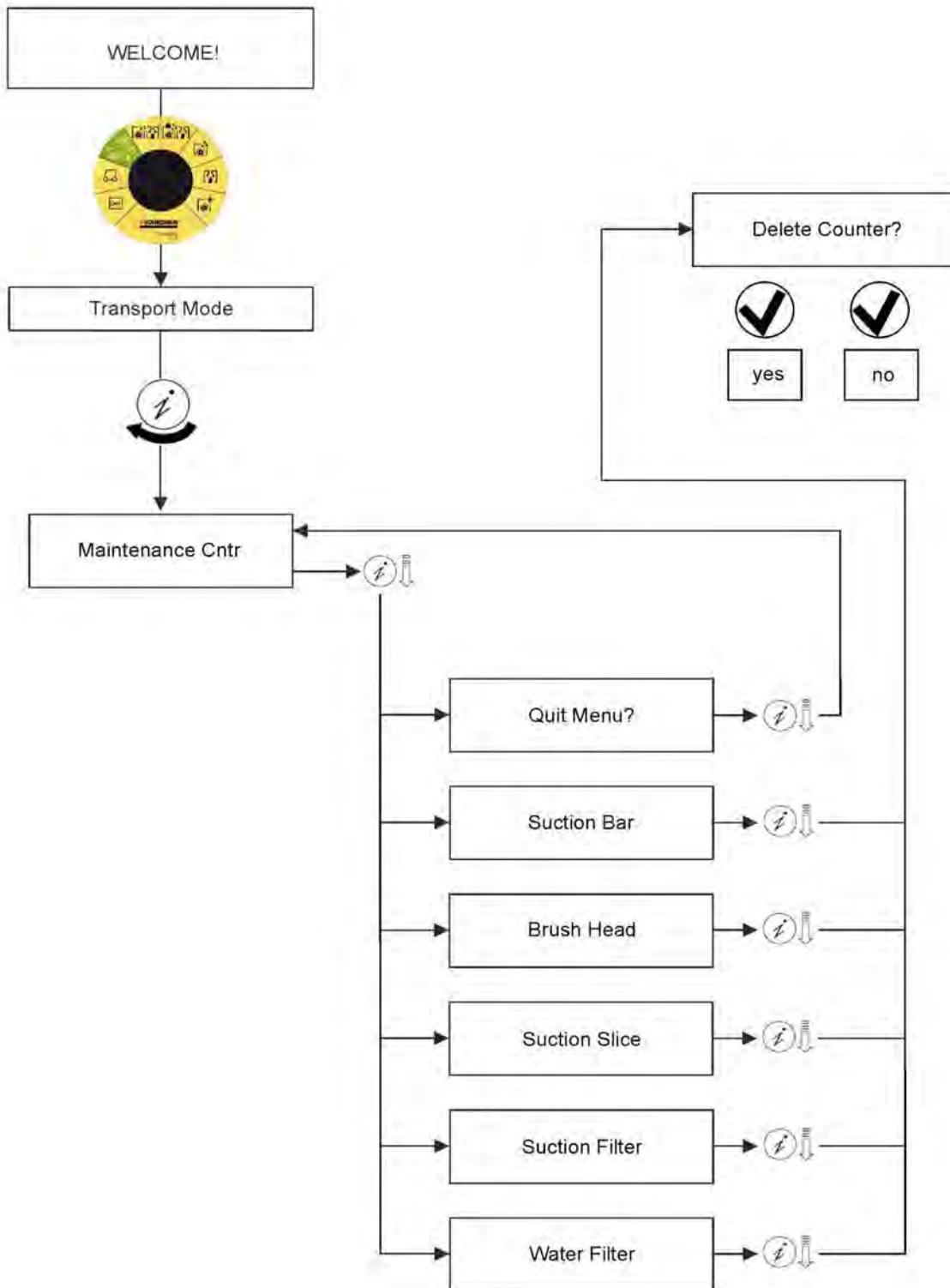
When the Info button is pressed, this message will be reset.

It is also possible to reset the maintenance counter using the yellow or grey KIK key.

The service technician can also do this with the red KIK key.

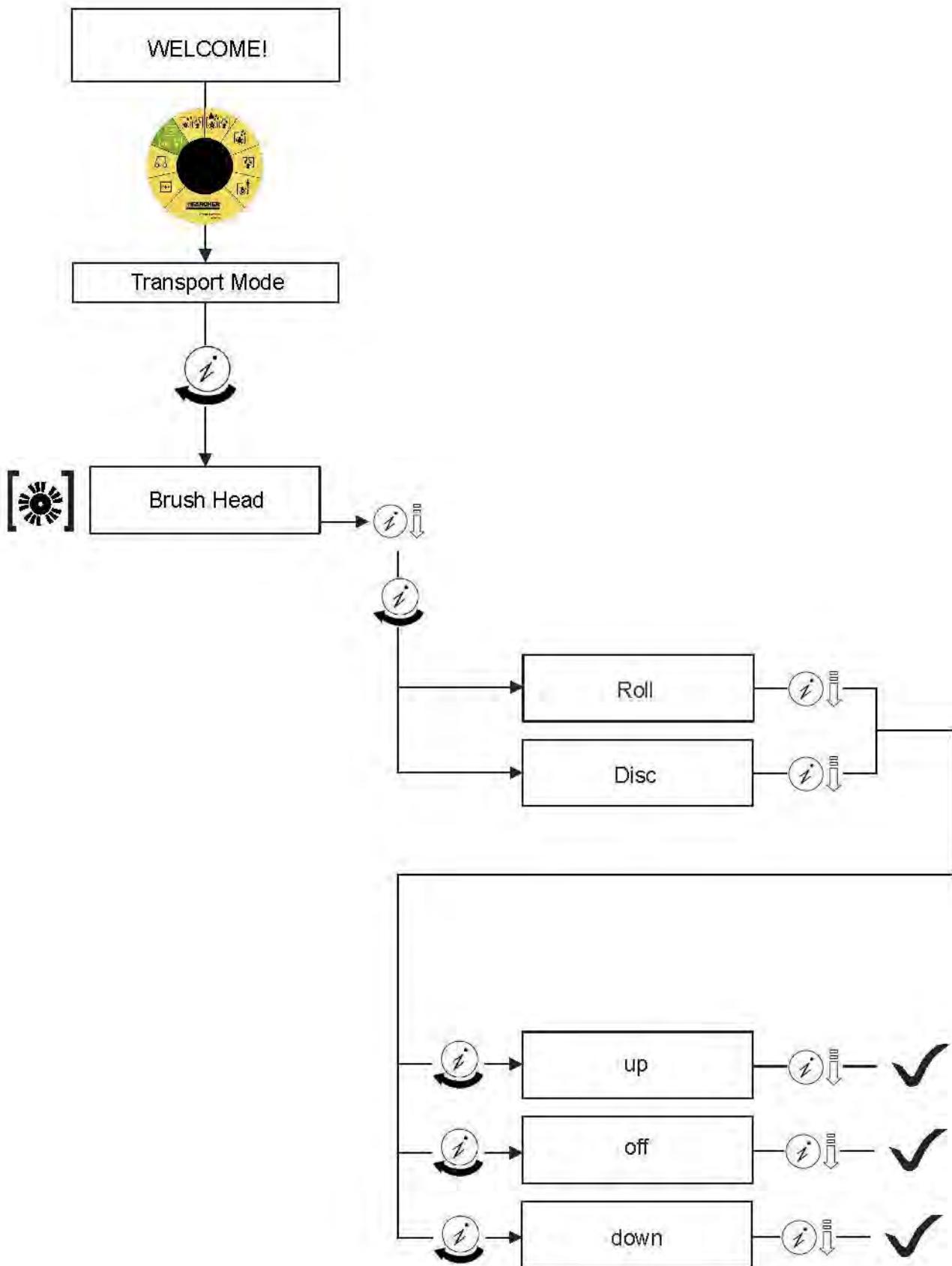
From the maintenance counter, you can get into transport mode by going through the menu with the I button (rotate and confirm).

Each separate maintenance counter can be erased in the "Erase counter" menu.



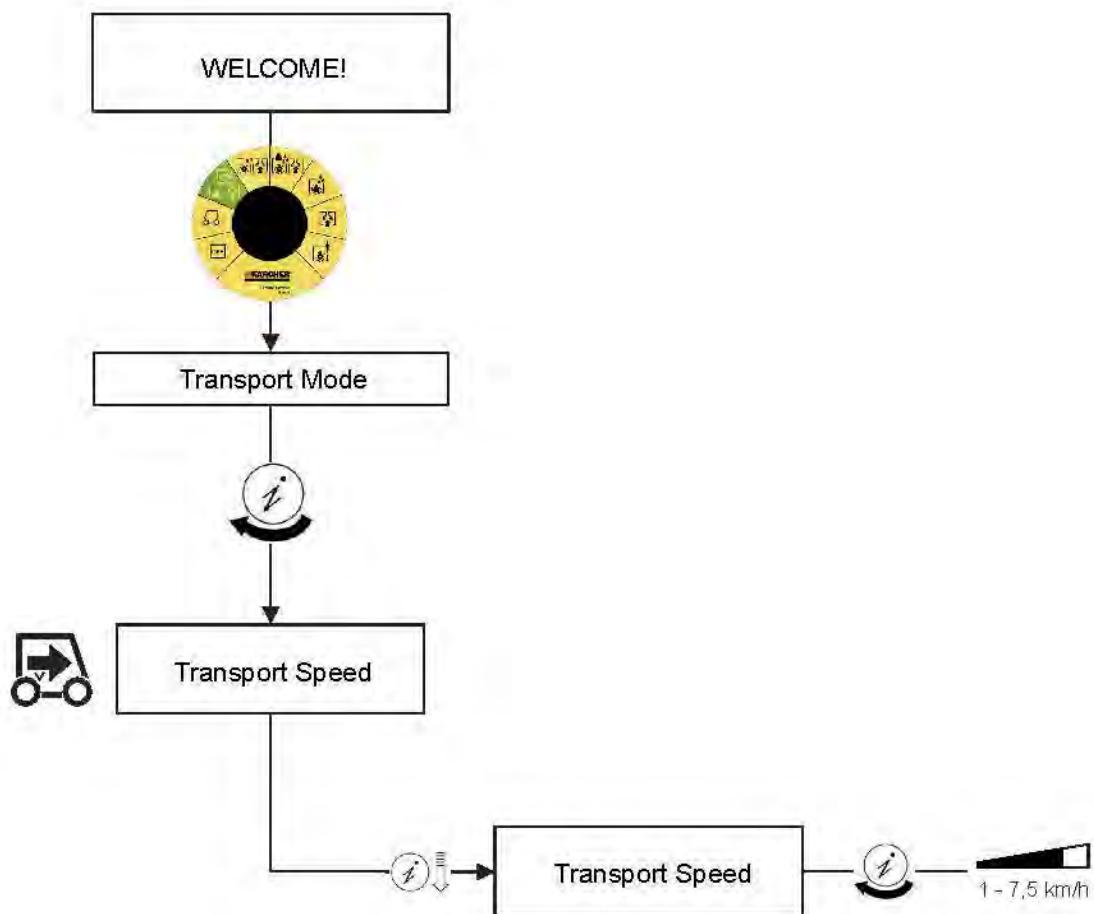
## Brush head

You can select between R and D brush head. It is also possible to move the brush head downwards and upwards.



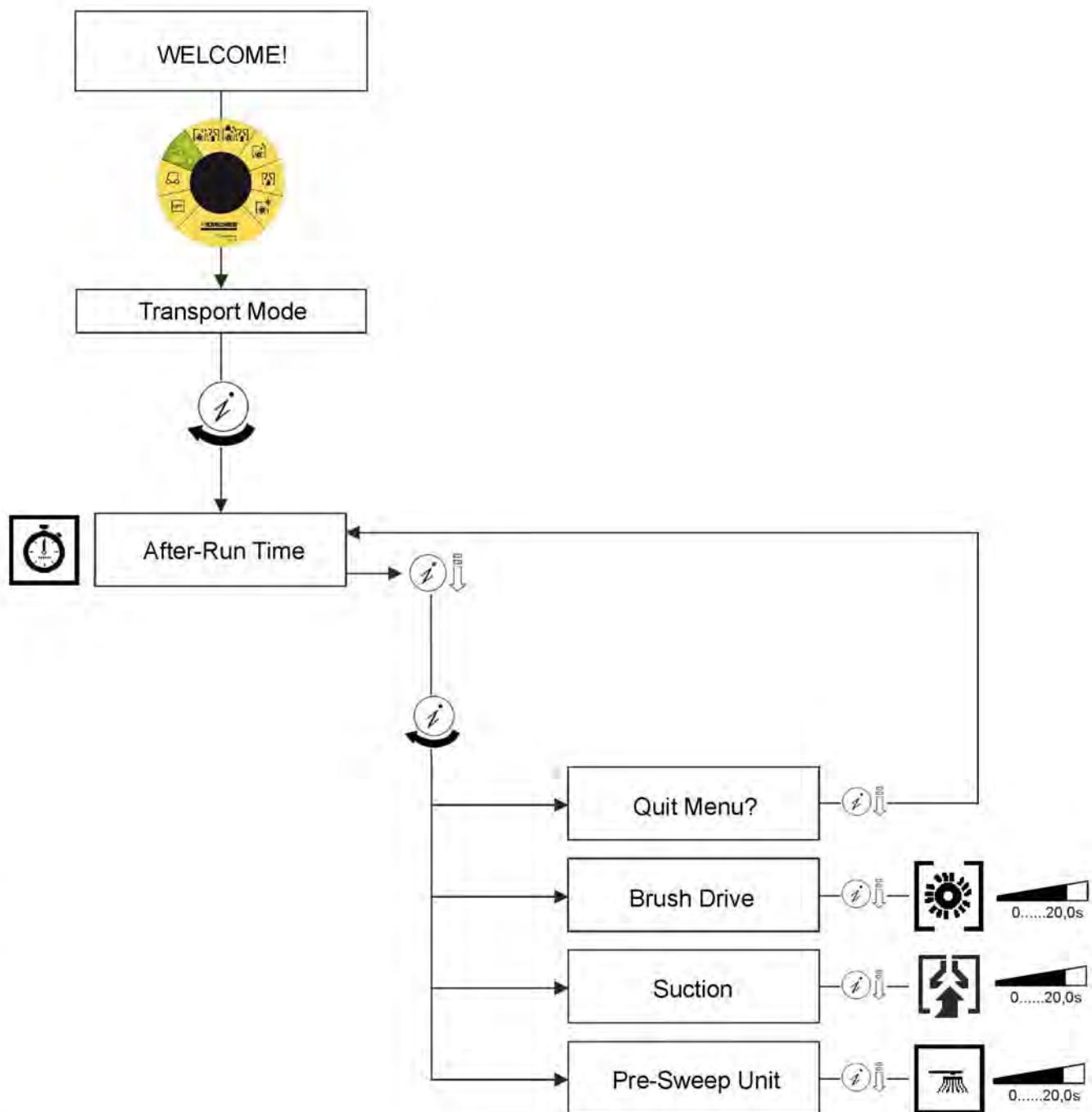
## Travel speed

The travel speed can be adjusted between 2 - 7.5 km/h.



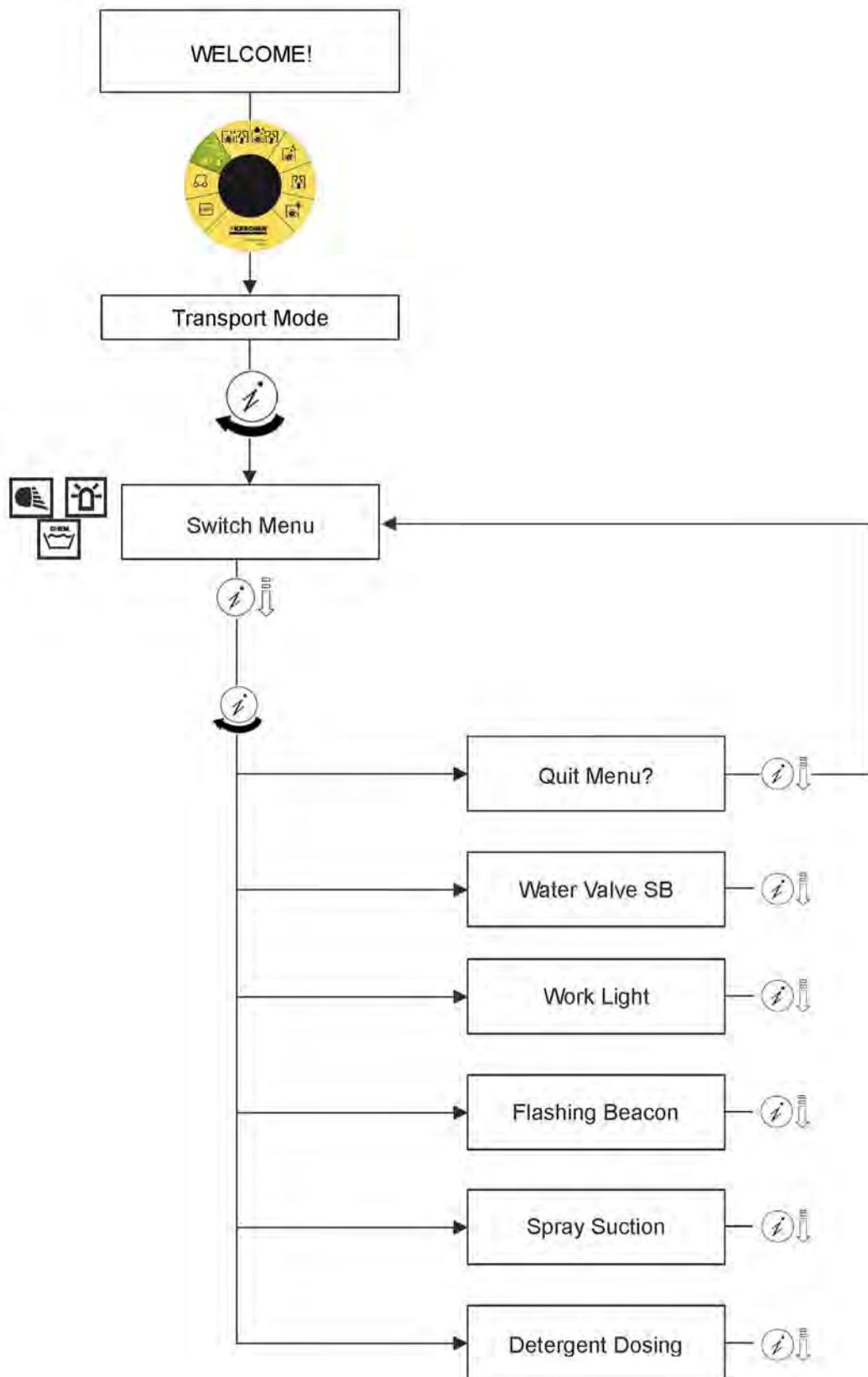
## Stopping times

The after-running times for the brush head, suction bar and side brushes can be adjusted.



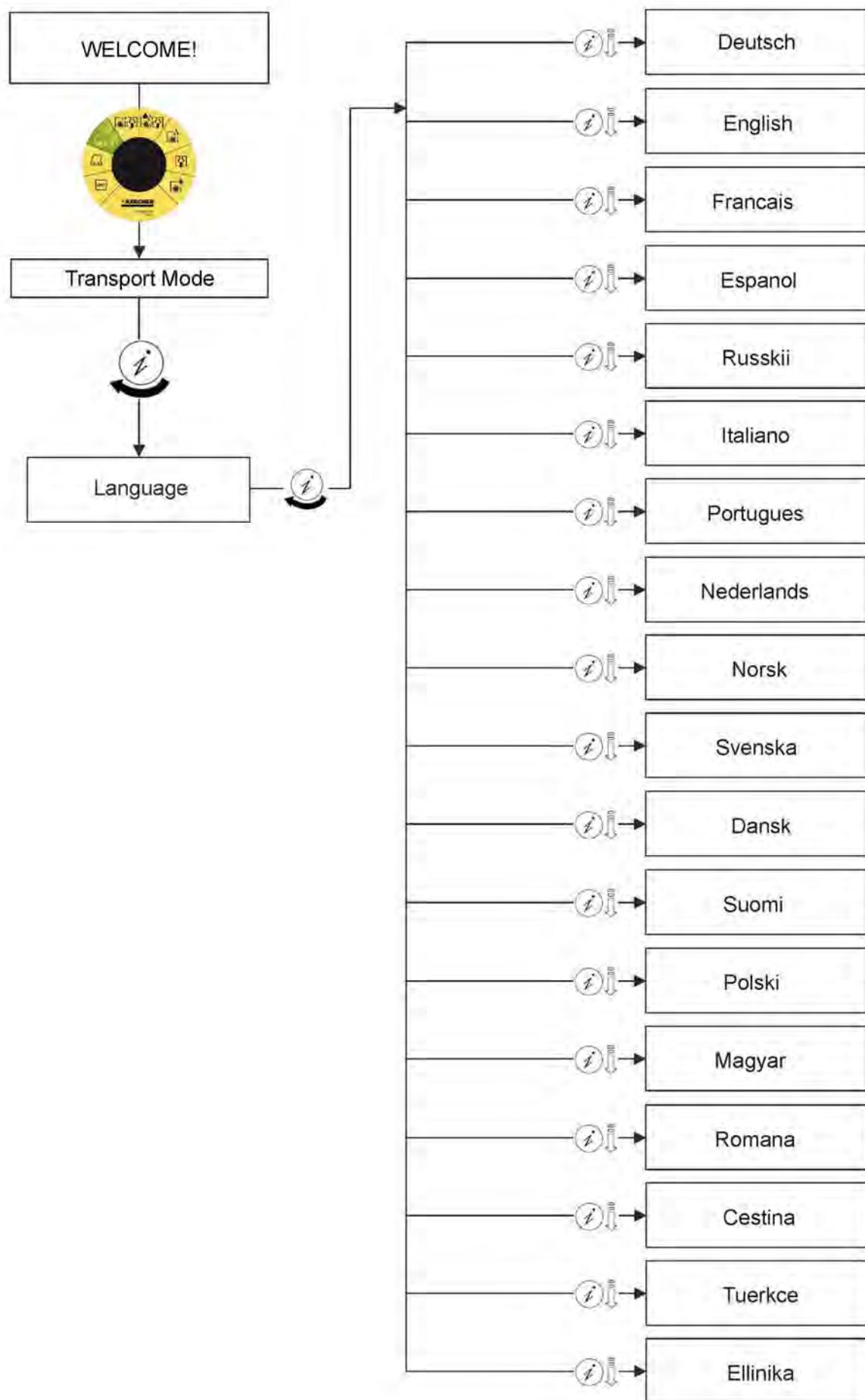
## Switch menu

The units work light, flashing beacon, spray suction, detergent dosing unit, water valve and side brushes can be switched on and off.



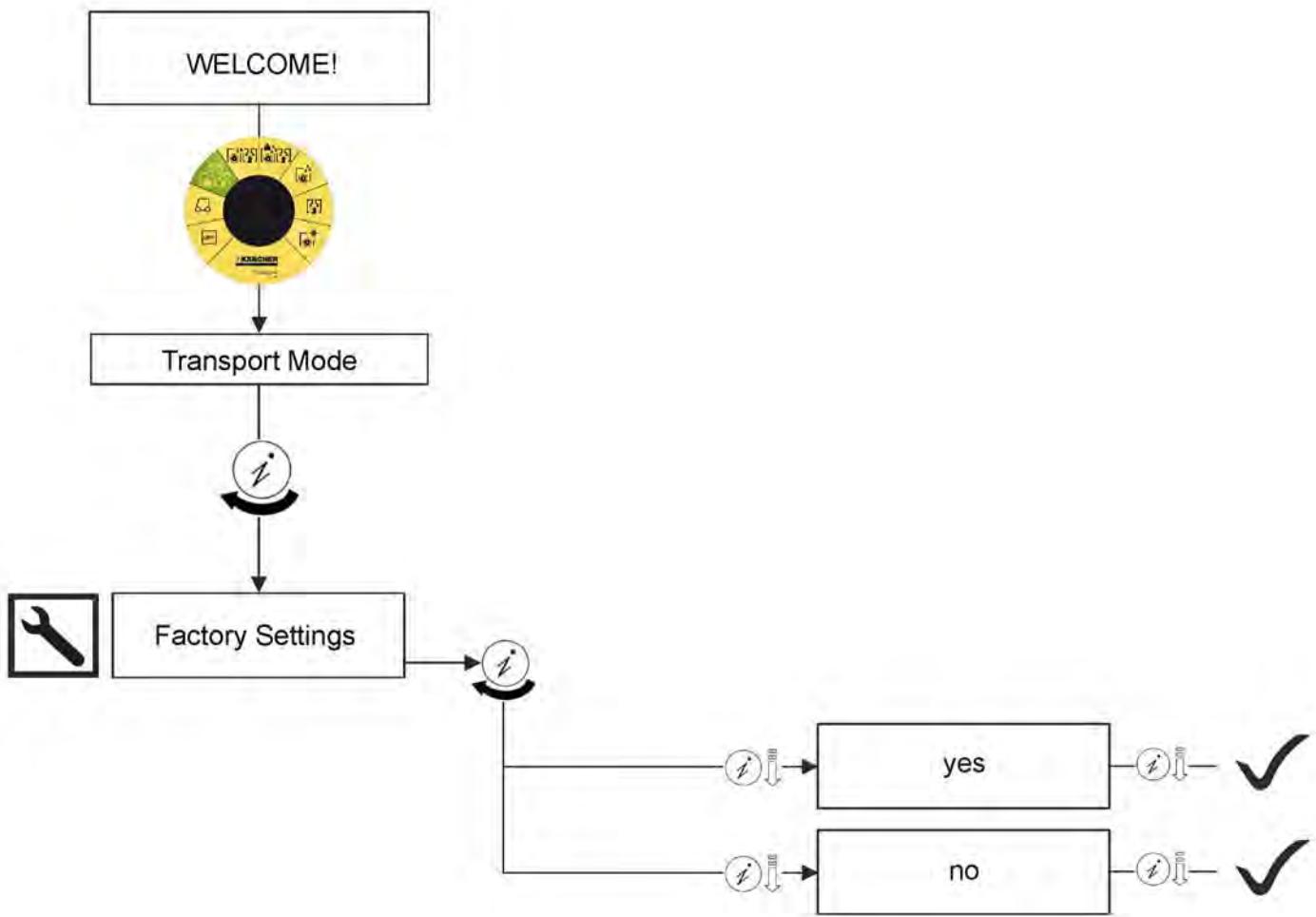
## Language

The languages provided can be selected.



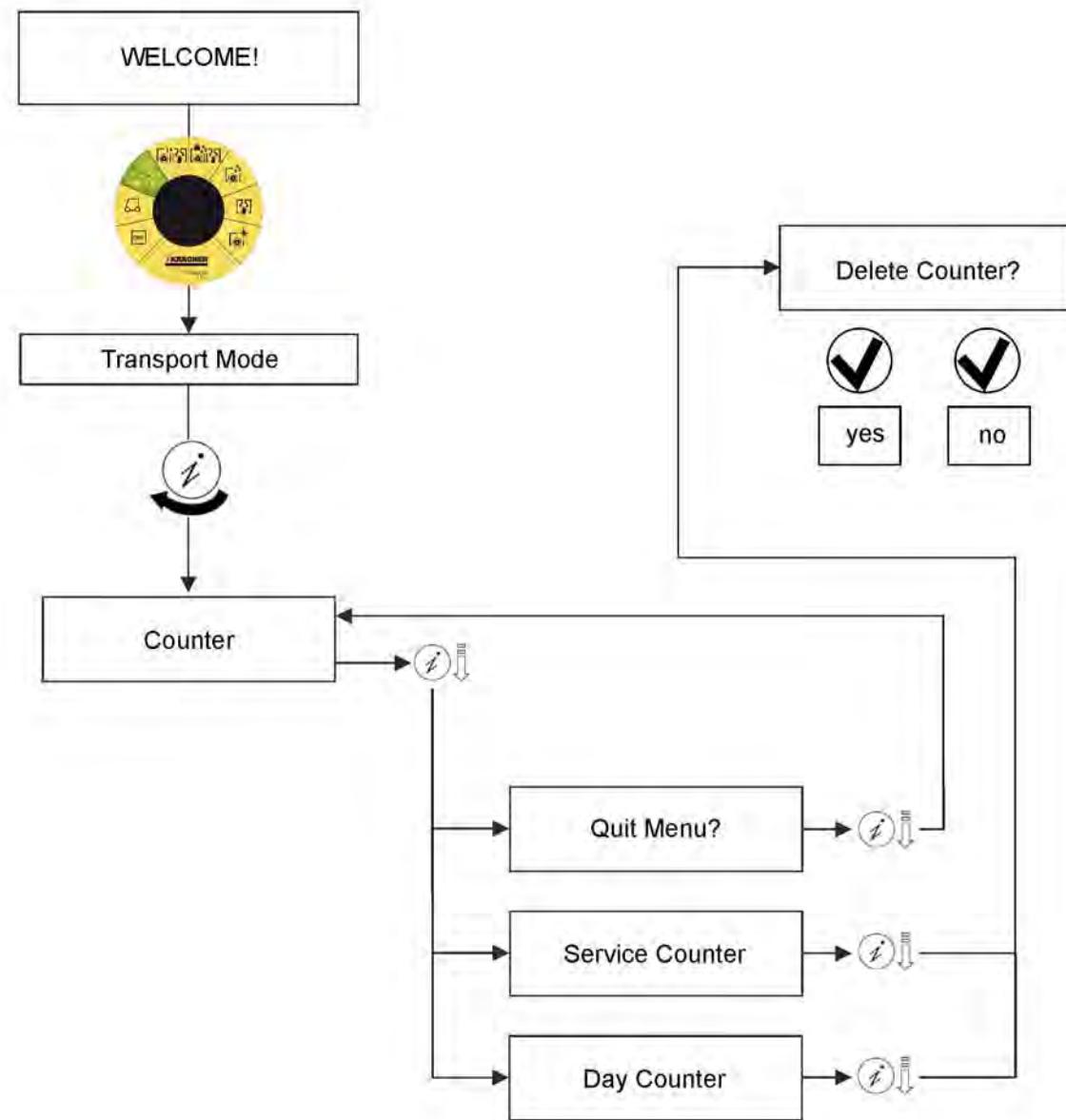
## Factory settings

If parameters have been misplaced, then it is possible to restore them to their original state.



## Counter

The day counter and the service counter can be reset. The service counter is reset to 400h and the day counter to 0h.



## Error memory

### Error messages for the user

The error messages enable the user to recognise incorrect machine conditions that he/she can rectify him-/herself.

If the control detects errors in the process functions, individual functions or the entire machine can be disabled.

For the correction of errors, the user must observe the recommendations in the message.

Error messages for the user are plain text information.

Errors / warnings have a higher priority than the user messages and overwrite them in the display.

## Fault messages and warning messages for head CPU A1

Error codes	Description	Measure
K1/102	Parameters are damaged. Most parameters from at least one module are not complete, or are faulty.	1 Check head CPU A1 parameters. 2 If no faults are able to be found, load head CPU A1 factory settings. 3 Faulty hardware in head CPU A1
K1/103	Operating hours counter is damaged. Memory for operating hours counter is faulty. Operating hours counter is set automatically to 0 h 0 min.	1 Faulty hardware in head CPU A1
K1/104	Overflow in parameter memory. Too many parameter changes are requested.	1 Restart the machine. 2 Load the factory settings. 3 Faulty hardware in head CPU A1
K1/105	Head CPU parameters are damaged.	1 Check parameters. 2 If no faults are able to be found, load head CPU A1 factory settings
K1/106	The received driving module status is not OK.	1 Check connections on bus system. 2 Check driving module parameters. 3 Check connections from driving module to the consumers (traction motor, brake ...). 4 Check wiring between B- and X22 (UBAT minus) on driving module A2.
K1/107	Module bus communication fault. 1 During switch-on procedure: The parameters of at least one module are not stable. 2 During operation: At least one module is not responding to a bus communication.	1 Check bus system (for example, voltage supply 13 V or RS 485 bus system interrupted). 2 Check wiring between B- and X22 (UBAT minus) on driving module A2. 3 Check minus connection to all modules. 4 Establish minimum configuration and determine faulty module. 5 Check parameters - load factory setting if no faults are able to be determined. 6 Faulty hardware in head CPU A1
K1/108	General contactor K1 has short-circuited. The battery voltage applied on the driving module is greater than (Vbatt-2V), before the general contactor is closed.	1 Check general contactor K1. 2 Check the bus cables (GS_in/GS_out).
K1/109	General contactor K1 cannot be closed. 1 After the general contactor has been closed, the battery voltage is too low. 2 No output at X1/5: X1/10 (head CPU is damaged). 3 One of the modules interrupts the coil voltage in the general contactor.	1 Check whether all modules on the head CPU are detected (module bus). 2 Establish minimum configuration and determine the faulty module or the faulty bus cables. 3 Check the bus cables (GS_in/GS_out). 4 Check the connections for general contactor K1. 5 Check resistance of coil K1 (result ~ 50 ohms). 6 Check the voltage supply between X1/5:X1:10. 7 Faulty hardware in head CPU A1
K1/110	The machine configuration (A1) does not match the configuration of the detected driving module (A2). The wrong machine type is stored in master module A1.	1 Check machine configuration using the service programme 2 Transfer the correct machine configuration (system parameters) to the appliance.
K1/111 Supply Voltage Incorrect	Battery voltage is outside of range 29 V < Vbatt > 45 V (29 V < Vbatt > 55 V when charging).	1 Check battery voltage. 2 Check connections and fixing of battery supply cables.

Error codes	Description	Measure
K1/113	Addressing of modules was unsuccessful. ATTN_IN voltage is not detected on head CPU A1 after the addressing.	<ol style="list-style-type: none"> <li>Check whether all connected up modules are addressed (module bus).</li> <li>Carry out power reset (disconnect battery for 1 minute).</li> <li>Establish minimum configuration and determine faulty module.</li> <li>Check bus cables (ATTN_in/ATTN_out) (result ~ 10 V).</li> <li>Check machine parameters.</li> </ol>
K1/116	Current value for general contactor K1 coil was above 1.6 A for 20 ms.	<ol style="list-style-type: none"> <li>Check cable between general contactor K1 and head CPU A1.</li> <li>Measure resistance of general contactor K1 coil (~ 50 ohms).</li> </ol>
K1/130	Internal fault STM8. Internal fault in 13 V switching voltage supply for head CPU A1.	<ol style="list-style-type: none"> <li>Carry out power reset (disconnect battery for 1 minute).</li> <li>Faulty head CPU A1</li> </ol>
K1/131	Internal fault Above STM8 13 V. Internal fault in 13 V switching voltage supply for head CPU A1.	<ol style="list-style-type: none"> <li>Carry out power reset (disconnect battery for 1 minute).</li> <li>Check 13 V bus line Voltage x1:1 against minus X12 target 12.8-14 V Check bus line for short-circuit.</li> <li>Check minimum configuration and determine faulty module.</li> <li>Faulty head CPU A1</li> </ol>
K1/132	Internal fault High STM8. Internal fault in 13 V switching voltage supply for head CPU A1. Voltage > 14 V	<ol style="list-style-type: none"> <li>Carry out power reset (disconnect battery for 1 minute).</li> <li>Check 13 V bus line Voltage x1:1 against minus X12 target 12.8-14 V Check bus line for external voltage.</li> <li>Check minimum configuration and determine faulty module.</li> <li>Faulty head CPU A1</li> </ol>
K1/133	Internal fault Low STM8 13 V. Internal fault in 13 V switching voltage supply for head CPU A1. Voltage > 12.8V	<ol style="list-style-type: none"> <li>Carry out power reset (disconnect battery for 1 minute).</li> <li>Check 13 V bus line Voltage x1:1 against minus X12 target 12.8-14 V Check bus line for short-circuit.</li> <li>Check minimum configuration and determine faulty module.</li> <li>Faulty head CPU A1</li> </ol>
K1/134	Internal fault backlight High STM8. Internal fault in 13 V switching voltage supply for head CPU A1. Backlight voltage for display > 13.5 V	<ol style="list-style-type: none"> <li>Carry out power reset (disconnect battery for 1 minute).</li> <li>Check 13 V bus line Voltage x1:1 against minus X12 target 12.8-13.5 V Check bus line for external voltage.</li> <li>Check minimum configuration and determine faulty module.</li> <li>Faulty head CPU A1</li> </ol>
K1/135	Internal fault backlight Low STM8. Internal fault in 13 V switching voltage supply for head CPU A1. Backlight voltage for display < 12.5 V.	<ol style="list-style-type: none"> <li>Carry out power reset (disconnect battery for 1 minute).</li> <li>Faulty head CPU A1</li> </ol>
K1/140	Parameterisation error in driving module A2 during startup phase "CHECK_PARAMETER". In the module synchronisation between master module A1 and driving module A2, a parameter was rejected during startup.	<ol style="list-style-type: none"> <li>Carry out power reset (disconnect battery for 1 minute).</li> <li>Transfer standard parameters to driving module A2 using Y cable and service module.</li> <li>Drive module A2 defective.</li> </ol>

Error codes	Description	Measure
K1/142	Parameterisation error in cleaning module A3 during startup phase "CHECK_PARAMETER". In the module synchronisation between master module A1 and cleaning module A3, a parameter was rejected during startup.	1 Carry out power reset (disconnect battery for 1 minute). 2 Transfer standard parameters to cleaning module A3 using Y cable and service module. 3 Cleaning module A3 defective.
K1/143	Parameterisation error in cleaning module A3.1 during startup phase "CHECK_PARAMETER". In the module synchronisation between master module A1 and cleaning module A3.1, a parameter was rejected during startup.	1 Carry out power reset (disconnect battery for 1 minute). 2 Transfer standard parameters to driving module A3.1 using Y cable and service module. 3 Cleaning module A3.1 defective.
K1/144	Parameterisation error in lifting module A4 during startup phase "CHECK_PARAMETER". In the module synchronisation between master module A1 and lifting module A4, a parameter was rejected during startup.	1 Carry out power reset (disconnect battery for 1 minute). 2 Transfer standard parameters to driving module A4 using Y cable and service module. 3 Lifting module A4 defective.
K1/145	Parameterisation error in lifting module A4.1 during startup phase "CHECK_PARAMETER". In the module synchronisation between master module A1 and lifting module A4.1, a parameter was rejected during startup.	1 Carry out power reset (disconnect battery for 1 minute). 2 Transfer standard parameters to driving module A4.1 using Y cable and service module. 3 Lifting module A4.1 defective.
K1/146	Parameterisation error in lifting module A4.2 during startup phase "CHECK_PARAMETER". In the module synchronisation between master module A1 and lifting module A4.2, a parameter was rejected during startup.	1 Carry out power reset (disconnect battery for 1 minute). 2 Transfer standard parameters to lifting module A4.2 using Y cable and service module. 3 Lifting module A4.2 defective.
K1/147	Parameterisation error in accessory module A5 during startup phase "CHECK_PARAMETER". In the module synchronisation between master module A1 and accessory module A5, a parameter was rejected during startup.	1 Carry out power reset (disconnect battery for 1 minute). 2 Transfer standard parameters to driving module A5 using Y cable and service module. 3 Accessory module A5 defective.

Fault code / warnings	Description	Measure
Sitzschalter offen! Seat switch opened!	Seat switch is not closed when the throttle pedal is pressed.	1 Release throttle pedal. 2 Sit on the seat. 3 Check cable and correct functioning of seat switch (closed seat switch S10 < 1 Ω).
Gaspedal loslassen! Throttle pedal release!	Throttle pedal B1 is pressed during the switch-on procedure.	1 Gaspedal loslassen! 2 Check microswitch S13. 3 Check throttle pedal microswitch S13. Throttle pedal not activated high impedance. Throttle pedal activated low impedance < 1 ohm.
Keine Fahrtrichtung! No travel	No travel switch S2. Travel switch is not detected on head CPU.	1 Check cable for travel switch S2 (closed switch < 1 Ω). 2 Check functionality of travel switch S2.
Overload in brush drive!	Brushes are overloaded. The sum current of both brushes was above 80 A for longer than 10 s.	1 Check mechanical system of brush motors. 2 Check mechanical system of lifting motor. 3 Check cables of brush motor and lifting motor. 4 Check brush motor and lifting motor in test mode. 5 Check connection for filling level sensor B2 fresh water (disconnect filling level sensor B2 and check appliance as to whether a fault is still present).
K1/607	Internal working parameter error.	1 Switch off the machine and restart. 2 Carry out power reset (disconnect battery for 1 minute). 3 Faulty hardware in head CPU A1
Kein Zugriff No Access	Wrong key in key menu. An operator key was not inserted.	The key menu can only be started using the grey or red KIK key. Only the white or yellow KIK key can be processed.

Fault code / warnings	Description	Measure
K1/611	Fault when exiting test mode. A timeout has occurred when exiting test mode.	1 Switch off the machine and restart. 2 Carry out power reset (disconnect battery for 1 minute).
Wartung Bürstenkopf! Maintenance Brush Head!	The brush head maintenance counter has expired.	Service/clean the brush head and reset the counter.
Wartung Saugbalken! Maintenance Suction Bar!	The suction bar maintenance counter has expired.	Service/clean the suction bar and reset the counter.
Wartung Sauglippe! Maintenance Suction Slice!	The suction slice maintenance counter has expired.	Service/clean the suction slice and reset the counter.
Wartung Turbinensieb! Maintenance Suction Filter!	The suction filter maintenance counter has expired.	Service/clean the suction filter and reset the counter.
Wartung Wasserfilter! Maintenance Water Filter!	The water filter maintenance counter has expired.	Service/clean the water filter and reset the counter.
K1/617	Maintenance counter is faulty.	1 Refreshing the counter was carried out automatically. 2 Switch off the machine and restart. 3 Carry out power reset (disconnect battery for 1 minute). 4 Faulty hardware in head CPU A1
K1/618	Fault when selecting a new language. 1 Graphic display not set. 2 Selected language is not within the range. 3 The selected language on head CPU A1 is empty.	1 Check system parameters. 2 Update all display texts using service module. 3 Load head CPU A1 factory settings.
K1/619	Fault when selecting new images and icons. 1 Graphic display not set. 2 Selected images are not within the range. 3 The selected images on head CPU A1 are empty.	1 Check system parameters. 2 Update the display of images and icons using service module. 3 Load head CPU factory settings.
K1/624	Mechanical roller brush block of presweep facility. Min. 10s roller brush presweep facility in controller block.	1 Check roller brush and drive. 2 Check cabling for short-circuit. 3 Disconnect motor and check for interwinding fault. 4 Measure voltage between X13:X5 on cleaning module A3/1 (approx. 24 V). 5 Cleaning module A3/1 defective.
K1/625	Internal co-processor fault _STM8Master module A1. Machine configuration (system parameters) and module configuration not compatible in regard of presweep facility.	1 Carry out power reset (disconnect battery for 1 minute). 2 Load head CPU A1 factory settings. 3 Faulty head CPU A1
K1/626	System parameters do not match up with the machine configuration. The adjustable options (attachment kits) do not match the machine hardware.	1 Check parameters for modules and reload standard parameters. 2 Attachment kit not selected in configuration. 3 Attachment kit configured, but no consumer connected up.

Fault code / warnings	Description	Measure
K1/631	Status of driving module is not OK.	<p>1 Check connections of driving module (voltage supply 13 V X1/1 and X2/1 bus system interrupted).</p> <p>2 Establish minimum configuration and determine faulty module.</p> <p>3 Check parameters, reload head CPU (A1) standard parameters.</p>
K1/633	No connection between travel direction switch and driving module.	<p>1 Incorrect travel direction selection parameterised (service programme parameter in driving module offset 10 - set direction selection using BUS =&gt; to "0").</p> <p>2 Transfer standard parameters to driving module A2.</p>
K1/651	Brush head lifting motor M20, implausible microswitch.	<p>1 Check cables for lifting motor M20.</p> <p>2 Check microswitches S20 and S21 for lifting motor M20.</p>
K1/652	Suction bar lifting motor M30, implausible microswitch	<p>1 Check cables for lifting motor M30.</p> <p>2 Check microswitches S30 and S31 for lifting motor M30.</p>
K1/653	No start position for lifting motors. One of the lifting motors does not reach the start position within 10 s.	<p>1 Check mechanical lifting system of brush head, suction bar, side brushes or presweep unit (M20/M30/M40/M50 block).</p> <p>2 Check cables for lifting motors M20/M30/M40/M50.</p> <p>3 Check functionality of motors M20/M30/M40/M50.</p> <p>4 Check microswitches S21 for lifting motors M20.</p> <p>5 Check microswitches S31 for lifting motors M30.</p> <p>6 Check microswitches S41 for lifting motors M40.</p> <p>7 Check microswitches S51 for lifting motors M50.</p> <p>8 Faulty lifting module A4/A4.1.</p>
K1/654	Timeout for brush head lifting motor (after 30 s). 1 The brush head lifting motor does not reach the upper end position (microswitch S21) within 30 seconds (lifting motor power consumption >10 A). Fault occurs as subsequent fault H1/668, which is signalled after 10 seconds.	<p>1 Check cables for lifting motor M20.</p> <p>2 Check functionality for lifting motor M20.</p> <p>3 Check microswitch S21 for lifting motor.</p> <p>4 Check mechanical functioning of brush head.</p> <p>5 Faulty lifting module A4.</p>
K1/655	Timeout for suction bar (after 30 s). 1 The suction bar lifting motor does not reach the upper end position (microswitch S31) or the lower end position (microswitch S30) within 30 seconds (lifting motor power consumption >10A). Fault occurs as subsequent fault H1/698, which is signalled after 10 seconds.	<p>1 Check cables for lifting motor M30.</p> <p>2 Check functionality for motor M30.</p> <p>3 Check microswitches S30/S31 for lifting motor M30.</p> <p>4 Check mechanical functioning of suction bar.</p> <p>5 Faulty lifting module A4.</p>
K1/661	Presweep unit or side brushes lifting motor M40, implausible microswitches.	<p>1 Check cables for lifting motors M40 or M50.</p> <p>2 Check microswitches for lifting motors S40/S41 or S50/S51.</p> <p>3 Check voltage of microswitches S40/S41 or S50/S51 (short-circuit to -Vbatt).</p>
K1/662	Timeout for side brushes lifting motor M40 (after 30 s). 1 The side brush lifting motor (M40) does not reach the upper end position (microswitch S41) or the lower end position (microswitch S40) within 30 seconds (lifting motor power consumption >10 A). Fault occurs as subsequent fault H2/698, which is signalled after 10 seconds.	<p>1 Check cables for lifting motor M40.</p> <p>2 Check functionality for motor M40.</p> <p>3 Check microswitches S40/S41 for lifting motor M40.</p> <p>4 Check mechanical functioning of side brush.</p> <p>5 Faulty lifting module A4.1.</p>

Fault code / warnings	Description	Measure
K1/662	Timeout for lifting motor (M50) of presweep unit (after 30 s). 1 The presweep facility lifting motor (M50) does not reach the upper end position (microswitch S51) or the lower end position (microswitch S50) within 30 seconds (lifting motor power consumption >10 A). Fault occurs as subsequent fault H2/698, which is signalled after 10 seconds.	1 Check cables for lifting motor M50. 2 Check functionality for motor M50. 3 Check microswitches S50/S51 for lifting motor M50. 4 Check mechanical functioning of presweep unit. 5 Faulty lifting module A4.1.
K1/671	Wrong cleaning module version. The detected cleaning module is older than V4.0.	1 Update cleaning module firmware to vers. > 4.0. 2 Faulty cleaning module A3.
K1/681	Implausible battery charge; runtime calculation not possible. Incorrect battery ID read out from charger.	Select the actual battery again in the battery menu. The battery charge will be reset consequently.

#### Fault messages and warning messages error in driving module A2

Fault code / warnings	Description	Measure
F1/001	A2 - internal fault: Failure in AD converter; ANALOG INPUT. The analogue readings do not change within 400 ms.	1 Check cabling on magnetic sensor for throttle pedal B1. 2 Check parameters, reload driving module (A2) standard parameters. 3 Check magnetic sensor for throttle pedal B1, voltage at X5/1 : X5/3 => 8-9 V Voltage at X5/2 : X5/3 => 0.2 V throttle pedal not activated. Voltage at X5/2 : X5/3 => 3.3 V throttle pedal activated. 4 Magnetic sensor for throttle pedal B1 defective. 5 Drive module A2 defective.
F1/002	A2 internal fault: EEPROM comparison error.	1 Hardware reset (disconnect battery for 1 minute). 2 Drive module A2 defective.
F1/003	A2: Internal logic error 1 Max-current hardware protective circuit is damaged. 2 One or several motor phases are interrupted (U, V, W). 3 Ubat_bus voltage missing during switch-on.	1 Hardware reset (disconnect battery for 1 minute). 2 Compare or transfer driving module A2 parameters with standard values. 3 Drive module A2 defective.
F1/004	A2: Internal intermediate circuit voltage fault. Intermediate circuit voltage at the capacitors does not rise.	1 Hardware reset (disconnect battery for 1 minute). 2 Compare or transfer driving module A2 parameters with standard values. 3 Driving module A2 defective.
F1/006	A2: Internal fault: general contactor K1 voltage driver defective. GS_IN / GS_OUT line short-circuited. It is not possible to open the contactor.	1 Hardware reset (disconnect battery for 1 minute). 2 Drive module A2 defective.
F1/008	A2: Internal fault: motor phases monitoring during self-test defective.	1 Check motor U, V, W wiring (cable breakage?). 2 Drive module A2 defective.
F1/009	A2: Internal motor current measurement during self-test defective.	1 Hardware reset (disconnect battery for 1 minute). 2 Drive module A2 defective.
F1/010	K1 general contactor not closed during self-test or operation.	1 Hardware reset (disconnect battery for 1 minute). 2 Test K1 coil wiring (cable breakage?). 3 K1 coil defective (~ 50 ohms). 4 Check bus cable in/out path. 5 Fuse F2 defective. 6 Check wiring B+ to driving module A2. 7 Drive module A2 defective.
F1/011	A2 internal voltage fault. A low voltage range or overvoltage was detected.	1 Hardware reset (disconnect battery for 1 minute). 2 Drive module A2 defective.

Fault code / warnings	Description	Measure
F1/012	A2 internal logic error: during driver self-test. 1 Circuits for voltage feedback of motor phases are damaged. 2 At least one motor phase with short-circuit to GND.	1 Hardware reset (disconnect battery for 1 minute). 2 Compare or transfer driving module A2 parameters with standard values. 3 Drive module A2 defective.
F1/013	Thermo PROTECTION - driving module Overtemperature >78°C	1 Cool down driving module A2 and restart. 2 Check fan M7 and voltage at A1 X1/3.8 (target 12 V). 3 Check cooling air gap for cleanliness. 4 Measure engine current M1. 5 Compare or transfer driving module A2 parameters with standard values. 6 Drive module A2 defective.
F1/014	A2 internal fault: Negative result with internal driver and performance level test. FET in drive circuit defective or FET driver defective.	1 Hardware reset (disconnect battery for 1 minute). 2 Drive module A2 defective.
F1/015	Battery voltage outside limit values < 28.8 and > 43.2 vol.	1 Check battery voltage. 2 Check cabling. 3 Check battery parameters (correct battery type selected?). 4 Drive module A2 defective.
F1/016	Signals of magnetic sensor throttle pedal B1 not OK.	1 Check cabling to throttle pedal. Caution! Check entire X5 wiring. 2 Check parameter (in service programme) offset 14 = 9 V. Reload driving module (A2) standard parameters. 3 Check correct functioning of throttle pedal magnetic sensor B1. Check voltage supply of magnetic sensor for throttle pedal between (+)X5/1 and (-)X5/3 Target = 8.9 V Throttle pedal magnetic sensor between X5/2 and X5/3(-) target = 0.2 V to 0.9 V at rest position of throttle pedal and approx. 3.3 V with depressed throttle pedal. 4 Throttle pedal magnetic sensor defective. 5 Drive module A2 defective.
F1/017	Phases (U, V, W of engine M1) do not reach Ubatt.	1 Check cabling. Measure Ubatt on A2 battery B+/B-. 2 Short-circuit between U,V or W to GND. 3 Drive module A2 defective.
F1/018	A2 internal logic error, Watchdog defective.	1 Hardware reset (disconnect battery for 1 minute). 2 Drive module A2 defective.
F1/019	A2 internal logic error, phases self-test. Short-circuit in motor phase GND (either incorrectly wired or damaged motor high-side power MOS-FETs).	1 Check cabling. Check/measure short-circuit between Ubatt and one of the motor phases U, V, W. 2 Compare or transfer driving module A2 parameters with standard values. 3 Driving module A2 defective.
F1/020	Brake short-circuit. This fault is displayed after 500 ms.	1 Check brake coil for short-circuit (resistance in case of intact brake approx. 16 ohms). Check cabling to brakes for short-circuit. 2 Compare or transfer driving module A2 parameters with standard values. 3 Drive module A2 defective.
F1/022	A2 internal logic error, Watchdog1 defective.	1 Hardware reset (disconnect battery for 1 minute). 2 Drive module A2 defective.

Fault code / warnings	Description	Measure
F1/023	A2 internal logic error, Watchdog2 defective.	1 Hardware reset (disconnect battery for 1 minute). 2 Drive module A2 defective.
F1/025	A2 internal fault - RAM test faulty.	1 Hardware reset (disconnect battery for 1 minute). 2 Drive module A2 defective.
F1/029	A2 internal INPUT fault. The expected signals are not at X4 during the self-test.	1 Check cabling from X4 to B3 engine encoder and R2 PTC engine resistor. 2 Check parameter (in service programme) offset 24; reload driving module (A2) standard parameters. 3 Drive module A2 defective.
F1/030	A2 faulty input signals travel direction switch S2. Travel direction signal at the inputs for driving module X4/2, X4/3 and X4/9 interconnected, although travel direction type selected via bus (travel direction switch is connected to A1).	1 Check cabling. Pins X4/2 and X4/3 at A2 must be free. 2 Check parameter (in service programme) offset 13, 14; reload driving module (A2) standard parameters. 3 Drive module A2 defective.
F1/031	A2 faulty input signals at X4. An unexpected signal present on one or several digital inputs for the control.	1 Check cabling at X4 to the sensors and switches 2 Check parameters; reload driving module (A2) standard parameters. 3 Drive module A2 defective.
F1/032	Throttle pedal voltage out of range. Throttle pedal signal X5/2 input not within range 0.2 V ÷ 3.4 V; measured during calibration.	1 Check cabling for throttle pedal at X5. 2 Measure voltage between X5/2 and X5/3 at throttle pedal magnetic sensor B1, = 0.2 - 3.3 V, depending on throttle pedal position. 3 Check parameters. Reload driving module (A2) standard parameters. 4 Calibrate throttle pedal. 5 Drive module A2 defective.
F1/035	Maximum current gain factor does not match the factory settings.	1 Drive module A2 defective.
F1/036	Fault at brake Y1 during running (brake returns to rest position). 1 At least one of the two FETs for activating brake Y1 is defective. 2 Cable breakage at brake Y1. 3 Brake Y1 defective.	1 Check cabling and brake Y1 for disruption (loose connection problem or brake coil defective). Measure brake coil = approx. 16 Ω 2 Drive module A2 defective.
F1/037	Brake cable connection open (cable breakage). Interruption in brake coil. Transistor driver for brake defective. Fault occurs during running.	1 Check cabling and brake Y1 for disruption (loose connection problem or brake coil defective). Measure brake coil = approx. 16 Ω 2 Drive module A2 defective.
F1/038	ENGINE M1 overtemperature. Engine temperature sensor signalled threshold of 150°C.	1 Check R2 PTC engine resistor. Resistance when engine is cold (25°C) approx. 600 ohms. If the temperature is rising, the resistance will also increase. 2 Check parameter (in service programme) offset 24; reload driving module (A2) standard parameters. 3 Drive module A2 defective.
F1/121	A2 driving module does not receive any voltage on the power electronics.	1 Check whether general contactor K1 is closed and whether contactor coil lines have a continuous connection with head CPU A1. 2 Check protective fuse F2 for driving module and replace if necessary. 3 Check whether there is a short-circuit between Ubatt and GND behind contactor K1 and the F2 fuses. Locate short-circuit, resolve. 4 Check whether battery voltage is between 27...42 V; if not, check battery. 5 Drive module A2 defective.

Fault code / warnings	Description	Measure
F1/122	A2 internal fault. Driving module does not receive 12-14 V control voltage.	1 Check whether 13-14 V are applied at A2-X1/1 and X2/1. 2 Drive module A2 defective.
F1/161	Fault in dual processor monitoring.	1 Hardware reset (disconnect battery for 1 minute). 2 Drive module A2 defective.
Calibration faulty	Drive sensor values are not within the calibrated tolerance window.	1 Recalibrate throttle pedal: Throttle pedal released, e.g. value 22. Throttle pedal pressed, e.g. value > 98. Difference > 76 increments 2 Measure supply voltage between X5/1 and X5/3, = 8 V. Measure throttle-pedal-not-activated sensor voltage between X5/2 and X5/3 = ~ 0.2 V, and activated 3.3 V. If sensor voltage does not change during throttle pedal activation, then magnetic sensor for throttle pedal B1 is defective. 3 Check parameters; reload driving module (A2) standard parameters (in service programme). 4 Repetition of 1. and 2. 5 Drive module A2 defective.
Battery dead	BATTERY discharge Measured battery voltage below 10% of fully charged battery.	1 Warning arrives at approx. < 33 V Ubatt All consumers are switched off except for traction. 2 Charge battery. 3 Drive module A2 defective.
F1/604	A2 internal fault input for drive release microswitch X4/1 (short-circuit) when throttle pedal activated.	1 Check the voltage supply for throttle pedal microswitch. Target = approx. 12 V between X4/8 and GND. 2 Activate throttle pedal; measure voltage between X4/1 and GND. Target = approx. 12 V 3 Check cabling for short-circuit to GND when microswitch throttle pedal S13 activated. 4 Check microswitch mechanical system. 5 Check parameters; reload driving module (A2) standard parameters. 6 Drive module A2 defective.
Release accelerator	Throttle pedal activated during switch-on.	1 Release throttle pedal and restart machine. 2 Check mechanical system of magnetic sensor for throttle pedal B1. 3 Check throttle pedal microswitch S13. Throttle pedal not activated high impedance. Throttle pedal activated low impedance <1 ohm. 4 Drive module A2 defective.
F1/608	Throttle pedal not calibrated.	1 Calibrate the throttle pedal.
Horn defective	HORN output is short-circuited.	1 Check cabling and horn H1 for short-circuit. 2 High-impedance horn then OK. 3 Output voltage when horn activated at X3/2 to X3/4 ~ 23 V. 4 Drive module A2 defective.
F1/667	A2 internal LOGIC fault. Interruption in bus cable GS IN in event of switched-on machine in idle state.	1 Hardware reset (disconnect battery for 1 minute). 2 Check BUS-GS line between head CPU A1 and driving module A2. (loose connection). 3 Measure voltage at A2 X2/4 (GS IN line) = Ubatt. 4 Measure voltage at A2 X1/4 (GS out line) = Ubatt. not measurable ==> A2 defective.
F1/698	BRAKE TIME RAMP TOO LONG. A2 wrong braking parameters set.	1 Check parameters; reload driving module (A2) standard parameters. 2 Drive module A2 defective.

## Fault messages and warning messages for cleaning module 1

Fault code / warnings	Description	Measure
C1/001	Switch off roller1 - overcurrent protection active.	<ol style="list-style-type: none"> <li>Check cleaning module parameters; reload cleaning module (A3) standard parameters.</li> <li>Disconnect motor M2 - A3/X8.</li> <li>With motor M2 disconnected, carry out reset, main switch S1. If fault is replaced with another one, then search for/remove short-circuit in cabling and motor. Motor M2 possibly defective.</li> <li>If the same fault is displayed again (despite disconnected motor M2), then cleaning module A3 is defective.</li> </ol>
C1/002	Switch off roller2 - overcurrent protection active.	<ol style="list-style-type: none"> <li>Check cleaning module parameters; reload cleaning module (A3) standard parameters.</li> <li>Disconnect motor M3 - A3/X13.</li> <li>With motor M3 disconnected, carry out reset, main switch S1. If fault is replaced with another one, then search for/remove short-circuit in cabling and motor. Motor M3 possibly defective.</li> <li>If the same fault is displayed again (despite disconnected motor), then cleaning module A3 is defective.</li> </ol>
C1/003	Switch off turbine - overcurrent protection active.	<ol style="list-style-type: none"> <li>Disconnect motor M4 - A3/X10.</li> <li>With motor M4 disconnected, carry out reset, main switch S1. If fault is replaced with another one, then search for/remove short-circuit in cabling and motor. Motor M4 possibly defective.</li> <li>If the same fault is displayed again (despite disconnected motor M4), then cleaning module A3 is defective.</li> </ol>
C1/005	Switch off water pump - overcurrent protection active.	<ol style="list-style-type: none"> <li>Check cleaning module parameters; reload cleaning module (A3) standard parameters.</li> <li>Disconnect motor M5 - A3/X12.</li> <li>With motor M5 disconnected, carry out reset, main switch S1. If fault is replaced with another one, then search for/remove short-circuit in cabling and motor M5. Motor M5 possibly defective.</li> <li>If the same fault is displayed again (despite disconnected motor M5), then cleaning module A3 is defective.</li> </ol>
C1/006	Battery voltage > 42V	<ol style="list-style-type: none"> <li>Measure Ubat.</li> <li>Check fuse (F6) 50A, and replace if necessary.</li> <li>Check cleaning module parameters; reload cleaning module (A3) standard parameters.</li> <li>Cleaning module A3 defective.</li> </ol>
C1/007	Battery voltage < 28V	<ol style="list-style-type: none"> <li>Measure Ubat.</li> <li>Check fuse (F6) 50A, and replace if necessary.</li> <li>Check battery and replace as may be the case.</li> <li>Measure input voltage at A3 - X6 and X5, = Ubatt.</li> <li>Cleaning module A3 defective.</li> </ol>
C1/008	Control temperature 90 °C Temperature too high.	<ol style="list-style-type: none"> <li>Cool down cleaning module A3 and restart.</li> <li>Check fan M7 and voltage at A1 X1/3.8 (target 12V).</li> <li>Check cooling air gap for cleanliness.</li> <li>Check power consumptions for the connected up drive units.</li> <li>Compare or transfer cleaning module A3 parameters with standard values.</li> <li>Cleaning module A3 defective.</li> </ol>

Fault code / warnings	Description	Measure
C1/009	A3 - internal fault CRC error, EEprom	1 Hardware reset (disconnect battery for 1 minute). 2 Cleaning module A3 defective.
C1/010	A3 - internal fault Read error, Eeprom	1 Hardware reset (disconnect battery for 1 minute). 2 Cleaning module A3 defective.
C1/011	A3 - internal fault Write error, Eeprom	1 Hardware reset (disconnect battery for 1 minute). 2 Cleaning module A3 defective.
C1/012	A3 - internal fault CRC error in RAM parameter set	1 Hardware reset (disconnect battery for 1 minute). 2 Cleaning module A3 defective.
C1/013	Fuse for cleaning module A3 defective.	1 Measure (and replace as may be the case) glass fuse (T 5A size 5x20) on circuit board for cleaning module F3. 2 Cleaning module A3 defective.
C1/601	Prewarning1: Control temperature has reached 60°. (Switch on fans)	1 Cool down cleaning module A3 and restart. 2 Check fan M7 and voltage at A1 X1/3.8 (target 12V). 3 Check cooling air gap for cleanliness. 4 Check parameters; reload cleaning module A3 standard parameters. 5 Cleaning module A3 defective.
C1/602	Overtemperature warning: Temperature switch-off at 95 °C.	1 Cool down cleaning module A3 and restart. 2 Check fan M7 and voltage at A1 X1/3.8 (target 12 V). 3 Check cooling air gap for cleanliness. 4 Check parameters; reload cleaning module A3 standard parameters. 5 Cleaning module A3 defective.
Waste water tank full	waste water tank is full. Suction turbine switches off.	1 Empty the waste water tank. 2 Check float switch. 3 Float installed incorrectly, turn 180 °.
C1/604	Detergent container is empty.	1 Refill detergent. 2 Check wiring of float switch S12. 3 Cleaning module A3 defective.
C1/664	Internal fault in cleaning module. All units connected up to the cleaning module are switched off; general contactor drops out - No cleaning module release.	1 Disconnect all units from cleaning module and re-connect individually. If fault occurs, examine the relevant unit. 2 Cleaning module A3 defective.

## Fault messages and warning messages for cleaning module 2

Fault code / warnings	Description	Measure
C2/002	Switch off roller brush M12; overcurrent protection active.	1 Check cleaning module parameters; reload cleaning module (A3.1) standard parameters. 2 Disconnect motor M12 - A3.1/X13. 3 With motor M12 disconnected, carry out reset, main switch S1. If fault is replaced with another one, then search for/remove short-circuit in cabling and motor. Motor M12 possibly defective. 4 If the same fault is displayed again (despite disconnected motor M12), then cleaning module A3.1 is defective.
C2/003	Switch off suction fan M13 - overcurrent protection active.	1 Disconnect motor M13 - A3.1/X10. 2 With motor M13 disconnected, carry out reset, main switch S1. If fault is replaced with another one, then search for/remove short-circuit in cabling and motor. Motor M13 possibly defective. 3 If the same fault is displayed again (despite disconnected motor M12), then cleaning module A3.1 is defective.

Fault code / warnings	Description	Measure
C2/005	Vibrator fault (filter cleaning) M14.	<p>1 Check cleaning module parameters; reload cleaning module (A3.1) standard parameters.</p> <p>2 Disconnect motor M14 - A3.1/X12.</p> <p>3 With motor M14 disconnected, carry out reset, main switch S1. If fault is replaced with another one, then search for/remove short-circuit in cabling and motor M14. Motor M14 possibly defective.</p> <p>4 If the same fault is displayed again (despite disconnected motor M12), then cleaning module A3.1 is defective.</p>
C2/006	Battery voltage > 50 V	<p>1 Measure Ubat.</p> <p>2 Check fuse (F6) 50A, and replace if necessary.</p> <p>3 Check cleaning module parameters; reload cleaning module (A3.1) standard parameters.</p> <p>4 If the same fault is displayed again (despite disconnected motor M12), then cleaning module A3.1 is defective.</p>
C2/007	Battery voltage < 28 V	<p>1 Measure Ubat.</p> <p>2 Check fuse (F6) 50A, and replace if necessary.</p> <p>3 Check battery and charge/replace as may be the case.</p> <p>4 Measure input voltage at A3 - X6 and X5, = Ubatt.</p> <p>5 Cleaning module A3.1 defective.</p>
C2/008	Control temperature 90 °C, temperature too high	<p>1 Cool down cleaning module A3.1 and restart.</p> <p>2 Check power consumptions for the connected up drive units.</p> <p>3 Compare or transfer cleaning module A3.1 parameters with standard values.</p> <p>4 Cleaning module A3.1 defective.</p>
C2/009	A3.1 - internal fault CRC error, EEprom	<p>1 Hardware reset (disconnect battery for 1 minute).</p> <p>2 Cleaning module A3.1 defective.</p>
C2/010	A3.1 - internal fault Read error, Eeprom (cannot be remedied).	<p>1 Hardware reset (disconnect battery for 1 minute).</p> <p>2 Cleaning module A3.1 defective.</p>
C2/011	A3.1 - internal fault Write error, Eeprom (cannot be remedied).	<p>1 Hardware reset (disconnect battery for 1 minute).</p> <p>2 Cleaning module A3.1 defective.</p>
C2/012	A3.1 - internal fault CRC error in RAM parameter set	<p>1 Hardware reset (disconnect battery for 1 minute).</p> <p>2 Cleaning module A3.1 defective.</p>
C2/013	Cleaning module A3.1 defective.	<p>1 Measure (and replace as may be the case) glass fuse (T 5A size 5x20) on circuit board for cleaning module F3 (for cleaning module).</p> <p>2 Cleaning module A3.1 defective.</p>
C2/601	Control temperature has reached 60°.	<p>1 Cool down cleaning module A3.1 and restart.</p> <p>2 Check parameters; reload cleaning module A3.1 standard parameters.</p> <p>3 Cleaning module A3.1 defective.</p>
C2/602	Overtemperature warning: Temperature switch-off at 95 °C.	<p>1 Cool down cleaning module A3.1 and restart.</p> <p>2 Check cleaning module parameters; reload cleaning module A3.1 standard parameters.</p> <p>3 Cleaning module A3.1 defective.</p>
C2/664	Internal fault in cleaning module. All units connected up to the cleaning module are switched off; general contactor drops out. No cleaning module release.	<p>1 Disconnect all units from cleaning module A3.1 and reconnect individually. If fault occurs, examine the relevant unit.</p> <p>2 Cleaning module A3.1 defective.</p>

Fault code / warnings	Description	Measure
C2/665	Vibrator M14 (filter cleaning) in block.	<ol style="list-style-type: none"> <li>1 Remove filter and check filter cleaning drive unit M14 for correct functioning.</li> <li>2 Check wiring between A3.1 X12/X23 and Motor M14 for short-circuit.</li> <li>3 Check motor M14 for short-circuit (resistance &lt; 1 ohm).</li> <li>4 Measure voltage between A3.1 X12 and X23 (target approx. 24 V).</li> <li>5 Cleaning module A3.1 defective.</li> </ol>
C2/667	Vibrator programme fault (filter cleaning).	<ol style="list-style-type: none"> <li>1 Hardware reset (disconnect battery for 1 minute).</li> <li>2 Cleaning module A3.1 defective.</li> </ol>

## Fault messages and warning messages for lifting module 1

Fault code / warnings	Description	Measure
H1/001	Overcurrent protection (motor short circuit) in lifting motor, or MOSFET bridge defective.	<p>1 Disconnect lifting motors (M20, M30) and carry out main switch (S1) reset. If the fault is replaced with another fault, then search for/remove short-circuit in cabling or lifting motor.</p> <p>2 Measure resistance at suction bar lifting motor and brush head lifting motor respectively (result &gt; 1 ohm). Lifting motor (M20 or M30) defective.</p> <p>3 Check voltage for suction bar lifting motor M30 between X4/2 and X4/6 (target approx. 24 V).</p> <p>4 Check voltage for brush head lifting motor M20 between X5/2 and X5/6 (target approx. 24 V).</p> <p>5 If fault remains when plugs X4 and X5 unplugged, then lifting module A4 is defective.</p>
H1/002	Voltage fault (>= 50 V or < 14 V).	<p>1 Check whether battery voltage is between 14...50 V. If not, check battery.</p> <p>2 Check whether main relay (K1) is closed and whether relay coil lines have a continuous connection with head CPU (A1).</p> <p>3 Check protective fuse (F4) for lifting module (A4) and replace if necessary.</p> <p>4 Check short-circuit between Ubatt and GND behind the main relay (K1). Locate short-circuit and resolve.</p> <p>5 If fault remains, then lifting module A4 defective.</p>
H1/003	Temperature fault (too hot). Lifting module A4 temperature exceeded.	<p>1 Check fan M7 and voltage at A1 X1/3.8 (target 12V) and check cabling to A1.</p> <p>2 Check cooling air gap for cleanliness.</p> <p>3 Lifting module A4 defective.</p>
H1/004	Temperature sensor defective.	<p>1 Restart the machine.</p> <p>2 Lifting module A4 defective.</p>
H1/005	Checksum error in EEPROM.	<p>1 Hardware reset (disconnect battery for 1 minute).</p> <p>2 Lifting module A4 defective.</p>
H1/006	EEPROM cannot be written to.	<p>1 Hardware reset (disconnect battery for 1 minute).</p> <p>2 Lifting module A4 defective.</p>
H1/009	Cable breakage in side brushes motor, right.	<p>1 Check cabling for side brushes motor (M41) to A4/X6 and UBAT minus X22.</p> <p>2 Check resistance of the side brushes motor and the cabling for low resistance (&lt; 1 ohm).</p> <p>3 Measure voltage between A4/6 and X23 (target 18-24 V).</p> <p>4 If fault remains, then module A4 defective.</p>
H1/010	MOSFET bridge HM_suction bar defective.	<p>1 Disconnect lifting motor (M30) A4/X4-2, 6 and check for connections between minus UBAT and X4/6 as well as plus UBAT and X4/2; resolve.</p> <p>2 Carry out main switch (S1) reset. If fault remains, then A4 defective.</p>
H1/011	MOSFET bridge HM_brush head defective.	<p>1 Disconnect lifting motor (M20) A4/X5-2, 6 and check for connections between minus UBAT and X5/6 as well as plus UBAT and X5/2; resolve.</p> <p>2 Carry out main switch (S1) reset. If fault remains, then A4 defective.</p>
H1/012	MOSFET bridge, side brushes defective.	<p>1 Disconnect side brushes motor (M41) A4/X6 and check for connections between plus UBAT and X6; resolve.</p> <p>2 Carry out main switch (S1) reset. If fault remains, then A4 defective.</p>

Fault code / warnings	Description	Measure
H1/013	Fault in module supply (not 12 .. 14 V).	<p>1 Check whether 13...14 V are applied at A4/X2-1 and X3-1 (measure against UBAT minus).</p> <p>2 Search for and remove fault in bus line 1.</p> <p>3 If fault remains, then A4 defective.</p>
H1/019	Internal module fault A4. Checksum error in EEPROM (cannot be remedied).	<p>1 Hardware reset (disconnect battery for 1 minute).</p> <p>2 Lifting module A4 defective.</p>
H1/020	Internal module fault A4. Voltage supply 3.3 V outside of tolerance.	<p>1 Check whether 13-14V are applied at A4/X3-1; if not, search for fault in bus line 1.</p> <p>2 Lifting module A4 defective.</p>
H1/021	Internal module fault A4. Voltage supply 3.3 V logic supply failure.	<p>1 Hardware reset (disconnect battery for 1 minute).</p> <p>2 Lifting module A4 defective.</p>
H1/022	Short-circuit in load output for side brushes (presweep facility) M41 during operation.	<p>1 Disconnect side brushes motor (M41) A4 /X6.</p> <p>2 Carry out main switch (S1) reset.</p> <p>If the fault is replaced with another, then search for/remove short-circuit in cabling.</p> <p>3 If fault remains, then A4 defective.</p>
H1/023	Internal fault lifting module A4. Intermediate circuit voltage defective.	<p>1 Check whether main relay (K1) is closed and whether relay coil lines have a continuous connection with head CPU (A1).</p> <p>2 Check protective fuse (F4) (30A) for lifting module (A4) and replace if necessary.</p> <p>3 Short-circuit between Ubatt and GND behind the main relay (K1). Locate short-circuit and resolve.</p> <p>4 Check whether battery voltage is between 27...50 V. If not, check battery.</p> <p>5 If fault remains, then A4 defective.</p>
H1/024	Internal fault lifting module A4. CRC error, Eeprom	<p>1 Hardware reset (disconnect battery for 1 minute).</p> <p>2 Lifting module A4 defective.</p>
H1/601	Overtemperature prewarning; switch on fans.	<p>1 Overtemperature prewarning; switch on fans.</p> <p>2 Check fan M7 and voltage at A1 X1/3.8 (target 12 V) and check cabling to A1.</p> <p>3 Check cooling air gap for cleanliness.</p> <p>4 Lifting module A4 defective.</p>
H1/602	Overtemperature warning (user information).	<p>1 Check drive for side brushes M41 for freedom of movement and ease of operation (measure current).</p> <p>2 Check fan M7 and voltage at A1 X1/3.8 (target 12 V) and check cabling to A1.</p> <p>3 Check cooling air gap for cleanliness.</p> <p>4 Lifting module A4 defective.</p>
H1/664	Low voltage range warning -> battery discharged or contact resistance in cabling.	<p>1 Check whether battery voltage is between 27...50 V. If not, check battery.</p> <p>2 Check whether main relay (K1) is closed and whether relay coil lines have a continuous connection with head CPU (A1).</p> <p>3 Check protective fuse (F4) for lifting module (A4) and replace if necessary.</p> <p>4 Check whether there is a short-circuit between Ubatt and GND behind the main relay (K1). Locate short-circuit and resolve.</p> <p>5 If fault remains, then A4 defective.</p>
H1/665	Switch S30 (suction bar down) not reached; anti-lock beforehand.	<p>1 Check mechanical system for block.</p> <p>2 Check lifting motor (M30), with limit switch (S30), for correct functioning.</p> <p>3 Check cabling for short-circuit.</p> <p>4 If fault remains, then A4 defective.</p>

Fault code / warnings	Description	Measure
H1/667	Switch S20 (brush down) not reached; anti-lock beforehand.	<p>1 Check mechanical system for block.</p> <p>2 Check lifting motor (M20), with limit switch S20, for correct functioning.</p> <p>3 Check cabling for short-circuit.</p> <p>4 If fault remains, then A4 defective.</p>
H1/668	Switch S21 (brush up) not reached; anti-lock beforehand.	<p>1 Check mechanical system for block.</p> <p>2 Check lifting motor (M20), with limit switch S21, for correct functioning.</p> <p>3 Check cabling for short-circuit.</p> <p>4 If fault remains, then A4 defective.</p>
H1/669	Switch discrepancy in brush head lifting motor M20, both switches open.	<p>1 Check wiring (cable breakage) between A4 X5/8, X5/5, X5/1 and lifting motor.</p> <p>2 Check microswitch for brush head lifting motor S20 for correct functioning. Measure voltage between X22 (Ubatt minus) and A4 X5/1 (approx. 11 V) Brush head up ==&gt; Measure voltage between X22 (Ubatt minus) and A4 X5/5 (approx. 11V); measure voltage between X22 (Ubatt minus) and A4 X5/8 (max. 3 V). Brush head down ==&gt; Measure voltage between X22 (Ubatt minus) and A4 X5/5 (max. 3 V); measure voltage between X22 (Ubatt minus) and A4 X5/8 (approx. 11 V).</p> <p>3 Lifting motor M20 defective.</p> <p>4 If fault remains, then A4 defective.</p>
H1/670	Switch discrepancy in suction bar lifting motor M30, both switches open.	<p>1 Check wiring (cable breakage) between A4 X4/8, X4/5, X4/1 and lifting motor.</p> <p>2 Check microswitch for brush head lifting motor S30 for correct functioning. Measure voltage between X22 (Ubatt minus) and A4 X4/1 (approx. 11 V) Brush head up ==&gt; Measure voltage between X22 (Ubatt minus) and A4 X4/5 (approx. 11V). Measure voltage between X22 (Ubatt minus) and A4 X4/8 (max. 3 V) Brush head down ==&gt; Measure voltage between X22 (Ubatt minus) and A4 X4/5 (max. 3 V). Measure voltage between X22 (Ubatt minus) and A4 X4/8 (approx. 11 V).</p> <p>3 Lifting motor M30 defective.</p> <p>4 If fault remains, then A4 defective.</p>
H1/698	Switch S31 (suction bar) not reached (up); anti-lock beforehand.	<p>1 Check mechanical system for block.</p> <p>2 Check microswitch S31 for correct functioning.</p> <p>3 Check cabling for short-circuit.</p> <p>4 Check lifting motor (M30) cabling for short-circuit.</p> <p>5 If fault remains, then A4 defective.</p>
H1/6129	Overtemperature prewarning cancelled.	Only info; acknowledge via iButton.
H1/6130	Overtemperature warning cancelled.	Only info; acknowledge via iButton.

## Fault messages and warning messages for lifting module 2

Fault code / warnings	Description	Measure
H2/001	Overcurrent protection (motor short circuit) in lifting motor "presweep facility", or MOSFET bridge defective.	<ol style="list-style-type: none"> <li>If the fault is replaced with another fault, then search for/remove short-circuit in cabling or lifting motor.</li> <li>Measure resistance of side brushes lifting motor (target &gt; 1 ohm) ==&gt; Lifting motor (M40) defective.</li> <li>Check voltage for side brushes lifting motor M40 (motor disconnected) between X4/2 and X4/6 (target approx. 14 V).</li> <li>If fault remains when plug X4 unplugged, then lifting module A4.1 is defective.</li> </ol>
H2/002	Voltage fault (>= 50V or < 14 V).	<ol style="list-style-type: none"> <li>Check whether battery voltage is between 27...50 V. If not, check battery.</li> <li>Check whether main relay (K1) is closed and whether relay coil lines have a continuous connection with head CPU (A1).</li> <li>Check protective fuse (F4) for lifting module (A4.1) and replace if necessary.</li> <li>Short-circuit between Ubatt and GND behind the main relay (K1). Locate short-circuit and resolve.</li> <li>If fault remains, then A4.1 defective.</li> </ol>
H2/003	Temperature fault (too hot).	<ol style="list-style-type: none"> <li>Check fan M7 and voltage at A1 X1/3.8 (target 12 V) and check cabling to A1.</li> <li>Check cooling air gap for cleanliness.</li> <li>Lifting module A4.1 defective.</li> </ol>
H2/004	Temperature sensor defective.	<ol style="list-style-type: none"> <li>Restart the machine.</li> <li>Lifting module A4.1 defective.</li> </ol>
H2/005	Checksum error in EEPROM.	<ol style="list-style-type: none"> <li>Hardware reset (disconnect battery for 1 minute).</li> <li>Lifting module A4.1 defective.</li> </ol>
H2/006	EEPROM not writable.	<ol style="list-style-type: none"> <li>Hardware reset (disconnect battery for 1 minute).</li> <li>Lifting module A4.1 defective.</li> </ol>
H2/009	Cable breakage in side brushes, left.	<ol style="list-style-type: none"> <li>Check cabling for side brushes motor (M42) to A4.1/X6 and UBAT minus X22.</li> <li>Check resistance of the side brushes motor and the cabling for low resistance (approx. 0.4 ohms).</li> <li>Measure voltage between A4/6 and X23 (target 18-24 V).</li> <li>If fault remains, then module A4.1 defective.</li> </ol>
H2/010	MOSFET bridge HM_side brushes (presweep facility) defective.	<ol style="list-style-type: none"> <li>Carry out main switch (S1) reset.</li> <li>Disconnect lifting motor M40 (M50) A4.1/X4-2, 6 and check for connections between minus UBAT and X4/6 as well as plus UBAT and X4/2.</li> <li>If fault remains, then A4.1 defective.</li> </ol>
H2/012	MOSFET bridge, presweep facility side brushes, or just side brushes, defective.	<ol style="list-style-type: none"> <li>Carry out main switch (S1) reset.</li> <li>Disconnect side brushes motor (M52) A4.1/X6 and check for connections between minus UBAT and X6; resolve.</li> <li>If fault remains, then A4.1 defective.</li> </ol>
H2/013	Fault in module supply (not 12 .. 14 V).	<ol style="list-style-type: none"> <li>Check whether 13...14 V are applied at A4.1/X2-1 and X3-1 (measure against UBAT minus).</li> <li>Search for and remove fault in bus line 1.</li> <li>If fault remains, then A4.1 defective.</li> </ol>

Fault code / warnings	Description	Measure
H2/015	Microswitch S40 (S50) for lifting motor side brushes (presweep facility) is permanently at High; cabling fault M40 (M50) side brushes HM.	<p>1 Check whether the connected up switch (S40) at A4.1 X4-5 is also supplied by A4.1/X4-1 without exception!</p> <p>2 Check whether fault voltages, e.g. due to short-circuit with Ubatt, are present via connected up switch (S40).</p> <p>3 If fault remains, then A4.1 defective.</p>
H2/016	Microswitch S41 (S51) for lifting motor side brushes (presweep facility) is permanently at High; cabling fault M40 (M50) side brushes HM.	<p>1 Check whether the connected up switch (S41) (S51) at A4.1 X4-8 is supplied by A4.1/X4-1 without exception!</p> <p>2 Check whether fault voltages, e.g. due to short-circuit with Ubatt, are present via connected up switch (S41) (S51).</p> <p>3 If fault remains, then A4.1 defective.</p>
H2/019	Checksum error in EEPROM (cannot be remedied).	<p>1 Hardware reset (disconnect battery for 1 minute).</p> <p>2 Lifting module A4.1 defective.</p>
H2/020	Voltage supply 3.3 V outside of tolerance.	<p>1 Check whether 13-14 V are applied at A4.1/X3-1; if not, search for fault in bus line 1.</p> <p>2 Lifting module A4 defective.</p>
H2/021	Voltage supply 3.3 V logic supply failure.	<p>1 Hardware reset (disconnect battery for 1 minute).</p> <p>2 Lifting module A4.1 defective.</p>
H2/022	Short-circuit in load output for side brushes (presweep facility) M42 during operation.	<p>1 Disconnect side brushes motor (M42) A4.1 /X6.</p> <p>2 Carry out main switch (S1) reset. If the fault is replaced with another, then search for/remove short-circuit in cabling.</p> <p>3 If fault remains, then A4.1 defective.</p>
H2/023	Intermediate circuit voltage defective.	<p>1 Check whether main relay (K1) is closed and whether relay coil lines have a continuous connection with head CPU (A1).</p> <p>2 Check protective fuse (F4) for lifting module (A4.1) and replace if necessary.</p> <p>3 Short-circuit between Ubatt and GND behind the main relay (K1). Locate short-circuit and resolve.</p> <p>4 Check whether battery voltage is between 27...50 V. If not, check battery.</p> <p>5 If fault remains, then replace A4.1.</p>
H2/024	CRC error, Eeprom.	<p>1 Hardware reset (disconnect battery for 1 minute).</p> <p>2 Lifting module A4.1 defective.</p>
H2/602	Overtemperature warning, user information.	<p>1 Check drive for presweep facility side brushes M42 for freedom of movement and ease of operation (measure current).</p> <p>2 Check fan M7 and voltage at A1 X1/3.8 (target 12 V) and check cabling to A1.</p> <p>3 Check cooling air gap for cleanliness.</p> <p>4 Lifting module A4.1 defective.</p>
H2/664	Low voltage range warning -> battery discharged or contact resistance in cabling.	<p>1 Check whether battery voltage is between 27...50 V. If not, check battery.</p> <p>2 Check whether main relay (K1) is closed and whether relay coil lines have a continuous connection with head CPU (A1).</p> <p>3 Check protective fuse (F4) for lifting module (A4) and replace if necessary.</p> <p>4 Short-circuit between Ubatt and GND behind the main relay (K1). Locate short-circuit and resolve.</p> <p>5 If fault remains, then A4.1 defective.</p>

Fault code / warnings	Description	Measure
H2/665	Switch S40 not reached; anti-lock beforehand.	<p>1 Check mechanical system for block.</p> <p>2 Check lifting motor (M40), with limit switch (S40), for correct functioning.</p> <p>3 Check cabling for short-circuit.</p> <p>4 If fault remains, then A4.1 defective.</p>
H2/669	Switch discrepancy in lifting motor M40/M50, both switches open.	<p>1 Check wiring (cable breakage) between X4/8 and X4/5.</p> <p>2 Check microswitch for side brushes lifting motor S41 (S51) for correct functioning. Measure voltage between X22 (Ubatt minus) and A4.1 X4/1 (approx. 11 V). Side brushes/presweep facility up ==&gt; Measure voltage between X22 (Ubatt minus) and A4.1 X4/5 (approx. 11 V); measure voltage between X22 (Ubatt minus) and A4.1 X4/8 (max. 3 V). Side brushes/presweep facility down ==&gt; Measure voltage between X22 (Ubatt minus) and A4.1 X4/5 (max. 3V); measure voltage between X22 (Ubatt minus) and A4.1 X4/8 (approx. 11 V).</p> <p>3 Lifting motor M40/M50 defective.</p> <p>4 If fault remains, then A4.1 defective.</p>
H2/671	Side brushes lifting motor M40 (M50) blocked; controller remains at programmed max. current.	<p>1 Disconnect lifting motor (M40) and carry out main switch (S1) reset. If the fault is replaced with another fault, then search for/remove short-circuit in cabling or lifting motor.</p> <p>2 Measure resistance of side brushes lifting motor (target &gt; 1 ohm) ==&gt; Lifting motor (M40) defective.</p> <p>3 Check voltage for side brushes lifting motor M40 (motor disconnected) between X4/2 and X4/6 (target approx. 14V).</p> <p>4 If fault remains when plug X4 unplugged, then lifting module A4.1 is defective.</p>
H2/698	Switch S41 not reached; anti-lock beforehand.	<p>1 Check mechanical system for block.</p> <p>2 Check lifting motor (M40 or M50), with limit switch (S41 or S51), for correct functioning.</p> <p>3 Check cabling for short-circuit.</p> <p>4 If fault remains, then A4.1 defective.</p>
H2/6129	Overtemperature prewarning cancelled.	Only info; acknowledge via iButton.
H2/6130	Overtemperature warning cancelled.	Only info; acknowledge via iButton.

## Accessory module faults and warnings

Fault code / warnings	Description	Measure
Z1/001	Voltage fault ( $\geq 50$ V or $< 14$ V).	<ol style="list-style-type: none"> <li>1 Check whether battery voltage is between 27...50 V. If not, check battery.</li> <li>2 Check whether main relay (K1) is closed and whether relay coil lines have a continuous connection with head CPU (A1).</li> <li>3 Check protective fuse (F4) for accessory module (A5) and replace if necessary.</li> <li>4 Short-circuit between Ubatt and GND behind the main relay (K1). Locate short-circuit and resolve.</li> <li>5 If fault remains, then A5 defective.</li> </ol>
Z1/002	Temperature fault (too hot).	<ol style="list-style-type: none"> <li>1 Check fan M7 and voltage at A1 X1/3.8 (target 12 V) and check cabling to A1.</li> <li>2 Check cooling air gap for cleanliness.</li> <li>3 Accessory module A5 defective.</li> </ol>
Z1/003	Temperature sensor defective.	<ol style="list-style-type: none"> <li>1 Restart the machine.</li> <li>2 Accessory module A5 defective.</li> </ol>
Z1/004	Checksum error in EEPROM (remediable, head CPU).	<ol style="list-style-type: none"> <li>1 Hardware reset (disconnect battery for 1 minute).</li> <li>2 Accessory module A5 defective.</li> </ol>
Z1/005	EEPROM not writable (cannot be remedied).	<ol style="list-style-type: none"> <li>1 Hardware reset (disconnect battery for 1 minute).</li> <li>2 Accessory module A5 defective.</li> </ol>
Z1/006	Fault in internal module supply (not 12...14 V).	<ol style="list-style-type: none"> <li>1 Hardware reset (disconnect battery for 1 minute).</li> <li>2 Check whether 13...14 V are applied at A5/X2-1 and A5/X3-1.</li> <li>3 Check bus line for interruption.</li> <li>4 Accessory module A5 defective.</li> </ol>
Z1/012	Checksum error in EEPROM (cannot be remedied).	<ol style="list-style-type: none"> <li>1 Hardware reset (disconnect battery for 1 minute).</li> <li>2 Accessory module A5 defective.</li> </ol>
Z1/013	Voltage supply 3.3 V outside of tolerance.	<ol style="list-style-type: none"> <li>1 Hardware reset (disconnect battery for 1 minute).</li> <li>2 Accessory module A5 defective.</li> </ol>
Z1/014	Checksum error in RAM.	<ol style="list-style-type: none"> <li>1 Hardware reset (disconnect battery for 1 minute).</li> <li>2 Accessory module A5 defective.</li> </ol>
Z1/015	Intermediate circuit voltage defective. (too low after 3 sec)	<ol style="list-style-type: none"> <li>1 Check whether main relay (K1) is closed and whether relay coil lines have a continuous connection with head CPU (A1).</li> <li>2 Short-circuit between Ubatt and GND behind the main relay (K1). Locate short-circuit and resolve.</li> <li>3 Check whether battery voltage is between 27...50 V. If not, check battery.</li> <li>4 If fault remains, then accessory module A5 defective.</li> </ol>
Z1/016	CRC error, Eeprom.	<ol style="list-style-type: none"> <li>1 Hardware reset (disconnect battery for 1 minute).</li> <li>2 Accessory module A5 defective.</li> </ol>
Z1/601	Overtemperature prewarning; switch on fans.	
Z1/602	Overtemperature warning, user information.	<ol style="list-style-type: none"> <li>1 Connected up accessories (headlights H2, H3, spraying valve Y5 and flashing beacon H4 (measure current)).</li> <li>2 Check fan M7 and voltage at A1 X1/3.8 (target 12 V) and check cabling to A1.</li> <li>3 Check cooling air gap for cleanliness.</li> <li>4 Accessory module A5 defective.</li> </ol>

Fault code / warnings	Description	Measure
Z1/664	Low voltage range warning -> battery discharged or contact resistance in cabling.	<p>1 Check whether battery voltage is between 27...50 V. If not, check battery.</p> <p>2 Check whether main relay (K1) is closed and whether relay coil lines have a continuous connection with head CPU (A1).</p> <p>3 Check protective fuse (F4) for lifting module (A4) and replace if necessary.</p> <p>4 Short-circuit between Ubatt and GND behind the main relay (K1). Locate short-circuit and resolve.</p> <p>5 If fault remains, then accessory module A5 defective.</p>
Z1/6129	Overtemperature prewarning cancelled.	Only info; acknowledge via iButton.
Z1/6130	Overtemperature warning cancelled.	Only info; acknowledge via iButton.

## Technical Documentation

Appliance type	Appliance no.:	Circuit diagram	Operating instructions	Inspection check list	Spare parts list
B 250 R	See area of application	0.089-598.0	5.966-217.0	5.950-627.0	2.480-001.3
B 250 RI		0.089-598.0	5.966-217.0	5.950-627.0	2.480-001.3

## Technical specifications

		B 250 R/ R 100	B 250 RI/ R 100	B 250 R/ D 100	B 250 RI/ D 100	B 250 R/ R 120	B 250 RI/ R 120
<b>Power</b>							
Nominal voltage	V	36	36	36	36	36	36
Battery capacity	Ah (5h)	630	630	630	630	630	630
Average power consumption	W	5500	6900	5000	6400	5500	6900
Drive motor output (rated output)	W	1600	1600	1600	1600	1600	1600
Suction engine output	W	840	840	840	840	840	840
Brush engine output	W	2x 1100	2x 1100	2x 750	2x 750	2x 1100	2x 1100
Output of roller brush drive	W	--	600	--	600	--	600
Output of side brush drive (2x)	W	--	2x 100	--	2x 100	--	2x 100
Output of suction turbine of sweeper	W	--	600	--	600	--	600
<b>Vacuuming</b>							
Cleaning power, air quantity	l/s	28	28	28	28	28	28
Cleaning power, negative pressure	kPa	1400	1400	1400	1400	1400	1400
Cleaning power of sweeper, air quantity	l/s	--	50	--	50	--	50
Suction power of sweeper, negative pressure	kPa	--	1,2	--	1,2	--	1,2
Filter surface area, dust filter	m <sup>2</sup>	--	4	--	4	--	4
<b>Cleaning brushes</b>							
Working width	mm	1000	1000	1000	1000	1200	1200
Brush diameter	mm	130	130	500	500	130	130
Brush speed	1/min	1250	1250	140	140	1250	1250
Roller brush diameter	mm	--	285	--	285	--	285
Roller brush width	mm	--	710	--	710	--	710
Roller brush speed	1/min	--	650	--	650	--	650
Side brush diameter	mm	--	450	--	450	--	450
Side brush speed	1/min	--	70	--	70	--	70
<b>Dimensions and weights</b>							
Drive speed (max.)	km/h	6	6	6	6	6	6
Slope max.	%	8	8	8	8	8	8
Theoretical surface cleaning performance	m <sup>2</sup> /h	5000	5000	5000	5000	6000	6000
Fresh/waste water tank volume	l	250	250	250	250	250	250
Volume of waste container	l	--	2x 30	--	2x 30	--	2x 30
Length	mm	1900	2730	1900	2730	1900	2730
Width (without vacuum bar)	mm	1060	1060	1060	1060	1260	1260
Height	mm	1550	1550	1550	1550	1550	1550
Weight, operative (with batteries and full tank)	kg	1500	1700	1500	1700	1520	1720
<b>Surface load (with driver and full fresh water tank)</b>							
Sweeper wheel	N/cm <sup>2</sup>	--	116	--	116	--	116
Front wheel	N/cm <sup>2</sup>	207	158	207	158	207	158
Rear wheel	N/cm <sup>2</sup>	60	63	60	63	60	63
<b>Noise emission</b>							
Sound pressure level (EN 60704-1)	dB(A)	73	71	73	71	73	71
<b>Machine vibrations</b>							

		B 250 R/ R 100	B 250 RI/ R 100	B 250 R/ D 100	B 250 RI/ D 100	B 250 R/ R 120	B 250 RI/ R 120
Vibration total value (ISO 5349)							
Arms	m/s <sup>2</sup>	0,3	1,6	0,3	1,6	0,3	1,6
Feet	m/s <sup>2</sup>	0,02	0,09	0,02	0,09	0,02	0,09
Seating	m/s <sup>2</sup>	0,22	0,16	0,22	0,16	0,22	0,16

### Technical data of individual consumers

Consumer	Device	R cleaning head	D cleaning head
Brush motor, unloaded		5 A - 8 A each	5 A - 8 A each
Brush motor loaded (brush rollers with medium load on concrete)		28.5 A - 31.5 A each	5 A - 8 A each
Maximum load of both brush motors (electronically controlled, without shutdown)		80 A - 90 A	80 A - 90 A
Suction turbine (vacuum bar lifted and waste water tank cover closed)	27 A - 31 A		
Stopping time suction turbine (upon leaving a programme with vacuum device)	10 - 20 seconds		
Travel drive forward (level way)	12 A - 18 A		
Measure drive between 2 phases (U, V, W) at full load	Target 22V - 26V		
Travel drive reverse (level way)	10 A - 16 A		
Charging current (charger) upon charging a discharged battery	70 A		
Charging current (charger) in the post charge phase	1 A		
Lifting motor brush head	3,9 A - 4,9 A		
Lifting motor vacuum bar	0,5 A - 2,5 A		
Water pump with max. water volume	7 - 9 l/min		
Water pump current consumption with maximum water volume	1,5 A - 2,5 A		
Detergent pump, max. feed volume	0,5 l/min		
Current consumption detergent pump with maximum delivery rate	0,3 A - 0,5 A		
Roller brush motor (RI version)	14 A - 18 A		
Fan motor (RI version)	9 A - 13 A		
Side brush motor (RI version)	je 1,5 A - 2,5 A		
Vibration motor (RI version)	0,8 A - 1,8 A		
Final discharge voltage (red LED flashes)	32,7 V - 33,1 V		
Final discharge voltage (red LED is on)	31,7 V - 32,1 V		
Relay K1	for a short time 24V, then 18V		
Power consumption for relay K1	0.3A		
Fan	13V		
Power consumption for fan	0,3A		
Brake coil	16 Ohm		
Power consumption for brake	1,5 A		
Brake	for a short time 24V, then 16V		
Work light	24V		

## Special tools

Screws M8 70 - 110 mm	Specialist stores
Molex puller tool	6.816-086.0
Service module A9	2.816-117.0
Bus cable service	4.822-417.0
Battery acid meter 1.10 - 1.30 kg/l	6.803-015.0
Multimeter to measure voltage, current and resistance	6.803-025.0
Magnetic tester	6.803-003.0
Test device Metrel MI 3309 Delta GT	6.803-034.0
Tool set steering wheel	2.860-166.0
Clamp meter AC/DC, A, V, ohm	6.803-022.0
Torque wrench (2 - 25 Nm)	6.815-090.0
Torque wrench (20 - 150 Nm)	6.815-027.0
Test cable (cable for connecting two bus cables with Mini Fit flat plug)	6.642-034.0

## Torques

Component	Nm
Wheel bolts front wheel	35
Wheel bolts rear wheel	75
Suspension pre-sweeping system	100
Steering wheel	40
Electronics bolt M5	2,6
Electronics bolt M6	3,9
Electronics bolt M8	6,2
Electronics nut with flange (safety device)	9
Connection cable on engine U1, V1, W1	7,5

## Circuit diagram

When working on the device, please always use the current circuit diagram in DISIS.