

KÄRCHER

makes a difference

B 150 R
B 150 R Adv
B 150 R Others
Service Manual



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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:	Fall 116067
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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.

Hazard levels

⚠ DANGER

For an immediate danger which can lead to severe injuries or death.

⚠ WARNING

For a possibly dangerous situation which could lead to severe injuries or death.

⚠ CAUTION

For a possibly dangerous situation which can lead to minor injuries or property damage.

ATTENTION

Pointer to a possibly dangerous situation, which can lead to property damage.

Note

Indicates useful tips and important information.

Required tools



- 1 Screwdriver bit T15 to T30
- 2 Combination drill
- 3 Clip-on ammeter / multimeter
- 4 Wire cutter
- 5 Combination pliers
- 6 Flat pliers
- 7 Circlip pliers
- 8 Ratchet with extension and socket wrench 17
- 9 Hexagon key 6, 7, 8
- 10 Wrench SW10 to SW 17
- 11 Magnetic probe
- 12 Ratchet with extension and socket wrench 8, 10, 11, 13, 15
- 13 Screwdriver set T15 to T25, crosshead and slot-head

For special tools required see Chapter "Special tools" at the end of this service manual.

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

The scrubber vacuum is used for wet cleaning or polishing of level floors.

Filling quantities

- Fresh water tank: 150 l
- Waste water tank: 150 l

Working width

70 - 90 cm, depending on the cleaning head used.

Drive

- The appliance is self-propelled, the propulsion motor is powered by a battery.
- Maximum speed 6 km/h
- Adv version with four-wheel drive and a maximum speed of 10 km/h

Climbing capability (max.)

- B 150 R BP 10%
- B 150 R BP ADV - 15%

Key

KIK System (KÄRCHER INTELLIGENT KEY)

Standby

The control will go to standby after a predefined time period in idle.

- After 15 minutes if no controls are actuated.
(The time can be changed using the service programme.)

The control needs to be switched off and back on again using the programme selector switch.

Operating hour counter

The operating hours are saved in the control panel board and in the control electronics. After a board is replaced, the operating hours are taken over by the other board.

Day counter

The day counter automatically erases itself after 6 hours. You can also reset it at any time with the grey or red intelligent key in the counter program.

Maintenance interval display

Maintenance intervals are displayed for the operator at defined times to achieve the best cleaning results.

Display after 20 hours:

- Clean the vacuum bar!

Display after 50 hours:

- Clean turbine sieve!
- Clean the fresh water filter!

Display after 100 hours:

- Check the wear on the brush!
- Check the suction lip!

Service timer

- First service after 200 hours.
- Each subsequent service after 400 hours.

The maintenance counter can be erased at any time with each intelligent key in the counter program.

The service timer can be reset with the red intelligent key.

Operation

- Innovative control system for even easier operation (KIK-KÄRCHER INTELLIGENT KEY)
 - Colour coding of the control and maintenance elements.
- The operating elements for the cleaning process are yellow.
- The controls for the maintenance and service are light gray.
- Warning messages on the display are optically highlighted by a backlight that is changing to red.

Chassis

- Reduced sound level.
- Carrier for the supply pumps and the water dosing valve.

Water dosing valve

The water dosing valve is actuated electronically.

Suction turbine

Encapsulated quiet turbine.

Wastewater reservoir

- 2-tank system
- Waste water tank rinsing system
- Coarse dirt sieve
- The waste water tank can be swivelled back.

Fresh water tank

Auto Fill-In (option)

Drive cleaning head

- Both brushes are turning toward each other.
- The cleaning head is raised and lowered by means of a lifting motor.

Vacuum bar

- The vacuum bar is raised and lowered via the lifting motor.
- The appliance can be operated with a curved or straight vacuum bar.

Charger

- The 1 ~ 50-60 Hz charger is suitable for a mains voltage of 207 to 264 Volts.
- The charger parameters can be adapted to the integrated battery.

Battery

- The appliance can be operated with 180 Ah and 240 Ah / 36V batteries.

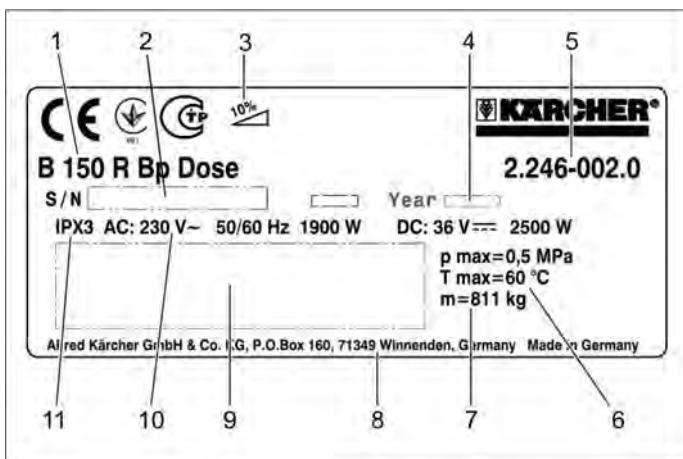
Options

- Homebase system
- DOSE system
- Beacon lamp
- Side brushes
- Brush head fender

B 150 R BP others

- This device corresponds to the standard design.
It does not contain a charger.

Type plate



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

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

The serial number relates to the part number.

Type plate confectioned

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

- 1 Serial number
- 2 Part number

The serial number relates to the part number.

Type plate material model

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

- 1 Serial number
- 2 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.



Type plate confectioned

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

- 1 Serial number
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The serial number relates to the part number.

Type plate material model

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

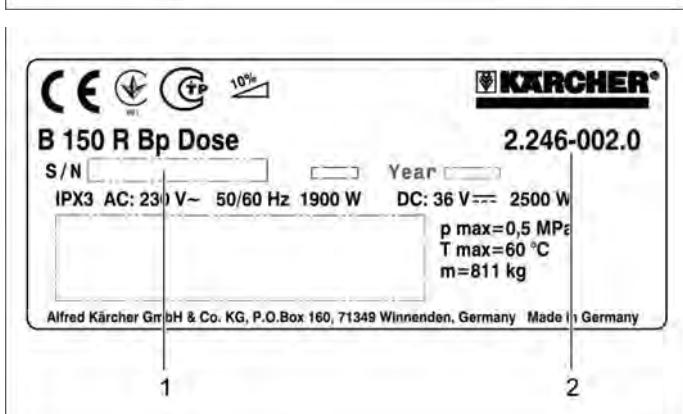
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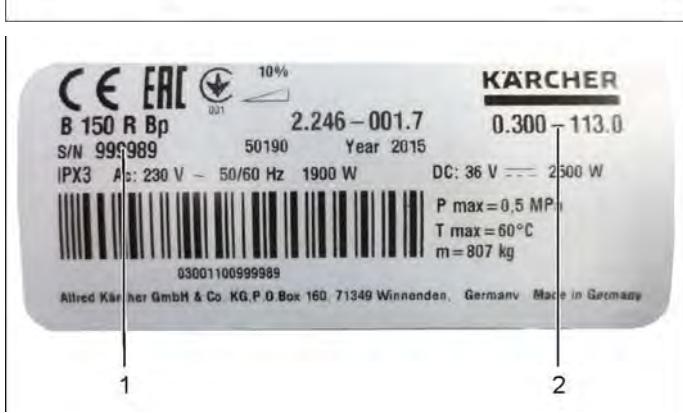
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The part number 0.3xx-xxx.x and the serial number S/N are required for technical enquiries.

DISIS

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



Overview of the appliance

Front view



- 1 Side brushes
- 2 Side brush motor
- 3 Drive pedal
- 4 Auto Fill-In
- 5 Driver seat
- 6 Beacon lamp
- 7 Steering wheel
- 8 DOSE system
- 9 Operator console
- 10 Daytime running light
- 11 Work light

Appliances without side brushes



Appliances without side brushes have adjustable bumper wheels on both sides of the fender in order to prevent damage to the cleaning head. The bumper wheels must be adjusted so that they protrude beyond the cleaning head.

B 150 R Adv

The daytime running light lights up weakly when the battery is being charged. The current consumption of approx. 66 mA is very low.

Rear view



- 1 Vacuum lip
- 2 Scraper roller
- 3 Closure waste water tank
- 4 Drain hose for wastewater
- 5 Spray nozzle
- 6 Cover waste water tank
- 7 Connection waste water tank rinsing system
- 8 Homebase accessory holder
- 9 Suction bar lift
- 10 Adjustment vacuum bar
- 11 Support roller, vacuum bar
- 12 Homebase - application example



Connection view



- | | |
|--|---|
| 1 Steering wheel | 12 Cleaning head |
| 2 Operator console | 13 Rear wheel |
| 3 DOSE system | 14 Closure waste water tank |
| 4 Cover waste water tank | 15 Vacuum bar |
| 5 waste water tank | 16 Brush head work light
The brush head work light illuminates the right side of the brush head. |
| 6 Driver seat/ seat contact switch | 17 Pull rod cleaning head |
| 7 Appliance electronics (underneath the cover) | 18 Charger (underneath the cover) |
| 8 Auto Fill-In | 19 Drive pedal |
| 9 Side brushes | |
| 10 Side brush motor | |
| 11 Fresh water tank lock | |

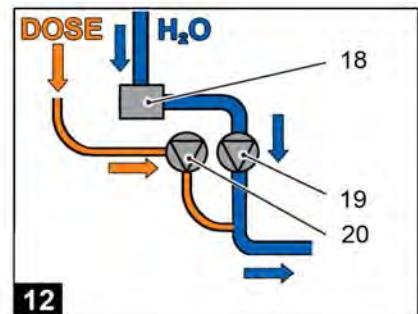
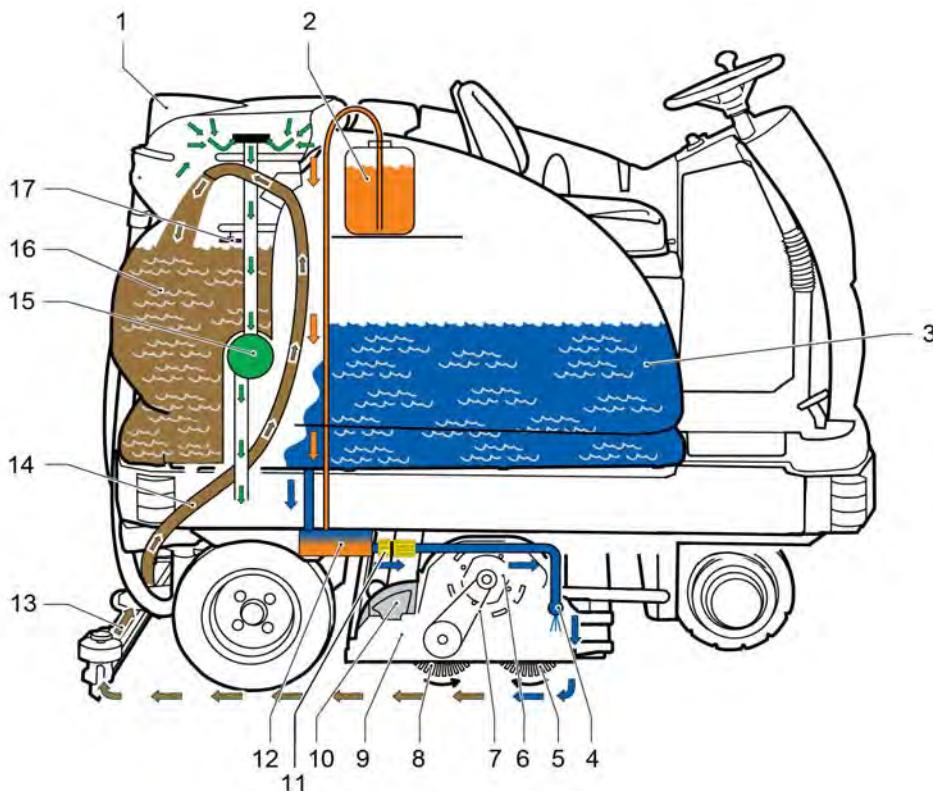
Water system

Waste water tank



- | |
|--|
| 1 Coarse dirt sieve |
| 2 Swimmer switch |
| 3 Seal of waste water tank |
| 4 Retainer float |
| 5 Float |
| 6 Connection waste water tank rinsing system |
| 7 Suction turbine air channel |
| 8 Tank rinsing system |
| 9 Lint sieve, suction turbine |

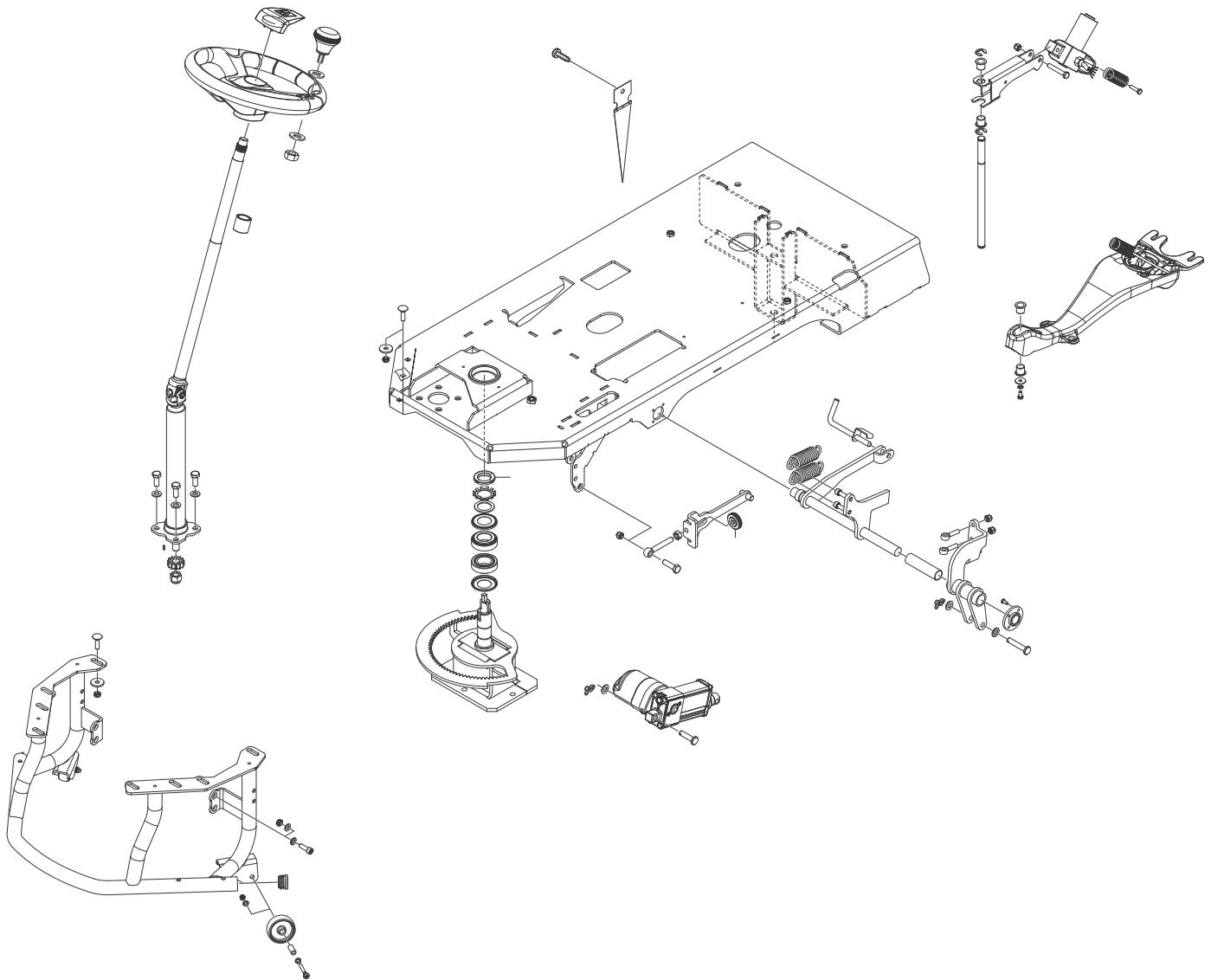
Functional diagram



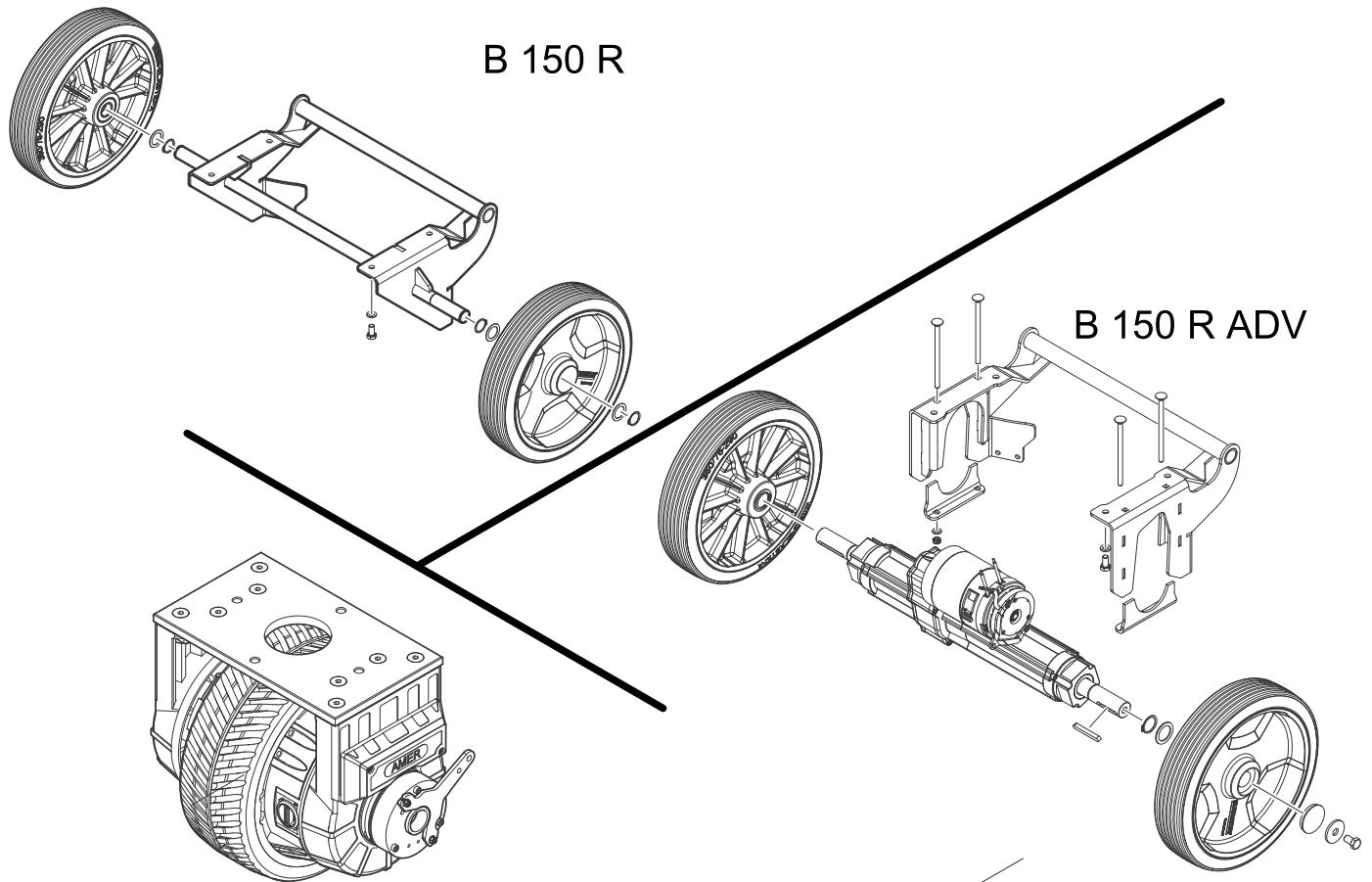
- 1 waste water tank
- 2 Detergent container DOSE system
- 3 Fresh water
- 4 Water distribution bar
- 5 Brush roller
- 6 Drive motor brush rollers
- 7 Gear belt
- 8 Brush roller
- 9 Cleaning head
- 10 Waste container
- 11 Hose coupling
- 12 Carrier supply pumps
- 13 Vacuum device on the vacuum bar
- 14 Suction hose
- 15 Suction turbine
- 16 Wastewater
- 17 Swimmer switch
- 18 Electric ball valve
- 19 Fresh water pump
- 20 Dosing pump detergent (DOSE)

Overview appliance components

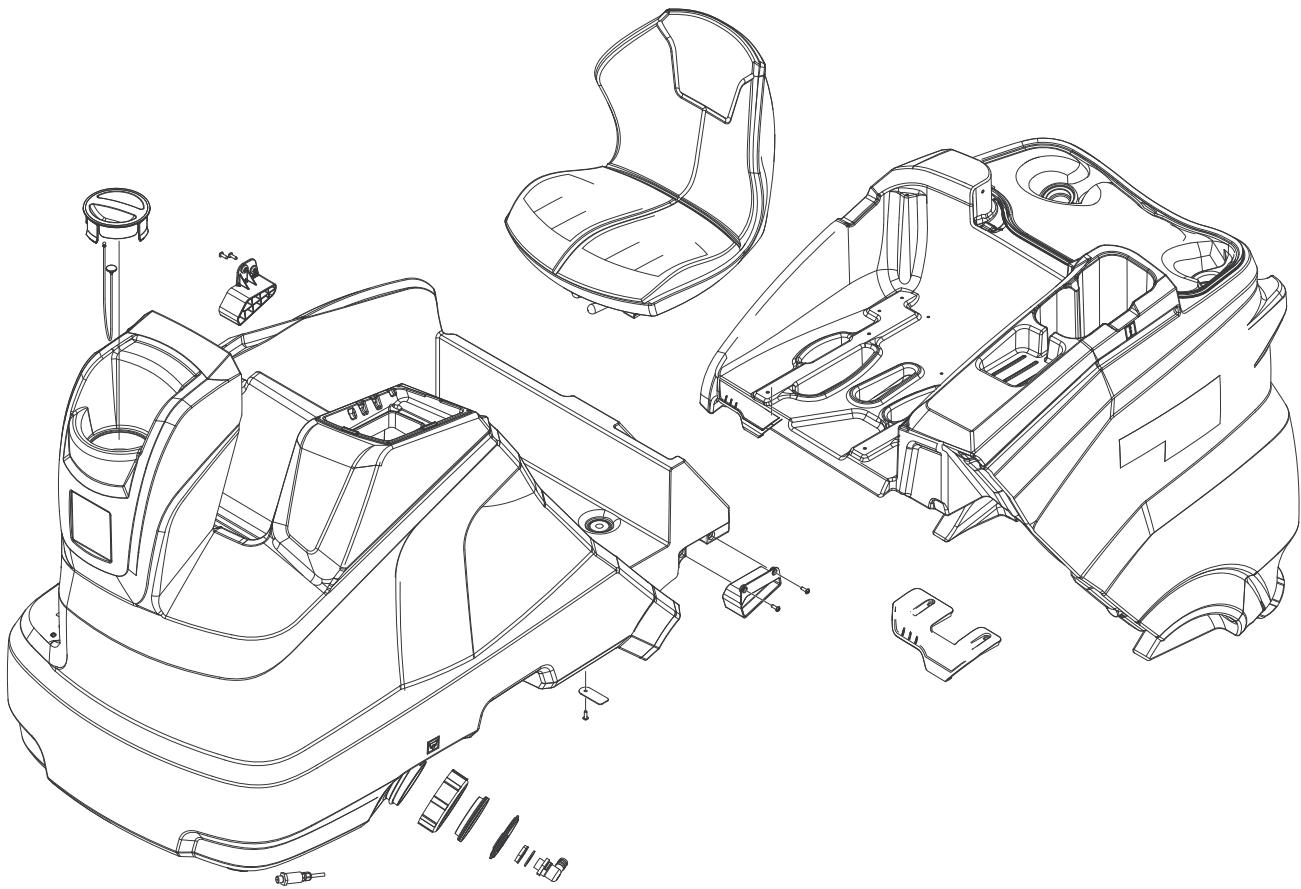
Frame and steering



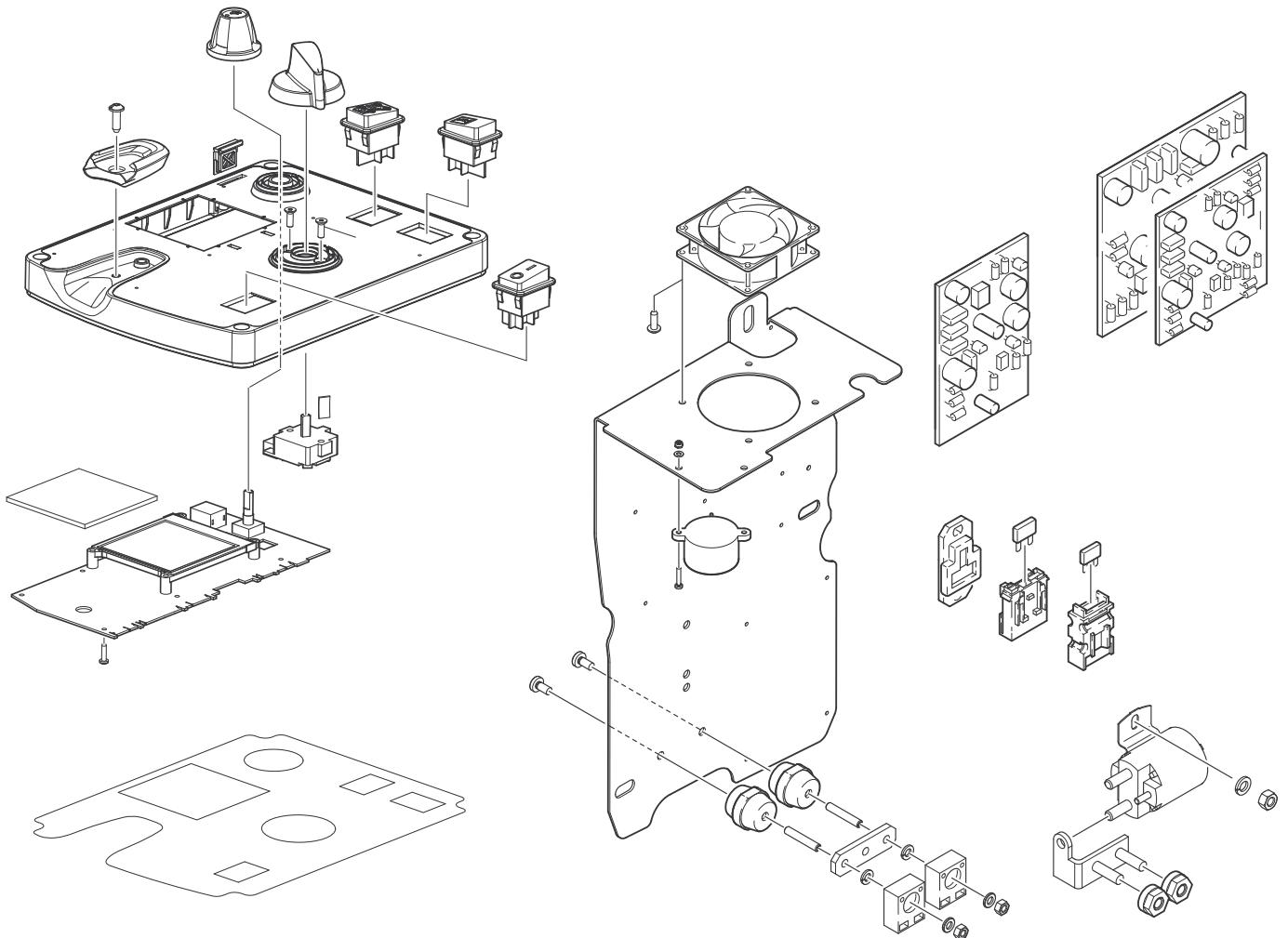
Wheels and drive



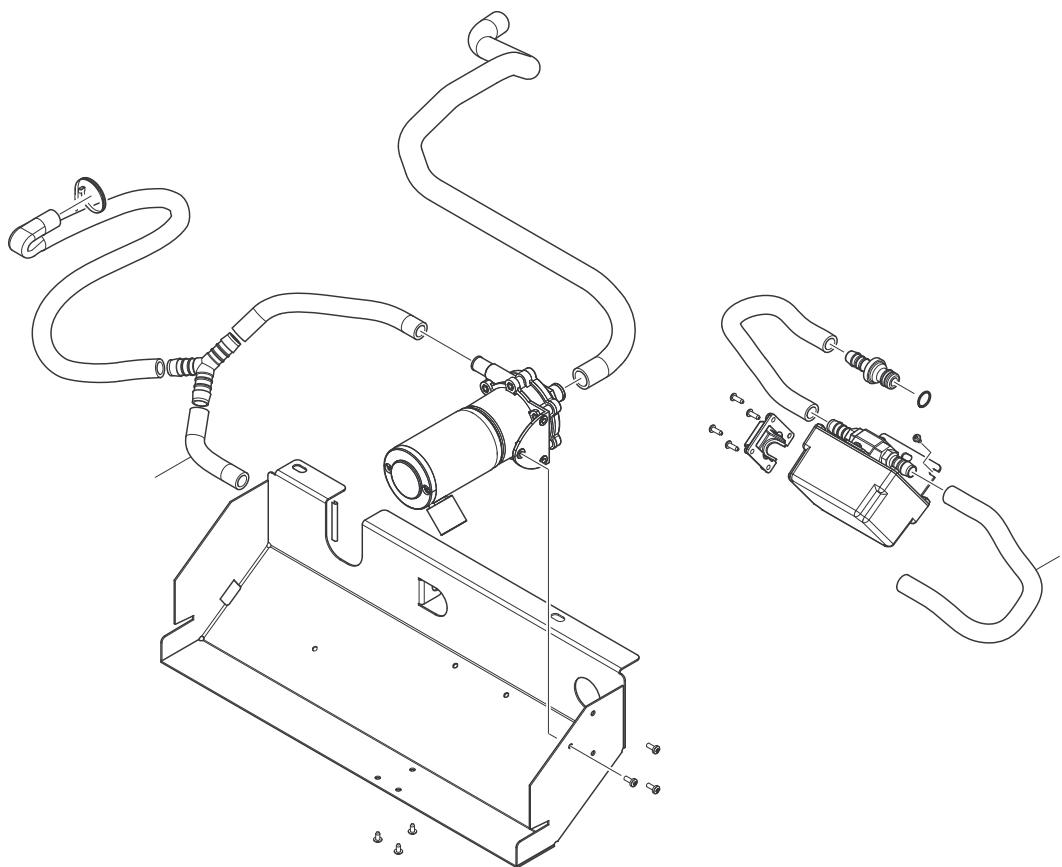
Tank system



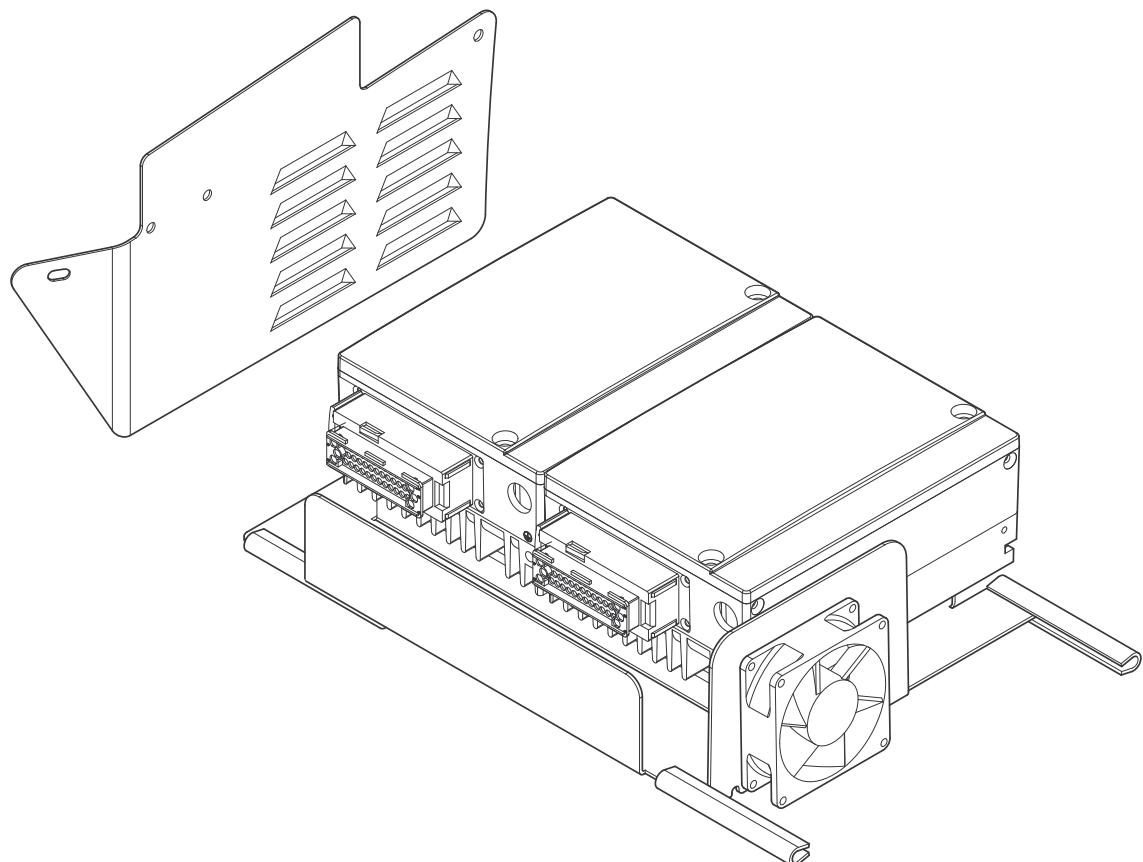
Control panel and electronics modules



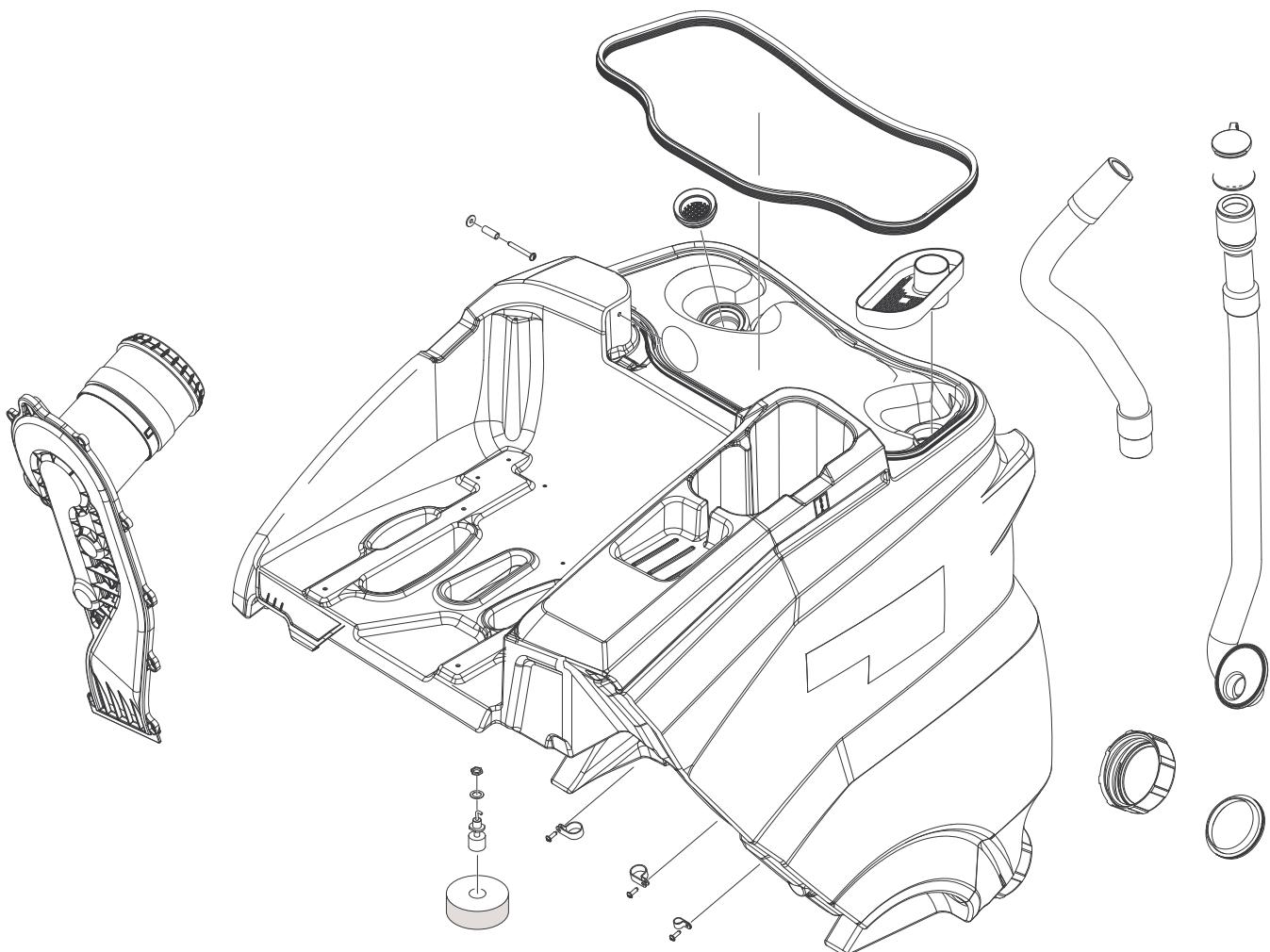
Pump assembly



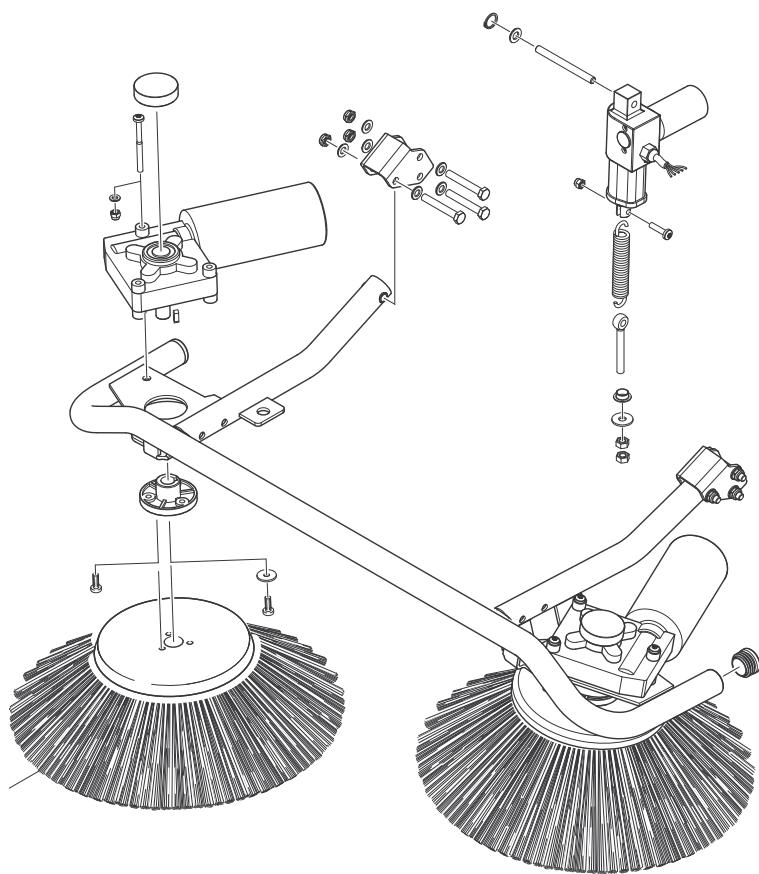
Charger



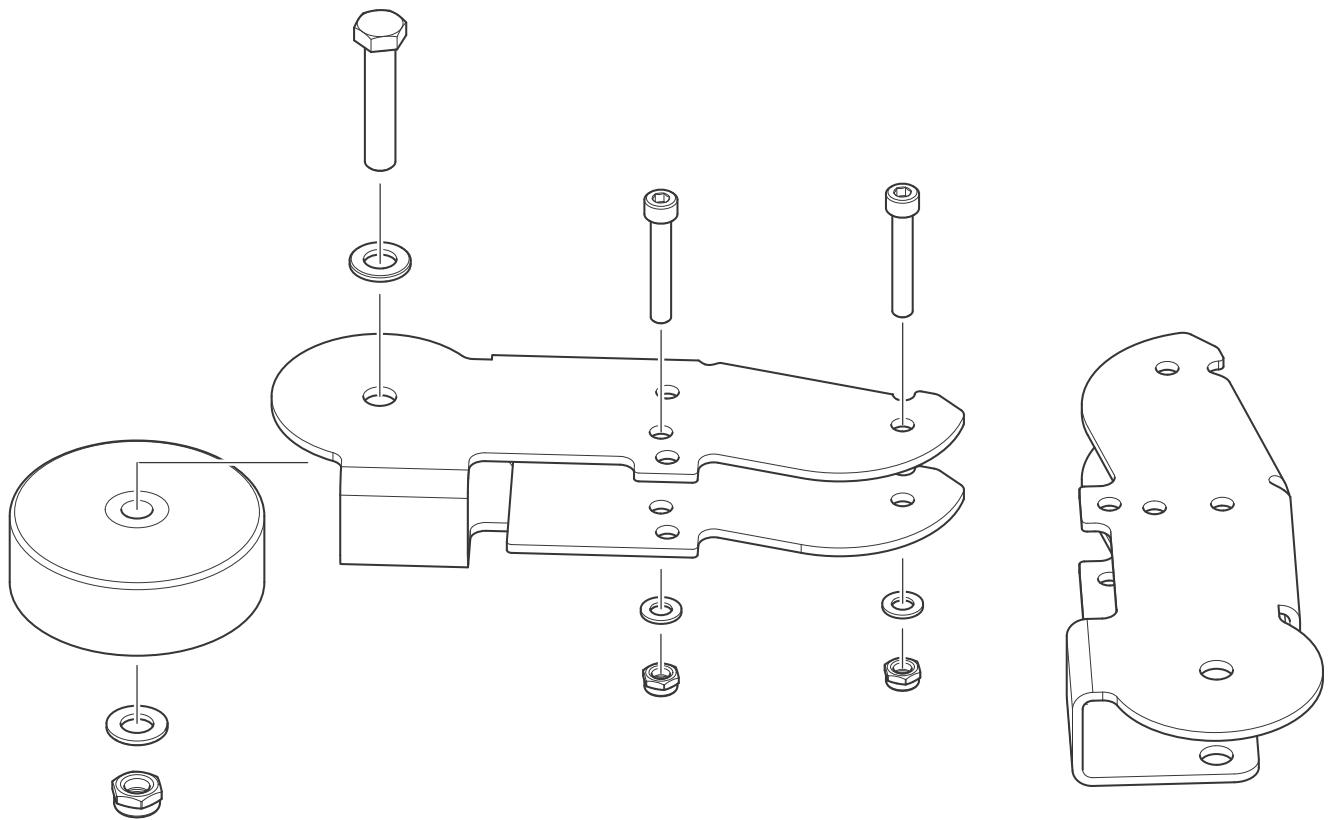
Suction system



Side brushes



Bumper wheel (with appliances without side brushes)



AB Service group setup

010 Safety information

Observe general safety information!

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

⚠ DANGER

Risk of injury! Before working on the appliance, remove the Intelligent Key and the mains plug of the charger.

Drain and dispose of the dirt water and the residual fresh water.

⚠ DANGER

Switch the appliance off and unplug the mains plug prior to performing any service work.

Disconnect the battery on the negative terminal (-).

020 Overview



ABFS Uninstall / install driver seat

ABFR Removing/installing the seat contact switch

030 Function

The seat contact switch is an active safety installation and prevents the operation of the appliances if the driver has not sat down on the driver seat.

040 Service activities

ABFS Uninstall / install driver seat



- Tilt the waste water tank backwards.
- Pull the driver seat out of the seat rails towards the front.



- Remove the plug at the seat contact switch.
- Unscrew the screws.
- Pull the seat contact switch out of the seat.

ABFR Removing/installing the seat contact switch



NOTICE

Prior to replacing the seat contact switch, check if the pressure plate functions correctly and the spring is present and correctly inserted in the retainer.

The connector of the connection cable may be another source of errors.

■ ABFS Uninstall / install driver seat

- Remove the pressure plate.
- Check the switch (NO contact) by means of an ohmmeter. During operation, the resistance must be less than 50 ohm.
- Check the function after installation.

Note

If the load on the seat is released during operation, the "Seat contact switch opened" message will appear on the display within 1 second and the machine will brake within 3 seconds.

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 panel

010 Safety information

Observe general safety information!

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

⚠ CAUTION

Risk of destruction by electrostatic discharge (ESD)!

The following measures must be taken prior to working on electronic components to avoid damages:

- Wear ESD shoes.
- Touch one of the battery terminals with your hand for equipotential.
- Do not remove the electronics from their packaging until you are ready to start the installation.

⚠ DANGER

Risk of injury! Before working on the appliance, remove the Intelligent Key and the mains plug of the charger.

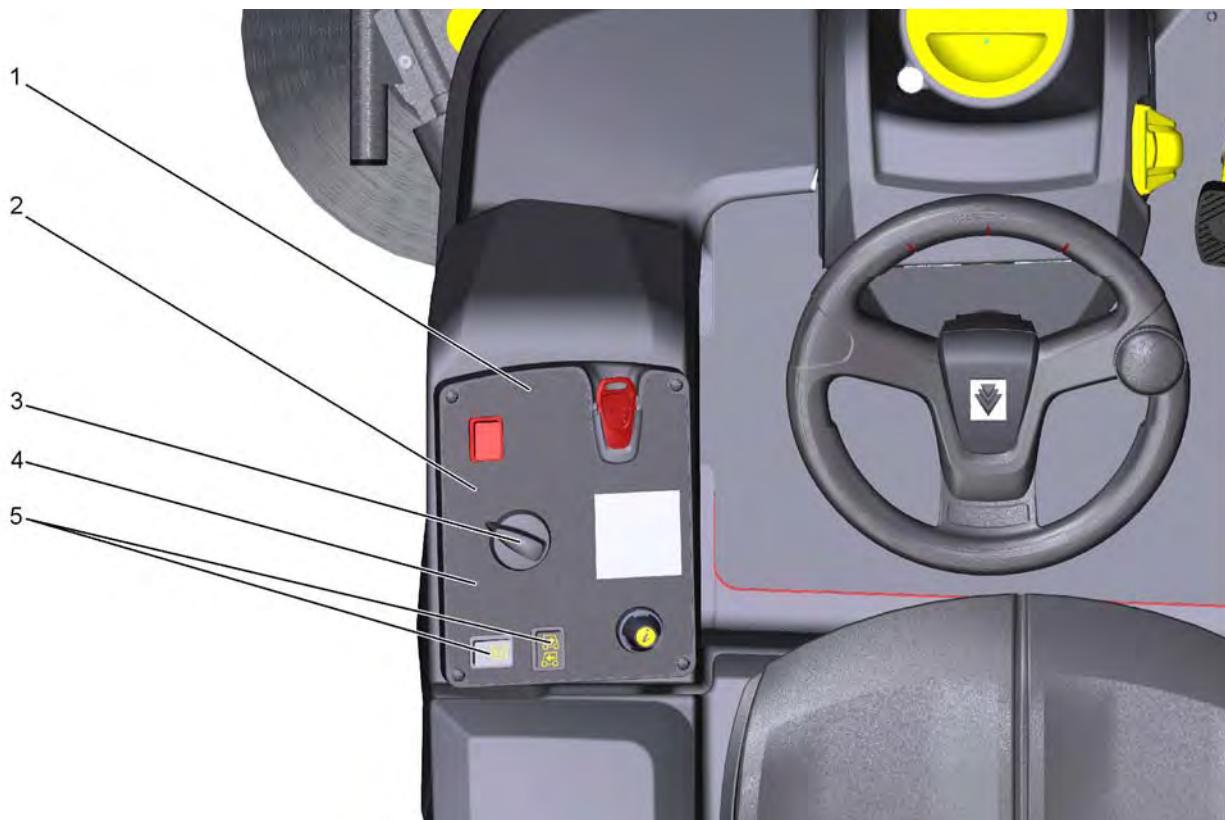
Drain and dispose of the dirt water and the residual fresh water.

⚠ DANGER

Switch the appliance off and unplug the mains plug prior to performing any service work.

Disconnect the battery on the negative terminal (-).

020 Overview



- 1 Dismantling the control panel
- 2 Replacing the control panel board
- 3 Replace the programme selector switch
- 3 Check the programme selector switch
- 4 Check the control panel
- 5 Replacing the travel direction switch and the signal horn pushbutton

030 Function

Operator console



- 1 KIK System (KÄRCHER INTELLIGENT KEY)
- 2 Lit up display
- 3 Info button
- 4 Travel direction switch (forward/reverse)
- 5 Signal horn
- 6 Program selection switch
- 7 Main switch/ emergency stop

Main switch

Switches the appliance on/off and serves as an emergency stop switch.

Program selection switch

The appliance is switched on and off by rotating the programme selector switch and the different cleaning programmes can be selected.

Info button

In connection with the grey and red intelligent keys, the info button can be used to access menus and appliance settings. You can set different adjustments on the appliance, depending on the use and the conditions on site. Depending on the access rights, appliance-specific data can be shown.

Display

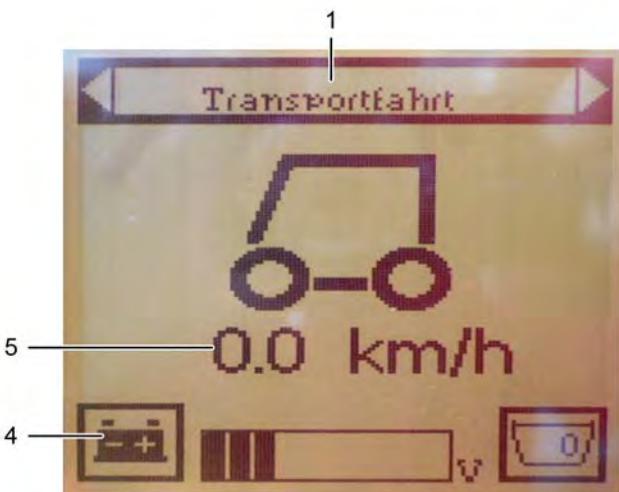
The display will show all menus and appliance settings that were retrieved via the info button, as well as the battery status, fault messages and maintenance interval information.

Display lighting

The display is back-lit in colour. Depending on the KIK used the display colour changes:

Operator (Yellow)	=	Yellow
Supervisor / facility manager (Grey)	=	Grey
Service technician (Red)	=	Red
Fault / error message	=	Red
Individual KIK (white)	=	White

Screen description



- 1 Programme selector switch position
- 2 Water filling level indicator
- 3 Battery empty, charge the battery immediately
- 4 Battery display
- 5 Speed indicator

Programme settings



1 OFF

Device is switched off

2 Transport mode

Driving to the Place of Use.

3 Eco mode

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

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 max. water volume) and vacuum up wastewater.

6 Intense mode

Wet clean the floor (with increased brush contact pressure and max. water volume) and let the detergent soak in.

7 Vacuum mode

Suck in the dirt fleet.

8 Polishing mode

Polish the floor without the application of liquid and max. brush contact pressure.

Intelligent Key

User-specific releases are saved in the intelligent key. The appliance can only be put into operation after the intelligent key has been inserted.

There are three different key types with different colours and their corresponding user groups.

Key colour	User group
Yellow	Operator
Grey	Supervisor / Facility Manager (M)
Red	Service technician (S)
White	Individual KIK

Yellow intelligent key



Appliance functions cannot be modified.

The user can work with preset programmes at the start of his day via programme selector switches. No adjustment possibility.

Grey Intelligent Key



The Supervisor/Facility Manager can define access rights/releases of appliance functions for the yellow user key. The Supervisor/Facility Manager has access to almost all relevant appliance functions, but not to service parameters.

Red intelligent key



The service technician has access to all parameters and appliance functions.

The service technician can also issue rights for the yellow user key.

White Intelligent Key



The device cleans with the programme that is set on the white Intelligent Key, independent of the selected cleaning programme.

A setting for certain floor coverings / applications/ areas is possible.

NOTE

Important: the white key must be configured to the floor to be cleaned before initial use.

The grey or red intelligent key is needed to do so.

The white intelligent key works from head CPU software version V4.4.

Key chains serve for the differentiation of the programmes on the individual keys.

NOTICE

If two intelligent keys are used at the same time, faults can be caused in the control electronics.

Always use the intelligent keys individually.

- Software diagrams and parameter overview

040 Service activities

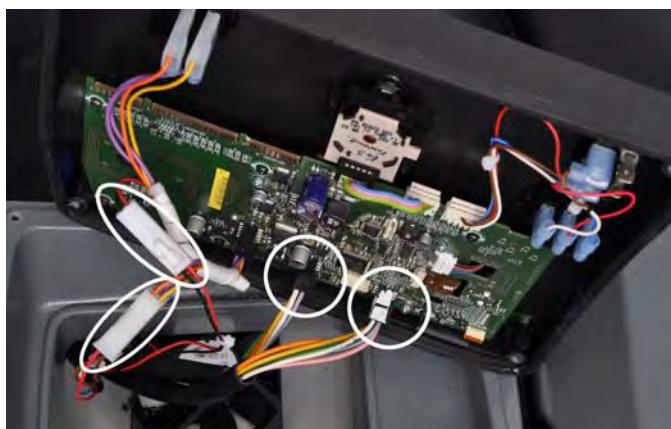
Dismantling the control panel



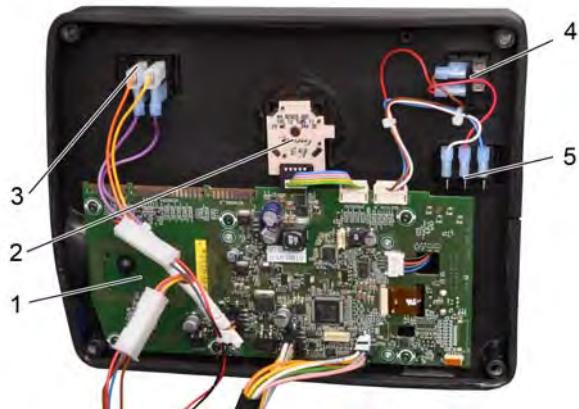
→ Unscrew the screws on the control panel.



→ Swivel the control unit towards the driver seat.



→ Disconnect the marked cable connections.



- 1 Board with head CPU, KIK reader, info button
- 2 Program selection switch
- 3 Main switch
- 4 Horn switch
- 5 Driving direction switch

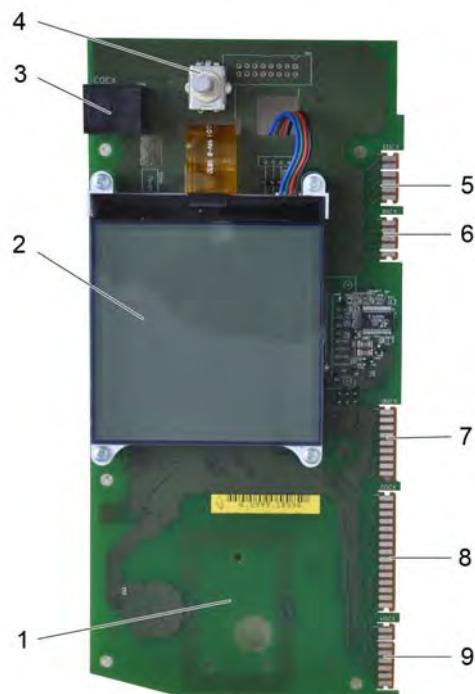
Replacing the control panel board

NOTICE

Check the cable connections prior to replacing components!



- Disconnect plug-in connections on the electronics.
- Pull the rotary knob off the info button.
- Unscrew the screws on the electronics.
- Remove the board from the control panel.



- 1 RFID antenna (for KIK key)
- 2 LC display, back-lit with LED in three colours
- 3 Connection service module
- 4 Push-button / rotary switch info button
- 5 Connection travel direction switch / horn
- 6 Connection programme selector switch
- 7 Not assigned
- 8 Not assigned
- 9 TCU connection

Replace the programme selector switch

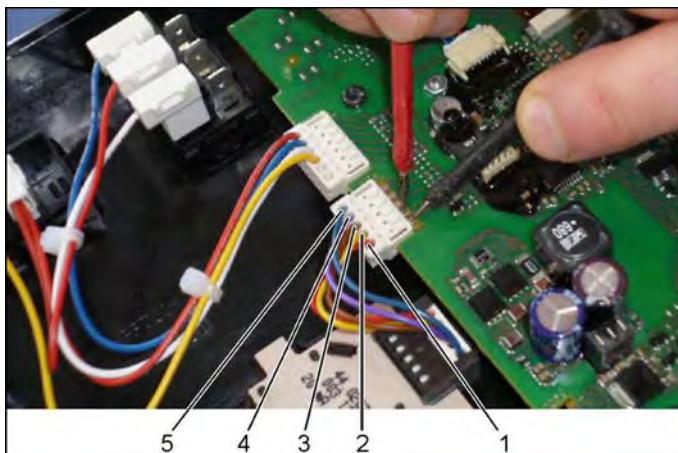


- Pull the connection cable off the head CPU board.
- Pull off the rotary knob of the programme selector switch.
- Loosen screws.



- Remove the programme selector switch from the casing and replace it.

Check the programme selector switch

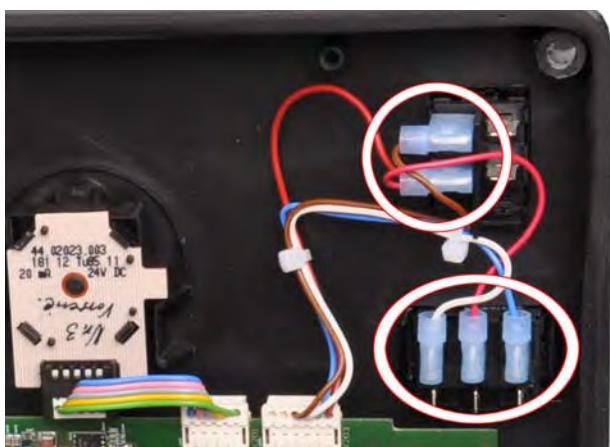


Dismantling the control panel

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

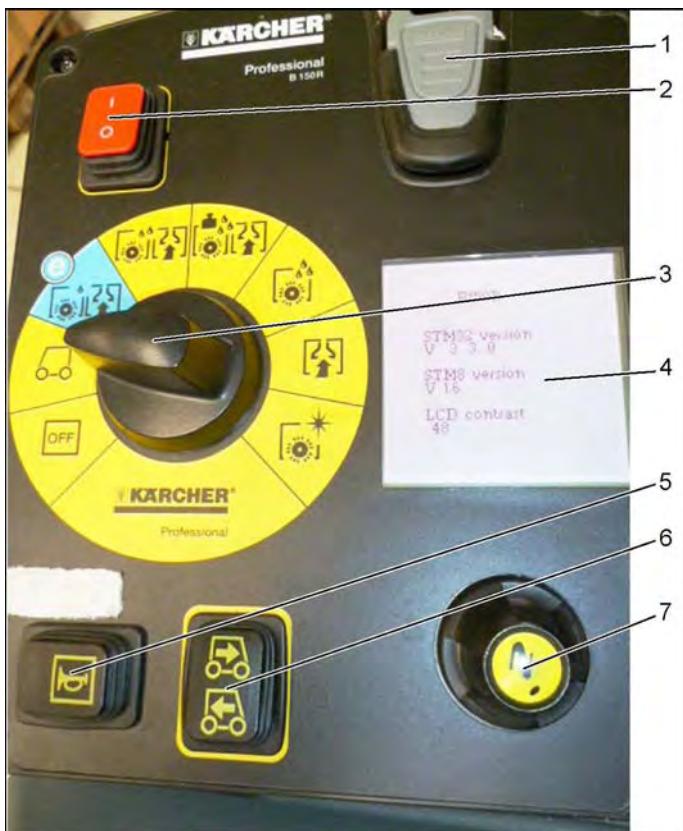
Switch setting	Resistance measurement between		Nominal value in Ohm
OFF	1		–
Transport mode	1	2	<50
Eco mode	1	2 3	<50
Normal mode	1	3	<50
Increased brush contact pressure	1	3 4	<50
Intense mode	1	2 3 4	<50
Vacuum mode	1	2 4	<50
Polishing mode	1	4	<50

Replacing the travel direction switch and the signal horn pushbutton



- Pull the cable off the switch/ pushbutton.
- Pull the switch/ pushbutton out of the casing.

Check the control panel



- 1 Intelligent Key
- 2 Main switch
- 3 Program selection switch
- 4 Display
- 5 Horn button
- 6 Driving direction switch
- 7 Info button

Check the following on the control panel:

- Display contrast
- Display pixel test
- Main switch
- Program selection switch
- Horn button
- Driving direction switch
- Info button
- Intelligent Key
- Backlighting

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.

Adjust 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.

Display Pixel Test

- 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

Testing the programme selector switch

- Turn the programme selector switch from Transport to Polish

Testing the horn button

- Press and release the horn button

Testing 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.

Testing 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.

Testing 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.

End tests

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

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.

AH Service group electrics

010 Safety information

Observe general safety information!

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

⚠ CAUTION

Risk of destruction by electrostatic discharge (ESD)!

The following measures must be taken prior to working on electronic components to avoid damages:

- Wear ESD shoes.
- Touch one of the battery terminals with your hand for equipotential.
- Do not remove the electronics from their packaging until you are ready to start the installation.

⚠ DANGER

Risk of explosion! Do not put tools or similar on the battery, i.e. on the terminal poles and cell connectors.

020 Overview



- 1 Connect the service module
- 2 Checking / replacing appliance electronics
AHPF Uninstall / install potentiometer accelerator pedal

030 Function

No special functional characteristics.

040 Service activities

Checking / replacing appliance electronics

NOTICE

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.

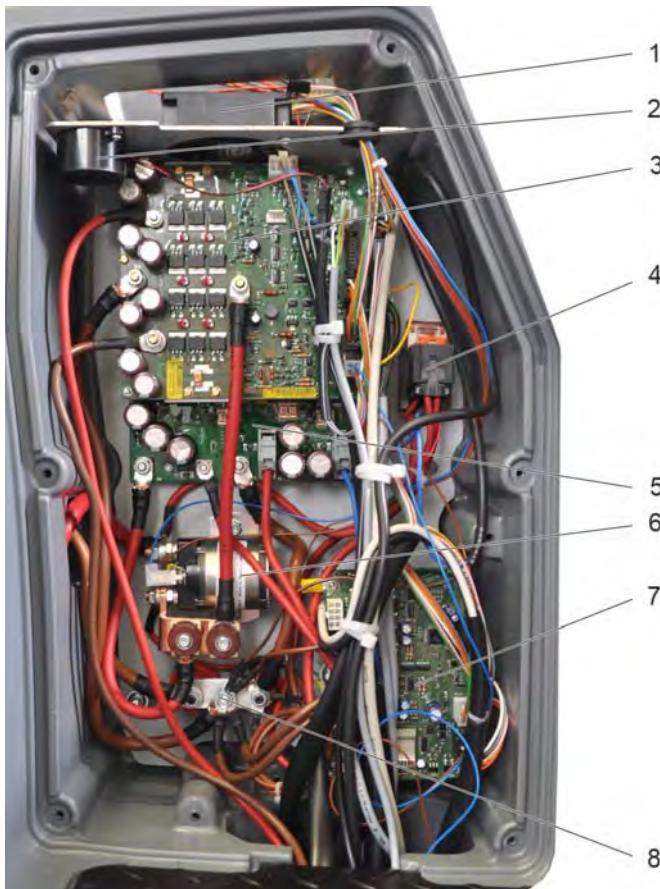


The appliance electronics is installed in the foot space of the appliance underneath the lateral cover.

- Unscrew the screws of the appliance electronics cover.



The vent openings are covered by means of a deflector plate on the inside to protect the electronics against splashing water.



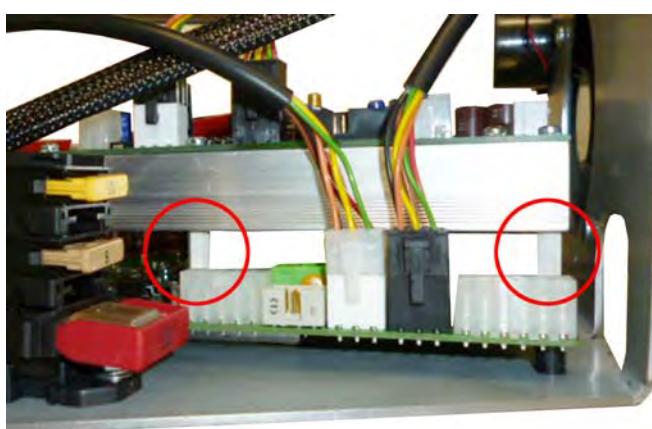
- Loosen / disconnect the cable connections at the appliance electronics.
- Unscrew the screws of the appliance electronics.
- Remove the appliance electronics from the appliance.

NOTICE

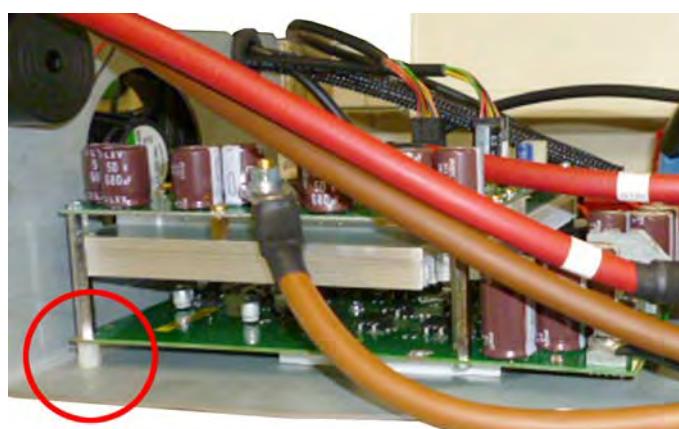
Check the cable connections prior to replacing components!

NOTICE

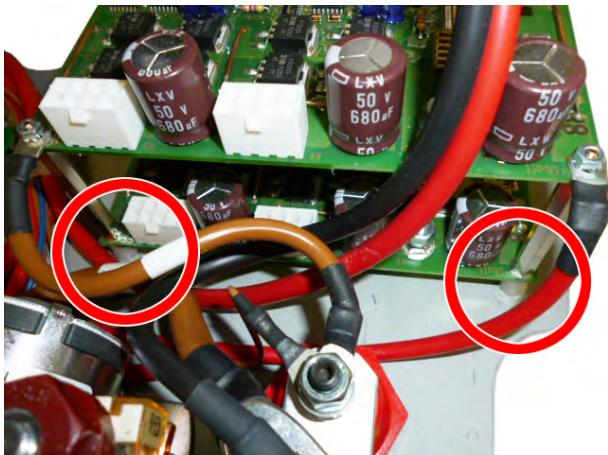
When installing the appliance electronics, ensure that the insulating spacers are installed in the correct place to avoid errors caused by short circuits.



Two insulating spacers between drive module A2 and clean module A3.



One insulating spacer between base plate and clean module A3



Two insulation spacers between base plate and lifting module A4, at the connection positive and negative.

Connect the service module

NOTICE

A precondition is the service programme software 7.1 and a service module version 4.9 or higher.

The latest service program software is available from Kärcher Inside or from the Kärcher InfoNet service area. The service module A9 must be updated with the latest version of the service module software.

Please use the latest version.

→ Turn off the appliance.

→ Open the interface cover at the control panel.



→ Integrate the service module adapter and service module A9 in the module bus of the machine.



- Connect the PC/laptop to the service module A9 via the USB interface.
- **Plug in the red Intelligent Key.**
- Set the programme selector switch of the machine to position 1.
- Start the service programme.
- Perform automatic scanning to recognize the device automatically.
- If the device is not recognised, the selection must be repeated.
- Before repeating, disconnect the service module from the machine and laptop.
- Turn the device off and end the service program.

LED at the service module is flashing, the following functions can be selected:

- 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 the serial number for fleet management.

Software update

Note when transferring the new software:

→ Select the update software.

Select the software, transfer it to the device and follow the programme instructions.

Do not interrupt the download!

NOTICE

The display of the device is switched off during the software transfer.

The successfully transferred software can be displayed in the module bus on the device.

After the software has been transferred, all text, images and icons need to be loaded in the "Update Display Text" menu. Next, make the following settings using the grey or red KIK key.

– Load the factory settings.

– Adjust the used brush head to "R or D".

– Set up the charge curve for the installed battery used in the battery menu.

(not for "Others" devices)

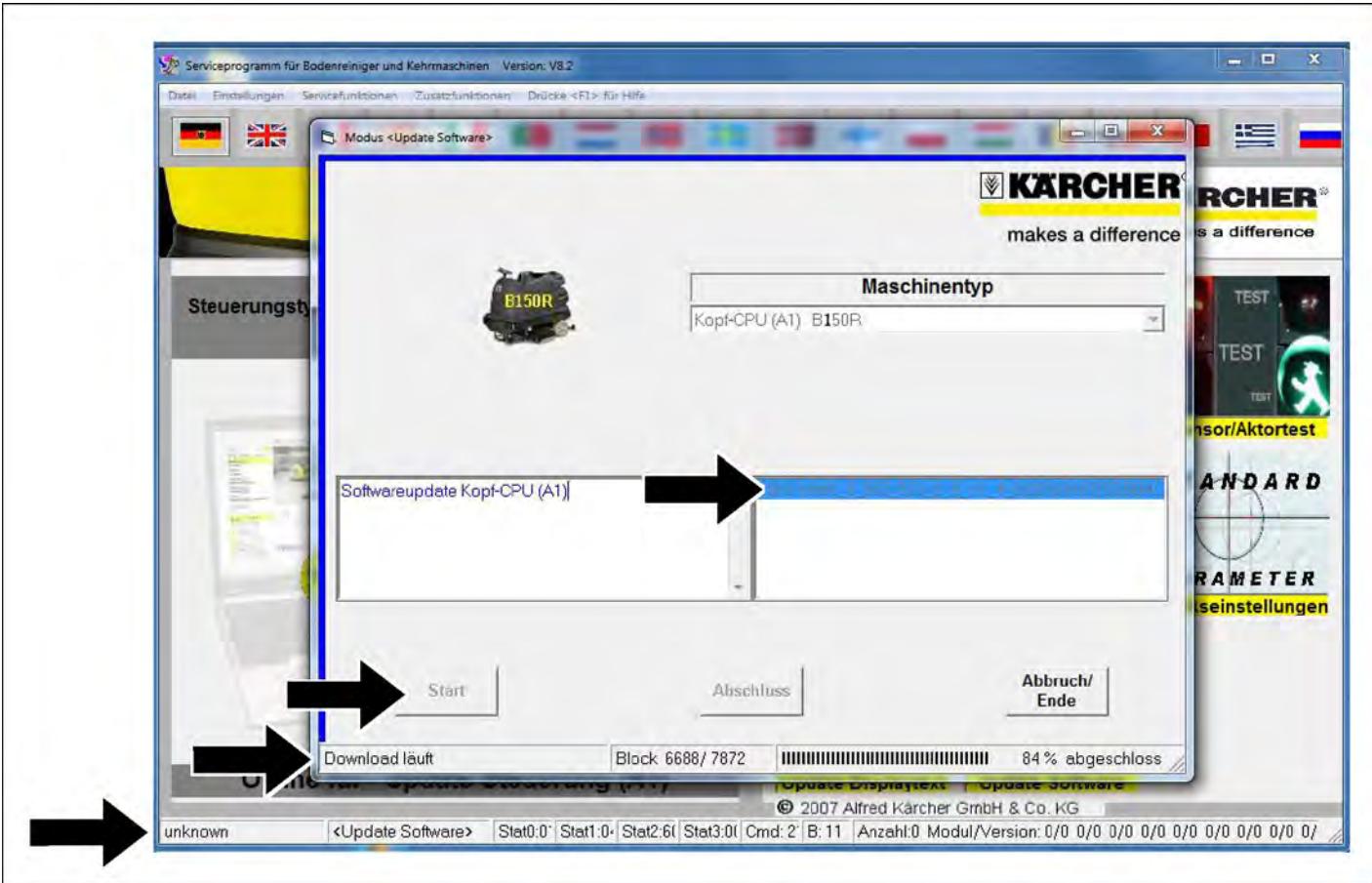
→ Turn the device off and back on.

The device can be started after all the settings have been made.

B 150 R TCU - software update cancelled

If a software update of the head CPU (A1) is paused or not completed, the software will be irreparably corrupted. 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 appliance is not detected and "unknown" is displayed in the service programme.
- Select software update.
- Select the appliance type.
- Select the software and start => Download is running.
- Confirm completion after the software has been transferred.

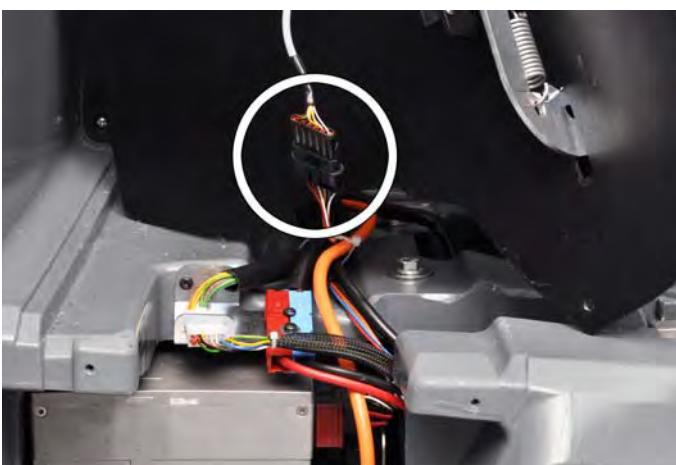


Service programme for floor cleaners and sweepers

AHPF Uninstall / install potentiometer accelerator pedal

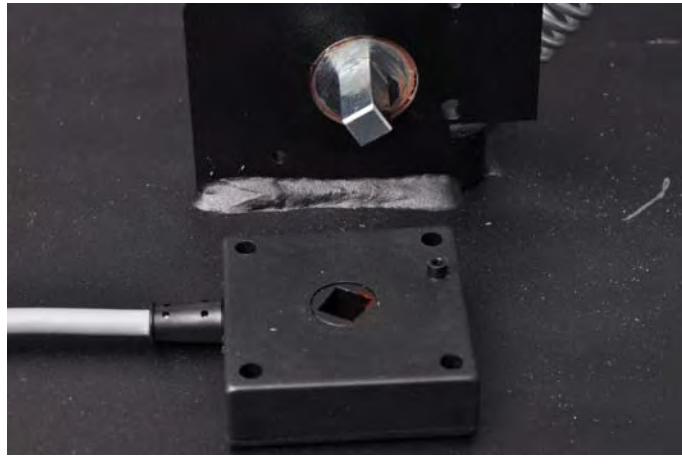


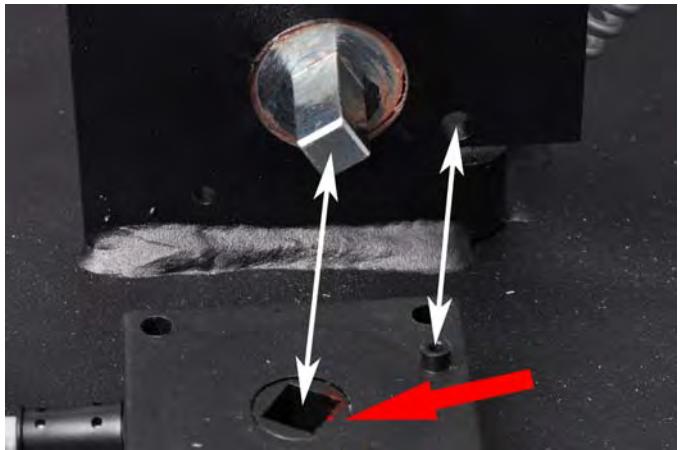
- Unscrew the screws.
- Remove the base plate from the appliance, pay attention to the connection cable.



- Disconnect the connector.

- 
- Unscrew the screws.
 - Pay attention to the notch.

- 
- Pull the accelerator potentiometer off the square of the accelerator.

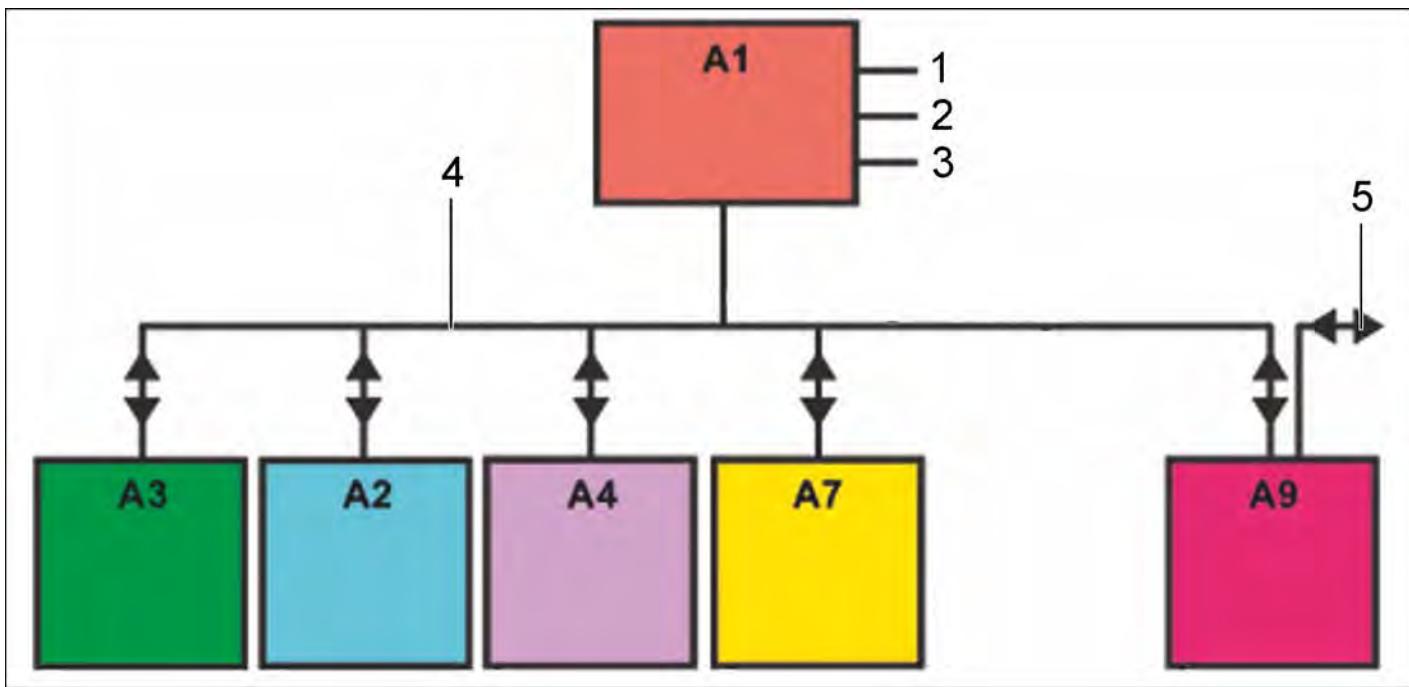
- 
- When installing the new accelerator potentiometer, pay attention to the correct position and the notch.

NOTE

After installation, the gas pedal potentiometer is calibrated via the test mode or the service programme.

- Follow the instructions of the software.

Module networking



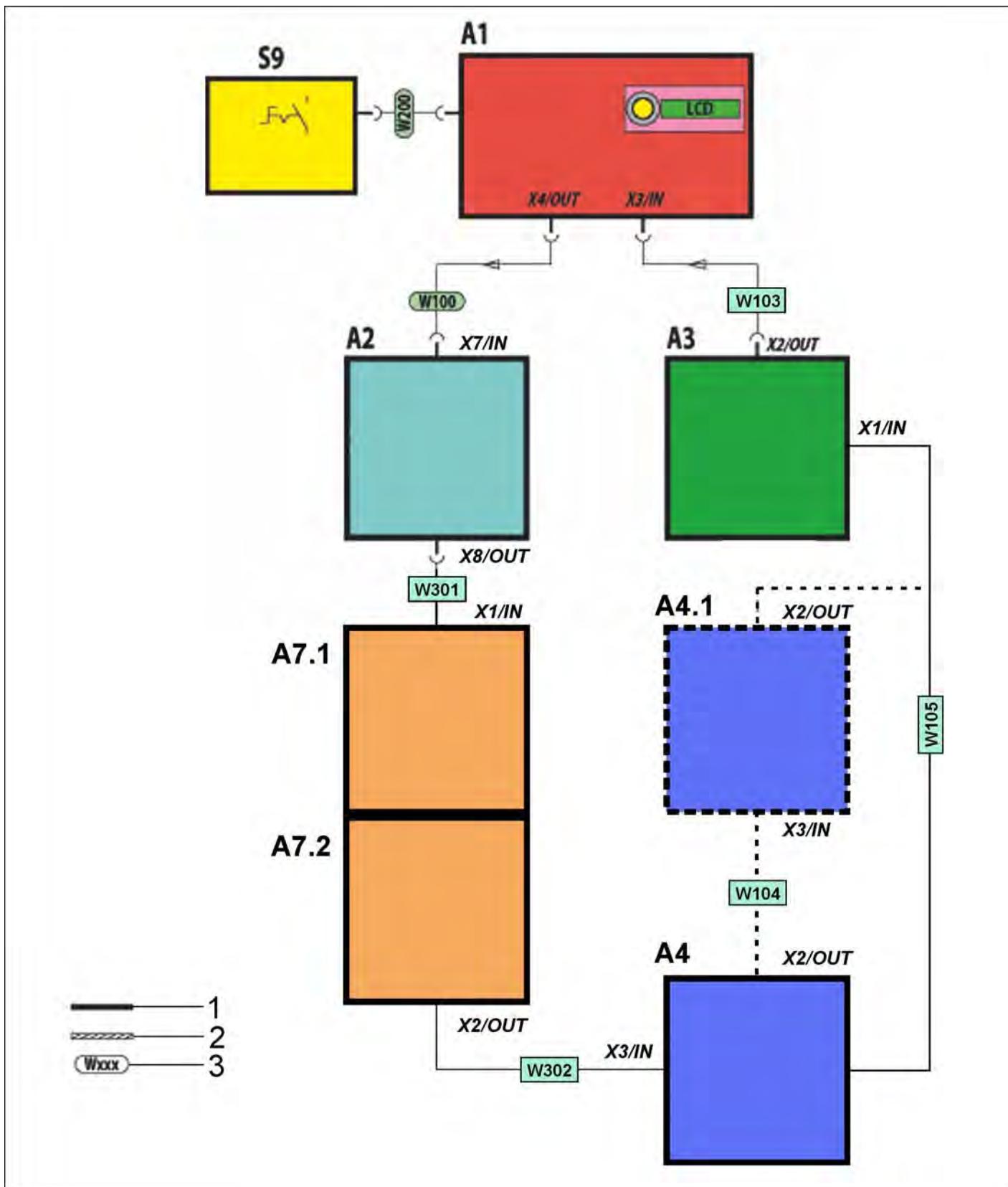
- 1 Operating System
- 2 Machine procedures
- 3 Error diagnosis
Correction

- 4 Extendible serial network cable bus)
- 5 Personal Computer

A1	Head CPU	<ul style="list-style-type: none"> - Fan Version 1 - Temperature sensor rear traction motor Adv version
A2	Drive module	<ul style="list-style-type: none"> - Driving operations - Electromagnetic brake - Horn - Seat switch - Drive pedal - Direction switch - Steering potentiometer Adv version
A3	Clean module	<ul style="list-style-type: none"> - Brushes - Vacuum device - Detergent dosing - Float switch - Water pump - Water valve - Waste water tank - Beacon light - Pressure switch fresh water tank - Fan Version 2
A4	Lift module	<ul style="list-style-type: none"> - Lifting motors - End switch - Side brushes
A7	Charge module	<ul style="list-style-type: none"> - Battery charger - Charge management
A9	Service module	<ul style="list-style-type: none"> - Diagnosis - Parameterization - Display adjustment - Firmware download

- 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.

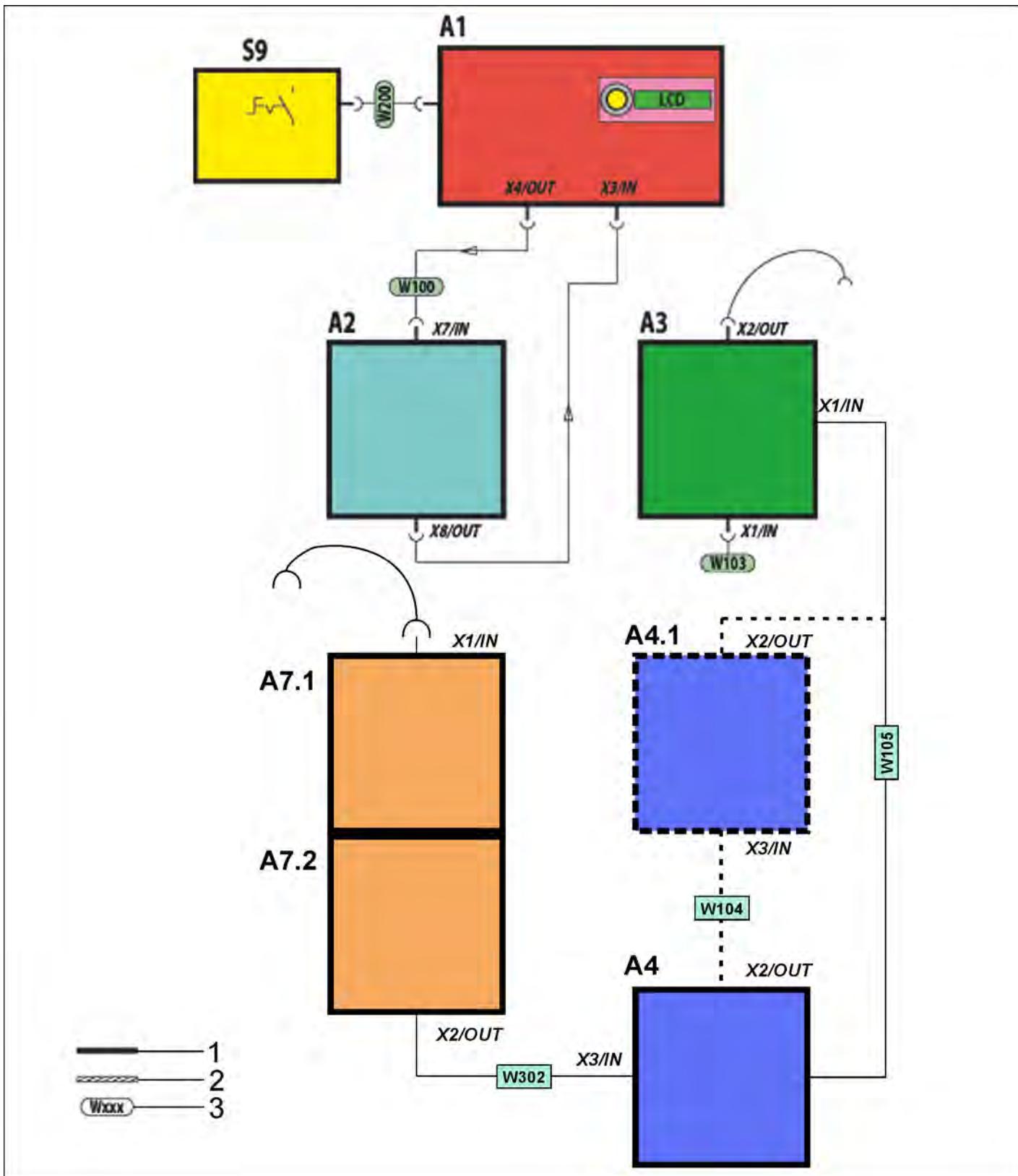
Module system B 150 R



A1	Head CPU
A2	Drive module
A3	Clean module
A4	Lift module
A4.1	Lifting module 2 Option
A7.1	Charge module
A7.2	Charge 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
A4	Lift module
A4.1	Lifting module 2 Option
A7.1	Charger
A7.2	Charger
S9	Program selection switch

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

Note

In case of a defective module, a driving operation is possible if the drive module is directly connected to the head CPU (see illustration). Remove the fuses of the connected modules.

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.

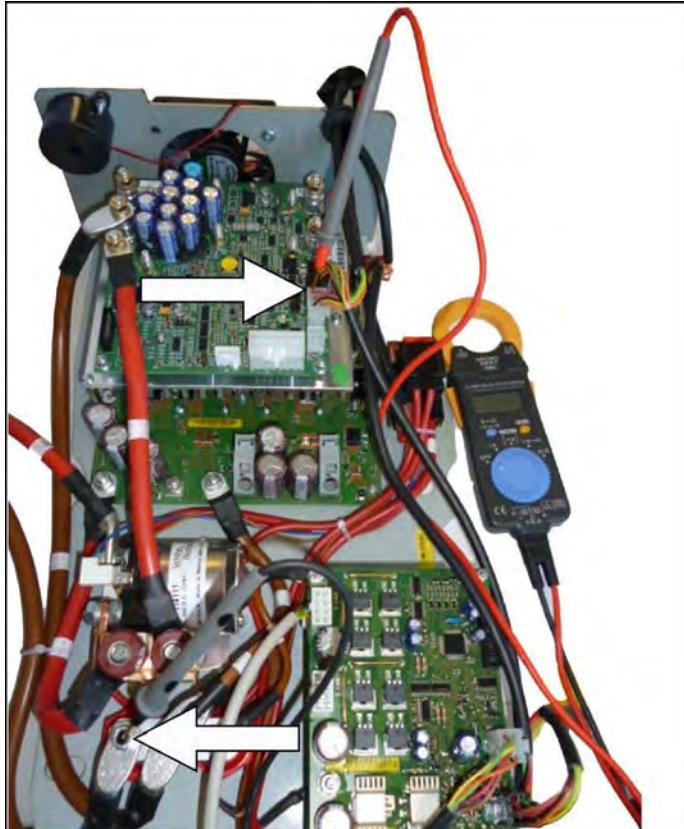
If there is no longer any voltage across an output of a module, it can be assumed that the module is damaged or the module bus plug contacts were poorly assembled or damaged.

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



General information concerning measurements on the electronics

- Use a voltmeter with suitable prods or terminals.
- Use a clamp meter for measuring electric current.
- Observe nominal measured values in the table at the end of this chapter.
- In the service menu, menu item test mode, the functions can individually be switched on and off.

Checking main relay

- Plug in the Intelligent Key.
- Set the programme selector switch to transport mode and wait until the self-test on the operating panel display is completed.
- Connect the voltmeter to the negative terminal and the relay.

The indicator on the voltmeter shows the battery voltage for a short period of time, then permanently 15V.

NOTICE

During the self-test, the relay increases briefly and then decreases again. After a successful self-test it will be high continuously.

Voltage measurement transport run at full load B 150 R Bp

- Plug in the Intelligent Key.
- Set the programme selector switch to transport mode and wait until the self-test on the operating panel display is completed.
- Connect voltmeter to the connections "X11" and "X12".
- Press the seat switch.
- Press the drive pedal fully.
- The voltmeter must indicate the battery voltage.

Voltage measurement transport run at full load B 150 R Bp ADV

Front-wheel drive

- Plug in the Intelligent Key.
- Set the programme selector switch to transport mode and wait until the self-test on the operating panel display is completed.
- Connect voltmeter to the connections "W1" and "V1".
- Press the drive pedal fully.
- The voltmeter must indicate 33 V.

Rear wheel drive

- Plug in the Intelligent Key.
- Set the programme selector switch to transport mode and wait until the self-test on the operating panel display is completed.
- Connect voltmeter to the connections "U1" and "V1".
- Press the drive pedal fully.
- The voltmeter must indicate 33 V.

Battery voltage

- Plug in the Intelligent Key.
 - Set the programme selector switch to transport mode and wait until the self-test on the operating panel display is completed.
 - Connect the voltmeter to the connections "GND" and relay K1/30.
- Display on the voltage measuring unit, approx. battery voltage.

Voltage measurement suction turbine under full load

- Plug in the Intelligent Key.
- Connect the voltmeter to the connections "GND" and "X10".
- Switch on the suction turbine in test mode.

Voltage measurement brush motor under full load

- Plug in the Intelligent Key.
- Connect the voltmeter to the connections "GND" and "X8 and X13".
- Lower the brush head.
- Switch on the brush motor in the test mode.

Voltage measurement at the water valve

- Plug in the Intelligent Key.
- Connect voltmeter to the connections on the electrical ball tap.
- Open the ball tap in test mode.

Voltage measurements of the dosing pump

- Plug in the Intelligent Key.
- Connect the voltmeter to the dosing pump connections.
- Switch on the dosing pump in the test mode.

Check the drive motor current

- Plug in the Intelligent Key.
- Set the programme selector switch to transport mode and wait until the self-test on the operating panel display is completed.
- Connect the measuring device to the propulsion motor cable.
- Press the seat switch.
- Actuate the accelerator pedal.
- Measure the current.

NOTICE

During this test, the appliances must be lifted and supported so that the propulsion motor can rotate freely.

With Adv. appliances (four-wheel drive) the measurement must be performed while driving or the appliance must be lifted completely.

Current measurement on the brush motor and the suction turbine

- Plug in the Intelligent Key.
- Set the programme selector switch to the respective programme (brush motor and/or suction turbine) and wait until the self-test on the control panel display is completed.
- Connect the measuring device to the battery cable/ brush motor cable/suction turbine cable.
- Switch on the motors in test mode and measure the current.

Table of measurement values

Description	Component	Measured between:	Result	Measured at:
M20	Lift motor cleaning head	X5/2 - X5/6	26 VDC, 3A during lowering and lifting	Lift module
S20 S21	Microswitch lifting motor cleaning head	X5/1 - X5/5	Cleaning head up = microswitch closed Cleaning head down = microswitch opened	Lift module
		X5/1 - X5/8	Cleaning head up = microswitch opened Cleaning head down = microswitch closed	Lift module
M30	Lifting motor vacuum bar	X4/2 - X4/6	21 VDC, 3.5A during lowering and lifting - vacuum bar not installed	Lifting module or junction box waste water tank
S30 S31	Microswitch lifting motor vacuum bar	X4/1 - X4/5	Vacuum bar up = microswitch closed Vacuum bar down = microswitch opened	Lifting module or junction box waste water tank
		X4/1 - X4/8	Vacuum bar up = microswitch opened Vacuum bar down = microswitch closed	Lifting module or junction box waste water tank
M40	Lifting motor side brush	X5/2 - X5/6	27 VDC, 3.5A during lowering and lifting	Lift module
S40 S41	Microswitch lifting motor side brush	X5/1 - X5/5	Side brush up = microswitch closed Side brush down = microswitch opened	Lifting motor
		X5/1 - X5/8	Side brush down = microswitch closed Side brush up = microswitch opened	Lifting motor
H4	Overall lamp	X4/4 - X4/8	20 VDC, smaller 1A	Accessory module
S10	Pressure switch	X7/8 - X7/11	37 VDC	Clean module
		X7/2 - X7/11	0.5 VDC with 10% fresh water level	
M1	Drive motor	X11 - X12	36 VDC, 5A full throttle off-load	Drive module
Y1	brake	X6/2 - X6/4	0.5 - 1A; 36 V DC then drops to 26 V DC	Drive module
M2 / M3	Brush motor	X8 - GND X13 - GND	24 VDC, 5A off-load in the test mode	Clean module
M4	Suction turbine	X10 - GND	UBat, 21A in the test mode	Clean module
M5	Water pump	X12 - GND	25VDC, 05 A in the test mode	Clean module
Y2	Water valve	X4/6 - X4/2	1.6 V DC valve completely opened	Clean module
		X4/6 - X4/2	4.5 V DC valve opened	
		X4/9 - X4/2	0 V DC valve closed	
		X4/9 - X4/2	10 V DC valve closed	
		X4/1 / X4/2	UBAT valve closed/opened	
M6	Dosing pump	X4/5 - X4/3 X4/7 - X4/3	UBat in the test mode 8-14 V (pulsed) at 3% adjustment - voltage fluctuates	Clean module
M10	Side brush motor	X6 - GND	19VDC, 1.5A in the test mode	Clean module
K1	Relay	85 - 86	24 V DC then drops to 17 V DC	Relay
M1	Engine ADV	U1 - V1	5 - 6A unladen full acceleration driving straight ahead	Drive module
M 1.1	Engine rear axle	W1 - U1	4 - 5A unladen full acceleration driving straight ahead	Drive module
Y1	Brake ADV	X3/1 - X3/3	0.5 - 1A; 36 V DC then drops to 26 V DC	Drive module
Y1.1	Brake rear axle	X3/1 - X3/3	0.5 - 1A; 36 V DC then drops to 26 V DC	Drive module
H2, H3	Daytime running light	K1/87 - UBat minus	UBat	General contactor K1
AL, BL	Work light	X6 - UBat minus or X4/2 - X4/6	24 V	Lifting module A4
			18 V	Lifting module A4/1

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.

010 Safety information

Observe general safety information!

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

Safety notes regarding the battery

	<i>Observe the directions on the battery, in the instructions for use and in the vehicle operating instructions</i>
	<i>Wear eye protection</i>
	<i>Keep children away from acid and batteries</i>
	<i>Danger of explosion</i>
	<i>Fire, sparks, naked flames and smoking must be strictly avoided</i>
	<i>Danger of chemical burns</i>
	<i>First aid</i>
	<i>Warning note</i>
	<i>Disposal</i>
	<i>Do not throw the battery into the regular waste</i>

DANGER

Risk of electric shock. Observe supply network and fuse protection - see "Charger". Only use the charger in dry rooms with sufficient ventilation!

NOTICE

Average charging time is approx. 10 - 12 hours.

The recommended chargers (matching the batteries used) are regulated electronically and will automatically switch off the charging process.

DANGER

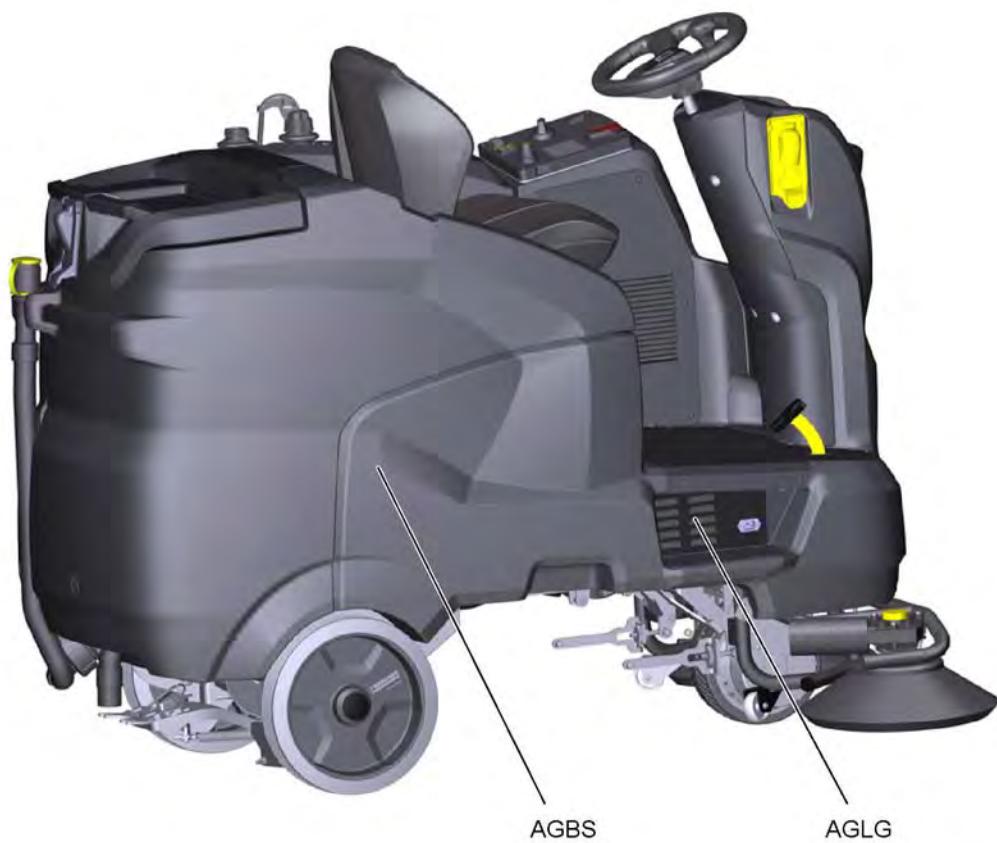
Danger of explosion. The charging of wet batteries is only permitted if the waste water reservoir is tilted up.

Danger

Danger of explosion. Do not put tools or similar on the battery, i.e. on the terminal poles and cell connectors.

Risk of injury. Ensure that wounds never come into contact with lead. Always clean your hands after having worked with batteries.

020 Overview



AGBS Uninstall / install batteries
AGLG Uninstall/ install charger

030 Function

Function of charger

- During the I constant phase, the charger is charged with the nominal current (see typeplate on charger) and the charge voltage will increase slower or faster depending on the charge condition. After that, the charger will switch to U constant phase.
- In the U constant phase, the voltage remains constant and the current sinks continuously. After that, the charger will switch to I constant phase.
- In the I constant recharging phase, the voltage will rise and the current remains constant.
The recharging phase serves to achieve the complete transformation of the active mass in all cells.
After that, the charger will switch to maintenance charge.
- During the maintenance charge, the fully charged battery status remains at constant voltage. The maintenance charge has no time limits.

Charger

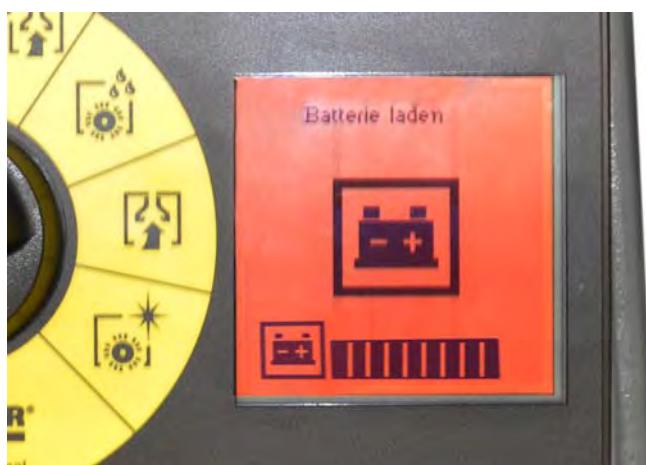


The charger is permanently installed in the appliance underneath the cover in the foot space.

Charging battery



- ➔ Connect the power cable to the charger.
- ➔ Connect the mains cable to the power supply system.



The state of charge of the battery is indicated on the display as an advancing bar.

"Battery fully charged" is shown on the display when the charging process is completed.

NOTICE

During the charging process all cleaning and driving functions are blocked.

- ➔ Pull the mains plug out of the socket after the charging process.

Version 1



Version 2



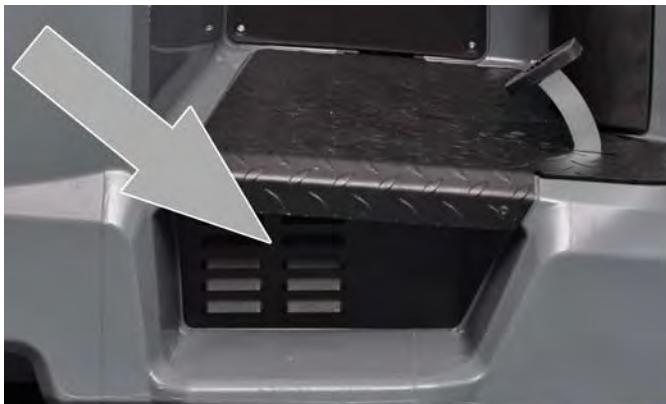
040 Service activities

AGLG Uninstall/ install charger

NOTE

B 150 R - Others do not have a charger!

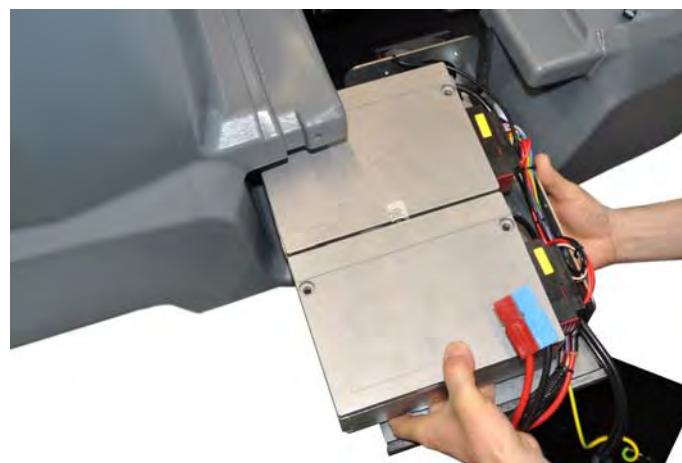
→ Dismantle the base plate and the charger cover.



→ Disconnect the plug connections at the charger
→ Unscrew the screws on the charger base.



→ Pull the charger with the charger base out of the appliance.

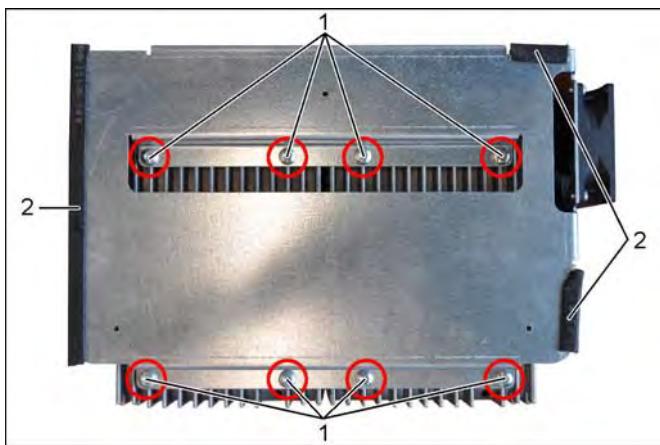


The charger consists of two identical modules, which are serially connected.





- Open the unlocking device on the connector using a screwdriver.
- Pull off the connector.



- 1 Screws
- 2 Edge protection

- Unscrew the screws.
- Remove the charger modules from the charger base.

NOTE

The edge protection system must be installed.
The charger must be isolated against the edge of the device. Otherwise, the display may show incorrect readings.

Checking the charger

NOTE

Check the cable connections prior to replacing components!

Measurements at the charger:



- Connect the charger to the batteries.
- Connect voltmeter and clamp meter to the wires to the battery.
- Plug in the mains plug of the charger.
- Determine the current and voltage measuring values after switching on the charger and record them.
- Determine the current and voltage measuring values after about 10 minutes and record them.

The measuring result of the I constant phase in the main charge must be close to the manufacturer's values of the charger.

See typeplate of charger.



⚠ CAUTION

Risk of damage! The charger is not equipped with polarity protection. If the battery is connected with the wrong polarity (positive / negative terminal confused), the charger will be destroyed.

⚠ CAUTION

Risk of damage! If a charger module is taken out of the pool, the battery can still be charged with the remaining module. The charging current, however, is halved in the i-constant phase. The charging process is longer, the battery is not charged completely. The service life of the battery is reduced.

Charger data and characteristics

For different battery types and manufacturers various charging characteristics are saved in the control electronics.

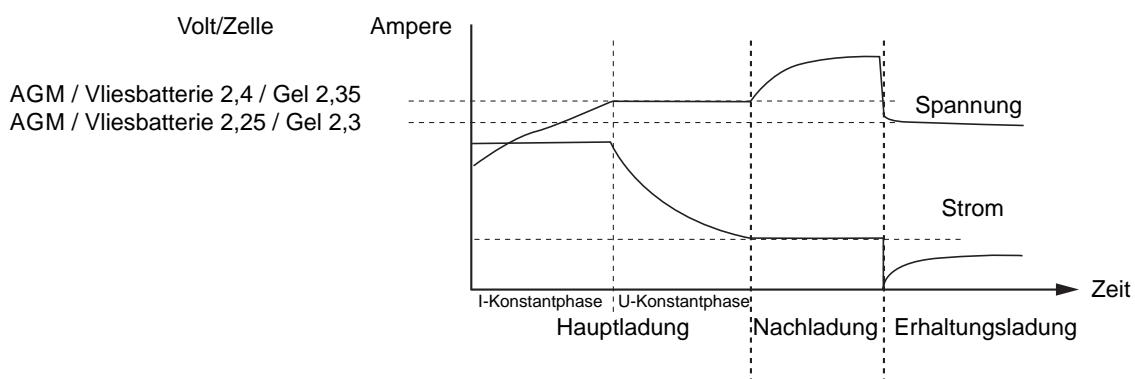
You can order a form for this, which the battery manufacturer must fill out.

Test report

- Fill out the check log in the case of a charger fault.

Appliance type:	Charge:
Manufacturer	daily:
Order number of appliance:	After each use:
Serial number:	Weekly:
Purchase date:	When was the last charge:
Are damages visible on the battery?	
Performance values of the charger with the battery connected immediately after the start of the charging process (maximum, continuous current value):	
Charge voltage:	Volt
Charge current (constant current!):	Ampere
Performance values of the charger with the battery connected after approx. 10 minutes:	
Charge voltage:	Volt
Charge current (constant current!):	Ampere

Regulated charge ID line IUI charger for maintenance-free batteries



IUIa means:

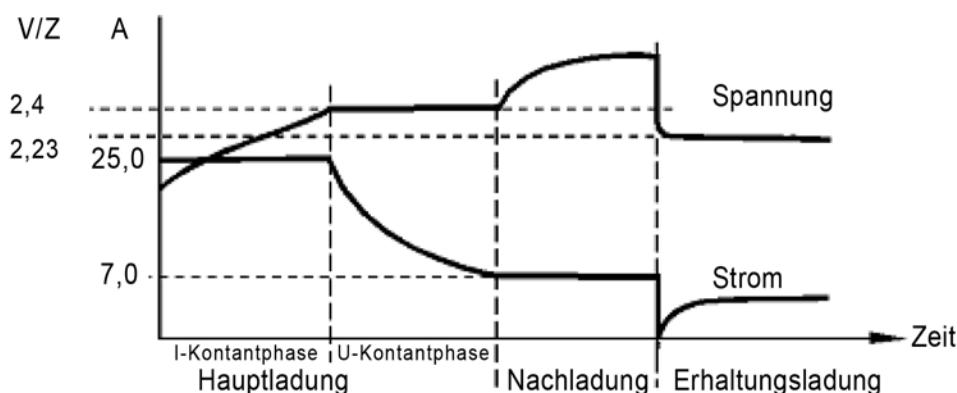
I = constant current line

U = constant voltage line

I = constant current line recharging

a = automatic switch-off (transition to maintenance charge)

Regulated charge ID line IUI charger for low-maintenance batteries



IUIa means:

I = constant current line

U = constant voltage line

I = constant current line recharging

a = automatic switch-off (transition to maintenance charge)

■ Function of charger

AGBS Uninstall / install batteries

NOTICE

Check the battery and charger prior to replacement.

Dismantling batteries:



Installing batteries:

⚠ Danger

Danger of explosion. Do not put tools or similar on the battery, i.e. on the terminal poles and cell connectors.

Risk of injury. Ensure that wounds never come into contact with lead. Always clean your hands after having worked with batteries.

Available batteries:

Battery	Order No.
Battery set 240Ah, trough, low-maintenance	4.035-987.7
Battery set 180Ah, trough, low-maintenance	4.035-988.7
Battery set 240Ah, 6 blocks, maintenance-free	4.654-306.7
Battery set 180Ah, 6 blocks, maintenance-free	4.654-307.7

Layout	A	B
Length	244 mm	312 mm
Width	190 mm	182 mm
Height	275 mm	365mm

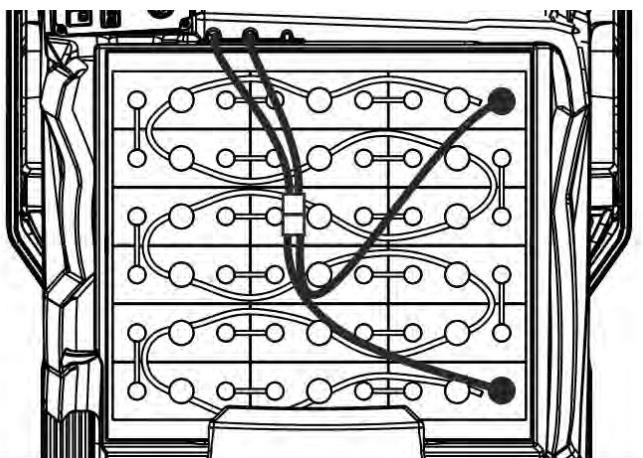
- Bring the emergency stop switch into the "0" position.
- Drain the waste water tank and swivel it to the rear.

NOTICE

The swivelling range is limited by a stop. It can be dismantled for easier access and thus the swivelling range can be extended.

- Dismantle stop on both sides of the appliance.
- Pull out the battery plug.
- Clamp off the minus pole of the battery.
- Clamp off the remaining cables from the battery.
- Remove the batteries.
- Dispose of the used batteries according to the local provisions.

Installation options



4.035-987.7

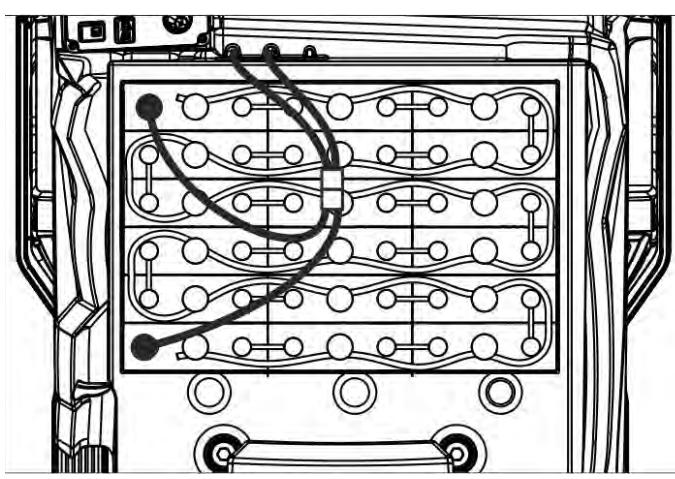
- Connect pole using the enclosed connecting cable.
- Connect the connection cable to the free battery poles (+) and (-).
- Insert battery plug.

⚠ CAUTION

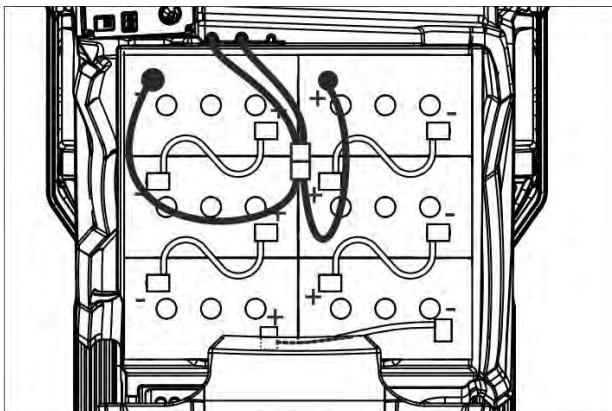
Risk of damage! Charger is not equipped with reverse voltage protection. Ensure correct polarity.

⚠ CAUTION

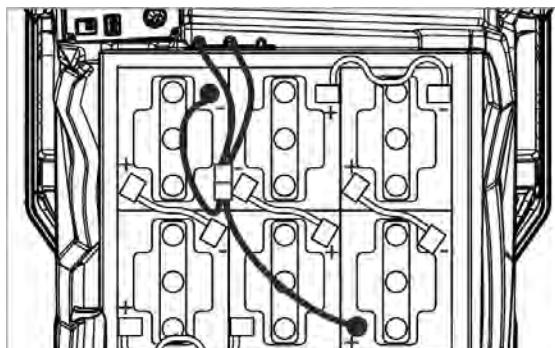
Risk of damage due to full discharge! Charge the batteries before commissioning the appliance.



4.035-988.7



4.654-306.7 (arrangement A)



4.654-307.7 (arrangement B)

Measuring the battery voltage under load until the appliance shuts off

- Use a voltmeter / multimeter to measure and record the battery voltage of every individual battery block.
- Measure and record the current during the voltage measurement using a clamp meter.
- Operate the appliance until the discharge end voltage / the total discharge protection shuts the appliance off.

Result

In case of problems, one or more battery blocks/battery cells will differ significantly from one another so that the error can be detected reliably.

Battery measuring log - maintenance-free battery

1. Measurement - idle voltage

Measure the idle voltage with charged battery without consumers.

Battery block	1	2	
	3	4	
	5	6	

2. Measurement - load test

Measure the battery voltage several times while the turbine is turned on.

Battery block	1	2	
	3	4	
	5	6	

3. Measurement - load test

Measure the battery voltage while the turbine is turned on, shortly before the discharge end voltage is triggered.

Battery block	1	2	
	3	4	
	5	6	

Measurement log

Battery measurement log - battery 18 x 2 volt = 36 V			
Acid density with charged battery without consumers			
Cell 1	Cell 2	Cell 3	Cell 4
Cell 5	Cell 6	Cell 7	Cell 8
Cell 9	Cell 10	Cell 11	Cell 12
Cell 13	Cell 14	Cell 15	Cell 16
Cell 17	Cell 18		
Idle voltage with charged battery without consumers			
Cell 1	Cell 2	Cell 3	Cell 4
Cell 5	Cell 6	Cell 7	Cell 8
Cell 9	Cell 10	Cell 11	Cell 12
Cell 13	Cell 14	Cell 15	Cell 16
Cell 17	Cell 18		
Voltage under load measurement 1			
Cell 1	Cell 2	Cell 3	Cell 4
Cell 5	Cell 6	Cell 7	Cell 8
Cell 9	Cell 10	Cell 11	Cell 12
Cell 13	Cell 14	Cell 15	Cell 16
Cell 17	Cell 18		
Measurement 2			
Cell 1	Cell 2	Cell 3	Cell 4
Cell 5	Cell 6	Cell 7	Cell 8
Cell 9	Cell 10	Cell 11	Cell 12

Battery measurement log - battery 18 x 2 volt = 36 V

Cell 13	Cell 14	Cell 15	Cell 16
Cell 17	Cell 18		

Measurement 3

Cell 1	Cell 2	Cell 3	Cell 4
Cell 5	Cell 6	Cell 7	Cell 8
Cell 9	Cell 10	Cell 11	Cell 12
Cell 13	Cell 14	Cell 15	Cell 16
Cell 17	Cell 18		

Measurement 4 Shortly before shutoff by the deep discharge protection with suction turbine running

Cell 1	Cell 2	Cell 3	Cell 4
Cell 5	Cell 6	Cell 7	Cell 8
Cell 9	Cell 10	Cell 11	Cell 12
Cell 13	Cell 14	Cell 15	Cell 16
Cell 17	Cell 18		

Machine log

Record further machine data			
Appliance type:	Battery type:		
Order number of appliance:	Manufacturer:		
Serial number:	Part number:		
Purchase date:			
Operating hours of appliance:			Hours
Have the pole clamps been tightened?			
Are damages visible on the battery?			
Current pickup	Drive motor		Ampere
	Suction turbine		Ampere
	Brush motor		Ampere
	All consumers during cleaning.		Ampere
Discharge end voltage	When does the discharge end voltage get triggered.		Volt
Runtime indication	How long was the customer able to work with the appliance when the batteries were still fully functional?		Hours / minutes
Battery date	Is indicated near the battery terminal on the battery.		Date or code
How long / how often is the appliance used per day / per week?			Hours / day
			Hours / week
Detailed description of the problem:			

Measuring the battery voltage under load

NOTICE

The battery terminals must be checked prior to the load test.

The battery terminals must always be clean and tight.

→ Switch the appliance on and take the suction turbine and the cleaning head into operation on an insensitive floor.

Important: The consumers must run continuously during this test.

The load test can also be performed while the suction turbine is turned on.

→ Use a voltmeter / multimeter to measure and record the battery voltage of every individual battery block.

Measure and record the current during the voltage measurement using a clamp meter.

Check the maintenance-free batteries

The battery must be fully charged prior to the inspection to obtain a reliable result. The reason for this is that the acid layer is not removed until the charge is depleted due to the initiated electrolysis.

Measuring the acid density during charging is prohibited. Check the battery fluid level and refill distilled water if necessary. If water is refilled, a charge must be conducted before measuring the idle voltage.

The following checks must then be made:

Measuring idle voltage (quick test)

→ The battery block with the lowest battery voltage must be replaced if it is outside the tolerance values.

If this procedure still does not indicate clearly that there is a faulty cell, the third measurement must be performed after the second load test.

Off-load voltage volt / cell	2,12 - 2,15	2,06	1,97	< 1,97
Charge condi- tion about (%)	100%	50%	20%	Deep dis- charge

The off-load voltage of the cell should at least reach the limit value of 2.03 volt.

If these values are not met, the battery must be charged first.

Measuring the acid density with the battery acid meter (quick test)

Acid density (kg/l)	1,29	1,21	1,13	<1,13
Charge condi- tion about (%)	100%	50%	20%	Deep dis- charge

The difference between the battery blocks/battery cells should not exceed 0.04 kg/l. If a battery block / a battery cell is outside this tolerance, this battery block / battery cell must be replaced.

Low acid density and voltage values are an indication for shorts and loss of acid in a cell.

Prior to the evaluation, check whether the battery has been charged properly and the charging process has not been interrupted prematurely.

Practice:

The above mentioned values are guide values at 30 °C temperature.

In practice, the battery temperature influences the acid density and the voltage.

Rule of thumb:

1. 15 °C deviation from 30 °C changes the measuring value of the density by 0.01 kg/l.

2. Acid density + 0.84 ~ idle voltage of battery cell.

Measuring the battery under load

With all measurements, the difference must not exceed the following voltage under load:

Exide batteries:

– between the battery blocks 0.1 volt.

Hoppecke batteries:

– between the battery blocks 0.2 volt.

If the difference between the battery blocks/battery cells is larger, the battery block/battery cell with the lowest voltage must be replaced.

Notes regarding the battery

Replacing a maintenance-free battery due to old age

When the battery blocks have been charged for more than 100 charging cycles or have been used for more than 6 months, the replacement of a defective battery block against a new one is not profitable anymore. We recommend replacing the entire battery set.

Water fill

- Where fluid level is too low, top up cells to the mark provided with distilled water.
- The suitable refill interval depends on the use.
- Note that no water is topped up before the charging process, as the electrolyte level increases due to gas formation during charging.
- The swimmer valves cannot prevent an overfilling here.

Check the final discharge voltage

Final discharge voltage with variable value

The final discharge voltage is variable and is regulated automatically, so that the max. admissible battery capacity can be taken out without damaging the batteries.

If a lot of current is taken, the final discharge voltage is deeper than with smaller current volumes.

What is important, is that the correct battery is set up in the battery manager.

Function of the final discharge voltage

All units are operated until the variable value is reached. The brush motor shuts off with a time delay of 60 seconds and "Battery depleted" is displayed on the display. The suction turbine continues to run until the trailing time has elapsed and then shuts off.

The drive motor can be used until the voltage has reached the presetting of 29 Volts. This will also shut the drive motor off.

Checking the final discharge voltage with a voltage regulator



1 Voltage regulator

Checking the fixed value with the voltmeter.

Taking out of operation

If batteries are not to be used for a while, the following must be observed when storing them:

- Disconnect the negative battery connection on the battery and store the cable so that it cannot inadvertently come into contact with the negative terminal of the battery.
- Only store batteries while charged.
- The storage location should be as cool and dry as possible (the self-discharge rates will be lower).

Maintenance-free batteries:

- Recharge once the battery capacity is lower than 60%.
- Monthly test of the acid density.
- Recharge once the density has fallen below 1.23 kg/l.

Discharge end voltage or total discharge protection

The settings of the discharge end voltage must be checked to ensure that the runtime of the machine is not limited and that the battery cannot deeply discharge.

NOTICE

The battery must be fully charged for this test so that relay K1 functions properly.

- Swivel the waste water tank upwards.
- Connect the voltage regulator in the power circuit.
- Plug in the Intelligent Key.
- Set the programme selector switch to programme 2 transport mode wet cleaning of the floor.

NOTICE

Do not press the accelerator pedal.

- Reduce the voltage slowly to the discharge voltage that is defined in the setup menu.

NOTICE

Observe the nominal values in the table "Switch-off voltage 65 A" in Chapter "Battery menu".

NOTICE

The switching off takes place with a 60 second delay.

As an alternative, you can check the total discharge protection using the voltmeter or the voltage tester.

- Connect the voltmeter directly to the battery and operate the appliance until the display shows "Battery depleted".
 - At that moment, read the battery voltage.
- In such cases, the brush motor will switch off immediately and the and turbine after a delay.
The drive motor is still active.
Important: The voltage test must take place under load.
- Then charge the battery.

Note on B150 R Other

This device does not have a battery menu from which different batteries can be selected.

A fixed value of 29.5 Volts is set in Head CPU A1.

After a delay of around 10 seconds, the brush motors and the suction turbine switch off after a delay. The switch off value cannot be viewed in the service program and cannot be modified. The complete device is switched off at 29.0 Volts.

Charging battery

NOTICE

(for B 150 R Others)

This device is loaded via an external charger which is adapted to the battery.

NOTICE

When using other batteries (e.g. made by other manufacturers) the charge characteristics for the respective battery must be readjusted.

⚠ DANGER

Risk of electric shock. Observe supply network and fuse protection - see "Charger". Only use the charger in dry rooms with sufficient ventilation!

NOTICE

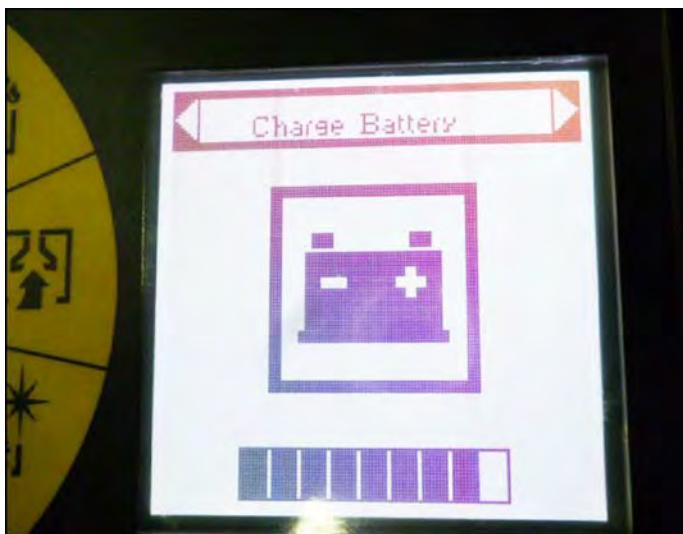
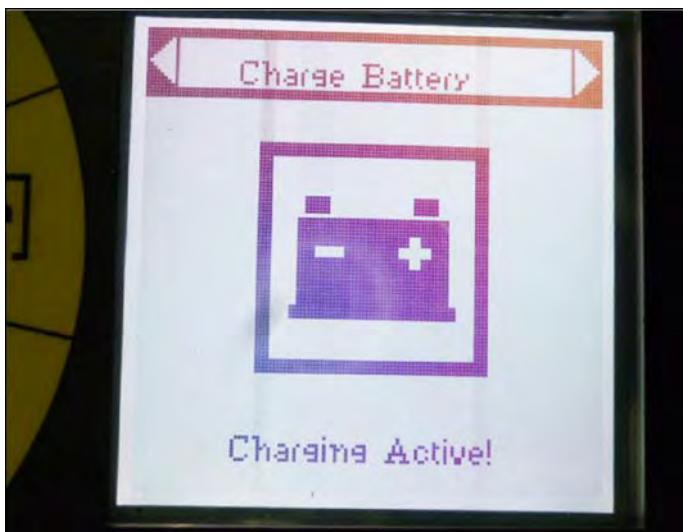
Average charging time is approx. 10 - 12 hours.

The recommended chargers (matching the batteries used) are regulated electronically and will automatically switch off the charging process.

⚠ DANGER

Danger of explosion. The charging of wet batteries is only permitted if the waste water reservoir is tilted up.

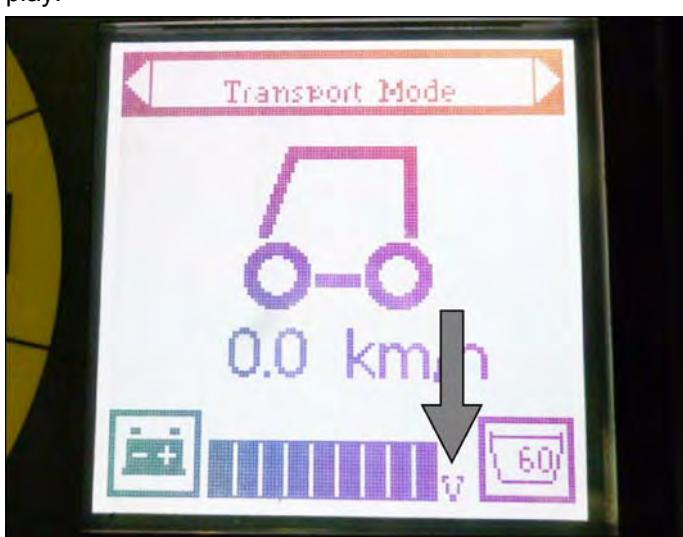
Display shows charging process



Battery display

The battery display operates according to either the voltage or the capacity display.

If the electronics has not determined the battery capacity yet, the device works in accordance with the voltage display.



During the battery charging process, the battery status is shown on the display.
There are two different displays

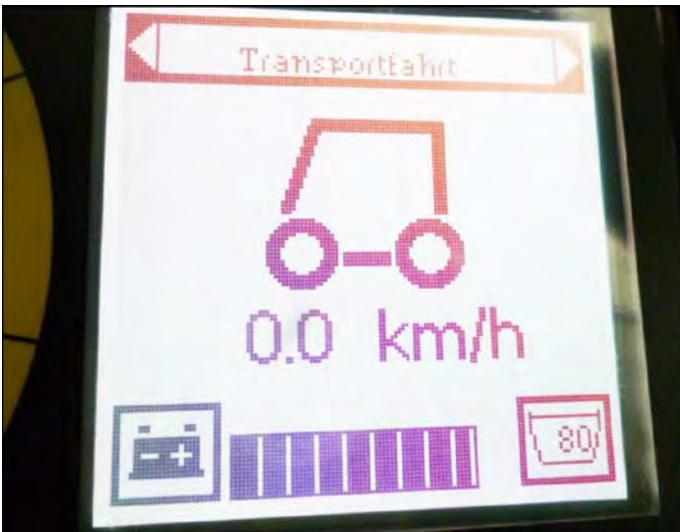
Voltage display

Capacity display

- After the battery has completely charged, "Battery Full!" will be displayed.
- In case of battery problems, you must always ensure that the correct battery has been set up in the battery menu.
- Recharge the battery type again where necessary.
- The charge parameters are adapted to the battery type.

Voltage display

- The battery display is determined from the battery voltage.
- The voltage display is identifiable through the "V" next to the bar graph.
- The voltage display is shown in the bar graph until the switch-off voltage is reached.



Capacity display

- In the capacity display, only the bar graph is visible.
- The battery indicator shows the available battery capacity, which is calculated from the supplied power of the battery charger to the battery and the power consumed by the battery
- The battery balance is displayed using the bar graph and shown down to the last 30 minutes. These are shown in minute steps.
- The device does not work in the capacity display until the device has been driven to the final discharge voltage (brush motors and suction turbines switch off) once. "Battery empty!" is displayed.
- Then the battery must be charged fully without faults. In the display, "Battery full!" appears. The "V" next to the bar graph is no longer visible.

CAUTION

The device switches from the capacity to the voltage based display if a new or the same charging characteristic is selected again from the battery menu.

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.

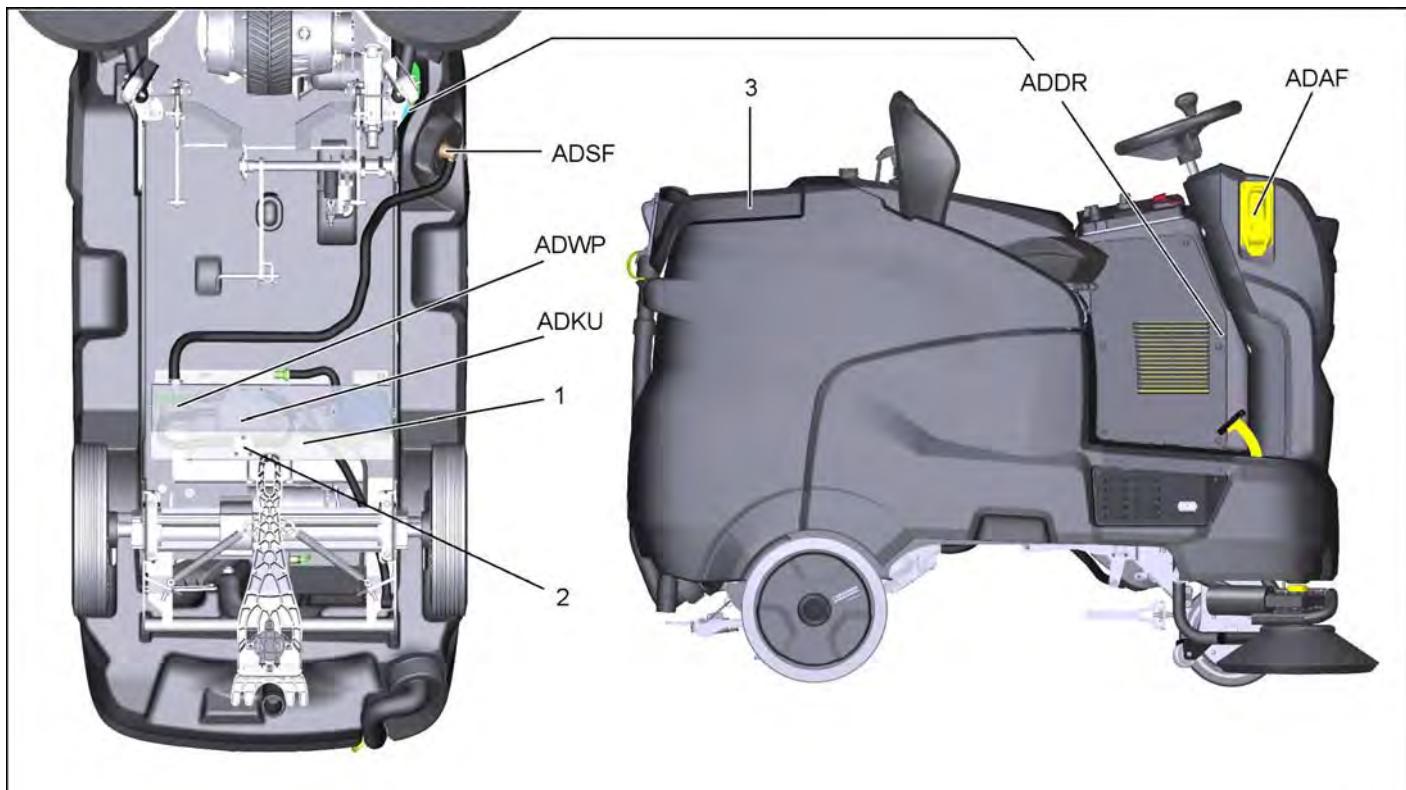
AD Service group water system

010 Safety information

Observe general safety information!

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

020 Overview



- 1 Dismantling the pump unit carrier
- 2 Clean the flowmeter
- 3 Replacing the waste water tank cover
ADAF Completely uninstall / install auto fill-in
ADKU Uninstall / install electric ball valve
ADWP Uninstall/install water pump
ADDR installing/removing pressure sensor fresh water tank
ADSF fresh water tank strainer

030 Function

Auto Fill-In



For the quick filling of the fresh water tank.
If the automatic shut-off does not react, the water will flow out of the safety overflow.

- Connect the water hose with the quick coupling.
- Open the water tap.
The fill process stops automatically as soon as the tank is full.
- Turn off tap.
- Pull off the water hose.

Function

The water will run into the tank via the quick coupling and the water filter through the valve.

Here, the water flows through the small diaphragm bore, pushes the diaphragm back at the same time and opens the valve.

The float is pressed upwards once the fresh water tank is full.

After the seal of the float linkage closes the outlet opening, a stronger water pressure builds up behind the diaphragm and closes the valve.

NOTICE

If the form hose is not installed, water will spray out of the safety overflow opening during the tank filling process.

Notes regarding removal

- The water filter cannot be replaced.
- The cover is clamped on and can be pushed out.
- The seal of the safety overflow can be pushed out of the front plate.
- The O-ring seal can be taken out of the front plate.

Drain off clean water



The fresh water tank can be emptied manually.

- Place the appliance above a floor drain.
- Disengage the grey lock ring.
- Drain water.

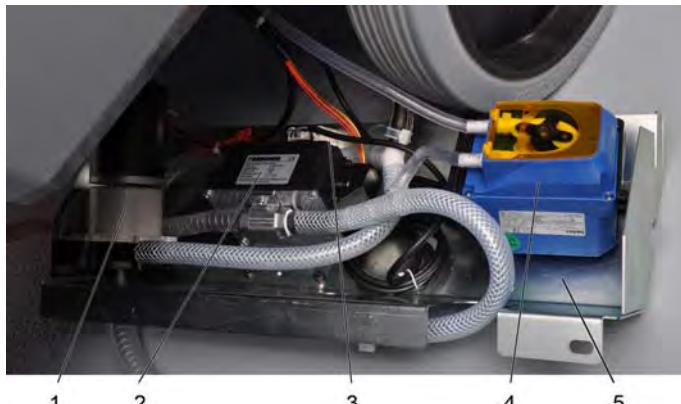


A strainer is inserted in the cap for protection of the fresh water pipe system and the fresh water pump.

- Remove the strainer from the cap and clean if necessary.

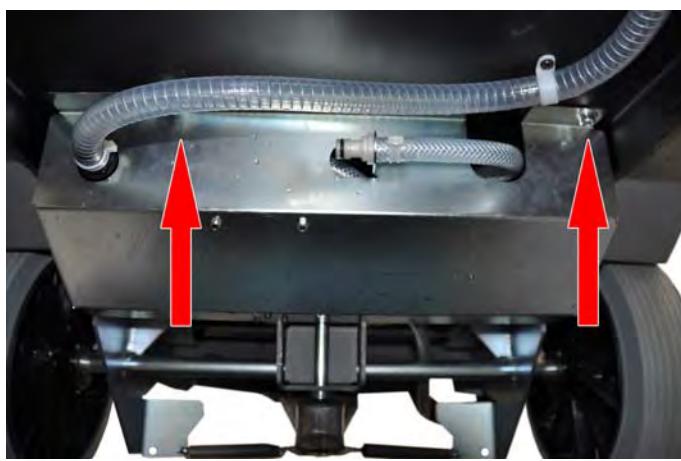
040 Service activities

Dismantling the pump unit carrier



Water pump, detergent dosing pump, flow meter and electric ball valve are installed in the appliance on a joint carrier.

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

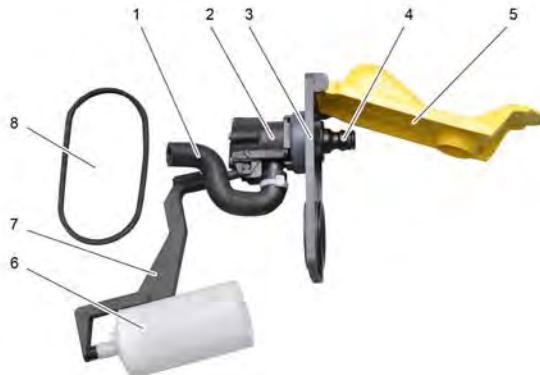


- Unscrew the screws on the carrier.
- Remove the carrier from the appliance towards the bottom.

NOTICE

Cables and wires are bundled by means of cable ties. If the carrier cannot be completely pulled out of the appliance, cut the cable ties.

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

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

NOTICE

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





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

NOTICE

The preformed hose must not be kinked during installation. 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.

ADKU Uninstall / install electric ball valve



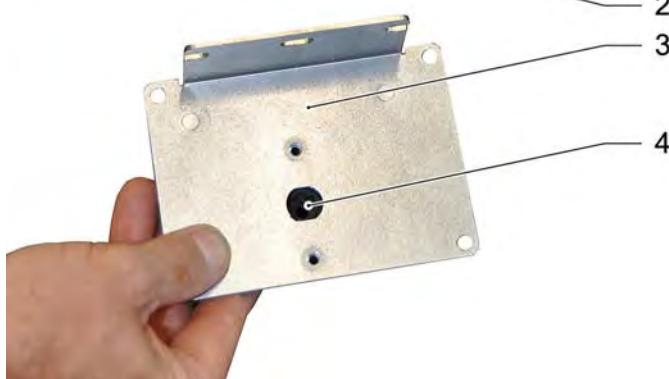
- 1 Hose clip
- 2 Screws
- 3 Electric ball valve

- Dismantle the pump unit carrier.
- Remove water hoses.
- Unscrew the screws.
- Remove the electric ball valve from the pump unit carrier.



- 1 Ball tap
- 2 Ball cock actuator
- 3 Angle plate
- 4 Electric drive ball valve

- Remove the screws from the support plate.
- Remove the drive from the angle plate.
- Disconnect the electrical connectors from the drive.

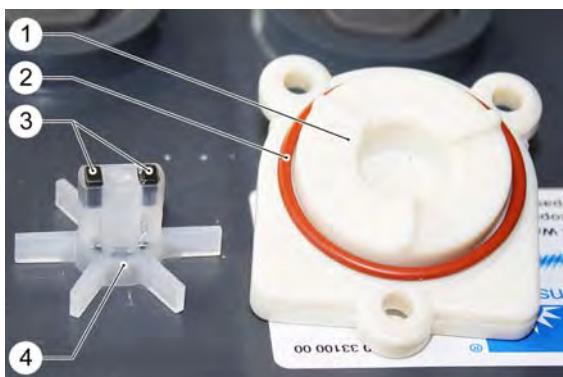


Clean the flowmeter



The flow meter is located in the pump unit carrier behind the electric ball valve.

- Unscrew the screws.
- Remove the flow meter from the carrier.
- Remove the cable plug.
- Unscrew the screws of the casing.



- 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.

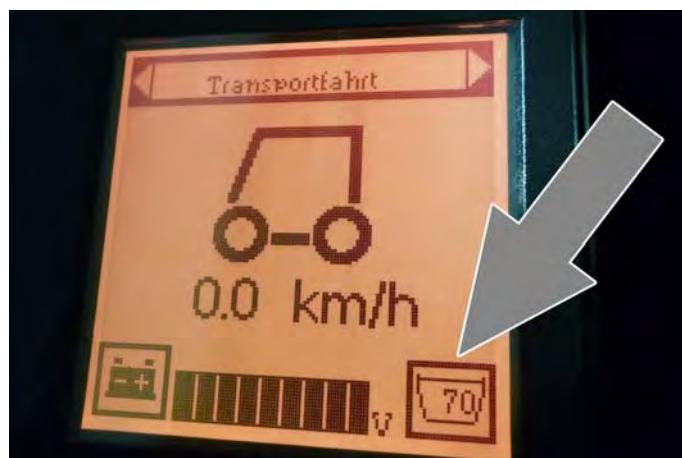


ADWP Uninstall/install water pump

■ Dismantling the pump unit carrier

- Dismantle the pump unit carrier.
- Unscrew three screws.
- Disconnect the plug-in contacts.
- Remove the water hoses.
- Remove the water pump from the carrier.

ADDR installing/removing pressure sensor fresh water tank



The pressure sensor measures the water level in the fresh water tank.

The display is updated every 3 seconds.

The result is shown on the display in percent.

If the tank is empty, the message "Fresh water tank empty" is issued and the water pump is switched off. The electric ball valve is closed.

NOTICE

If the pressure sensor is faulty, the components are not switched off when the tank is empty and the tank filling level indicator does not change.

Version 1

- 1 Pressure sensor

The pressure sensor is fitted underneath the fresh water tank.

Installation information

Do not fill the fresh water tank until the pressure sensor is installed completely.

ATTENTION

Ensure there is a cushion of air in the hose between the fresh water tank and the pressure sensor.

The pressure sensor must not come into contact with any water.

Version 2

- 1 Pressure sensor

Pressure sensor installed in the e-cabinet

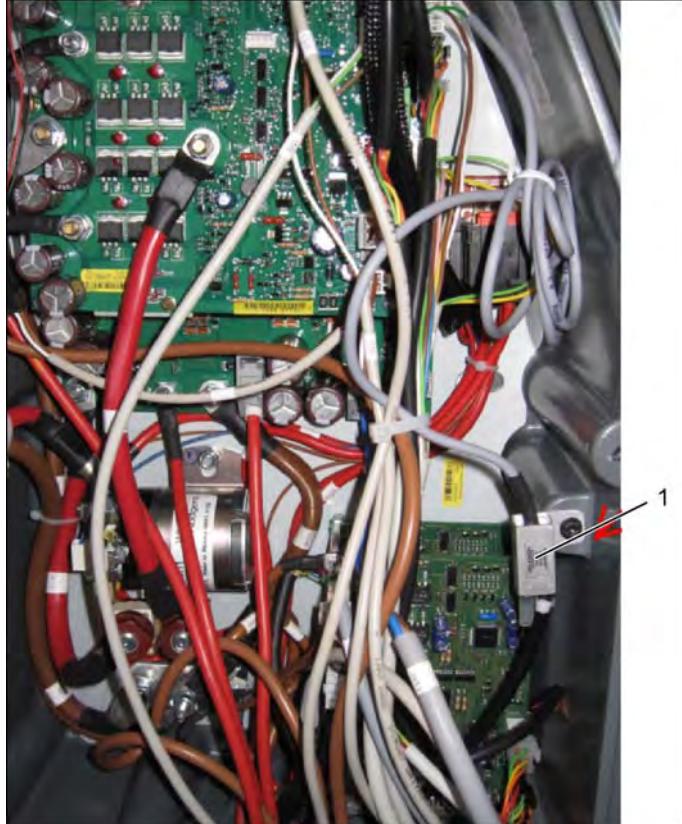
Installation information

Do not fill the fresh water tank until the pressure sensor is installed completely.

ATTENTION

Ensure there is a cushion of air in the hose between the fresh water tank and the pressure sensor.

The pressure sensor must not come into contact with any water.





Version 3

Pressure sensor underneath the side cover in the foot room of the device.

- Unscrew the screws of the appliance electronics cover.
- Remove cover.

1 Plug-in location

X7

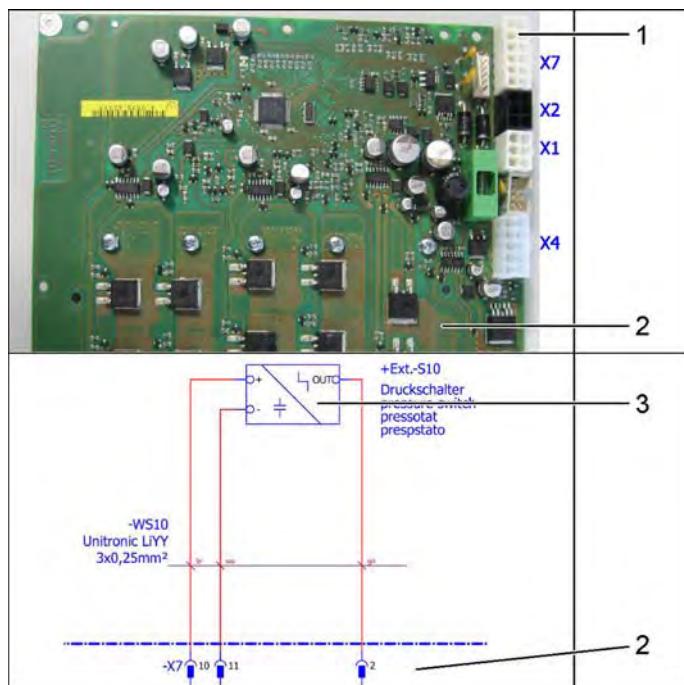
2 Printed board

Clean module

3 Pressure sensor

- Unplug the electrical cables of the pressure sensor at socket X7.
Sockets 2,10 and 11.

Please observe the current circuit diagram.



→ Unscrew the screws of the steering column cover.



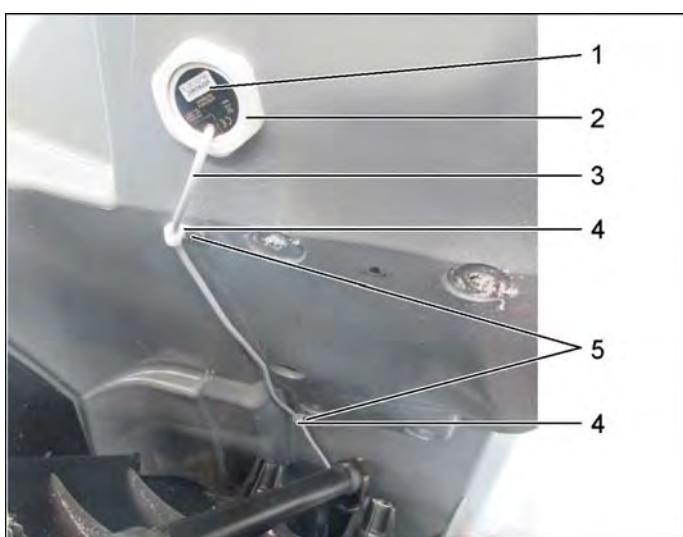
→ Swivel the cover towards the driver seat.



Installation information

Do not fill the fresh water tank until the pressure sensor is installed completely.

View from above



1 Pressure sensor

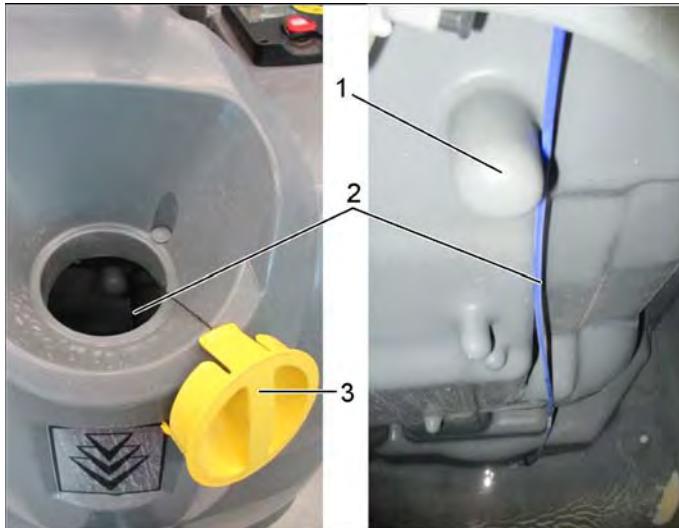
2 Screw connections

3 Wiring

4 Wiring fastener

→ Remove the electric line from the wiring fastener.

→ Remove the screw connection.



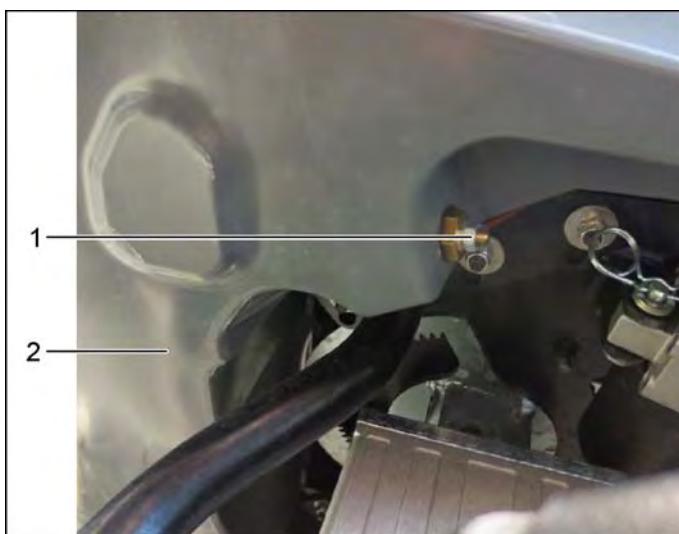
- 1 Guidance
- 2 Wiring
- 3 Fresh water tank cover

→ Remove the lid from the fresh water reservoir.
→ Remove the pressure sensor through the fresh water tank opening.

Installation information

Mind correct installation of the lines.

Route the pressure sensor electric cables (in travel direction) to the left of the guide.



- 1 Fresh water tank earth connection
- 2 Fresh water tank

Note

The pressure sensor will not function correctly if there is no earth connection to the fresh water tank.

View from below:

Check the pressure sensor on the clean module

The following voltages can be measured:	Measured between:	Result:
Input voltage	X7/10 - X7/11	13 V
Output voltage (depending on the resistance)	X7/2 - X7/11	0,3 V - 3,8 V

ADSF fresh water tank strainer



In order to protect all components from contamination, there is a filter sieve installed between the tank and the screw-on lid.

- Open the closure of the fresh water tank.



- Remove the sieve from the cap and clean it, replace in case of damage.

NOTICE

The sieve simultaneously serves as a sealing ring. Replace the sieve if the screw connection is leaking.

Replacing the waste water tank cover



- Open the waste water tank cover by 90°



- Push the tank out of the hinge towards the operator's seat.
- Close the waste water tank cover and remove it from the hinge towards the top.

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.

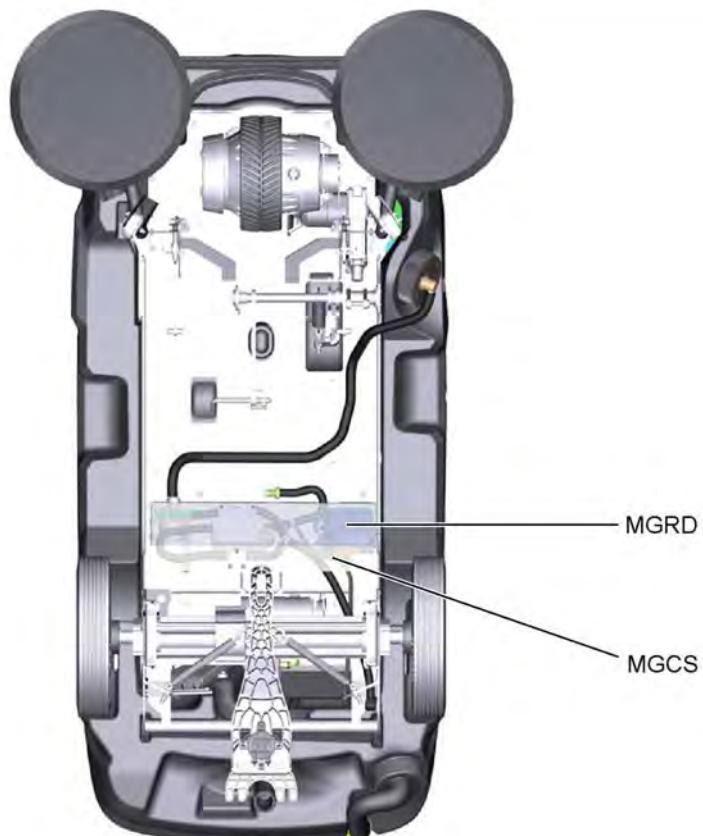
MG Service group detergent dosing unit

010 Safety information

For this service group there is no special safety information.

Observe general safety information!

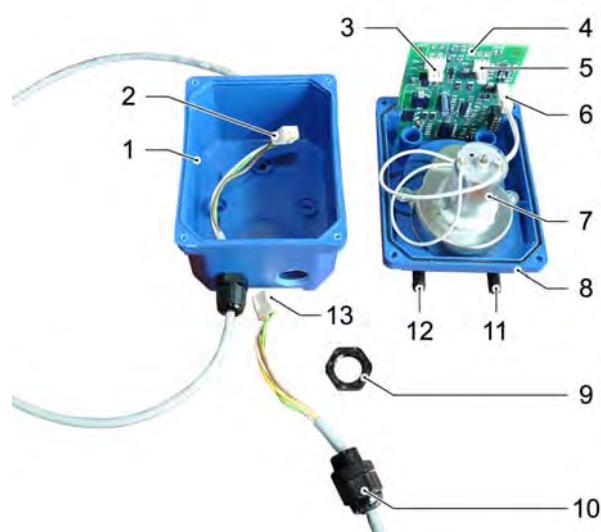
020 Overview



MGRD Uninstall / install detergent dosing pump

MGCS Uninstall / install dosing hose

Construction of the detergent pump



- 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

030 Function

Detergent dosing (DOSE)

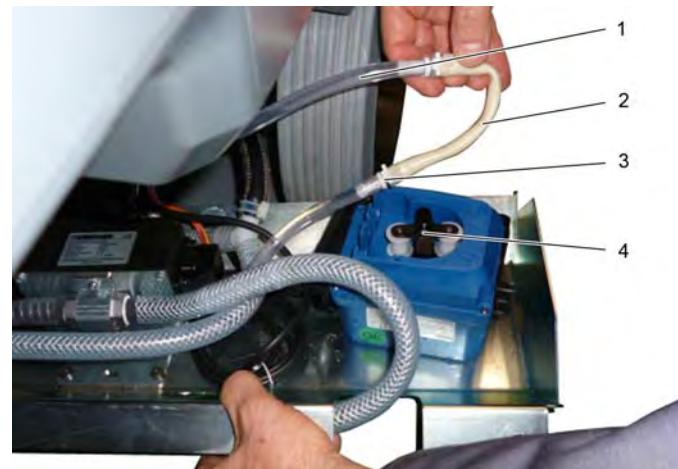
Detergent is added to the fresh water on the way to the cleaning head with the help of a dosaging device.



- Place the detergent bottle into the device.
- Close the bottle lid.
- Insert the suction hose of the dosaging equipment into the bottle.

040 Service activities

MGCS Uninstall / install dosing hose



MGRD Uninstall / install detergent dosing pump



NOTICE

The metering device can be used to add 3% of detergent at maximum. In case of a higher dose the detergent must be poured into the fresh water tank.

⚠ CAUTION

Risk of clogging due to dried detergent when the detergent is added to a fresh water tank of the Dose version. The flow meter of the dosing equipment can agglutinate on account of drying detergent and hamper the functioning of the dosing equipment. Subsequently rinse the fresh water tank and the appliance with clear water.

NOTICE

The appliance is equipped with a fresh water level display. If the fresh water tank is empty, then the function of adding detergent gets deactivated. The cleaning head continues to work without the addition of any liquid.

- 1 Detergent hose
- 2 Pump hose
- 3 Hose nipple
- 4 Pump wheel

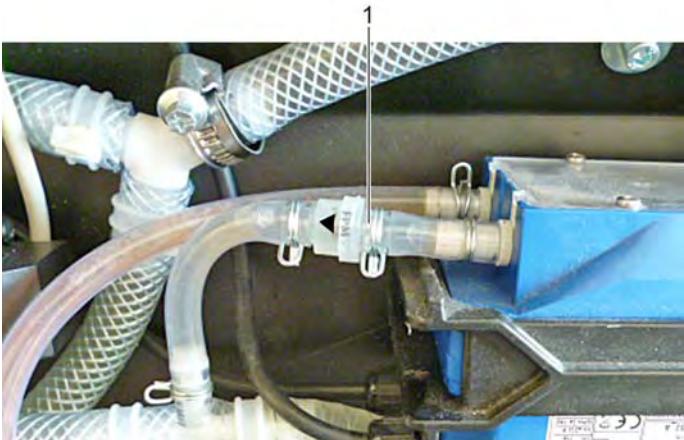
- Remove the detergent pump.
- Remove the lid.
- Remove the pump hose from the pump wheel.
- Remove the cable ties.
- Remove the pump hose.
- Install the new pump hose.
- Check the function of the pump.

- Unscrew the screws.

- Remove the detergent hoses from the detergent dosing.

Hold the detergent hoses up and secure them to prevent detergent from leaking out.

- Remove the cable.



Installation information

1 Check valve

A check valve for preventing unintentional emission of the cleaning agent is installed at the dosing pump outlet. Observe the flow direction during the installation.

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.

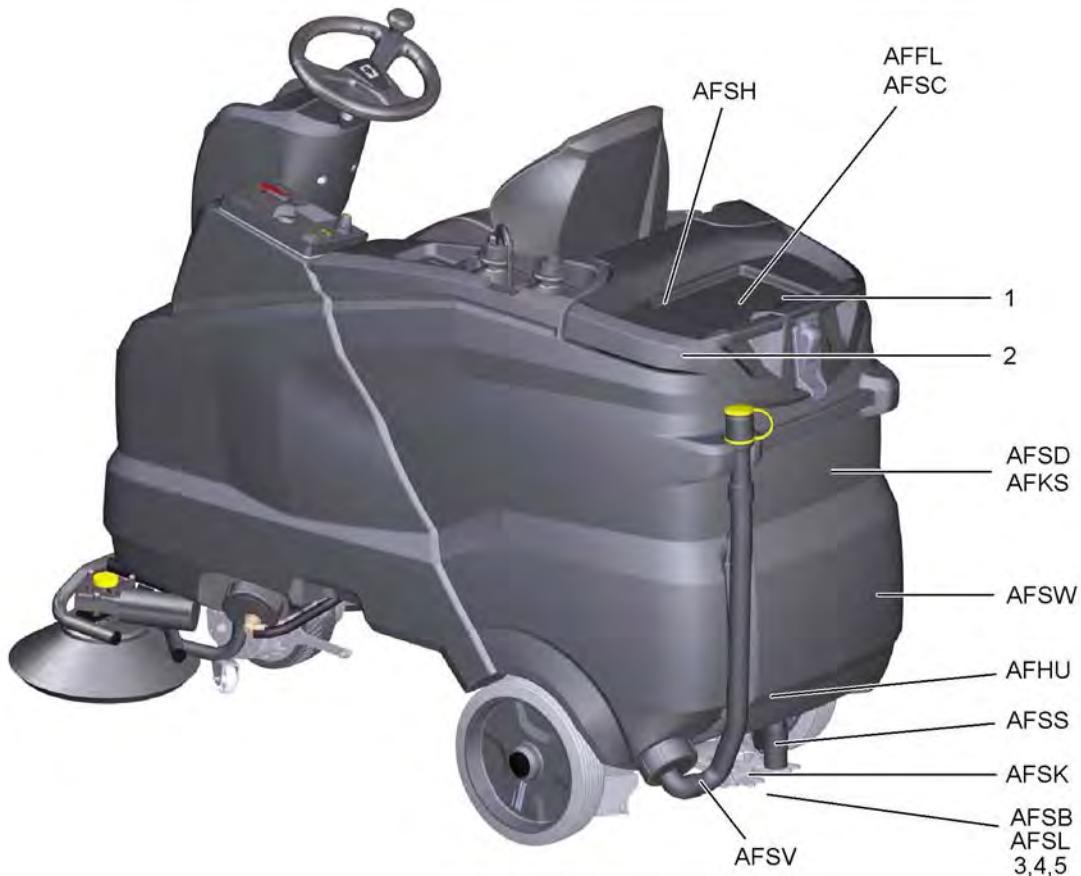
AF Service group suction system

010 Safety information

Observe general safety information!

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

020 Overview



- 1 Replacing the lint trap
 - 2 Replacing the dirt strainer
 - 3 Vacuum bar installation
 - 4 Clean the suction bar
 - 5 Setting the vacuum Bar
- AFSH Removing/installing the float switch
AFSC Uninstalling/installing float of the waste water tank
AFFL Cleaning/ replacing lint trap of the waste water tank
AFSD Uninstall / install suction turbine
AFKS Uninstall / install sliding contacts of the suction turbine
AFSW Uninstall / install waste water tank
AFHU Uninstall / install lifting motor suction bar
AFSE Uninstalling/ installing suction hose
AFSK swing arm vacuum bar lifting unit
AFSB Uninstall/ install suction bar
AFSL Uninstall/ install suction lips
AFSV drain hose waste water

030 Function

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.

The suction turbine creates a vacuum in the waste water tank.

The waste water is thus pumped from the vacuum bar into the waste water reservoir through the suction hose.

If the waste water tank is full, the float closes the suction opening.

Note

The suction turbine shuts off automatically when the waste water tank is full.

The suction turbine overheats if it does not suction in air for a long time.

After the device has been switched off, the suction turbine will continue to run to suck out the residual water from the suction hose (after-running time).

Suction turbine

The suction turbine has a trailing time of 10 seconds after the programme selector switch has been set to a programme without suctioning.



The suction turbine is installed in the waste water tank underneath the intake port cover.

Tank rinsing system

The wastewater tank is cleaned after the cleaning process via the nozzle system.



- 1 Connecting piece
- 2 Connection hose
- 3 Spray nozzle

- Open the lock.
- Connect the water hose via the quick coupling.
- Place the wastewater drain hose over a suitable drain and open the locking cap.
- Open the water tap and rinse the tank.

040 Service activities

Note

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

AFSC Uninstalling/installing float of the waste water tank

The float is installed in the waste water tank cover.



In order to protect the suction turbine, the intake port is closed by means of a float when the wastewater tank is full.



- Squeeze the retainer and remove the float.
- Replace damaged float (poor sealing effect, soiling of the lint trap and damage of the suction turbine)

AFFL Cleaning/ replacing lint trap of the waste water tank



Turn the lint trap in a counter-clockwise direction and remove it (bayonet catch).

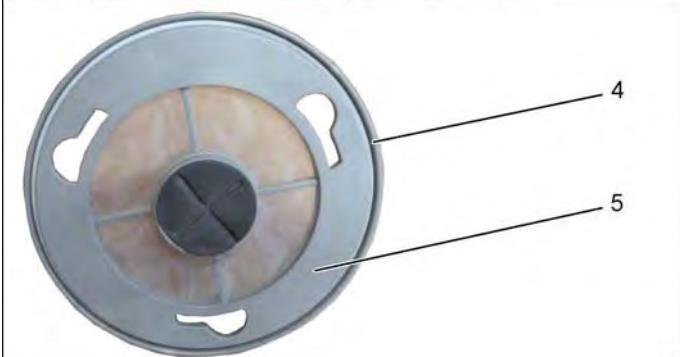


- 1 Intake
- 2 Seal disc
- 3 Cover waste water tank
- 4 Sealing profile
- 5 Fluff filter

Installation information

Ensure the correct seating of the sealing profile in the fluff filter.

Ensure correct seating of the sealing washer in the intake.



AFSH Removing/installing the float switch



A float switch is installed in the waste water tank to monitor the filling level.

The magnetic float causes the contact of the reed switch to close when the wastewater tank is full.

10 seconds after the contact is triggered, the suction turbine is switched off and a message is issued in the display.

- ➔ Unscrew the screw connection on the cable bushing.
- ➔ Pull the float switch out of the retainer.

NOTICE

Ensure proper fitting position of the float switch. The reversed installation of the float switch causes the suction turbine to switch off with an empty wastewater tank.

AFSD Uninstall / install suction turbine



The suction turbine is installed in the waste water tank underneath the intake port cover.

- Tilt the waste water tank backwards.
- Unscrew 8 screws of the intake port cover.
- Remove the intake port cover.



- Disconnect the plug-in connection of the suction turbine.
- Unscrew the screws.



- Remove the suction turbine from the casing.
- Check the seals for damage, replace if necessary.

AFKS Uninstall / install sliding contacts of the suction turbine



→ Remove the protective casing of the suction turbine.



→ Remove the contact springs from the sliding contacts.



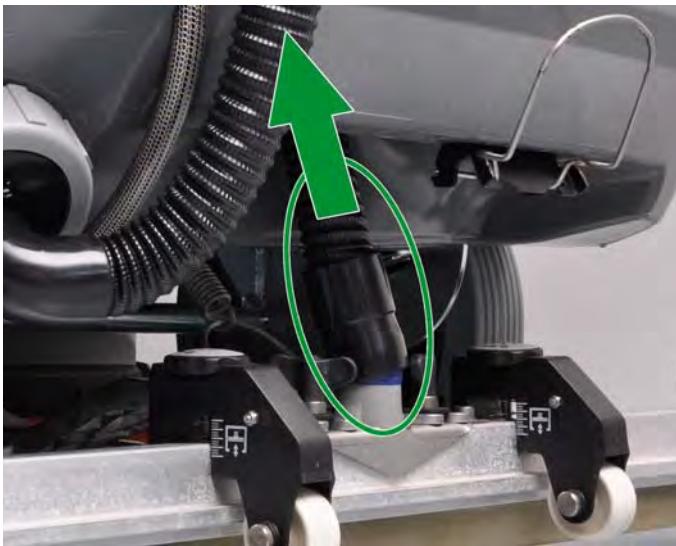
→ Pull the sliding contact out of the duct.
→ Install a new glide contact; no adjustments necessary.

Replacing the lint trap



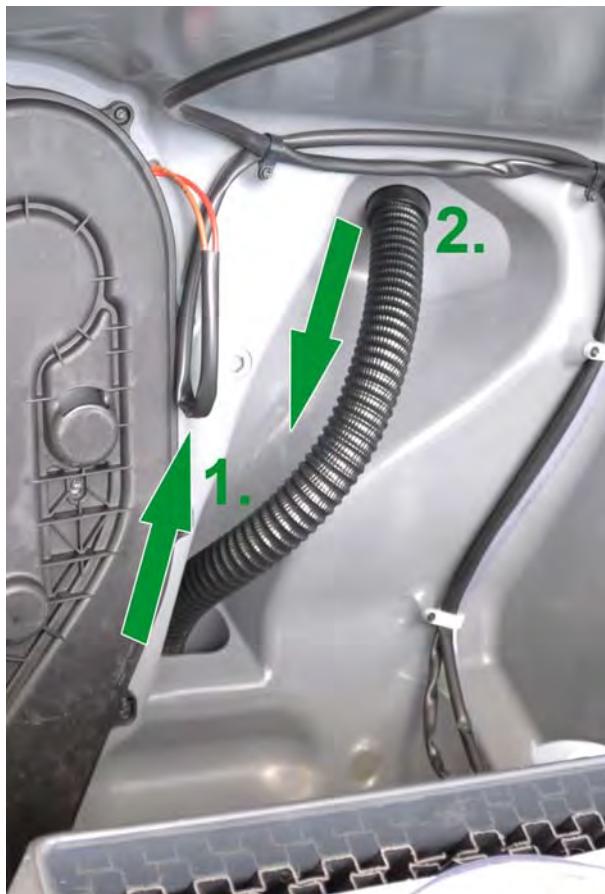
- Pull the lint trap off the intake port towards the top.
- Clean sieve, replace if damaged.

AFSE Uninstalling/ installing suction hose

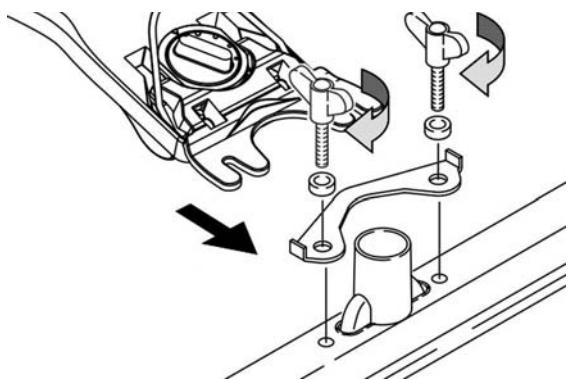


- Pull out the suction hose from the vacuum bar.
- Tilt the waste water tank backwards.

- Pull the suction hose out of the appliance.



AFSB Uninstall/ install suction bar



- Pull off the suction hose.
- Loosen the wing nuts.
- Pull the vacuum bar out of the vacuum bar suspension.

■ Setting the vacuum Bar

Vacuum bar installation



Note

The vacuum bar must be installed as shown to prevent the suction bar rocker from breaking.

Important: the sheet metal part and the sleeve between the suction bar rocker and wing nut must be installed.

- 1 Aluminium
5.035-355.0
2 Welded sheet metal version
4.035-212.0
This part number includes sheet metal part 5.036-102.0.

- Version 1 was made out of aluminium.
- Version 2 is welded out of sheet steel.
With this version, the sheet metal part must be thinned to allow the suction bar to be installed completely in the intake. The aluminium version can be replaced with the welded one.



AFSK swing arm vacuum bar lifting unit

■ AFSB Uninstall/ install suction bar

The vacuum bar is lifted by means of a lifting motor. Two springs stabilise the vacuum bar at the side.



- Unscrew the screws of the lifting motor mount.
- Unscrew the screws on the retaining plate of the springs.

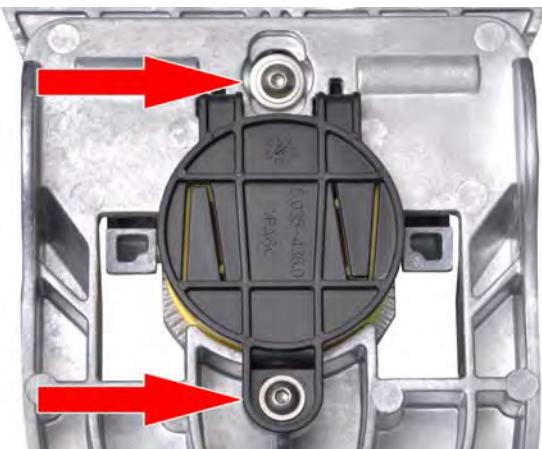


- Loosen the screws of the axle, hold up the top of the axle.
- Pull the vacuum bar lifting device with the plastic sleeves off the axle.





- 1 Counter support
- 2 Cover of rotary handle
- 3 Turning handle
- 4 Link
- 5 Spring
- 6 Lifting motor, spring and retaining clamp



- Unscrew the screws on the counter support and the cover of the rotary handle.
- Remove the cover of the rotary handle and the counter support from the swing arm.



- When installing the vacuum bar suspension, pay attention to the correct order of the plastic sleeves.

NOTICE
Replace damaged plastic sleeves.

■ *Setting the vacuum Bar*

AFSL Uninstall/ install suction lips

■ AFSB Uninstall/ install suction bar

If the suction lips are worn down by about 1 cm, they must be reversed.

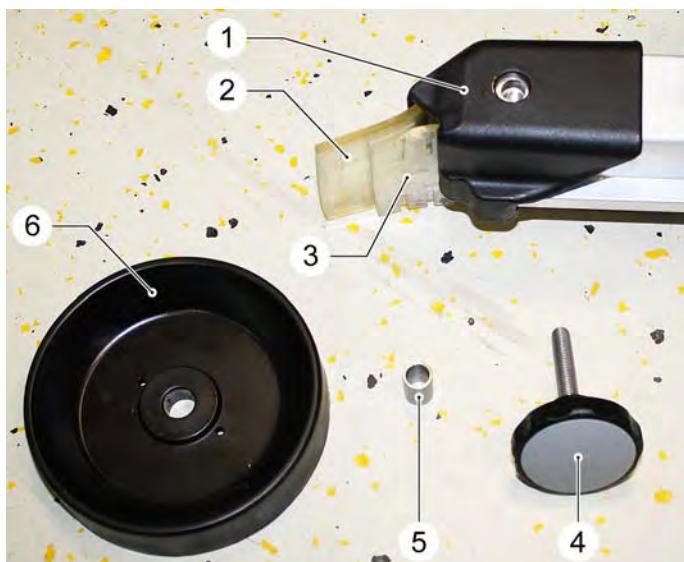
- 1 Star handle screw
- 2 Deflector disc

→ Loosen the star handle screws on both sides of the vacuum bar.



- 1 Suction lip holder
- 2 Rear vacuum lip
- 3 Front vacuum lip
- 4 Star handle screw
- 5 Sleeve
- 6 Deflector disc

→ Remove the deflector discs.



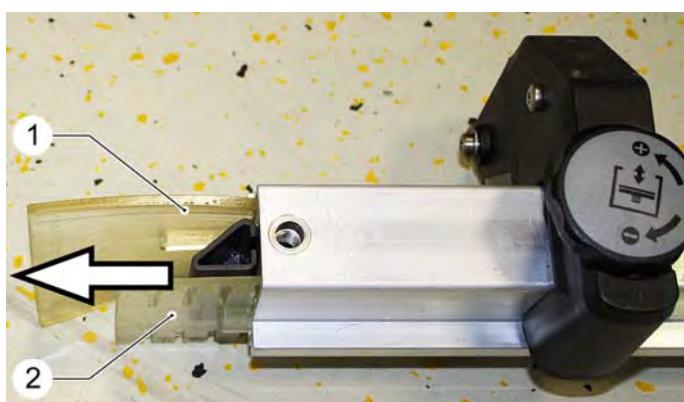
- 1 Suction lip holder

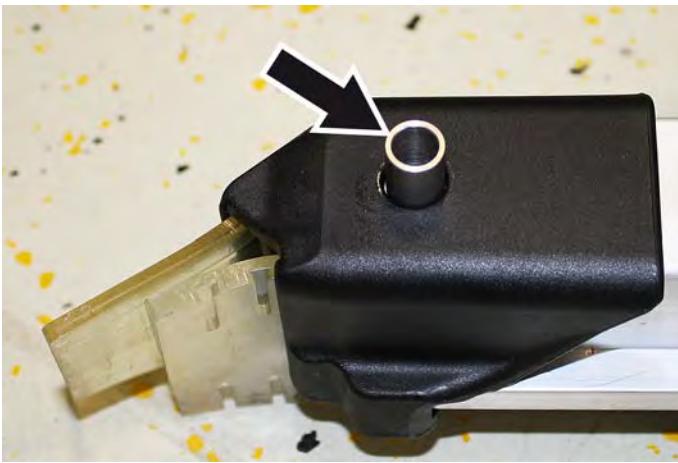
→ Pull the suction lip holder off on both sides.



- 1 Rear vacuum lip
- 2 Front vacuum lip

→ Pull the suction lips out on the side, replace if required





→ When assembling the vacuum bar ensure the correct seating of the sleeve.

■ *Setting the vacuum Bar*

Replacing the dirt strainer



- Remove the dirt strainer from the retainer and clean it, replace in case of damage.
- Pay attention to the correct fitting position during installation.

AFSV drain hose waste water



- Open and remove the closure of the waste water tank.



- Remove the wastewater hose from the threaded ring and replace it.

NOTICE

The wastewater drain hose simultaneously serves as a sealing ring. Replace the wastewater drain hose if the screw connection is leaking.

AFSW Uninstall / install waste water tank

- Empty the waste water tank.
- Tilt the waste water tank backwards.

→ Dismantle stop on both sides.



- Open distributor casing.
- Disconnect the following plug-in connections:
 - Suction turbine
 - Beacon lamp
 - Float switch
 - Seat contact switch

→ Lift the waste water tank out of the revolute joint towards the top and then remove it towards the back.

⚠ WARNING

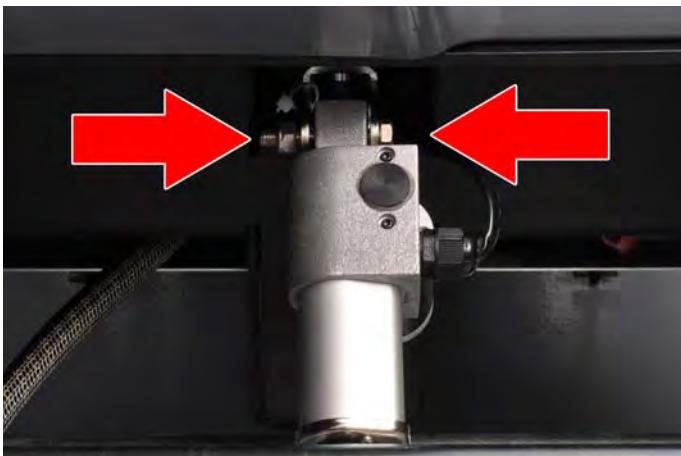
Risk of injury! Tank is heavy. Two people are required for removal. Risk of damage! Do not use other aids (crane, forklift) to lift the tank out of the appliance.

→ Lay the waste water tank down on the rear side.



AFHU Uninstall / install lifting motor suction bar

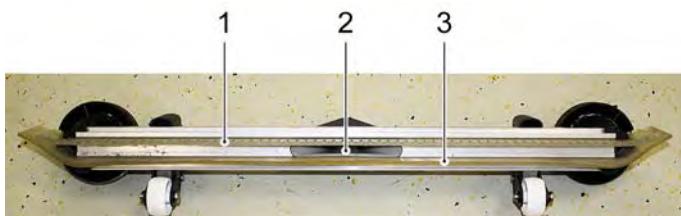
- Completely extend the lifting motor.
- Disconnect the electrical connection on the lifting motor.
- ➔ Unscrew the screw and the lock nut of the spring seat.



- ➔ Unscrew the screw and the lock nut on the lifting motor mount.
- ➔ Remove lifting motor.

050 Maintenance and inspection

Clean the suction bar



- 1 Front vacuum lip
- 2 Suction support
- 3 Rear vacuum lip

- Clean the suction lips.
- Clean the contamination off the vacuum stub.

Setting the vacuum Bar

Basic setting of straight suction bars

Adjust the suction bar so that the rear suction lip bends slightly when driving forwards.

To optimise on different ground surfaces, the inclination of the suction bar can be moved up to 5°.

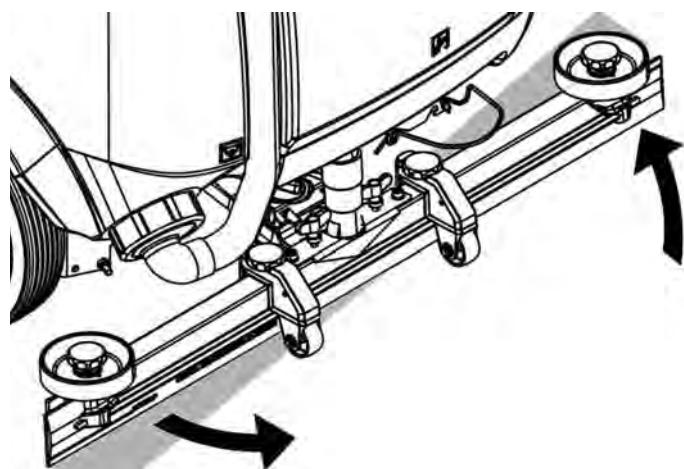
Basic setting of bent suction bars

The suction bar must be adjusted horizontally. The rear suction lip should bend slightly when driving forwards.

Basic setting support roll

When driving forwards, the support roll should move along slightly too. Note that the rear suction lip is bent slightly.

Oblique position



To improve the vacuuming result on tiled floors the vacuum bar can be turned to an oblique position of up to 5°.

- Release the wing nuts.
- Turn the vacuum bar.
- Tighten the wing nuts.

If the vacuum result is unsatisfactory the inclination of the straight vacuum bar can be modified.

- 1 Quick tensioner
- 2 Turning handle

- Open the quick tensioning lever.
- Adjust the rotary handle to incline the suction bar.
- Close the quick tensioner.

NOTE

The quick tensioning lever prevents the inclination of the suction bar from changing during transport.

- *AFSB Uninstall/ install suction bar*

060 Error diagnosis

The service group does not contain any error diagnosis.

070 Peculiarities/ others

The service group does not contain any peculiarities.

AJ Service group cleaning head

010 Safety information

Observe general safety information!

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

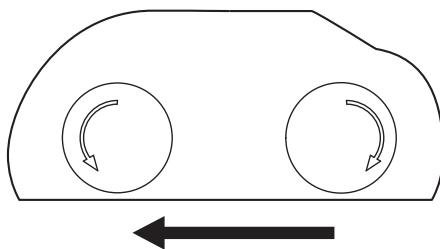
020 Overview



- 1 Replace the bow with sealing lip and deflector roller (BR model "S" only)
AJBW Uninstall/ install the cleaning head completely
AJAX Removing/installing the drive belt
AJNE Uninstalling/ installing pulley of the drive
AJAC installing/uninstalling axle brush retainer
AJME Uninstalling/ installing brush motor
AJKE Uninstalling/ installing sliding contacts of brush motor

030 Function

R head



The two roller brushes have the same speed and opposite rotation directions.

Each roller brush is driven by a separate motor and timing belt.

The brush rollers are switched off automatically if the brush motors are overloaded, e.g., due to too high contact pressure or blockage of the cleaning brushes.

040 Service activities

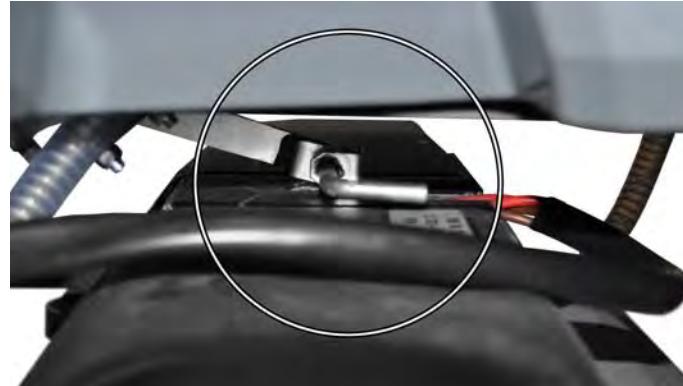
AJBW uninstall/ install the cleaning head completely

- Select test mode.
- Lower the cleaning head.

→ Disconnect the connector for the water connection.



→ Pull out the safety pin.



- 1 Drawbar
- 2 Unlocking button

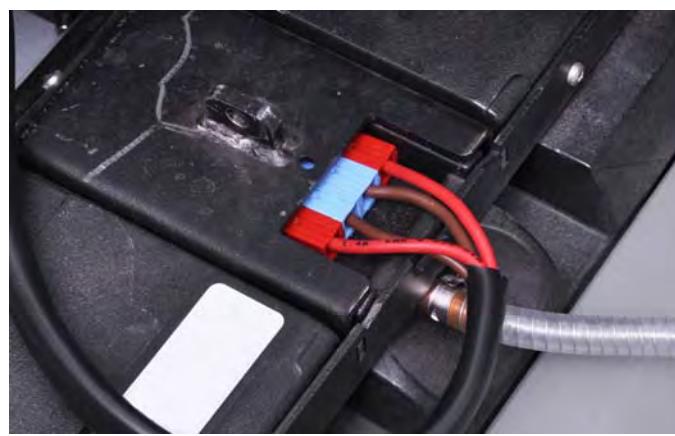
→ Remove the unlocking button on BR, on BD push it in.

→ Unhook the pull rod on the cleaning head.

→ Pull the cleaning head out of the appliance.



→ Disconnect the electrical connection on the cleaning head.



AJAX Removing/installing the drive belt



- 1 Cover, drive belt
- 2 Screws

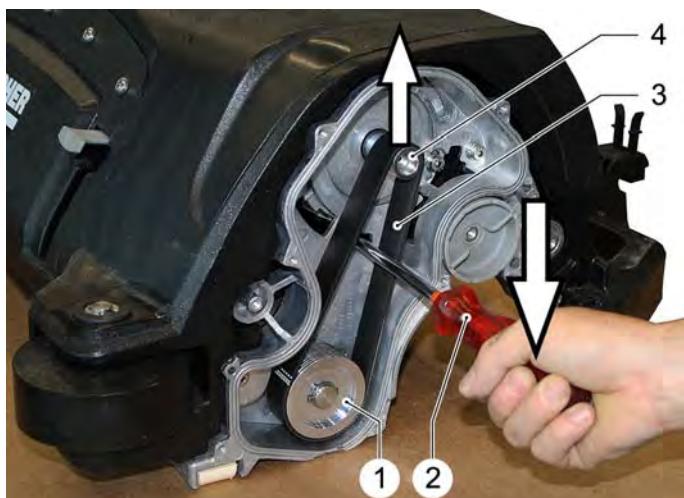
→ Unscrew the screws and remove the lid.



→ Loosen the screws on the motor.

→ Remove the drive belt.

→ Insert a new drive belt.

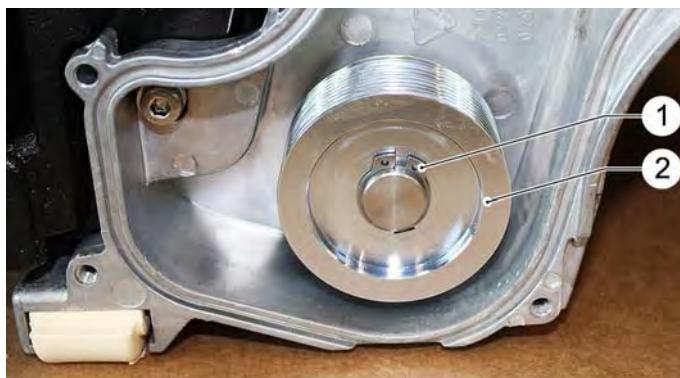


- 1 Pulley
- 2 Screwdriver
- 3 Drive belt
- 4 Drive pinion

→ Lift the motor up with a screwdriver and tension the drive belt.

→ Tighten the screws on the motor.

AJNE Uninstalling/ installing pulley of the drive



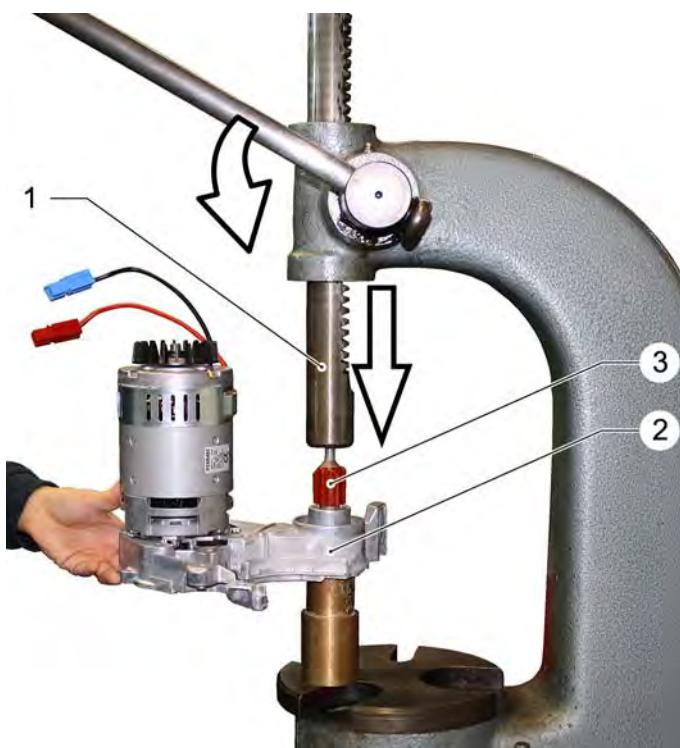
- 1 Safety ring
- 2 Pulley

→ Remove the drive belt.
→ Remove the safety ring.



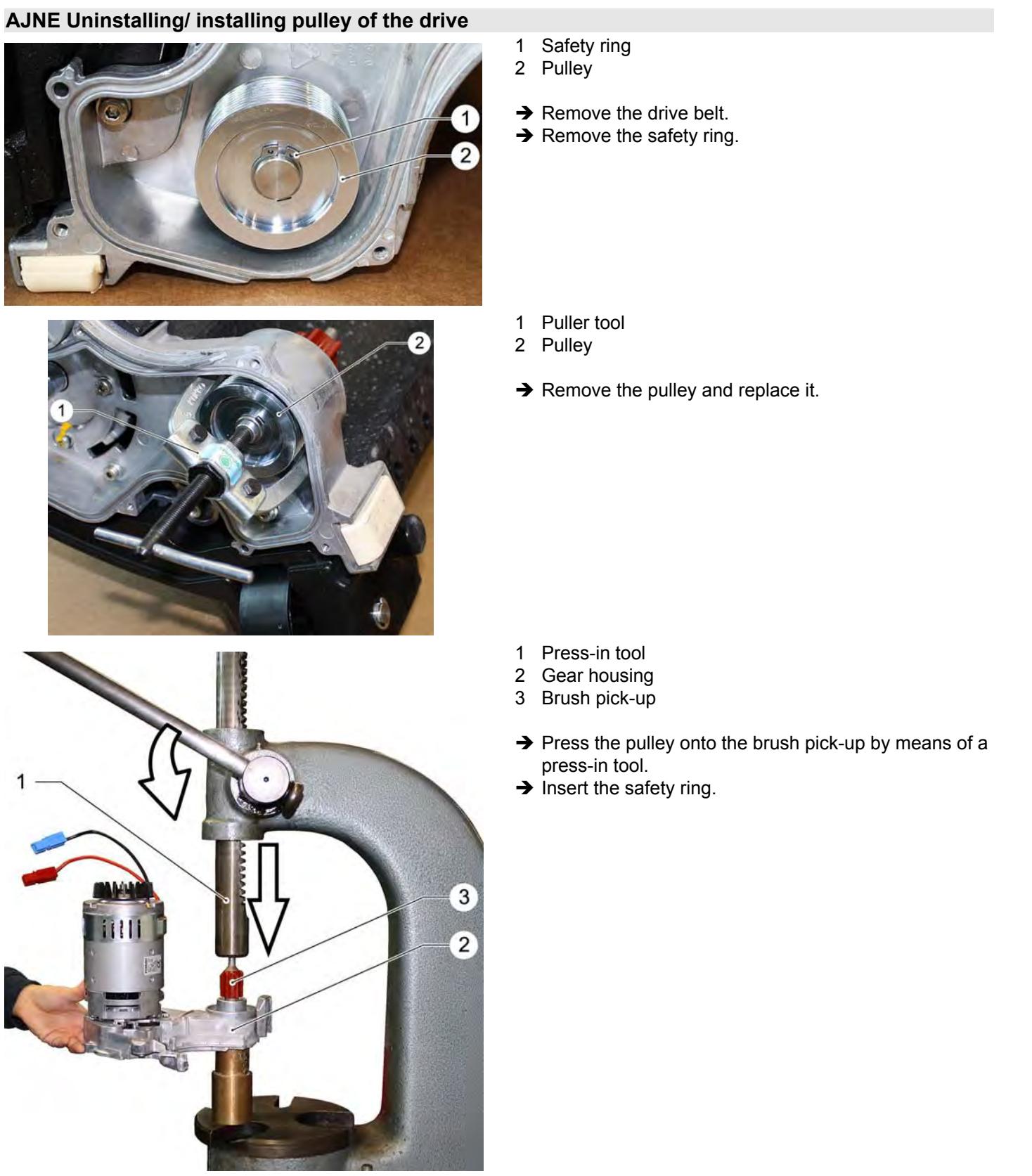
- 1 Puller tool
- 2 Pulley

→ Remove the pulley and replace it.



- 1 Press-in tool
- 2 Gear housing
- 3 Brush pick-up

→ Press the pulley onto the brush pick-up by means of a press-in tool.
→ Insert the safety ring.



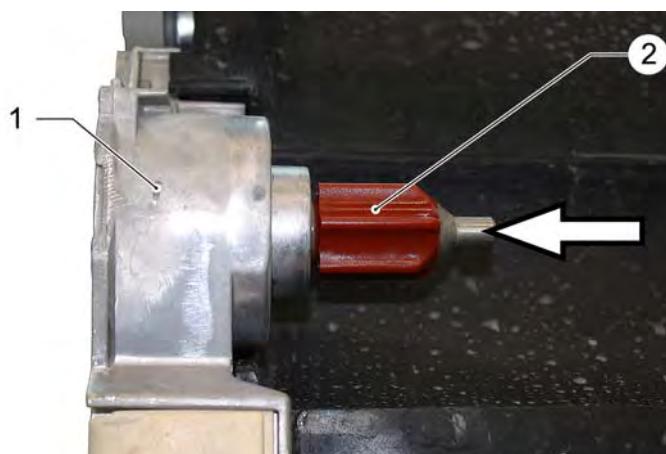
AJAC installing/uninstalling axle brush retainer



1 Safety ring

2 Axle

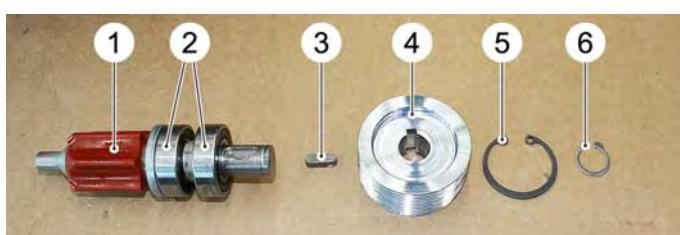
- Remove the brush rollers from the brush head.
- Remove the pulley.
- Remove the safety ring.



1 Gear housing

2 Axle with brush roller intake

- Lightly strike the axle with a rubber hammer. Drive the axle out of the casing.



1 Axle with brush roller intake

2 Ball bearing

3 Fitting key

4 Pulley

5 Safety ring

6 Safety ring

1 Rubber nose on the brush roller pick-up

2 Washer ring

The rubber nose is used to balance the brush width tolerances.

There is a seal ring on the ball bearing that prevents water from entering the ball bearing.

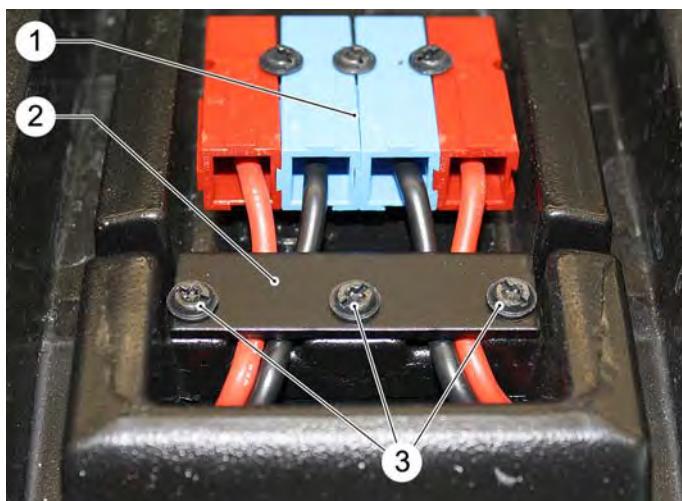


AJME Uninstalling/ installing brush motor



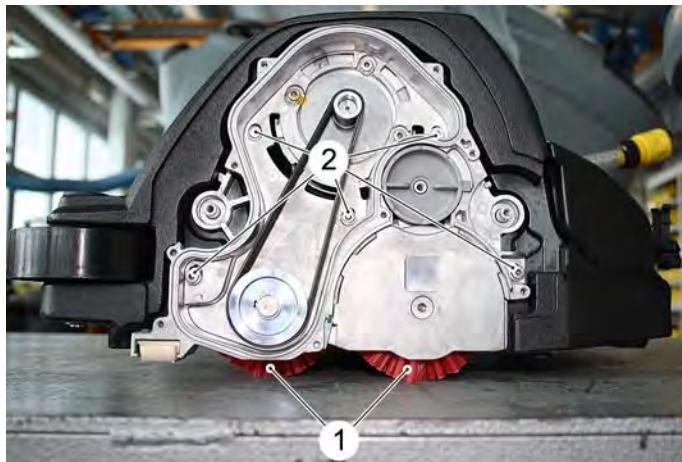
- 1 Cover of brush head plug
- 2 Screws

→ Unscrew the screws.
→ Remove the cover.



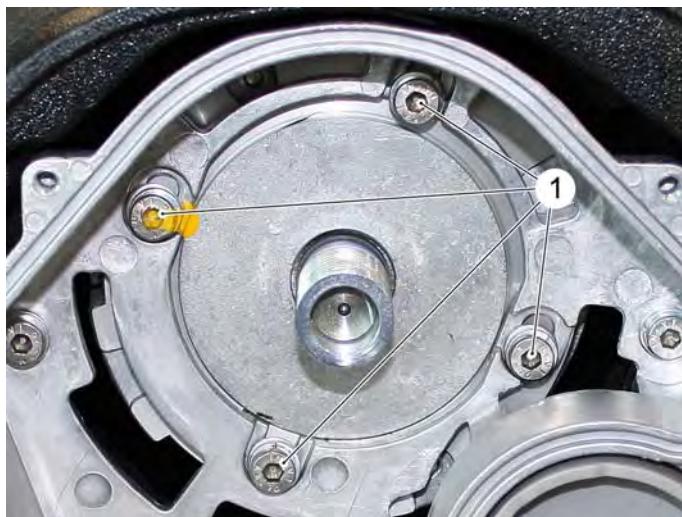
- 1 Brush head plug
- 2 Cable tension guard
- 3 Screws

→ Unscrew the screws.
→ Disconnect the plug elements.
→ Remove the drive belt cover.

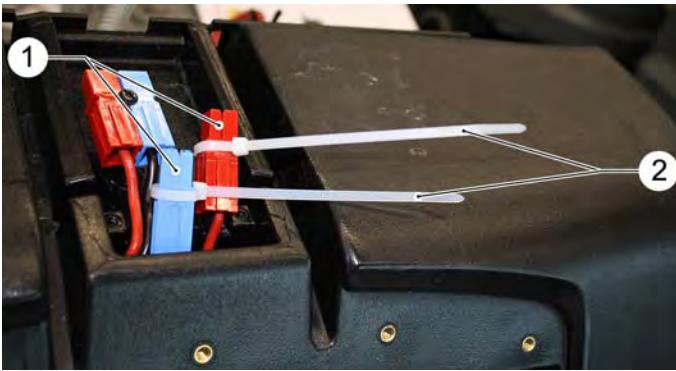


- 1 Brushing rollers
- 2 Screws

→ Remove the brushing rollers.
→ Unscrew the screws and remove gear casing from the brush head.



- 1 Motor screws
- Unscrew the screws.
→ Remove the motor from the gear casing.

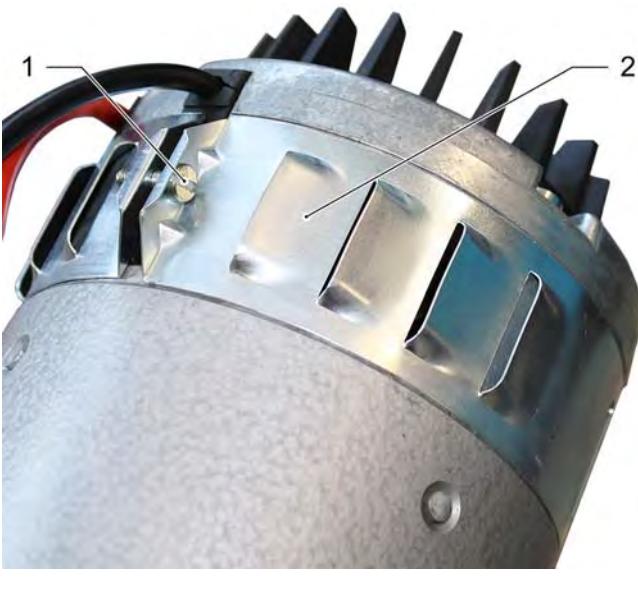


Installation aid

- 1 Plug elements
- 2 Cable connector

→ Install a cable tie as a guide aid on every plug element. The plug elements can be guided through the opening on the brush head easier by using cable ties.

AJKE Uninstalling/ installing sliding contacts of brush motor



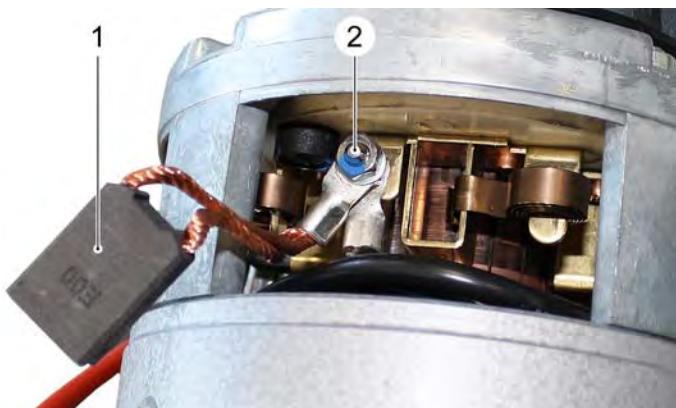
- 1 Screw
- 2 Cover, sliding contacts

→ Remove the brush motor.
→ Unscrew the screw.
→ Remove the cover of the sliding contacts.



- 1 Nut, glide contact
- 2 Glide contact
- 3 Press spring

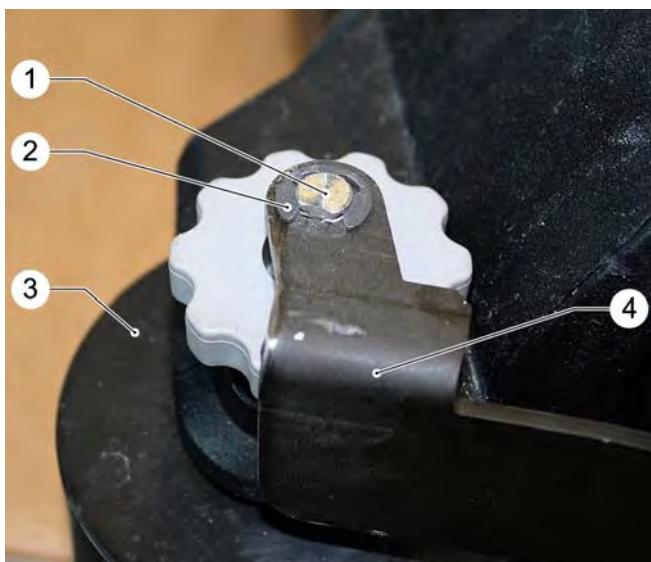
→ Lift the contact spring and pull the glide contact out of the chute.
→ Carefully place the contact spring onto the chute.



- 1 Glide contact
- 2 Nut, glide contact

→ Unscrew the nut and replace the glide contact.
→ Perform this procedure on all four sliding contacts.

Replace the bow with sealing lip and deflector roller (BR model "S" only)



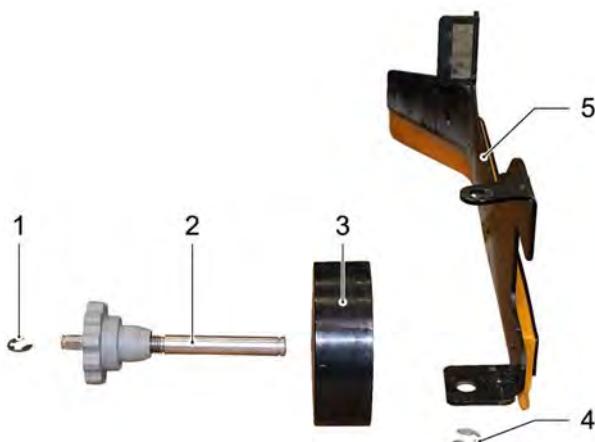
- 1 Axle bolt with star handle
- 2 Safety ring
- 3 Scraper roller
- 4 Bow with seal lip

→ Remove the safety ring.



- 1 Axis pins
- 2 Safety ring

→ Remove the safety ring.
→ Remove the bow with seal lip from the axle bolt.
→ Remove the axle bolt.



- 1 Safety ring
- 2 Axle bolt with star handle
- 3 Scraper roller
- 4 Safety ring
- 5 Bow with seal lip

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.

AM Service group cleaning head suspension

010 Safety information

Observe general safety information!

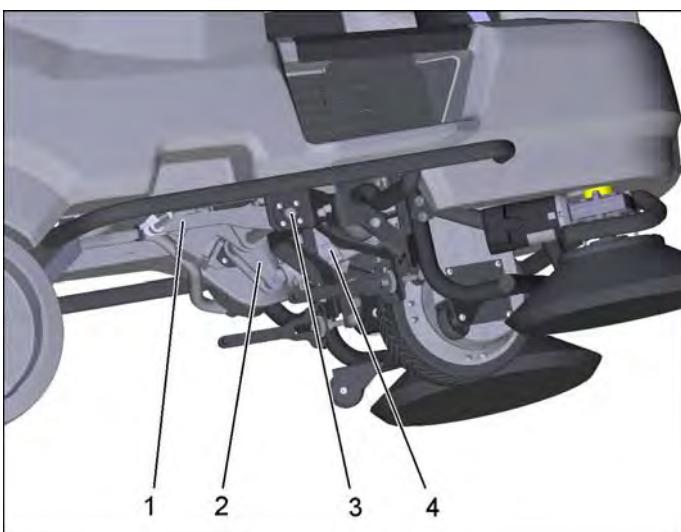
Service and maintenance tasks may only be performed by qualified and specially trained specialists.

020 Overview



AMHM Uninstall / install lifting motor cleaning head

030 Function



- 1 Hookup of cleaning head
- 2 Cleaning head suspension lever
- 3 Bearings
- 4 Lifting motor (M20)

The lifting motor moves the lever for the cleaning head suspension, causing the cleaning head to rise and fall.

Function of brush head lifting motor

Lowering 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.

Raising the brush head:

- The lifting motor moves the brush head upwards at fast speed up to the microswitch. If the microswitch fails to

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

Note

The brush mirror must be set with new roller brushes.

Test mode operation:



- 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.

switch off due to a defect, then the lifting motor will switch off via the electronics.

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.

Brush drive



Brush head

040 Service activities

AMHM Uninstall / install lifting motor cleaning head



■ *AJBW uninstall/ install the cleaning head completely*

- 1 Socket pin with spring cotter pin
- 2 Lifting motor
- 3 Socket pin with spring cotter pin
- 4 Lifting rod assembly cleaning head
- 5 Axle mount / bearing



- ➔ Pull out split pin.
- ➔ Remove the disc and the bolt.

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.

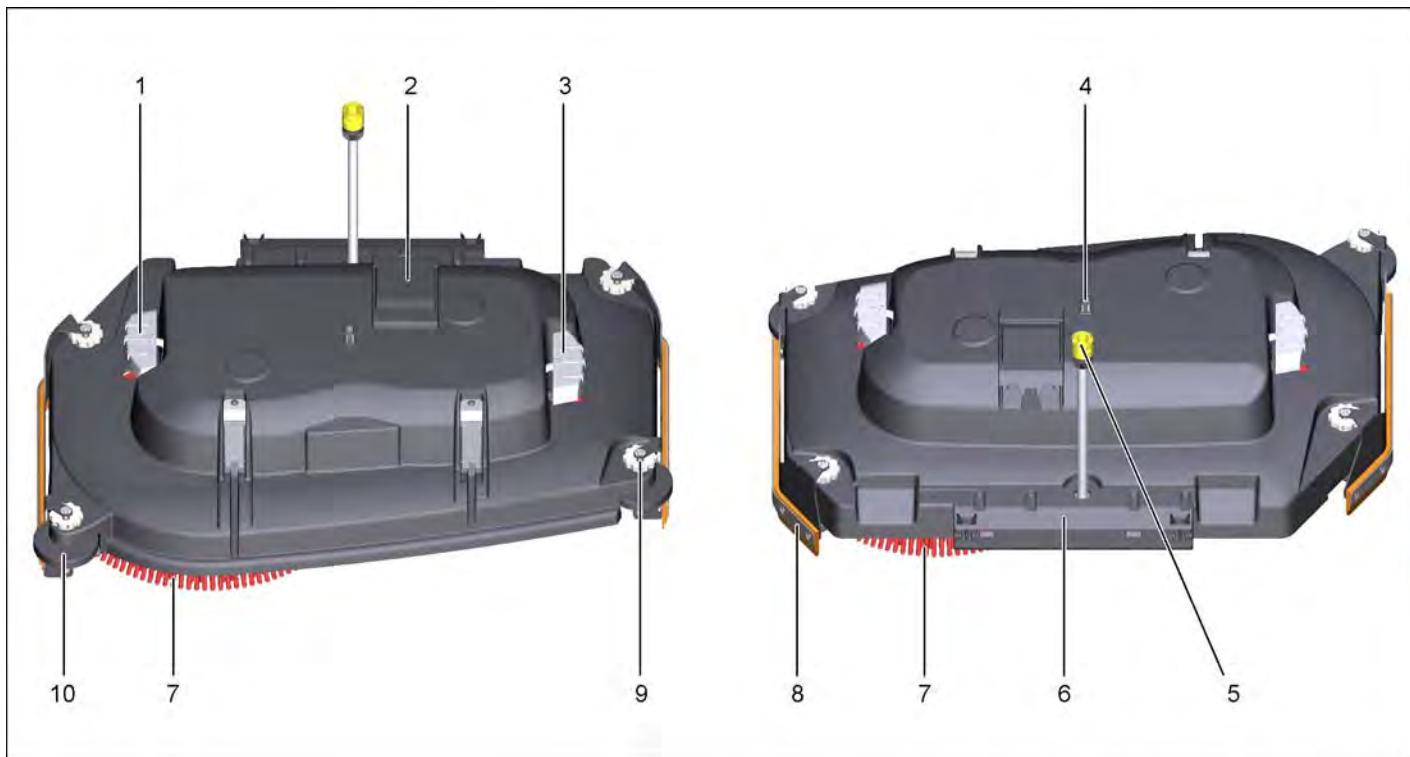
AK Service group cleaning head D

010 Safety information

For this service group there is no special safety information.

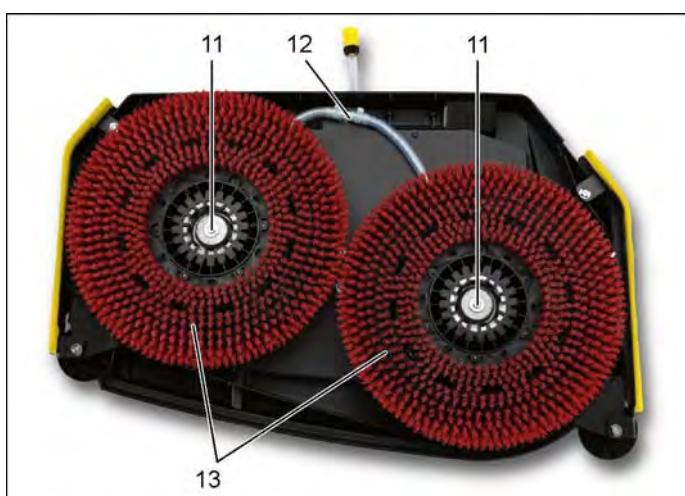
Observe general safety information!

020 Overview

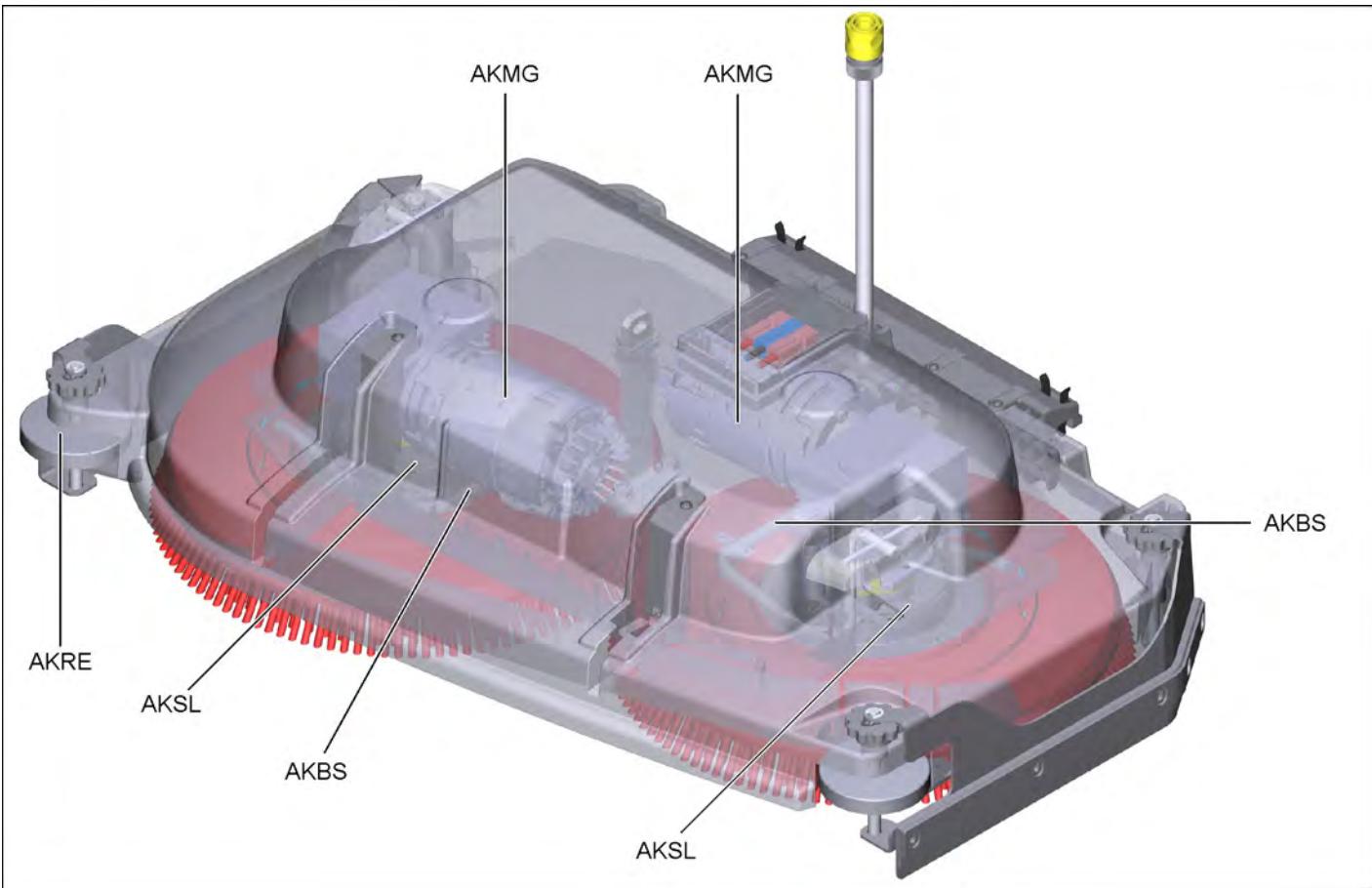


- 1 Pedal for changing brushes
- 2 Lid, plug for mains connection
- 3 Pedal for changing brushes
- 4 Retainer cleaning head
- 5 Water connection

- 6 Pick-up, push bar
- 7 Disc brush
- 8 Wiping flap
- 9 Adjustment wheel for wiping flap*
- 10 Scraper roller



- 11 Transmission/ disc brush retainer
- 12 Water inlet
- 13 Disk brush



AKSL Removing/installing the disc brush mounting

AKBS Uninstall / install bracket disc replacement

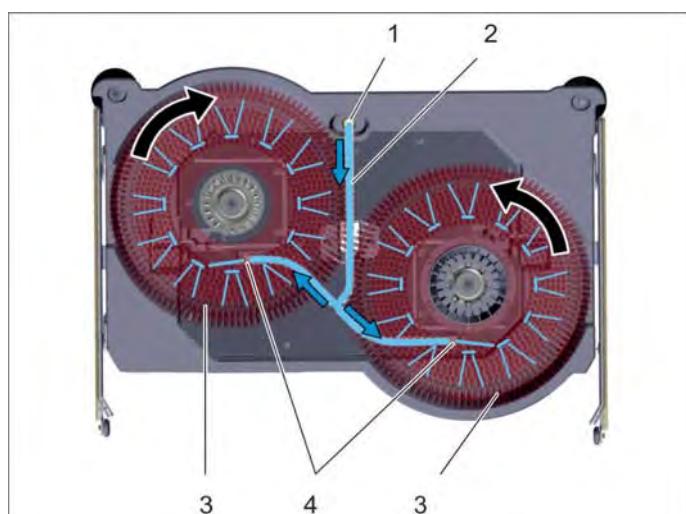
AKMG Uninstall / install brush motor with transmission

AKKB Removing/installing the brush motor sliding contacts

AKAL Uninstalling/installing the squeegee blade

AKRE Uninstall / install deflector roller

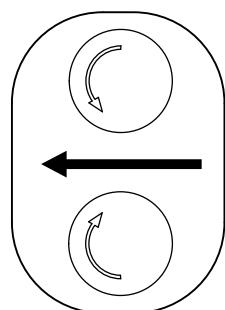
030 Function



- 1 Hose coupling
- 2 Water inlet
- 3 Disc brush
- 4 Cable tie

The two disc brushes have the same speed but opposite rotation directions and are powered by two motors with a transmission.

The brush rollers are switched off automatically if the brush motors are overloaded, e.g., due to too high contact pressure or blockage of the cleaning brushes.

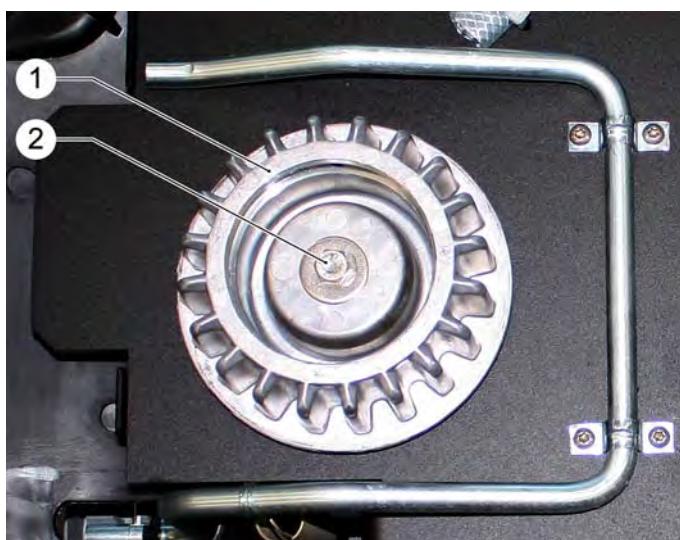


040 Service activities

AKSL Removing/installing the disc brush mounting



- 1 Water distribution hose, left
- 2 Bow to release the disc brush, left
- 3 Disc brush pick-up left
- 4 Floor plate
- 5 Bow to release the disc brush, right
- 6 Disc brush pick-up, right
- 7 Sealing lip
- 8 Water distribution hose, right



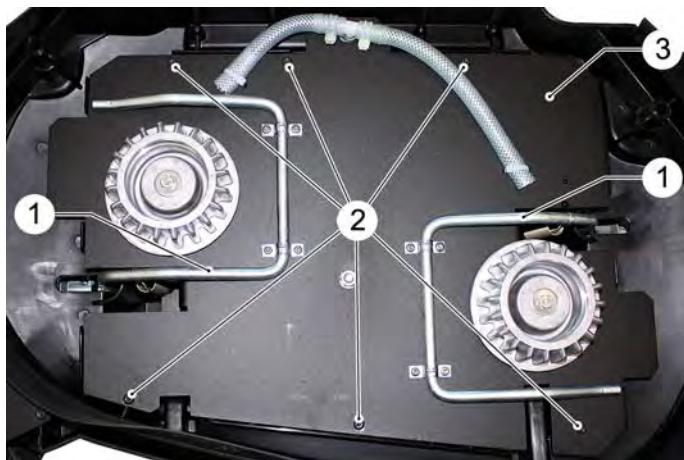
- 1 Disc brush intake
 - 2 Screw
- Loosen the screw.
→ Remove the disc brush intake.

AKBS Uninstall / install bracket disc replacement



- 1 Bow to release the disc brush, left
 - 2 Bow guide
 - 3 Spring
 - 4 Bow holder
- Unscrew the screws on the holders.
→ Unhook the springs.
→ Remove the bow through the guides.

AKMG Uninstall / install brush motor with transmission



1 Bow to release the disc brush

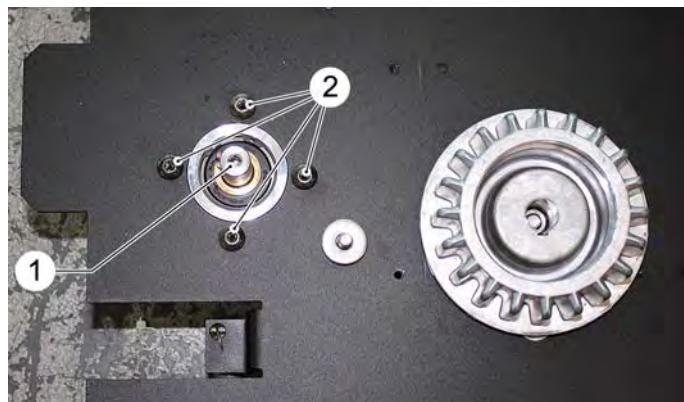
2 Screws

3 Floor plate

→ Unscrew the screws.

→ Remove the floor plate.

→ Remove the disc brush pick-up.

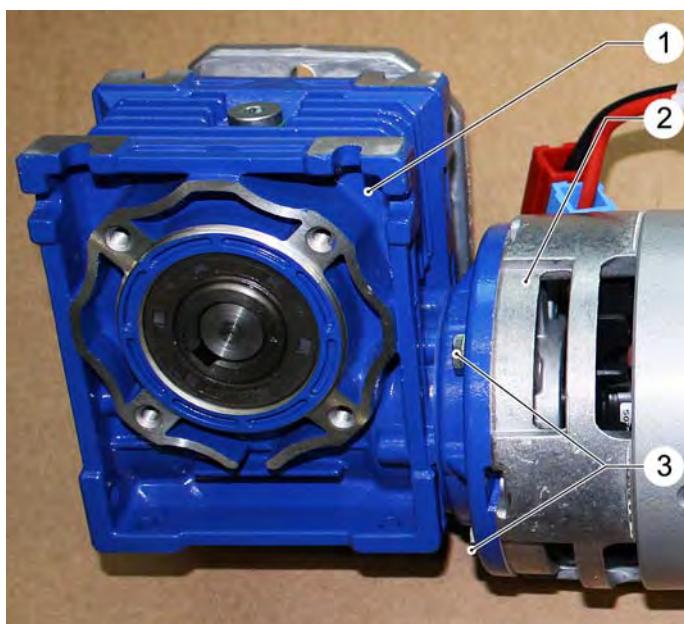


1 Gear axle

2 Screws

→ Unscrew the screws.

→ Remove the gear with motor.

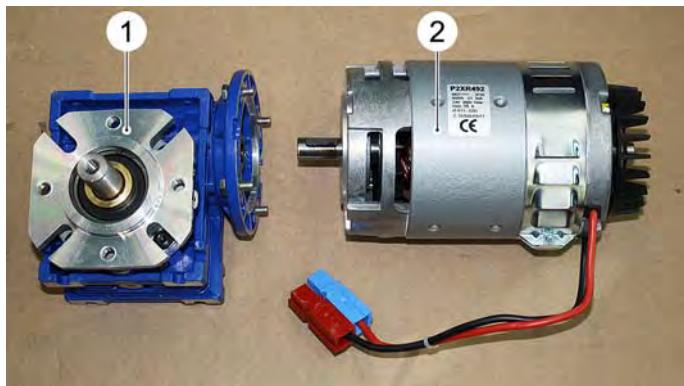


1 Gear

2 Motor

3 Screws

→ Unscrew the screws.



1 Gear

2 Motor

AKKB Removing/installing the brush motor sliding contacts



- 1 Screw
2 Cover, glide contacts

→ Remove the brush motor.
→ Unscrew the screw.
→ Remove the cover of the glide contacts.



- 1 Nut, glide contact
2 Glide contact
3 Press spring

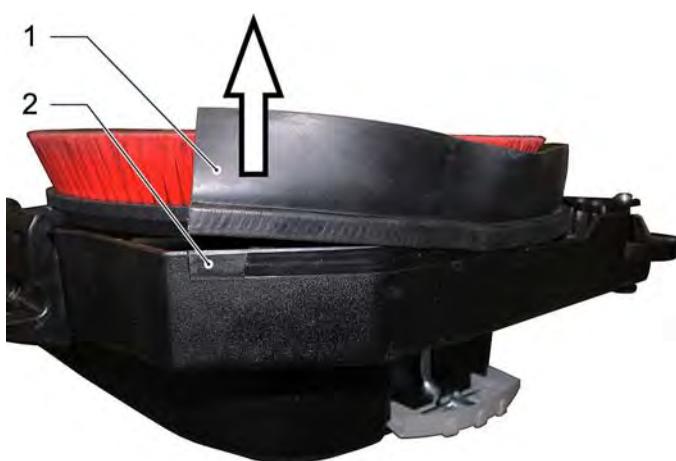
→ Lift the contact spring and pull the glide contact out of the chute.
→ Carefully place the contact spring onto the chute.



- 1 Glide contact
2 Nut, glide contact

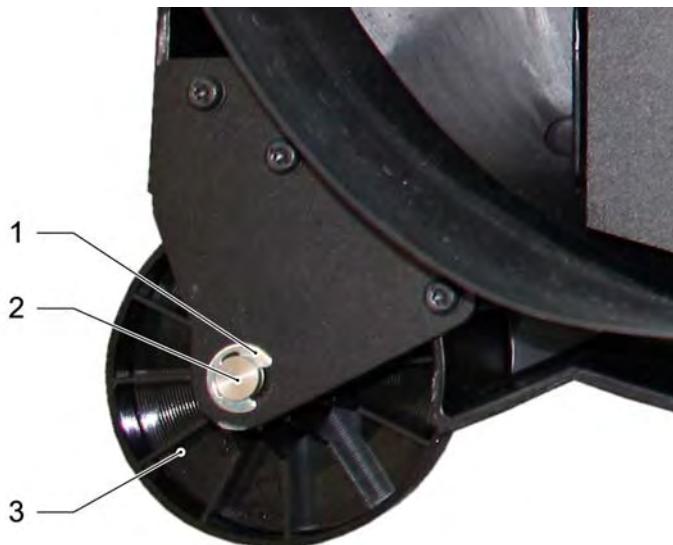
→ Unscrew the nut and replace the glide contact.
→ Perform this procedure on all four sliding contacts.

AKAL Uninstalling/installing the squeegee blade



- 1 Sealing lip
2 Edge trim
→ Remove the sealing lip from the edge trim.

AKRE Uninstall / install deflector roller



- 1 Safety ring
- 2 Axis pins
- 3 Scraper roller

→ Remove the safety ring.
→ Take the pivot pin out of the holder.

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

For service tasks and further information observe separate service manual.

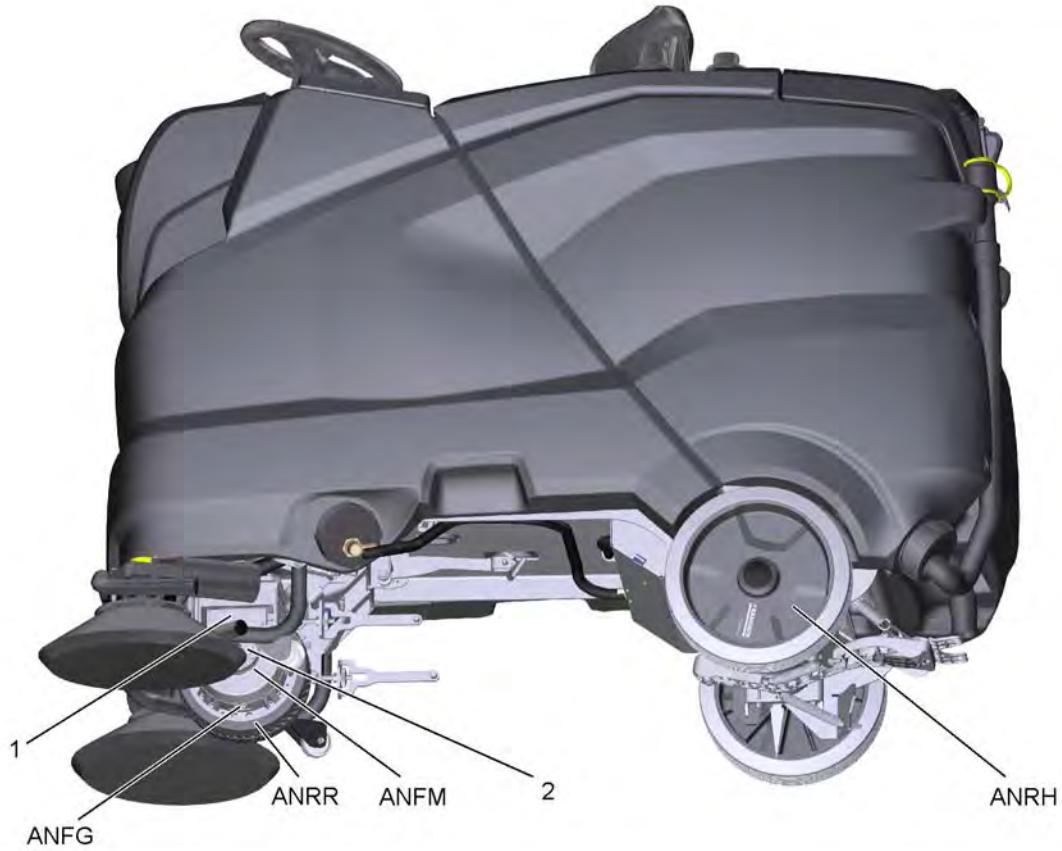
AN Service group running gear

010 Safety information

Observe general safety information!

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

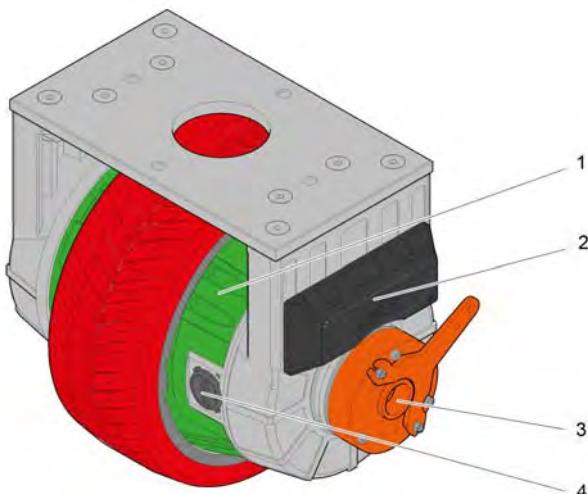
020 Overview



- 1 Sliding contacts voltage supply
 - 2 Replacing / adjusting the brake
- ANFM - Uninstall / install propulsion motor
ANRR - Uninstall / install tyre of propulsion motor
ANFG Uninstall / install sliding contacts engine
ANRH - Uninstall / install wheels in the back

030 Function

Drive motor and parking brake



- 1 Drive motor
- 2 Terminal box
- 3 Parking brake
- 4 Glide contact chute

The propulsion motor works as a pure drive motor. The drive control regulates the speed via a pulse width modulation. The duty cycle depends on the position of the accelerator pedal.

When the accelerator pedal is completely pressed down, the drive motor is controlled with the maximum pulse duration.

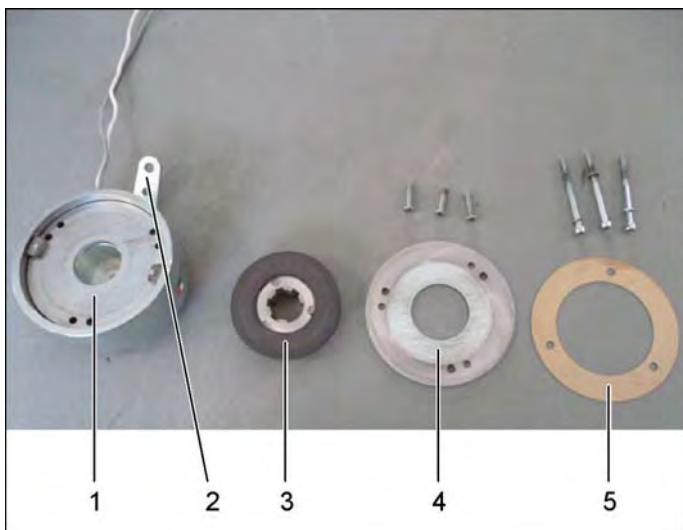
When driving downhill or during braking, the energy generated by the propulsion motor is used for braking.

The electromagnetic brake is a maintenance-free parking brake that is activated shortly before a standstill of the appliance. When switching on/off the brake, a clear clicking sound can be heard.

The parking brake is completely released during the trip. Its purpose is to regulate the driving speed.

If the foot is taken off the pedal, the engine will brake the device.

Brake



- 1 Brake coil
- 2 Hand lever
- 3 Brake disc
- 4 Pressure disc
- 5 Seal

The brake is opened via the brake coil if the following conditions are met:

- Seat switch must be actuated.
- An operating program must be selected with the programme selection switch.
- Throttle pedal must be pressed down.

The brake closes if one of the above conditions is not met. The brake can be opened mechanically with the hand lever. The device can be moved without the propulsion motor working.

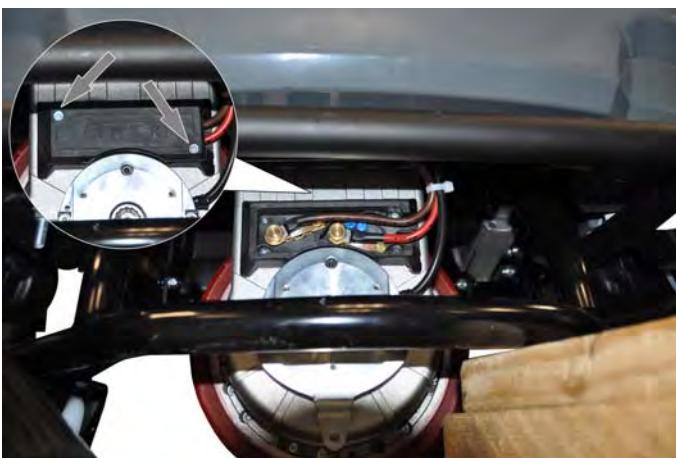
The brake is fully enclosed, no dirt can get into the brake from the outside.

040 Service activities

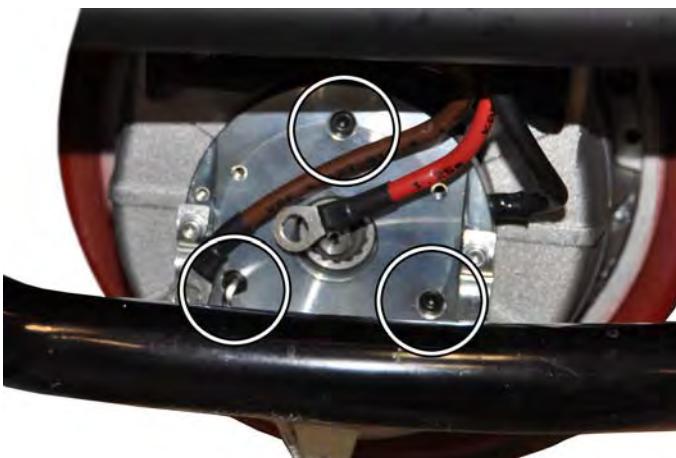
ANFM - Uninstall / install propulsion motor



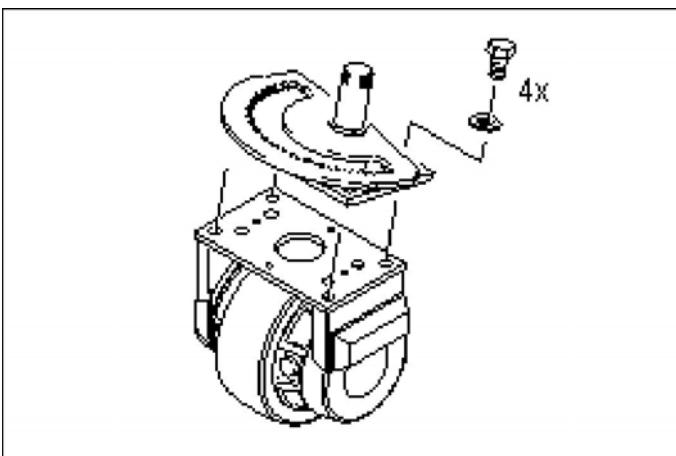
→ Lift the front of the appliance and support it.



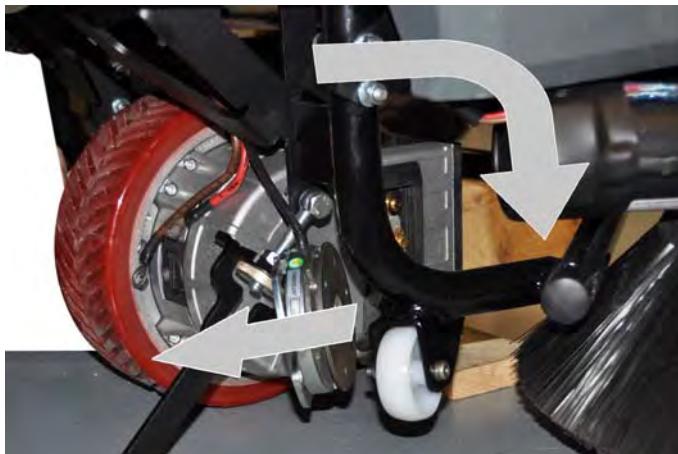
→ Remove the cover of the terminal box.
→ Unscrew the screw connection of the connection cable.
→ Pull the connecting cable off the motor.



→ Unscrew the screws of the brake.
→ Pull the brake off the propulsion motor.



→ Unscrew the screws of the propulsion motor mount.

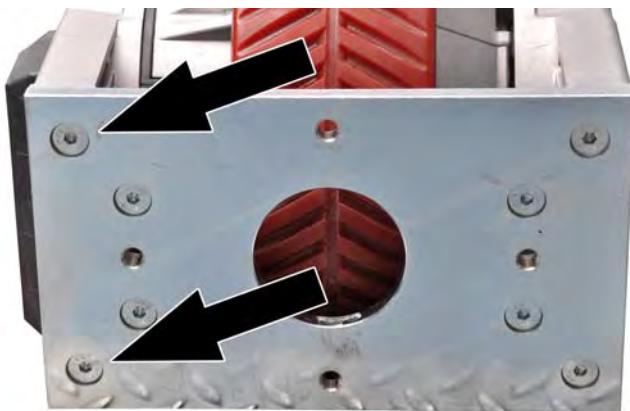


→ Tilt the propulsion motor and remove it from the appliance towards the back.

ANRR - Uninstall / install tyre of propulsion motor

■ ANFM - Uninstall / install propulsion motor

→ Unscrew the screws of the bearing carrier.



→ Pull the bearing carrier off.



→ Unscrew the wheel lugs.



- Carefully drive the tyre off the hub using a plastic mallet.



- Clean the seating and the bearing from dirt.



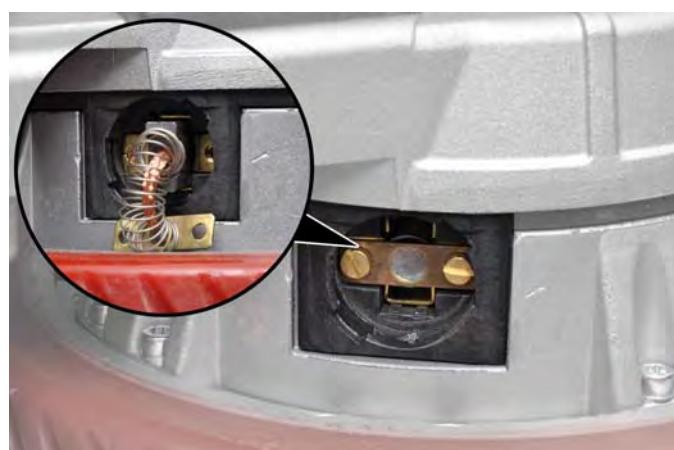
- Grease the seating of the wheel hub using copper paste prior to installing the new tyre.
→ Fit new tyre.
→ Wet the screw with the screw securing adhesive.
Screw securing adhesive, soluble
Slightly screw in the wheel bolts.
→ Tighten wheel bolts crosswise.



ANFG Uninstall / install sliding contacts engine

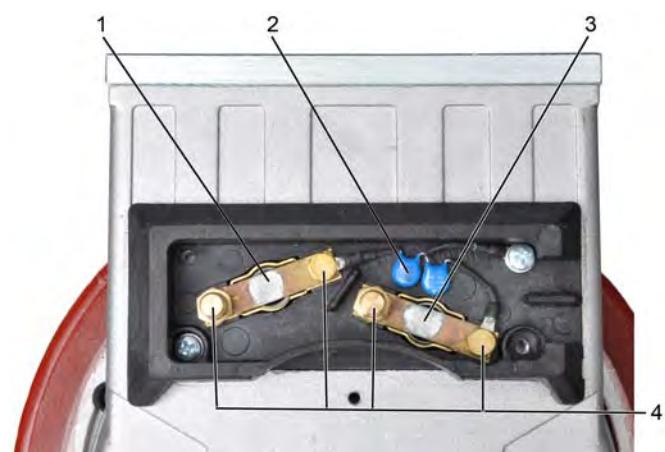


→ Open the gliding contact duct cover (bayonet catch)



→ Unscrew the screw connection of the holding strip.
→ Pull the sliding contact out of the duct.
→ Install a new glide contact; no adjustments necessary.

Sliding contacts voltage supply



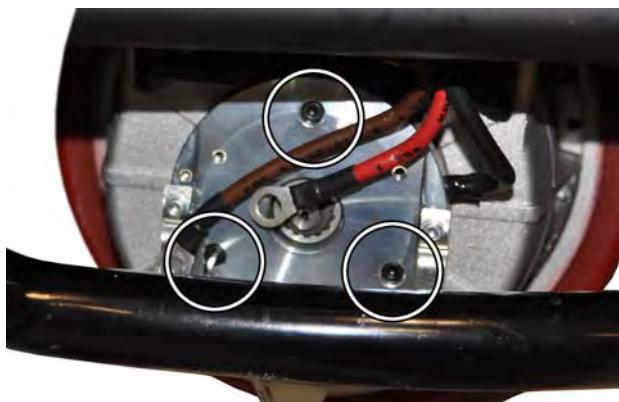
- 1 Sliding contact negative terminal
- 2 De-interference capacitor
- 3 Sliding contact positive terminal
- 4 Screw connection holding strip

→ Unscrew the screw connection of the holding strip.



→ Pull the sliding contact out of the duct.
→ Install a new glide contact; no adjustments necessary.

Replacing / adjusting the brake



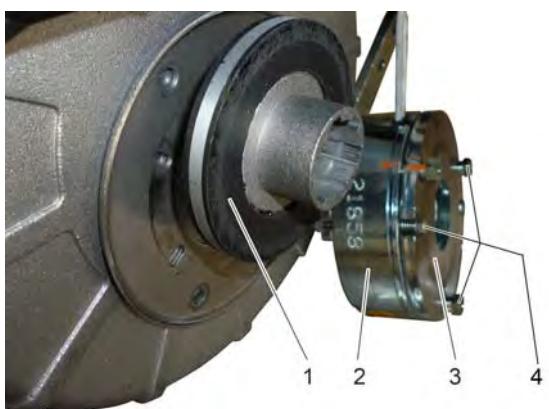
■ Drive motor and parking brake

→ Unscrew the screws of the brake.



→ Pull the brake off the wheel axle.
→ Replace the connecting cable.

Adjusting the brake



- 1 Brake disc
- 2 Magnet coil
- 3 Pressure plate
- 4 Adjusting screw

→ Join the brake, brake disc and pressure plate.



→ Adjust the clearance of the hand brake lever at the two adjustment screws.

Clearance brake lever = 0.5 mm measured in the unin-stalled condition.



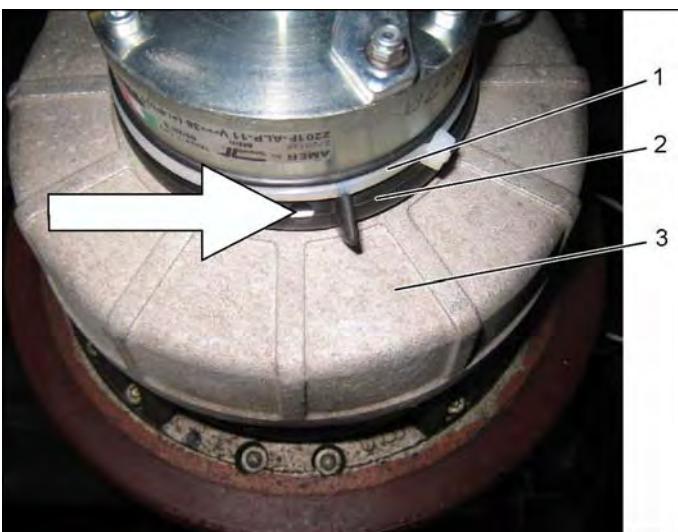
- Measure the gap between the magnetic coil and the pressure plate directly at the two adjustment screws.



- Adjust the three screws to 36.5 mm.
- Install brake.



- Remeasure the gap between the magnetic coil and the pressure plate at the three adjustment screws. Target ~0.2 mm.
- If necessary, readjust at the three adjustment screws.

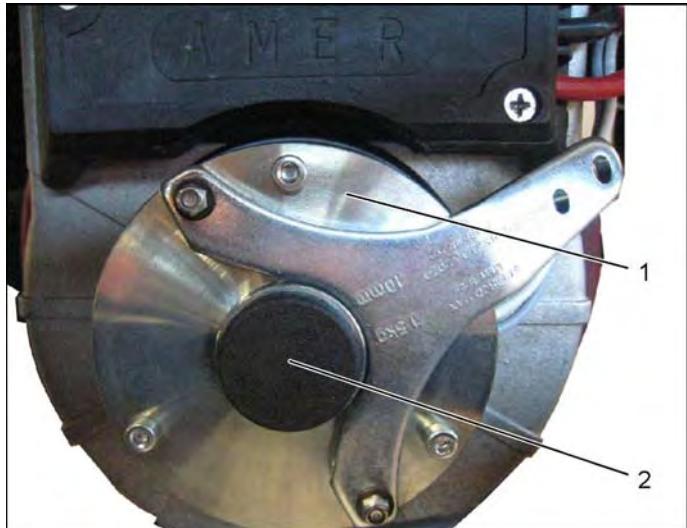


- 1 Cable tie
- 2 Dust protection collar
- 3 brake

- Before installing the brake, fit the anti-dust collars.
- Secure with cable ties.

Note

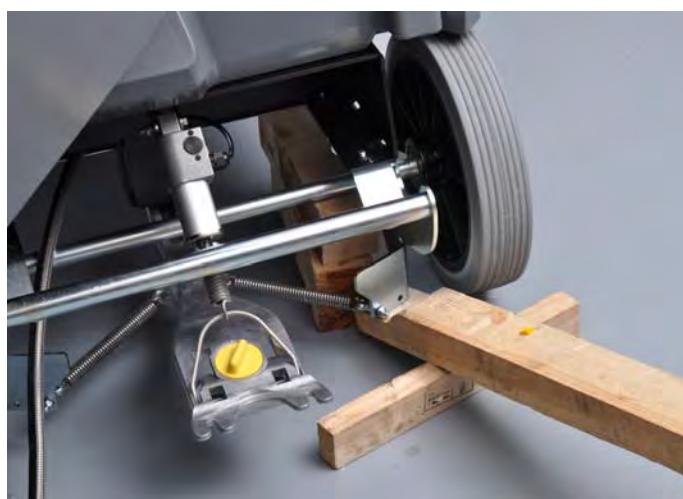
The recess in the anti-dust collars must be at the lowest point during assembly to prevent any water which may have got in from escaping.



- 1 brake
- 2 Plugs

→ Close the brake opening with the plug.

ANRH - Uninstall / install wheels in the back



→ Lift the back of the appliance and support it.



→ Remove the axle cover at the wheel.



- Remove the retaining ring.
- Pull the wheel off the axle.



The disc on the axle serves as the rear limitation for the wheel. The disc is secured by means of a retaining ring.
→ Grease the axle prior to reinstallation.

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.

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

AOLS uninstalling/installing steering column

AOZL Uninstall / install gear rim steering

030 Function

No special functional characteristics.

040 Service activities

AOLR Uninstalling/ installing steering wheel



NOTICE

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.

AOLS uninstalling/installing steering column

■ AOLR Uninstalling/ installing steering wheel

→ Unscrew the screws of the steering column cover.



→ Swivel the cover towards the driver seat.



→ Unscrew four screws of the steering column support.
→ Pull off the steering column and remove it from the appliance together with the cover.





→ When installing the steering column, place the sprocket in the gear rim and fasten it.

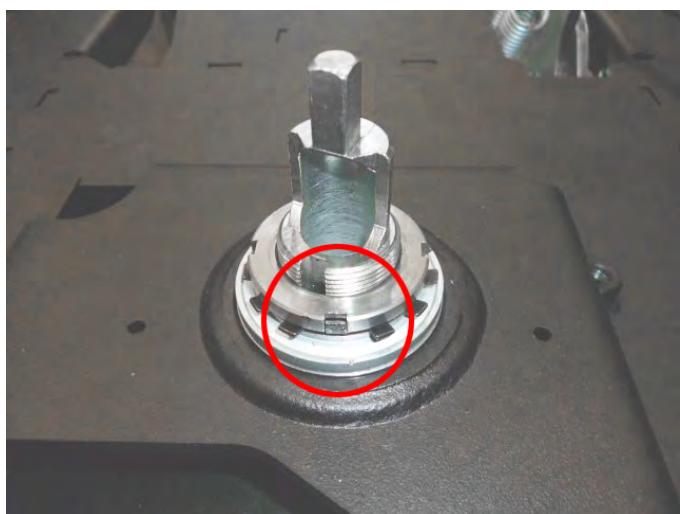
NOTICE

Grease the gear rim and the sprocket.

AOZL Uninstall / install gear rim steering

■ AOLS uninstalling/installing steering column

→ Bend down the safety tab.



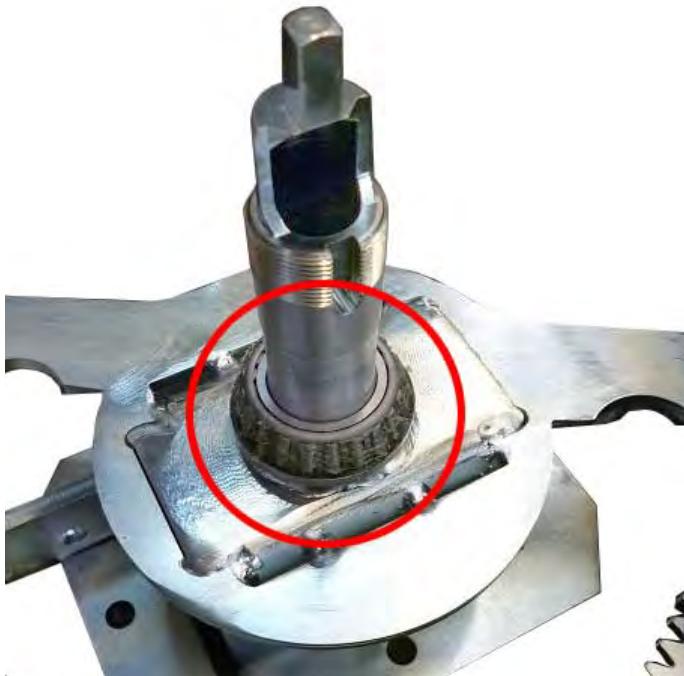
→ Unscrew the groove nut using special tools.
→ Remove shim washer and locking plate.



→ Remove the gear rim of the steering from the appliance towards the bottom.



→ Pull the bearing off the shaft.



→ Knock the bearing ring out of the retainer on both sides.



NOTICE

The bearing ring is destroyed upon removal. When installing the steering, use a new bearing ring.

Observe during installation:

- 1 Slip ring
- 2 Bevel roller bearing
- 3 Bearing ring

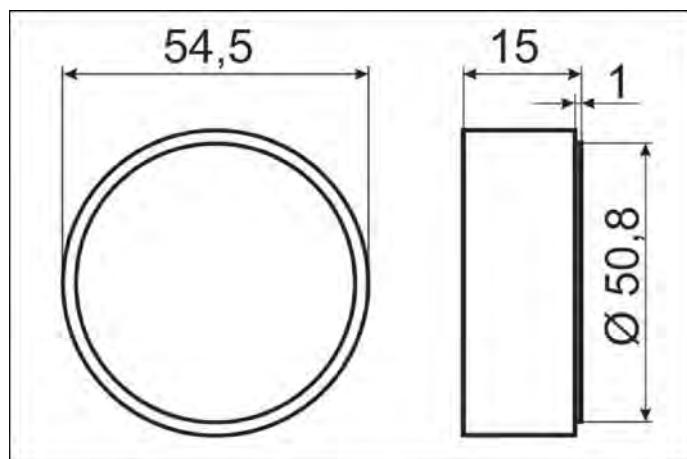


→ Lightly grease the retainer.





→ Drive the bearing ring in using special tools.
Use an old bearing ring as a drive-in mandrel if possible.



→ Slide the slip ring over the shaft and grease it slightly.
→ Grease tapered roller bearing and shaft.
→ Fit the bearing onto the shaft, do not cant.

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.

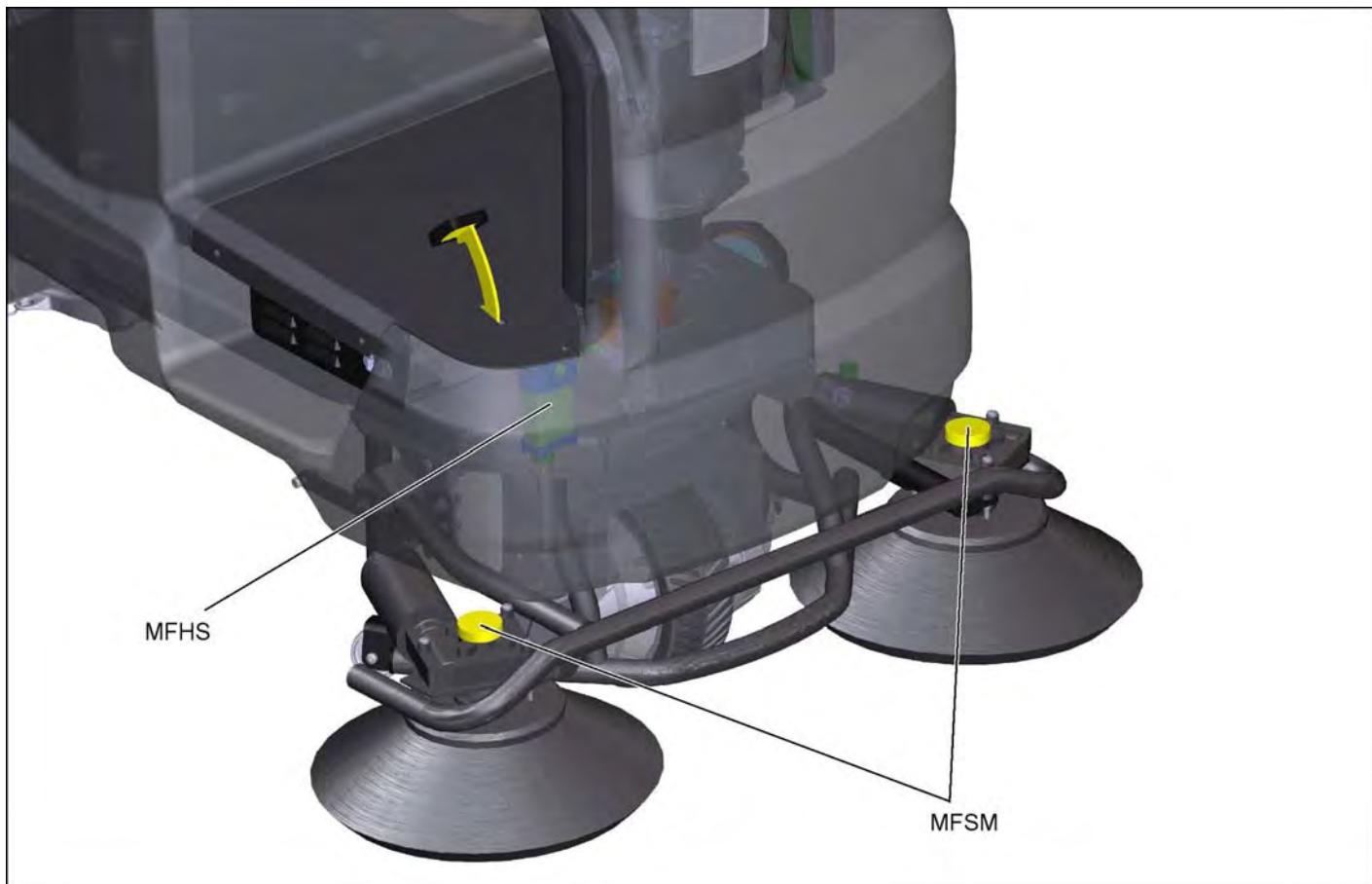
MF service group side brushes

010 Safety information

Observe general safety information!

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

020 Overview



MFHS lifting motor side brush

MFSM uninstalling/installing side brush motor

030 Function

No special functional characteristics.

040 Service activities

MFSM uninstalling/installing side brush motor

- Unscrew the screws.
- Remove side brush.



- Remove the cable ties.
- Disconnect the plug connection to the side brush motor.
- Unscrew the screws.
- Remove the side brush motor from the appliance.



- Remove the screw, the driver plate and the feather key prior to replacement and install them in the new side brush motor.

MFHS lifting motor side brush

The lifting motor for the side brushes is installed underneath the base plate of the work station.



- Unscrew the screws of the base plate and lift the base plate.



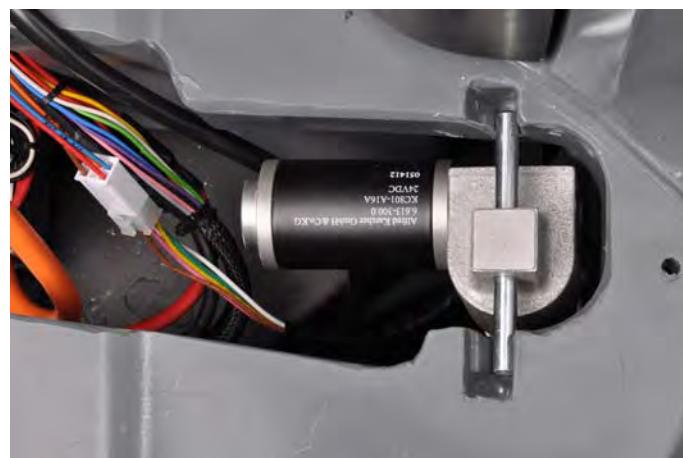
- Disconnect the plug-in connection of the accelerator pedal.

- Remove the floor plate.

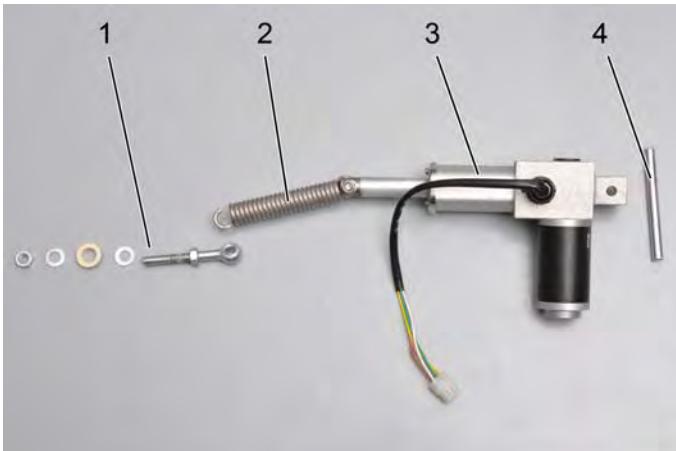


- Unscrew the lock nut and pull the screw out of the holder.

- Disconnect electrical connection of the lifting motor.



- Remove the lifting motor from the appliance towards the top.



- 1 Eye screw
- 2 Spring
- 3 Lifting motor
- 4 Holding pin

→ Remove the spring.
→ Ensure the correct order when installing the bushing, washer and lock nut.

NOTICE

Replace bent retaining bolt.

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.

MN Service group tank rinsing system

010 Safety information

Observe general safety information!

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

020 Overview



- 1 Spray nozzle
- 2 Hose ring
- 3 T-piece
- 4 Supply line connection of the waste water tank rinsing system



Uninstalling/installing spray nozzles

MNSD uninstalling/installing hose ring with nozzles

MNKT uninstalling/installing clutch with tank rinsing

030 Function

No special functional characteristics.

040 Service activities

Uninstalling/installing spray nozzles



- 1 Hose ring
- 2 Screw
- 3 Spray nozzle with holder

→ Unscrew the screw.
→ Pull the spray nozzle out of the hose ring.
→ Remove the spray nozzles.



→ Clean clogged spray nozzle using a needle or a fine wire.
→ Replace damaged spray nozzle.

MNSD uninstalling/installing hose ring with nozzles



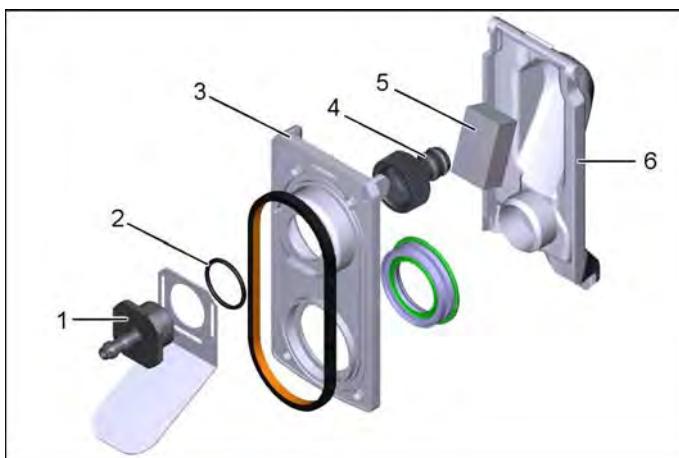
→ Remove the supply line from the connection of the wastewater tank rinsing system.
→ Take out all screws of the spray nozzles.
→ Remove the hose ring with the spray nozzles, the tee and supply line from the wastewater cover.
→ Remove the spray nozzles from the hose ring.
→ Remove hose from the tee.
→ Tightly attach the new hose to the spray nozzles and the tee.
→ Reinstall the spray nozzles.
→ Reattach the supply line to the connection of the waste water tank rinsing system.

MNKT uninstalling/installing clutch with tank rinsing



- 1 Screws
- 2 Connection push-fit system
- 3 Seal overflow

→ Remove the supply line from the connection of the wastewater tank rinsing system.
→ Unscrew the screws.



- 1 Hose nipple
 - 2 O ring
 - 3 Mounting plate
 - 4 3/4" coupling for push-fit systems
 - 5 Seal
 - 6 Cover cap
- Unscrew the 3/4" coupling and replace in case of damage.
→ Unscrew the hose stem, check O-ring for damage.
→ Ensure proper seating of the O-ring during installation.
- NOTE**
A seal is glued into the covering cap that prevents the turbine from taking in bad air.

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.

Additional basic settings and service tasks for the Adv version

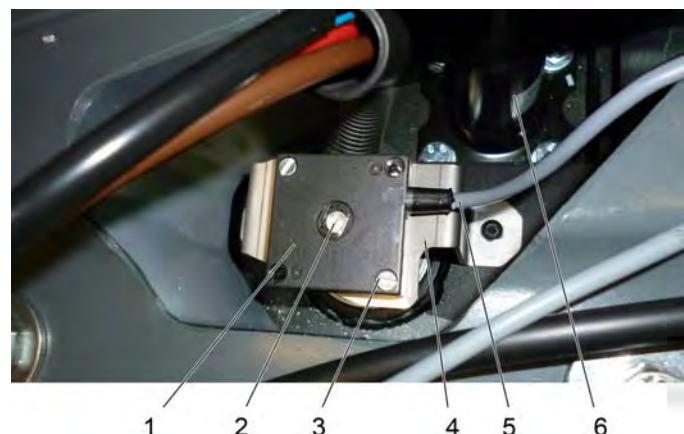
Steering angle sensor

The Adv. version can achieve a maximum speed of 10 km/h.

To prevent the appliance from tipping over, the speed is reduced when cornering.

The speed is reduced starting at a steering angle of 13°.

Replacing the steering angle sensor



The reduction is non-linear. In the beginning, the speed is reduced more. At a steering angle of 90° the speed is reduced to 2 km/h.

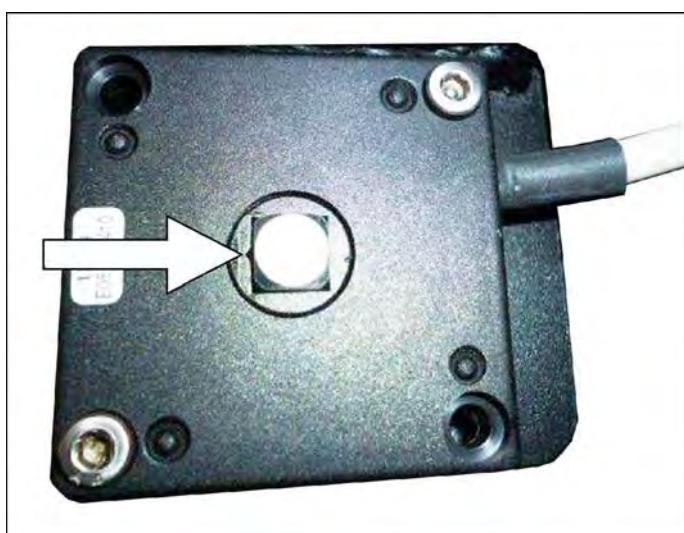
The value is determined via a steering angle sensor at the gear rim of the steering.

- 1 Steering angle sensor
- 2 Square
- 3 Screw
- 4 Support plate
- 5 Connection cable
- 6 Steering column

- Remove the base plate.
- Unplug the steering angle sensor.

- Unscrew the screws.
- Remove the steering angle sensor from the square.

- The notch must be as follows when centering the steering wheel.



Calibrating the steering angle sensor

After installation, the steering angle sensor is calibrated via the test mode or the service programme.

- Follow the instructions of the software.

Rear wheel drive

The Adv. version is equipped with four-wheel drive. In addition to the front-wheel drive a driven rear axle is installed. The drive is effected with an electric motor, that acts via a differential on the rear wheels.

Temperature monitor

The electric motor of the rear wheel axle has a temperature monitor.

This should protect the engine from overloading.

In the event of an overload, the display shows the following:

Level 1

- "Thermal protection active"
- "Drive/clean active"

Driving and cleaning may continue for 10 more minutes.

Level 2

- "Thermal protection active"
- "Drive/suction active"
- "Turn off the machine"

Driving and cleaning may continue for 5 more minutes.

Level 3

- "Thermal protection active"
- "Drive active"
- "Turn off the machine"

The machine must be allowed to cool down.

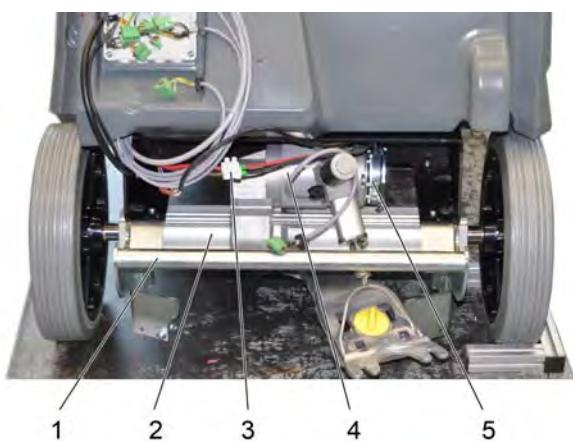
Level 4

- "Thermal protection active"
- "Cooling down phase active"

The machine is no longer operational until the temperature monitor has cooled down.

The temperature monitor will switch back on automatically.

Dismantling the rear axle

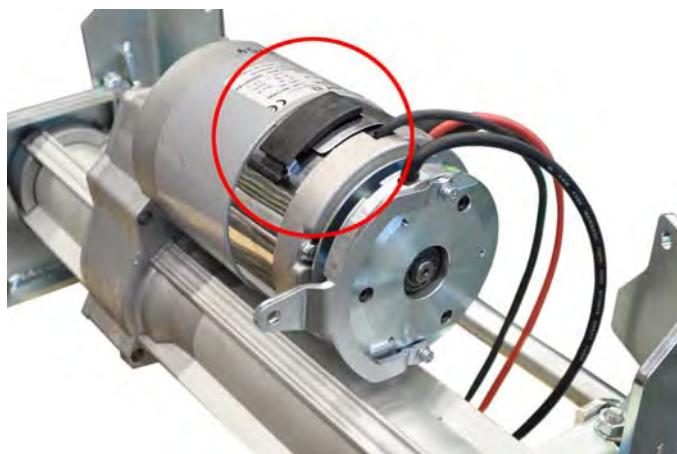


- 1 Suspension waste water tank
- 2 Rear axle with differential and transmission
- 3 Plug-in connection drive motor
- 4 Drive motor
- 5 brake

- ➔ Remove the waste water tank.
- ➔ Lift and support the appliance on the suspension of the waste water tank.
- ➔ Remove the rear wheels.
- ➔ Disconnect the plug-in connection of the drive motor.

- 
- Unscrew the nuts of the rear axle carrier on both sides.
 - Remove the rear axle from the appliance.

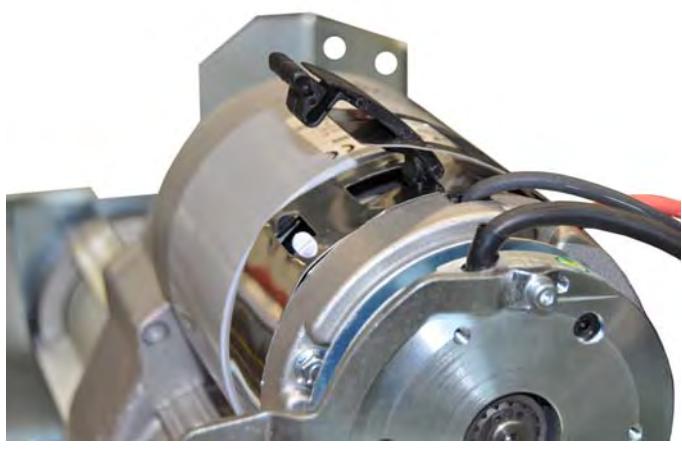
Replace the glide contacts (carbon brushes).



- Open the locking device and remove the protective ring.



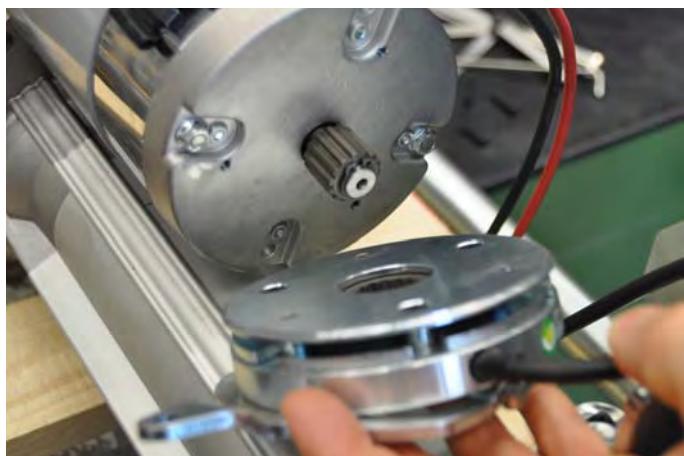
- Unscrew the screw of the connection cable.
- Lift the contact spring and pull the glide contact out of the chute.
- Place the protective ring around the motor.

- 
- Catch and close the locking device of the protective ring as shown.

Replacing the brake/ brake pad/ brake disc



→ Unscrew the screws.



→ Remove the brake from the motor shaft.



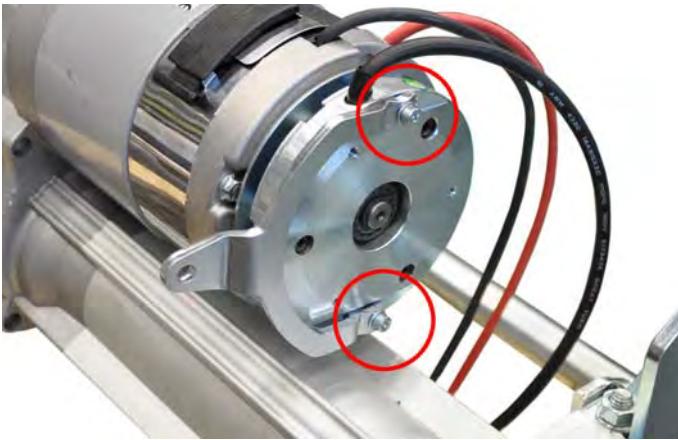
→ Unscrew the screws.



- 1 Spacer bushes
- 2 Brake pad
- 3 Brake disc

→ Remove brake disc.

→ Replace the brake disc and brake pad in case of wear.



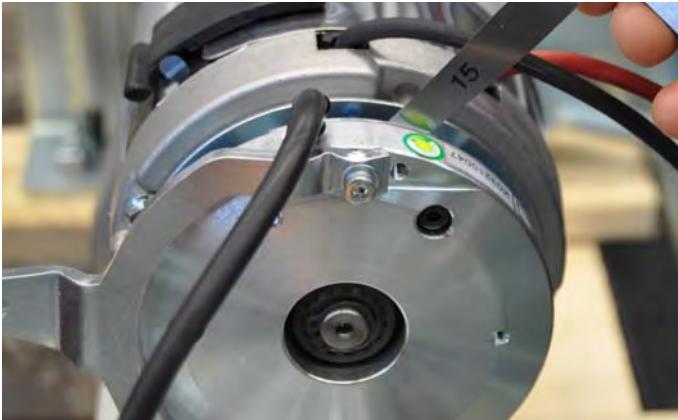
→ Adjust the hand brake lever at the two screws.

Clearance 0.5 mm directly measured at the two screws.

NOTICE

The adjustment procedure is described in Chapter "Replacing / adjusting brake"

■ *Replacing / adjusting the brake*



NOTICE

During installation, it must be ensured that the spacer bushes are inserted correctly. Adjusting the brake is not required, the correct distance is defined via the spacer bushes.

→ Check clearance after assembly.

→ Check the gap between the magnetic coil and the pressure plate at the three adjustment screws. Gap approx. 0.2 mm.

Wheel replacement on the rear axle



- 1 Screw
2 Wheel

→ Lift the back of the appliance and support it.

→ Unscrew the screw.

→ Remove the wheel.



Installation information

Before installing the wheel, apply plenty of grease to the rear axle shaft.

Torques	Nm
Screw	90

Troubleshooting

DANGER

Risk of injury! Before working on the appliance, remove the Intelligent Key and the mains plug of the charger.

Pull out the battery plug.

- Drain and dispose of the dirt water and the residual fresh water.

NOTICE

Suction turbine will continue to run for a while after switch-off. Carry out maintenance tasks only after the suction turbine has come to a halt.

NOTICE

Check the cable connections prior to replacing components!

Fault indication

If errors appear on the display, then proceed as follows:

- Turn the program selection switch to "OFF".
- Wait till the text on the display has disappeared.
- Turn the programme switch into the previous position. Carry out the troubleshooting measures in the indicated order only if the error occurs again. The key switch must be in the "0" position and the emergency stop button pressed.

Note

Warnings can be acknowledged with the I-button. If the cause for the warning persists, the warning will appear again.

Warning messages:

Warning messages affect the operation of the machine in different ways.

A short circuit in the horn does not immediately require an exchange of the drive module (A2) or of the horn - a warning message is simply generated.

Contrary to this, warnings caused by peripheral errors of the lift module (A4) are critical, if i.e. the microswitches of the suction bar lift motor return contradicting results.

The lift module (A4) will then block the suction bar function and this will impair the cleaning process significantly.

Both cases show that the reaction to warnings must differ.

Faults with display

Display	Cause	Remedy
Seat switch open!	Seat switch is not closed when the throttle pedal is pressed.	<ul style="list-style-type: none">→ Do not press down on the accelerator.→ Sit on the driver's seat.→ Check electric cables and correct functioning of seat switch (closed seat switch S10 < 1 Ω).
Release accelerator!	Operate the accelerator pedal during start-up. B1	<ul style="list-style-type: none">→ Do not operate throttle pedal, and restart machine.→ Check throttle pedal microswitch S13.Throttle pedal not activated high impedance.Throttle pedal activated low impedance <1000 ohm.→ Check mechanical system of throttle for throttle pedal B1.→ Drive module A2 defective.
No direction of travel!	No travel switch S2. Travel direction switch is not detected on head CPU.	<ul style="list-style-type: none">→ <i>Check the control panel</i>→ Check electric line of travel direction switch S2 to A1 X203/1,2,3 for open circuit.→ Check the voltages for the travel direction: Travel direction switch to forwards: Measure voltage between X1/9 and X203/1 (target approx. 13.6 volts) and between X1/9 and X203/2 (target approx. 13.6 volts) as well as between X1/9 and X203/3 (target < 1 volt). Travel direction switch to reverse: Measure voltage between X1/9 and X203/1 (target approx. 13.6 volts) and between X1/9 and X203/2 (target < 1 volt) as well as between X1/9 and X203/3 (target approx. 13.6 volts).→ Check switch S12: Travel direction forwards: Resistance 1-1b (<2 ohms), 1-1a (>1 MΩ). Travel direction backwards: Resistance 1-1a (<2 ohms), 1-1b (>1 MΩ).→ Start machine with connected travel direction switch; if fault remains, then head CPU A1 is defective.
Charging process terminated!	Charger error message	<ul style="list-style-type: none">→ Check the battery voltage. (Target > 28 volt)→ Check fuse F5.→ Check electric cable from charger to battery.→ Check charge parameters of on-board charger A7.→ Charger A7 defective.

Display	Cause	Remedy
Battery voltage in-admissible!	Battery voltage outside of the limits 29V < VBat < 45V. Battery voltage during the charging process outside of the limits 29V < VBat < 55V.	→ Check battery voltage. → Check battery cable for correct sitting. → Check whether the correct battery (G1) (24 V or 36 V network) is connected. → When working with test power supplies, max. 45 V are permitted! → If fault remains despite correct voltage, then head CPU A1 is defective.
Battery dis-charged!	Battery voltage too low. Measured battery voltage below 10% of fully charged battery.	→ Warning arrives at approx. < 33 V Ubatt All consumers are switched off except for traction. → Turn off the appliance. → Wait 2 minutes → Turn on the machine. → Drive the appliance directly to the charging station; avoid any steep gradients in the process. → Charge battery. → Where necessary, check the shut-off parameters on the charger. → Drive module A2 defective.
Charger defective!	Error on the charger, charging is not possible.	→ Check the charger.
Fresh water tank empty!	Level sensor or cable connection defective. Fresh water tank empty.	→ Refill fresh water. Should the error continue to exist: → Check pressure sensor, replace if required. → Check electrical wiring and replace if necessary.
Waste water tank full!	waste water tank is full. Suction turbine switches off.	→ Empty the waste water tank.
	Level sensor or cable connection defective.	→ Empty the waste water tank. → Check cable connection, replace as necessary. → Check S6 at A3 X7:3 and 9. → Check level sensor, replace as necessary.
Brush head main-tenance counter	The maintenance counter brush head has run down.	→ Maintain brush head. → Reset maintenance counter. ■ <i>Maintenance counter</i>
Vacuum bar main-tenance counter	The maintenance counter suc-tion bar has run down.	→ Maintain suction bar. → Reset maintenance counter. ■ <i>Maintenance counter</i>
Suction lip main-te-nance counter	The suction lip maintenance counter has run down.	→ Maintain suction lip. → Reset maintenance counter. ■ <i>Maintenance counter</i>
Turbine strainer main-tenance counter	The maintenance counter suc-tion filter has run down.	→ Maintain suction filter. → Reset maintenance counter. ■ <i>Maintenance counter</i>
Fresh water filter main-tenance counter	The maintenance counter wa-ter filter has run down.	→ Maintain water filter. → Reset maintenance counter. ■ <i>Maintenance counter</i>
Brake defective!	Highside FET (Field Effect Transistor) of solenoid brake triggering defective.	→ Check cabling of brake Y1 and brake coil for open circuit (problems with loose contacts or defective brake coil). Measure brake coil at X6/2 and X6/4 = approx. 50 ohms. → Drive module A2 defective.
Engine overload!	Time limit for motor overload (propulsion motor) exceeded.	→ Turn off the appliance. → Allow engine M1 to cool down and check it. → Check brake Y1. → Check electric cables to brake Y1.

Display	Cause	Remedy
Propulsion motor hot! Allow to cool down!	Motor protection was triggered	<ul style="list-style-type: none"> → Cool down driving module A2 and restart. → Check fan M7 and voltage at A1 X1/3.8 (target 12V). → Check cooling air gap for cleanliness. → Brake Y1 defective. → Measure engine current M1 rotating freely. Target approx. 5A unloaded. → Compare or transfer driving module A2 parameters with standard values. → Drive module A2 defective.
Overload in brush drive!	Brushes are overloaded. The sum current of both brushes was above 80 A for longer than 10 s.	<ul style="list-style-type: none"> → Check mechanical system of brush motors. → Check mechanical system of lifting motor. → Check electric cables of brush motor and lifting motor. → Check brush motor and lifting motor in test mode. → Measure brush motor current M2/ M3 in idle mode (test mode). (target approx. 5A per brush motor measured at X 8 and X 13) → Unclamp brush motors M2/ M3. Restart machine and switch on brush. If a fault is no longer displayed, check for short-circuit in the electric cabling or on the brush motors. → Check connection of fresh water fill level sensor B2. → Disconnect the fill level sensor B2 and restart the device. If a fault is no longer displayed, check the fill level sensor. → If fault remains despite disconnected brush motor and fill level sensor, clean module A3 is defective.
Display text is messy	Software update not carried out fully. Display texts were not updated after a software update.	<ul style="list-style-type: none"> → Update all texts, pictures and icons.
Charging process terminated.	Charger has detected charging fault.	<ul style="list-style-type: none"> → Check battery voltage. (Target = 28 V) → Check the fuse. F5 → Check electric cables from charger to battery. → Check charge parameters of on-board charger A7. → Charger is defective. A7
No access	Incorrect intelligent key (KIK) inserted No intelligent key inserted.	<ul style="list-style-type: none"> → Using the grey or red intelligent key, enable the relevant intelligent key in the Key Manager menu. → Intelligent keys can only be processed in the key menu/key manager.
Maintenance brush head	The brush head maintenance counter has run down.	<ul style="list-style-type: none"> → Maintain/clean brush head and reset counter.
Maintenance suction bar	The suction bar maintenance counter has run down.	<ul style="list-style-type: none"> → Maintain/clean suction bar and reset counter.
Maintenance Suction lip	The suction lip maintenance counter has run down.	<ul style="list-style-type: none"> → Maintain/clean suction lip and reset counter.
Maintenance turbine screen	The turbine filter maintenance counter has run down.	<ul style="list-style-type: none"> → Maintain/clean turbine filter and reset counter.
Maintenance water filter	The water filter maintenance counter has run down.	<ul style="list-style-type: none"> → Maintain/clean water filter and reset counter.

Display	Cause	Remedy
Hot drive module!	Overtemperature warning for users with shutdown	<ul style="list-style-type: none"> ➔ Cool down driving module A2 and restart. ➔ Check fan M7 and voltage at A1 X1/3.8 (target 12 V). ➔ Check cooling air gap for cleanliness. ➔ Brake Y1 defective. ➔ Measure engine current M1. ➔ Compare or transfer driving module A2 parameters with standard values. ➔ Drive module A2 defective.
Horn defective	Defective horn power supply	<ul style="list-style-type: none"> ➔ Check electric cabling for horn H1 and check for open circuit (problems with loose contacts or defective horn). Measure horn connection at X6/1 and X6/3 = approx. 26V. ➔ Drive module A2 defective.
Horn defective	Short circuit horn H1 Horn output is short-circuited.	<ul style="list-style-type: none"> ➔ Check electric cabling and horn H1 for short-circuit. ➔ High-impedance horn then OK. ➔ Output voltage when horn activated at X3/2 to X3/4 approx. 23 volts. ➔ Drive module A2 defective.
Calibration faulty	Drive sensor values are not within the calibrated tolerance window.	<ul style="list-style-type: none"> ➔ Recalibrate 1st throttle of throttle pedal B1 in test mode. Throttle pedal released, e.g. value inc 22. Throttle pedal pressed, e.g. value > inc 102. Difference > 80 increments ➔ Check 2nd throttle for throttle pedal B1. Carry out all measurements against ground support point X22. Voltage at X5/1 approx. 8-9 volts. Voltage at X5/3 approx. 0.5 volts. Voltage at X5/2 approx. 0.5 volts, throttle pedal not actuated. Voltage at X5/2 approx. 4.8 volts, throttle pedal actuated. ➔ Check parameters; reload driving module (A2) standard parameters (in service programme). ➔ Repetition of 1. and 2. ➔ Drive module A2 defective.

Head CPU: coded error messages

Display code	Important	Measure
K1/101	Incorrect battery type selected. Charging not possible. Charging parameter for this battery type is not present in the charger.	<ul style="list-style-type: none"> ➔ Transfer correct battery parameters with Service program to machine. ➔ Perform a power reset. (Disconnect battery for 1.5 minutes from machine) ➔ Faulty hardware head CPU A1.
K1/102	Parameters are damaged. Parameters from at least one module are not complete or are faulty.	<ul style="list-style-type: none"> ➔ Check head CPU A1 parameters. ➔ If no faults are able to be found, load head CPU A1 factory settings. ➔ Transfer the standard parameters to the head CPU. ➔ Perform a power reset. (Disconnect battery for 1.5 minutes from machine) ➔ Faulty hardware head CPU A1.
K1/103	Operating hours counter is damaged. Operating hours counter is set automatically to 0 h 0 min. Memory for operating hours counter is incomplete or faulty.	<ul style="list-style-type: none"> ➔ Perform a power reset. (Disconnect battery for 1.5 minutes from machine) ➔ Faulty hardware head CPU A1.
K1/104	Parameter buffer overflow Too many parameter changes are requested.	<ul style="list-style-type: none"> ➔ Restart the machine. ➔ Load factory settings ➔ Faulty hardware head CPU A1.
K1/105	Head CPU parameters are damaged.	<ul style="list-style-type: none"> ➔ Check parameters. ➔ If no faults are able to be found, load head CPU A1 factory settings.

Display code	Important	Measure
K1/106	The drive module status received is not OK.	<ul style="list-style-type: none"> → Check connections on bus system. → Check driving module parameters. → Check connections from driving module to the consumers (traction motor, brake ...). → Check the electrical cables between B- and UBat Minus X22 on the drive module A2.
K1/107	<p>Module bus communication fault.</p> <p>1 During switch-on procedure: Parameters from at least one module are not incomplete or faulty.</p> <p>2 During operation: At least one module is not responding to a bus communication.</p>	<ul style="list-style-type: none"> → Check bus system (for example, voltage supply 13 V or RS 485 bus system interrupted). → One of the modules could not be addressed. → Check the electrical cables between B- and UBat Minus X22 on the drive module A2. → Check earth connection to all modules. → Check minimum configuration and determine faulty module. → Check parameters - load factory setting if no faults are able to be determined. → Faulty hardware head CPU A1.
K1/108	<p>General contactor K1 has short-circuited.</p> <p>The battery voltage applied at the drive module is greater than (UBat-2V) before the general contactor is closed.</p>	<ul style="list-style-type: none"> → Check general contactor K1. → Check the bus lines (GS_in/GS_out).
K1/109	<p>General contactor K1 cannot be closed.</p> <ul style="list-style-type: none"> - After the general contactor has been closed, the battery voltage is too low. - No output at X1/5: X1/10 (head CPU is damaged). - One of the modules interrupts the coil voltage in the general contactor. 	<ul style="list-style-type: none"> → Check whether all modules on the head CPU are detected (module bus). → Check for loose contacts. → Check minimum configuration and determine faulty module or defective bus lines. → Check the bus lines (GS_in/GS_out). → Check general contactor K1 connections. → Check resistance of coil K1 (result ~ 50 ohms). → Check the voltage supply between X1/5:X1/10. → Faulty hardware head CPU A1.
K1/110	Incorrect machine type selected in machine selection or machine configuration (A1) does not match the configuration of the detected drive module (A2).	<ul style="list-style-type: none"> → Transfer/adapt correct machine type in the machine selection menu on the device. → Transfer the correct machine configuration (system parameters) with service program to head CPU A1.
K1/111	Battery voltage is outside of range 29 V < UBat > 45 V (29 V < VBat < 55 V when charging)	<ul style="list-style-type: none"> → Check battery voltage. → Check connections of battery supply lines.
K1/113	<p>Addressing of modules was unsuccessful.</p> <p>ATTN_IN - voltage is not detected at head CPU A1 after addressing.</p>	<ul style="list-style-type: none"> → Check whether all connected up modules are addressed (module bus). → Perform a power reset. (Disconnect battery for 1.5 minutes from machine) → Check minimum configuration and determine faulty module. → Check bus cables (ATTN_in/ATTN_out) (result ~ 10 V) → Check machine parameters.
K1/116	Current value for general contactor K1 coil was above 1.6 A for 20 ms.	<ul style="list-style-type: none"> → Check electric cable between general contactor K1 and head CPU A1. → Measure resistance of general contactor K1 coil (~ 50 ohms).

Display code	Important	Measure
K1/119	<p>Safety switch-off of co-processor.</p> <p>Both driving signals, for forward and reverse, are present simultaneously.</p>	<ul style="list-style-type: none"> ■ <i>Check the control panel</i> ➔ Check electric lines of travel direction switch S2 to A1 X203/1,2,3 for short circuit or coupled external voltage. ➔ Check the voltages for travel direction: <ul style="list-style-type: none"> Travel direction switch to forwards: Measure voltage between X1/9 and X203/1 (target approx. 13.6 volts) and between X1/9 and X203/2 (target approx. 13.6 volts) as well as between X1/9 and X203/3 (target < 1 volt). Travel direction switch to reverse: Measure voltage between X1/9 and X203/1 (target approx. 13.6 volts) and between X1/9 and X203/2 (target < 1 volt) as well as between X1/9 and X203/3 (target approx. 13.6 volts). ➔ Check switch S12: <ul style="list-style-type: none"> Travel direction forwards: Resistance 1-1b (<2 ohms), 1-1a (>1 MOhm). Travel direction backwards: Resistance 1-1a (<2 ohms), 1-1b (>1 MOhm). ➔ Start machine with connected travel direction switch; if fault remains, then head CPU A1 is defective.
K1/130	<p>Internal fault.</p> <p>Internal fault in 13 V switching voltage supply for head CPU A1.</p>	<ul style="list-style-type: none"> ➔ Perform a power reset. (Disconnect battery for 1.5 minutes from machine) ➔ Faulty hardware head CPU A1.
K1/131	<p>Internal fault.</p> <p>Internal fault in 13 V switching voltage supply for head CPU A1.</p> <p>Overload in 13 V bus line.</p>	<ul style="list-style-type: none"> ➔ Perform a power reset. (Disconnect battery for 1.5 minutes from machine) ➔ Check 13 V bus line Voltage X1:1 to Minus X12 target 12.8-14 V Check bus line for short circuit ➔ Not B 150 R Adv: A soldered connection on the rear side of the drive module A2 is connected to the aluminium heatsink. Eliminate the connection. ➔ Check minimum configuration and determine faulty module. ➔ Faulty hardware head CPU A1.
K1/132	<p>Internal fault.</p> <p>Internal fault in 13 V switching voltage supply for head CPU A1.</p> <p>Voltage > 14 V</p>	<ul style="list-style-type: none"> ➔ Perform a power reset. (Disconnect battery for 1.5 minutes from machine) ➔ Check 13 V bus line Voltage X1:1 to Minus X12 target 12.8-14 V Check bus line for external voltage ➔ Check minimum configuration and determine faulty module. ➔ Faulty hardware head CPU A1.
K1/133	<p>Internal fault.</p> <p>Internal fault in 13 V switching voltage supply for head CPU A1.</p> <p>Voltage < 12.8 V</p>	<ul style="list-style-type: none"> ➔ Perform a power reset. (Disconnect battery for 1.5 minutes from machine) ➔ Check 13 V bus line Voltage X1:1 to Minus X12 target 12.8-14 V Check bus line for short circuit ➔ Check minimum configuration and determine faulty module. ➔ Faulty hardware head CPU A1.
K1/134	<p>Internal fault.</p> <p>Backlighting</p> <p>Internal fault in 13 V switching voltage supply for head CPU A1.</p> <p>Backlight voltage > 13.5V.</p>	<ul style="list-style-type: none"> ➔ Perform a power reset. (Disconnect battery for 1.5 minutes from machine) ➔ Check 13 V bus line Check voltage X1:1 to negative X12 target 12.8-13.5 V Check bus line for external voltage ➔ Check minimum configuration and determine faulty module. ➔ Faulty hardware head CPU A1.
K1/135	<p>Internal fault.</p> <p>Backlighting</p> <p>Internal fault in 13 V switching voltage supply for head CPU A1.</p> <p>Backlight voltage for display voltage < 12.5 V.</p>	<ul style="list-style-type: none"> ➔ Perform a power reset. (Disconnect battery for 1.5 minutes from machine) ➔ Faulty hardware head CPU A1.

Display code	Important	Measure
K1/140	Parametrisation error in drive module A2 during startup phase "CHECK_PARAMETER". During module synchronisation between head CPU A1 and drive module A2, a parameter was rejected during start-up.	→ Perform a power reset. (Disconnect battery for 1.5 minutes from machine) → Connection of machine system with service module via Y-cable and manual correction of parameters of drive module A2 by transfer of standard parameters. → Drive module A2 defective.
K1/142	Parametrisation error in clean module A3 during start-up phase "CHECK_PARAMETER". During module synchronisation between head CPU A1 and clean module A3, a parameter was rejected during start-up.	→ Perform a power reset. (Disconnect battery for 1.5 minutes from machine) → Connection of machine system with service module via Y-cable and manual correction of parameters of clean module A3 by transfer of standard parameters. → Clean module A3 defective.
K1/143	Head CPU A1 cannot read the parameters. Relay K1 is not switching on.	→ Check minimum configuration and determine faulty module. → Faulty hardware head CPU A1.
K1/144	Parametrisation error in lifting module A4 during start-up phase "CHECK_PARAMETER". During module synchronisation between head CPU A1 and lifting module A4, a parameter was rejected during start-up.	→ Perform a power reset. (Disconnect battery for 1.5 minutes from machine) → Connection of machine system with service module via Y-cable and manual correction of parameters of lifting module A4 by transfer of standard parameters. → Lifting module A4 defective.
K1/145	Parametrisation error in lifting module A4.1 during start-up phase "CHECK_PARAMETER". During module synchronisation between head CPU A1 and lifting module A4.1, a parameter was rejected during start-up.	→ Perform a power reset. (Disconnect battery for 1.5 minutes from machine) → Connection of machine system with service module via Y-cable and manual correction of parameters of lifting module A4.1 by transfer of standard parameters. → Lifting module A4.1 defective.
K1/149	Error during parameter comparison.	→ A self-repair is performed after restarting.
K1/607	Internal working parameter error.	→ Switch off the machine and restart. → Perform a power reset. (Disconnect battery for 1.5 minutes from machine) → Faulty hardware head CPU A1.
K1/611	Fault when exiting test mode. A timeout occurred when exiting test mode.	→ Switch off the machine and restart. → Perform a power reset. (Disconnect battery for 1.5 minutes from machine)
K1/617	<ul style="list-style-type: none"> - Operating hours counter has been reloaded. - Maintenance counter memory is faulty. - All counters have been reloaded. 	<ul style="list-style-type: none"> → If message is no longer displayed, erase all maintenance counters. → Switch off the machine and restart. → Perform a power reset. (Disconnect battery for 1.5 minutes from machine) → Faulty hardware head CPU A1.
K1/618	<ul style="list-style-type: none"> - Graphic display not set. - Selected language is not within the range. - The selected language on head CPU A1 is empty. 	<ul style="list-style-type: none"> → Check system parameters. → Update the display of texts, icons and images using the service module. → Load head CPU A1 factory settings.
K1/619	<ul style="list-style-type: none"> - Fault when selecting new images and icons. - Graphic display not set. - Selected images are not within the range. - The selected images on head CPU A1 are empty. 	<ul style="list-style-type: none"> → Check system parameters. → Update the display of texts, icons and images using the service module. → Load head CPU A1 factory settings.

Display code	Important	Measure
K1/625	<ul style="list-style-type: none"> - Fan M7 defective or connected with reverse polarity. - Internal co-processor fault. Head CPU A1 Machine configuration (system parameters) not compatible. - Fan M7 has an excessively high startup current >350 mA. 	<p>→ Check the ventilation function. Voltage at A1 between 3 and 8 Target = approx. 12 volts.</p> <p>→ Fan connected to M1 with reverse polarity. Unplug the fan. If fault is no longer displayed - check electric cables and fans.</p> <p>→ Perform a power reset. (Disconnect battery for 1.5 minutes from machine)</p> <p>→ Load head CPU A1 factory settings.</p> <p>→ Faulty hardware head CPU A1.</p> <p>→ Connect fan M7 in parallel to pressure sensor S10 on the clean module A3. Connect the red Plus cable to X7/10 and the black Minus cable to X7/11.</p>
K1/626	System parameters do not match up with the machine configuration.	<p>→ Check head CPU parameters and correct.</p> <p>→ Attachment kit not selected in configuration.</p> <p>→ Attachment kit configured, but no consumer connected up.</p> <p>→ Load factory settings</p> <p>→ Perform a power reset. (Disconnect battery for 1.5 minutes from machine)</p>
K1/631	Status of drive module is not OK.	<p>→ Check drive module connections. (Voltage supply 13 V X1/1 and X2/1 bus system interrupted).</p> <p>→ Check minimum configuration and determine faulty module.</p> <p>→ Check parameters, reload head CPU (A1) standard parameters.</p> <p>→ Not B 150 R Adv: A soldered connection on the rear side of the drive module A2 is connected to the aluminium heatsink. Eliminate the connection.</p>
K1/633 B 150 R Adv only	<ul style="list-style-type: none"> - Travel direction switch S2 faulty. - Open circuit in the cabling between the drive module A2 and travel direction switch S2. - Cabling incorrectly connected to the drive module A2 or travel direction switch S2. 	<p>→ Check travel direction switch, replace as necessary.</p> <p>→ Check the wiring to the drive module A2 X4/2, X4/3, X4/9 for open circuit.</p> <p>→ Cables X4/3 and X4/9 from the drive module A2 to the travel direction switch S2 are connected interchanged.</p> <p>→ Travel direction switch S2 faulty.</p>
K1/651	Brush head lifting motor M20, implausible microswitch.	<p>→ Check electric cables of lifting motor M20.</p> <p>→ Check microswitches S20 and S21 for lifting motor M20.</p> <p>→ Measure voltage between GND* (UBat Minus) and A4 X5/1 (approx. 11 V). Upper brush head: Measure target voltage between GND* (UBat Minus) and A4 X5/5 (approx. 11V). Measure target voltage between GND* (UBat Minus) and A4 X5/8 (max. 3 V). Lower brush ==> target voltage between GND* (UBat Minus) and A4 X5/5 (max 3 V). Measure target voltage between GND* (UBat Minus) and A4 X5/8 (approx. 11 V).</p> <p>→ Lifting motor M20 defective.</p>
K1/652	Suction bar lifting motor M30, implausible microswitch	<p>→ Check electric cables of lifting motor M30.</p> <p>→ Check microswitches S30 and S31 for lifting motor M30. Measure voltage between GND* (UBat Minus) and A4 X4/1 (approx. 11 V). Top suction bar: Measure target voltage between GND* (UBat Minus) and A4 X4/5 (approx. 11V). Measure voltage between GND* (UBat Minus) and A4 X4/8 (max. 3 V). Lower Suction bar: Measure target voltage between GND* (UBat Minus) and A4 X4/5 (max. 3 V). Measure target voltage between GND* (UBat Minus) and A4 X4/8 (approx. 11 V).</p> <p>→ Lifting motor M30 defective.</p>

Display code	Important	Measure
K1/653	No start position for lifting motors. One of the lifting motors does not reach the start position within 10 s.	<ul style="list-style-type: none"> → Check mechanical lifting system of brush head, suction bar, side brushes. (Blockade M20/M30/M42) → Check electric cables for lifting motors M20/M30/M42. → Check functionality of motors M20/M30/M42. → Check microswitch S21 (top brush head) for M20 lifting motors. Measure voltage between GND* (UBat Minus) and A4 X5/8 target < 3 V. → Check microswitch S31 (top suction bar) for lifting motors M30. Measure voltage between GND* (UBat Minus) and A4 X4/8 target < 3 V. → Check microswitch S41 (top side brush) for lifting motors M40. Measure voltage between GND* (UBat Minus) and A4.1 X5/8 target < 3 V. → Faulty lifting module A4/A4.1.
K1/654	Timeout for brush head lifting motor (after 30 s). 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.	<ul style="list-style-type: none"> → Check electric cables of lifting motor M20. → Check functionality of lifting motor M20. → Check mechanical functioning of brush head. → Check microswitch S21 of lifting motor. Top brush head: Measure target voltage between GND* (UBat Minus) and A4 X5/5 (approx. 11V). Measure target voltage between GND* (UBat Minus) and A4 X5/8 (max. 3 V). → Faulty lifting module A4.
K1/655	Timeout for suction bar lifting motor (after 30 s). 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.	<ul style="list-style-type: none"> → Check electric cables of lifting motor M30. → Check functionality for motor M30. → Check mechanical functioning of suction bar. → Check microswitches S30 and S31 for lifting motor M30. Upper suction bar: Measure target voltage between GND* (UBat Minus) and A4 X4/5 (approx. 11V). Measure target voltage between GND* (UBat Minus) and A4 X4/8 (max. 3 V). → Faulty lifting module A4.
K1/661	Implausible microswitch of M42 side brush lifting motor	<ul style="list-style-type: none"> → Check electric cables for M42 lifting motors. → Check microswitches for S40/S41 lifting motors. → Check mechanical functioning of side brush. → Check voltage of S40/S41 microswitches (short-circuit to Ubat).Top side brushes: Measure target voltage between GND* (UBat Minus) and A4.1 X5/5 (approx. 11V). Measure target voltage between GND* (UBat Minus) and A4.1 X5/8 (max. 3 V)
K1/671	Wrong cleaning module version. The detected cleaning module is older than V4.0.	<ul style="list-style-type: none"> → Update clean module firmware to version > 4.0. → Faulty cleaning module A3.
K1/681	Implausible battery charge; range calculation not possible. Incorrect battery ID read from charger.	<ul style="list-style-type: none"> → Reselect the correct battery in the battery menu. → Disconnect the charger from the mains. → Connect the charger to the mains again. Completely carry out the charging cycle without interruptions → Check the charger. Measure the charging current. → Check battery. → Battery not charged despite being intact - faulty charger. → Faulty hardware head CPU A1.

*GND = Ground (-) Minus

Drive module: Coded error messages

Display code	Important	Measure
F1/001	<ul style="list-style-type: none"> - Short-circuit of propulsion motor M1 between X11 and X12. - Equipotential bonding missing between the splash guard and support plate. 	<ul style="list-style-type: none"> ➔ Disconnect the drive motor (M1) from A2/X11. ➔ Carry out main switch (S1) reset. ➔ If the fault is no longer displayed, then search for/eliminate short-circuit in electrical cabling and motor. ➔ Propulsion motor M1 defective. ➔ If fault remains, drive module A2 is defective. ➔ Make a cable connection between the splash guard 5.035-895.0 and electronics support plate. 5.035-897.0.
F1/002	Battery voltage outside limit value < 28.8 volts and > 43.2 volts.	<ul style="list-style-type: none"> ➔ Check battery voltage. ➔ Check the fuse F2. ➔ Check electrical wiring. ➔ Check battery parameters (correct battery type selected?). ➔ Drive module A2 defective.
F1/003	Thermo PROTECTION - driving module Overtemperature >78°C	<ul style="list-style-type: none"> ➔ Cool down driving module A2 and restart. ➔ Check fan M7 and voltage at A1 X1/3.8 (target 12 V). ➔ Check cooling air gap for cleanliness. ➔ Measure engine current M1 rotating freely. Target approx. 5A unloaded. ➔ Compare or transfer driving module A2 parameters with standard values. ➔ Drive module A2 defective.
F1/004	Drive sensor values are not within the calibrated tolerance window.	<ul style="list-style-type: none"> ➔ Recalibrate new throttle pedal. Release throttle pedal e.g. value 3, Throttle pedal depressed approx. value 1238 ➔ Electrical wiring interrupted at X4/3 negative. ➔ Measure supply voltage between X4/1 and X4/3 = 8 volts. Measure sensor voltage of throttle pedal when unactuated between X4/2 and X4/3 = approx. 0.2 volts and when actuated 4.3 volts. If the sensor voltage does not change while the throttle pedal is actuated, the solenoid sensor for throttle pedal B1 is defective. ➔ Check parameters; reload standard parameters for drive module (A2) (in service programme). Recalibrate new throttle pedal. ➔ Drive module A2 defective.
F1/005	Temperature sensor at drive module A2 is defective.	<ul style="list-style-type: none"> ➔ Drive module A2 defective.
F1/006	Fault during data transfer between service module A9 and drive module A2.	<ul style="list-style-type: none"> ➔ Using the Service program, download the drive module parameters to check the communication history between drive module A2 and service module A9. ➔ Transfer standard parameters set to machine. ➔ Exit parameter menu. ➔ If fault remains, drive module A2 is defective.
F1/007	Drive module A2 fault: EEPROM comparison error.	<ul style="list-style-type: none"> ➔ Perform a power reset. (Disconnect battery for 1.5 minutes from machine) ➔ Drive module A2 defective.
F1/008	Motor protection of propulsion motor M1 responds due to too high current.	<ul style="list-style-type: none"> ➔ Turn off the appliance. ➔ Allow device to cool down. ➔ Check electric cables for propulsion motor M1. ➔ Check carbon brushes. ➔ Check brake Y1. ➔ Drive module A2 defective.
F1/009	Time limit for motor overload (propulsion motor) exceeded.	<ul style="list-style-type: none"> ➔ Turn off the appliance. ➔ Allow engine M1 to cool down and check it. ➔ Check electric cables for brake Y1. ➔ Check brake Y1.

Display code	Important	Measure
F1/010	Electric cable interrupted for propulsion motor M1	<ul style="list-style-type: none"> → Check electric cabling for propulsion motor M1 for an open circuit (problems with loose contacts or defective propulsion motor). → Check carbon brushes, replace as necessary. → Drive module A2 defective.
F1/011	Fault at brake Y1 during running (brake returns to rest position). At least one of the two FETs (Field Effect Transistors) for activating brake Y1 is defective Electric cable interrupted for brake Y1. Brake Y1 defective.	<ul style="list-style-type: none"> → Check cabling of brake Y1 and brake coil for open circuit (problems with loose contacts or defective brake coil). Measure brake coil = approx. 56 Ω. → Drive module A2 defective.
F1/012	Brake short-circuit.	<ul style="list-style-type: none"> → Check brake coil for short-circuit (resistance in case of intact brake approx. 56 ohms) → Check electric cables for brake Y1 for short circuit. → Compare or transfer drive module A2 parameters with standard values. → Drive module A2 defective.
F1/013	Defective MOSFET bridge.	<ul style="list-style-type: none"> → Disconnect the drive motor (M1) from A2/X11, X12.
F1/014	or	<ul style="list-style-type: none"> → Incorrect parameters in the drive module. Transfer the default parameters to the drive module.
F1/015		<ul style="list-style-type: none"> → Turn on the machine.
F1/016		<ul style="list-style-type: none"> → If error persists, replace A2.
F1/017	Motor termination to *GND (UBat Minus) or positive.	<ul style="list-style-type: none"> → Check propulsion motor (M1), replace as necessary.
F1/018	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 UBat Minus.	<ul style="list-style-type: none"> → Perform a power reset. (Disconnect battery for 1.5 minutes from machine) → Compare or transfer driving module A2 parameters with standard values. → Drive module A2 defective.
F1/019	Safety switch-off of CO processor	<ul style="list-style-type: none"> → Perform a power reset. (Disconnect battery for 1.5 minutes from machine) → If fault remains, drive module A2 is defective.
F1/020	Failure arithmetic processing unit.	<ul style="list-style-type: none"> → Perform a power reset. (Disconnect battery for 1.5 minutes from machine) → Drive module A2 defective.
F1/021	A2: Internal intermediate voltage fault. Intermediate circuit voltage at the capacitors does not rise.	<ul style="list-style-type: none"> → Perform a power reset. (Disconnect battery for 1.5 minutes from machine) → BUS cable open circuit X7/3. Measure UBat BUS voltage between UBat Minus and X7/3. Target = UBat ~ 36 volts Search for open circuit on BUS cable. → Drive module A2 is not receiving preload voltage on start-up. Voltage between B- and B+ (drive module A2). Target = UBat. → Compare or transfer driving module A2 parameters with standard values. → Drive module A2 defective.
F1/022	A2 internal fault. Driving module does not receive 12-14 V control voltage.	<ul style="list-style-type: none"> → Check whether 13-14 volts are present at A2 X7/1 and X8/1. → Drive module A2 defective.

Display code	Important	Measure
F1/023	Power Supply to throttle pedal defective or overloaded.	<ul style="list-style-type: none"> → Check electric cables to throttle pedal for open circuits. Caution! Check all electric cables X5. → Check parameter (in service programme) offset 12 = 8 V. Reload driving module (A2) standard parameters. → Check throttle pedal potentiometer B1 is working. Measure supply voltage between X 4/1 and X 4/3 = 8 volts. → Measure sensor voltage of throttle pedal when unactuated between X 4/2 and X 4/3 = approx. 0.2 volts and when actuated 4.3 volts. → If the sensor voltage does not change while the throttle pedal is actuated - throttle pedal potentiometer B1 is defective. → Drive module A2 defective.
F1/024	Electric cable for throttle pedal has open circuit at X 4/1 and X 4/3.	<ul style="list-style-type: none"> → Check electric cables to throttle pedal for open circuits. Caution! Check all electric cables X4. → Check parameter (in service programme) offset 12 = 8 V. Reload driving module (A2) standard parameters. → Check throttle pedal potentiometer B1 is working. Measure supply voltage between X 4/1 and X 4/3 = 8 volts. → Measure sensor voltage of throttle pedal when unactuated between X 4/2 and X 4/3 = approx. 0.2 volts and when actuated 4.3 volts. → If the sensor voltage does not change while the throttle pedal is actuated - throttle pedal potentiometer B1 is defective. → Drive module A2 defective.
F1/026	Incorrect connection of seat switch	<ul style="list-style-type: none"> → An external voltage (UBat) is present at X 5/1 or X 5/5. → Measure the voltage between connection B (drive module A2) and X 5/5. Target > approx. 11 volts. → Measure the voltage between connection B (drive module A2) and X 5/1 with the seat switch open. Target = < 3 volts, with seat switch closed target = 11 volts.
F1/028	Incorrect connection of drive controller B1 (13-14)	<ul style="list-style-type: none"> → An external voltage (UBat) is present at X 5/3 or X 5/7. → Measure the voltage between connection B (drive module A2) and X 5/7. Target > approx. 11 volts. → Measure the voltage between connection B (drive module A2) and X 5/3 with the throttle pedal unactuated. Target = < 3 volts, with throttle pedal actuated target = 11 volts.
F1/030	Checksum error in EEPROM.	<ul style="list-style-type: none"> → Perform a power reset. (Disconnect battery for 1.5 minutes from machine) → Drive module A2 defective.
F1/031	General contactor control system defective.	<ul style="list-style-type: none"> → Perform a power reset. (Disconnect battery for 1.5 minutes from machine) → Drive module A2 defective.
F1/032	Communication error between arithmetic processing unit and central processor.	<ul style="list-style-type: none"> → Perform a power reset. (Disconnect battery for 1.5 minutes from machine) → Drive module A2 defective.
F1/033	3.3V processor voltage outside the admissible range.	<ul style="list-style-type: none"> → Perform a power reset. (Disconnect battery for 1.5 minutes from machine) → Drive module A2 defective.
F1/034	5.0V processor voltage outside the admissible range.	<ul style="list-style-type: none"> → Perform a power reset. (Disconnect battery for 1.5 minutes from machine) → Drive module A2 defective.
F1/036	Brake short-circuit. This fault is displayed after 500 ms.	<ul style="list-style-type: none"> → Check brake coil for short-circuit Y1 Measure brake coil at X6/2 and X6/4 = approx. 50 ohms. → Compare or transfer driving module A2 parameters with standard values. → Drive module A2 defective.
F1/037	A2 internal fault - RAM test faulty.	<ul style="list-style-type: none"> → Perform a power reset. (Disconnect battery for 1.5 minutes from machine) → Drive module A2 defective.
F1/038	Internal error A/D converter fault Co-processor and main processor have different values.	<ul style="list-style-type: none"> → Perform a power reset. (Disconnect battery for 1.5 minutes from machine) → Drive module A2 defective.

Display code	Important	Measure
F1/039	Internal error Safety chain of the arithmetic processing unit interrupted.	→ Perform a power reset. (Disconnect battery for 1.5 minutes from machine) → Drive module A2 defective.

Drive module: coded error messages B 150 ADV

Display code	Important	Measure
F1/001	A2 - internal fault: Failure in AD converter; ANALOG INPUT. The analogue readings do not change within 400 ms.	→ Check electric cables on throttle (throttle pedal) B1. → Check parameters, reload driving module (A2) standard parameters. → Check throttle for throttle pedal B1. Carry out all measurements against ground support point X22. Voltage at X5/1 approx. 8-9 volts. Voltage at X5/3 approx. 0.5 volts. Voltage at X5/2 approx. 0.5 volts, throttle pedal not actuated. Voltage at X5/2 approx. 4.8 volts, throttle pedal actuated. → Throttle for throttle pedal B1 defective. → Drive module A2 defective.
F1/002	A2 internal fault: EEPROM comparison error.	→ Perform a power reset. (Disconnect battery for 1.5 minutes from machine) → 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.	→ Perform a power reset. (Disconnect battery for 1.5 minutes from machine) → Compare or transfer driving module A2 parameters with standard values. → Drive module A2 defective.
F1/004	A2: Internal intermediate circuit voltage fault. Intermediate circuit voltage at the capacitors does not rise.	→ Perform a power reset. (Disconnect battery for 1.5 minutes from machine) → Compare or transfer driving module A2 parameters with standard values. → Drive 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.	→ Perform a power reset. (Disconnect battery for 1.5 minutes from machine) → Drive module A2 defective.
F1/008	A2: Internal fault: Motor phases monitoring during self-test defective.	→ Engine front M1 and engine rear M1.1 - U1, V1, W1 check electric cables (cable breakage?). → Clean and check the sliding contact and duct.
F1/009	A2: Internal motor current measurement during self-test defective.	→ Perform a power reset. (Disconnect battery for 1.5 minutes from machine) → Drive module A2 defective.
F1/010	K1 general contactor not closed during self-test or operation.	→ Perform a power reset. (Disconnect battery for 1.5 minutes from machine) → K1 Test coil for electric cables (cable breakage?). → K1 coil defective (~ 50 ohms). → Check bus cable in/out path. → Fuse F2 defective. → Check electric cable B+ to drive module A2. → Drive module A2 defective.

Display code	Important	Measure
F1/011	A2 internal voltage fault. A low voltage range or overvoltage was detected.	1 Perform a power reset. (Disconnect battery for 1.5 minutes from machine) 2 Drive module A2 defective.
F1/012	A2 internal logic error: during driver self-test. – Circuits for voltage feedback of motor phases are damaged. – At least one motor phase with short-circuit to GND (Ubat Minus).	➔ Perform a power reset. (Disconnect battery for 1.5 minutes from machine) ➔ Compare or transfer driving module A2 parameters with standard values. ➔ Drive module A2 defective.
F1/013	Thermo PROTEC-TION - driving module Overtemperature >78°C	➔ Cool down driving module A2 and restart. ➔ Check fan M7 and voltage at A1 X1/3.8 (target 12 V). ➔ Check cooling air gap for cleanliness. ➔ Measure engine current M1 and M1.1. ➔ Compare or transfer driving module A2 parameters with standard values. ➔ 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.	➔ Perform a power reset. (Disconnect battery for 1.5 minutes from machine) ➔ Drive module A2 defective.
F1/015	Battery voltage outside limit values < 28.8 and > 43.2 vol.	➔ Check battery voltage. ➔ Check cabling. Check electrical wiring. ➔ Check battery parameters (correct battery type selected?). ➔ Drive module A2 defective.
F1/016	Signals of throttle (throttle pedal) B1 not OK.	➔ Check electric cables to throttle B1. Caution! Check all electric cables X5. ➔ Check parameter (in service programme) offset 21 = 9 volts (value = 90). Reload driving module (A2) standard parameters. ➔ Check throttle (throttle pedal) B1. Carry out all measurements against ground support point X22. Voltage at X5/1 approx. 8-9 volts. Voltage at X5/3 approx. 0.5 volts. Voltage at X5/2 approx. 0.5 volts, throttle pedal not actuated. Voltage at X5/2 approx. 4.8 volts, throttle pedal actuated. ➔ Throttle for throttle pedal B1 defective. ➔ Drive module A2 defective.
F1/017	Phase (U1, V1, W1 of engine M1 and M1.1) do not reach Ubat.	➔ Check electrical wiring. Measure Ubatt on A2 battery B+/B-. ➔ Short-circuit between U1,V1 or W1 to GND (UBat Minus). ➔ Drive module A2 defective.
F1/018	A2 internal logic error, Watchdog defective.	➔ Perform a power reset. (Disconnect battery for 1.5 minutes from machine) ➔ Drive module A2 defective.

Display code	Important	Measure
F1/019	<ul style="list-style-type: none"> - A2 internal logic error, phases self-test. - Short-circuit in engine M1 or M1.1 between phase and GND (Ubat Minus), engine connected up incorrectly or damaged. High-side power MOSFETs). 	<ul style="list-style-type: none"> → Check electrical wiring. Check/measure short-circuit between Ubatt and one of the motor phases U1, V1, W1. → Compare or transfer driving module A2 parameters with standard values. → Drive module A2 defective.
F1/020	Short-circuit in brake Y1 or Y1.1. This fault is displayed after 500 ms.	<ul style="list-style-type: none"> → Check brake coil for short-circuit → Check electric cables for brakes for short circuit. → Compare or transfer driving module A2 parameters with standard values. → Drive module A2 defective.
F1/022	A2 internal logic error, Watchdog1 defective.	<ul style="list-style-type: none"> → Perform a power reset. (Disconnect battery for 1.5 minutes from machine) → Drive module A2 defective.
F1/023	A2 internal logic error, Watchdog2 defective.	<ul style="list-style-type: none"> → Perform a power reset. (Disconnect battery for 1.5 minutes from machine) → Drive module A2 defective.
F1/025	A2 internal fault - RAM test faulty.	<ul style="list-style-type: none"> → Perform a power reset. (Disconnect battery for 1.5 minutes from machine) → Drive module A2 defective.
F1/029	A2 internal INPUT fault. The expected signals are not at X4 during the self-test.	<ul style="list-style-type: none"> → Check electric cables at R1 steering potentiometers for X4/14 and X4/7. → Carry out calibration of steering potentiometers. → Carry out measurement against ground support points X22 and X4/7, approx. 4.5 volts with steering for driving straight ahead. → Check parameter (in service programme) offset 23, value = 283. → Reload driving module (A2) standard parameters. → 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).	<ul style="list-style-type: none"> → Check electrical wiring. Pins X4/2 and X4/3 at A2 must be free. → Check parameter (in service programme) offset 12; value = 21. → Reload driving module (A2) standard parameters. → 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. (microswitch for throttle B1, seat switch S5 and driving direction switch S2)	<ul style="list-style-type: none"> → Check electric cables at X4 to the sensors and switches. → Check parameters; reload driving module (A2) standard parameters. → 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.	<ul style="list-style-type: none"> → Check electric cables for throttle pedal B1 at X5. → Check parameters. Reload driving module (A2) standard parameters. → Calibrate throttle pedal. → Drive module A2 defective.

Display code	Important	Measure
F1/033	Temperature sensor on drive module A2 faulty.	→ Perform a power reset. (Disconnect battery for 1.5 minutes from machine) → Drive module A2 defective.
F1/035	Maximum current gain factor does not match the factory settings.	→ Perform a power reset. (Disconnect battery for 1.5 minutes from machine) → Drive module A2 defective.
F1/036	Fault at brake Y1 during running (brake returns to rest position). – At least one of the two FETs for activating brake Y1 and Y1.1 is defective. – Electric cable on brake Y1 and Y1.1 broken. – Brake Y1 and Y1.1 defective.	→ Check electric cables and brakes Y1 and Y1.1 for open circuit (loose connection problem or brake coil defective). → Measure the brake coils. → Drive module A2 defective.
F1/037	Brake line connection open (line breakage). Interruption in brake coil Y1 and Y 1.1. Transistor driver for brake defective. Fault occurs during running.	→ Check electric cables and brakes Y1 and Y1.1 for open circuit (loose connection problem or brake coil defective). → Measure the brake coils. → Drive module A2 defective.
F1/121	A2 driving module does not receive any voltage on the power electronics.	→ Check whether general contactor K1 is closed and whether contactor coil lines have a continuous connection with head CPU A1. → Check protective fuse F2 for driving module and replace if necessary. → Check whether there is a short-circuit between Ubatt and GND behind contactor K1 and the F2 fuses. Locate short-circuit, resolve. → Check whether battery voltage is between 27...42 V; if not, check battery. → Drive module A2 defective.
F1/122	A2 internal fault. Driving module does not receive 12-14 V control voltage.	→ Perform a power reset. (Disconnect battery for 1.5 minutes from machine) → Drive module A2 defective.
F1/161	Fault in dual processor monitoring.	1 Perform a power reset. (Disconnect battery for 1.5 minutes from machine) 2 Drive module A2 defective.

Drive module: Coded warnings

Display code	Important	Measure
F1/603	Time delay between seat switch actuation and throttle pedal actuation incorrectly configured.	→ Fault can only be rectified from service program software V8.1 or above. → Transfer standard parameter of drive module to the device. → Drive module A2 defective.

Drive module: coded warnings B 150 ADV

Display code	Important	Measure
F1/604	A2 internal fault input for drive release microswitch X4/1 and X4/8 (short-circuit) when throttle pedal activated.	<ul style="list-style-type: none"> → Check the voltage supply for throttle (throttle pedal) microswitch. Target = approx. 12 V between X4/8 and ground support point X22. → Activate throttle for throttle pedal; measure voltage between X4/1 and GND (Ubat Minus). Target = approx. 12 V → Check electric cables for short-circuit to GND (Ubat Minus) when microswitch throttle pedal B1 activated. → Check microswitch mechanical system. → Check parameters; reload driving module (A2) standard parameters. → Drive module A2 defective.
F1/608	Throttle pedal not calibrated.	<ul style="list-style-type: none"> → Calibrate the throttle pedal in test mode.
F1/667	A2 internal LOGIC fault. Interruption in bus line GS IN in event of switched-on machine in idle state.	<ul style="list-style-type: none"> → Perform a power reset. (Disconnect battery for 1.5 minutes from machine) → Check BUS-GS line between head CPU A1 and driving module A2. (loose connection). → Measure voltage at A2 X2/4 (GS IN line) = Ubatt. → Measure voltage at A2 X1/4 (GS out line) = Ubatt. not measurable ==> A2 defective.
F1/684	Values of the steering angle sensor implausible.	<ul style="list-style-type: none"> → Calibrate the steering angle sensor in test mode. → Check steering angle sensor, replace as necessary. → Drive module defective.
F1/698	BRAKE TIME RAMP TOO LONG. A2 wrong braking parameters set.	<ul style="list-style-type: none"> → Check parameters; reload driving module (A2) standard parameters (in service programme). → Drive module A2 defective.

Cleanmodul: coded error messages

Display code	Important	Measure
C1/001	Switch off roller/disc1 - overcurrent protection active	<ul style="list-style-type: none"> → Check brush for blockage and sluggishness. → Measure brush current in idle mode (test mode). Target approx. 5A. → Disconnect the motor (M2) A3/X8. → With motor M2 disconnected, carry out reset, main switch S1. If the fault is no longer displayed, then search for/eliminate short-circuit in electric cabling and motor. Motor M2 possibly defective. → Check parameters; reload cleaning module A3 standard parameters. → If the same fault is displayed again despite motor M2 being disconnected, then clean module A3 is defective.
C1/002	Switch off roller/disc2 - overcurrent protection active	<ul style="list-style-type: none"> → Check brush for blockage and sluggishness. → Measure brush current in idle mode (test mode). Target approx. 5A. → Disconnect motor (M3) A3/X13. → With motor M3 disconnected, carry out reset, main switch S1. If the fault is no longer displayed, then search for/eliminate short-circuit in electric cabling and motor. Motor M3 possibly defective. → Check parameters; reload cleaning module A3 standard parameters. → If the same fault is displayed again despite motor M3 being disconnected, then clean module A3 is defective.
C1/003	Switch off turbine - overcurrent protection active.	<ul style="list-style-type: none"> → Check suction turbine M4 for overload, measure suction turbine current in test mode - target approx. 19A. → Disconnect motor (M4) A3/X10. → With motor M4 disconnected, carry out reset, main switch S1. If the fault is no longer displayed, then search for/eliminate short-circuit in electric cabling and motor M4. Motor M4 possibly defective. → Check parameters; reload cleaning module A3 standard parameters. → If the same fault is displayed again despite motor M4 being disconnected, then clean module A3 is defective.

Display code	Important	Measure
C1/004	Switch off water pump - overcurrent protection active.	<ul style="list-style-type: none"> ➔ Measure current of water pump M5 at A3 X12. Target approx. 1A. ➔ Disconnect motor (M5) A3/X12. ➔ With motor M5 disconnected, reset main switch S1. If the fault is no longer displayed, then search for/eliminate short-circuit in electric cabling and motor M5. Motor M5 possibly defective. ➔ Check parameters; reload cleaning module A3 standard parameters. ➔ If the same fault is displayed again despite motor M5 being disconnected, then clean module A3 is defective.
C1/005	Error beacon light.	<ul style="list-style-type: none"> ➔ Disconnect flashing beacon H2 at A3/X4, 8-4. ➔ Perform a main and programme switch reset. ➔ If fault is replaced with another one, then search for/eliminate short-circuit in electric cabling. ➔ Check flashing beacon H2 and electric cabling for any defects.
C1/006	Battery voltage > 42V	<ul style="list-style-type: none"> ➔ Check whether battery voltage is between 27...50 V. If not, check battery and charge if necessary. ➔ Measure voltage at A3 - X6 and X5, measure target = UBat. ➔ Check the fuse (F3) 150 A, replace if necessary. Check electrical wiring. ➔ Clean module A3 defective.
C1/007	Battery voltage < 28V	<ul style="list-style-type: none"> ➔ Check whether battery voltage is between 27...50 V. If not, check battery and charge if necessary. ➔ Measure voltage at A3 - X6 and X5, measure target = UBat. ➔ Check the fuse (F3) 150 A, replace if necessary. Check electrical wiring. ➔ Clean module A3 defective.
C1/008	Alarm, control temperature. 90°C temperature too high.	<ul style="list-style-type: none"> ➔ Cool down cleaning module A3 and restart. ➔ Check fan M7 and voltage at A1 X1/3.8 (target 12 V). ➔ Check cooling air gap for cleanliness. ➔ Check current consumption of connected drive units in test mode without loads. Approx. 5A per brush motor. Suction turbine approx. 21 A. ➔ Compare or transfer cleaning module A3 parameters with standard values. ➔ Clean module A3 defective.
C1/009	Internal error A3 CRC error EEPROM.	<ul style="list-style-type: none"> ➔ Perform a power reset. (Disconnect battery for 1.5 minutes from machine) ➔ Clean module A3 defective.
C1/010	Internal error A3 Read error, Eeprom (cannot be reme-died).	<ul style="list-style-type: none"> ➔ Perform a power reset. (Disconnect battery for 1.5 minutes from machine) ➔ Clean module A3 defective.
C1/011	Internal error A3 Write error, Eeprom (cannot be reme-died).	<ul style="list-style-type: none"> ➔ Perform a power reset. (Disconnect battery for 1.5 minutes from machine) ➔ Clean module A3 defective.
C1/012	Internal error A3 CRC error in RAM parameter set	<ul style="list-style-type: none"> ➔ Perform a power reset. (Disconnect battery for 1.5 minutes from machine) ➔ Clean module A3 defective.
C1/013	Water servovalve not opening. Fuse F3 in clean module A3 defective.	<ul style="list-style-type: none"> ➔ Measure (and replace as may be the case) glass fuse (T 5A size 5x20) on circuit board for cleaning module F3. ➔ Clean module A3 defective.

Cleanmodul: coded warnings

Display code	Important	Measure
C1/601	Prewarning1: Control temperature has reached 60°C. (Switch on fans)	<ul style="list-style-type: none"> ➔ Cool down cleaning module A3 and restart. ➔ Check fan M7 and voltage at A1 X1/3.8 (target 12 V). ➔ Check cooling air gap for cleanliness. ➔ Check parameters; reload cleaning module A3 standard parameters. ➔ Clean module A3 defective.
C1/602	Overtemperature warning: Thermal cut-out at 95°C.	<ul style="list-style-type: none"> ➔ Cool down cleaning module A3 and restart. ➔ Check fan M7 and voltage at A1 X1/3.8 (target 12 V). ➔ Check cooling air gap for cleanliness. ➔ Check parameters; reload cleaning module A3 standard parameters. ➔ Clean 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.	<ul style="list-style-type: none"> ➔ Disconnect all units from cleaning module and reconnect individually. If fault occurs, examine the relevant unit. ➔ Clean module A3 defective.

Lifting module A4: coded error messages

Display code	Important	Measure
H1/001	Overcurrent protection (motor short circuit) in lifting motor, or MOSFET bridge defective.	<ul style="list-style-type: none"> ➔ Disconnect lifting motors (M20, M30) and carry out main switch (S1) reset. ➔ If the fault is replaced with another fault, then search for/eliminate short circuit in electric cabling or in lifting motors. ➔ Measure resistance at suction bar lifting motor and brush head lifting motor respectively (result > 1 ohm). Lifting motor (M20 or M30) defective. ➔ Check voltage for suction bar lifting motor M30 between X4/2 and X4/6 (target approx. 20 V). ➔ Check voltage for brush head lifting motor M20 between X5/2 and X5/6 (target approx. 24 V). ➔ If fault remains when plugs X4 and X5 unplugged, then lifting module A4 is defective.
H1/002	Voltage fault (>= 50 volts or < 27 volts).	<ul style="list-style-type: none"> ➔ Check whether battery voltage is between 27...50 V. If not, check battery and charge if necessary. ➔ Check whether the main relay (K1) is closed and the relay coil lines have an open connection with the head CPU (A1). ➔ Check the safety fuse (F4) to the lift module (A4) and replace if necessary. ➔ Check whether there is a short-circuit between Ubat and Ubat Minus behind the main relay (K1). Locate short-circuit and resolve. ➔ If fault remains, then A4 defective.
H1/003	Temperature fault (too hot). Lifting module A4 temperature exceeded.	<ul style="list-style-type: none"> ➔ Check fan M7 and voltage at A1 X1/3.8 (target 12V) and check electric cabling to A1. ➔ Check cooling air gap for cleanliness. ➔ Check side brushes drive is moving freely. ➔ Check side brush motors current consumption M40 in idle mode (test mode). Target = 1.5-2.5 ampere. Find short circuit in electric cabling. Side brushes motor may be defective. ➔ Lifting module A4 defective.
H1/004	Temperature sensor defective.	<ul style="list-style-type: none"> ➔ Perform a power reset. (Disconnect battery for 1.5 minutes from machine) ➔ Lifting module A4 defective.
H1/005	Checksum error in EEPROM (remediable, head CPU).	<ul style="list-style-type: none"> ➔ Perform a power reset. (Disconnect battery for 1.5 minutes from machine) ➔ Lifting module A4 defective.

Display code	Important	Measure
H1/006	EEPROM cannot be written to.	➔ Perform a power reset. (Disconnect battery for 1.5 minutes from machine) ➔ Lifting module A4 defective.
H1/009	Electric cable interrupted for right side brushes motor.	➔ Check electric cabling of side brushes motor (M40) to A4/X6 and UBAT Minus. ➔ Check resistance of the side brushes motor and electric cabling for low resistance. ➔ Measure voltage between A4/X6 and UBat (target 18-24 V). ➔ If fault remains, then A4 defective.
H1/010	MOSFET bridge lifting motor for suction bars defective.	➔ 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. ➔ Carry out main switch (S1) reset. If fault remains, then A4 defective.
H1/011	MOSFET bridge lifting motor for brush head defective.	➔ 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. ➔ Carry out main switch (S1) reset. If fault remains, then A4 defective.
H1/012	MOSFET bridge, side brushes defective.	➔ Disconnect side brushes motor (M40) A4/X6 and check for connections between Minus UBAT and X6; remove if necessary. ➔ Check side brushes motor for short circuit. ➔ Carry out main switch (S1) reset. If fault remains, then A4 defective.
H1/013	Fault in module supply (not 12 .. 14 V).	➔ Check whether 13...14 V are applied at A4/X2-1 and X3-1 (measure against UBAT minus). ➔ Search for and remove fault in bus line 1. ➔ If fault remains, then A4 defective.
H1/015	Short circuit between microswitch and casing electric lines in brush head lifting motor M20, suction bar M30 lifting motor.	➔ Restart device and actuate brush head M20 lifting motor in test mode. If the fault is triggered, the lifting motor is defective. ➔ Unplug brush head M20 lifting motor and restart device. If the fault is replaced by another fault, lifting motor M 20 is defective. ➔ Restart device and actuate suction bar M30 lifting motor in test mode. If the fault is triggered, the lifting motor is defective. ➔ Unplug suction bar M30 lifting motor and restart device. If the fault is replaced by another fault, lifting motor M 30 is defective. ➔ Lifting module A4 defective.
H1/016	Short circuit between microswitch and casing electric lines in brush head lifting motor M20, suction bar M30 lifting motor.	➔ Restart device and actuate brush head M20 lifting motor in test mode. If the fault is triggered, the lifting motor is defective. ➔ Unplug brush head M20 lifting motor and restart device. If the fault is replaced by another fault, lifting motor M 20 is defective. ➔ Restart device and actuate suction bar M30 lifting motor in test mode. If the fault is triggered, the lifting motor is defective. ➔ Unplug suction bar M30 lifting motor and restart device. If the fault is replaced by another fault, lifting motor M 30 is defective. ➔ Lifting module A4 defective.
H1/017	Short circuit between microswitch and casing electric lines in brush head lifting motor M20, suction bar M30 lifting motor.	➔ Restart device and actuate brush head M20 lifting motor in test mode. If the fault is triggered, the lifting motor is defective. ➔ Unplug brush head M20 lifting motor and restart device. If the fault is replaced by another fault, lifting motor M 20 is defective. ➔ Restart device and actuate suction bar M30 lifting motor in test mode. If the fault is triggered, the lifting motor is defective. ➔ Unplug suction bar M30 lifting motor and restart device. If the fault is replaced by another fault, lifting motor M 30 is defective. ➔ Lifting module A4 defective.
H1/018	Short circuit between microswitch and casing electric lines in brush head lifting motor M20, suction bar M30 lifting motor.	➔ Restart device and actuate brush head M20 lifting motor in test mode. If the fault is triggered, the lifting motor is defective. ➔ Unplug brush head M20 lifting motor and restart device. If the fault is replaced by another fault, lifting motor M 20 is defective. ➔ Restart device and actuate suction bar M30 lifting motor in test mode. If the fault is triggered, the lifting motor is defective. ➔ Unplug suction bar M30 lifting motor and restart device. If the fault is replaced by another fault, lifting motor M 30 is defective. ➔ Lifting module A4 defective.

Display code	Important	Measure
H1/019	Internal module fault A4. Checksum error in EEPROM (cannot be remedied).	➔ Perform a power reset. (Disconnect battery for 1.5 minutes from machine) ➔ Lifting module A4 defective.
H1/020	Internal module fault A4. Voltage supply (3.3V) outside the tolerance.	➔ Perform a power reset. (Disconnect battery for 1.5 minutes from machine) ➔ Check whether 13-14 V are present at A4/X3-1; if so, A4 is defective. ➔ Search error in bus line 1.
H1/021	Internal module fault A4. Voltage supply 3.3 V logic supply failure.	➔ Perform a power reset. (Disconnect battery for 1.5 minutes from machine) ➔ Check whether 13-14 V are present at A4/X3-1; if so, A4 is defective. ➔ Search error in bus line 1.
H1/022	Short-circuit in load output for right side brushes motor M40 during operation.	➔ Disconnect right side brushes motor (M40) A4/X6. ➔ Check side brushes motor and connecting cable for short-circuit. ➔ Carry out main switch (S1) reset. If the fault is replaced with another fault, then search for/remove short circuit in electric cabling. ➔ If fault remains, then A4 defective.
H1/023	Internal fault lifting module A4. Intermediate circuit voltage defective.	➔ Check whether main relay (K1) is closed and whether relay coil lines have a continuous connection with head CPU (A1). Check fusible cut-out (F4) (20/40A) for lifting module (A4) and replace if necessary. ➔ Check whether there is a short-circuit between Ubat and UBat Minus behind the main relay (K1). Locate short-circuit and resolve. ➔ Check whether battery voltage is between 27...50 V. If not, check battery. ➔ If fault remains, then A4 defective.
H1/024	Internal fault lifting module A4. Program fault on EEPROM.	➔ Perform a power reset. (Disconnect battery for 1.5 minutes from machine) ➔ Lifting module A4 defective.

Lifting module A4:1: coded error messages

Display code	Important	Measure
H2/001	Overcurrent protection (motor short circuit) in side brushes lifting motor or MOS-FET bridge defective.	➔ Disconnect lifting motors (M42) and carry out main switch (S1) reset. ➔ If the fault is replaced with another fault, then search for/eliminate short circuit in electric cabling or in lifting motors. ➔ Measure resistance of side brushes lifting motor (target > 1 ohm) ==> Lifting motor (M42) defective. ➔ Check voltage for side brushes lifting motor M42 (motor disconnected) between X4/2 and X4/6 (target approx. 24 V). ➔ If fault remains when plug X4 unplugged, then lifting module A4.1 is defective.
H2/002	Voltage fault (>= 50 volts or < 27 volts).	➔ Check whether battery voltage is between 27...50 V. If not, check battery and charge if necessary. ➔ Check whether the main relay (K1) is closed and the relay coil lines have an open connection with the head CPU (A1). ➔ Check protective fuse (F4) for lifting module (A4.1) and replace if necessary. ➔ Check whether there is a short-circuit between Ubat and UBat Minus behind the main relay (K1). Locate short-circuit and resolve. ➔ If fault remains, then A4.1 is defective.

Display code	Important	Measure
H2/003	Temperature fault (too hot).	<ul style="list-style-type: none"> ➔ Check fan M7 and voltage at A1 X1/3.8 (target 12V) and check electric cabling to A1. ➔ Check cooling air gap for cleanliness. ➔ Check side brushes drive is moving freely. ➔ Check side brush motors current consumption M41 in idle mode (test mode). Target = 1.5-2.5 ampere. Find short circuit in electric cabling. Side brushes motor may be defective. ➔ Lifting module A4.1 defective.
H2/004	Temperature sensor defective.	<ul style="list-style-type: none"> ➔ Perform a power reset. (Disconnect battery for 1.5 minutes from machine) ➔ Lifting module A4.1 defective.
H2/005	Checksum error in EEPROM (remediable, head CPU).	<ul style="list-style-type: none"> ➔ Perform a power reset. (Disconnect battery for 1.5 minutes from machine) ➔ Lifting module A4.1 defective.
H2/006	EEPROM not writable (cannot be remedied).	<ul style="list-style-type: none"> ➔ Perform a power reset. (Disconnect battery for 1.5 minutes from machine) ➔ Lifting module A4.1 defective.
H2/009	Electric cable interrupted for left side brushes motor.	<ul style="list-style-type: none"> ➔ Check cabling of side brushes motor (M41) to A4.1/X6 and UBAT Minus. ➔ Check resistance of the side brushes motor and electric cabling for low resistance (< 1 ohm). ➔ Measure voltage between A4.1/X6 and UBat Minus (target 18-24 V). ➔ If fault remains, then A4.1 is defective.
H2/010	MOSFET bridge lifting motor for side brushes defective.	<ul style="list-style-type: none"> ➔ Carry out main switch (S1) reset. ➔ Disconnect lifting motor (M42) A4.1/X5-2, 6 and check for connections between Minus UBAT and X5/6 as well as positive UBAT and X5/2; resolve. ➔ If fault remains, then A4.1 is defective.
H2/012	MOSFET bridge, side brushes defective.	<ul style="list-style-type: none"> ➔ Disconnect side brushes motor (M41) A4.1/X6 and check for connections between Minus UBAT and X6; resolve if possible. ➔ Check side brushes motor for short circuit. ➔ If fault remains, then A4.1 is defective.
H2/013	Fault in module supply (not 12 .. 14 V).	<ul style="list-style-type: none"> ➔ Check whether 13...14 V are applied at A4.1/X2-1 and X3-1 (measure against UBAT Minus). ➔ Search for and remove fault in bus line 1. ➔ If fault remains, then A4.1 is defective.
H2/015	<ul style="list-style-type: none"> - Side brushes lifting motor microswitch S40 stuck on High, fault in electric line M42 side brushes lifting motor. - Short-circuit between microswitch and casing electric lines in the side brushes lifting motor M42. 	<ul style="list-style-type: none"> ➔ Check whether the connected switch (S40) at A4.1 X5-5 is also supplied by A4.1/X5-1 without exception! Voltage at X5.1 target = approx. 10 volts. Lower side brush: Voltage at X5/5 approx. 2.5 volts and at X5/8 approx. 10 volts. Top side brush: Voltage at X5/5 approx. 10 volts and at X5/8 approx. 2.5 volts. ➔ Check electrical cabling of X5/5 for short-circuit to UBat or X5/1. ➔ Restart device and actuate M42 lifting motor in test mode. If a fault is displayed at once, the lifting motor is defective. ➔ Unplug side brushes M42 lifting motor and restart device. If the fault is replaced by another fault, lifting motor is defective. ➔ If fault remains, then A4.1 is defective.

Display code	Important	Measure
H2/016	<ul style="list-style-type: none"> - Side brushes lifting motor microswitch S41 stuck on High, fault in electric line M42 side brushes lifting motor. - Short-circuit between microswitch and casing electric lines in the side brushes lifting motor M42. 	<p>→ Check whether the connected switch (S41) at A4.1 X5-5 is also supplied by A4.1/X5-1 without exception! Voltage at X5.1 target = approx. 10 volts. Lower side brush: Voltage at X5/5 approx. 2.5 volts and at X5/8 approx. 10 volts. Top side brush: Voltage at X5/5 approx. 10 volts and at X5/8 approx. 2.5 volts.</p> <p>→ Check electrical cabling of X5/8 for short-circuit to UBat or X5/1. → Restart device and actuate M42 lifting motor in test mode. If a fault is displayed at once, the lifting motor is defective. → Unplug side brushes M42 lifting motor and restart device. If the fault is replaced by another fault, lifting motor is defective. → If fault remains, then A4.1 is defective.</p>
H2/017	Short-circuit between microswitch and casing electric lines in the side brushes lifting motor M42.	<p>→ Restart device and actuate M42 lifting motor in test mode. If a fault is displayed at once, the lifting motor is defective.</p> <p>→ Unplug side brushes M42 lifting motor and restart device. If the fault is replaced by another fault, lifting motor is defective.</p> <p>→ Lifting module A4.1 defective.</p>
H2/018	Short-circuit between microswitch and casing electric lines in the side brushes lifting motor M42.	<p>→ Restart device and actuate M42 lifting motor in test mode. If a fault is displayed at once, the lifting motor is defective.</p> <p>→ Unplug side brushes M42 lifting motor and restart device. If the fault is replaced by another fault, lifting motor is defective.</p> <p>→ Lifting module A4.1 defective.</p>
H2/019	Checksum error in EEPROM (cannot be remedied).	<p>→ Perform a power reset. (Disconnect battery for 1.5 minutes from machine)</p> <p>→ Lifting module A4.1 defective.</p>
H2/020	Voltage supply (3.3V) outside the tolerance.	<p>→ Perform a power reset. (Disconnect battery for 1.5 minutes from machine)</p> <p>→ Check whether 13-14V are applied at A4.1/X3-1; if so, A4.1 is defective.</p> <p>→ Search error in bus line 1.</p>
H2/021	Voltage supply 3.3 V logic supply failure.	<p>→ Perform a power reset. (Disconnect battery for 1.5 minutes from machine)</p> <p>→ Check whether 13-14V are applied at A4.1/X3-1; if so, A4.1 is defective.</p> <p>→ Search error in bus line 1.</p>
H2/022	Short-circuit in load output for left side brushes motor M41 during operation.	<p>→ Disconnect left side brushes motor (M41) A4.1/X6.</p> <p>→ Check side brushes motor and connecting cable for short-circuit.</p> <p>→ Carry out main switch (S1) reset. If the fault is replaced with another fault, then search for/remove short circuit in electric cabling.</p> <p>→ If fault remains, then A4.1 is defective.</p>
H2/023	Intermediate circuit voltage defective.	<p>→ Check whether main relay (K1) is closed and whether relay coil lines have a continuous connection with head CPU (A1). Check fusible cut-out (F4) (20/40A) for lifting module (A4.1) and replace if necessary.</p> <p>→ Check whether there is a short-circuit between Ubat and Ubat Minus behind the main relay (K1). Locate short-circuit and resolve.</p> <p>→ Check whether battery voltage is between 27...50 V. If not, check battery.</p> <p>→ If fault remains, then A4.1 is defective.</p>
H2/024	Program fault on EEPROM.	<p>→ Perform a power reset. (Disconnect battery for 1.5 minutes from machine)</p> <p>→ If fault remains, then A4.1 is defective.</p>

Lifting module: coded warnings

Display code	Important	Measure
H1/601	Overtemperature prewarning; switch on fans.	<ul style="list-style-type: none"> ➔ Check drive for side brushes M40 for freedom of movement and ease of operation. ➔ Check side brush motors current consumption M40 in idle mode (test mode). Target = 1.5-2.5 ampere. Find short circuit in electric cabling. Side brushes motor may be defective. ➔ Check fan M7 and voltage at A1 X1/3.8 (target 12V) and check electric cabling to A1. ➔ Check cooling air gap for cleanliness. ➔ Lifting module A4 defective.
H1/602	Overtemperature warning, user information.	<ul style="list-style-type: none"> ➔ Check drive for side brushes M40 for freedom of movement and ease of operation. ➔ Check side brush motors current consumption M40 in idle mode (test mode). Target = 1.5-2.5 ampere. Find short circuit in electric cabling. Side brushes motor may be defective. ➔ Check fan M7 and voltage at A1 X1/3.8 (target 12V) and check electric cabling to A1. ➔ Check cooling air gap for cleanliness. ➔ Lifting module A4 defective.
H1/664	Low voltage warning: Discharge battery or transitional resistance in electric lines.	<ul style="list-style-type: none"> ➔ Check whether battery voltage is between 27...50 V. If not, check battery and charge if necessary. ➔ Check whether the main relay (K1) is closed and the relay coil lines have an open connection with the head CPU (A1). ➔ Check fusible cut-out (F4) (20/40A) for lifting module (A4) and replace if necessary. ➔ Check whether there is a short-circuit between Ubat and Ubat Minus behind the main relay (K1). Locate short-circuit and resolve. ➔ If fault remains, then A4 defective.
H1/665	Switch S30 (suction bar down) not reached; anti-lock beforehand.	<ul style="list-style-type: none"> ➔ Check mechanical system for block. ➔ Measure current of suction bar lifting motor in test mode. Target = approx. 3.5 ampere. ➔ Check lifting motor (M30), with limit switch (S30), for correct functioning. Check whether switch (S30) at A4/X4-5 is also supplied by A4/X4-1 without exception! Voltage at X4.1 target = approx. 10 volts. Lower suction bar M30 lifting motor: Voltage at X4/5 approx. 2.5 volts and at X4/8 approx. 10 volts. Upper suction bar M30 lifting motor: Voltage at X4/5 approx. 10 volts and at X4/8 approx. 2.5 volts. ➔ Check electric line of X4/5 for short-circuit to Ubat or X4-1. ➔ If fault remains, then A4 defective.
H1/667	Switch S20 (brush down) not reached; anti-lock beforehand.	<ul style="list-style-type: none"> ➔ Check mechanical system for block. ➔ Measure current of brush head lifting motor M20 in test mode. Target = approx. 3.5 ampere. ➔ Check lifting motor (M20), with limit switch (S20), for correct functioning. Check whether switch (S20) at A4 X5-5 is also supplied by A4/X5-1 without exception! Voltage at X5.1 target = approx. 10 volts. Lower brush head M20 lifting motor: Voltage at X5/5 approx. 2.5 volts and at X5/8 approx. 10 volts. Upper brush head M20 lifting motor: Voltage at X5/5 approx. 10 volts and at X5/8 approx. 2.5 volts. ➔ Check electric lines for short-circuit to Ubat or X5-1. ➔ If fault remains, then A4 defective.

Display code	Important	Measure
H1/668	Switch S21 (brush up) not reached; anti-lock beforehand.	<ul style="list-style-type: none"> ➔ Check mechanical system for block. ➔ Measure current of brush head lifting motor M20 in test mode. Target = approx. 3.5 ampere. ➔ Check lifting motor (M20) with limit switch (S21) for correct functioning. Check whether switch (S21) at A4 X5-5 is also supplied by A4/X5-1 without exception! Voltage at X5.1 target = approx. 10 volts. Upper brush head M20 lifting motor: Voltage at X5/5 approx. 10 volts and at X5/8 approx. 2.5 volts. Lower brush head M20 lifting motor: Voltage at X5/5 approx. 2.5 volts and at X5/8 approx. 10 volts. ➔ Check electric line of X5/8 for short-circuit to UBat or X5-1. ➔ If fault remains, then A4 defective.
H1/669	Switch contradiction lifting motor M20 (brush head), both switches open.	<ul style="list-style-type: none"> ➔ Check electric lines between X5/8 and S21 and between X5/5 and lifting motor S20. ➔ Check microswitch for brush head lifting motor S20/S21 for correct functioning. ➔ Measure voltage between UBat Minus and A4 X5/1 (approx. 10 V). Upper brush head: Measure voltage between Ubat Minus and A4 X5/5 (approx. 10 V); measure voltage between UBat Minus and A4 X5/8 (approx. 2.5V). Lower brush head: Measure voltage between Ubat Minus and A4 X5/5 (approx. 2.5 V); measure voltage between UBat Minus and A4 X5/8 (approx. 10 V). ➔ Lifting motor M20 defective. ➔ If fault remains, then A4 defective.
H1/670	Switch contradiction lifting motor M30 (vacuum bar), both switches open.	<ul style="list-style-type: none"> ➔ Check electric lines between X4/8 and S31 and between X4/5 and lifting motor S30. ➔ Check microswitch for suction bar lifting motor S30/S31 for correct functioning. Measure voltage between Ubat Minus and A4 X4/1 (approx. 10 V). Upper suction bar: Measure voltage between Ubat Minus and A4 X4/5 (approx. 10 V); measure voltage between Ubat Minus and A4 X4/8 (approx. 2.5 V). Lower suction bar: Measure voltage between Ubat Minus and A4 X4/5 (approx. 2.5 V); measure voltage between Ubat Minus and A4/8 (approx. 10V). ➔ Lifting motor M30 defective. ➔ If fault remains, then A4 defective.
H1/671	Side brushes blocked; controller remains at programmed max. current.	<ul style="list-style-type: none"> ➔ Examine side brushes motor M40 for foreign bodies (string) and remove this. ➔ Disconnect side brushes motor (M40) at X6. If the fault is replaced with another fault, then search for/remove short circuit in electric cabling. ➔ Measure resistance of side brushes motor (target < 1 ohm), side brushes motor (M40) defective. ➔ Check voltage at side brushes motor M40 between X6 and Ubat Minus (target approx. 20 V). ➔ If fault remains when Line X6 is unplugged, then lifting module A4 is defective.

Display code	Important	Measure
H1/698	Switch S31 (suction bar up) not reached; anti-lock beforehand.	<ul style="list-style-type: none"> ➔ Check mechanical system for block. ➔ Measure current of suction bar M30 lifting motor in test mode (target = approx. 3.5A). ➔ Check lifting motor (M30), with limit switch (S31), for correct functioning. ➔ Check whether switch (S31) at A4 X4-5 is also supplied by A4/X4-1 without exception! <p>Voltage at X4.1 (target = approx. 10 V).</p> <p>Lower suction bar M30 lifting motor: Voltage at X4/5 approx. 2.5 volts and at X4/8 approx. 10 volts.</p> <p>Upper suction bar M30 lifting motor: Voltage at X4/5 approx. 10 volts and at X4/8 approx. 2.5 volts.</p> <ul style="list-style-type: none"> ➔ Check electric line of X4/8 for short-circuit to UBat or X4-1. ➔ If fault remains, then A4 defective.
H1/6129	Overtemperature prewarning cancelled.	Only info; acknowledge via iButton.
H1/6130	Overtemperature warning cancelled.	Only info; acknowledge via iButton.

Lifting module: coded warnings

Display code	Important	Measure
H2/602	Overtemperature warning, user information.	<ul style="list-style-type: none"> ➔ Check drive for side brushes M41 for freedom of movement and ease of operation. ➔ Check side brush motors current consumption M41 in idle mode (test mode). <p>Target = 1.5-2.5 ampere.</p> <p>Find short circuit in electric cabling.</p> <p>Side brushes motor may be defective.</p> <ul style="list-style-type: none"> ➔ Check fan M7 and voltage at A1 X1/3.8 (target 12V) and check electric cabling to A1. ➔ Check cooling air gap for cleanliness. ➔ Lifting module A4.1 defective.
H2/664	Low voltage warning: Discharge battery or transitional resistance in electric lines.	<ul style="list-style-type: none"> ➔ Check whether battery voltage is between 27...50 V. If not, check battery and charge if necessary. ➔ Check whether the main relay (K1) is closed and the relay coil lines have an open connection with the head CPU (A1). ➔ Check fusible cut-out (F4) (20/40A) for lifting module (A4) and replace if necessary. ➔ Check whether there is a short-circuit between Ubat and Ubat Minus behind the main relay (K1). Locate short-circuit and resolve. ➔ If fault remains, then A4.1 defective.
H2/665	Switch S40 (side brush down) not reached; anti-lock beforehand.	<ul style="list-style-type: none"> ➔ Check mechanical system for block. ➔ Measure current of side brushes lifting motor M42 in test mode. <p>Target = approx. 3.5 ampere.</p> <ul style="list-style-type: none"> ➔ Check lifting motor (M42), with limit switch (S40), for correct functioning. ➔ Check whether switch (S40) at A4.1/X5-5 is also supplied by A4/X5-1 without exception! <p>Voltage at X5.1 target = approx. 10 volts.</p> <p>Lower side brushes M42 lifting motor: Voltage at X5/5 approx. 2.5 V and at X5/8 approx. 10 V.</p> <p>Upper side brushes M42 lifting motor: Voltage at X5/5 approx. 10 V and at X5/8 approx. 2.5 V.</p> <ul style="list-style-type: none"> ➔ Check electric line of X5/5 for short-circuit to UBat or X5-1. ➔ If fault remains, then A4.1 defective.

Display code	Important	Measure
H2/669	Switch discrepancy in lifting motor M42, both switches open.	<ul style="list-style-type: none"> ➔ Check electric lines between X5/8 and S41 and between X5/5 and S40 of lifting motor M42. ➔ Check microswitch for side brushes lifting motor S40/S41 for correct functioning. ➔ Measure voltage between Ubat Minus and A4.1 X5/5 (approx. 10 V). Upper side brushes M42 lifting motor: Measure voltage between Ubat Minus and A4.1 X5/5 (approx. 10 V); measure voltage between UBat Minus and A4.1X5/8 (approx. 2.5 V). Lower side brushes M42 lifting motor: Measure voltage between Ubat Minus and A4.1 X5/5 (approx. 2.5 V); measure voltage between UBat Minus and A4.1 X5/8 (approx. 10 V). ➔ Lifting motor M42 defective. ➔ If fault remains, then A4.1 defective.
H2/671	Side brushes blocked; controller remains at programmed max. current. M41	<ul style="list-style-type: none"> ➔ Examine side brushes motor M41 for foreign bodies (string) and remove this. ➔ Disconnect side brushes motor (M41) at X6. If the fault is replaced with another fault, then search for/remove short circuit in electric cabling. ➔ Measure resistance of side brushes motor (target < 1 ohm), side brushes motor (M41) defective. ➔ Check voltage at side brushes motor M41 between X6 and Ubat Minus (target approx. 20V). ➔ If fault remains when Line X6 is unplugged, then lifting module A4.1 is defective.
H2/6129	Overtemperature prewarning cancelled.	Only info; acknowledge via iButton.
H2/6130	Overtemperature warning cancelled.	Only info; acknowledge via iButton.

On-board charger: Coded error messages

Display code	Important	Measure
L1/021	Charging module timeout during phase 0 (desulphurisation)	<ul style="list-style-type: none"> ➔ Check battery. ➔ Check charger A7. ➔ Check the battery characteristic curve. ➔ Charger A7 defective.
L1/022	Charging module timeout during phase 1 I-phase.	<ul style="list-style-type: none"> ➔ Check battery. ➔ Check charger A7. ➔ Check the battery characteristic curve. ➔ Charger A7 defective.
L1/023	Charging module timeout during phase 2 U-phase. The battery does not reach the expected voltage in the expected time.	<ul style="list-style-type: none"> ➔ Check battery. ➔ Check charger A7. ➔ Check the battery characteristic curve. ➔ Charger A7 defective.
L1/030	Wrong charge parameters loaded.	<ul style="list-style-type: none"> ➔ Correct charging characteristic via service module. ➔ Check electrical wiring and replace if necessary. ➔ Check battery. ➔ Check charger A7.
L1/033	Wrong charging characteristics selected.	<ul style="list-style-type: none"> ➔ Correct charging characteristic curve via service module or battery menu.

Display code	Important	Measure
L1/040	Hardware fault in the charger.	➔ Charger is defective.
L1/041	Fault of the internal voltage supply of the charging module.	➔ Charger is defective.
L1/050	Software test fault. (CRC Check, RAM Test)	➔ Perform a firmware update of the charger with the service program. ➔ Load the factory settings.

On-board charger: Coded warnings

Display code	Important	Measure
L1/615	Charging process throttled due to too high temperature ($T > 90^\circ\text{C}$).	➔ Restart charging process. ➔ Check fan in charger A7 and replace if necessary. ➔ Check air duct. ➔ Check battery. ➔ Check charger A7.
L1/616	Stop charging process due to too high temperature ($T > 100^\circ\text{C}$).	➔ Check electrical wiring and replace if necessary. ➔ Check battery. ➔ Check charger A7.
L1/620	Battery voltage too low ($U_{\text{batt}} < 27 \text{ V}$).	➔ Check plug connection between charger A7 and battery. ➔ Check battery.
L1/621	Battery voltage too high ($U_{\text{batt}} > 50 \text{ V}$).	➔ Check battery.
L1/625	The difference between I_{target} and I_{actual} is 2A.	➔ Check battery. ➔ Check the battery characteristic curve. ➔ Charger is defective. ➔ Compare or transfer charger A7 parameters with standard values.
L1/630	Error in the parallel connection of the two chargers.	➔ Communication problem with both chargers. Both chargers have different software. ➔ Check electrical wiring and replace if necessary. ➔ Check charger A7.
L1/635	Failure fan.	➔ Check electrical wiring of fan and replace fan if necessary.
L1/638	The internal voltage supply is outside the range (+12 V, +5 V).	➔ Check charger A7.

Faults without display on the console

Fault	Remedy
Check/replace the drive direction switch in test mode.	Check the programme selector switch.
Appliance cannot be started	Check fuses / replace defective fuse. Check / charge / replace battery. Check/replace the main relay. Check / replace intelligent key. Check the connecting cables between all the modules in test mode. Check accelerator sensor / perform calibration / replace. Check/replace the drive direction switch in test mode. Check / replace head CPU. Check/replace the seat switch in test mode. Check the drive module by means of the test mode / replace. Check the propulsion motor by means of the test mode / replace.
Noise in the area of the wheel hub motor	Adjust the fastening nut of the steering bearing. Check / replace the steering bearing. Check/set the brake. Check the fastening of the tyres (drive motor).
No or insufficient water supply	Check / replace the pressure switch in the fresh water tank Check the water hoses to the cleaning head / remove obstruction / bend location. Check / replace programme selector switch. Check/replace the dosing valve in test mode. Check / replace the water pump in test mode. Check cable connections / remove defect. Check / replace the clean module.
The electrical ball tap will not open and the suction turbine only operates at reduced speed	The parameters in the clean module are incorrect. The default parameters of the clean module must be transferred to the clean module with the help of the Service module.
No or insufficient detergent supply	Check the hose to the cleaning head / remove obstruction / bend location. Check / replace programme selector switch. Check / replace the detergent pump in test mode. Check the flowmeter for obstructions. Check cable connections / remove defect. Check / replace the clean module.
Suction is too low	Check whether the suction performance is set to "WHISPER". If the lint trap in the air intake (waste water tank) is obstructed / clean. The lid of the dirt water rinsing system is missing the seal which protects against coupling. ■ <i>MNKT uninstalling/installing clutch with tank rinsing</i> Check the suction bar inclination setting. ■ <i>Setting the vacuum Bar</i>
Suction turbine does not run	Vacuum bar raised. waste water tank is full. Check/replace the fuse. Check / replace the float switch of the waste water tank. float switch blocked / defective (is only fully active for waste water tank). Check / replace programme selector switch. Check / replace the suction turbine. Check cable connections / remove defect. Check / replace the clean module.
Suction turbine does not switch off after trailing time	float switch blocked / defective (is only fully active for waste water tank). Check the lifting motor by means of the test mode / replace. Check / replace the clean module.

Fault	Remedy
Waste water tank is overflowing	Check/replace the fuse.
	Check / replace the float switch in the waste water tank in test mode.
	Check cable connections / remove defect.
	Check / replace the clean module.
Vacuum bar cannot be raised / lowered.	Check/replace the fuse.
	Lifting mechanism is blocked.
	Check the lifting motor by means of the test mode / replace.
	Check/replace the programme selection switch in test mode.
	Check / replace the lift motor in test mode.
	Check cable connections / remove defect.
The R clean head vibrates strongly	Check / replace lifting module.
	Check the brush level, adjust if required.
	Contact pressure not suitable for the floor covering. Change the contact pressure.
	Roller brushes are unbalanced. Replace the brush rollers.
	Roller brushes have axial play. Balance out the axial play with the VA shims.
Cleaning head cannot be raised / lowered.	Brush speed is too high for the floor covering. Reduce the speed.
	Roller brush is too high for the floor covering. Use softer brushes.
	Check/replace the fuse.
	Lifting mechanism is blocked.
	Check the lifting motor by means of the test mode / replace.
	Check / replace programme selector switch.
The brush motors do not run	Check / replace the lift motor in test mode.
	Check / replace the lift module (A4) in test mode.
	Check/replace the fuse.
	Check connector on cleaning head.
	Check / replace the brush motor (M2/M3) in test mode.
Bad brake effect	Check / replace programme selector switch.
	Check cable connections / remove defect.
	Check / replace the clean module.
Unsatisfactory cleaning result	Check / adjust / replace the electromagnetic brake in test mode.
	Check / replace drive module.
	Check cable connection to the brake
	Check the brush rollers for suitability, wear and foreign objects. Bristle length at least 10 mm.
	Check / adjust the contact pressure of the brush rollers.
	Suction power is too low.
Service program not fully operational.	No water supply or water supply too weak.
	No or insufficient detergent supply.
	Check the brush rotation direction and speed (FACT).
	Use the red intelligent Key.
	Water servovalve not opening. Fuse F3 in clean module A3 defective.
Measure glass fuse (T 5A size 5x20) on printed circuit board for clean module and replace as required. Clean module A3 defective.	

Software diagrams and parameter overview

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). NOTE 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.

If no change or selection is made in the submenu for 10 seconds, the program changes to the relevant standard setting.

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

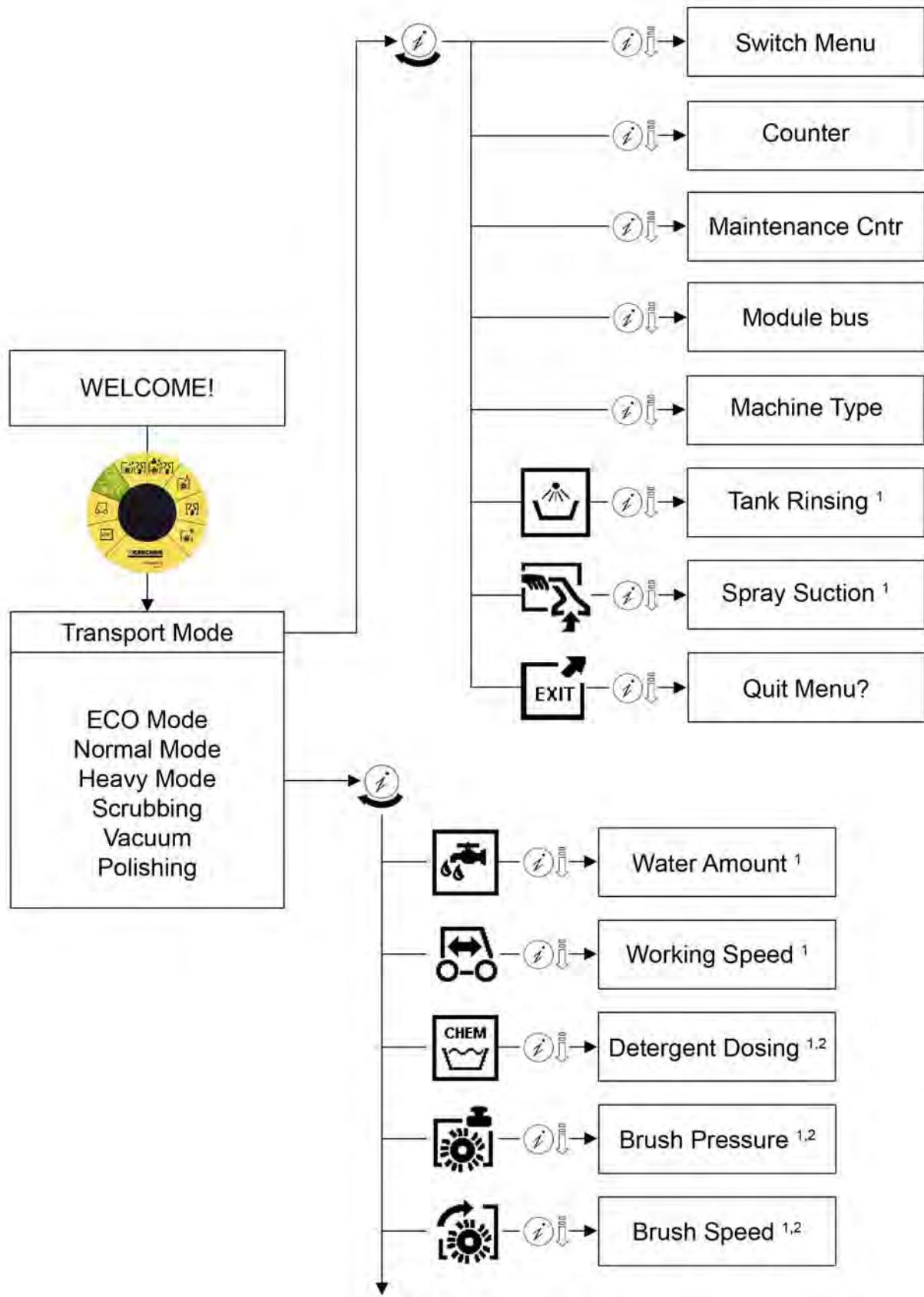
■ Intelligent Key

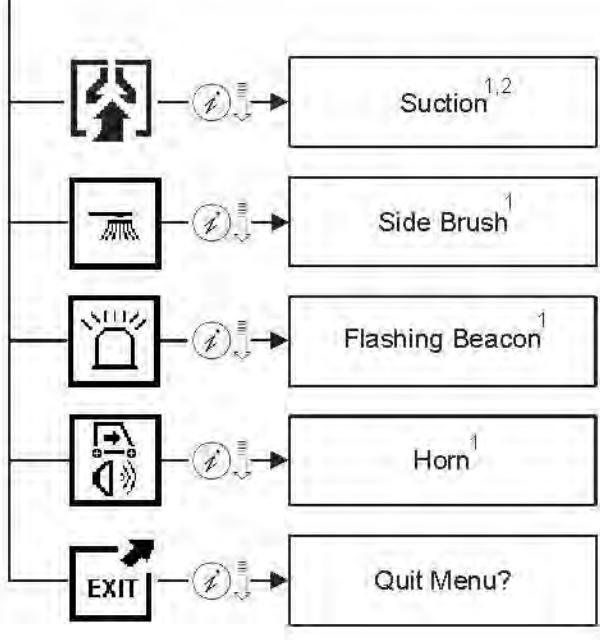
Function overview: Intelligent Keys

Note

The menus displayed relative to the selected mode. The diagram shows all available menus as an overview.
At software version V5.0 or greater.

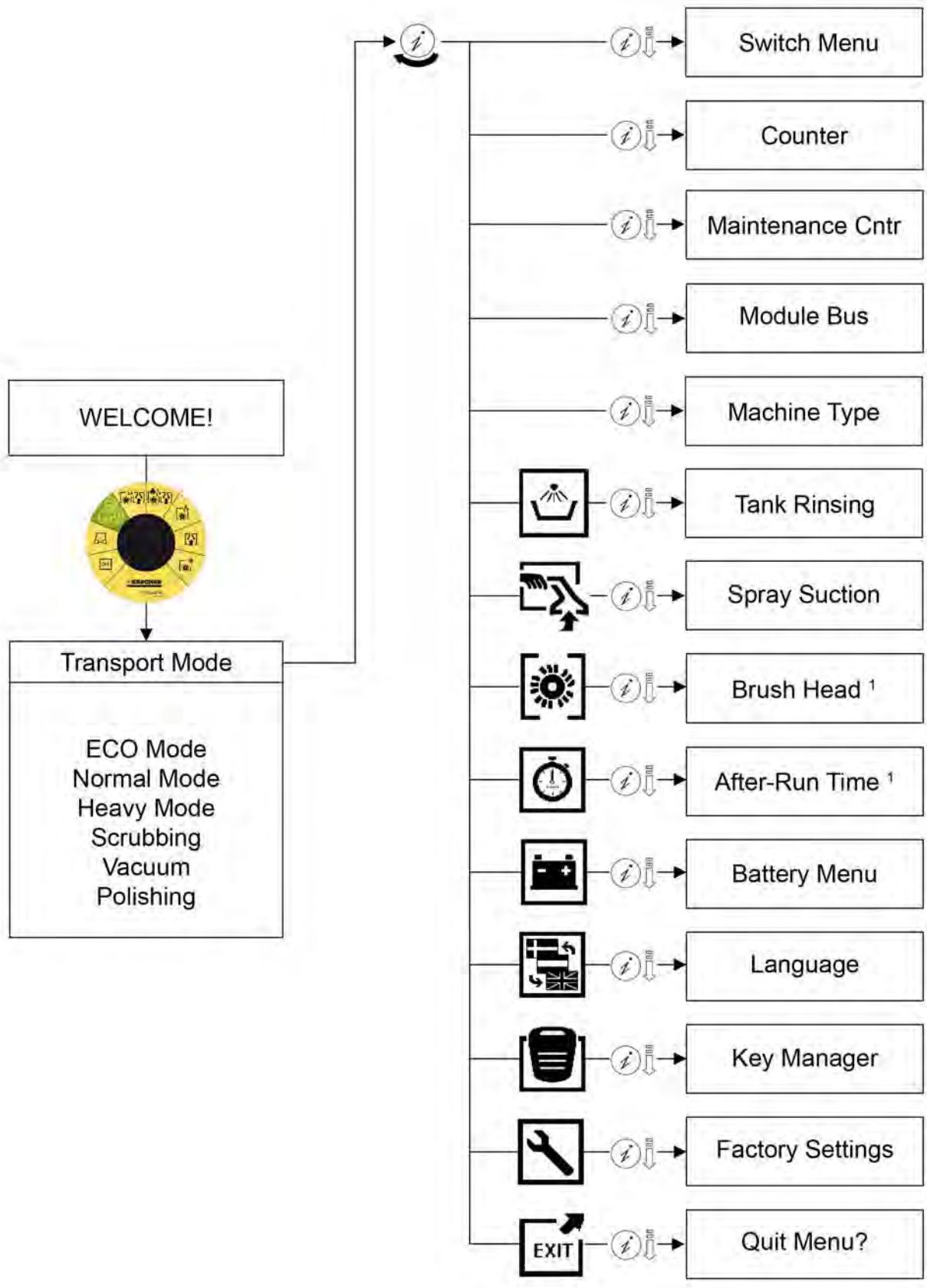
Function overview of the yellow intelligent key

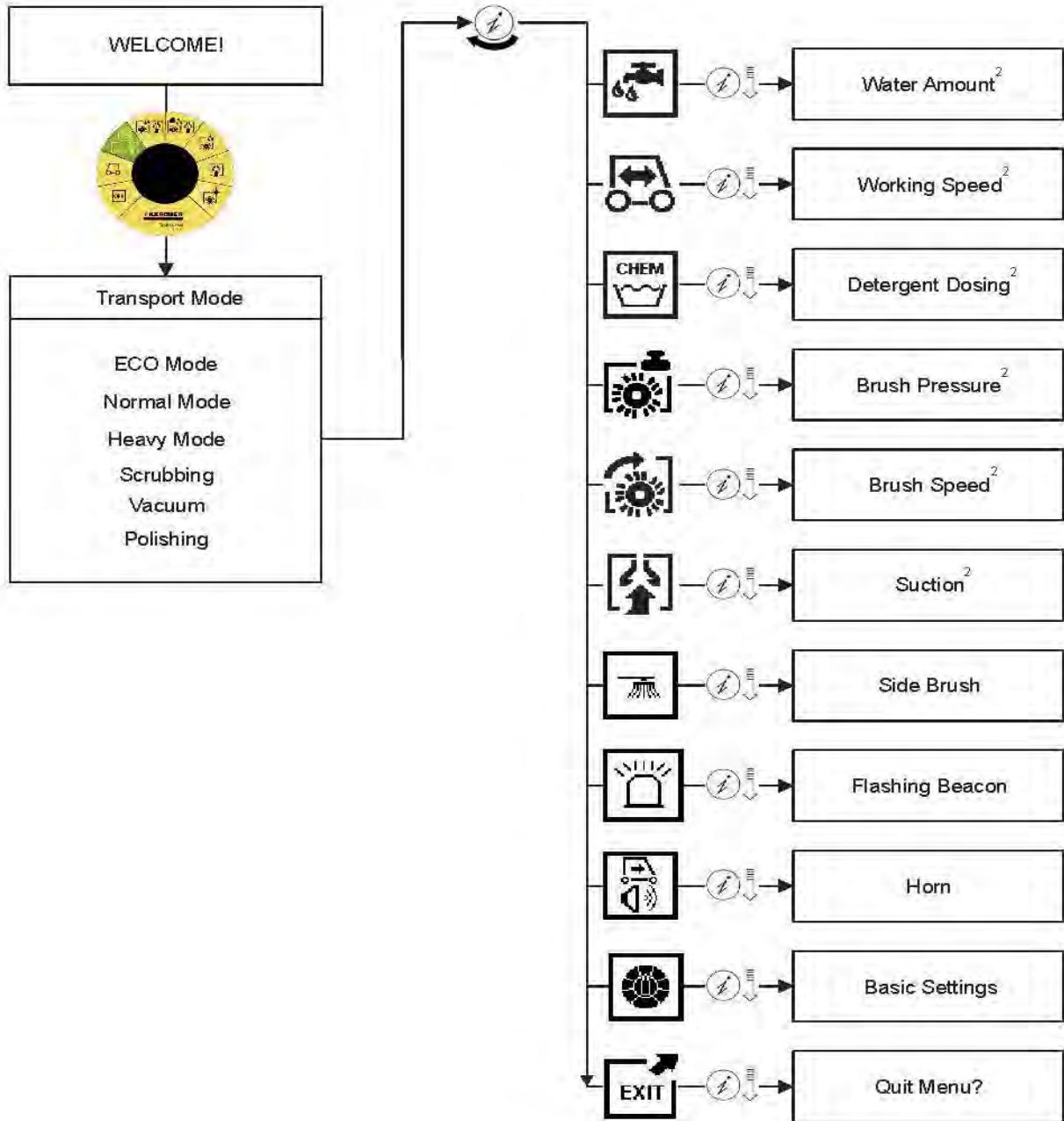




- 1 Those menus must be enabled in the key menu.
- 2 Selection not permanent. The setting will be lost if the program selection switch is adjusted.

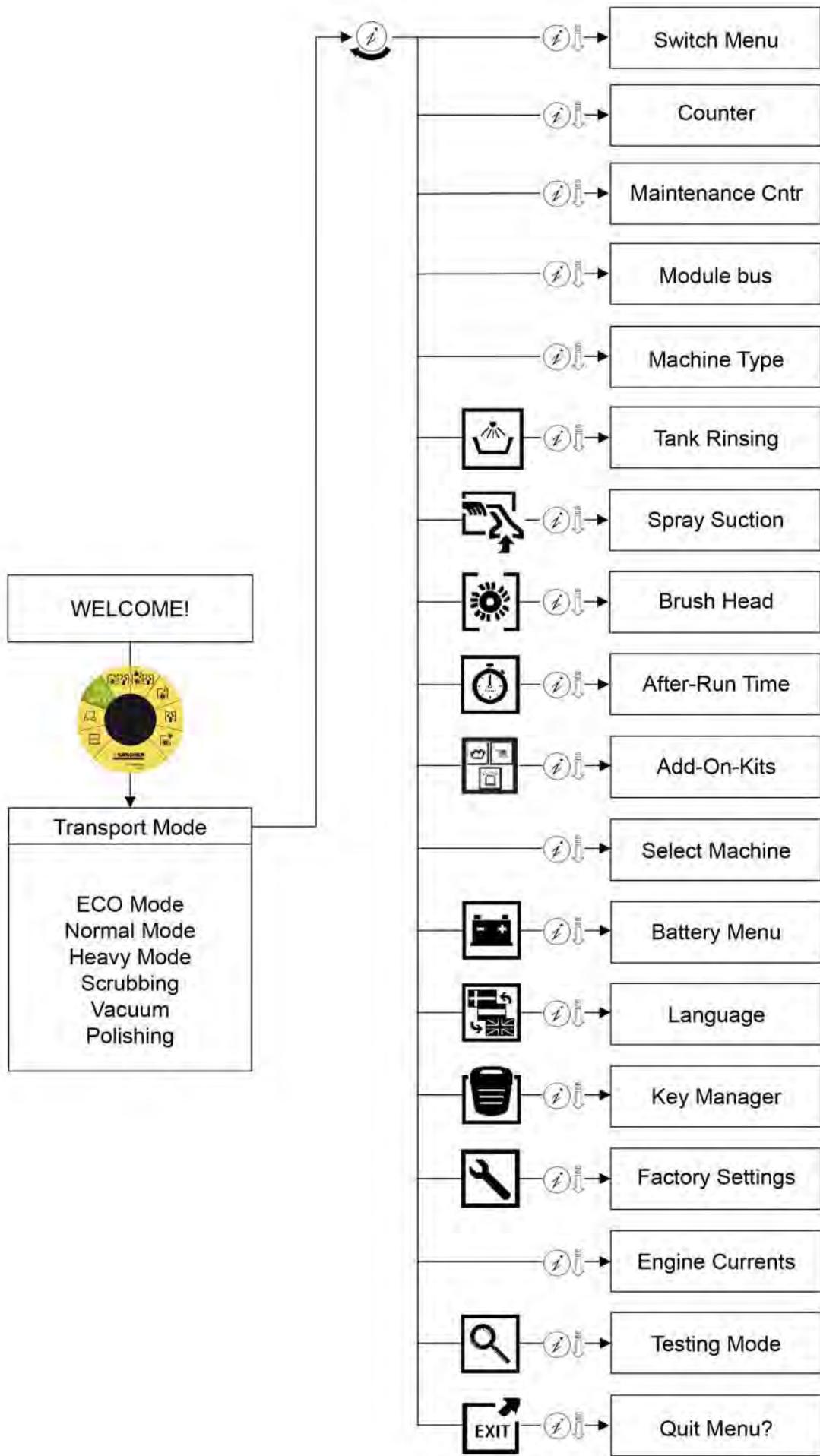
Function overview of the grey intelligent key

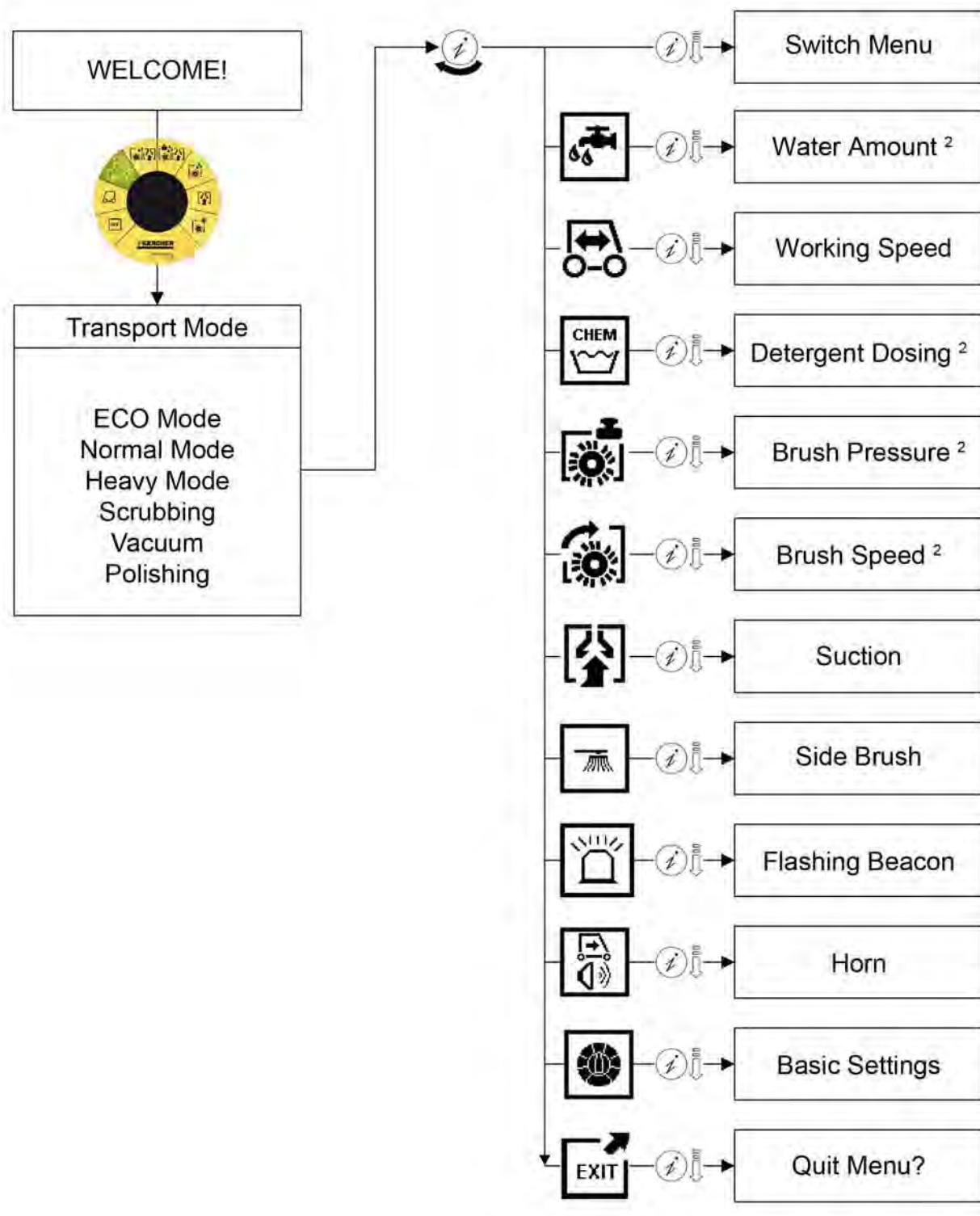




- 2 Selection not permanent. The setting will be lost if the program selection switch is adjusted.

Function overview of red intelligent key





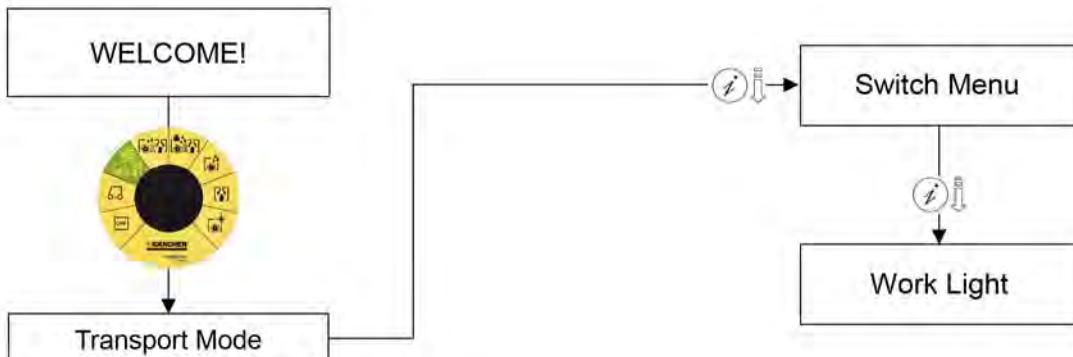
- 2 Selection not permanent. The setting will be lost if the program selection switch is adjusted.

Work light switch menu

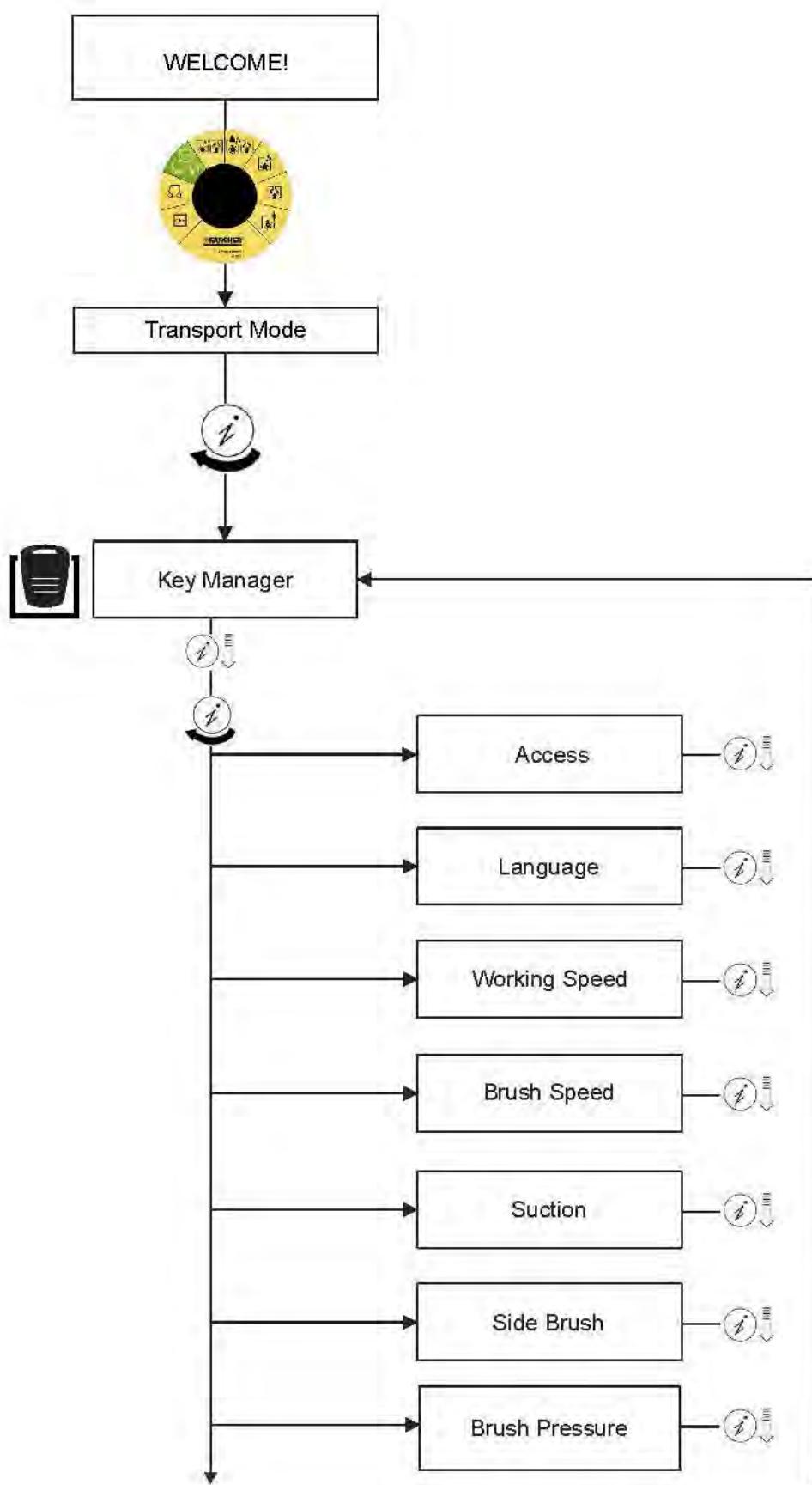
The switch menu can be set at every program selection position.

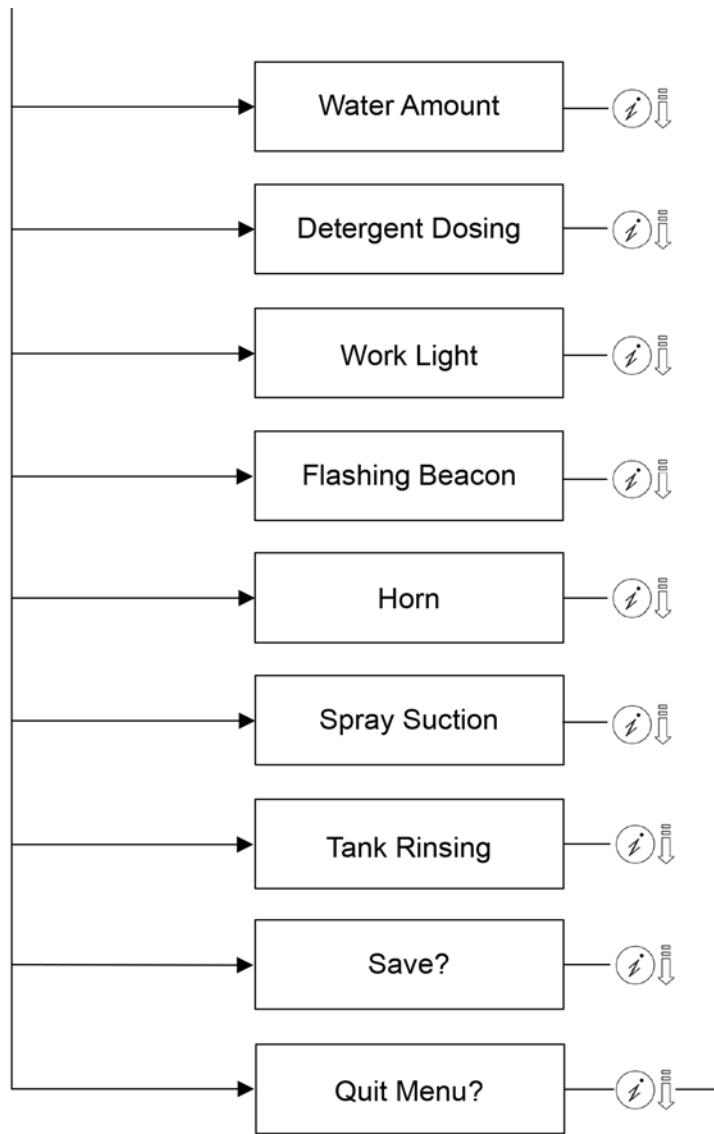
This function is only possible at head CPU software version V4.9 or greater.

The work light must be selected again as soon as the program selection switch is switched off.



Key menu

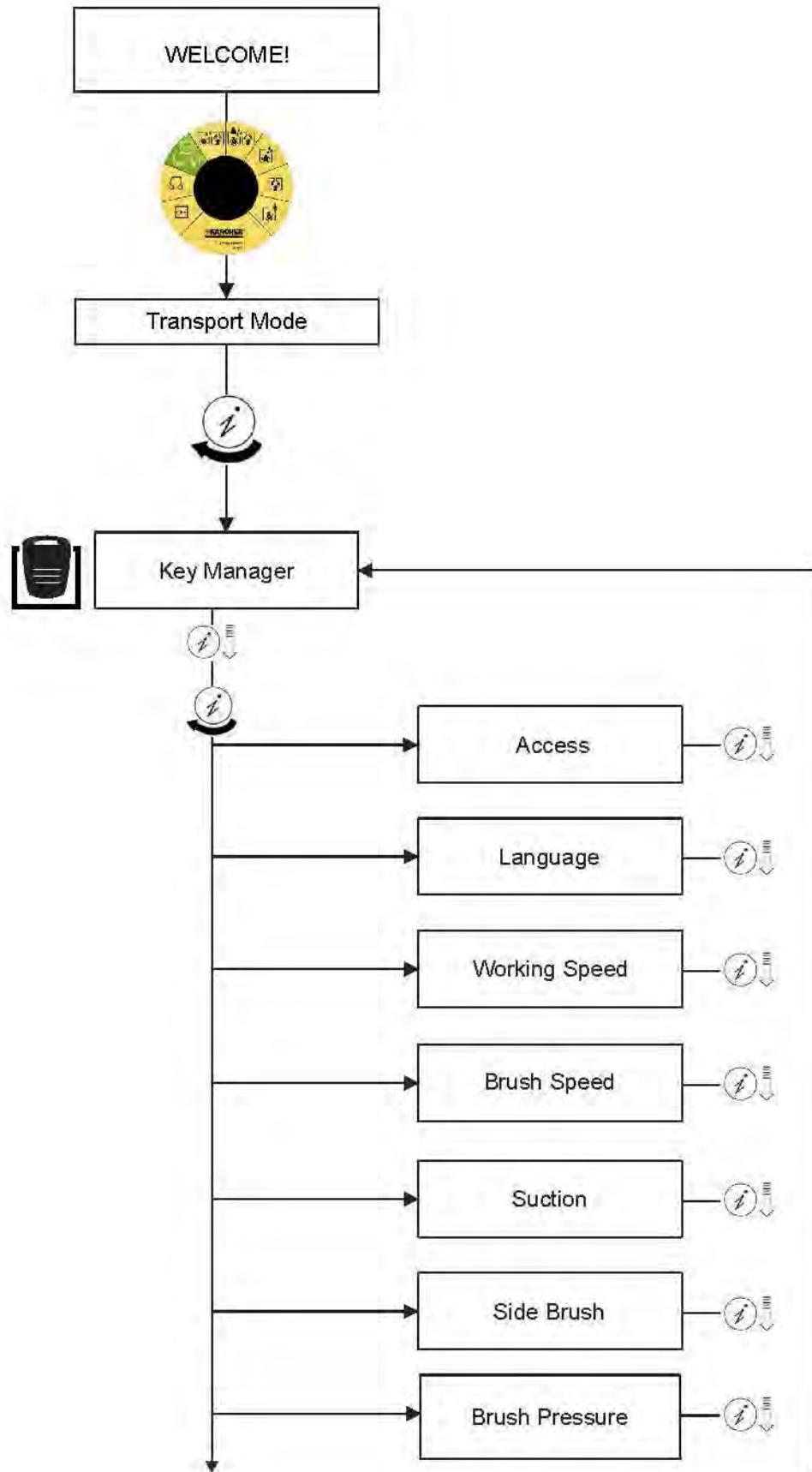


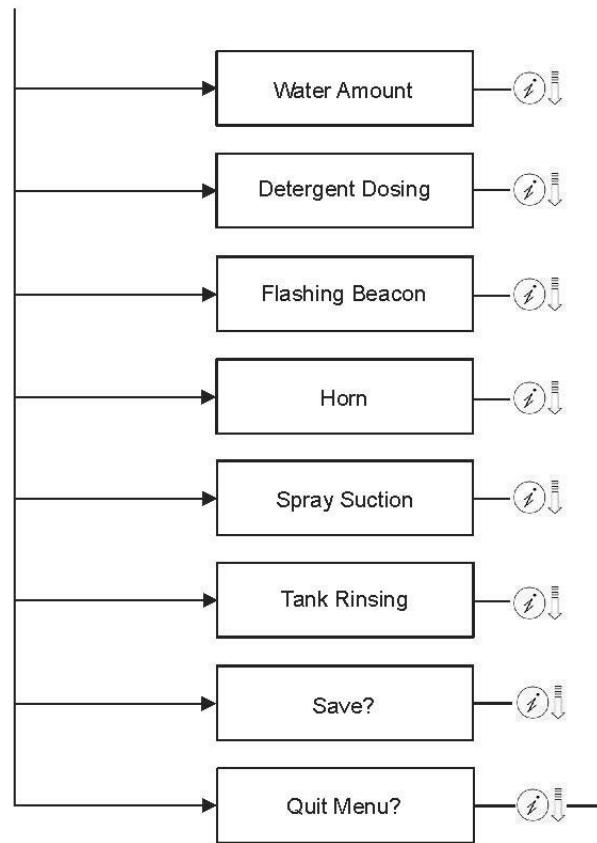


Note

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

Standard setting





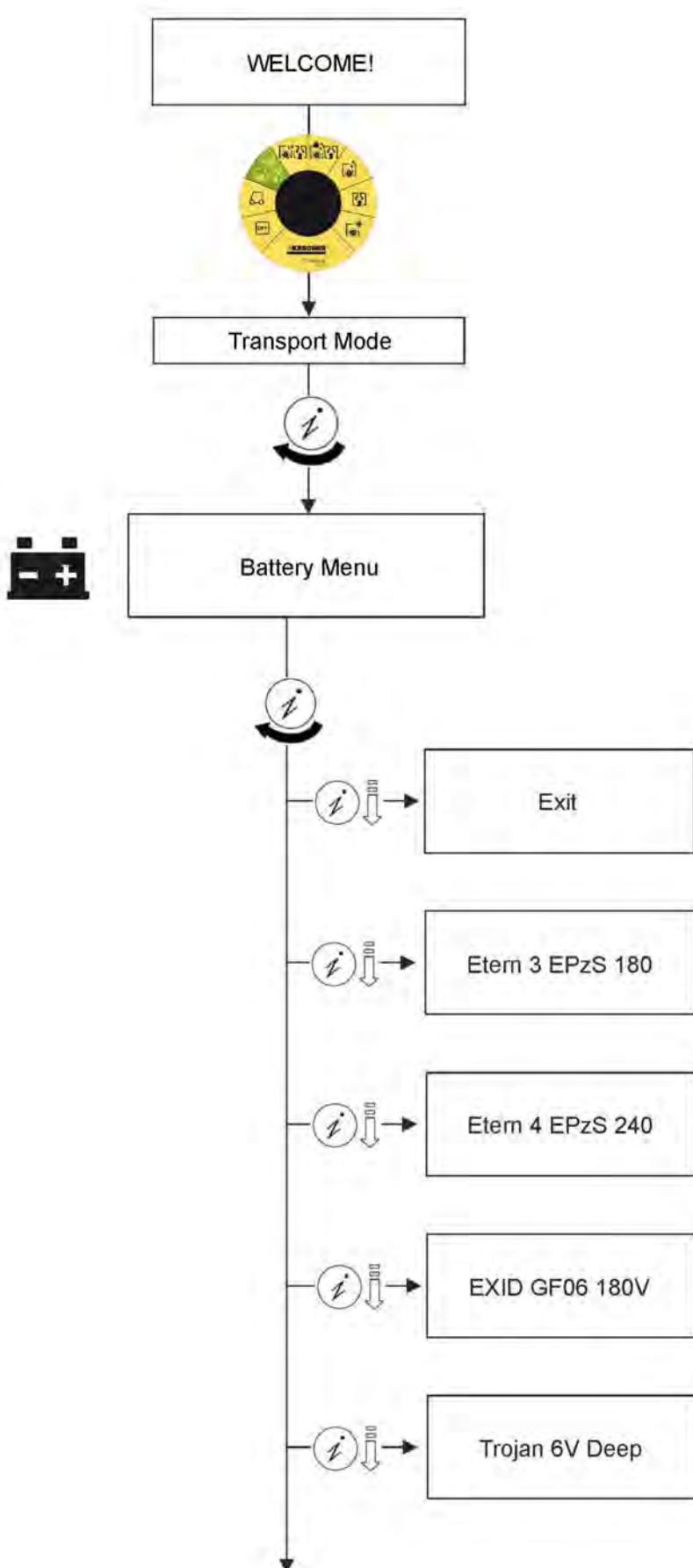
Battery menu

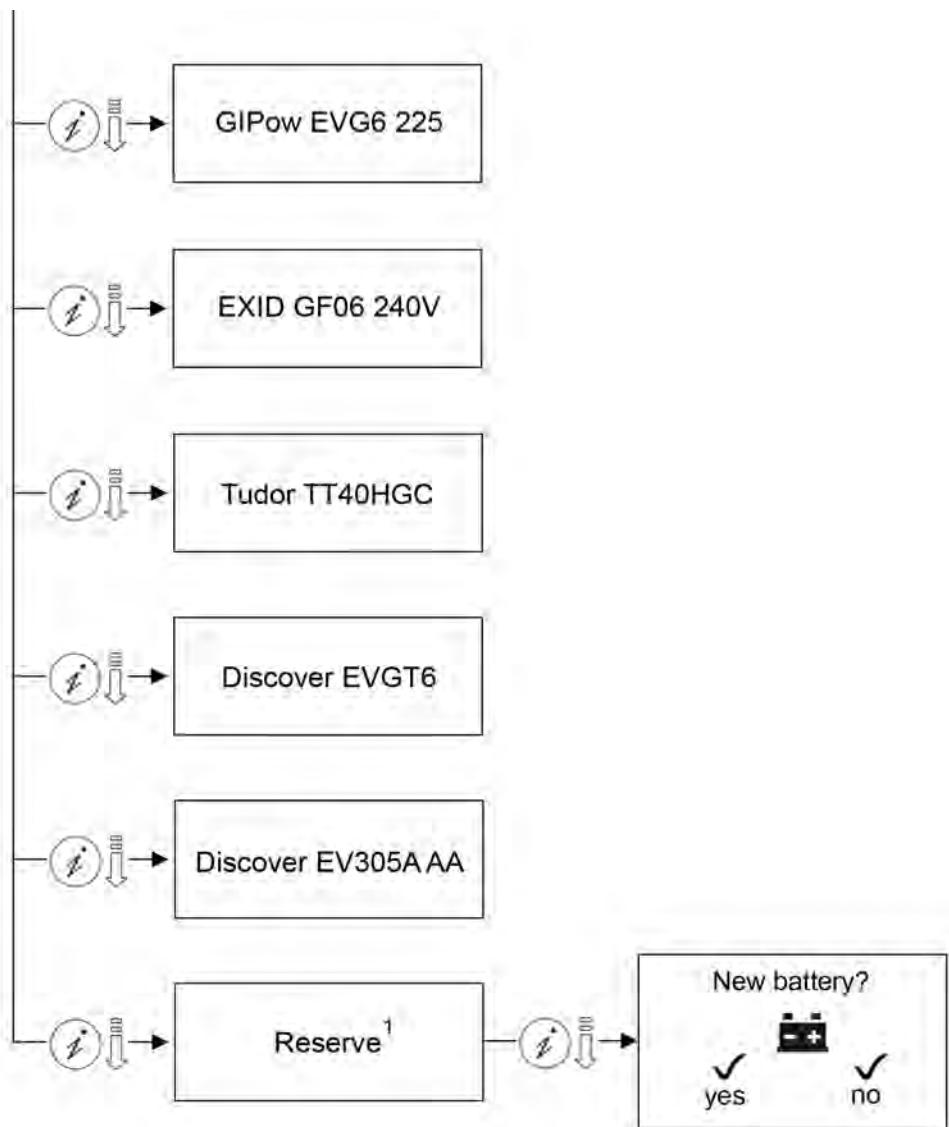
New batteries must be installed using the service program.

NOTE

B 150 R Others

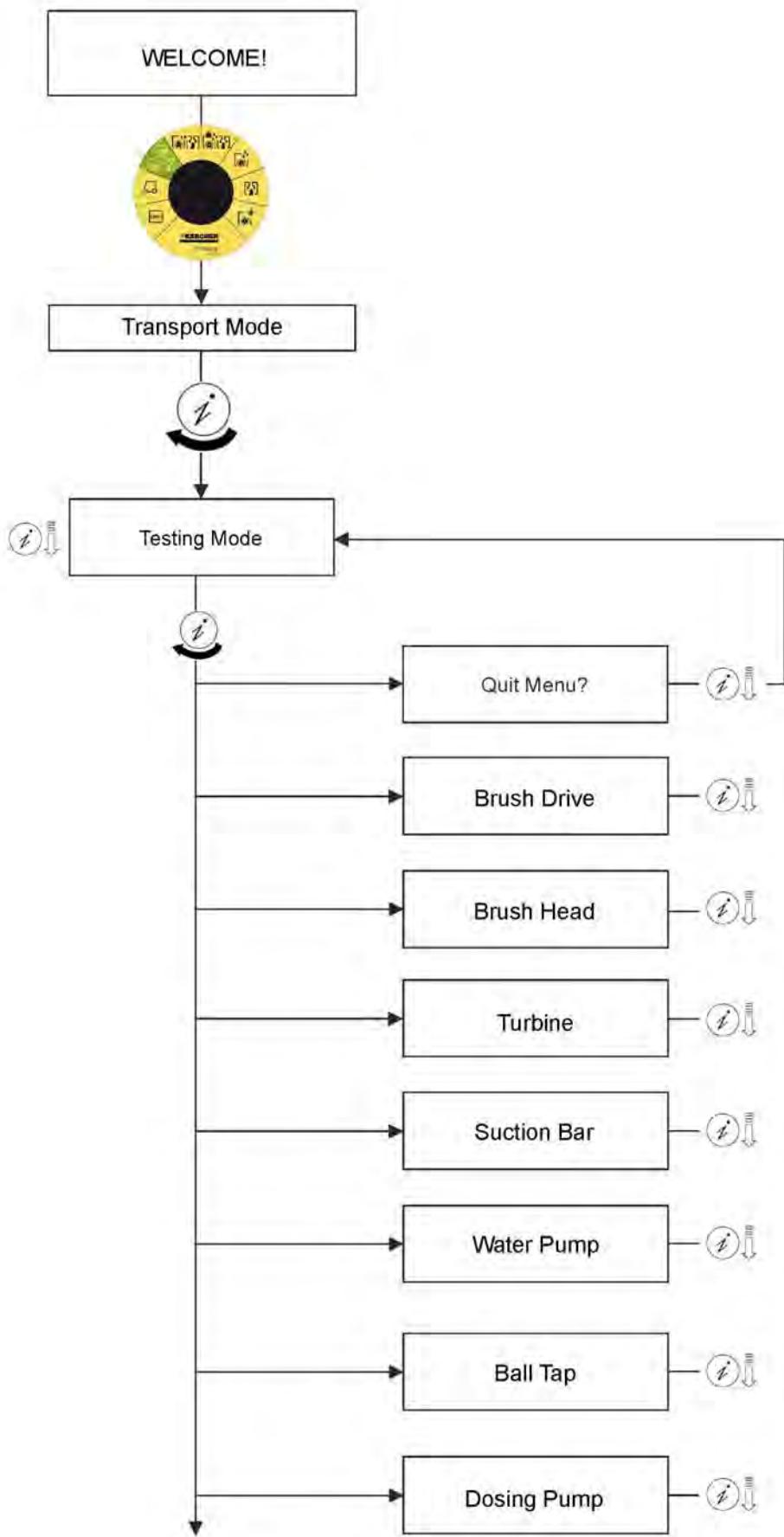
The battery menu is not displayed because an onboard charger is not installed.

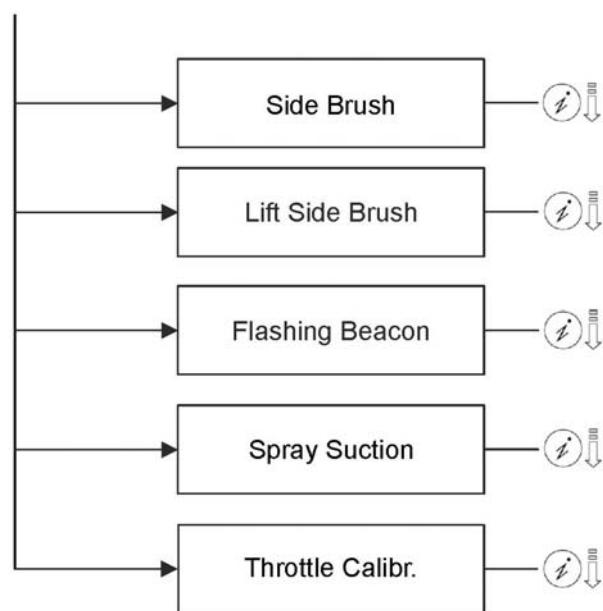




¹= Spaces still available (new batteries).

Test mode menu

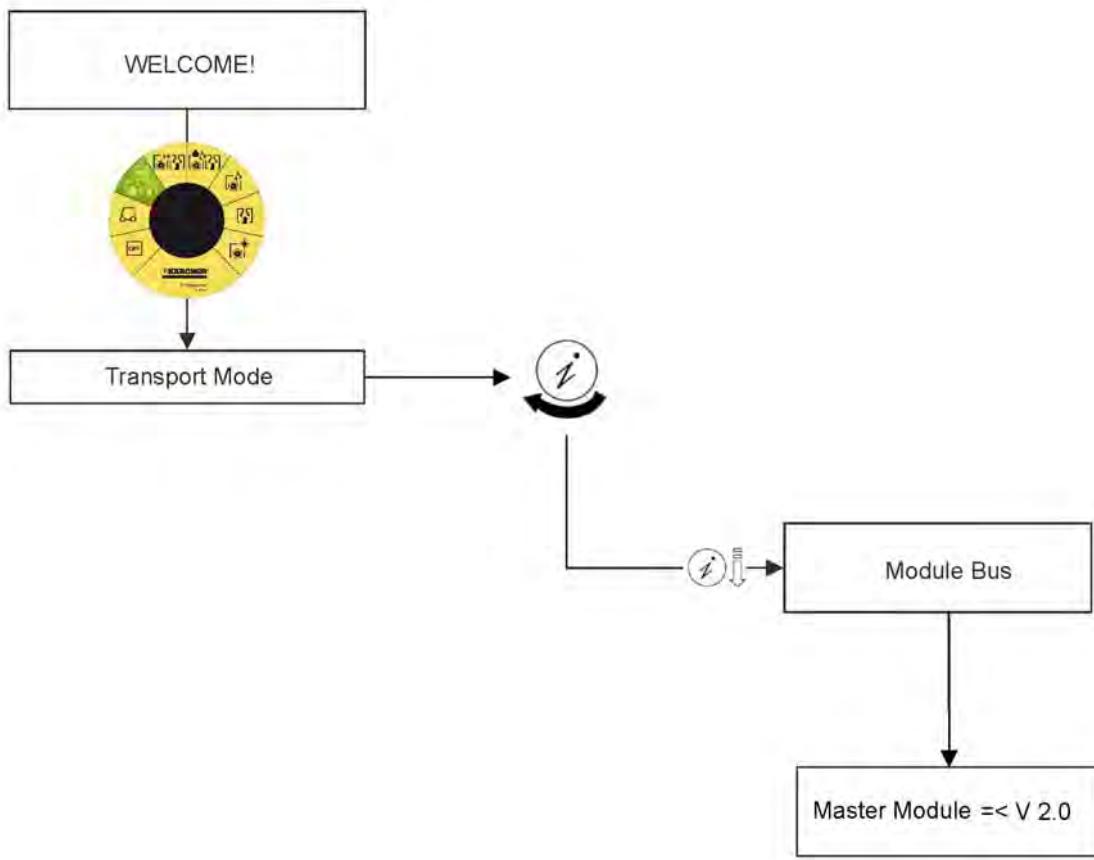




Maintenance counter

NOTE

As of Head CPU software version V2.0 and above, the device generates a message to remind the customer to perform various maintenance activities after certain operating hours.



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 run down, the message "Service xxx" will appear in the display.

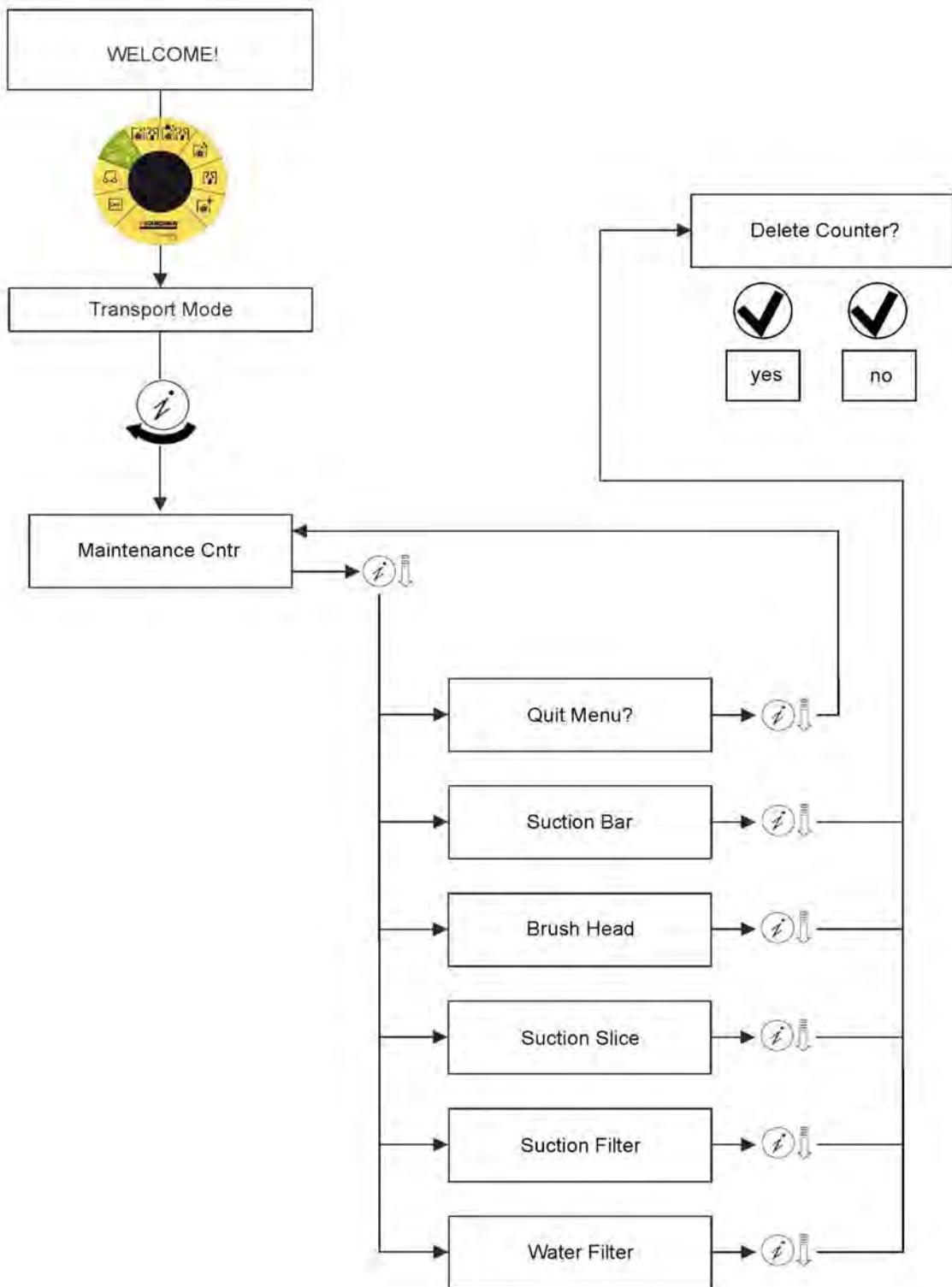
When the Info button is pressed, this message will be reset.

The maintenance counter can also be reset using the yellow or grey intelligent key.

The Service technician can do this too with the red intelligent key.

To enter the maintenance counter in transport mode, use the I-button (turn and acknowledge) to scroll through the menu.

In the "Delete counter" menu, each individual maintenance counter can be erased.



Maintenance counter states must be erased individually.

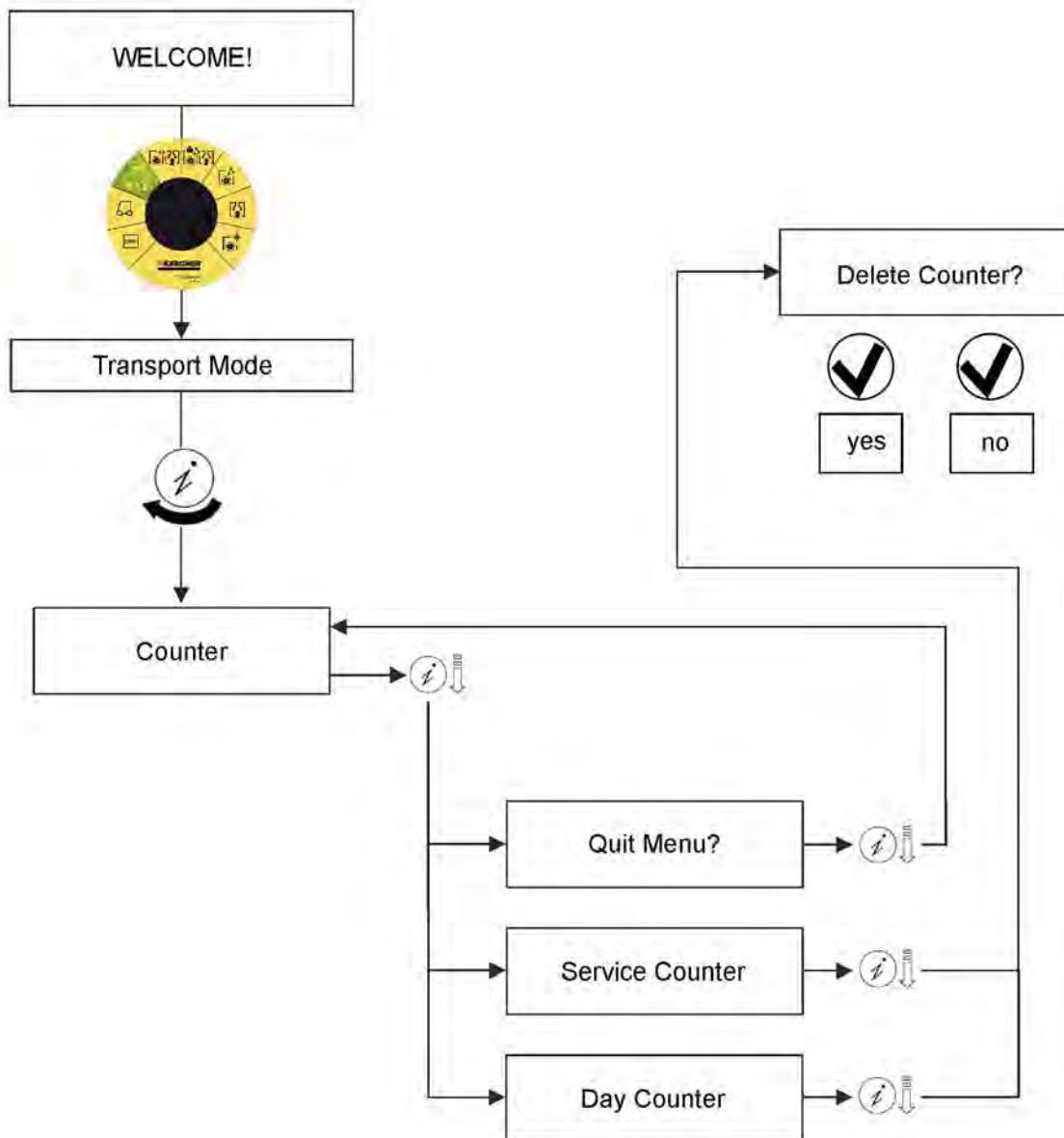
Counter

The day counter and the service counter can be reset.

The service counter is set to 200h on initial commissioning. Each subsequent reset sets the service counter to 400h.

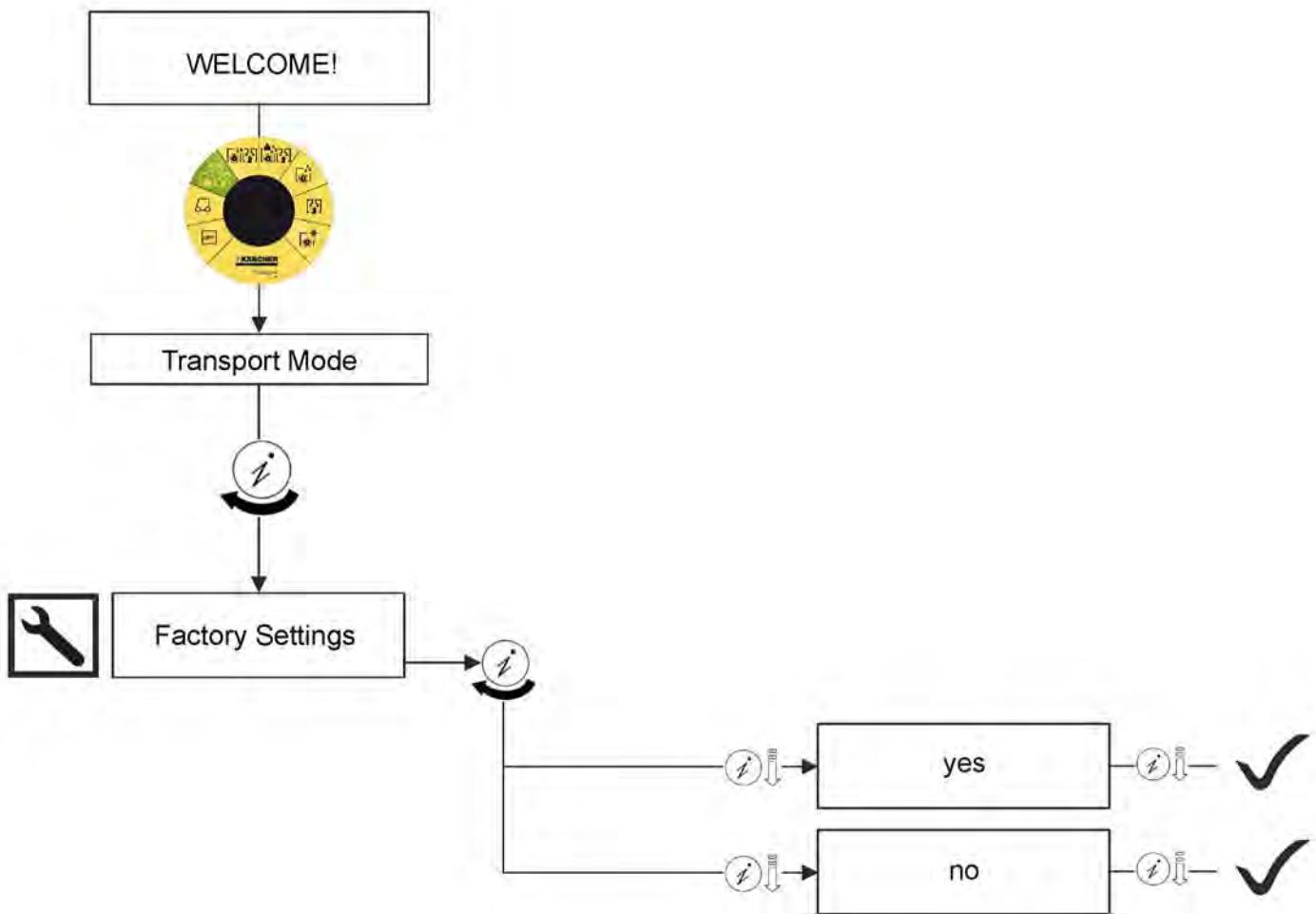
Note

The service counter is automatically set to 200h after a software update. After a software update, the service counter should therefore be reset again using the red KIK service key.



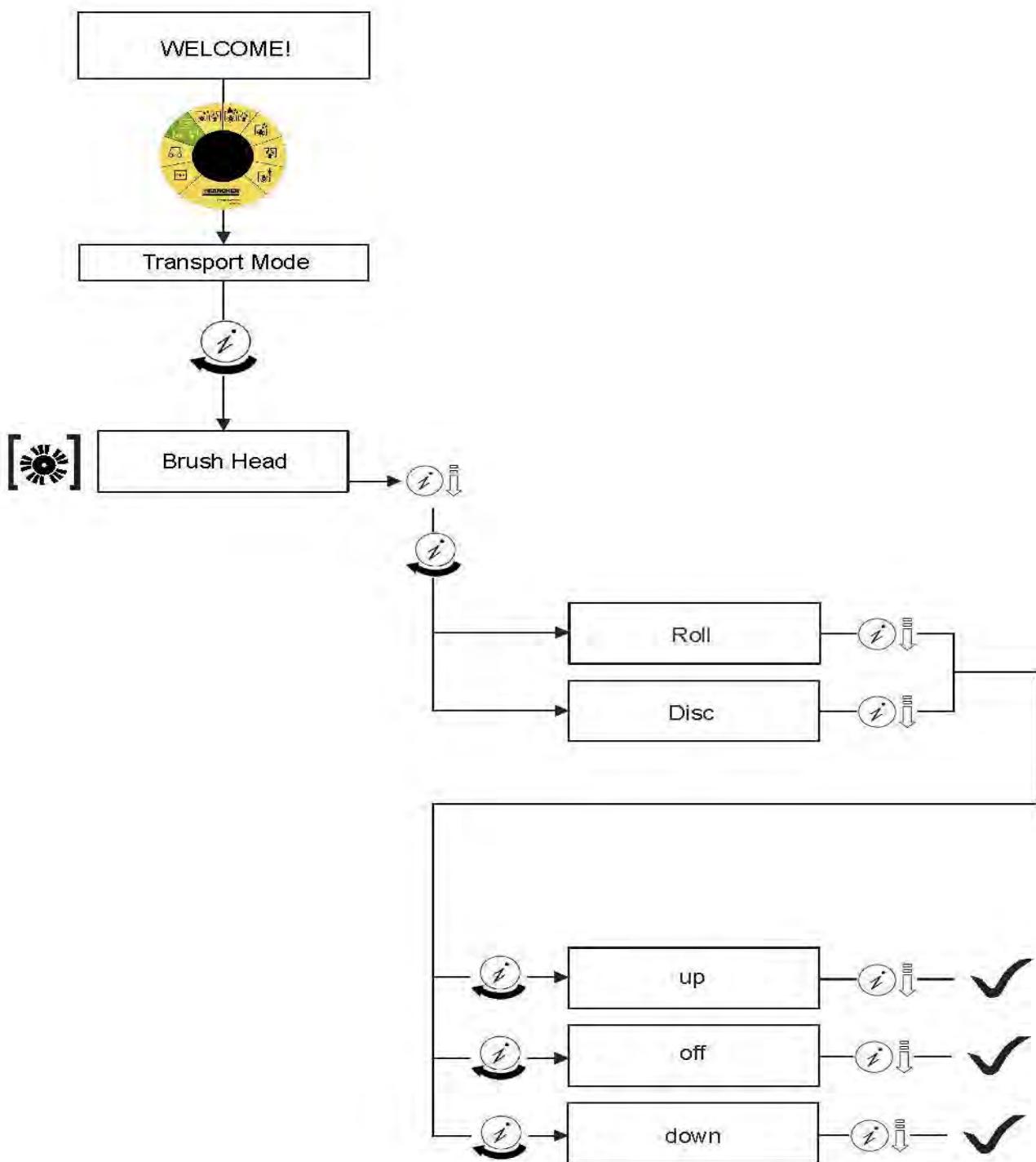
Factory settings

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



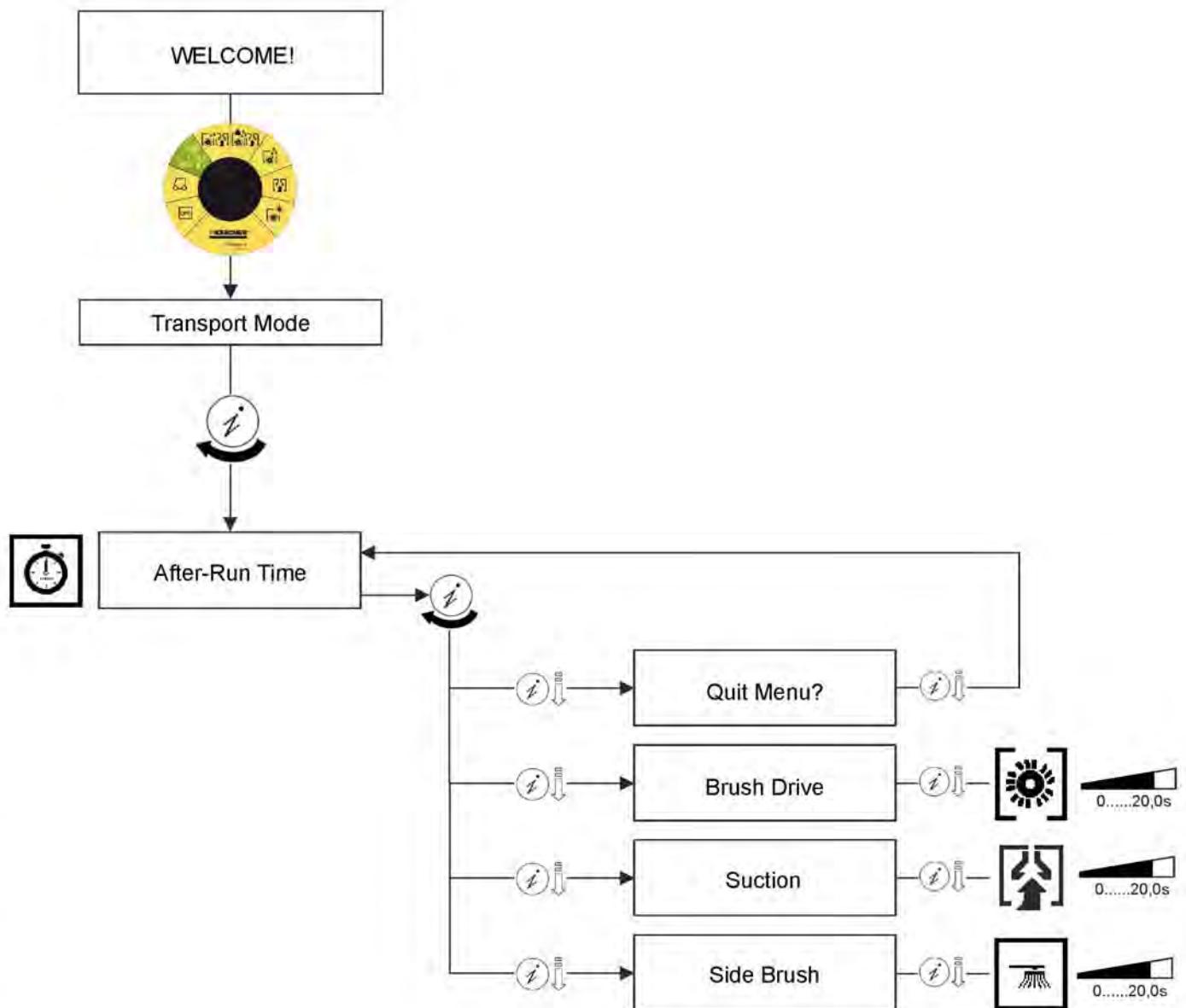
Brush head

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

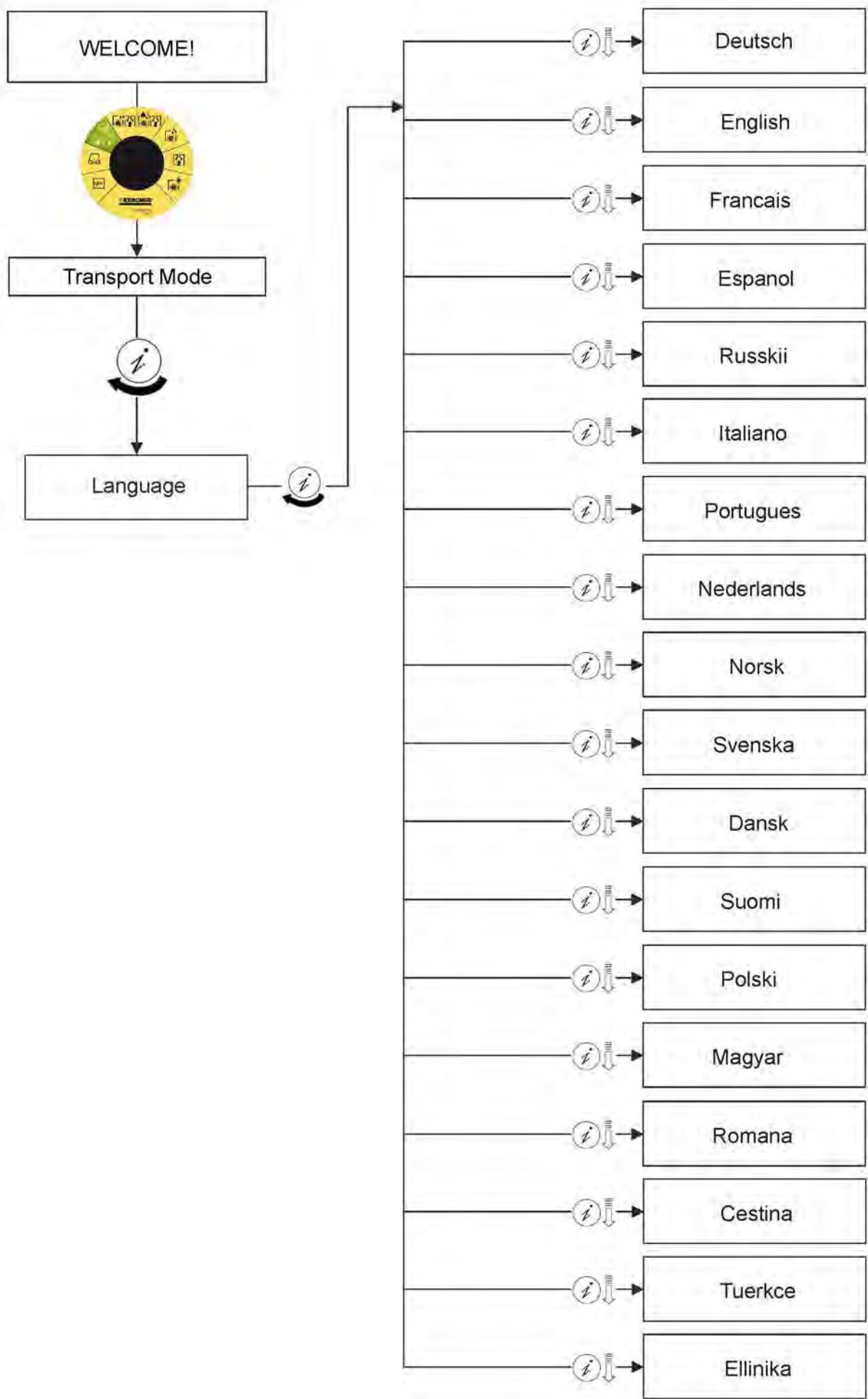


Stopping times

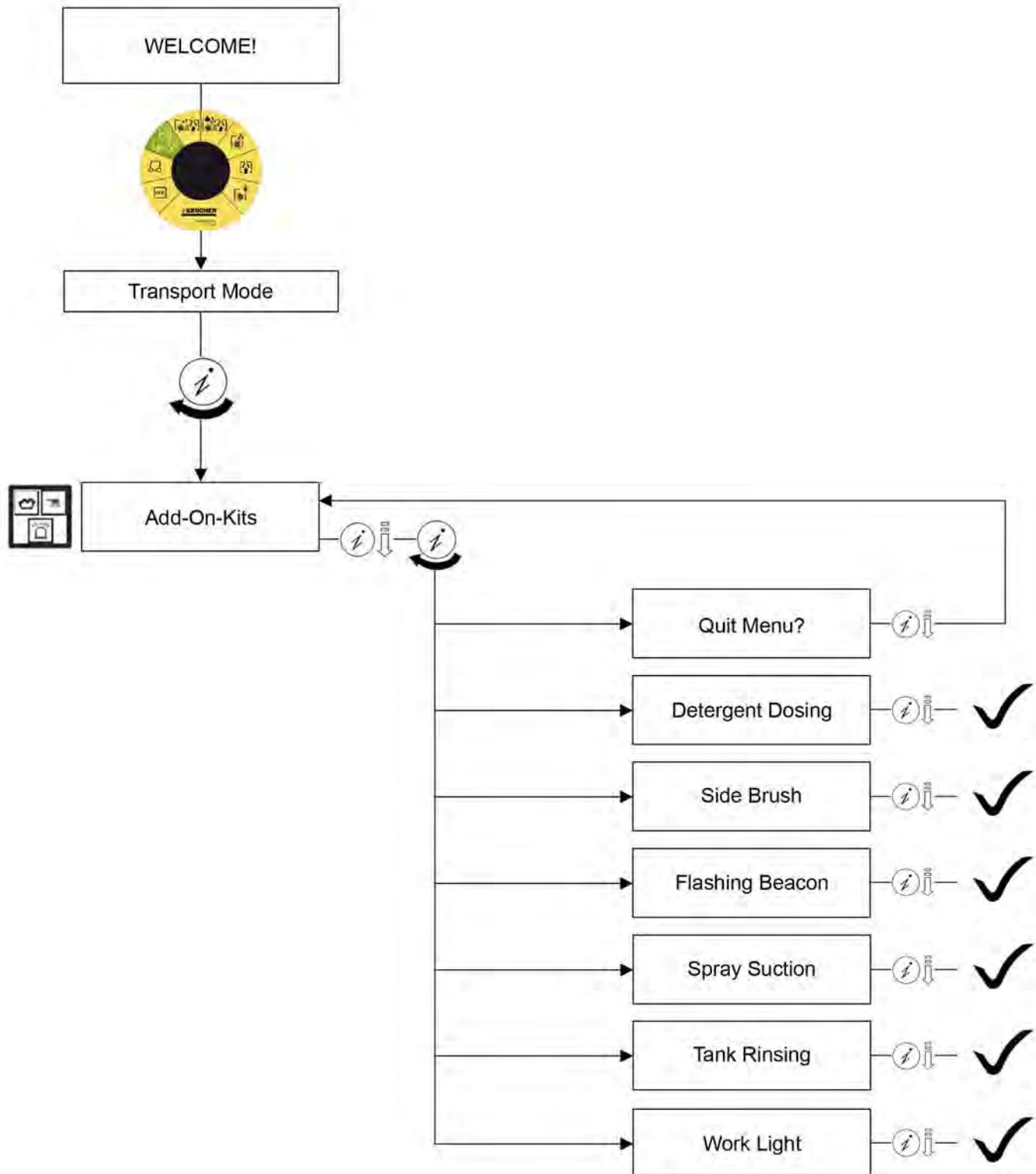
The after-running times for the brush head, suction bar and side brushes can be adjusted.



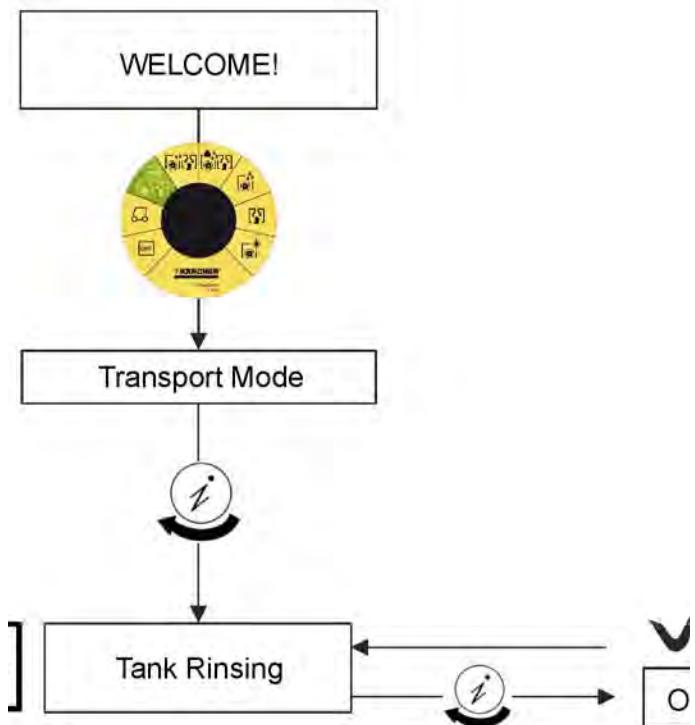
Language



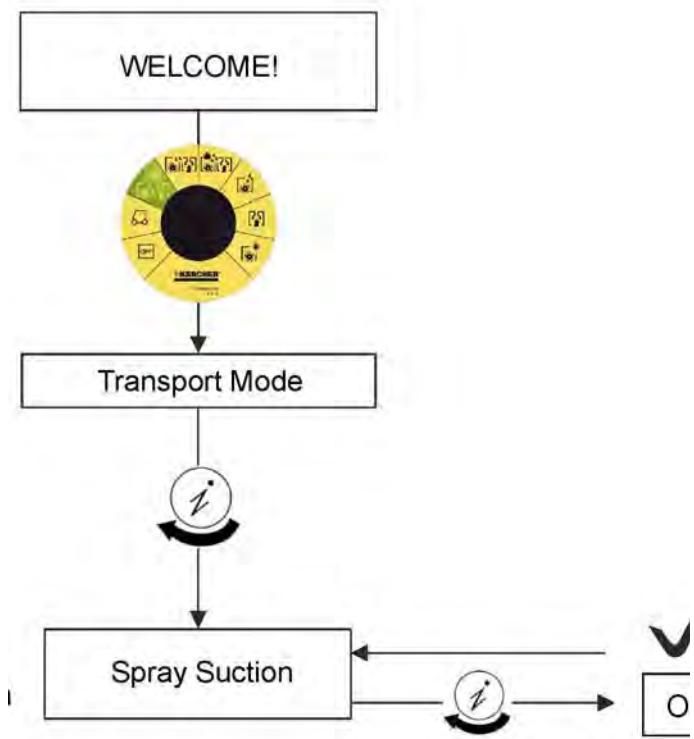
Attachment sets



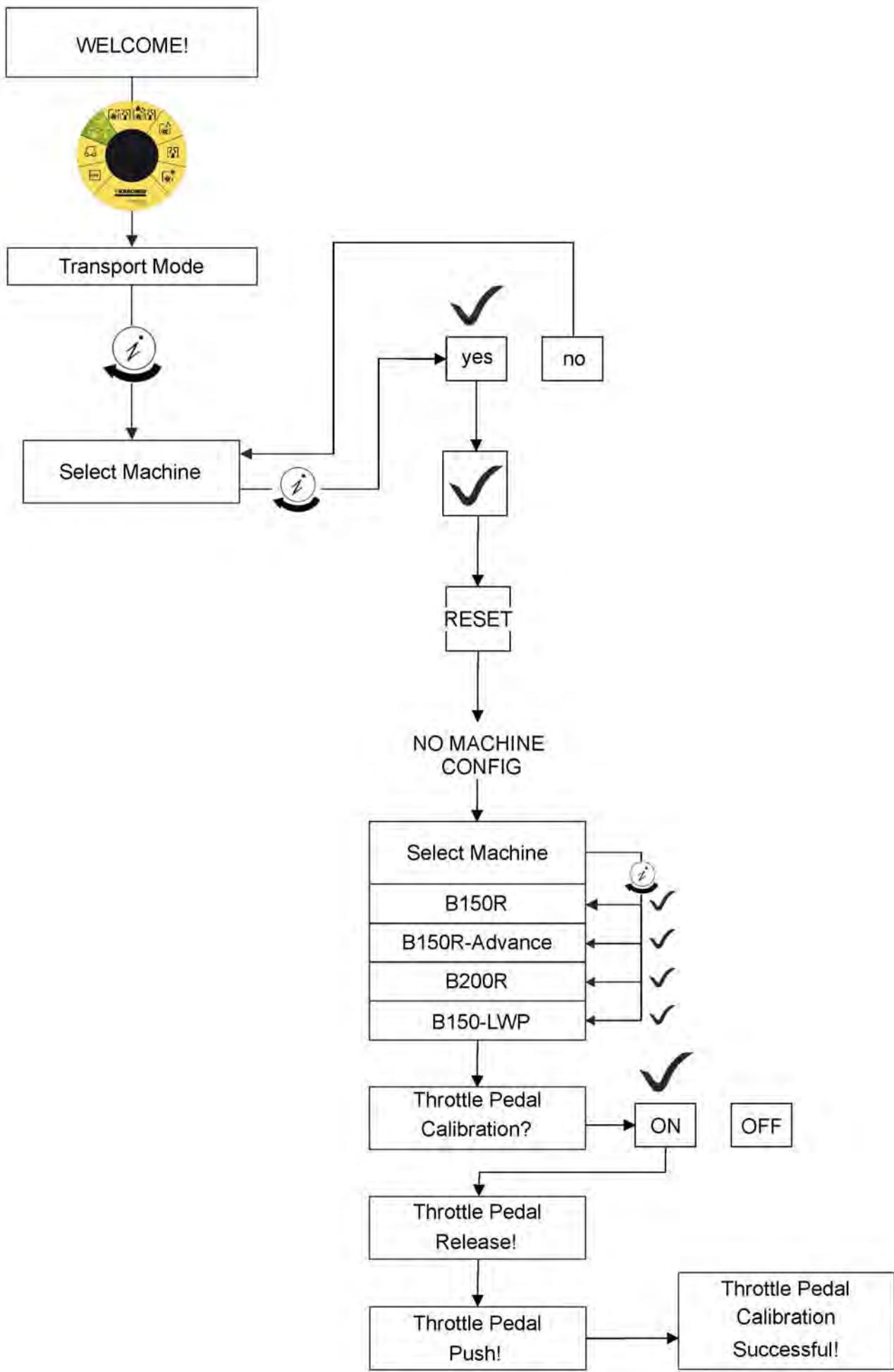
Tanks flush



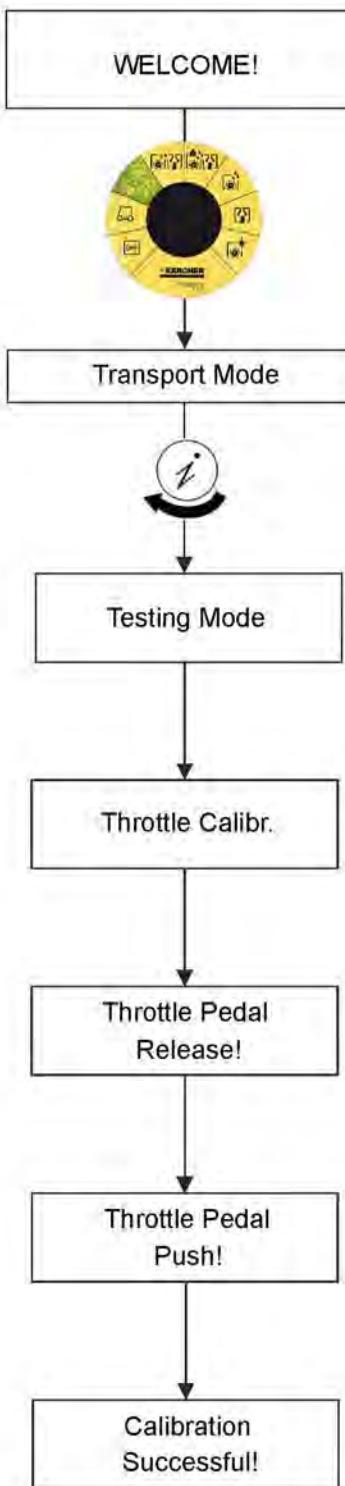
Spray suction



Machine selection



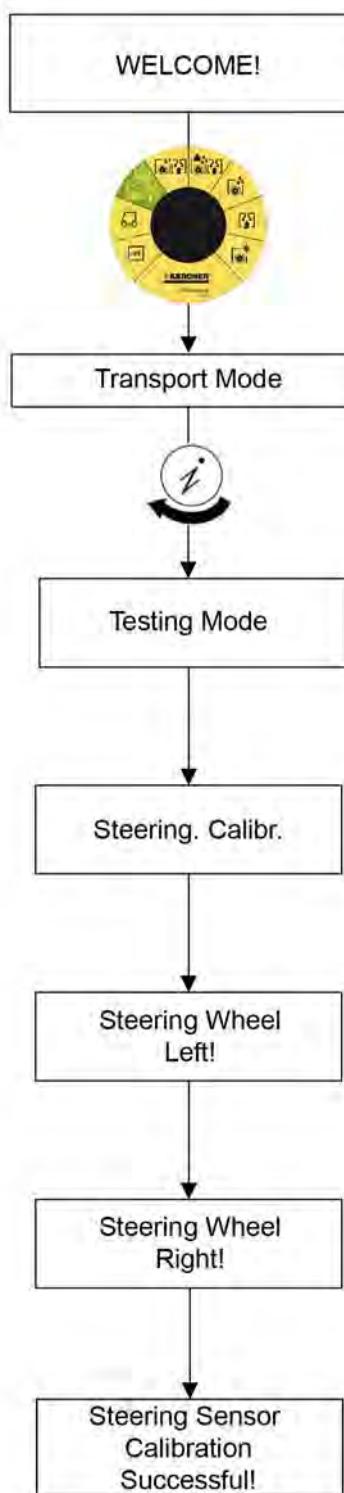
Gas calibration



	B 150 R	B 150 R Adv
Release accelerator!	approx. value = 2 increments.	approx. value = 10 increments.
Depress throttle pedal to full throttle!	approx. value = 1250 increments.	approx. value = 135 increments.
Difference between releasing and full throttle.	> 700 increments.	> 100 increments.

Steering wheel calibration

B 150 R Adv



Left steering wheel position	Min. value = 75 increments Max. value = 110 increments
Right steering wheel position	Min. value = 460 increments Max. value = 500 increments

Overview of special functions and basic settings

At software version V5.0 or greater.

Summary and basic setting of key menu

Program	Transport				Eco programme				Scrubbing suction			
	Key				Key				Key			
	white	yellow	grey	red	white	yellow	grey	red	white	yellow	grey	red
Switch menu	X	X	X	X	X	X	X	X	X	X	X	X
Counter	X	X	X	X								
Maintenance counter	X	X	X	X								
Module bus	X	X	X	X								
Machine type	X	X	X	X								
Tank rinsing	X	X	X	X								
Spray suction	X	X	X	X								
Brush head D/R/S			Roll	Roll								
Stopping times			X	X								
Attachment kits				X								
Machine selection				X								
Battery menu			X	X								
Language			X	X								
Key menu			X	X								
Factory setting			X	X								
Test mode				X								
Water quantity							40%	40%			70%	70%
Working speed							100%	100%			100%	100%
RM-Dosing							0,5%	0,5%			1,0%	1,0%
Contact pressure							50%	50%			70%	70%
Brush speed							Whis- per	Whis- per			Pow- er	Pow- er
Vacuum device							Low	Low			High	High
Side brushes							X	X			X	X
Beacon light							X	X			X	X
Horn							X	X			X	X
Basic settings							X	X			X	X
Exit (closing the menu)	X	X	X	X	X	X	X	X	X	X	X	X

Program	Heavy programme				Scrubbing				Vacuuming			
	Key				Key				Key			
	white	yellow	grey	red	white	yellow	grey	red	white	yellow	grey	red
Switch menu	X	X	X	X	X	X	X	X	X	X	X	X
Counter												
Maintenance counter												
Module bus												
Machine type												
Tank rinsing												
Spray suction												
Brush head D/R/S												
Stopping times												
Attachment kits												
Machine selection												
Battery menu												
Language												
Key menu												
Factory setting												
Test mode												
Water quantity		100%	100%			100%	100%					
Working speed		70%	70%			100%	100%			100%	100%	
RM-Dosing		3,0%	3,0%			3,0%	3,0%					
Contact pressure		100%	100%			100%	100%			50%	50%	
Brush speed		Pow-er	Pow-er			Pow-er	Pow-er					
Vacuum device		High	High							High	High	
Side brushes		X	X			X	X			X	X	
Beacon light		X	X			X	X			X	X	
Horn		X	X			X	X			X	X	
Basic settings		X	X			X	X			X	X	
Exit (closing the menu)	X	X	X	X	X	X	X	X	X	X	X	X

Program	Polishing								
	Key								
	white	yellow	grey	red					
Switch menu	X	X	X	X					
Counter									
Maintenance counter									
Module bus									
Machine type									
Tank rinsing									
Spray suction									
Brush head D/R/S									
Stopping times									
Attachment kits									
Machine selection									
Battery menu									
Language									
Key menu									
Factory setting									
Test mode									
Water quantity									
Working speed		100%	100%						
RM-Dosing									
Contact pressure		50%	50%						
Brush speed		Power	Power						
Vacuum device									
Side brushes		X	X						
Beacon light		X	X						
Horn		X	X						
Basic settings		X	X						
Exit (closing the menu)	X	X	X	X					

Technical Documentation

Technical specifications

B 150	R 75	D 75	R 90	D90
Power				
Nominal voltage	V	36		
Battery capacity	Ah (5h)	180	180	240
Average power consumption	W	2100	2400	2800
Nominal power propulsion motor (Adv)	W	1200	1200	1200
Suction engine output	W	750	750	750
Brush engine output	W	2 x 600		750
Vacuuming				
Cleaning power, air quantity	l/s	26	26	26
Cleaning power, negative pressure	kPa	18,0	18,0	18,0
Cleaning brushes				
Working width	mm	750		900
Brush diameter	mm	105	410	105
Brush speed	1/min	1200	140	1200
Dimensions and weights				
Driving speed, max.	km/h	6		
Driving speed, max. (Adv)	km/h	10		
Slope max.	%	10		
Slope max. (Adv)	%	15		
Theoretical surface cleaning performance	m ² /h	4500		5400
Theoretical surface capacity (Adv)	m ² /h	7500		10000
Fresh/waste water tank volume	l	150		
Capacity coarse dirt container	l	7	-	9
Length	mm	1690		
Width (without vacuum bar)	mm	810	810	910
Height	mm	1390		
Permissible overall weight	kg	850		
Permissible overall weight	kg	870		
Transport weight (without batteries)	kg	246	251	253
Surface load (with driver and full fresh water tank)				
Front wheel	N/cm ²	94		
Rear wheel	N/cm ²	51		
Values determined as per EN 60335-2-72				
Total oscillation value	m/s ²			
Uncertainty K	m/s ²			
Sound pressure level L _{pA}	dB(A)	67		
Uncertainty K _{pA}	dB(A)	2		
Sound power level L _{WA} + Uncertainty K _{WA}	dB(A)	85		
Water volume pump	l/min	0,4-9,5		
Detergent volume RM pump	ml/min	5-220		

Discharge end voltage

B 150 R

B 150 R Adv

There are three discharge end voltages for each battery type, depending on the device's present current consumption.

The voltages for the selected battery can be checked with the service program in charge module A7.

They cannot be parametrised.

After a delay of 60 seconds the brush motor and the - with a delay - the turbine switch off.

The complete device is switched off at 29.0 Volts.

	Siap 3 Gel 250	Gobal Power EVG 6 225	Siap 3 Gel 250	Discover EVG T6
discharge current				
65 A	32,8 V	37,7 V	32,8 V	34,2 V
84 A	32,6 V	36,1 V	32,6 V	34,2 V
95 A	32,4 V	32,9 V	32,4 V	34,2 V
	EnerSys 4EPzS	EnerSys 4 EPzV	Trojan L16E-A10	
discharge current				
65 A	32,0 V	32,9 V	32,6 V	
84 A	32,0 V	32,9 V	32,6 V	
95 A	32,0 V	32,9 V	32,6 V	

	Eternity4 EPzS 240	Eternity3 EPzS 180	ExideGF06 240 V	ExideGF06 180V
discharge current				
65 A	32,6 V	33,0 V	34,2 V	33,1 V
80 A	31,6 V	32,0 V	33,5 V	31,2 V
95 A	30,4 V	31,0 V	32,4 V	29,9 V
	Trojan 6V J305H	Discov. EV305V_AA	Tudor Bavrn-SP TT40HGC	
discharge current				
65 A	33,3 V	35,1 V	32,9 V	
80 A	32,4 V	34,7 V	31,1 V	
95 A	31,5 V	34,5 V	29,9 V	

NOTE

These variable switch-off voltages do not arise in the B 150

R Others.

A fixed value of 29.5 Volts is set in Head CPU A1.

After a delay of 10 seconds the brush motor and the - with a delay - the turbine switch off.

The switch off value cannot be viewed in the service program and cannot be modified.

The complete device is switched off at 29.0 Volts.

Device run times with maximally charged battery

B 150 R

Kärcher part number	Nominal voltage (V)	Nominal capacity (Ah)	Battery type	Run time with (h) input current (A)						Load cycles at medium load	
				plain		medium		rough			
				h	A	h	A	h	A		
6.654-298.0 4.035-987.7	18 X 2	240	PzS-T (wa)	3,0	65	2,4	80	2,0	95	1000 - 1100	
6.654-299.0 4.035-988.7	18 X 2	180	PzS-T (wa)	2,2	65	1,7	80	1,3	95	950 - 1050	
6.654-119.0 4.654-306.7	6 x 6	240	GIV-B(wf)	3,0	65	2,4	80	2,0	95	400 - 450	
6.654-124.0 4.654-307.7	6 x 6	180	GIV-B(wf)	2,2	65	1,7	80	1,3	95	350 - 400	

B 150 R - ADV

Kärcher part number	Nominal voltage (V)	Nominal capacity (Ah)	Battery type	Run time with (h) input current (A)						Load cycles at medium load	
				plain		medium		rough			
				h	A	h	A	h	A		
6.654-298.0 4.035-987.7	18 X 2	240	PzS-T (wa)	2,7	70	2,1	90	1,6	110	1000 - 1100	
6.654-299.0 4.035-988.7	18 X 2	180	PzS-T (wa)	2,0	70	1,5	90	1,1	110	950 - 1000	
6.654-119.0 4.654-306.7	6 x 6	240	GIV-B(wf)	2,7	70	2,1	90	1,7	110	380 - 430	
6.654-124.0 4.654-307.7	6 x 6	180	GIV-B(wf)	2,0	70	1,5	90	1,2	110	320 - 370	

Exchange times

Part designation	Exchange time in minutes	Part designation	Exchange time in minutes
Mains cable - charger	5	waste water tank	15
Program selection switch	15	Batteries with crane or forklift	15
Control panel board	15	Lifting motor side brush	20
Main switch	15	Adv version	
Horn button	15	Rear propulsion motor	60
Driving direction switch	15	Replacing / adjusting the brake of the rear propulsion motor	30
Seat contact switch	15	Steering angle sensor	15
Steering wheel	15	BD brush head	
Side brushes	10	Worm gear	45
Side brush motor	25	Glide contact kit brush motor	60
Beacon lamp	15	Motor of brush drive	35
Electronics drive module, lifting module, clean module	15-30	Ball bearing, brush drive	70
Charger	20	Disc brush	5
Potentiometer accelerator	15	Splash guard	8
Suction turbine	30	Brush head BR	
Glide contacts of the suction turbine	20	Motor of brush drive	30
Drive motor	45	Gear belt	10
Glide contacts drive motor	30	Glide contact kit brush motor	60
Detergent dosing pump	30	Ball bearing, brush drive assembly	50
Pump hose of the detergent dosing pump	20	Brush roller	5
Flowmeter	30	Wiping flap	10
Water valve	30	Scraper roller of suction bar	5
Water pump	30	Splash guard	8
Lint sieve, suction turbine	5		
Cleaning head	15		
Cleaning head retainer	30		
Cleaning head linking	15		
Lifting motor cleaning head	60		
Lift motor suction bar	15		
Bumper wheels	5		
Tyres propulsion motor	75		
Vacuum bar	10		
Dirt water drain hose	10		
Suction hose	5		
Replacing / adjusting the brake of the propulsion motor	30		
Rear wheel	10		
Fender	70		

Documents

Appliance type	Appliance no.	Circuit diagram	operating instructions	Spare parts list
B 150 R Bp	2.246-001.0	0.089-477.0	5.966-130.0	5.972-478.0
B 150 R Bp Dose	2.246-002.0	0.089-477.0	5.966-130.0	5.972-478.0
B 150 R Bp Adv	2.246-003.0	0.089-478.0	5.966-130.0	5.972-478.0
B 150 R Bp Adv Dose	2.246-004.0	0.089-478.0	5.966-130.0	5.972-478.0
B 150 R Bp SB	2.246-005.0	0.089-477.0	5.966-130.0	5.972-478.0
B 150 R Bp Dose SB	2.246-006.0	0.089-477.0	5.966-130.0	5.972-478.0
B 150 R Bp Adv SB	2.246-007.0	0.089-478.0	5.966-130.0	5.972-478.0
B 150 R Bp Adv Dose SB	2.246-008.0	0.089-478.0	5.966-130.0	5.972-478.0
B 150 R Bp others	2.246-009.0	0.089-477.0	5.966-130.0	5.972-478.0
B 150 R Bp SB others	2.246-010.0	0.089-477.0	5.966-130.0	5.972-478.0

Special tools

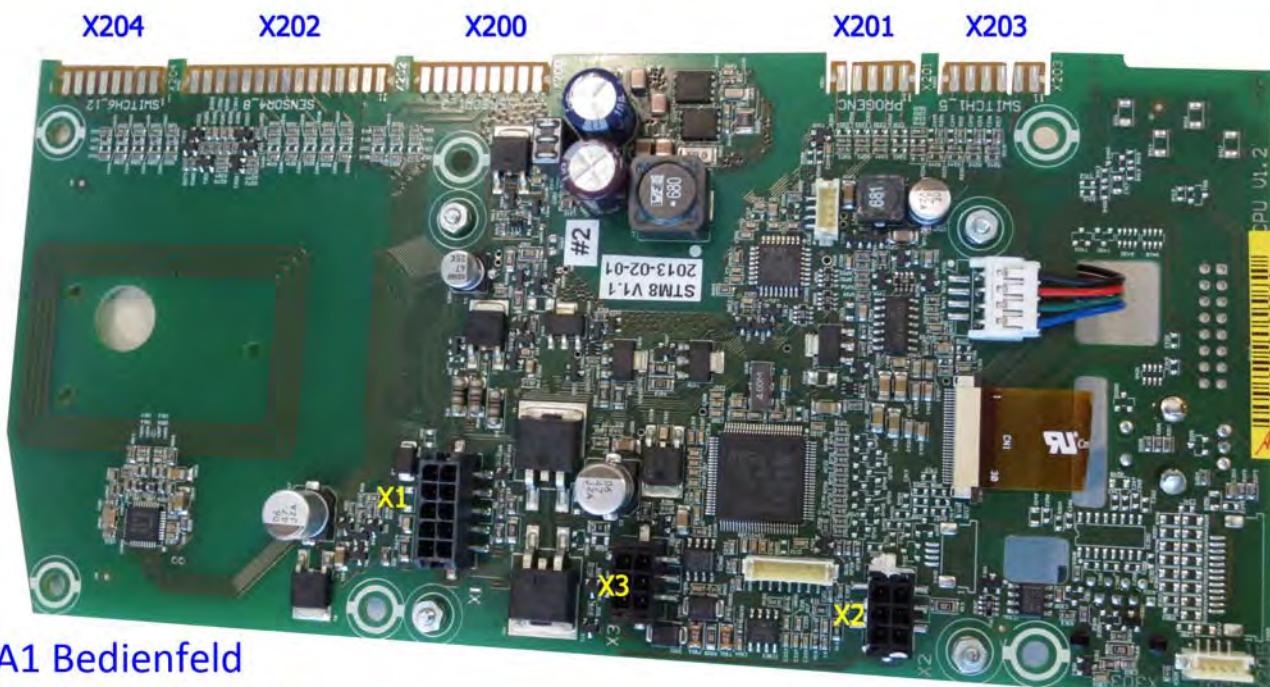
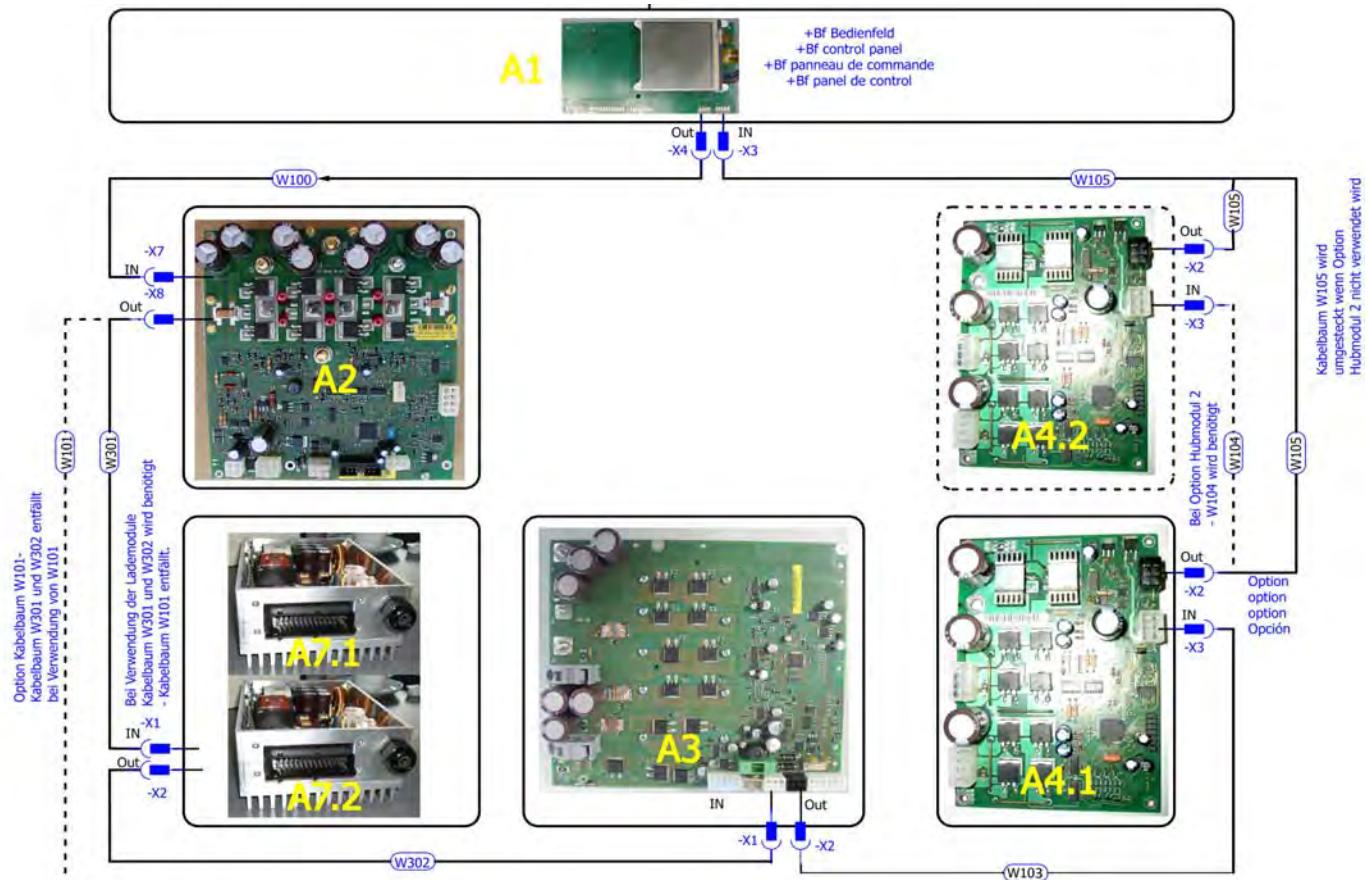
Intelligent Key, red	5.035-337.0
Voltage regulator	6.803-025.0
Multimeter	6.803-022.0
Set service module	2.816-117.0
Molex puller tool	6.816-086.0
Hebe acid meter for low-maintenance batteries	6.803-015.0
Puller tool for steering wheel	2.860-166.0
Magnetic field tester	6.803-003.0
Disc brakes	5.116-199.0
Torque wrench	6.815-090.0
Interface cable service interface	4.822-866.0
Tester electrics Metra tester	6.803-034.0
Socket wrench KM 6 for steering tapered roller bearing steering	6.035-045.0
Bus cable set	4.822-417.0
Grease 400 g	6.288-059.0
Grease 100 g	6.288-134.0
Copper paste 100 g	6.869-087.0
Test cable (cable for connecting two bus cables with Mini Fit flat plug)	6.642-034.0

Torques

Bevel roller bearing Steering	20 Nm
Screw brake	3 Nm
Wheel nut on rear engine (B 150 ADV)	90 Nm
Electronics system screw bolts M3	1,0 Nm
Electronics system screw bolts inserted M5	4,0 Nm
Electronics system screw bolts pressed-in M5	2,2 Nm
Electronics system screw bolts inserted M6	4,0 Nm
Electronics system screw bolts pressed-in M6	4,0 Nm
Nut with flange (150 A fuse) M8	10 Nm
Bolts screwed in plastic:	
M3 x 16	1,8 Nm
M5 x 12	1,8 Nm
M5 x 16	1,8 Nm
M5 x 30	2,5 Nm

Circuit diagram

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



A1 Bedienfeld

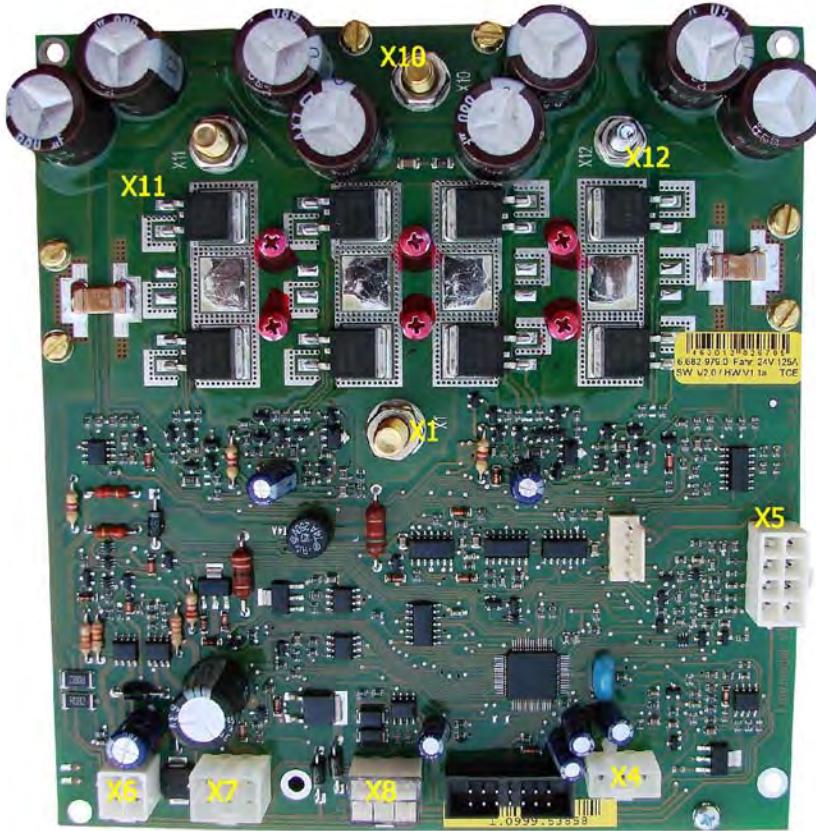
A1 Control panel

A1 Panneau de commande

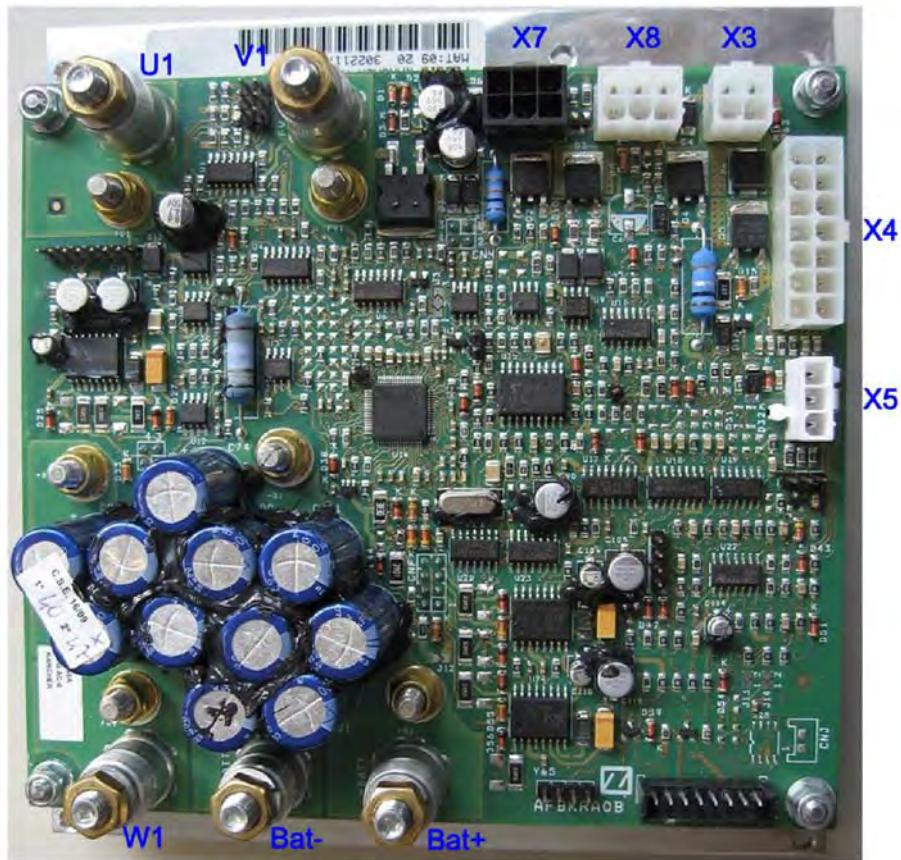
A1 panel de control

B 150 R

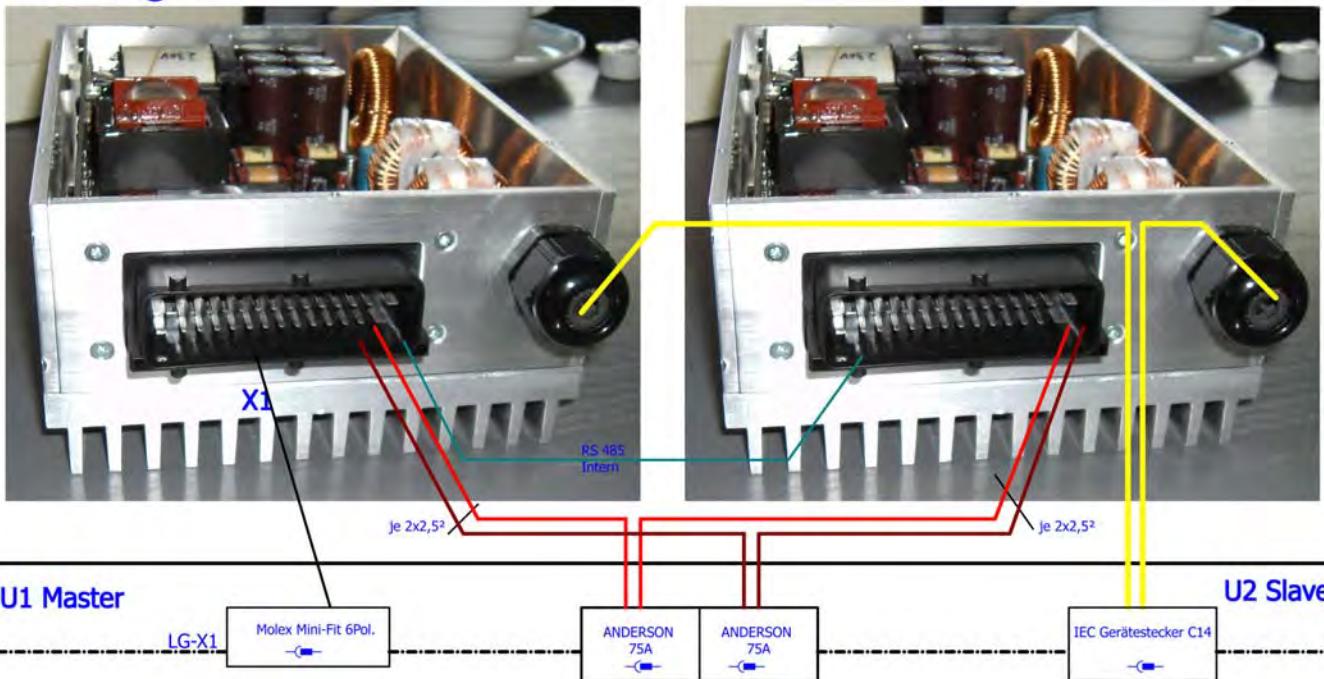
Drive module (A2)



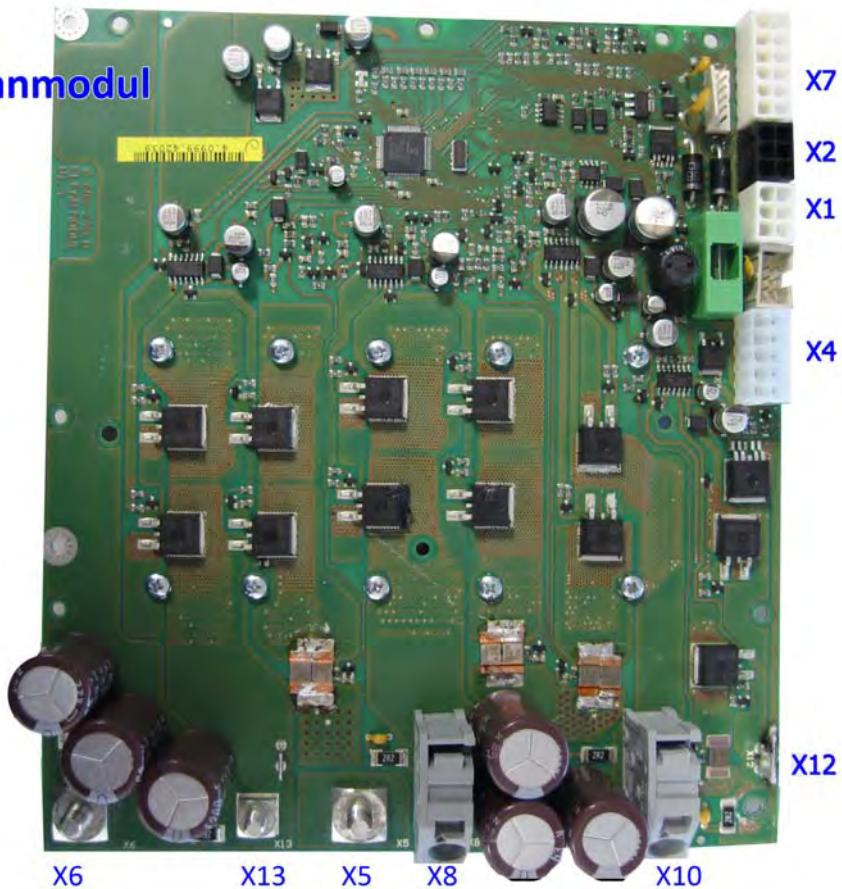
B 150 R Adv
Drive module (A2)



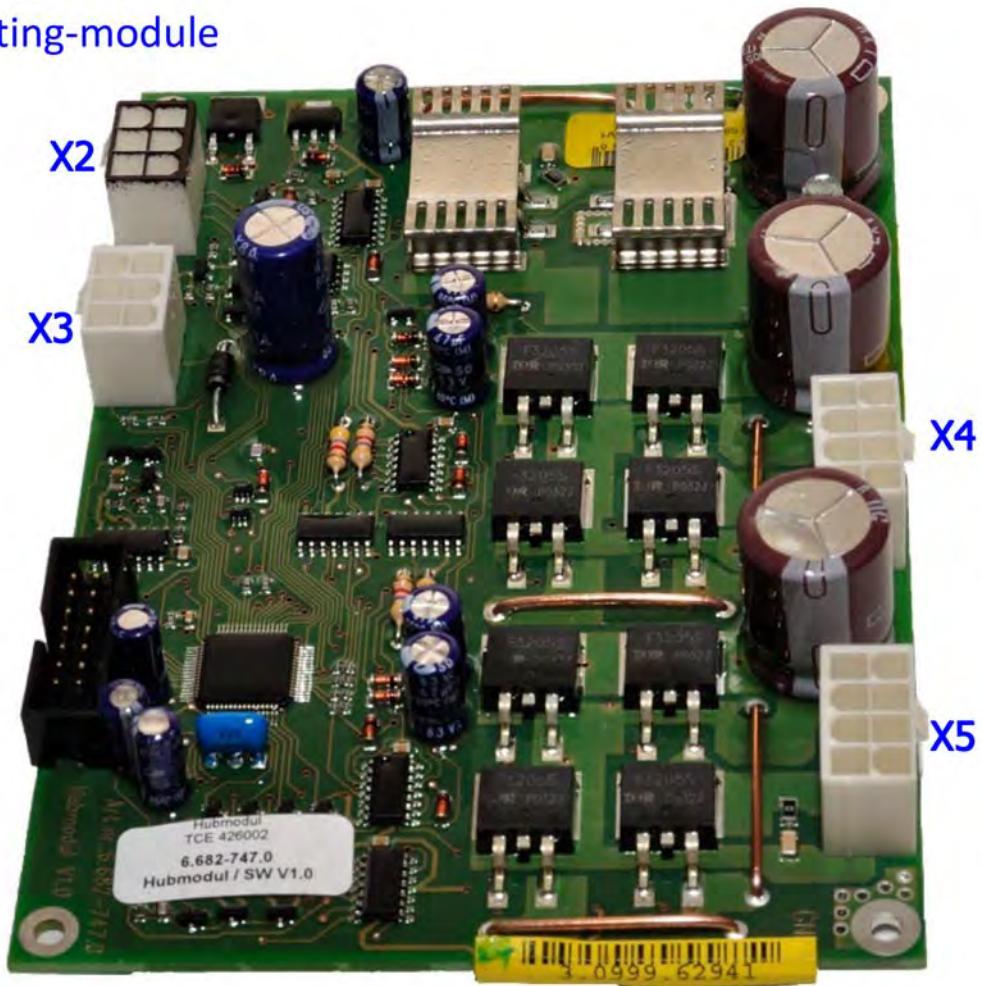
A7 Ladegerät A7 Charger



A3 Cleanmodul

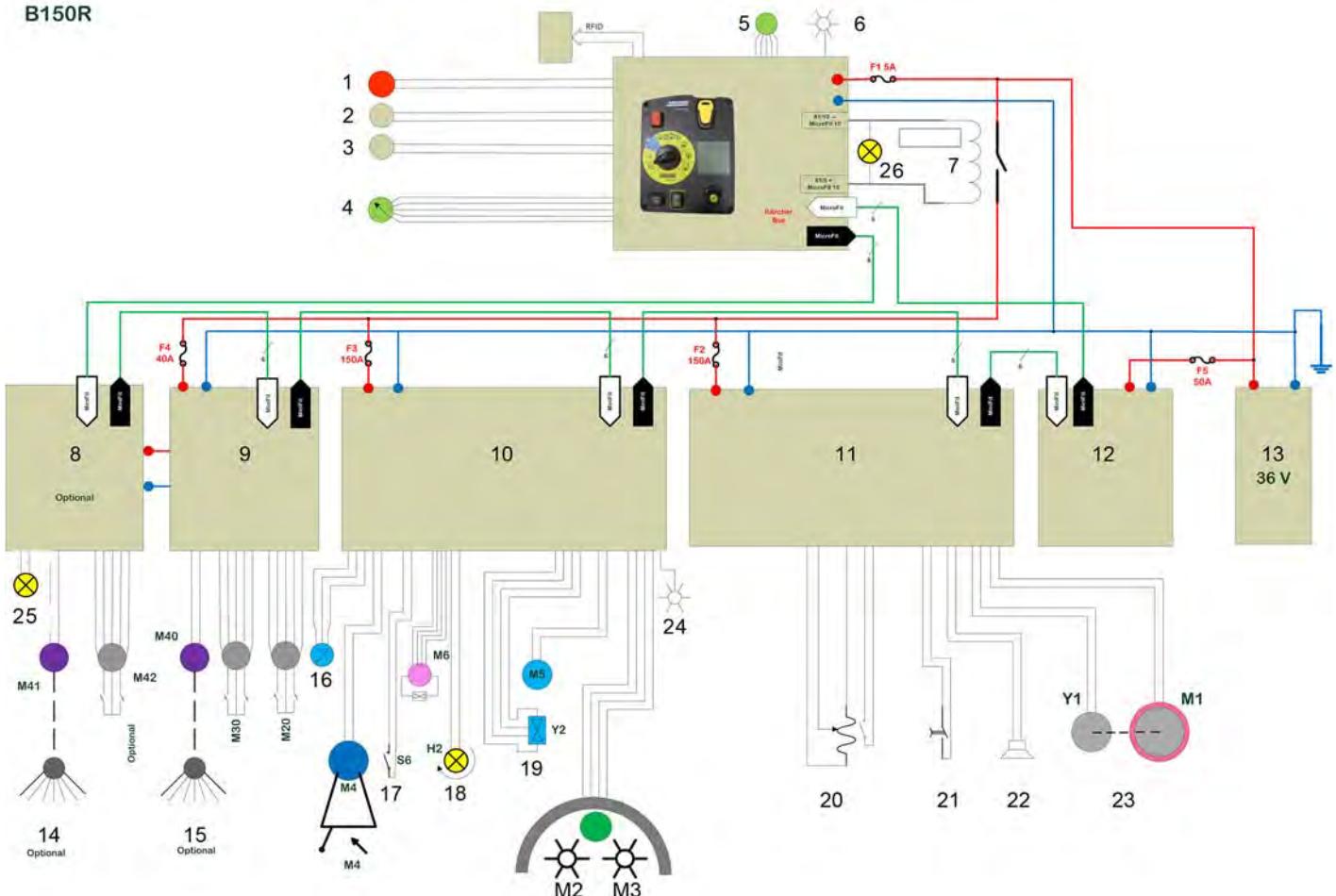


A4 Hubmodul
A4 Lifting-module



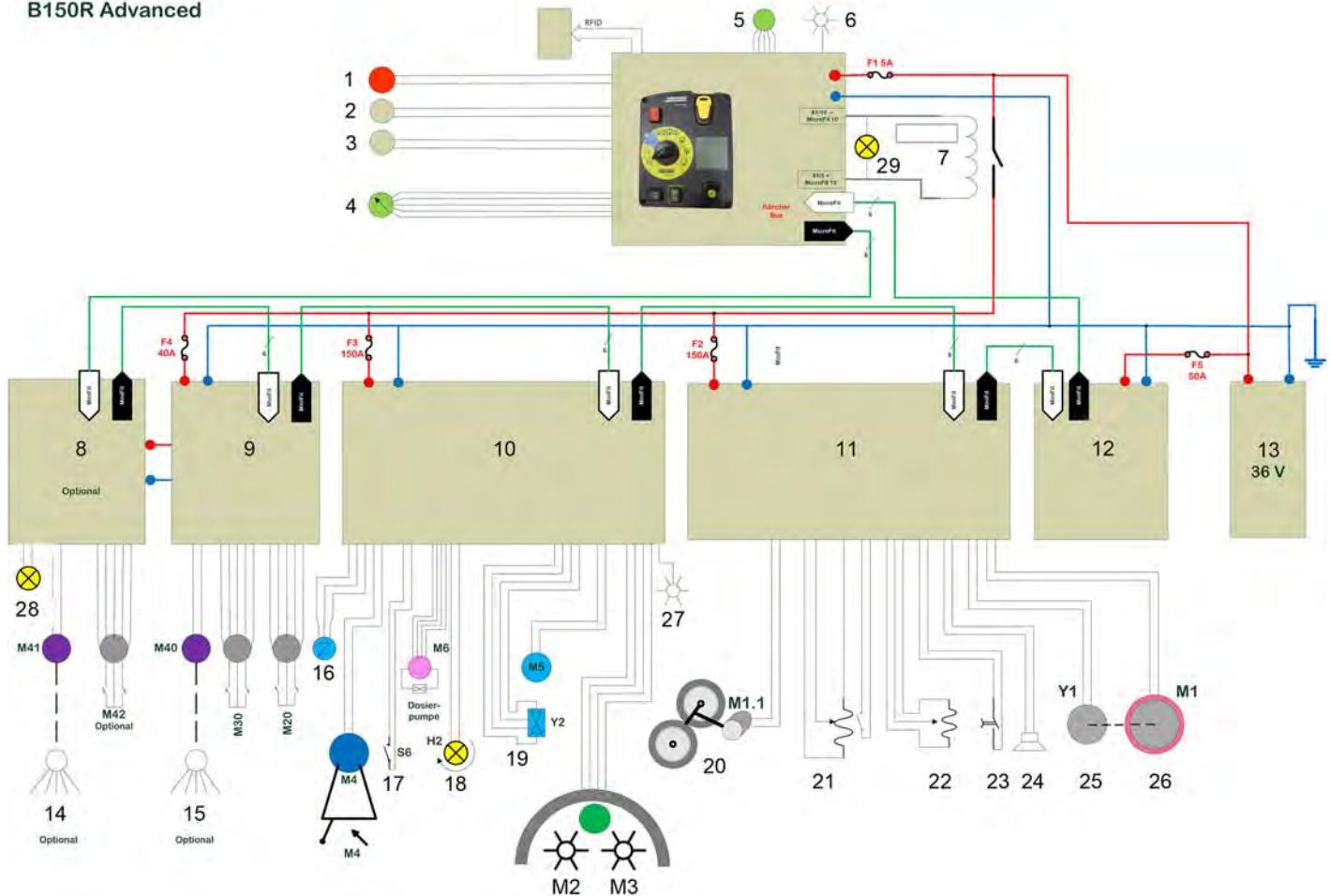
Block diagram

B150R



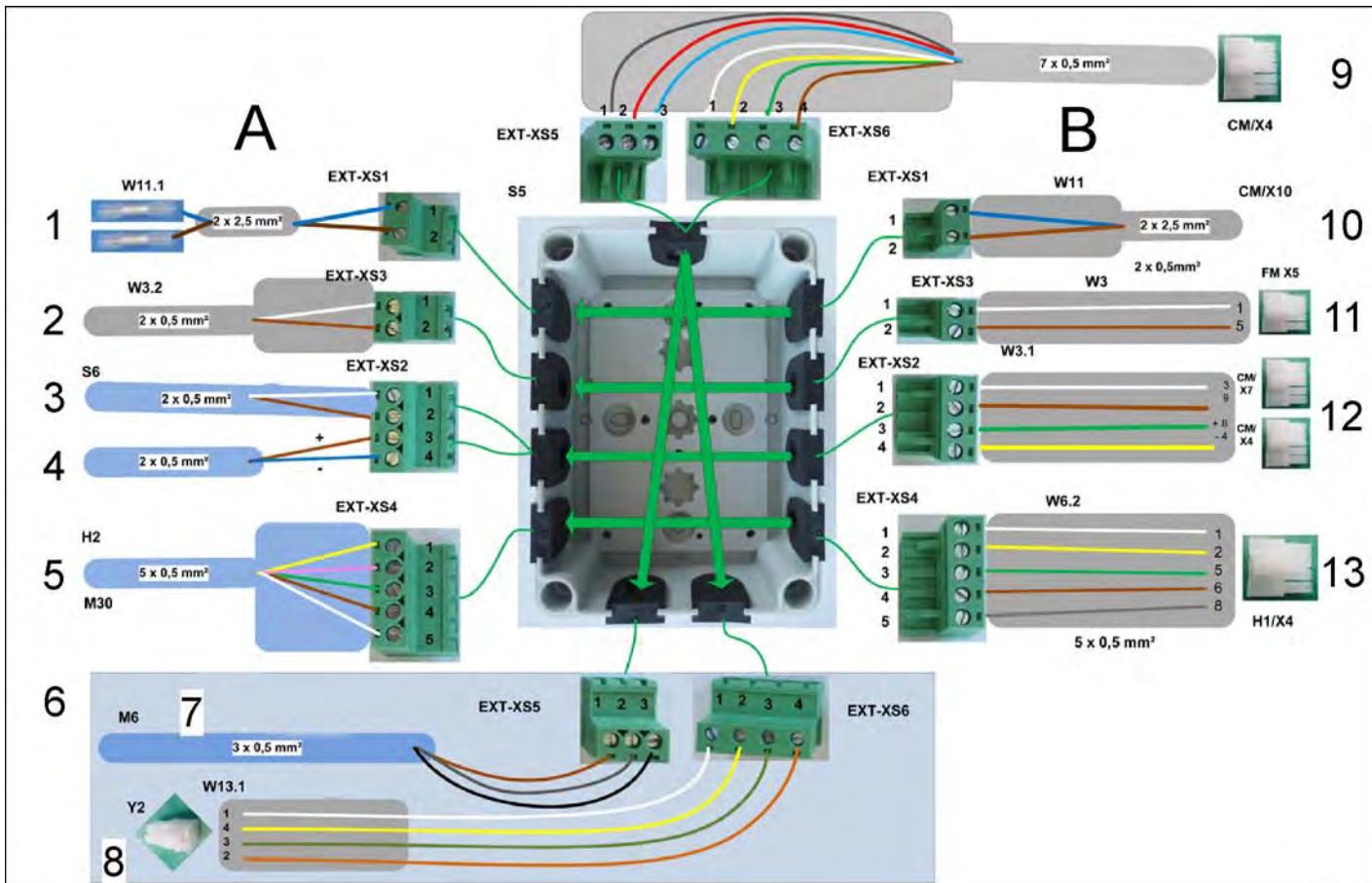
- 1 Main switch
- 2 Selector for the direction of travel
- 3 Horn button
- 4 Program selection switch
- 5 I button
- 6 Fan
Version 1
- 7 Main relay
- 8 Lifting module 2
- 9 Lifting module 1
- 10 Clean module
- 11 Drive module
- 12 On-board charger
- 13 Battery
- 14 Side brush, left
- 15 Side brush, right
- 16 Fresh water sensor
- 17 Wastewater sensor
- 18 Overall lamp
- 19 Electric ball valve
- 20 Accelerator sensor
- 21 Seat contact switch
- 22 Horn
- 23 Propulsion motor / brake
- 24 Fan
Version 2
- 25 Work light
- 26 Daytime running light

B150R Advanced



- 1 Main switch
- 2 Selector for the direction of travel
- 3 Horn button
- 4 Program selection switch
- 5 I button
- 6 Fan
Version 1
- 7 Main relay
- 8 Lifting module 2
- 9 Lifting module 1
- 10 Clean module
- 11 Drive module
- 12 On-board charger
- 13 Battery
- 14 Side brush, left
- 15 Side brush, right
- 16 Fresh water sensor
- 17 Wastewater sensor
- 18 Overall lamp
- 19 Electric ball valve
- 20 Rear propulsion motor
- 21 Accelerator sensor
- 22 Steering angle sensor
- 23 Seat contact switch
- 24 Horn
- 25 Drive motor
- 26 Brake, front propulsion motor
- 27 Fan
Version 2
- 28 Work light
- 29 Daytime running light

Junction box



- A Appliance side
 B Control side
 1 Suction turbine
 2 Seat contact switch
 3 Float switch of waste water tank
 4 Beacon lamp
 5 Lifting motor vacuum bar
 6 Water supply
 7 Dosing pump
 8 Water dosing valve
 9 Water control valve / dosing pump
 10 Suction turbine
 11 Seat contact switch
 12 Float switch waste water tank / rotating beacon
 13 Lifting motor vacuum bar