KÄRCHER

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BR 45/22 C
Service Manual

Contents

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:	***Case 122366***

The responsible product specialist will take care of your issue.

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Safety instructions

Service and maintenance tasks may only be performed by qualified and specially trained specialists.
Observe safety information in the chapters!
⚠ DANGER
First pull out the plug from the mains before carrying out any tasks on the machine.
⚠ CAUTION
Risk of damage by electrostatic discharge (ESD)! Take suitable measures for discharging electrostatic charge prior to performing work on the appliance electronics.

Hazard levels

⚠ DANGER
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.

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

- EPA filter (optional)
- FLEET (optional)
- Steering wheel
- Controllable cleaning head

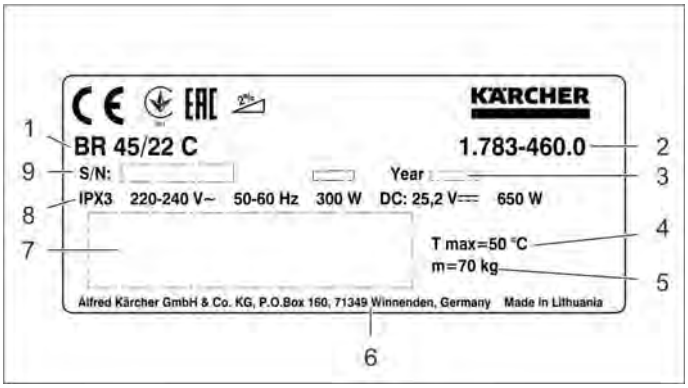
Field of application

This service manual describes the appliance family:
- BR 45/22 C

Safety installations

Safety devices serve to protect the user and must not be rendered in operational or their functions bypassed.
Observe safety information in the chapters!

Type plate

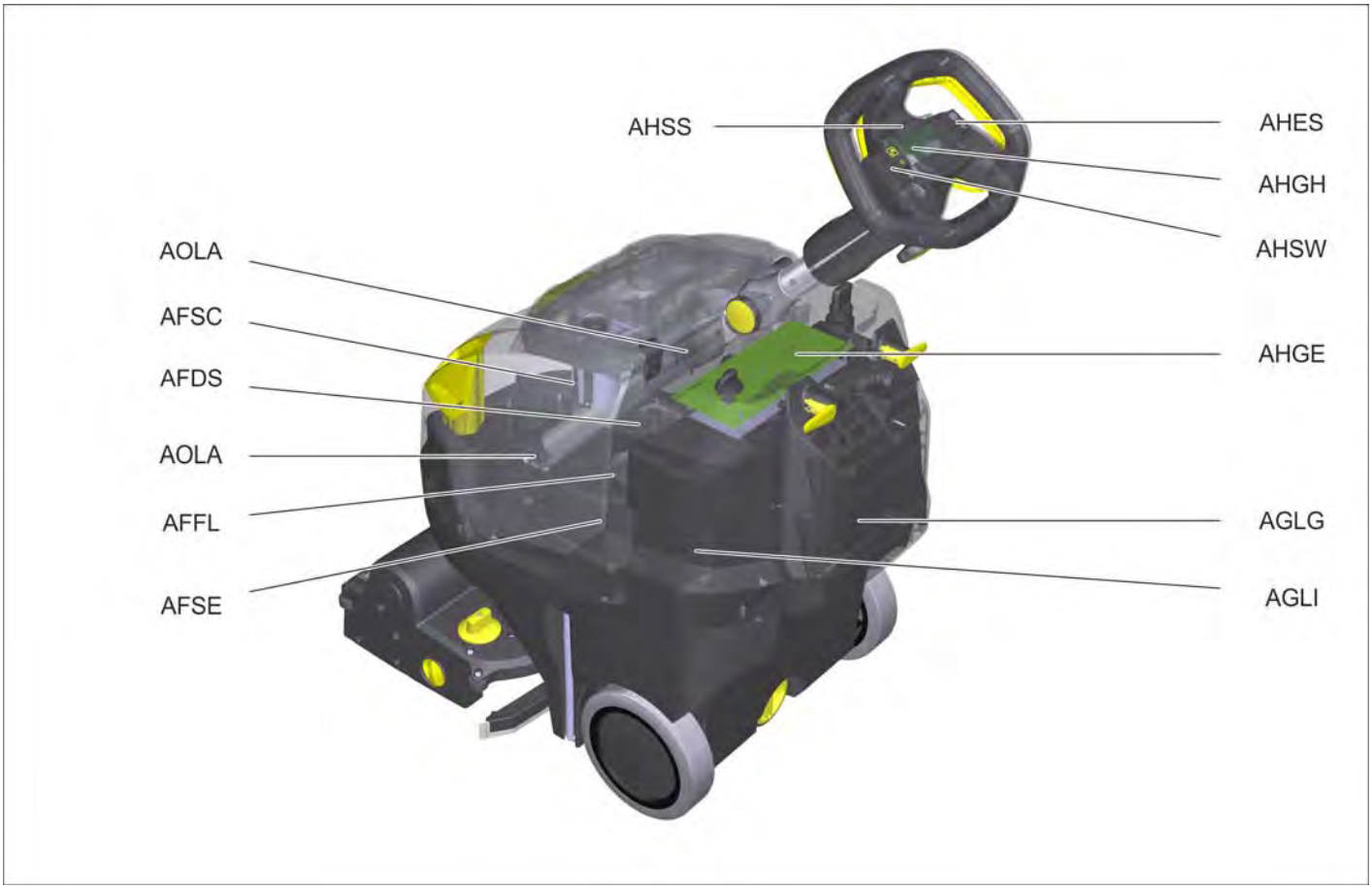


The type plate is located on the rear of the appliance.

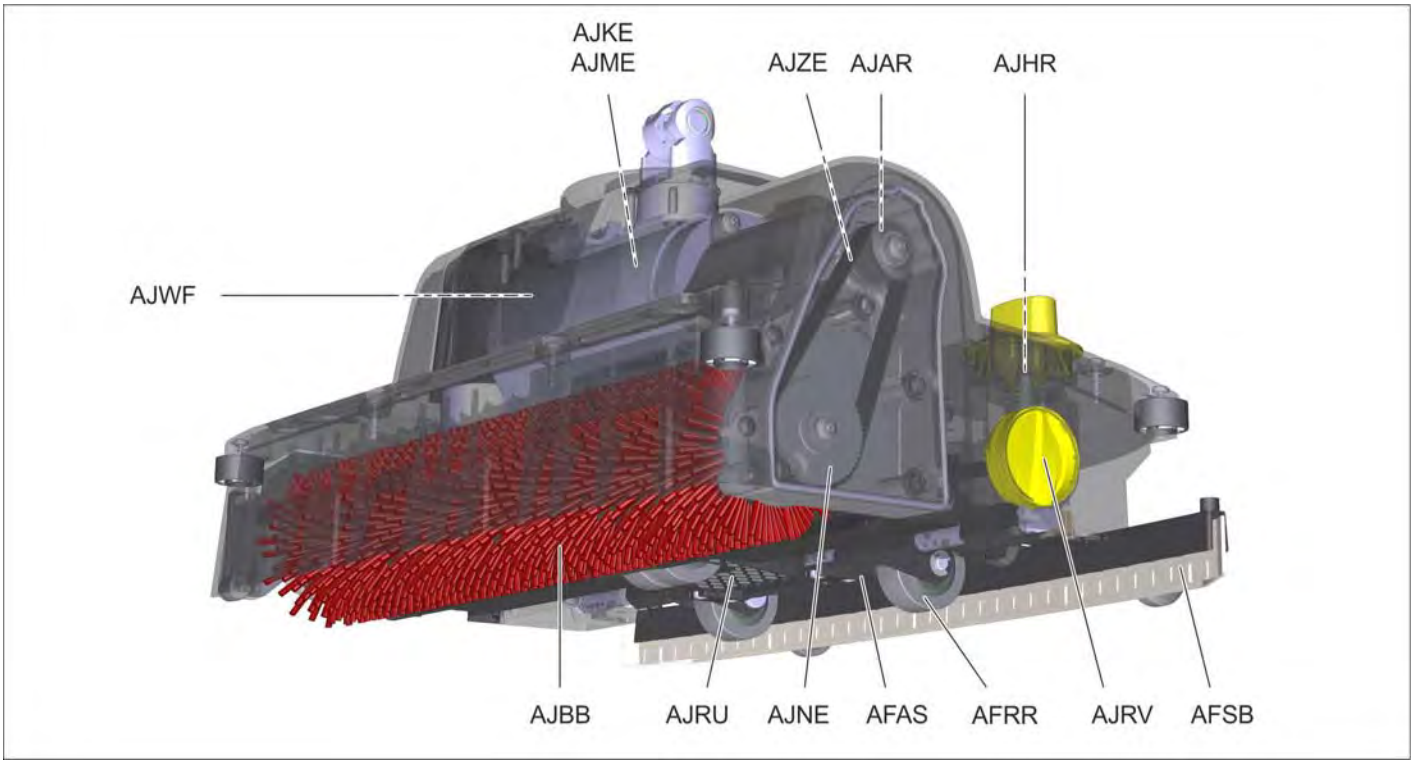
1 Appliance description
2 Part number
3 Year of manufacture
4 Max. feed temperature
5 Typical operating weight
6 Address of manufacturer
7 Bar code. Contains part and serial number.
8 Type of protection
9 Serial number

Overview of the appliance

ABGO Uninstalling/installing the top part of the appliance
ABLT Uninstalling/installing charger base
ADWF Uninstalling / installing water filter
ADWP Uninstall / install water pump
AFSW Uninstall / install waste water tank
AHSL Uninstalling/ installing key switch
AJBW Uninstall/ install cleaning head
AJAA Removing/installing the cleaning head cover
ANRH Uninstalling/installing rear wheel
AOGH Uninstalling/ installing articulated joint of the steering column
AOLO Uninstall/install upper steering column
AOLR Uninstalling/ installing steering wheel
AOLR Uninstalling/ installing steering wheel

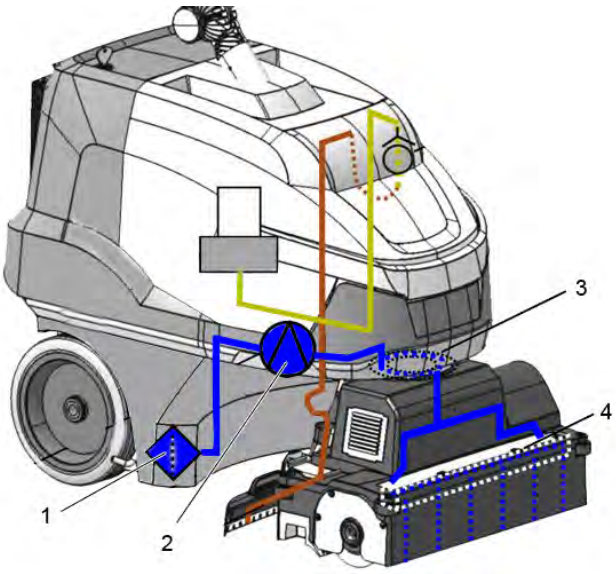


AFSC Uninstalling/installing float of the waste water tank
AFDS Removing/installing the suction duct seal
AFFL Cleaning/removing the suction turbine fluff filter
AFSE Uninstall/ install suction turbine
AGLI Uninstalling/ installing Li-ion battery
AGLG Uninstall/ install charger
AHGE Remove / install appliance electronics
AHES Uninstalling/ installing switch of the ECO function
AHSW Uninstalling/installing switch of the water pump
AHGH Removing/installing the steering wheel circuit board
AHSS Uninstalling/ installing safety switch
AOLA Uninstalling/ installing bearing shells of the steering



AFAS Uninstalling/installing suspension of the vacuum bar
AFRR Uninstall/install support roller of the vacuum bar
AFSB Uninstalling/ installing vacuum bar / vacuum lip
AJWF Cleaning the water guide
AJME Uninstalling/ installing brush motor
AJKE Uninstalling/ installing sliding contacts of brush motor
AJZE Uninstalling/installing drive belt
AJAR Uninstalling/ installing pulleys of the drive motor
AJHR Uninstalling/ installing height adjustment of the cleaning head
AJRV Removing/installing transport rollers turn button
AJNE Uninstalling/ installing pulley of the drive
AJRU Removing/installing the transport rollers support
AJBB Uninstalling/ installing brush roller

Flow pattern



1 Fresh water tank
2 Water pump
3 Labyrinth
4 Water distribution bar

Detergent solution/ fresh water is delivered from the fresh water tank by the water pump.
Foreign objects and soiling in the cleaning detergent solution/ fresh water are retained by the water filter.
The detergent solution/ fresh water flows through the hose system onto the labyrinth.
From the labyrinth the water flows through the hose system onto the water distribution bar of the cleaning head.
The water distribution bar equally distributes the water onto the brush roller.

AB Service group setup

010 Safety information

General

Observe general safety information!
Service and maintenance tasks may only be performed by qualified and specially trained specialists.

⚠ ***DANGER***

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

⚠ ***CAUTION***

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

020 Overview

1 Charger carrier
2 Housing top

030 Function

Top part of appliance

The top part of the appliance carries the waste water tank and the steering column.
In the appliance cover there are

- Appliance electronics
- Operator console
- TCU (optional)

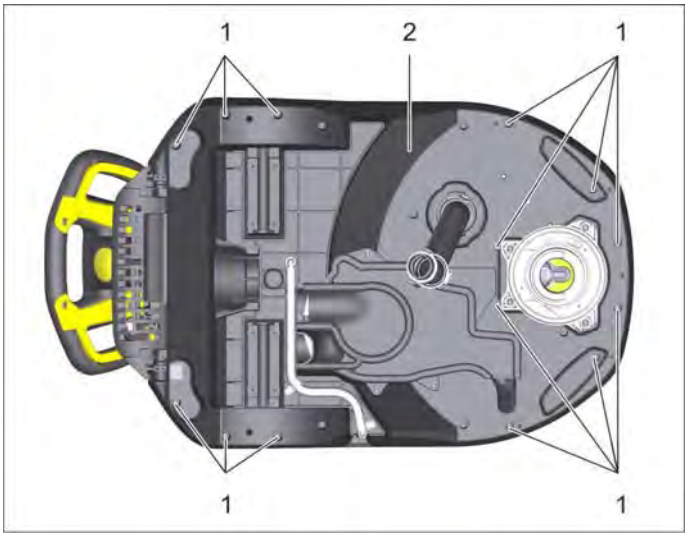
installed.

Charger base

The charger is installed in the charger base. The charger base is also the rear appliance cover.

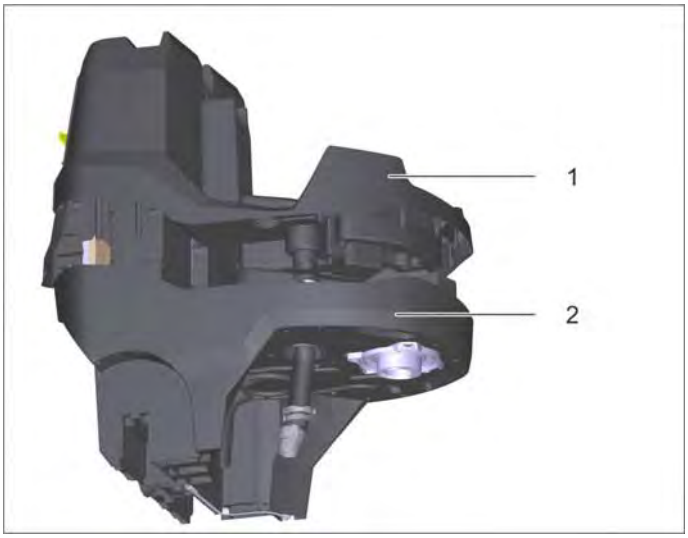
ABGO Uninstalling/installing the top part of the appliance

- *ADWP Uninstall / install water pump*
- *AHGE Remove / install appliance electronics*
- *AHSL Uninstalling/ installing key switch*
- *AJBW Uninstall/ install cleaning head*
- *ANRH Uninstalling/installing rear wheel*
- *ABLT Uninstalling/installing charger base*



1 Screws
2 Casing bottom

➔ Unscrew the screws.

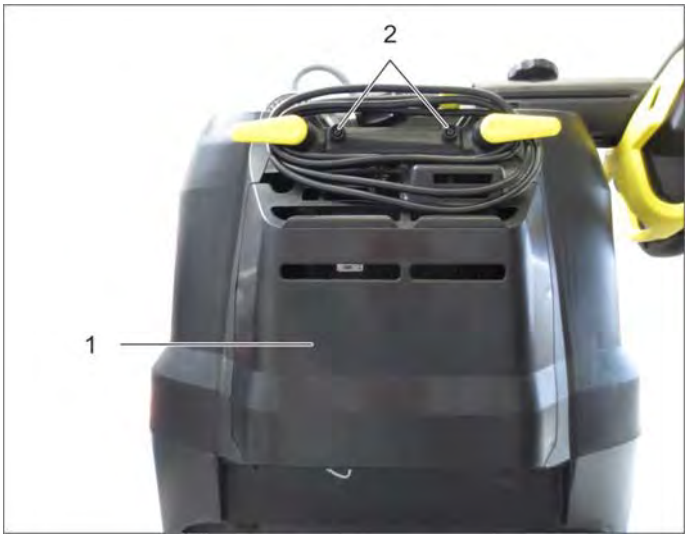


1 Housing top
2 Casing bottom

➔ Remove the top part of the casing.

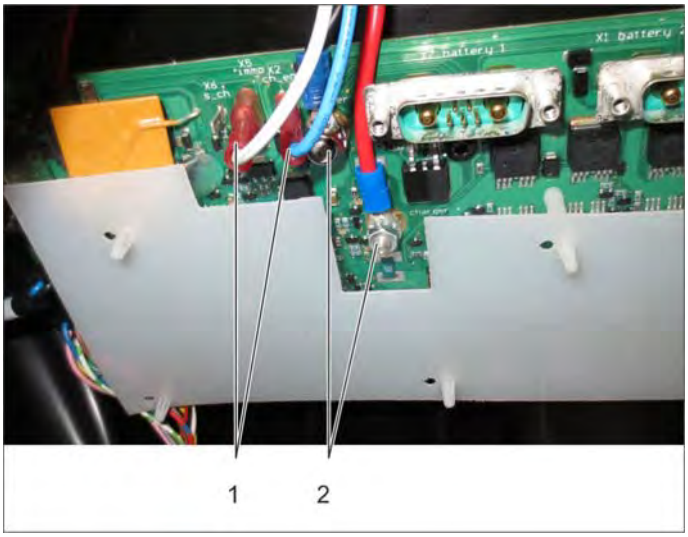
Note
Mind correct installation of the lines.

ABLT Uninstalling/installing charger base



1 Charger carrier
2 Screws

➔ Unscrew the screws.
➔ Carefully tilt the charger carrier to the rear.



1 Electric connectors
2 Connection cables X2: blue; X5: white

➔ Separate the electric connectors.
➔ Dismount connection cables.
➔ Carefully remove the charger carrier from the mounting.

Note
Mind correct installation of the lines.

050 Maintenance and inspection

Service group does not contain any maintenance and inspection points.

060 Error diagnosis

Findings	Possible cause	Correction
Damage, cracks	External mechanical impact	Replace casing, instruct operator
Cracked screw bosses	Incorrect lifting	Replace casing, instruct operator
Casing distorted	Thermal impact	Replace casing

070 Peculiarities/ others

The service group does not contain any peculiarities.

AD Service group fresh water system

010 Safety information

⚠ ***WARNING***
Switch off the appliance and remove the plug from the socket.
Observe general safety information!

020 Overview

1	Water pump	M3
2	Water filter	

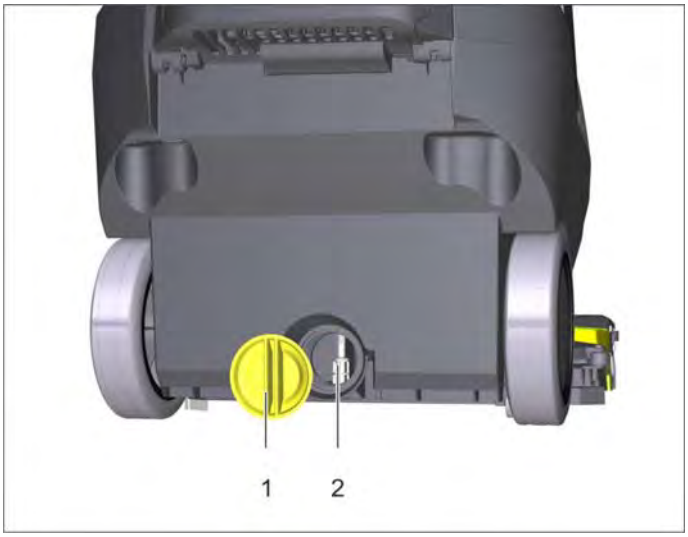
030 Function

No special functional characteristics.

040 Service activities

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

ADWF Uninstalling / installing water filter



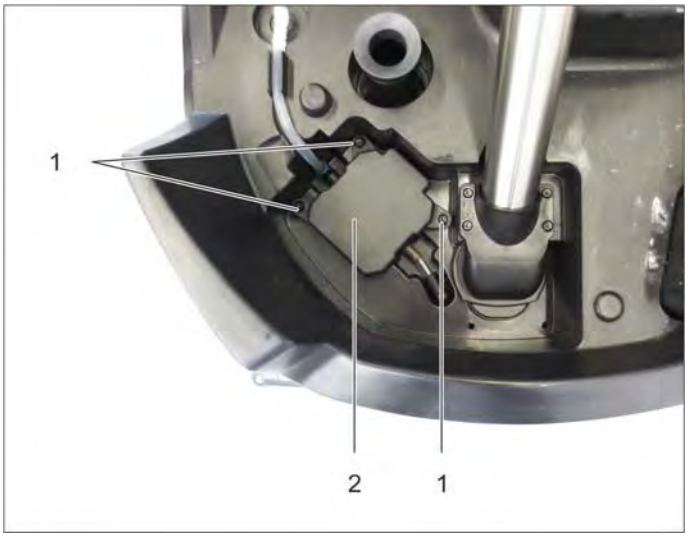
1 Fresh water tank screw connection
2 Water filter

➔ Open the fresh water tank screw connection.
➔ Remove the water filter with hose.
➔ Remove the water filter from the water hose.

Note
Carefully pull off the water filter.

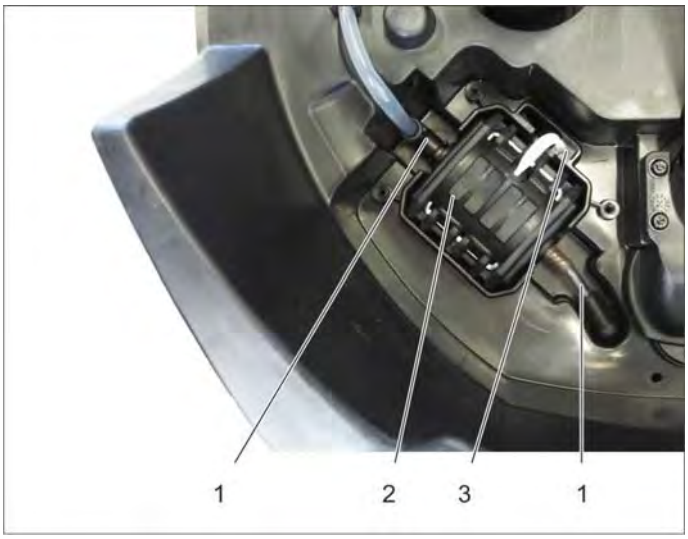
ADWP Uninstall / install water pump

■ *AFSW Uninstall / install waste water tank*



1 Screws
2 Cover

➔ Unscrew the screws.
➔ Remove cover.



1 Hoses
2 Water pump M3
3 Electric connectors

➔ Detach the hoses.
➔ Separate the electric connectors.
➔ Remove the water pump.

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

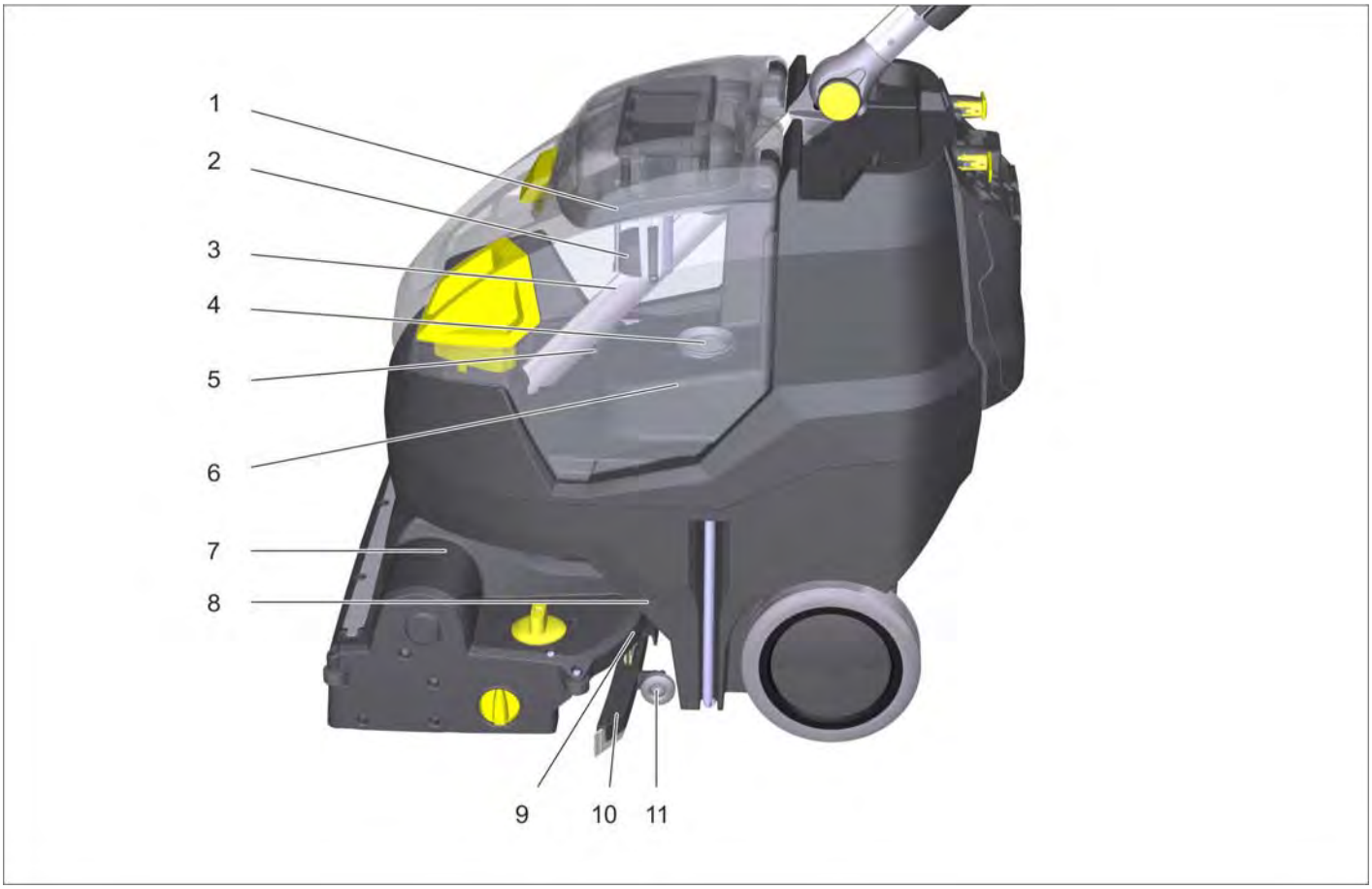
The service group does not contain any peculiarities.

AF Service group suction system

010 Safety information

For this service group there is no special safety information.
Observe general safety information!

020 Overview



1	Seal of cover of waste water tank		7	Microswitch, suction turbine	S2
2	Float of wastewater tank		8	Suction hose	
3	waste water tank		9	Suspension suction bar	
4	Suction turbine fluff filter		10	Vacuum bar	
5	Suction duct seal		11	Support roller, suction bar	
6	Suction turbine	M2			

030 Function

Wastewater is sucked through the intake port into the wastewater tank via the vacuum bar.
The suction turbine generates the necessary vacuum in the wastewater tank.
In order to protect the suction turbine from damage caused by water ingress, the float closes the air duct when the wastewater tank is full.

040 Service activities

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

AFSW Uninstall / install waste water tank

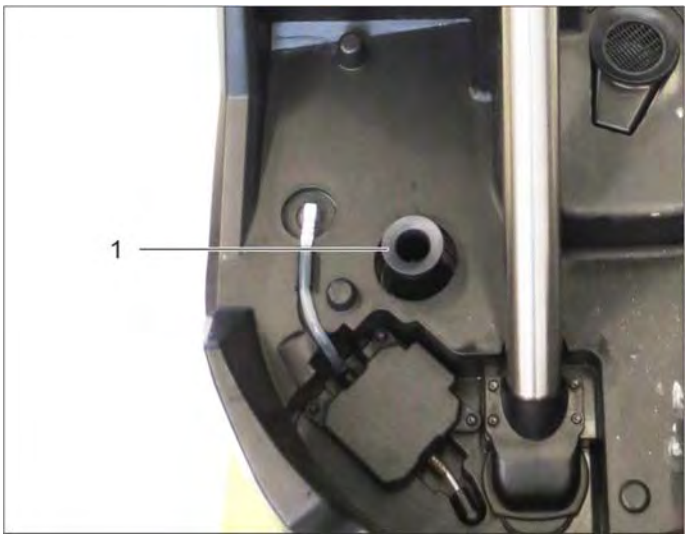
1 waste water tank

➔ Remove the waste water tank.

Note
Grasp the tank by the recessed grips.

AFDS Removing/installing the suction duct seal

■ *AFSW Uninstall / install waste water tank*

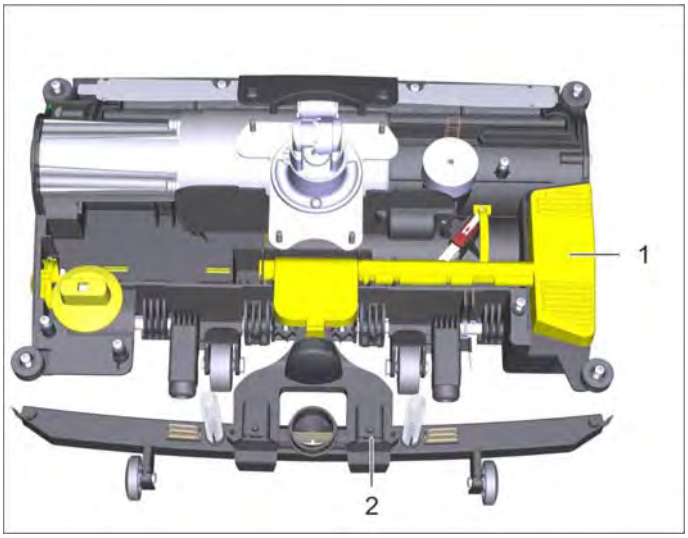


1 Suction duct seal

➔ Remove the seal of the intake port.

AFAS Uninstalling/installing suspension of the vacuum bar

■ *AJAA Removing/installing the cleaning head cover*

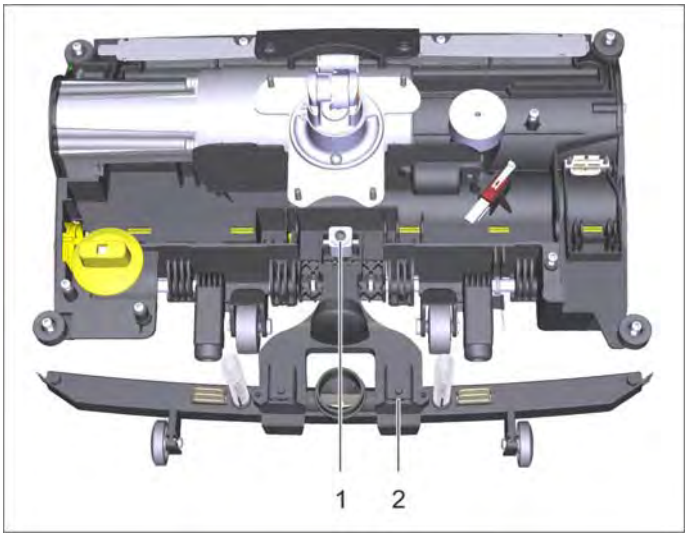


1 Pedal
2 Suspension suction bar

➔ Remove the pedal.

Note
Ensure that the clip for the microswitch is not damaged.

Installation information
Carefully install the pedal.

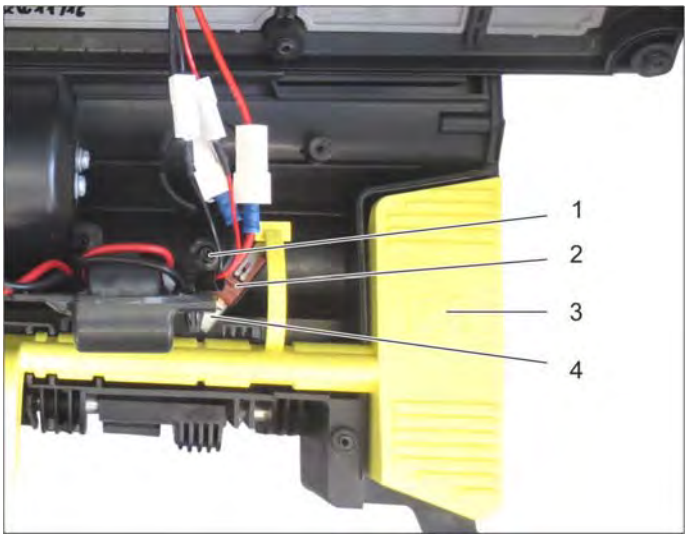


1 Screw
2 Suspension suction bar

➔ Unscrew the screw.
➔ Remove the suction bar suspension.

AFMS Uninstalling/installing microswitch suction turbine

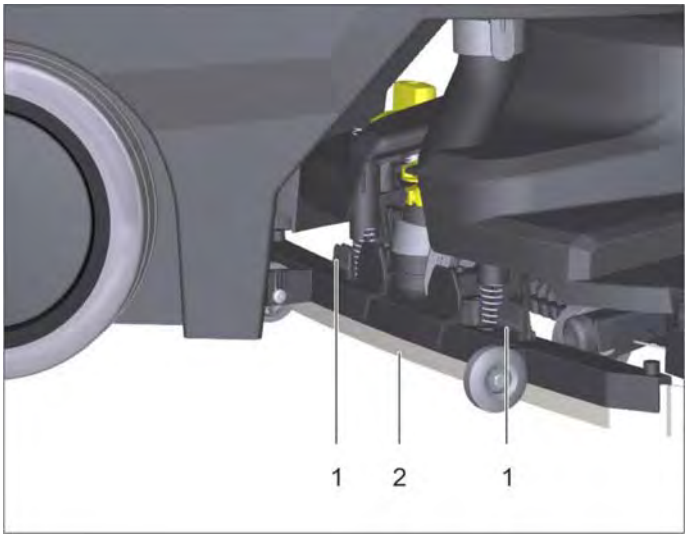
■ *AJAA Removing/installing the cleaning head cover*



1 Screw
2 Microswitch, suction turbine S2
3 Pedal
4 Electric socket plug connections

➔ Remove the pedal.
➔ Separate the electric connectors.
➔ Unscrew the screw.
➔ Remove microswitch suction turbine.

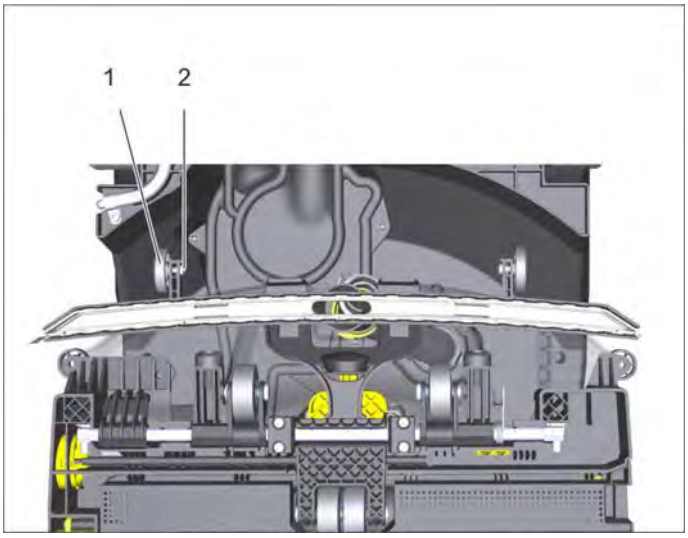
AFSB Uninstalling/ installing vacuum bar / vacuum lip



1 Clips
2 Vacuum bar

➔ Push the clips together and down.
➔ Remove the vacuum bar.
➔ Remove the holder with suction lips.
➔ Remove the suction lips from the holder.

AFRR Uninstall/install support roller of the vacuum bar



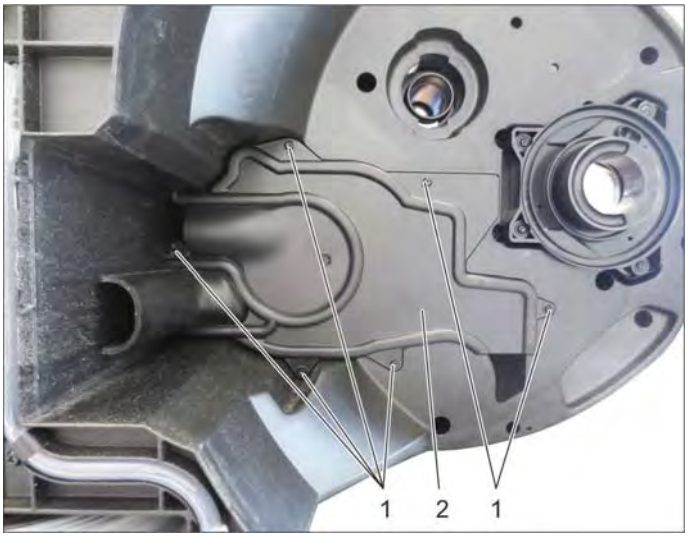
1 Support roller, suction bar
2 Screw

➔ Unscrew the screw.
➔ Remove the suction bar support roller.

Note
The support rollers need to be adjusted after installation.

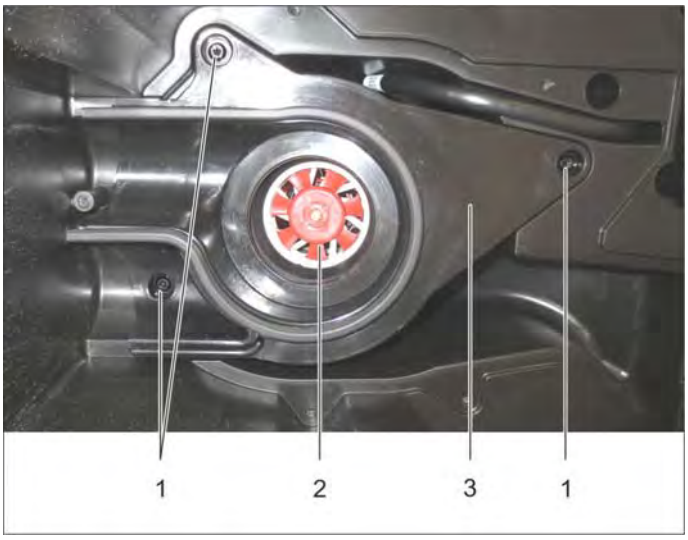
AFSE Uninstall/ install suction turbine

■ Remove the waste water tank.
■ Empty the fresh water reservoir.



1 Screws
2 Cover of the suction turbine

➔ Lay the device on the side.
➔ Unscrew the screws.
➔ Remove cover of suction turbine.



1 Screws
2 Suction turbine M2
3 Air guidance

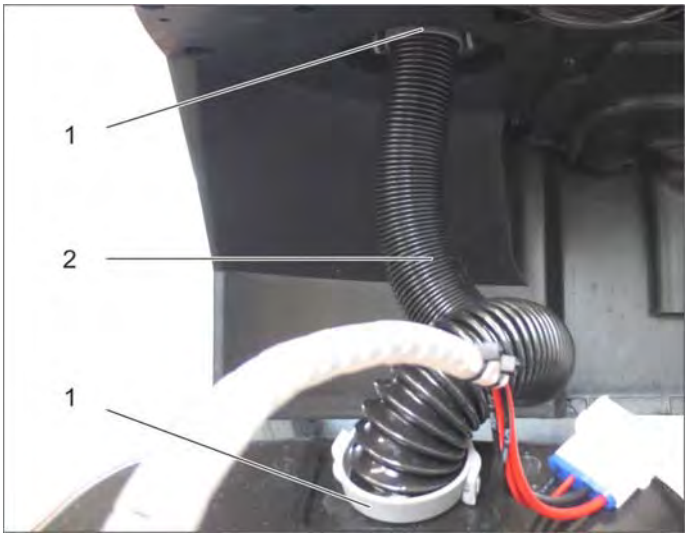
➔ Unscrew the screws.
➔ Remove the air guide with suction turbine.
➔ Remove the suction turbine from the air guide.

1 Electric socket plug connections
2 Suction turbine M2

Note
Mark the position of the seal rings and the suction turbine.

➔ Separate the electric connectors.

AFSE Uninstalling/ installing suction hose

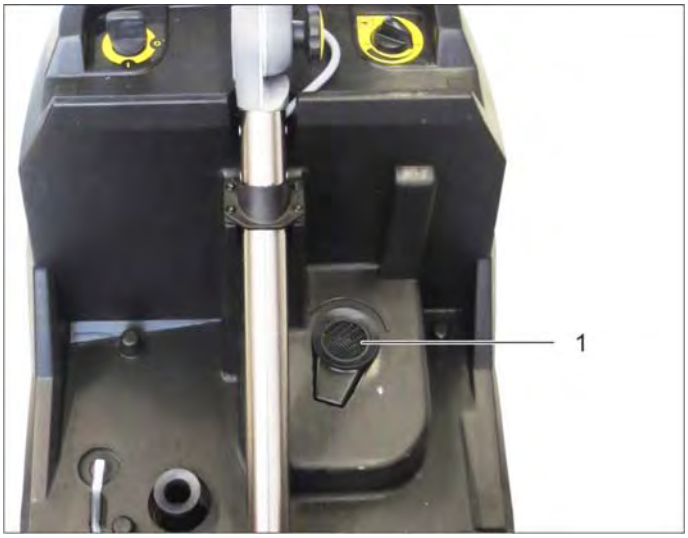


1 Suction hose lock
2 Suction hose

➔ Detach the suction hose lock.
➔ Pull off the suction hose.

AFFL Cleaning/removing the suction turbine fluff filter

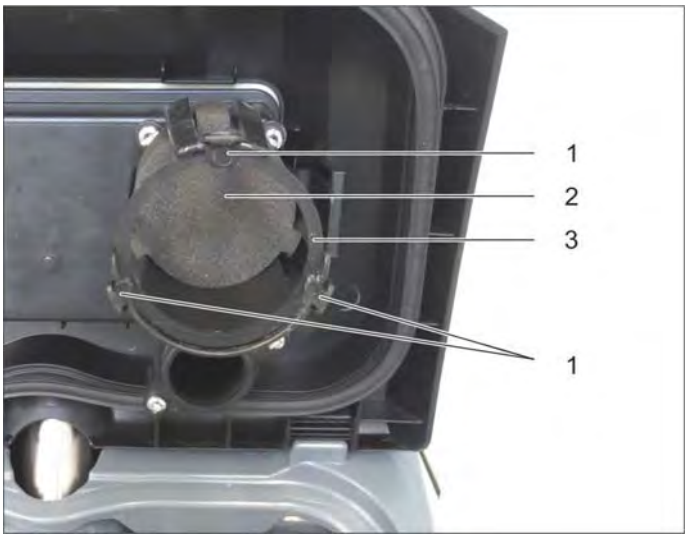
■ *AFSW Uninstall / install waste water tank*



1 Fluff filter

➔ Remove the fluff filter.

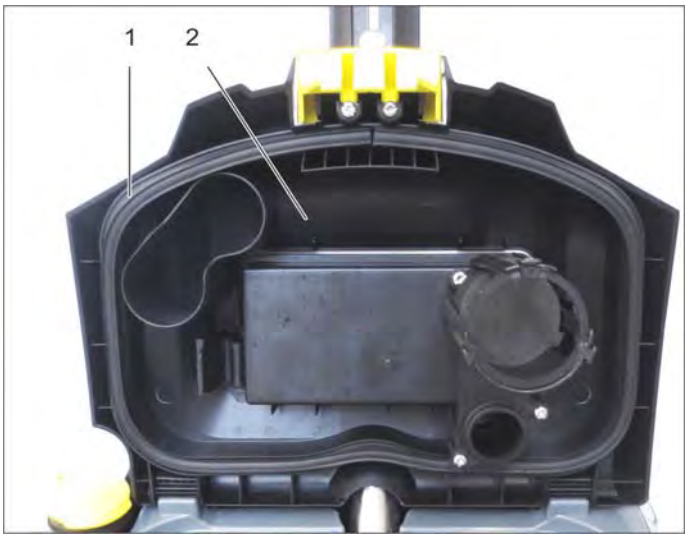
AFSC Uninstalling/installing float of the waste water tank



1 Clips
2 Float
3 Ring

➔ Open the cover of the waste water tank.
➔ Release the clips.
➔ Remove the ring.
➔ Remove the float.

AFSD Replacing the seal of the lid of the waste water tank



1 Seal
2 Cover waste water tank

➔ Open the cover of the waste water tank.
➔ Remove the seal.

050 Maintenance and inspection

➔ Clean the vacuum lips, check for wear and replace the vacuum bar if required.
➔ Check and clean seals, replace damaged seals.
➔ Check the suction hose for damages.
➔ Check suction hose for clogging.
➔ Check suction hose to see it is leak-proof.
➔ Check the brush for wear and tear.

060 Error diagnosis

Findings	Possible cause	Correction
Water passes through suction turbine despite float being closed	Seal of the intake port is damaged	Replace washers
	Intake port casing is damaged	Replace casing
Vacuum bar oscillating in the vacuuming operation	Vacuum bar installed incorrectly.	Properly install the vacuum bar.
	Vacuum bar suspension damaged	Replace vacuum bar suspension.
No suction effect of the vacuum bar, water remains on the cleaned surface.	Vacuum lips soiled/ worn. Suction hose clogged.	Clean the vacuum lips, check for wear and replace if necessary.
Vacuum bar has a time lag on one side, has too much contact.	Support roller defective / worn.	Replace support roller.
No suction effect.	Suction turbine does not run	Check/replace the suction turbine.
	Suction hose kinked	Check suction hose, lay correctly.
	Suction hose / connection defective	Replace suction hose.
	Closure of the drain of the waste water tank damaged.	Replace closure.
	Seal of the lid of the waste water tank damaged.	Replace seal.
	Float closes suction duct	Empty the waste water tank.
	Cover of drainage hose missing/damaged	Replace cover of drainage hose.
	Waste water tank vacuum leak	Check waste water tank seal.
Bracket broken	Mechanical impact	Replace bracket
Bracket does not snap in place	Holder, snap-in noses or bracket damaged	Replace bracket. Replace waste water tank.
Insufficient vacuum performance	Lint trap soiled	Clean the fluff filter.
Large foreign objects in the waste water tank	Lint trap damaged	Replace the lint trap.
Handle broken	Mechanical impact	Replace handle
Lid does not snap in place	Locking hook damaged	Replace handle
Wastewater in the appliance	Closure of the drain of the waste water tank damaged.	Replace closure.
Suction turbine does not start up	Suction turbine defective.	Replace the suction turbine.
	Microswitch of suction turbine defective	Replace the micro switch.

070 Peculiarities/ others

The service group does not contain any peculiarities.

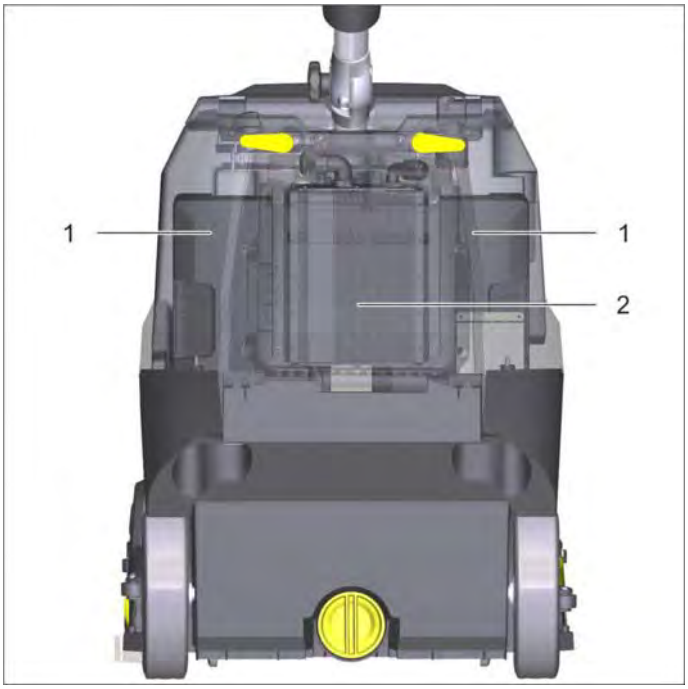
AG service group energy supply

010 Safety information

⚠ ***WARNING***

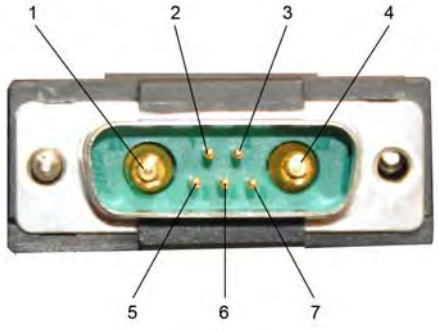
The appliance contains a built in Li-ion battery. The handling of this battery is subject to special criteria.
A defective battery can only be replaced as a whole. The replacement or repair of individual cells is not possible.
Observe the safety information "Li-ion battery" in the general part of this service manual as well as the respective country-specific regulations concerning handling, transport and disposal!

020 Overview



1	Batteries	G1, G2
2	Charger	U1

030 Function



The charger is connected to the appliance electronics.
The charge management is controlled by the charger.
The Li-ion battery is equipped with its own internal electronics, which monitors the charging process and internal safety functions (temperature monitoring, cell parameters).
The internal electronics of the Li-ion battery communicates with the charger via a system cable.

1 Negative terminal (-)
2 Communication (K)
3 Battery wake-up signal (W)
4 Positive terminal (+)
5 Emergency shutdown (ER)
6 Not classified (NC)
7 Charge enable (LF)

The appliance functions are supplied with battery power via the appliance electronics.

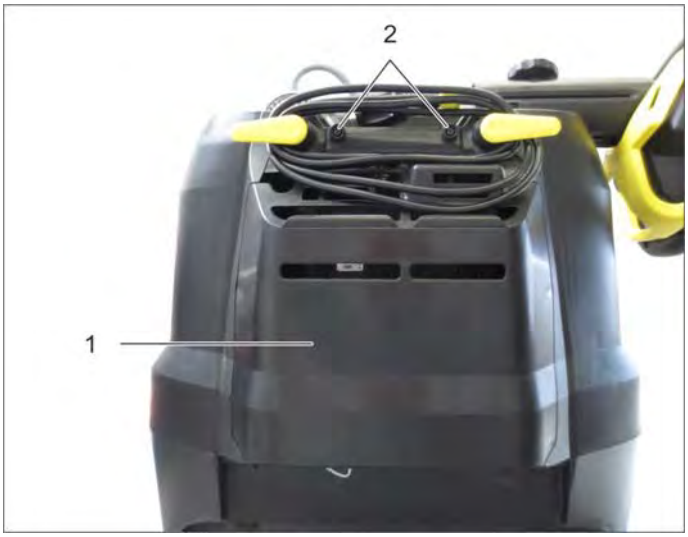
Charging process

When the mains voltage is applied, the charger activates the immobiliser. The immobiliser prevents appliance functions during the charging phase.
The charger sends voltage impulses to wake up the Li-ion battery.
As soon as the charger detects a battery voltage, the charging process starts with a defined charging curve.
If safety-critical conditions occur during the charging process, the charging process of the Li-ion battery is interrupted

040 Service activities

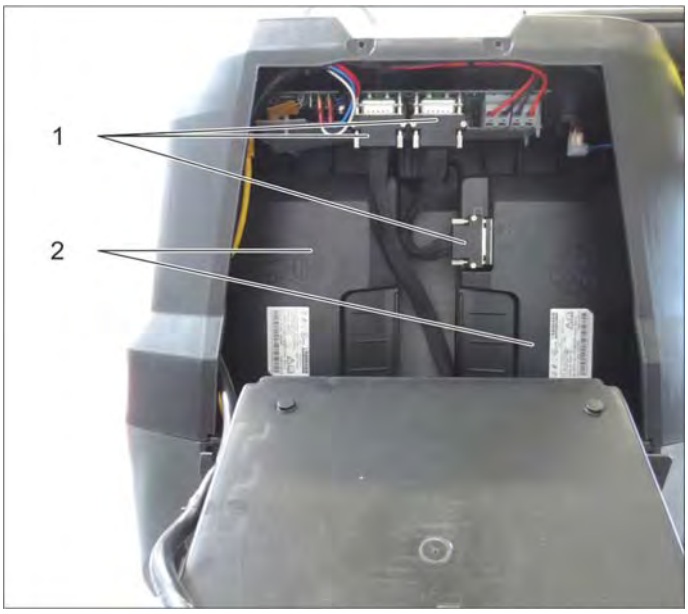
Note
Unless otherwise described, the installation takes place in reverse order.

AGLI Uninstalling/ installing Li-ion battery



1 Charger carrier
2 Screws

➔ Unscrew the screws.
➔ Tilt the charger base backwards.



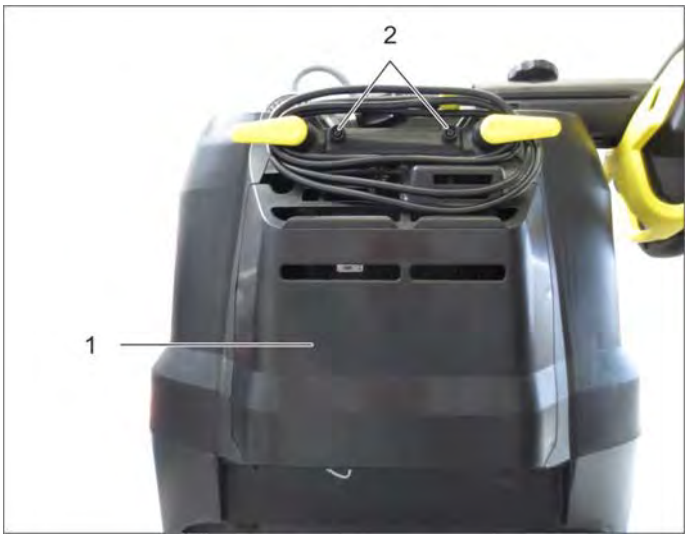
1 Electric socket plug connections
2 Batteries G1, G2

➔ Separate the electric connectors.
➔ Remove the batteries.

Note
First remove the left battery.
Ensure that the unit electronics are not damaged during removal and installation.

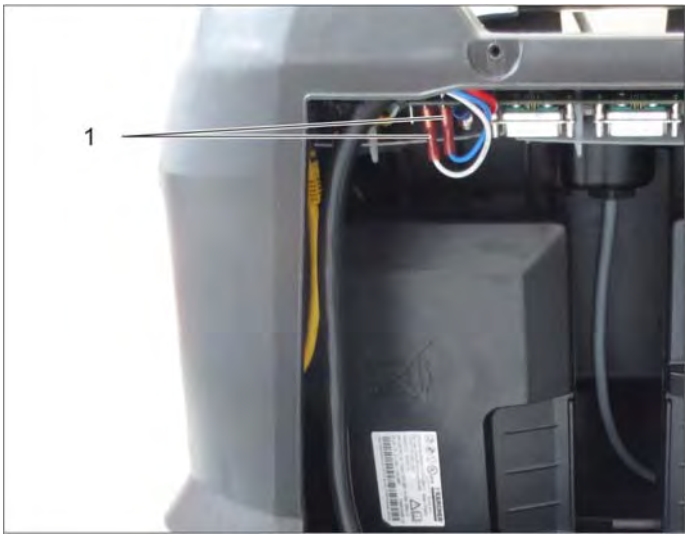
AGLG Uninstall/ install charger

■ Clamping/unclamping the batteries



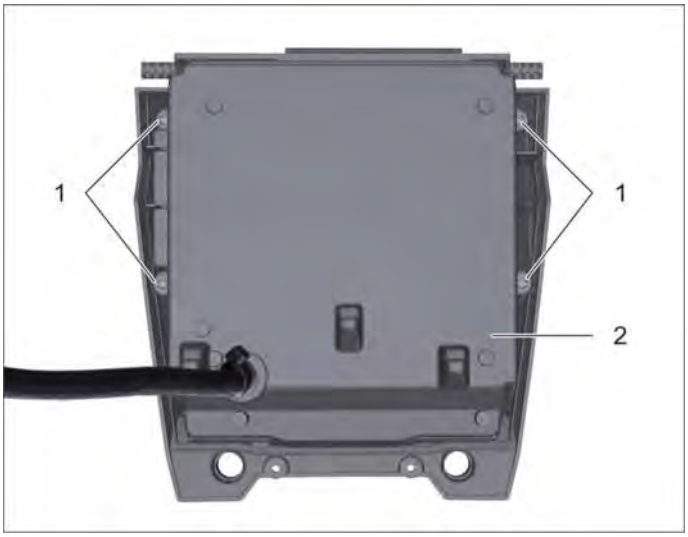
1 Charger carrier
2 Screws

➔ Unscrew the screws.
➔ Tilt the charger base backwards.



1 Electric socket plug connections X2, X5

➔ Separate the electric connectors.



1 Screws
2 Cover

➔ Unscrew the screws.
➔ Remove cover.

1 Charger U1

➔ Remove charger.

050 Maintenance and inspection

Service group does not contain any maintenance and inspection points.

060 Error diagnosis

Findings	Possible cause	Correction
Short operating time of the appliance.	Li-ion battery worn	Replace battery.
No function	Li-ion battery defective	Replace battery.
Battery is not being charged	Li-ion battery/ charger defective	Check, replace battery/ charger.
Fault indicator lamp is on	Fault charger Li-ion battery defective	Check / replace the charger. Replace battery.
Accumulator is not being charged	Charger is defective.	Check / replace the charger.

070 Peculiarities/ others

Defective or damaged Li-ion batteries are subject to special transport regulations:
Li-ion batteries are hazardous goods in accordance with UN3480. They are therefore subject to general transport regulations, depending on the mode of transport.
The transport of damaged Li-ion batteries must be organised and accounted for in accordance with the local regulations by the local Kärcher agencies.
Transport of damaged Li-ion batteries is only permitted under the additional conditions defined by the responsible authority. Freedom from damage in accordance with the ADR, special provision 661 is a requirement for all transport of Li-ion batteries.

Regulations as per ADR (661)

Without this regulatory permit the transport of damaged Li-ion batteries on the road is not permitted. Marine or air transport of damaged Li-ion batteries is basically not admissible as per today's standards.
Only packaging approved for these goods by the competent authority must be used
Each shipment must contain a copy of the permit issued by the competent authority or the transport document must contain a reference to the permit of the competent authority
The competent authority of the contracting party of the ADR that issued a permit in accordance with this special provision must inform the office of the UNECE for the purpose of announcing this information via its website. Recommendations of the United Nations for technical requirements on the transport of damaged Li-ion batteries must be considered upon the granting of a permit.
Among damaged Li-ion batteries are especially batteries in which the manufacturer has detected defects that impair the safety, Li-ion batteries with damaged or severely distorted casings, leaking cells or batteries with gas leaks or Li-ion batteries with defects that can not be diagnosed prior to the transport to the place where the analysis takes place.

Service life of Li-ion batteries

Li-ion batteries have an expected service life that is equivalent to the service life of the appliances. If the use of the Li-ion battery is terminated, it must be disposed of as hazardous material in accordance with the applicable local provisions by an expert company.
Freedom from damage in accordance with the ADR, special provision 661 is a requirement for all transport of Li-ion batteries.

Lifetime of Li-ion batteries

Li-ion batteries will be classified by Kärcher Service on site. We recommend the following procedure for determining whether a Li-ion battery is undamaged and can be transported as hazardous goods:
This procedure is based on Li-ion batteries 6.654-294.0 21Ah.
The responsibility for the transport is assumed by the person that declares the battery as free of defects in accordance with ADR, SV661 and makes the decision for the transport. If an expert is to be called in for the decision via the Service-International, his/her requirements are to be supported and implemented as effectively as possible by the local service. A return transport of Li-ion batteries that are free of damage to the Kärcher headquarters always requires the approval of the Service-International.
Li-ion batteries classified by Service or by an expert as defective on site can no longer be transported using transport equipment and have special transport requirements.

Recommendation for Kärcher-Service regarding the handling of Li batteries

Defective Li batteries may constitute a hazard potential. A defective battery should therefore be removed from the customer's premises as quickly as possible. In Germany Kärcher is legally obliged to return and dispose of defective or used batteries generally and hence lithium batteries too. Please observe also the legal requirements for your country.

Service International will provide support on request in cases where it is unclear if a Li battery should be classified as defective or merely used.
Transport packaging of used Li batteries:

Preparing a used Li battery for transport
Used Li batteries (i.e. not defective in accordance with ADR SV 661) must be placed in their original packaging prior to transport for disposal purposes. Special instructions need to be observed for transport for disposal purposes. The packaging is marked in accordance with the UN. The empty space in the box should be filled with vermiculite. Example rechargeable battery 6.654-294.0:

6.652-001.0 Original packaging of Li battery or 6.591-046.0 Alternative Packaging. Minimum size 310mm x 250mm x 200mm, Label 10 x 10cm, Text: "UN3480" in capital letters.

Used Li batteries may also be transported in the LiBaPack 6.652-000.0 with the corresponding labelling.

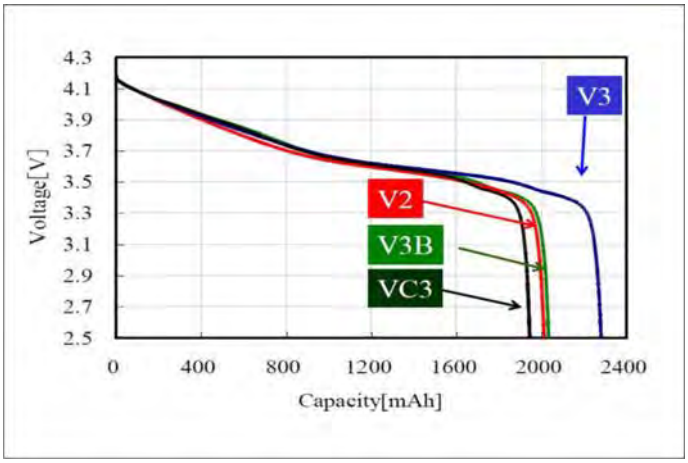
Preparing a defective Li battery for transport
A defective or damaged Li battery must not be stored and transported in the original box. In such cases LiBaPack 6.652-000.0 should be used together with the required hazardous goods documents. If a battery smaller than the 6.654-294.0 battery is transported in the LiBaPack, the empty space in the box must be filled with vermiculite or fire-extinguishing sand.

Defective or damaged Li batteries must be removed from the LiBaPack and service technician's vehicle as soon as they are transferred to a disposal point. They should be handed over as soon as possible. If the service technician's vehicle needs to be parked during this procedure, this must be done on open ground and without exposure to excessive heat. The local disposal company must be informed as early as possible. We recommend LiBaPack 6.652-000.0, vermiculite and accompanying papers be stowed away in the service technician's vehicle.

Calculation example of battery run time

Discharged down to:	21 volts
Battery switches off at:	18.9 V
Battery can no longer be charged below:	17.5 V

The capacity of the battery between 22V and 17.5V is approx. 500 mAh (with 10 cells).



Full battery with TCU

Battery capacity: 21Ah = 21000 mAh (10 cells)

Consumption

Electronics idle current:	100 mA
Battery electronics:	5 mA
TCU electronics:	1 mA
Total	approx. 106 mA

After approx. 200 hours (= 8 days) the battery will switch off at 18.9 volts.
With 2 batteries = 16 days capacity

Full battery without TCU

The battery switches to deep sleep mode.

Battery capacity: 21 Ah = 21000 mAh (10 cells)

Consumption

Idle current of battery electronics:	0.010 mA
Self-discharge of battery (10 cells):	0.010 mA
Total:	approx. 0.02 mA

After approx. 1,050,000 hours (43,750 days = 120 years), the battery switches off at 18.9 volts.

Empty battery with TCU

Capacity between 22V and 18.9V: approx. 400 mAh (with 10 cells)

Electronics idle current:	100 mA
Battery electronics:	5 mA
TCU electronics:	1 mA
Total:	approx. 106 mA

After approx. 4 hours the battery switches off at 18.9 volts.

Empty battery without TCU

Capacity between 22V and 18.9V: approx. 400 mAh (with 10 cells)

The battery switches to deep sleep mode.

Idle current of battery electronics:	0.010 mA
Self-discharge of battery (10 cells):	0.010 mA
Total:	0.02 mA

After approx. 20,000 hours = 833 days = 2.3 years, the battery switches off at 18.9 volts.

Deep sleep mode

Battery switches off at:	18.9V
Battery can no longer be charged below:	17.5V

Capacity between 18.9V and 17.5V: approx. 100 mAh (10 cells)

Idle current of battery electronics:	0.010 mA
Self-discharge of battery (10 cells):	0.010 mA
Total:	0.02 mA

After approximately 5000 hours = 208 days = 0.6 years

Result: After six months, the discharged battery can no longer be recharged.

AH service group electrics

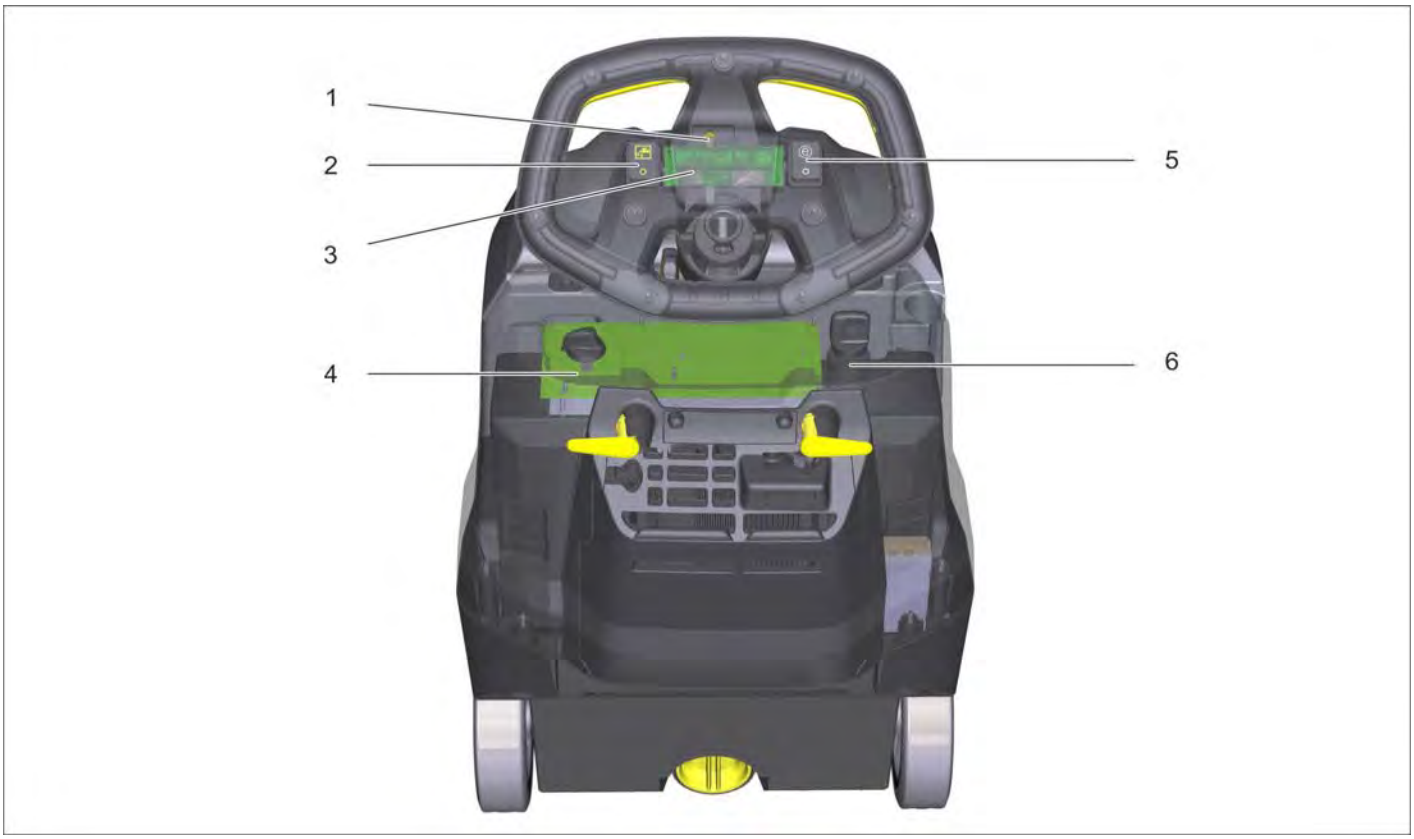
010 Safety information

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

⚠ DANGER
Mortal danger due to exploding Li-ion battery! Always uninstall the Li-ion battery and remove the connector plug prior to performing work on the appliance electronics. Observe the safety instructions for handling Li-ion batteries.

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

020 Overview



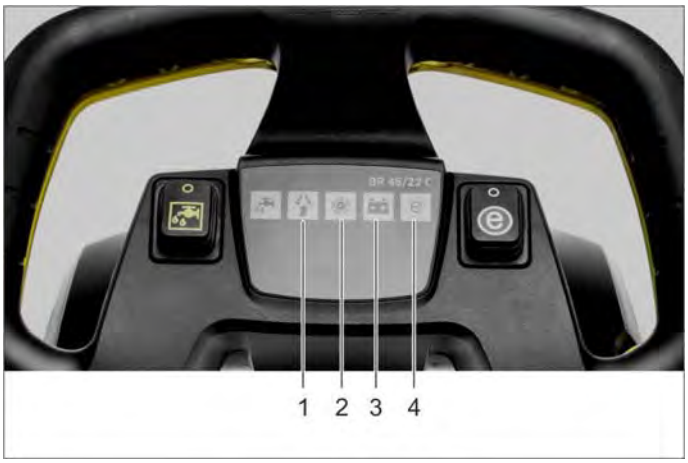
1	Safety button	S5	5	ECO function switch	S4
2	Water pump switch	S3	6	Key switch	S1
3	Steering wheel circuit board	A2			
4	Appliance electronics	A1			

030 Function

The appliance electronics controls all appliance functions.
Charger and Li-ion battery communicate via the appliance electronics.
The steering wheel control panel is connected to the appliance electronics.
The indicator lamps and switches are accommodated in the steering wheel control panel.
The key switch is also the main switch and bolted down in the upper part of the casing.
The safety switch is installed in the steering wheel and is operated via the safety lever

Operating hour counter

Operating hours and minutes are displayed via a blink code. The run time of the brush motor counts as operating time.
The operating hours counter is activated by turning the key-operated switch to "Off". Before 10 seconds have passed, the operating lever then needs to be pressed 3 times in quick succession (within 5 seconds). The operating hours will then be displayed on the steering wheel via the LED blink code.



1 LED green (100 hours)
2 LED green (10 hours)
LED red (10 minutes)
3 LED green (1 hour)
LED red (1 minute)
4 Counter

Example:
LED 1 lights up green and LED 4 flashes 4 times = 400 hours
LED 2 lights up green and LED 4 flashes 2 times = 20 hours
LED 3 lights up green and LED 4 flashes 5 times = 5 hours
LED 2 lights up red and LED 4 flashes 3 times = 30 min.
LED 3 lights up red and LED 4 flashes 6 times = 6 min.

Total = 425 hours 36 min. of operating time

Battery and service indicator

1 LED lights up green: Brush motor operating state

If the brush motor is not running, the suction turbine and water pump will also not be activated.
No load test takes place however i.e. the motor can also be unclamped.

1 LED flashes orange: Brush motor overcurrent

Switch off will follow.

1 LED lights up green: Suction turbine operating state

The suction turbine only starts up if the brush motor is running.
No load test takes place.
The suction turbine continues to run for 5 seconds after being switched off.

1 LED flashes orange: Suction turbine overcurrent

Switch off will follow.

1 LED lights up green: Battery fully charged
Bat > 21.6V (± 0.1V)

1 LED flashes orange: Battery partially discharged
Bat ≥ 19.80V and ≤ 21.60V (± 0.1V)

1 LED lights up red: Battery empty
Bat < 20.00V (± 0.1V)

Brush motor and turbine are switched off. The red LED switches off after 30 seconds too.
After a short-circuit of the battery poles, a reset will take place after 30 seconds. This is repeated a maximum of 3 times. After the fourth short-circuit, either brief interim recharging needs to be performed or deep sleep mode can be awaited (deep sleep mode is activated 30 minutes after "Key to off".

1 LED lights up green: Water pump on

The water pump only switches on if the brush motor is running.
No load test takes place.

1 LED lights up/flashes blue

LED lights up blue: ECO mode on (brush + motor with 70% power, water quantity remains unchanged)

LED flashes blue: One of the two batteries is not supplying sufficient current for Power mode. The device then switches to ECO mode.

Controls

Partial load operation
The control informs the user about partial load operation by automatic selection of Reduced Power mode using the ECO mode LED.
Forced ECO mode = reduced power mode
If the total current requirement is < 30 A the power supply is also provided for Power mode via a single battery.

Monitoring
The device control system monitors both batteries by making constant current measurements. If the discharge current per battery exceeds a value of I > 20 A individual current (+/- 0.5A) per battery, the device will switch to Reduced Power mode.

As soon as the batteries have reached their end point voltage and therefore need to be charged, the user will be informed of this. Loads are switched off. Batteries that exceed 21V are switched off. On discharge, the maximum discharge current (short-term) is limited to 39A at 25°C and to 25A at 40°C per battery.

The charging operation is transmitted to the unit control via the immobilizer signal line. The travel and cleaning functions are then blocked.
During partial load operation, the control system can enable charging of just one battery and block the other battery. Charging is only enabled for the battery if charging is enabled for both batteries.

The "Immobilizer" signal is drawn from the charger to GND if the immobilizer is active.
Charging enable comes from the battery. This input drawn to GND in order to enable the battery.

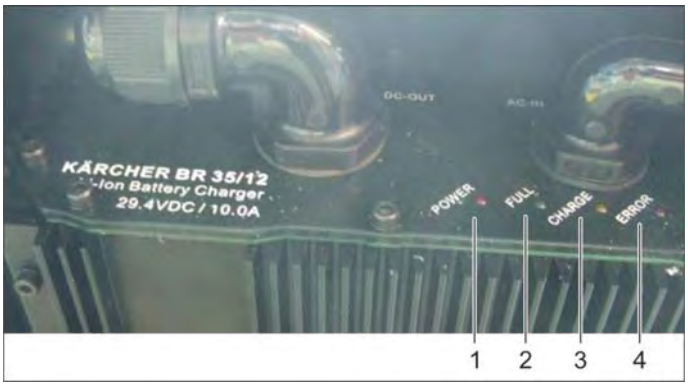
The short-circuit strength of the power outputs is provided via the short-circuit resistant battery. Electronic, reversible excess current switch-off for all signal and LED outputs

The main board is always active until the battery switches off. X15 forwards a voltage signal to the TCU if the main switch = ON.

Temperature monitoring power modules
Temperature monitoring is implemented for the power modules.

Charging of the battery

The charging unit wakes the battery with at least 29.4V. The batteries are woken via the charger's power output via X3.



1 Power (red)
2 Full (green)
3 Charge (yellow)
4 Error (red)

Situation	red	green	yellow	red	Comment
No load				blinking	Following 10 wake-up attempts, the process is cancelled
Charging process			blinking		– Charging process starts -> yellow LED flashes, 10A – as of battery voltage 28.8V -> yellow LED constant, charging current 10A – as of battery voltage 29.3V -> green LED constant, charging current 0A – from battery voltage 29.4V -> green LED constant, charging current 0A, charging finished
Charger and battery reverse-poled				blinking	Following 10 wake-up attempts, the process is cancelled.
Wake-up attempt		blinking	blinking		Alternating green/yellow flashing
Charging cable short circuit				blinking	Following 10 wake-up attempts, the process is cancelled.
Power cord connected	lights up				
Charging finished		lights up			

Both batteries are woken simultaneously by the power-on switch.
The charging state of the batteries is evaluated constantly by measuring the individual currents. The batteries can therefore be switched in parallel or disable one another. This precludes any mutual charging.

The charging operation is transmitted to the unit control via the immobilizer signal line.

The travel and cleaning functions are blocked during charging. In partial load operation, the control system can enable charging of just one battery and block the other battery.

Charging will only be enabled for the battery if charging is enabled for both batteries via X2/Charging Enable.

Discharging

Partial load operation is indicated to the user by automatic selection of Reduced Power mode via the ECO mode LED. The unit control monitors both batteries by means of constant current measurements. When the discharge current exceeds a defined value per battery, the device switches to Reduced Power mode.

– Switchover criterion: I >= 20A individual current per battery, tolerance +/- 0.5A
  As soon as the batteries have reached their end point voltage and therefore need to be charged, the loads are switched off.
– The end point voltage is configurable.
  During discharge, the maximum (discharge) current is limited for each battery. In case of a fault, the device switches to reduced power mode.
– Total current consumption: 39A at 25°C; 25A at 40°C

This prevents mutual charging of the two rechargeable batteries. Both batteries are switched in parallel with the same power components.
On starting the device, the power take-up of both batteries is blocked. The unit control decides in which circumstances the two batteries may be interconnected based on a one-off voltage measurement.

Collaboration of batteries

The control system informs the Service Technician via an LED (on the circuit board) about from which of the two batteries current is no longer flowing.
If Reduced Power mode is active:
LED D29 on if no current can be detected from battery 1.
LED D29 off if no current can be detected from battery 2.
During longer downtimes without any active use of the batteries (deep sleep mode), the batteries may drift apart. In such cases the machine can start in Reduced Power mode directly providing the charging states are different. E.g. in case of idle times > 4 weeks. This is a guideline value. The time span is not monitored by the unit however since time recording is not possible.

Two Li-ions batteries are used. Both batteries are self-sufficient i.e. the unit can also be operated with just one battery.

– The constant voltage and current measurements of the batteries form the basis for parallel operation. The 2 Li-ion batteries are switched in parallel due to the required run time.
– The batteries are switched in parallel via MOSFETS

Work programmes

Power-Mode
If the Eco switch is not opened and Reduced Power mode is not active: Brush motor [max. current] and suction turbine [max. current] and stage 1 of water quantity turn switch.

– Brush switches on when pressing the dead-man switch.
– Water pump switches on if brush is on and water switch is on.
– Turbine switches on if brush is on and end switch suction bar is down.
– After "Brush off", the suction turbine continues to run for approx. 5s.
– Water quantity adjustment via infinitely variable potentiometer and evaluation of potentiometer voltage.

ECO-Mode
In ECO mode, brush motor and suction turbine are limited to a definable value. The water quantity (preselection by turn switch) is limited to a value range that can be defined. If ECO mode has been selected, the ECO mode LED lights up blue. During error mode (Reduced power mode), the ECO mode LED flashes blue and enters an error message into the error memory.

– Brush switches on when pressing the dead-man switch.
– Water pump switches on if brush is on and water switch is on.
– Turbine switches on if brush is on and end switch suction bar is down.
– After "Brush off", the suction turbine continues to run for approx. 5s.

Deep-Sleep-Mode
The key-operated switch is set to OFF and the machine is then supplied with power for 30 min. Thereafter access to the machine via an external interface is no longer possible as the batteries are in deep sleep mode. The batteries need to be woken again explicitly via the key-operated switch. Deep sleep mode is realised via the battery's internal BMS. The battery can be woken from deep sleep mode via the "key-operated switch ON signal" or by applying the charger 's wake-up voltage (U> = 29.0V).

Reduce-Power-Mode
In Reduced power mode, the control changes if impermissible individual currents are detected for each battery based on the current measurements. In this case the total current consumption needs to be reduced like in ECO mode.
Total current consumption < 15A, tolerance +/- 0.5A

Settings and indicators

Metering of water quantity:
Metering of water quantities can be adjusted via four stages by means of a turn switch. Depending on the operating mode switch, two different stage ranges are used.

ECO-Mode
0 - 1.5 litres/minute
"infinitely adjustable", non-linear
1st stage: Power max. = Eco max. = 1.5 l/min
2nd stage: 0.9 l/min
3rd stage: 0.7 l/min
stage: Power min. = Eco min. = 0.5 l/min
Configurable values

Power-Mode
0 - 1.5 litres/minute
"infinitely adjustable", linear
1st stage: Power max. = 1.5 l/min
2nd stage: 1.2 l/min
3rd stage: 0.8 l/min
4th stage: Power min. = 0.5 l/min
This is realised via soft-PWM with 50 Hz via Profet output

Both normal mode and error mode are indicated to the user via a dual LED. In error mode, the water pump status LED flashes orange and an error message is entered in the error memory. In normal mode, the water status LED lights up green constantly.

The water pump is activated with 50 Hz rectangular voltage (magnetic piston pump).
Maximum continuous output 40W.

Brush speed
The brush speed also controls the travel speed. The brush allows two different speeds depending on the operating mode switch. Both normal mode and error mode are indicated to the user via a dual LED. In error mode, the brush status LED flashes orange and an error message is entered in the error memory. In normal mode, the brush status LED is illuminated green.
The LED lights up green in the operating mode if there is no error. This is regardless of whether the brush is on or off. The suction turbine and the brush motor are actuated via a PWM.

- Maximum continuous power 240W, maximum current 13A
- Type: Rotomag
- On switching on the machine, the brush motor is activated via a soft start phase.

Suction turbine
The suction turbine supports two different speeds depending on the operating mode switch. Both normal mode and error mode are indicated to the user via a dual LED. In error mode, the suction turbine status LED flashes orange and an error message is entered in the error memory. In normal mode, the suction turbine LED is illuminated green.
Maximum continuous output 300W, 12A, Domel.
On switching on the machine, the suction turbine is activated via a soft start phase.

Software update
LED display during the active software update:
All five LEDs (water, turbine, brush, battery, ECO) are activated in turn in running direction (to the right) as follows:

- The corresponding LED flashes three times and then lights up constantly.
- Water, turbine, brush and battery LED light up/flash green
- ECO mode LED lights up/flashes blue
- As soon as the ECO mode LED lights up blue, the procedure starts again.

LED display on successful software update:
When the software has been updated successfully, the water, turbine, brush and battery LEDs light up simultaneously and the ECO mode LED lights up blue. The machine then performs a reset automatically and is in standby mode again.

The user is then informed about whether the unit control is in the bootloader or in the application. This is indicated via an LED (D24) on the circuit board:

- Bootloader flashing sequence: 2.0Hz
- Application flashing sequence: 1.0Hz

The software update can only be performed if the machine is switched on via the turn switch. Remote update via TCU is not possible.

Error case:
LED display in bootloader mode:
In bootloader (error case) the water, turbine, brush and battery LEDs light up red simultaneously.

Diagnostics or fleet interface

The following parameters can be read/edited via an external interface:

- Material and serial number of machine
- Cumulative operating hours
- Daily cleaning time (brush signal)
- Condition of machine (functioning/defective)
- Error memory
- Status whether battery is currently being charged including time
- Current charging state of battery in 10% increments, depending on remaining capacity
- Current unit operating mode
- Separate operating hours for water pump, turbine and brush
- Device parameters
- Switch-on and switch-off signals of device
- Hardware and software version

Test-Mode

The unit control is equipped with a test mode in which all engines are switched on or off via an external interface so their functionalities can be checked. The following components constitute part of test mode:

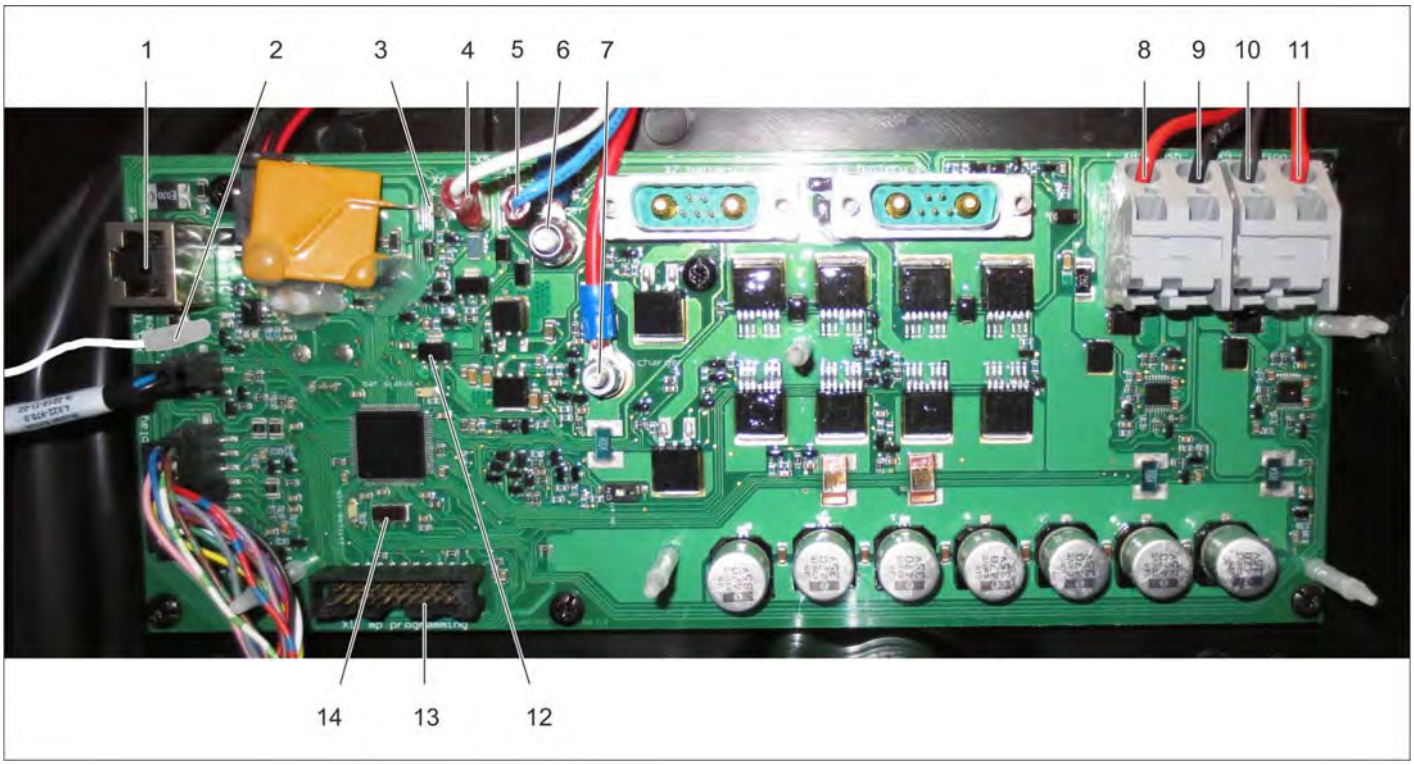
- Brush
- Suction turbine
- Water pump
- LEDs on steering wheel

To finish test mode, the unit needs to be restarted.

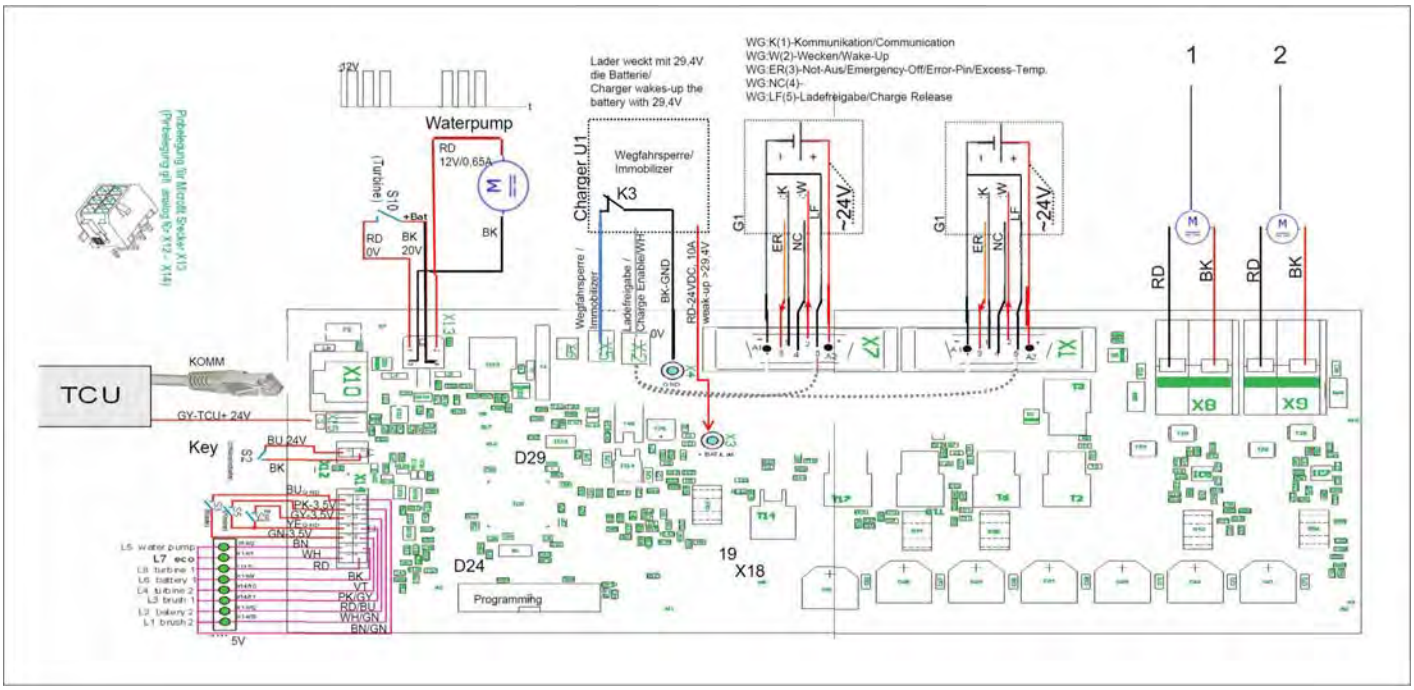
Operating states

Operating status	Terminal voltage present A1, A2	Charge enable status X2 Charge Enable	Status Error, Pin Sub-D, Pin 3	How can the battery be reactivated?		Battery is disabled after X occurrences	Message via Comm interface readable
				Wake-up line Sub-D, Pin 2	Initial charging required M4:X3 + M5:X4 -		
Active operating state	Yes	Yes	No	-	-	-	Yes
Deep-Sleep	No	No	No	Yes	No	-	No
Overtemperature and low temperature shutdown	No	No	Yes	-	-	1	Yes
Overcurrent shutdown stage 1 (charging)	No	No	Yes	-	No (Discharge)	3	Yes
Overcurrent shutdown stage 1 (discharging)	No	Yes	Yes	-	Yes	3	Yes
Overcurrent shutdown stage 2 (short-circuit)	No	Yes	Yes	-	Yes	3	Yes
Low voltage shutdown (single cell monitoring)	No	Yes	Yes	-	Yes	1	Yes
Overvoltage shutdown (single cell monitoring)	Yes	No	Yes	-	No (Discharge)	1	Yes
Charge mode	Yes	Yes	No	-	-	-	Yes

Overview of circuit board



1 Communication port
2 TCU +
3 X6
4 X5
5 X2
6 Charge controller -
7 Charge controller +
8 Brush motor +
9 Brush motor -
10 Suction turbine +
11 Suction turbine -
12 D29
13 Programming plug
14 D24



1 Brush motor
2 Suction turbine

Connectiing piece	Component	
X8	Brush motor	M1
X9	Suction turbine	M2
X13	Water pump	M3
X7	Battery 1	G1

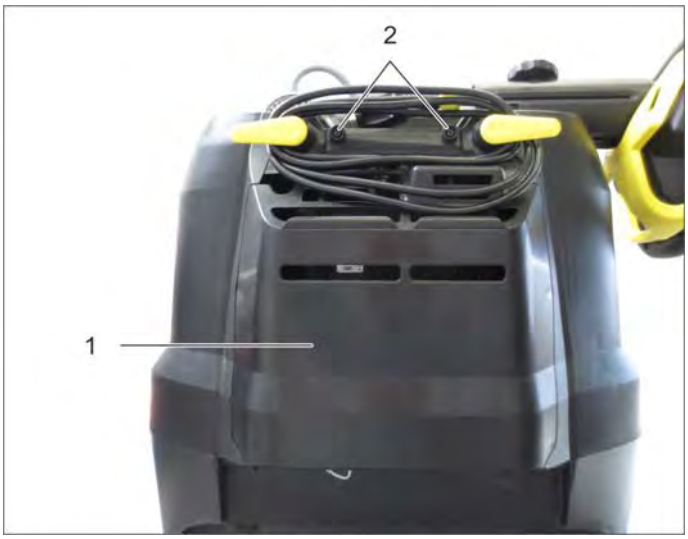
Connectiing piece	Component	
X1	Battery 2	G2
X12	Key switch	S2
X13	SB microswitch	S10
X2	Pump switch	S5
X2	ECO switch	S4

Connectiing piece	Component	
X2	Dead man's switch	S3
X10	TCU	
	Charger	U1
X18	DIP switch	

040 Service activities

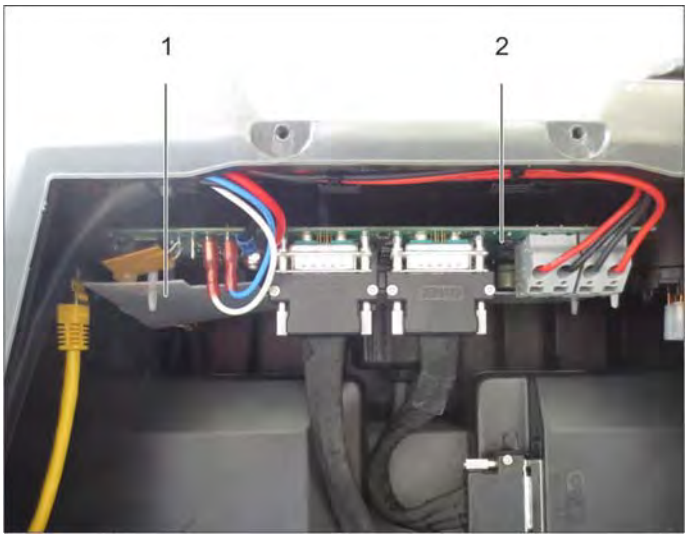
Note
Unless otherwise described, the installation takes place in reverse order.

AHGE Remove / install appliance electronics



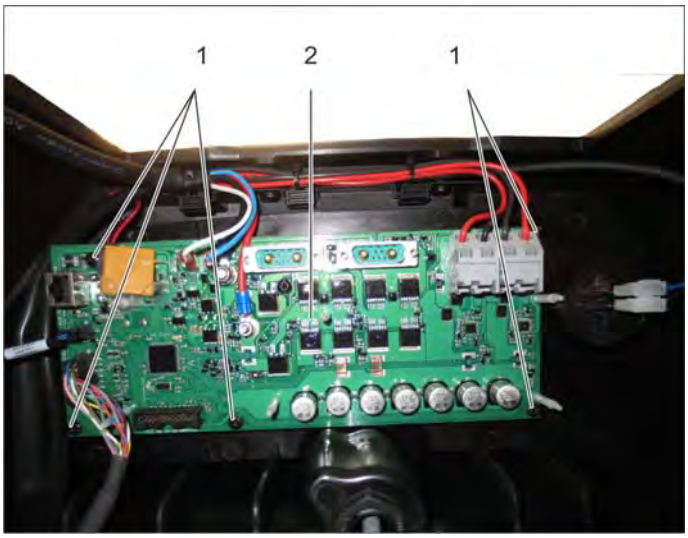
1 Charger carrier
2 Screws

➔ Unscrew the screws.
➔ Tilt the charger base backwards.



1 Cover
2 Appliance electron- ics A1

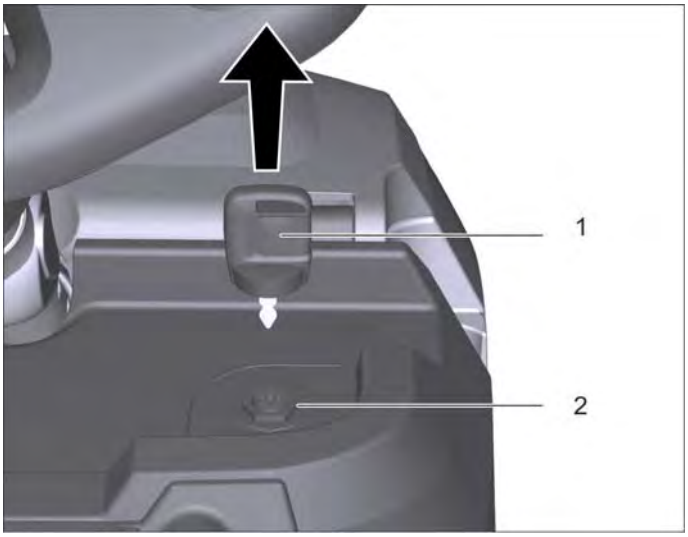
➔ Remove cover.
➔ Disconnect all electrical connections.



1 Screws
2 Appliance electronics A1

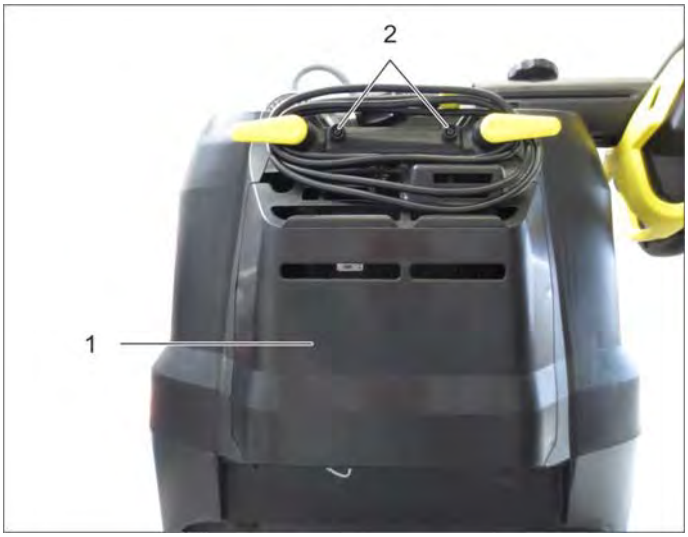
➔ Unscrew the screws.
➔ Remove the appliance electronics.

AHSL Uninstalling/ installing key switch



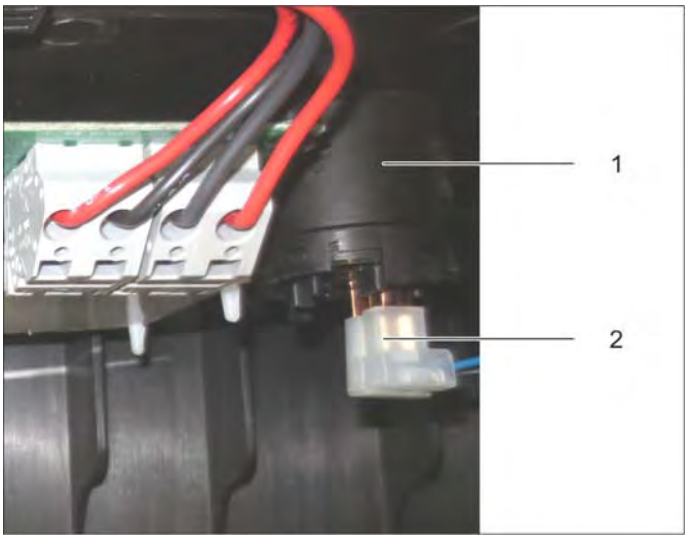
1 Key
2 Nut

➔ Remove the key.
➔ Unscrew the nut.



1 Charger carrier
2 Screws

➔ Unscrew the screws.
➔ Tilt the charger base backwards.

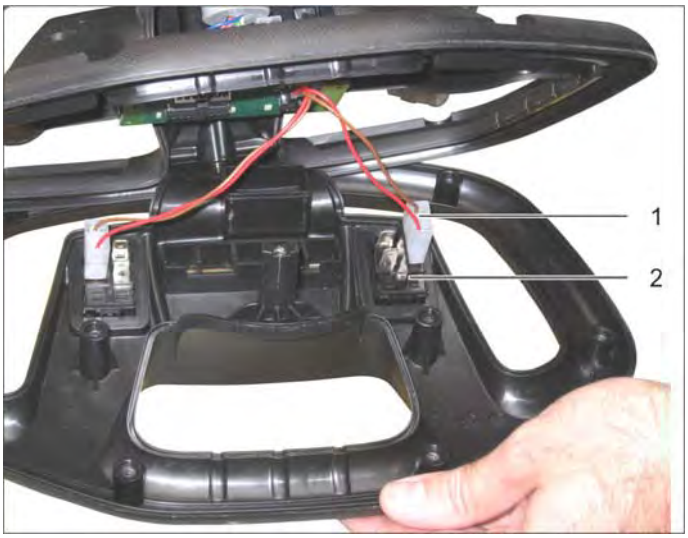


1 Key switch S1
2 Electric socket plug connections X12 1/2

➔ Separate the electric connectors.
➔ Remove key switch.

AHES Uninstalling/ installing switch of the ECO function

■ *AOLN Separating the steering wheel shells*

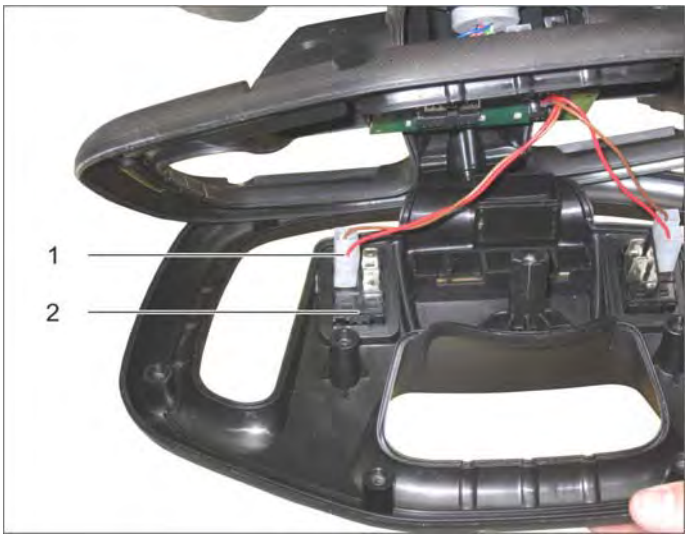


1 Electric socket plug connections
2 ECO function switch S4

➔ Separate the electric connectors.
➔ Remove ECO function switch.

AHSW Uninstalling/installing switch of the water pump

■ *AOLN Separating the steering wheel shells*

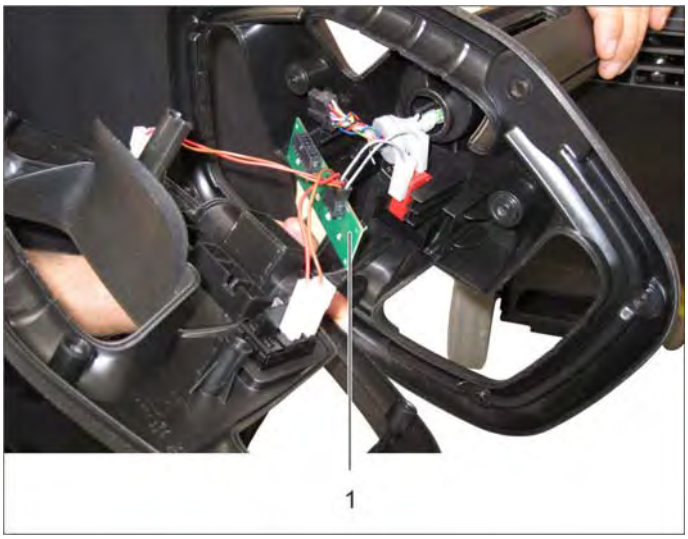


1 Electric socket plug connections
2 Water pump switch S3

➔ Separate the electric connectors.
➔ Remove the water pump switch.

AHGH Removing/installing the steering wheel circuit board

■ *AOLN Separating the steering wheel shells*

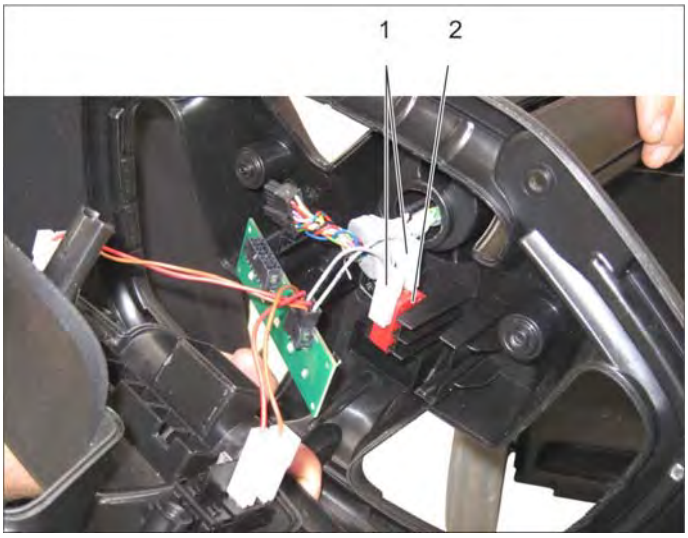


1	Steering wheel circuit board	A2

➔ Disconnect all electrical connections.
➔ Remove the steering wheel circuit board.

AHSS Uninstalling/ installing safety switch

■ *AOLN Separating the steering wheel shells*



1	Electric socket plug connections	
2	Safety button	S5

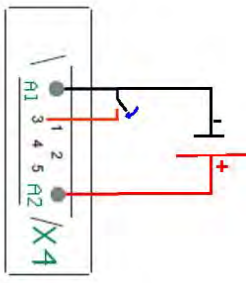
➔ Separate the electric connectors.
➔ Remove safety switch.

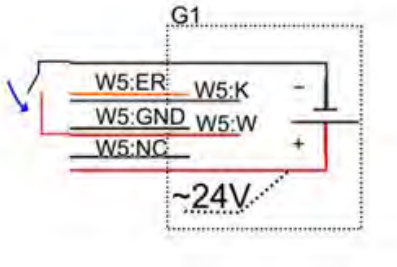
050 Maintenance and inspection

Service group does not contain any maintenance and inspection points.

060 Error diagnosis

Findings	Possible cause	Correction
All indicator lamps are on	Fault in the appliance electronics	Check/ replace appliance electronics.
No function	Appliance electronics defective	Check/ replace appliance electronics.
No operation possible	Fault in the appliance electronics	Check/ replace appliance electronics.
Key broken off	Mechanical impact	Replace key switch, instruct operator
No function of the key switch	Water in the key switch	Replace key switch, check cover, instruct operator
	Defective switch	Replace key switch
	Electrical connection	Check the connector.
No Eco function	Defective switch	Replace the switch
No fresh water function	Defective switch	Replace the switch
Appliance cannot be switched on	Safety switch defective	Check / replace safety switch.

Signal point	Test parameter 1	Test parameter 2
D24	If D24 flashes (2Hz), bootloader is active. If D24 flashes (1Hz), the application is running	D29 function test: Unplug G1 or G2 and check D29.
D29	If D29 is on, battery 1 (G1) has no current (removal not possible). If D29 flashes, battery 2 (G2) has no current (removal not possible). If D29 is off, both batteries (G1 + G2) supply current	
S2	Open -> 24V to Pin 1	
S3	Open -> 3.5V to Pin 5	Closed -> 0V
S4	Open -> 3.5V to Pin 3	Closed -> 0V
S5	Open -> 3.5V to Pin 2	Closed -> 0V
M3	Pulse signal approx. 8.5V	Variable pulse frequency
M2	Open -> +24VDC (Power mode)	
M1	Open -> +24VDC (Power mode)	
Emergency off signal of G1 or G2 to A1	G1 or G2 switches off board A1 with the emergency off signal. Simulation of emergency off signal: 1 Remove the Sub-D from X1 2 Apply external voltage supply (24VDC) at X1:A1 (-) and X1:A2 (+). 3 Bridge between X1:A1 and X1:3 4 If bridge (X1:A1 and X1:3) is closed; (D24 flashes and all other LEDs are off). The same for WX7, X7 and G2	1 If (emergency off signal on); (D24 flashes and all other LEDs are off) 2 If (WX1 - X1) is open; If (no emergency off signal); then (0V between WX1:ER and G1:-) 3 Test arrangement for simulation of emergency off signal  If a battery transmits an emergency off signal, the other battery is normally still active.

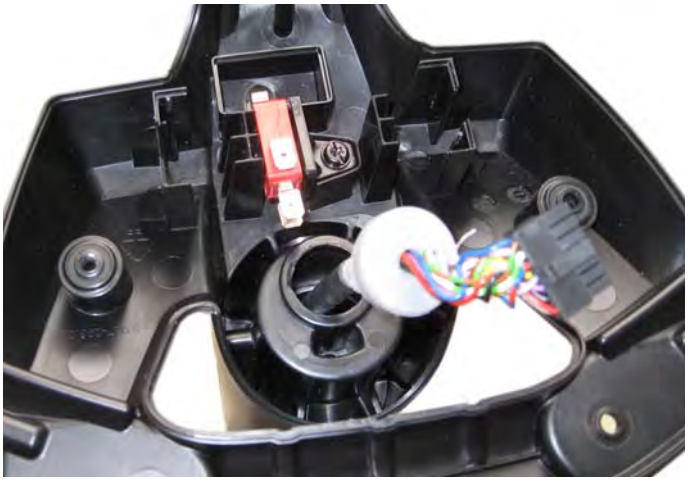
Signal point	Test parameter 1	Test parameter 2
Wake signal from A1 to G1 or G2	Signal path A1 - WX1:W - G1 Test procedure: 1 Key-operated switch S2 on 2 Remove cable WX1 from X1 3 Measure the voltage between G1:+ and G1:- (setpoint 24VDC) 4 If (voltage between G1:+ and G1:- = 0V), then ("Wake" failed) 5 If ("Wake" has failed), then ("Wake G1 manually") 6 If ("Wake G1 manually" failed), then (G1 defective), otherwise (search for fault on A1). The same for WX7, X7 and G2. the wake signal must be at least 29.4V.	"Wake G1 manually": Bridge between G1:- and WX1:W. If ("Wake G1 manually" successful), then (24V between G1:- and G1:+), otherwise (0V between G1:- and G1:+) 
Overtemperature display	Signal path G1 - WX1:NC - X1:5 -X5 - U1 The same via WX7, X7 and G2.	If (WX1 - X4) open: If (temperature of battery < 0°C or > 45°C), then (>2.4V (max. 7V) between G1:- and WX1:NC), otherwise (0.2V between G1:- and WX1:NC)
Immobilizer from U1 to A1	Signal path X5 - U1 - X4	If (K3 closed), then (U1 on) and (D24 flashes) and (LEDs display goes out)
Communication	W5:K is not used	
Ground	W5 GND is not used	
K3	Test procedure to distinguish emergency off error: 1 Remove white cable from X2. Switch key-operated switch off and on again 2 If (D24 continues to flash and all other LEDs remain off), then (emergency off signal is faulty and G1 or A1 defective), otherwise (K3 defective)	If (K3 defective), then (D24 flashes and all other LEDs are on)
X18 dip switch	If "On" then Deep sleep not possible. The battery will always carry voltage.	In "On" mode, the battery can discharge itself. Current consumption up to 0.4Ah. Prior to longer downtimes (>2 weeks) either activate "Deep sleep" (Dip switch = Off) or unplug both Sub-D plugs.
X2 Charge Enable	Charging is not possible if X2 of battery G1 or G2 is not drawn to ground.	Charging is not possible if charge enable (Pin 5 of battery) is not drawn to GND.
Reduce-Power-Mode	If discharge current per battery Gx > 20A (tolerance +/- 0.5A), A1 changes to reduced power mode (=forced ECO mode)	Power mode power supply provided via a battery. The unit control monitors both batteries by means of constant current measurements. If the discharge current per battery exceeds a specific value (I> 20A individual current per battery tolerance +/- 0.5A), the system switches to Reduced Power mode.
X6 is not required	For Delta-Q charger only	
discharge current	Maximum discharge current (short-term) per battery: 39A at 25°C and 25A at 40°C	

070 Peculiarities/ others

Connection cable WX14 is conducted through a cable gland to the steering column.
The connection cable runs through the steering column to the steering wheel control unit.
Observe during disassembly:

➔ Disconnect the cable on the appliance electronics.
➔ Loosen and uninstall the cable gland.
➔ Guide the plug through the opening as shown.

➔ Disassemble the articulated joint of the steering column.
➔ Loosen cable protection.
➔ Pull the cable out of the joint halves



➔ Pull the cable out of the appliance through the opening in the steering wheel

Operating conditions of batteries

- Batteries G1 and G2 can block the power output of circuit board A1 in case of malfunctions.
- The batteries can disable charger A1 in case of a malfunction via ER(3).
- Both batteries are always active and switched in parallel. This means both batteries always supply current simultaneously.
- The device can function with just one battery if the second battery is defective or empty.
- On charging, the battery that is charged more will be protected from reverse polarity. A short-circuit between A1 and A2 does not lead to a defective battery.
- 30 minutes after "Key off" battery G1 enters deep sleep mode.
- 30 seconds after a battery short-circuit, battery G1 performs a reset. This will happen for up to 3 battery short-circuits.
- After four battery short-circuits in succession, resets are no longer performed automatically. Either interim charging or activation of deep sleep mode with G1 is required for a reset. In Deep sleep mode, G1 deletes the entire memory.
- The battery can be woken up again by unplugging the Sub-D plug and plugging it back in again.

Battery charge state

The following states are indicated for the user via a dual LED:

UBat >= 22V	→	Battery full	→	LED lights up green
22V > UBat >= 21V	→	Battery partially discharged	→	LED flashes orange
UBat < 21V	→	Battery empty	→	LED lights up red

If a battery is switched off (end point voltage) partial discharge is automatically displayed, regardless of what the voltage of the battery that is still active is.
Both battery voltages are measured separately via a voltage divider with approx. 2% accuracy.
The current charge state can be queried via the interface for the battery.

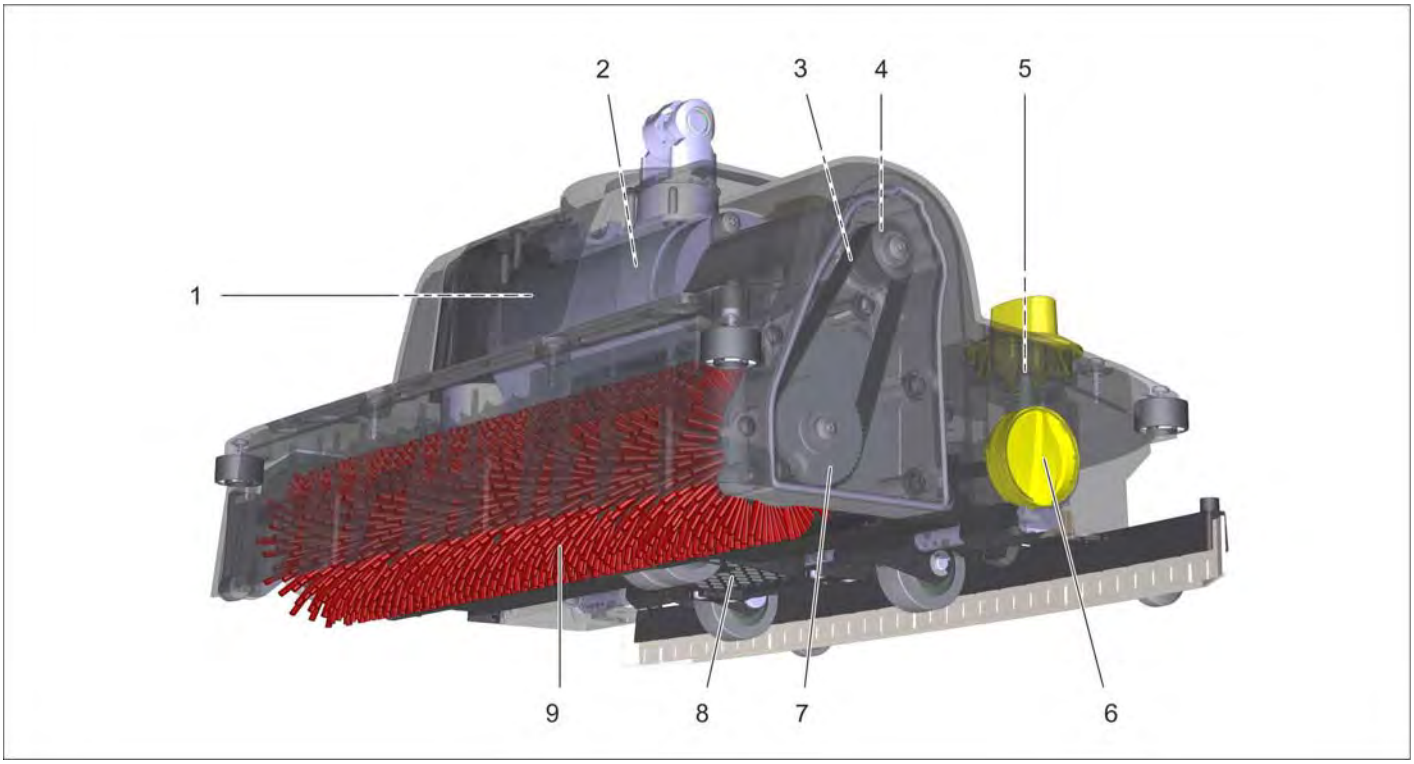
AJ service group cleaning head R

010 Safety information

For this service group there is no special safety information.

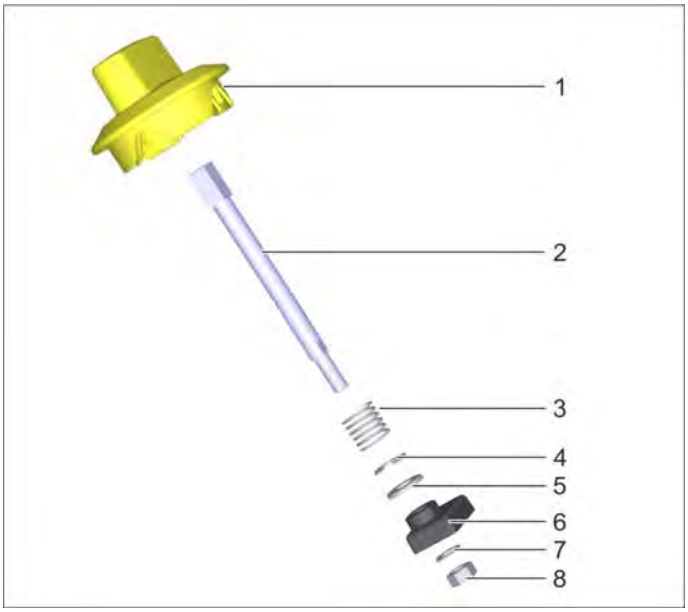
Observe general safety information!

020 Overview



1	Water channel		6	Transport rollers turn button
2	Brush motor	M1	7	Drive belt pulley
3	Drive belt		8	Transport rollers support
4	Drive motor belt pulley		9	Brush roller
5	Height adjustment cleaning head			

Cleaning head height adjustment



1	Rotary knob
2	Shaft
3	Spring
4	Safety disc
5	Disc
6	Sliding part
7	Disc
8	Nut

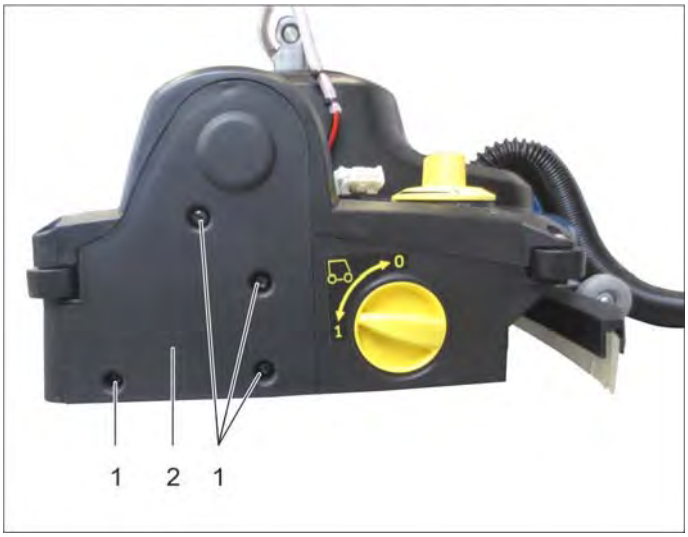
030 Function

The brush motor drives the brush roller via a belt drive.
The cleaning head is connected to the appliance via a central joint.
The supply cables are routed through the central joint.
The central joint transfers the steering movement to the cleaning head.
With this appliance the suction bar is attached to the cleaning head.
The height of the cleaning head can be adjusted via the running gear.

040 Service activities

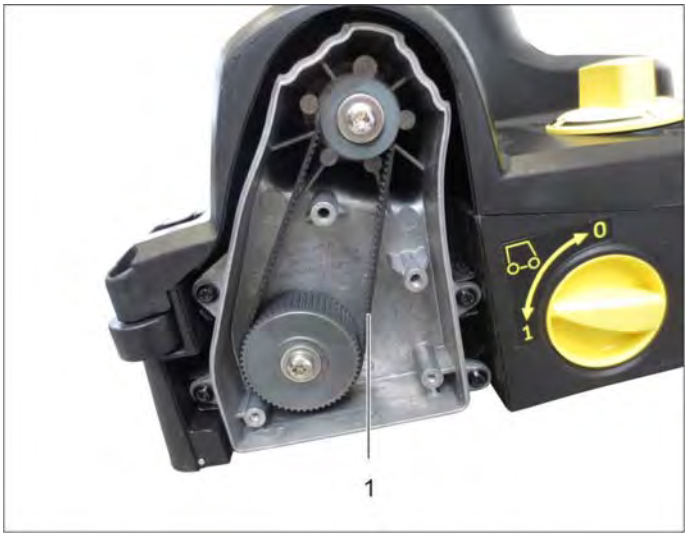
Note
Unless otherwise described, the installation takes place in reverse order.

AJZE Uninstalling/installing drive belt



1 Screws
2 Cover

➔ Unscrew the screws.
➔ Remove cover.



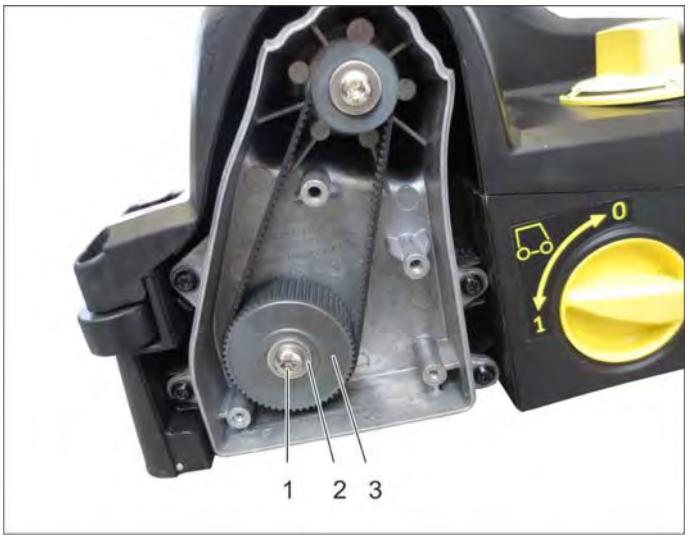
1 Drive belt

➔ Remove the drive belt.

Note
Do not use any sharp-edged tools.
Remove the drive wheel via the drive belt pulley.

AJNE Uninstalling/ installing pulley of the drive

■ *AJZE Uninstalling/installing drive belt*

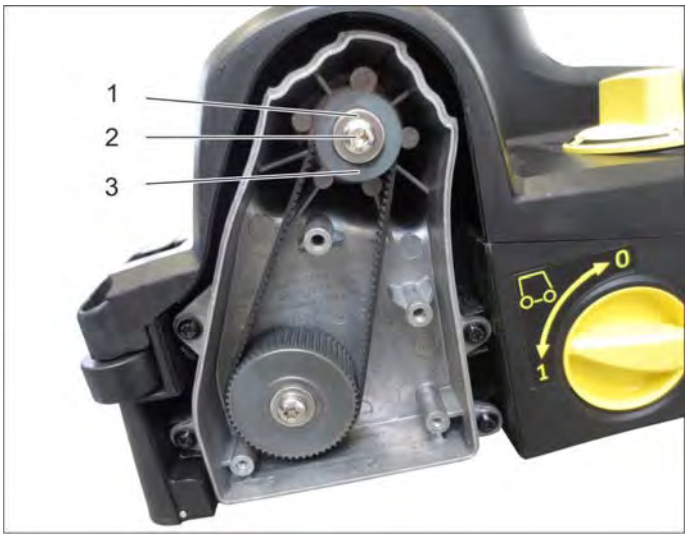


1 Screw
2 Disc
3 Drive motor belt pulley

➔ Unscrew the screw.
➔ Remove the disc.
➔ Remove pulley.

AJAR Uninstalling/ installing pulleys of the drive motor

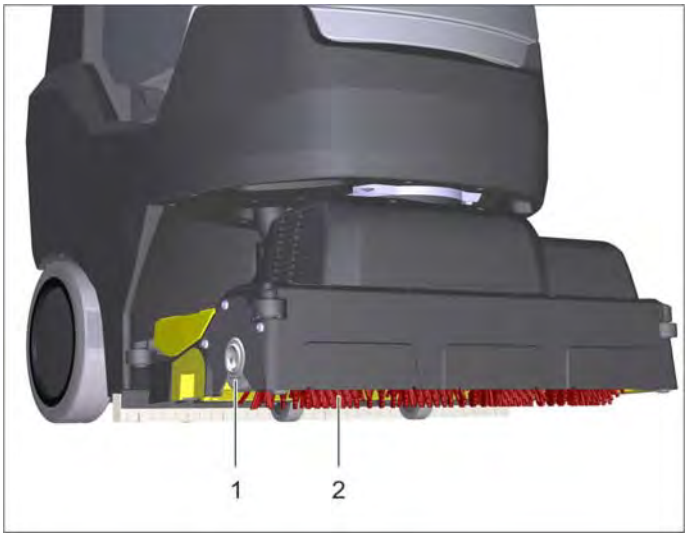
■ *AJZE Uninstalling/installing drive belt*



1 Disc
2 Screw
3 Drive belt pulley

➔ Unscrew the screw.
➔ Remove the disc.
➔ Remove pulley.

AJBB Uninstalling/ installing brush roller

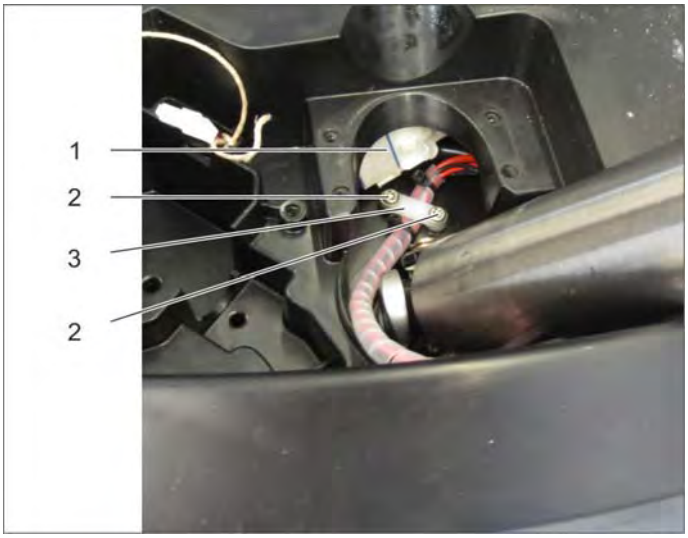


1 Roller brush unlocking button
2 Brush roller

➔ Push in the roller brush unlocking button.
➔ Remove the roller brush.

AJBW Uninstall/ install cleaning head

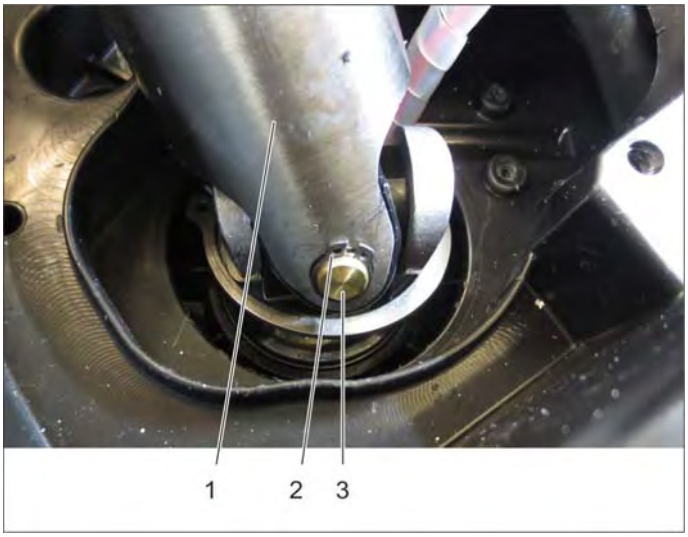
- *AFSW Uninstall / install waste water tank*
- *AOLA Uninstalling/ installing bearing shells of the steering*



1 Electric connectors
2 Screws
3 Cable clamp

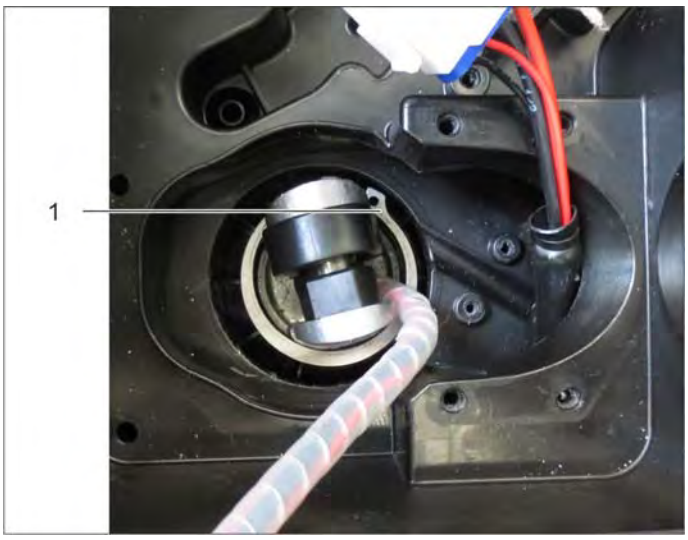
➔ Unscrew the screws.
➔ Remove the cable clamp.
➔ Separate the electric connectors.

Note
Mind correct installation of the lines.



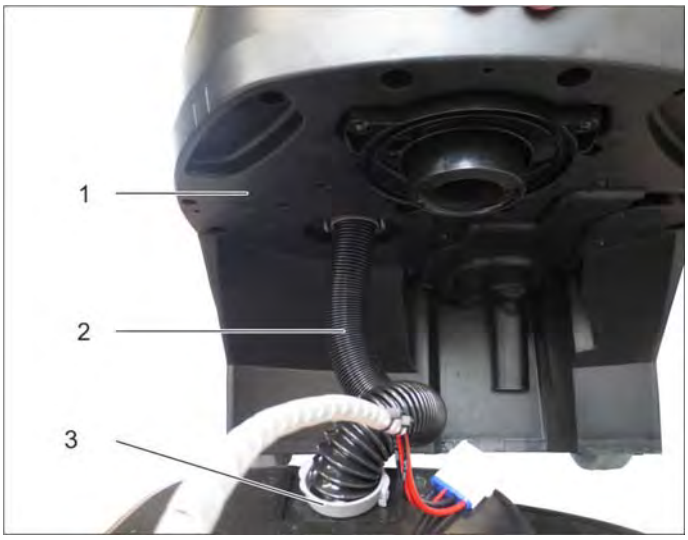
1 Steering column
2 Safety ring
3 Bolts

➔ Remove the safety ring.
➔ Pull out the bolt.
➔ Remove the steering column.



1 Safety ring

➔ Remove the retaining ring.

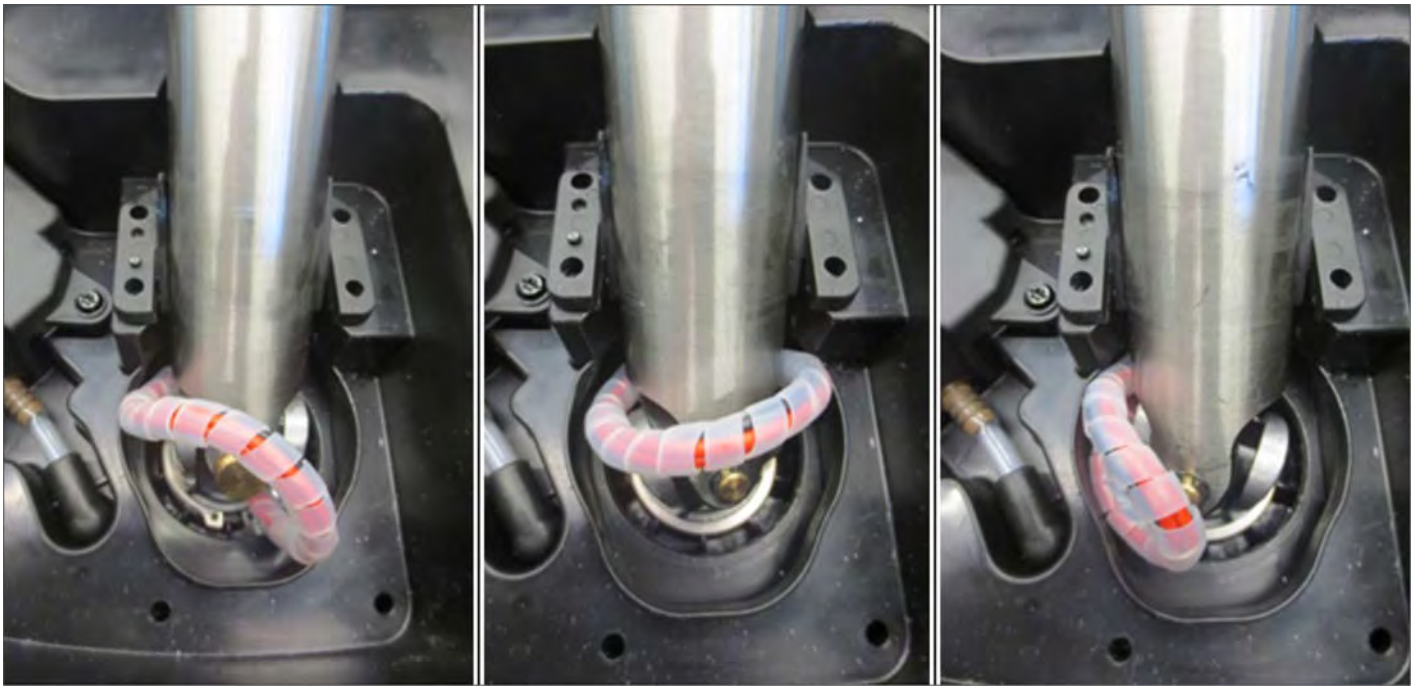


1 Device
2 Suction hose
3 Suction hose lock

➔ Lift the appliance.
➔ Detach the suction hose lock.
➔ Pull off the suction hose.

Installation note

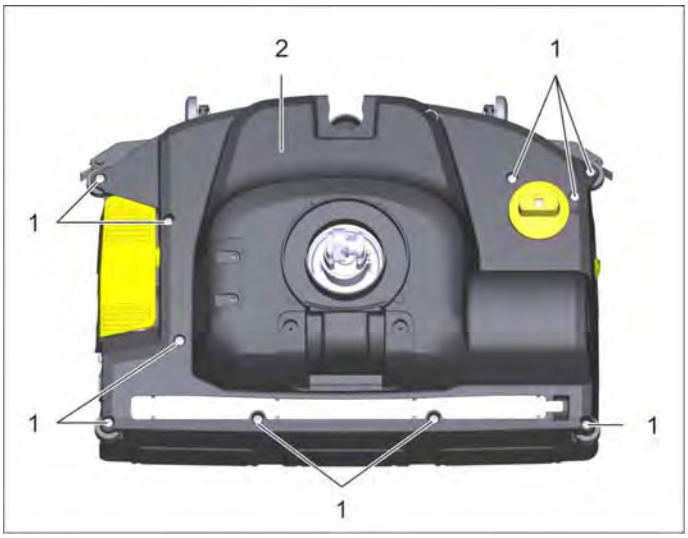
0° position | 190° left limit stop | 190° right limit stop



During installation make sure that the cable is not tensioned too much when guiding in the cleaning head.

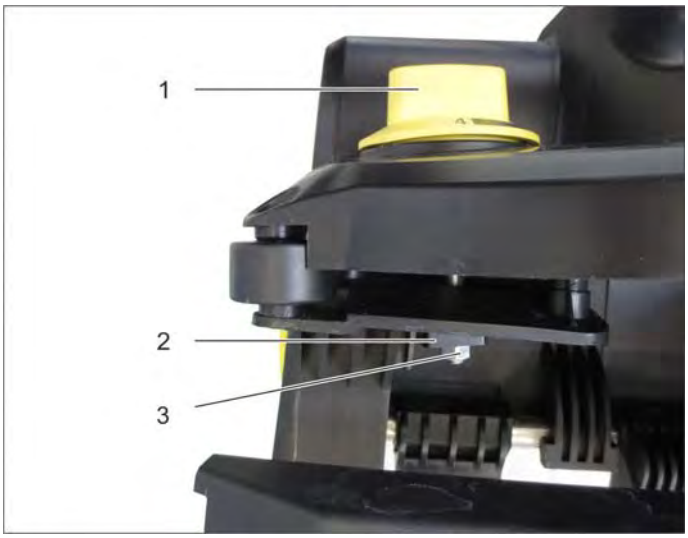
AJAA Removing/installing the cleaning head cover

■ *AJBW Uninstall/ install cleaning head*



1 Screws
2 Cover of cleaning head

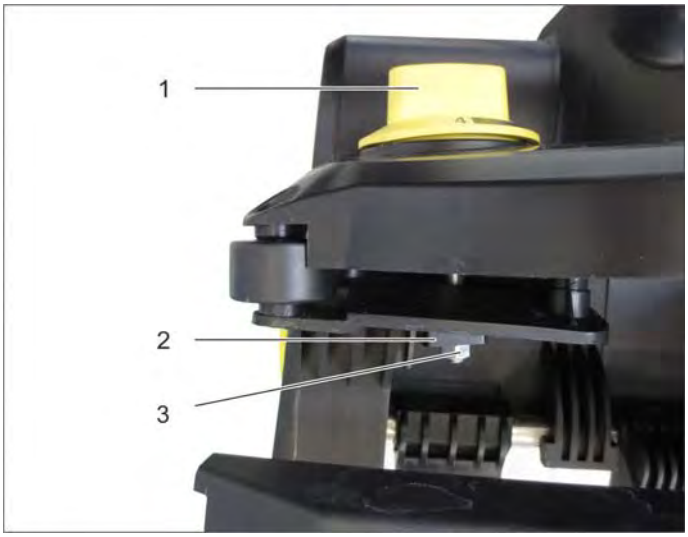
➔ Unscrew the screws.



1 Rotary knob
2 Sliding part
3 Nut

➔ Unscrew the nut.
➔ Detach the glide part.
➔ Remove the rotary button with shaft.
➔ Remove the cleaning head cover.

AJHR Uninstalling/ installing height adjustment of the cleaning head

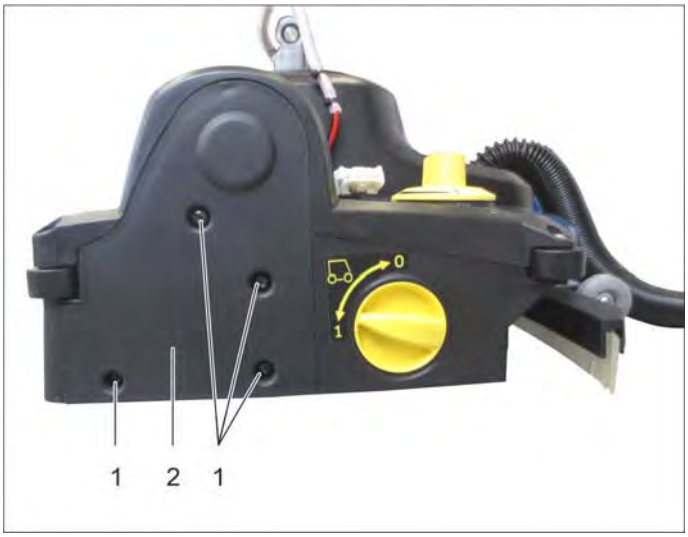


1 Rotary knob
2 Sliding part
3 Nut

➔ Unscrew the nut.
➔ Detach the glide part.
➔ Remove the rotary button with shaft.

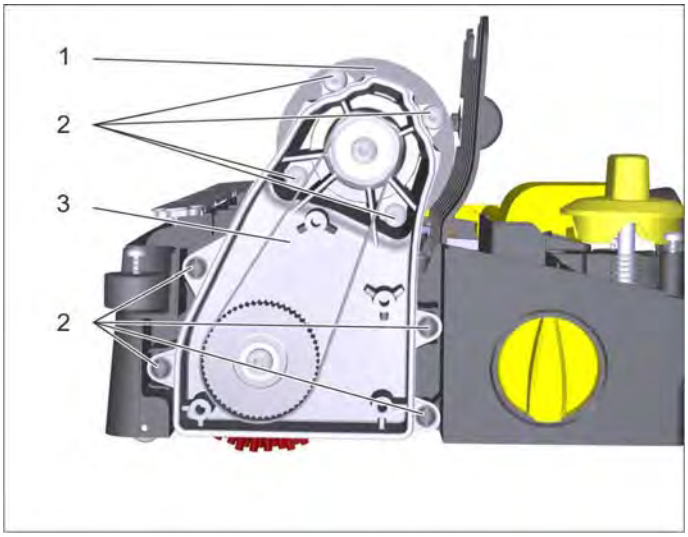
AJME Uninstalling/ installing brush motor

- *AJBB Uninstalling/ installing brush roller*
- *AJAA Removing/installing the cleaning head cover*



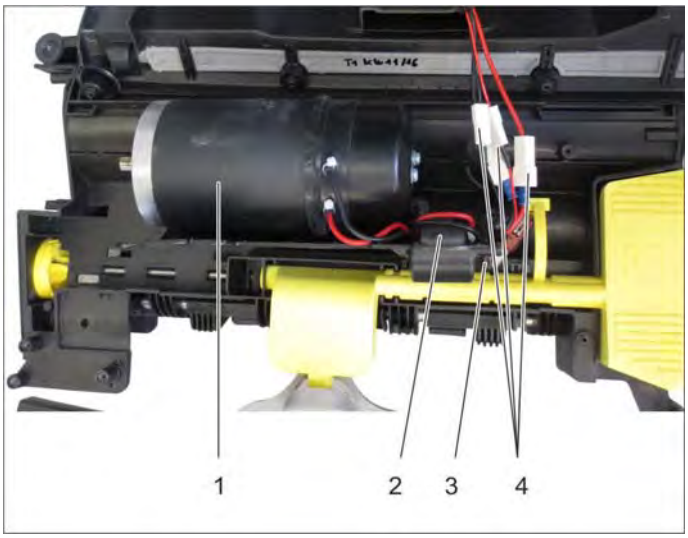
1 Screws
2 Cover

➔ Unscrew the screws.
➔ Remove cover.



1 Brush motor M1
2 Screws
3 Gear

➔ Unscrew the screws.
➔ Remove the gear.

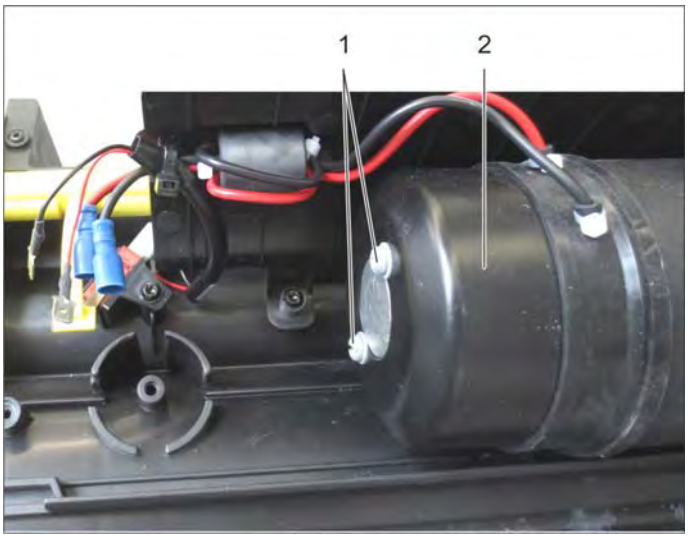


1 Brush motor M1
2 Ferrite core
3 Cable connector
4 Electric socket plug connections

➔ Separate the electric connectors.
➔ Remove the cable ties.
➔ Remove ferrite core.
➔ Remove the brush motor.

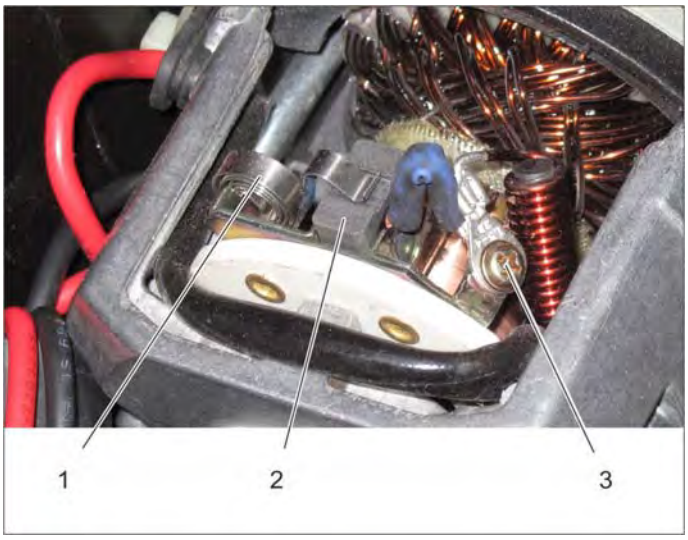
AJKE Uninstalling/ installing sliding contacts of brush motor

■ *AJME Uninstalling/ installing brush motor*



1 Protective cover screws
2 Protective cover

➔ Unscrew the screws of the protective cap.
➔ Remove the protective cap.

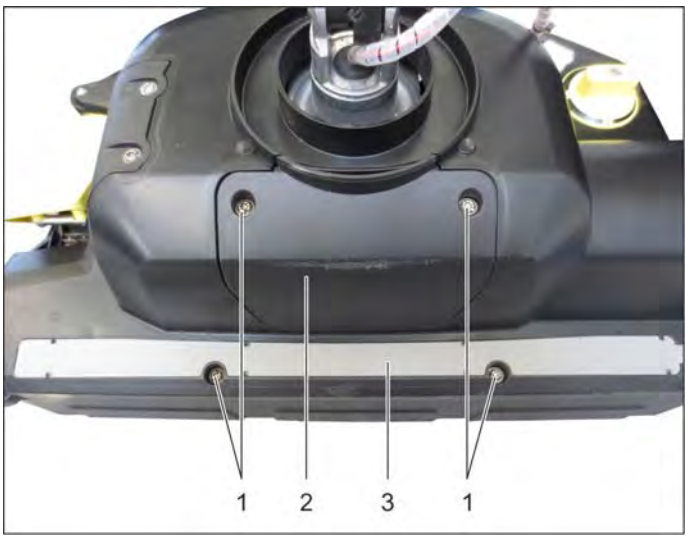


1 Press spring
2 Glide contact
3 Screw

➔ Unscrew the screw.
➔ Lift the contact springs off the sliding contact.
➔ Pull the sliding contact out of the duct.

Note
Always replace both glide contacts at once.
Check the collector for wear and contamination.

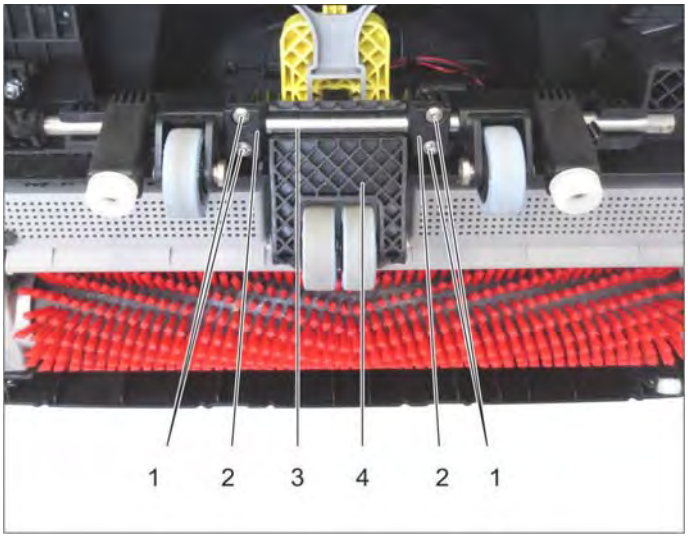
AJWF Cleaning the water guide



1 Screws
2 Water guide cover
3 Water distribution strip cover

➔ Unscrew the screws.
➔ Remove the water guide cover.
➔ Remove the water distribution strip cover.
➔ Clean the water guide and water distribution strip.

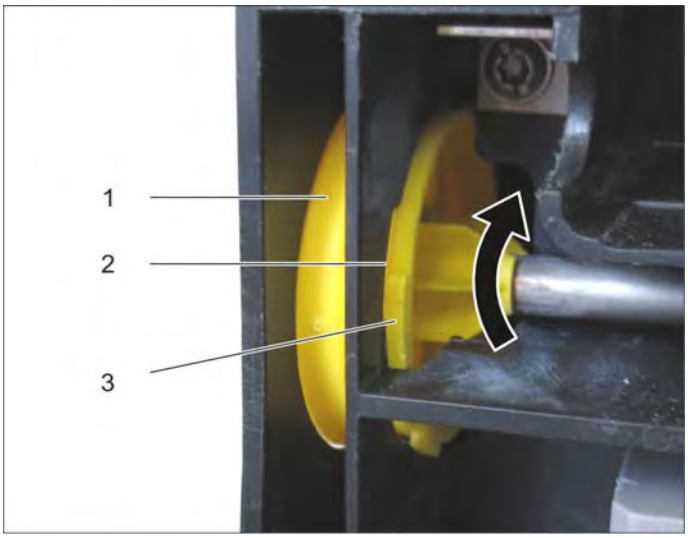
AJRU Removing/installing the transport rollers support



1 Screws
2 Support
3 Axle
4 Transport rollers support

➔ Unscrew the screws.
➔ Remove the holders.
➔ Remove axle.
➔ Clipping the transport rollers support from the axle.

AJRV Removing/installing transport rollers turn button



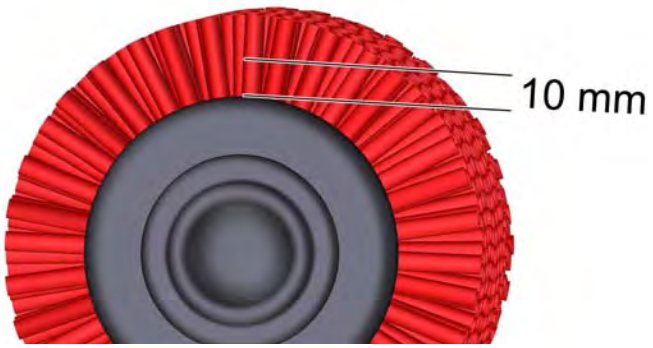
1 Transport rollers turn button
2 Recess
3 Tooth

➔ Pull the rotary knob off.

Note
Recess and tooth must be flush.

050 Maintenance and inspection

AJBC Checking roller brush for wear and tear



➔ Check brush roller for wear, minimum length of the bristles 10 mm.

060 Error diagnosis

Findings	Possible cause	Correction
Brush roller does not rotate Noise in the cleaning head	Drive pinion loose/ damaged. Drive belt damaged.	Replace the drive pinion Replace drive belt.
Cleaning effect inadequate	Brush roller is soiled or worn.	Check/replace the brush rollers.
The brush roller touches the ground in the parking position.	Stoppers of the cleaning head support are worn/ missing	Replace/ attach stoppers.
Damaged drive belt, drive pinion, pulley.	Moisture or dirt in the transmission casing	Replace seal of the cover.

070 Peculiarities/ others

The service group does not contain any peculiarities.

AN Service group running gear

010 Safety information

For this service group there is no special safety information.
Observe general safety information!

020 Overview

1 Rear wheels

030 Function

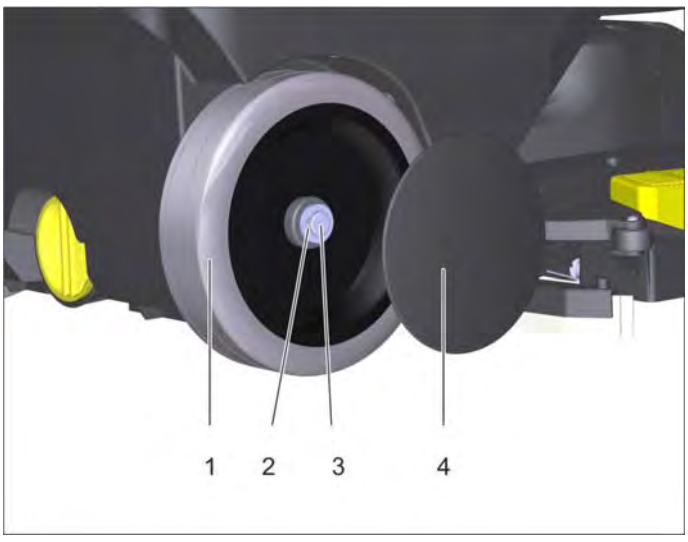
The running gear carries the appliance.
The wheels can be replaced individually.

040 Service activities

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

ANRH Uninstalling/installing rear wheel

■ Remove the waste water tank.



1 Rear wheel
2 Safety ring
3 Axle
4 Wheel cap

➔ Carefully wedge the wheel cap free.
➔ Remove the retaining ring.
➔ Remove the rear wheel from the axle.

050 Maintenance and inspection

➔ Check wheels for ease of movement.
➔ Check whether the axle is bent.
➔ Check whether both holders are present and secured.

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

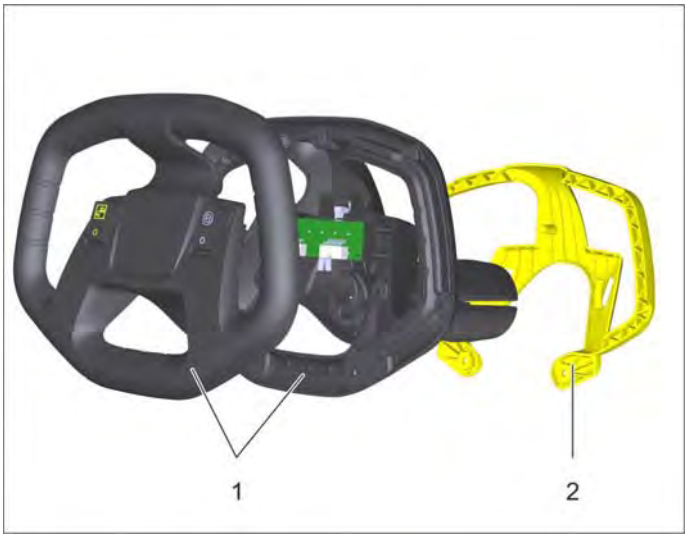
010 Safety information

⚠ ***WARNING***
Risk of injury due to rolling or accidentally operated appliance! After work on the steering wheel, check safety lever and safety switch for function.
Observe general safety information!

020 Overview

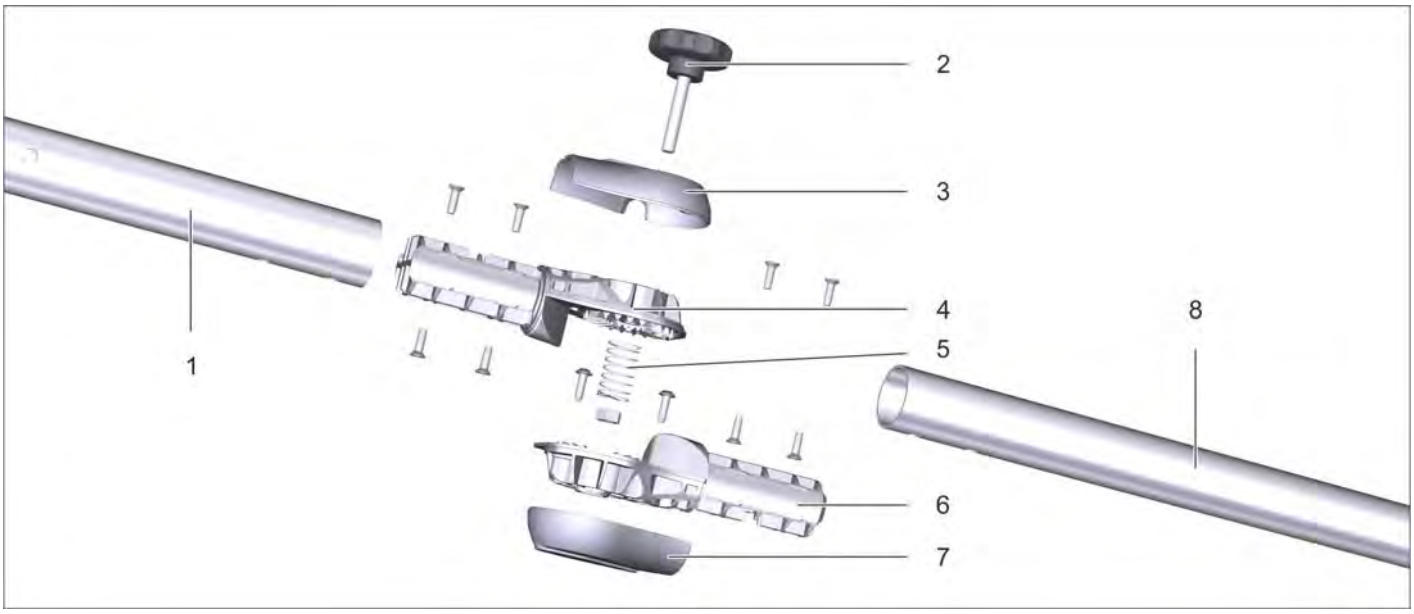
1 Steering wheel
2 Actuator lever
3 Upper steering column
4 Steering column articulated joint
5 Bearing shells

Steering wheel



1 Steering wheel shells
2 Actuator lever

Steering column



1 Upper steering column
2 Adjusting screw
3 Cover
4 Upper articulated joint
5 Spring
6 Lower articulated joint
7 Cover
8 Lower steering column

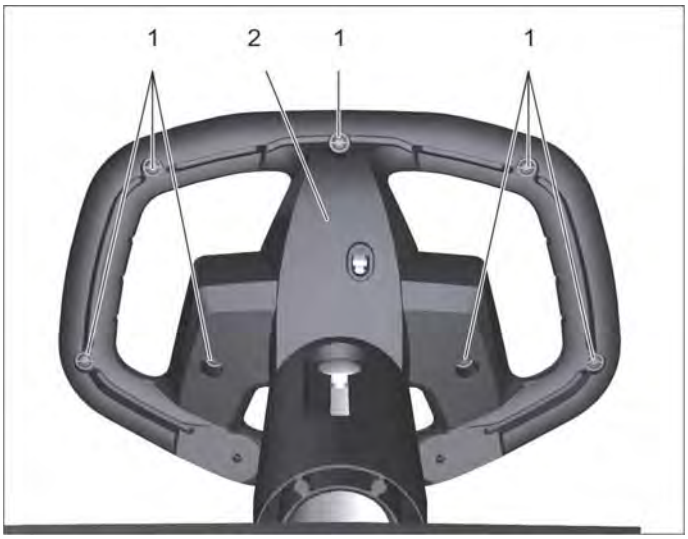
030 Function

The steering directly acts on the cardan joint of the cleaning head.
The lower steering column has a double bearing in the casing of the appliance.
The bearings consist of two screwed bearing shells each.
The lower and upper steering column are connected with an articulated joint.
The steering wheel is attached to the upper steering column.
The height of the steering wheel can be adjusted.
The control unit, the switch for the water pump and the Eco function as well as the safety switch are installed in the steering wheel.

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

AOLN Separating the steering wheel shells

■ *AOSC Removing/installing the actuation lever*

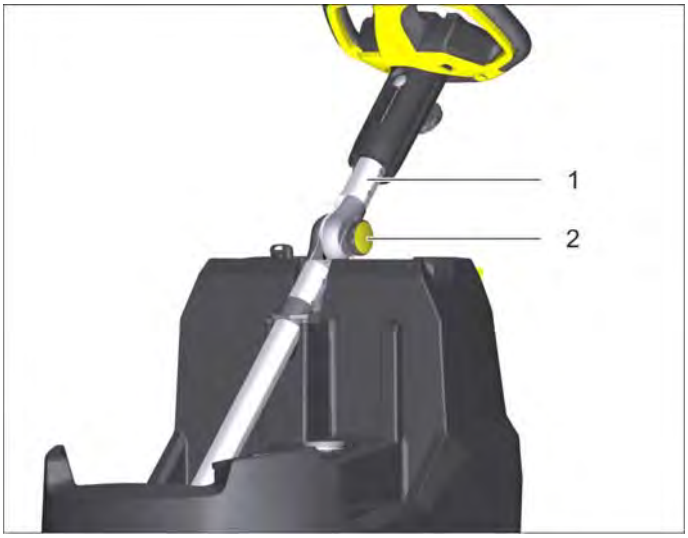


1 Screws
2 Steering wheel shells

➔ Unscrew the screws.
➔ Separate the steering wheel shells.

AOGH Uninstalling/ installing articulated joint of the steering column

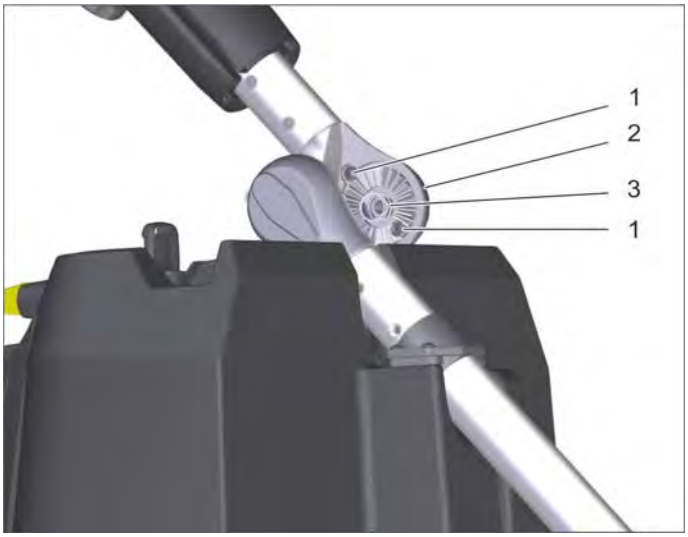
■ *AFSW Uninstall / install waste water tank*



1 Upper steering column
2 Adjusting screw

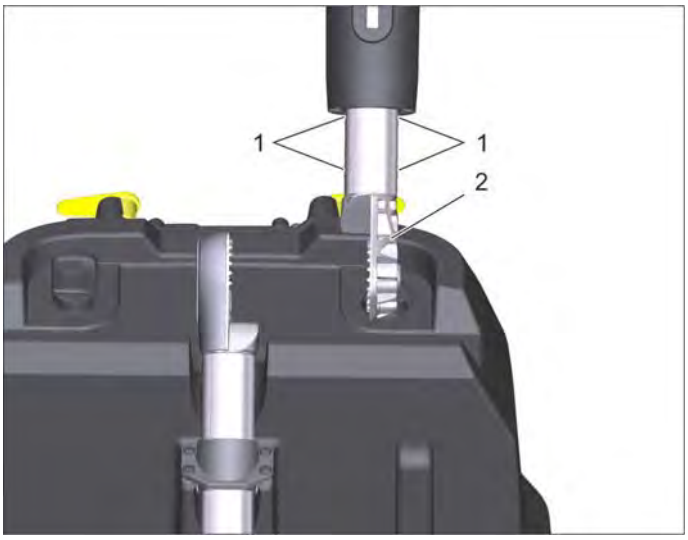
➔ Remove the adjustment screw.
➔ Place the upper steering column to the side.

Note
Note the cables.



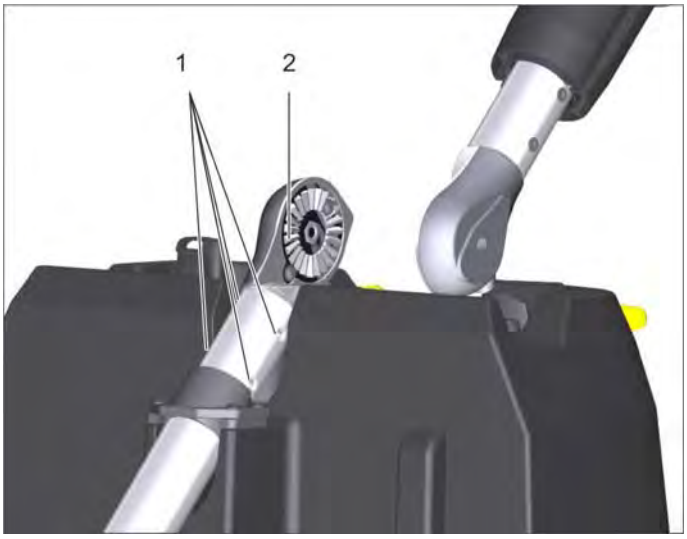
1 Screws
2 Cover
3 Spring

➔ Remove the spring.
➔ Unscrew the screws.
➔ Remove cover.



1 Screws
2 Articulated joint

➔ Unscrew the screws.
➔ Pull the articulated joint out of the steering column.



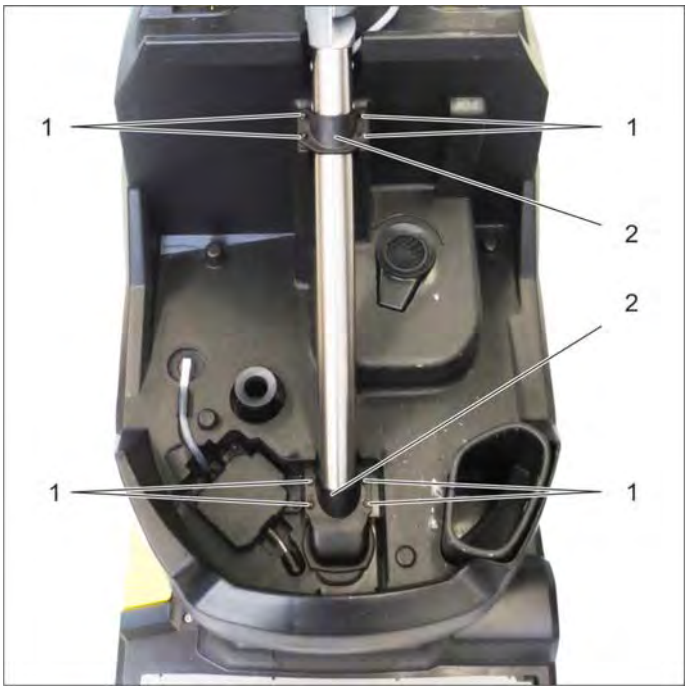
1 Screws
2 Articulated joint

➔ Unscrew the screws.
➔ Pull the articulated joint out of the steering column.

Note
The cable is routed through the upper joint half and the upper tube to the steering wheel. After removing the tubes from the joint, open the strain relief and remove the cable from the joint half.
Ensure that the yellow marking is placed inside the strain relief and the cable is not squeezed upon installation.
➔ Disassemble joint.
➔ Replace worn out joint halves.
➔ Replace damaged star knob.
➔ Insert missing spring.

AOLA Uninstalling/ installing bearing shells of the steering

■ *AFSW Uninstall / install waste water tank*

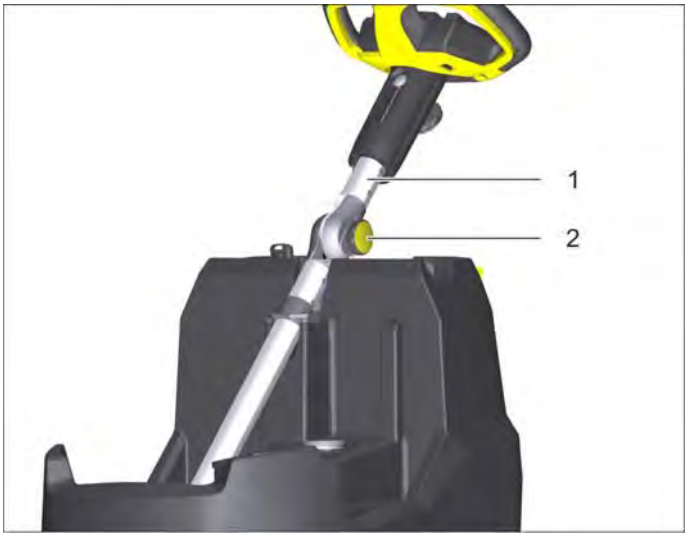


1 Screws
2 Bearing shells

➔ Unscrew the screws.
➔ Remove the bearing shells.

AOLO Uninstall/install upper steering column

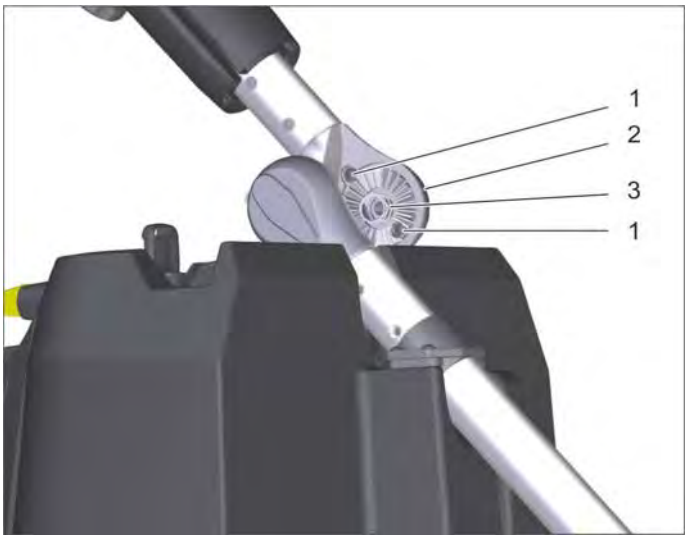
■ *AFSW Uninstall / install waste water tank*
■ *AGLI Uninstalling/ installing Li-ion battery*



1 Upper steering column
2 Adjusting screw

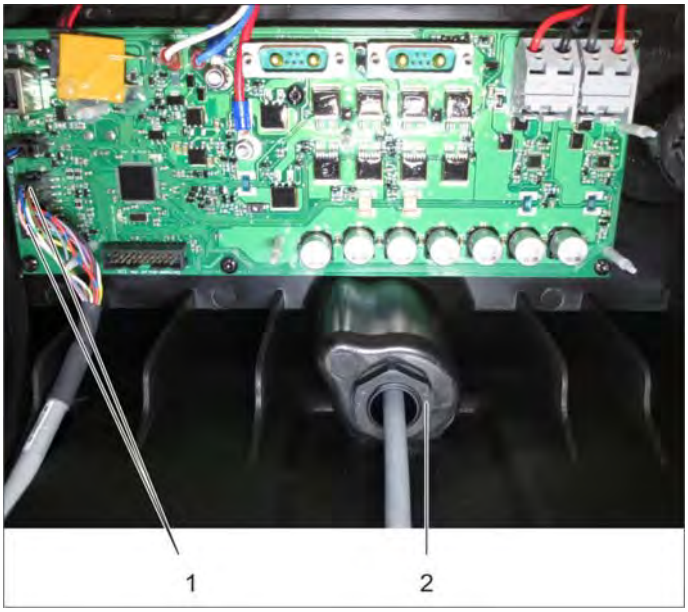
➔ Remove the adjustment screw.
➔ Place the upper steering column to the side.

Note
Note the cables.



1 Screws
2 Cover
3 Spring

➔ Remove the spring.
➔ Unscrew the screws.
➔ Remove cover.



1 Electric socket plug connections X14
2 Nut

➔ Unscrew the nut.
➔ Separate the electric connectors.

1 Upper steering column
2 Cables
3 Nut

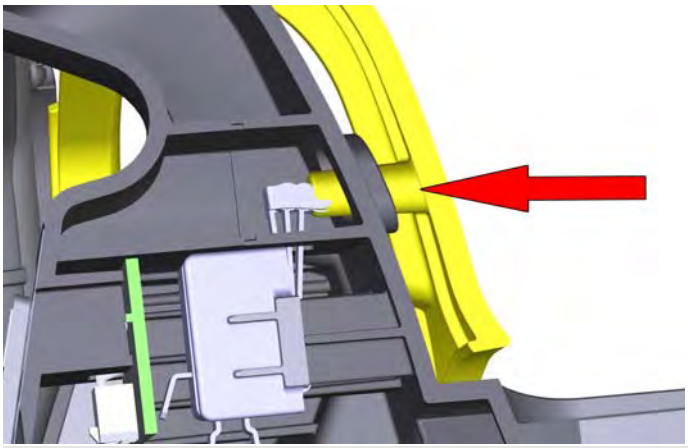
➔ Unscrew the nut.
➔ Pull cable through the opening.
➔ Remove the upper steering column.

Note
Ensure that the plug is not damaged and no contacts are loosened or cables are pulled off during disassembly.

AOSC Removing/installing the actuation lever

1 Screws
2 Actuation lever

➔ Unscrew the screws.
➔ Remove the actuation lever.



⚠ ***WARNING***
Risk of injury due to faulty safety installation! Upon installation ensure that the actuating bolt correctly operates the safety switch inside and can be moved without resistance.

AOLR Uninstalling/ installing steering wheel

- *AHES Uninstalling/ installing switch of the ECO function*
- *AHSW Uninstalling/installing switch of the water pump*
- *AHSS Uninstalling/ installing safety switch*
- *AHGH Removing/installing the steering wheel circuit board*

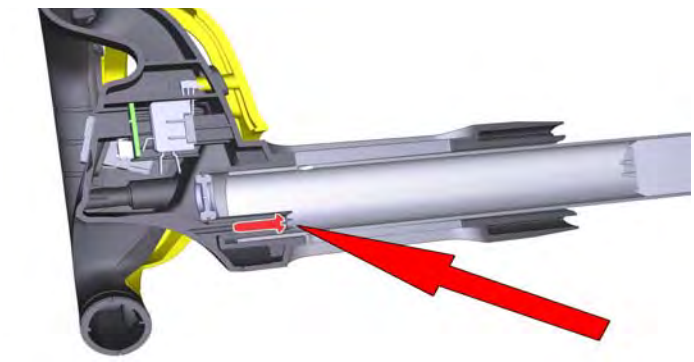
050 Maintenance and inspection

Service group does not contain any maintenance and inspection points.

060 Error diagnosis

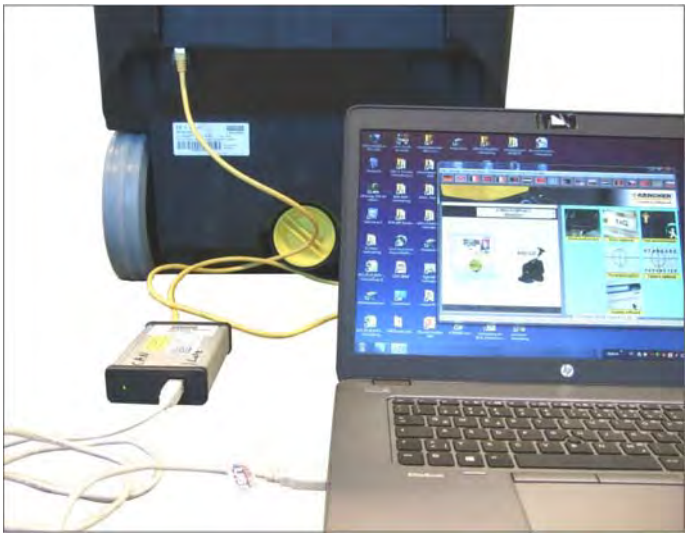
Findings	Possible cause	Correction
Steering column can no longer be locked in position	Articulated joint of the steering column defective/ missing parts	Check / replace articulated joint.

070 Peculiarities/ others



Note
One screw of the steering wheel halves is located in the retainer of the steering column and is difficult to access.

Connect service module



Note
A requirement is a service module 46830660 (CAN) and a service program V 8.0 or above.
The service programme software is available at Kärcher Inside.
The service module must be updated with the latest version of the service module software.

➔ Turn off the appliance.
➔ Remove the rear appliance cover.
➔ Plug the service module adapter and service module into the device.
➔ Connect the PC/laptop to the service module via the USB interface.
➔ Turn on the machine.
➔ Turn the programme selector switch to the transport run position.
➔ Start the service programme.
➔ Set the correct USB COM port of the PC/laptop. This must be determined via the device manager of the operating system. Maximum COM port number = 15.
➔ Perform automatic scanning to recognize the device automatically.
➔ If the device is not recognised, the selection must be repeated.

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
- Delete head CPU parameter memory
- Reset maintenance counter

Software update

Service programme for floor cleaners and sweepers 5.0

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.
➔ Now update the display texts.

Note
The display of the device is switched off during the software transfer.
The successfully transferred software can be displayed on the device.
After transferring the software, the following settings must be made using the grey or red KIK key.

➔ Load the factory settings.
➔ Adjust the used brush head to "R or D".
➔ Set up the charge curve for the installed battery used in the battery menu.
➔ Turn the device off and back on.
➔ The device can be started after all the settings have been made.

Technical Documentation

Appliance type	Appliance no.	Circuit diagram	Operating instructions
BR 45/22 C	1.783-460.0	0.089-720.0	5.965-557.0

Technical specifications

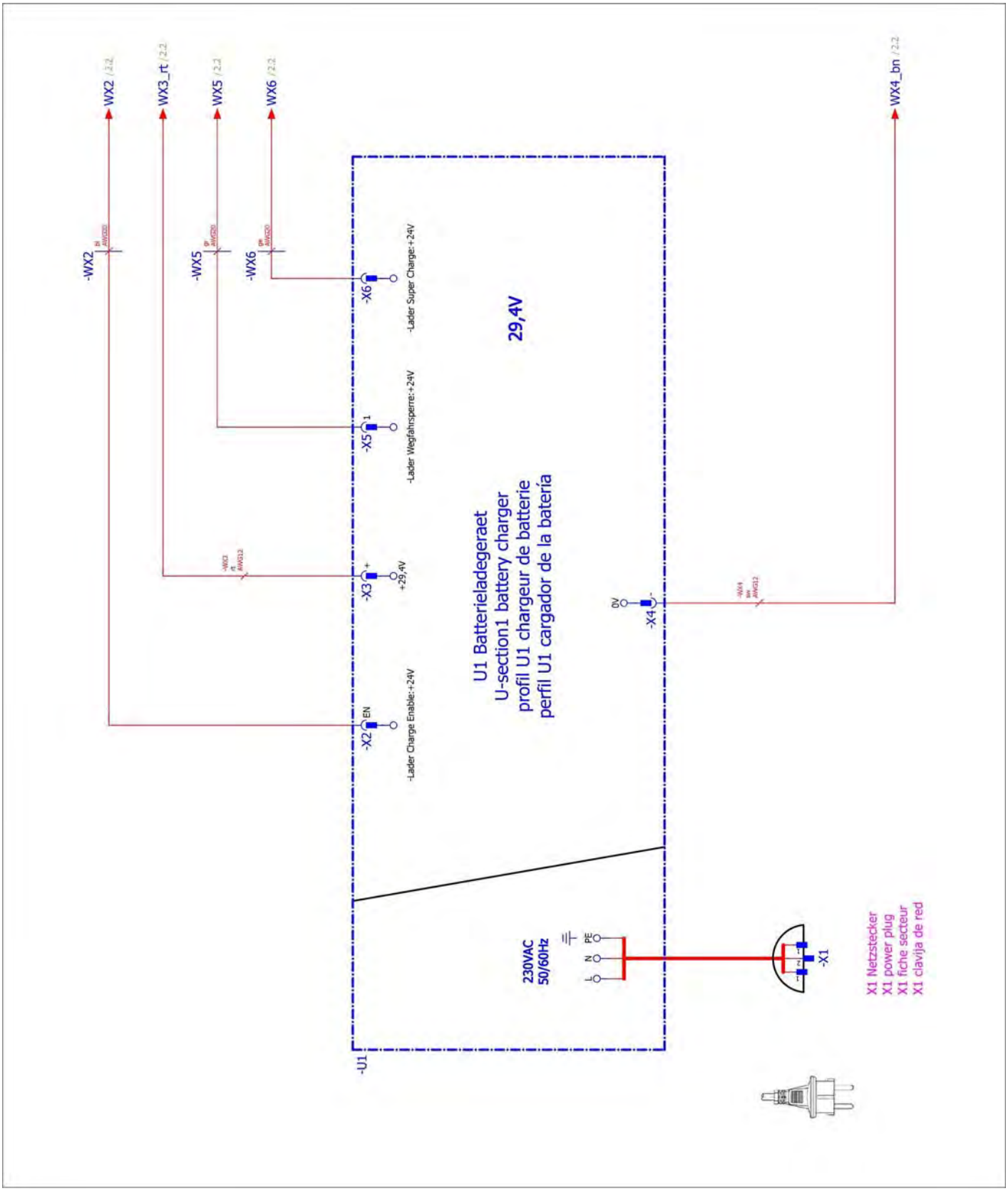
Power		
Nominal voltage	V	25.2
Battery capacity	Ah (5h)	42
Battery type		Li-ion
Mean power consumption Power/Eco	W	650/350
Type of protection		IPX3
Protective class	-	1
Suction engine output	W	280
Brush engine output	W	185
Operating temperature range	°C	2...40
Max. water temperature	°C	50
Vacuuming		
Suction performance, air quantity Power/Eco	l/s	20/15
Suction performance, vacuum Power/Eco	kPa	8/5
Cleaning brushes		
Working width	mm	450
Brush diameter	mm	96
Brush speed Power/Eco	1/min	1050/750
Charger		
Voltage	V/Hz	220...240/50-60
Power Input	W	300
Dimensions and weights		
Theoretical surface cleaning performance	m^2/h	1400
Fresh/waste water tank volume	l	22
Permissible overall weight	kg	70
Transport weight	kg	48
Length x width x height (transport)	mm	970 x 530 x 1115 (780 x 530 x 815)
Values determined as per EN 60335-2-72		
Total oscillation value	m/s^2	<2.5
Uncertainty K	m/s^2	0.2
Sound pressure level L_{pA}	dB(A)	66.5
Uncertainty K_{pA}	dB(A)	2
Sound power level L_{WA} + Uncertainty K_{WA}	dB(A)	87

Fault codes

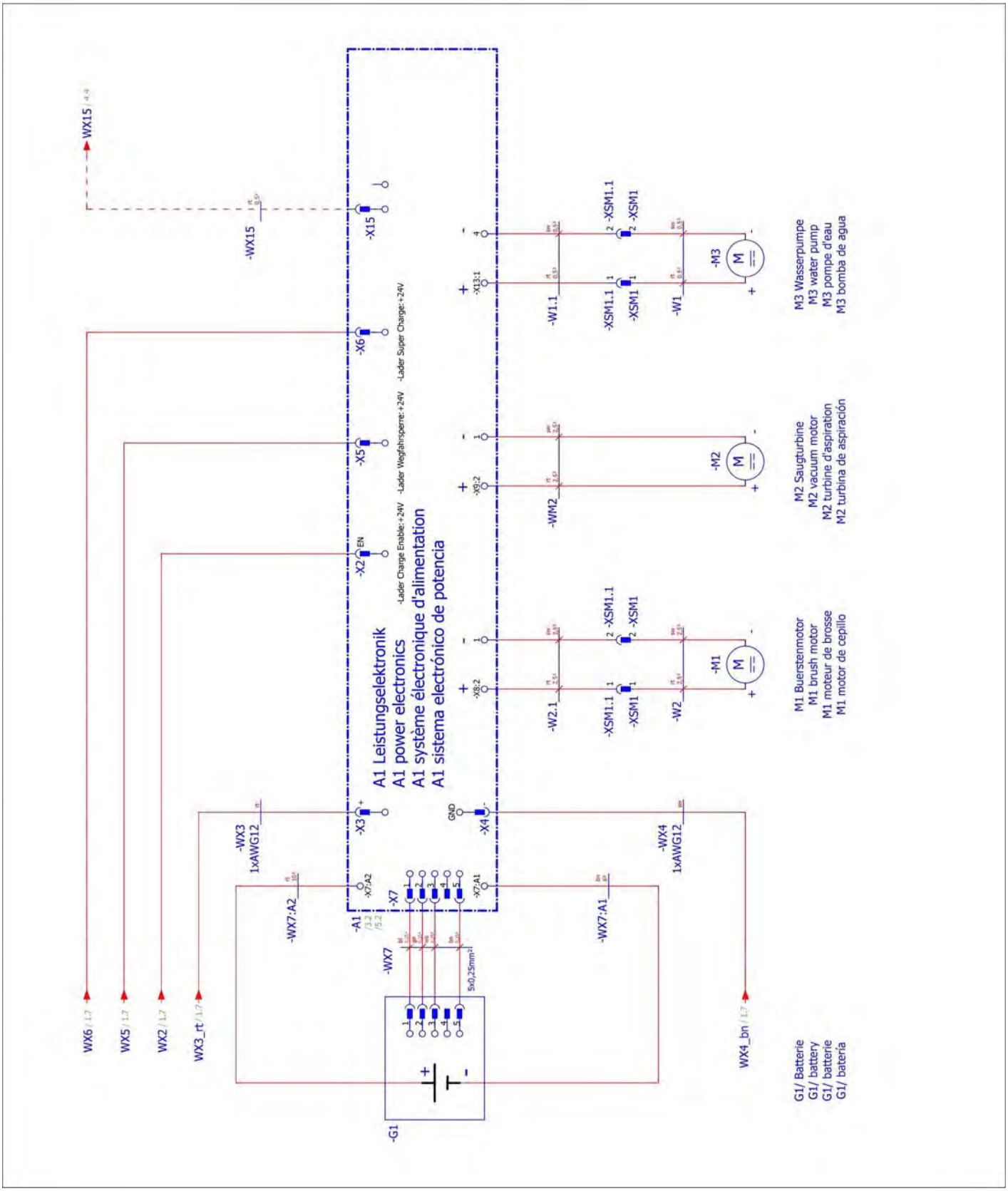
Event ID	Error description	Reason	Signal	Correction	Cause
251658241	OPEN_LOAD_BRUSH	Brush current < 1A although output is on. The fault is generated 2s after the brush is activated.	The brush motor LED flashes orange	Check the lines and brush motors.	Wire break, defective brush motor, (defective fuse), high resistance
251658242	BRUSH_DRIVER_ERROR	FET drive of brushes has fault. Possible reasons: – Drive indicates an internal fault. – Drive indicates an excess temperature of 170°C.	The brush motor LED flashes orange	– Measure the voltage at the brush motor output (Brush motor in operation) – Measure the power consumption – Allow the control to cool down. – Check the battery and motor connection on the circuit board.	– Low voltage range at brush motor output i.e. voltage drop between FET and brush motor. – Overtemperature at brush motor output i.e. high load.
251658243	CURRENT_LIMIT_BRUSH	Brush current is limited to maximum current for more than 10s. The maximum current is limited via parameters.	The brush motor LED flashes orange	– High load on brush motor, check application and bearing – Check the brush motor	Brush current maximum value reached for more than 10s. High current requirement of brush motor.
251658244	OPEN_LOAD_TURBINE	Turbine current < 1A although output is on. Fault is generated 2s after the turbine has been activated.	The suction turbine LED flashes orange	Check the lines and turbine.	Wire break, defective turbine, (defective fuse), high resistance
251658245	TURBINE_DRIVER_ERROR	FET driver of turbine has fault. Possible reasons: – Drive indicates an internal fault. – Drive indicates an excess temperature of 170°C.	The suction turbine LED flashes orange	– Measure the voltage at the turbine output (turbine in operation) – Measure the power consumption – Allow the control to cool down. – Check the battery and motor connection on the circuit board	– Low voltage at turbine output i.e. voltage drop between FET and turbine – Overtemperature at turbine output i.e. high load.
251658246	CURRENT_LIMIT_TURBINE	Turbine current is limited to maximum current for more than 10s. The maximum current is limited via parameters.	Turbines LED flashes orange	– High load at turbine, check application and bearing – Checking the turbine	Turbine maximum value reached for more than 10s. High current requirement of turbine.
251658247	OPEN_LOAD_WATER_PUMP	Water pump current < 1A although output is on. Fault is generated 2s after the water pump has been activated.	Water pumps LED is off	Check the lines and pump.	Wire break, defective pump, (defective fuse), high resistance
251658248	OVER_CURRENT_WATER_PUMP	Water pump current is greater than the maximum current for more than 10s. The maximum current is limited via parameters.	Water pumps LED is off	– High load at pump, check secure fitting – Checking pump	Pump reaches maximum value for more than 10s. High current requirement of pump

Event ID	Error description	Reason	Signal	Correction	Cause
251658249	NO_CHARGING_BATT_1_2	Charge enable of both batteries is reset for 5s.	Battery LED flashes red	– Check batteries individually and try to charge – Measure the battery voltage – Check the charge enable signal of charger via the control to the battery	Charging not possible. Charge-FET and disable-FET of both batteries are disabled.
251658250	PRE_CHARGING	Pre-charging of intermediate circuit failed. Pre-charge intermediate circuit under 8V after 100ms. A short-circuit may be present on one of the loads or on the control unit.	Brush motor LED, suction turbines LED and battery LED flash red	Check control unit and its outputs for short-circuits	Machine will not complete the switch-on procedure. No discharge enable. Machine can still be charged.

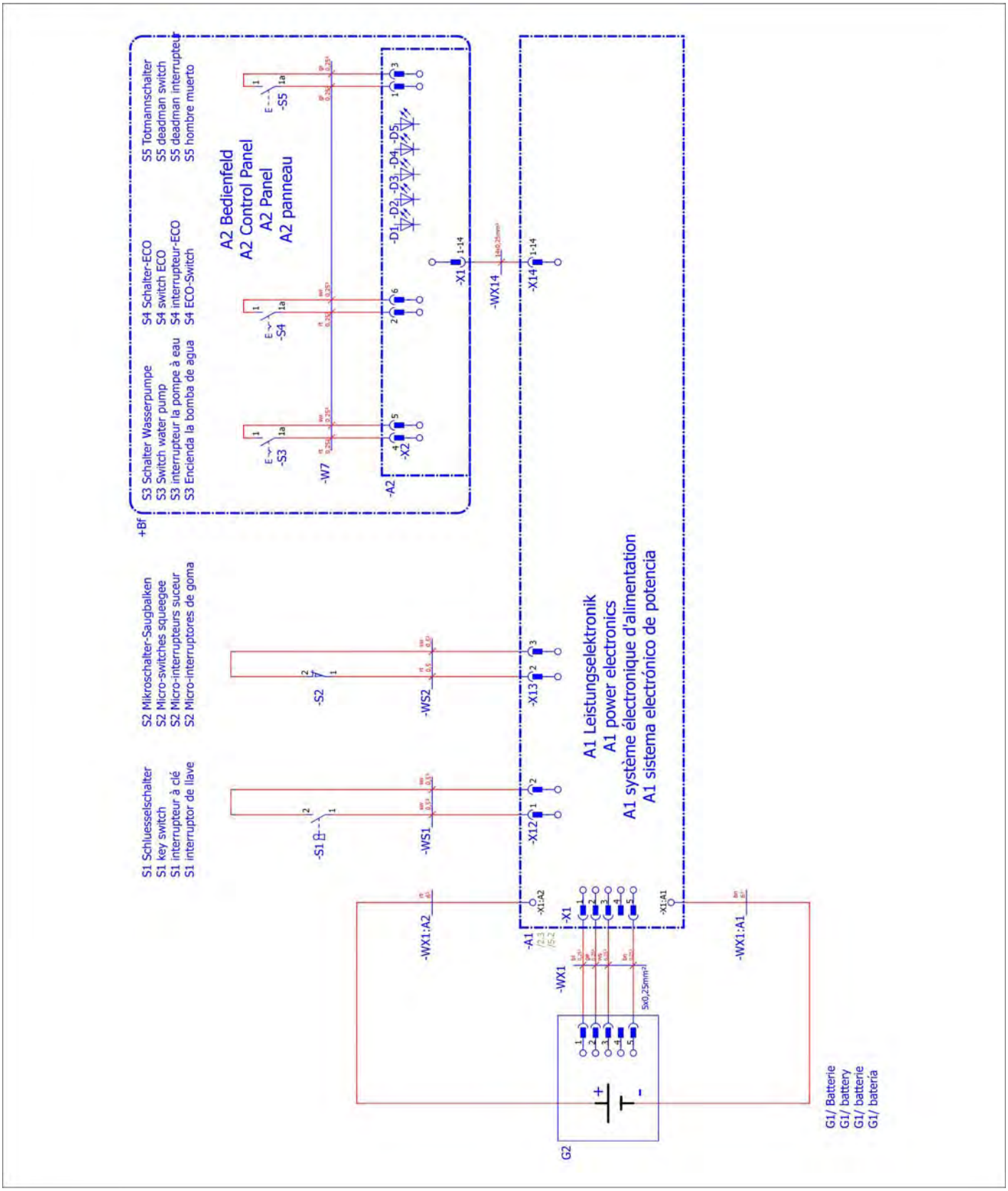
Circuit diagram



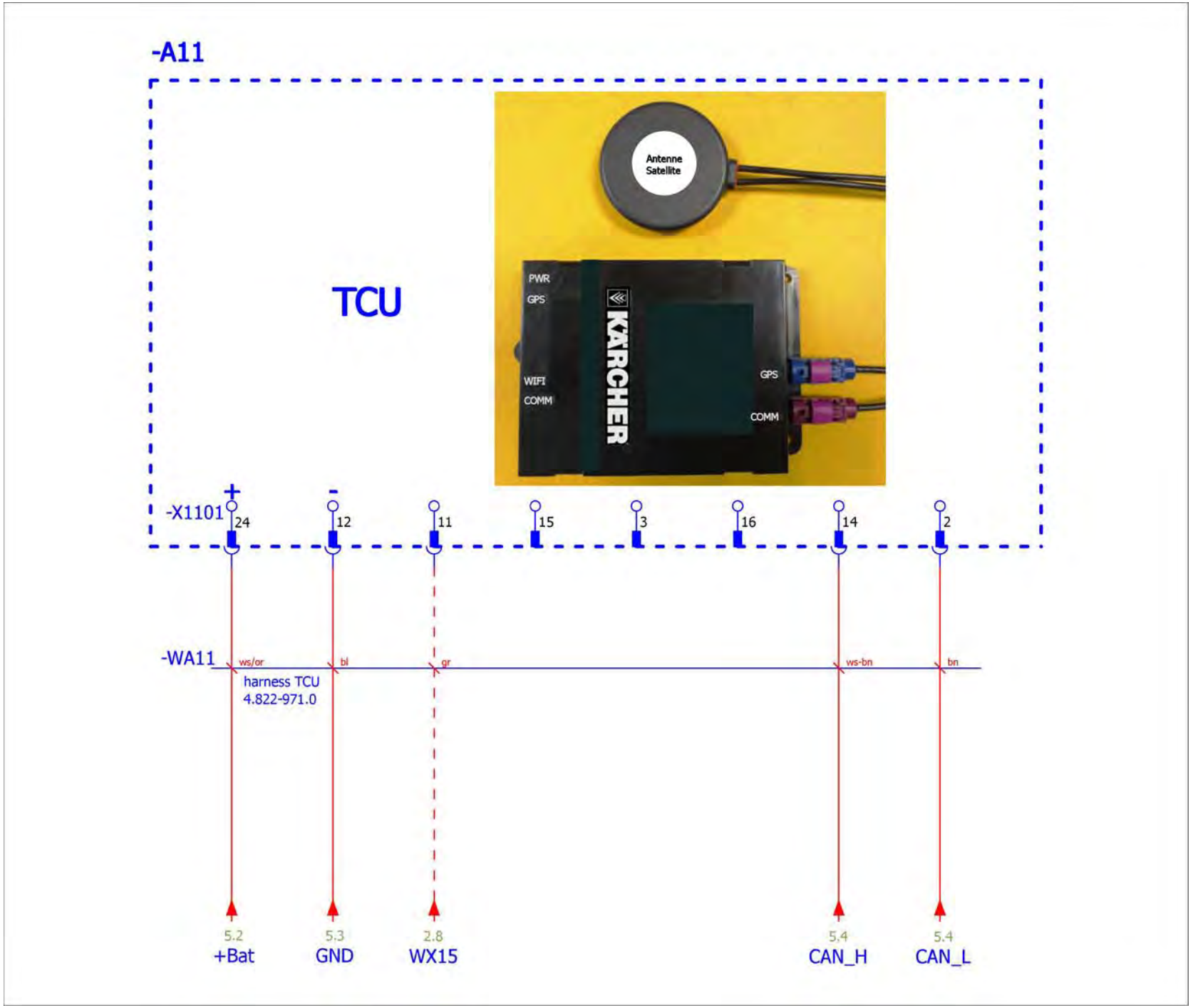
X1 Mains plug
U1 Battery charger

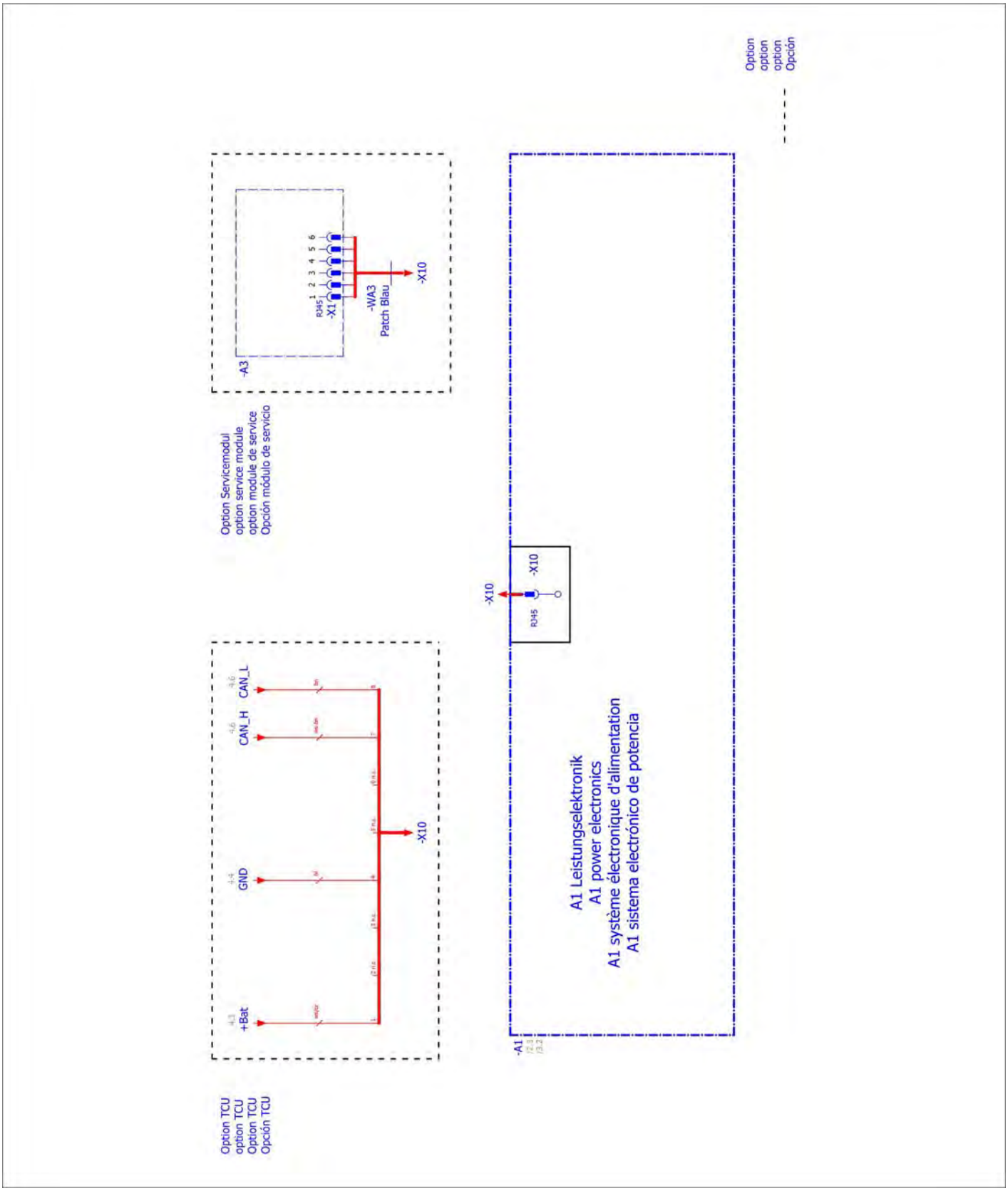


A1 Performance electronics
G1 Battery
M1 Brush motor
M2 Suction turbine
M3 Water pump



A1	Performance electronics
A2	Operating field
G1	Battery
S1	Key switch
S2	Microswitch vacuum bar
S3	Water pump switch
S4	ECO switch
S5	Dead man's switch


-A11
TCU
Antenne Satellite
PWR
GPS
WIFI
COMM
KÄRCHER
GPS
COMM
+
-
-X1101
24
12
11
15
3
16
14
2
-WA11
ws/or
bl
gr
ws-bn
bn
harness TCU
4.822-971.0
5.2
+Bat
5.3
GND
2.8
WX15
5.4
CAN_H
5.4
CAN_L



A1 Performance electronics
A3 Service module (option)