

# New Unit Information



**KM 120/150 R Bp  
KM 120/150 R Bp Pack**

1.511-...

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## 1.1 Technical features

### Types

- KM 120/150 R BP
- KM 120/150 R BP Pack

### Features

- 24 volt battery (BP Pack)
- Battery charger (BP Pack)
- Cab as mounting kit.
- Driver protective hood as mounting kit.
- A rotary switch for all driving and sweeping functions.
- Left side brush (optional).
- Rigid function to protect the main brush.
- Tool-free roller replacement.
- Continuous filter cleaning (optional).
- Cover, debris throw in (optional).
- Adjustable steering wheel.
- Adjustable driver's seat.

### Driving unit and steering

- 3-wheel running gear with front wheel steering.
- Solid-rubber tyres for front wheel and rear wheels.
- Forward and reverse drive with two drive pedals.
- Variable driving speed for forwards and reverse drive.
- Sweeper brakes automatically if the driver leaves the driver's seat (seat contact sensor) or removes their foot from the drive pedal, or switches off the unit.
- The seat and the hood can be raised for maintenance purposes.

### Vacuum system

- Impeller fan draws in the dust swirled up during sweeping.
- Automatic impeller fan stop when the sweeper is at a standstill.

### Filter system

- Dust filter made of polyester, washable.
- The vacuumed dust is cleaned via the dustfilter system.
- Automatic cleaning of the dust filter for approx 15 secs after switching off the Unit or leaving the driver's seat.

### Sweeping system

- Main brush rigid or floating by means of pushbutton.
- The main brush operates according to the throw-over principle.
- One side-brush, right (optional side brush left).
- Coarse-dirt flap raised/lowered with left foot pedal.
- Main brush and side brushes lowered using rotary switch on control panel, the motors are switched on at the same time.
- Debris container with hydraulic discharge in raised position.

### Electrics

- All electrical components easily accessible, located centrally behind the front cover and under the control panel.
- Control panel with horn, operating hours counter, light, rotary switch, manual filter cleaning, two-handed operation debris container emptying, pushbutton for floating/rigid main brush operation, LED display.
- Pushbutton for extend/retract the debris container and pushbutton for tipping the debris container, two-hand operation.

### Motors

- 24V 1000 W wheel hub motor in front wheel, variable speed adjustment.
- 24V 600 W impeller fan and main brush motors, speed 3500 rpm.
- 24V 100 W side brush motor, speed 70 rpm.

## 1.2 Front view



- 1 Steering wheel
- 2 Front cover
- 3 Coarse-dirt flap pedal
- 4 All round tubular steel frame
- 5 Headlights (2x)
- 6 Main brush
- 7 Freewheeling lever

- 8 Front wheel with drive motor
- 9 Side brush
- 10 Drive pedal, forward drive
- 11 Drive pedal, reverse drive
- 12 Motor cover
- 13 Side console

## 1.3 View from the side



*Steering wheel and seat*



*Seat, tilted open*



*Motor cover, tilted open*

### Motor cover (8) open

The motor cover (8) must be folded open according to the following sequence to load the batteries and carry out various maintenance work on the unit.

- Press down steering wheel tilt adjustment lever (2) and tilt steering wheel (1) to the front.
- Press driver's seat adjustment lever (4) to the outside left and let driver's seat (3) latch into middle position.
- Tilt driver's seat (3) to the left.
- Tilt complete motor cover (8) to the front with the tilted driver's seat (6).

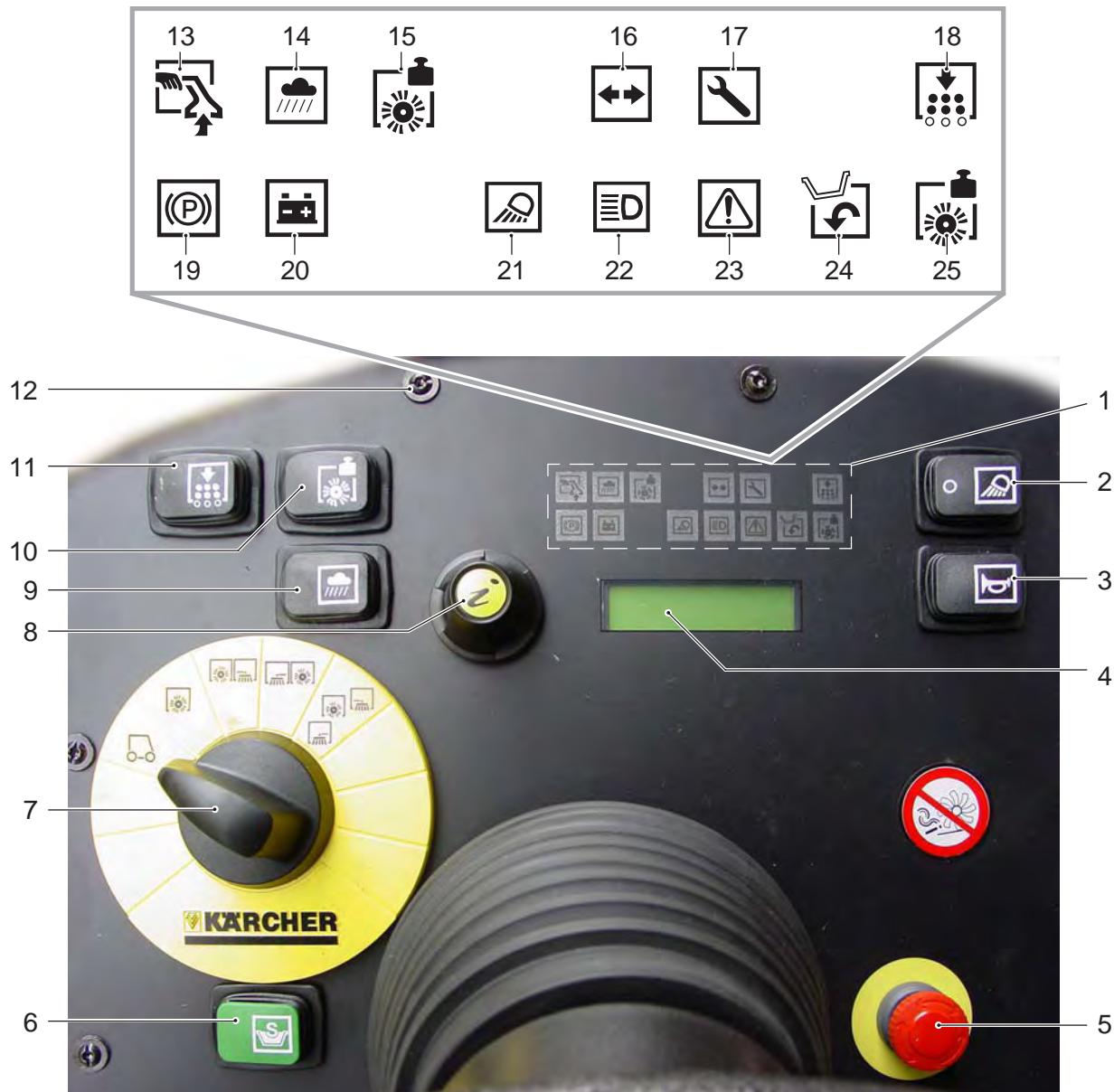
- 1 Steering wheel, adjustable inclination
- 2 Steering wheel adjustment lever
- 3 Seat
- 4 Seat adjustment lever
- 5 Pedal, coarse-dirt flap
- 6 Seat, tilted open
- 7 Motor compartment
- 8 Motor cover

## 1.4 Rear view



- |  |                    |
|--|--------------------|
| 1 Latch, filter container (2x)         | 6 Waste container  |
| 2 Side cover plate, brush roller       | 7 Filter container |
| 3 Rear wheel                           | 8 Dust filter      |
| 4 Flap for throwing in collected waste | 9 Seal             |
| 5 Seal                                 |                    |

## 2.1 Control panel



- |   |   |
|---|---|
| 1 Control lights  | 14 Wet sweeping, indicator light  |
| 2 Switch, headlight (S3)                                    | 15 Rigid brush operation, indicator light   |
| 3 Rocker button, horn (S7)                                  | 16 Direction of travel indicator light (optional)   |
| 4 Display   | 17 Service indicator light  |
| 5 EMERGENCY STOP button (S1)                                | 18 Filter cleaning indicator light<br>flashes green: in service<br>Illuminates green: Automatic activated |
| 6 Rocker button, debris container, two-hand operation (S15) | 19 Automatic parking brake is active  |
| 7 Program selector switch (S8)                              | 20 Battery monitoring   |
| 8 Info selector switch, rotary and inching function         | 21 Parking lights switched on (optional, StVZO)   |
| 9 Switch, wet cleaning mode (S4)                            | 22 High beams switched on (optional, StVZO)   |
| 10 Rocker button, floating/rigid brush roller (S6)          | 23 General fault indicator light  |
| 11 Rocker button, filter cleaning (S5)                      | 24 Debris container tipped out  |
| 12 Retaining screws, instrument panel (7x)                  | 25 Overload on main roller brush  |
| 13 Hand tool suction, indicator light (optional)            |   |

## 2.2 Program selection switch



- 1 Drive only
- 2 Sweeping with main brush:  
(Y5) Rigid mode or (Y6) floating mode,  
both controlled by switch (S6), during  
(Y5) „Rigid main brush roller active“  
indicator lamp illuminates.
- 3 Sweeping with main brush and right side  
brush:  
As item 2 plus (Y7)

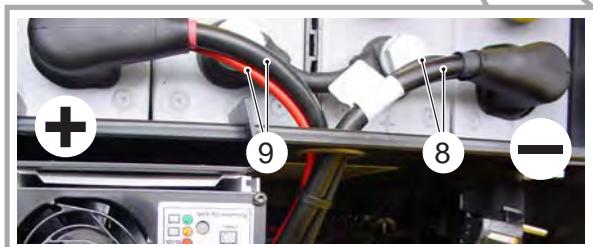
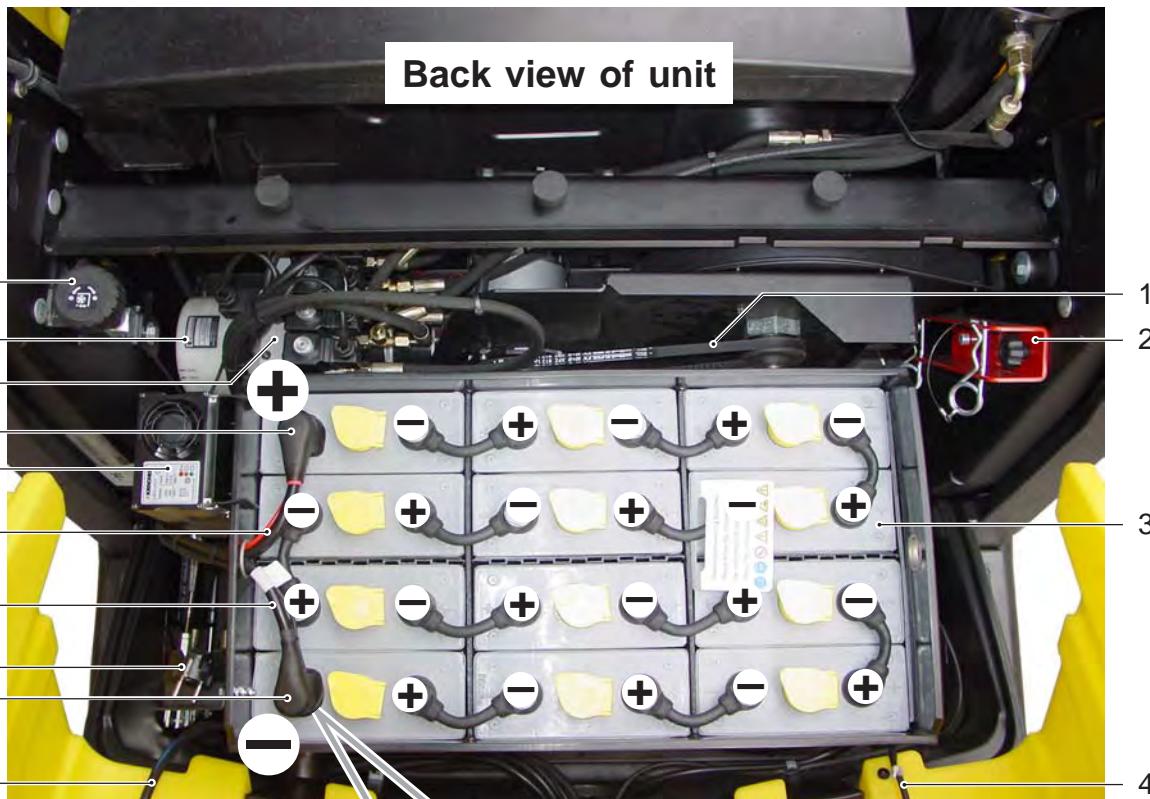
- 4 Sweeping with main brush and left side  
brush (optional):  
As item 2 plus (Y8)
- 5 Sweeping with main brush and right and  
left side brushes (left side brush optional):  
As item 2 plus (Y7) and (Y8)

## 2.3 Controls



- 1 Key switch (S0)
  - 2 Drive pedal, reverse drive
  - 3 Drive pedal, forward drive
  - 4 Rocker button for raising/lowering the debris container (S17), two-hand operation
  - 5 Rocker button for tipping out /in the debris container (S16), two-hand operation
  - 6 Side console
  - 7 Side console retaining screws (6x)
  - 8 Raise/lower coarse-dirt flap pedal
- The driving speed can be variable adjusted by slowly pressing the drive pedals (2/3).
  - The machine automatically brakes if the drive pedal is no longer pressed.

## 2.4 Battery compartment



**Note:**

Only connect the two red marked connection cables (9) to the positive post (11) and only the two black connection cables (8) to the negative post (6). Incorrect connection can cause malfunctions or even destroy the electronics module.

- |  |   |
|--|---|
| 1 Drive belt, suction motor                                | 8 Connection cable to battery (-)         |
| 2 Safety profile for locking the extended debris container | 9 Connection cable to battery (+)         |
| 3 Battery (G1), low maintenance                            | 10 Battery charger (Bp Pack only)         |
| 4 Connection cable, seat contact sensor                    | 11 Negative post (-)                      |
| 5 Connection cable, control panel                          | 12 Hydraulic unit                         |
| 6 Positive post (+)  | 13 Hydraulic oil tank                     |
| 7 Mains plug, battery charger (Bp Pack only)               | 14 Handwheel, sweeping pattern adjustment |

## 2.5 Debris container raised



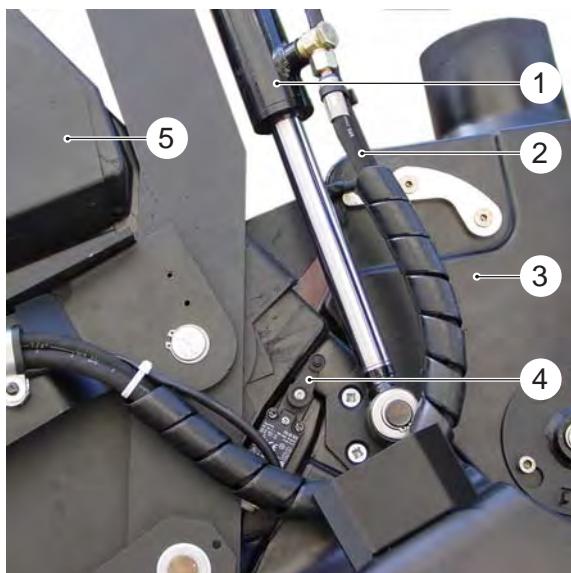
- 1 Hydraulic cylinder for tipping the debris container
- 2 Operating air intake flange
- 3 Filter container
- 4 Microswitch (S14), debris container tipped in/out
- 5 Filter container cover
- 6 Debris container flap
- 7 Microswitch (S13), lever arm retracted/extended
- 8 Hydraulic unit
- 9 Hydraulic oil tank
- 10 Hydraulic cylinder for raising/lowering the debris container

11 Locking profile (for working under the raised debris container)

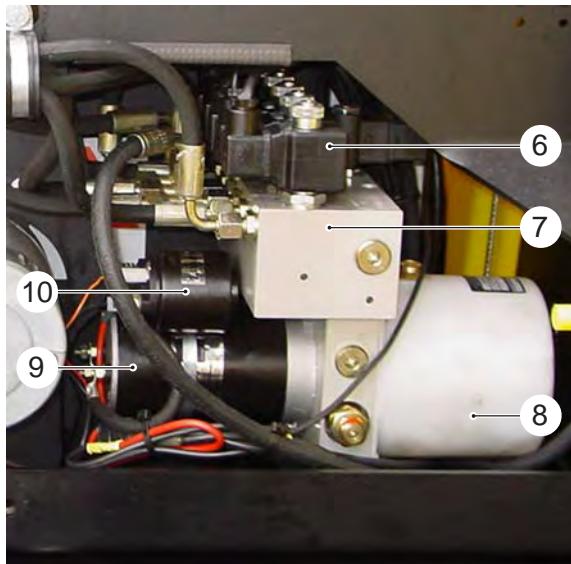
 **Danger!**

Always secure the debris container with the locking profile (11). Do not stand under the debris container unless the locking profile has been attached.

## 2.6 Hydraulics



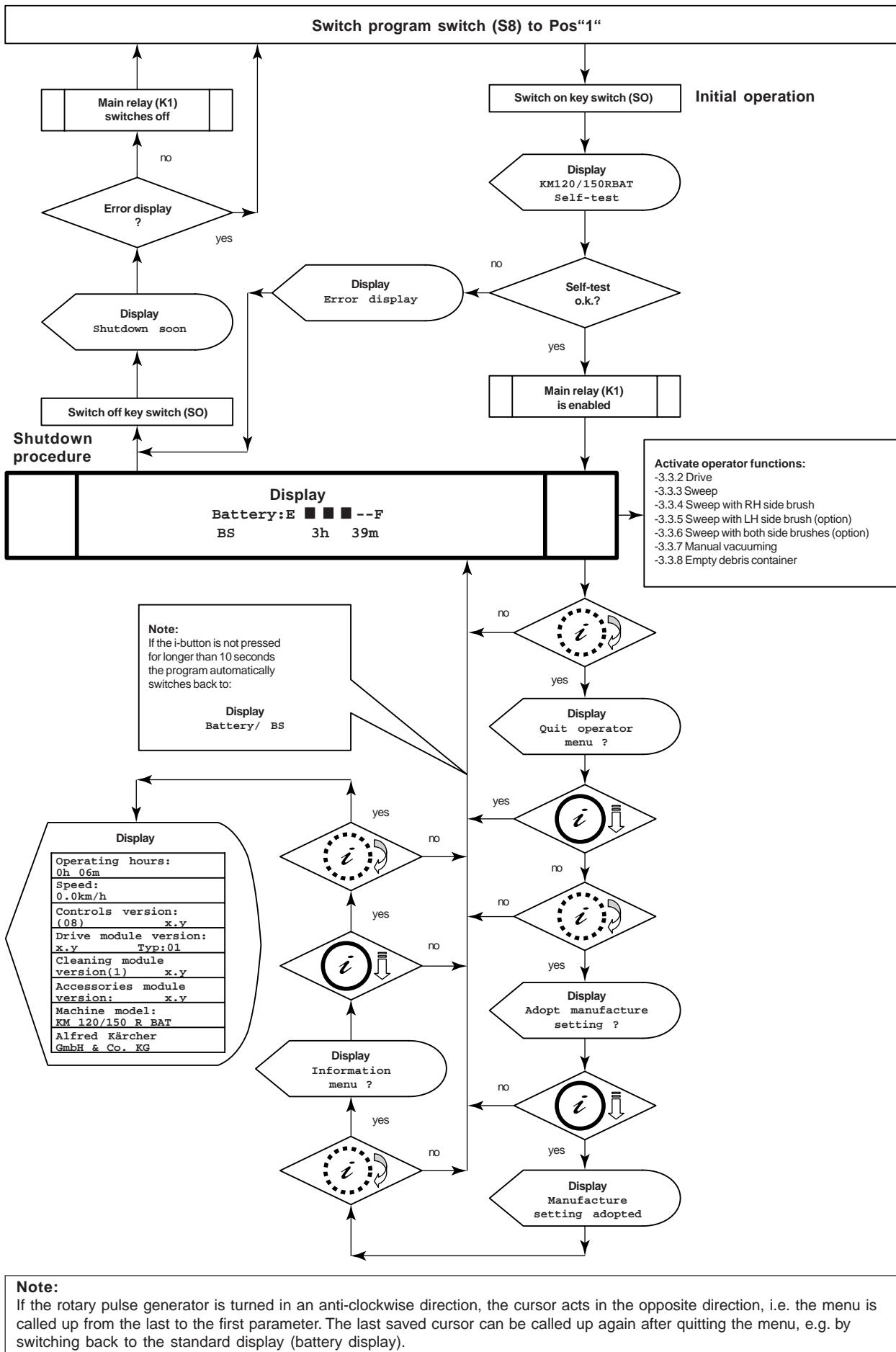
Hydraulic cylinder at debris container



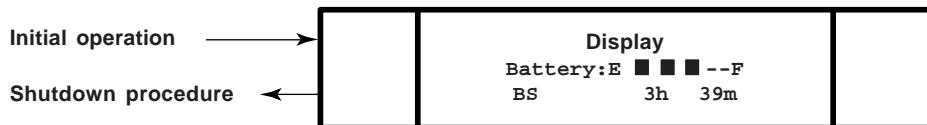
View of hydraulic unit

- 1 Hydraulic cylinder for tipping the debris container
- 2 Hydraulic hose
- 3 Filter container
- 4 Microswitch (S13), debris container tipped in/out
- 5 Waste container
- 6 Solenoid valves
- 7 Hydraulic control block
- 8 Hydraulic oil tank
- 9 Hydraulic pump
- 10 Relay, hydraulic pump (K2)

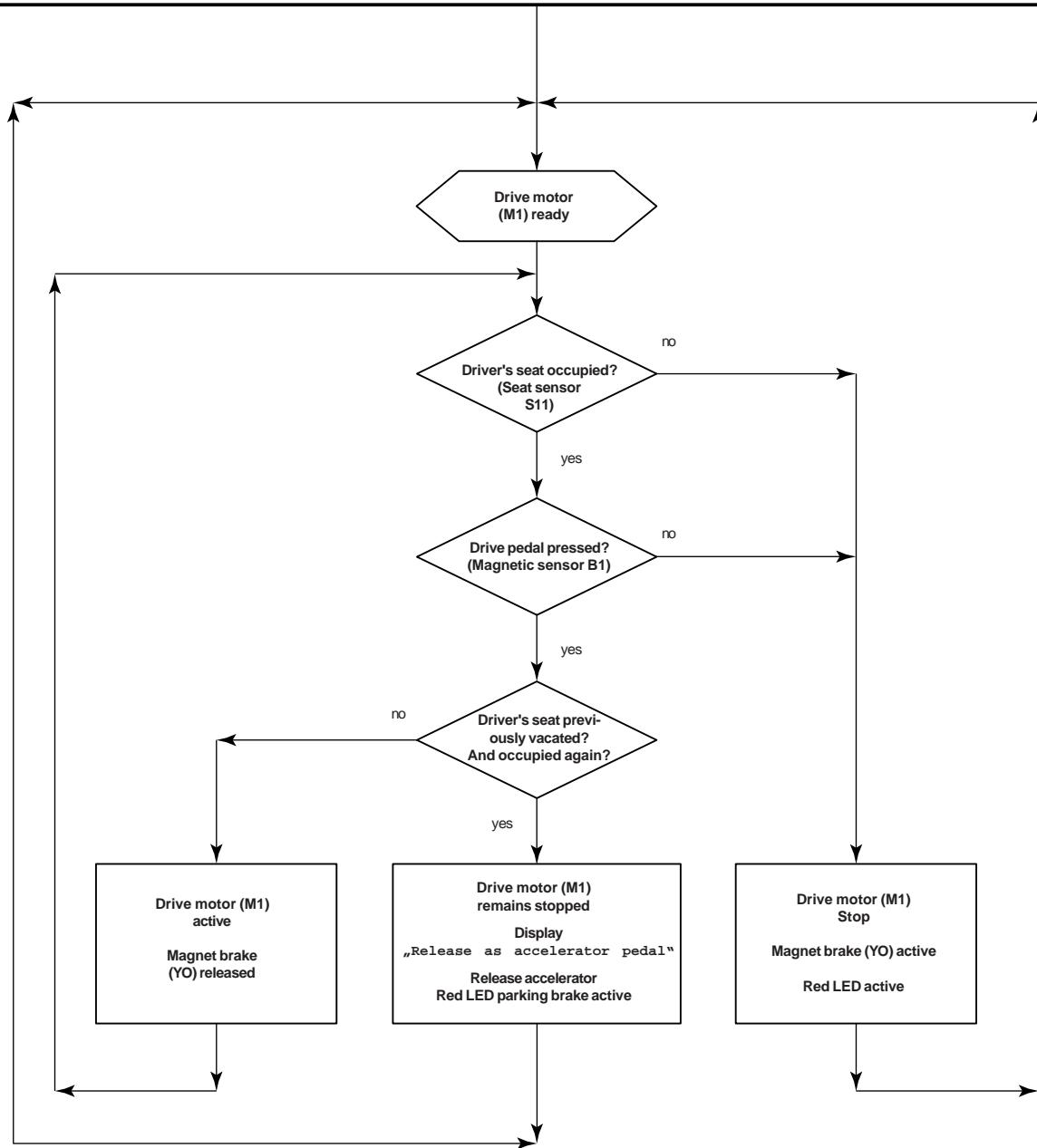
### 3.1 Initial operation and information menu



## 3.2 Driving



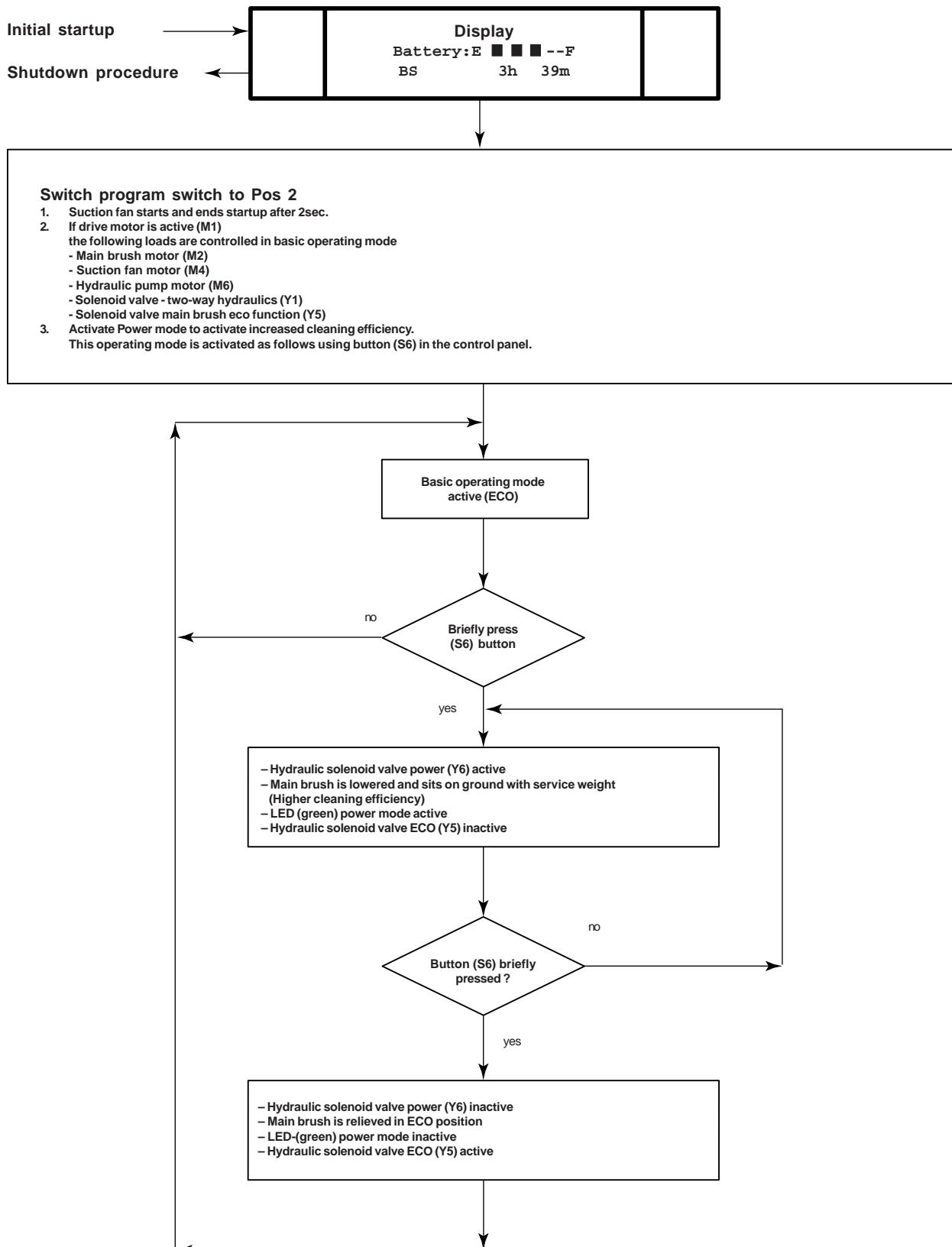
**Switch program switch to Pos 1 (no cleaning units active)**  
If the drive pedals (forwards or reverse) are pressed and the driver's seat is occupied  
the drive motor (M1) is active.



**Note:**

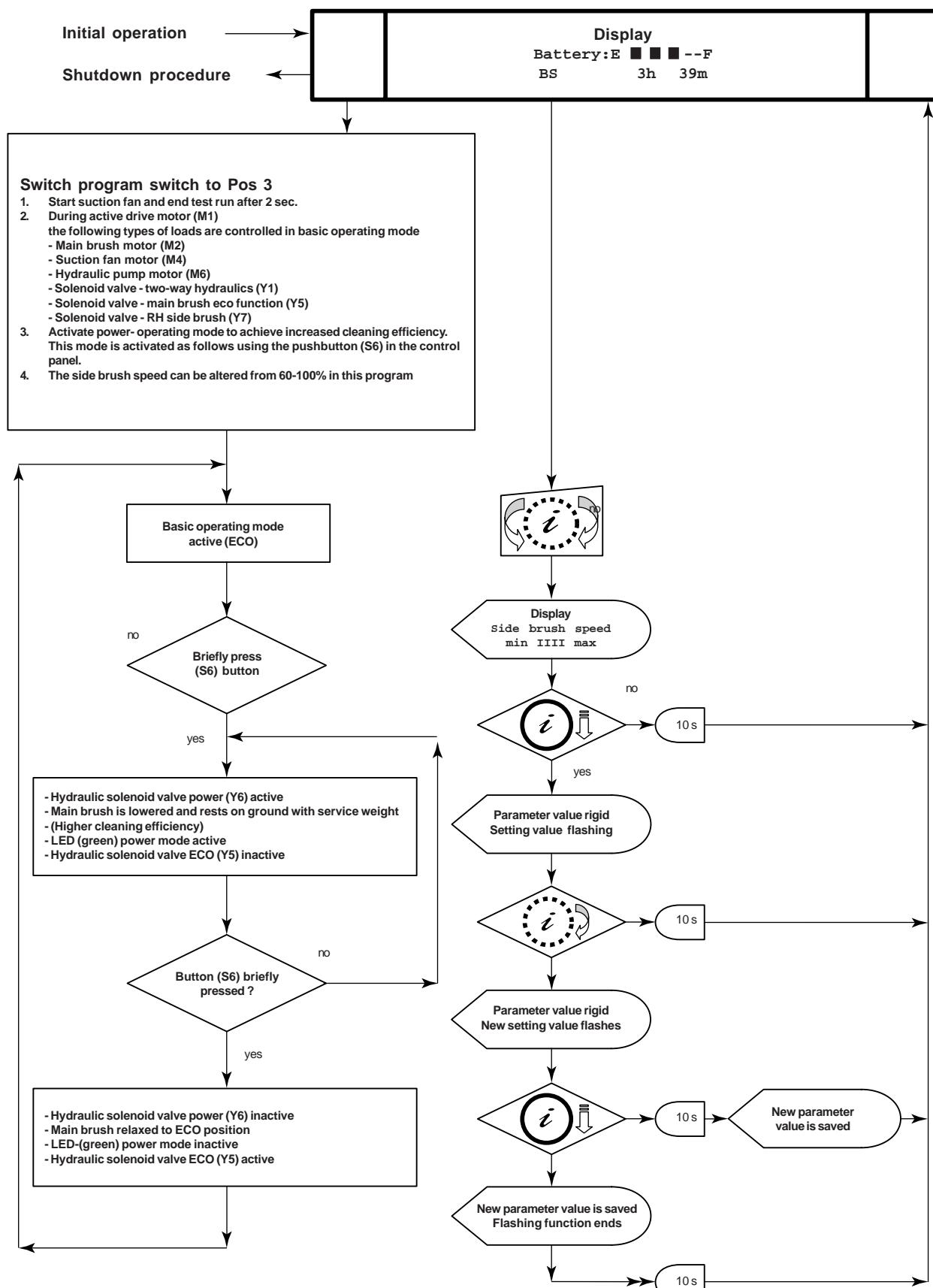
If the program is changed to drive (Pos 1) or switch off unit using the program switch (S8), filter cleaning is activated. The filter cleaning period is 17 sec, during which the green LED (Pos 6 in accordance with BTA) in the control panel flashes.

### 3.3 Sweeping

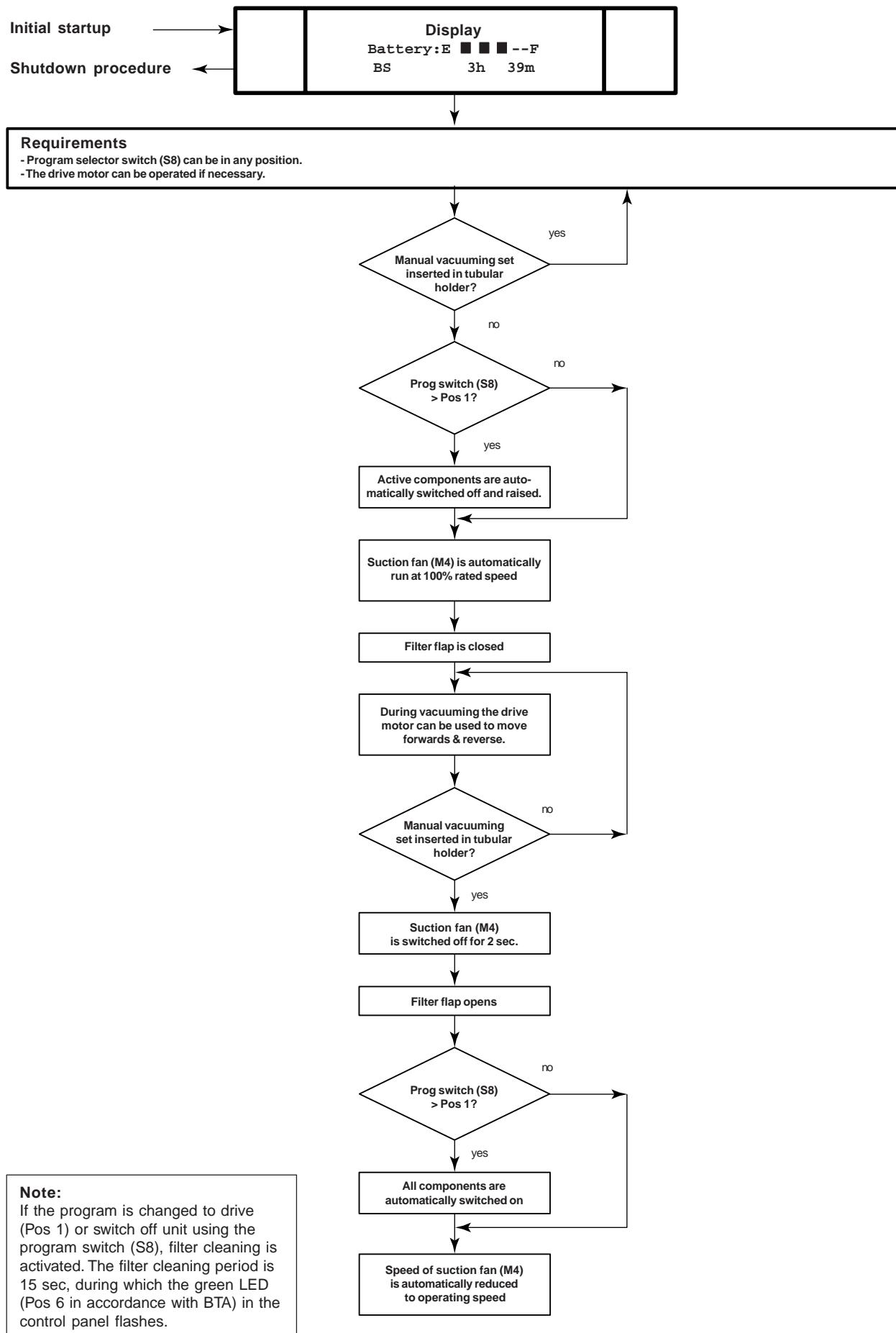
**Note:**

Filter cleaning is activated if the program is changed to drive(Pos 1) or switch off unit using the program switch (S8). The filter cleaning time is approx 17 sec; during which the green LED (item 6 in accordance with BTA) in the control panel flashes.

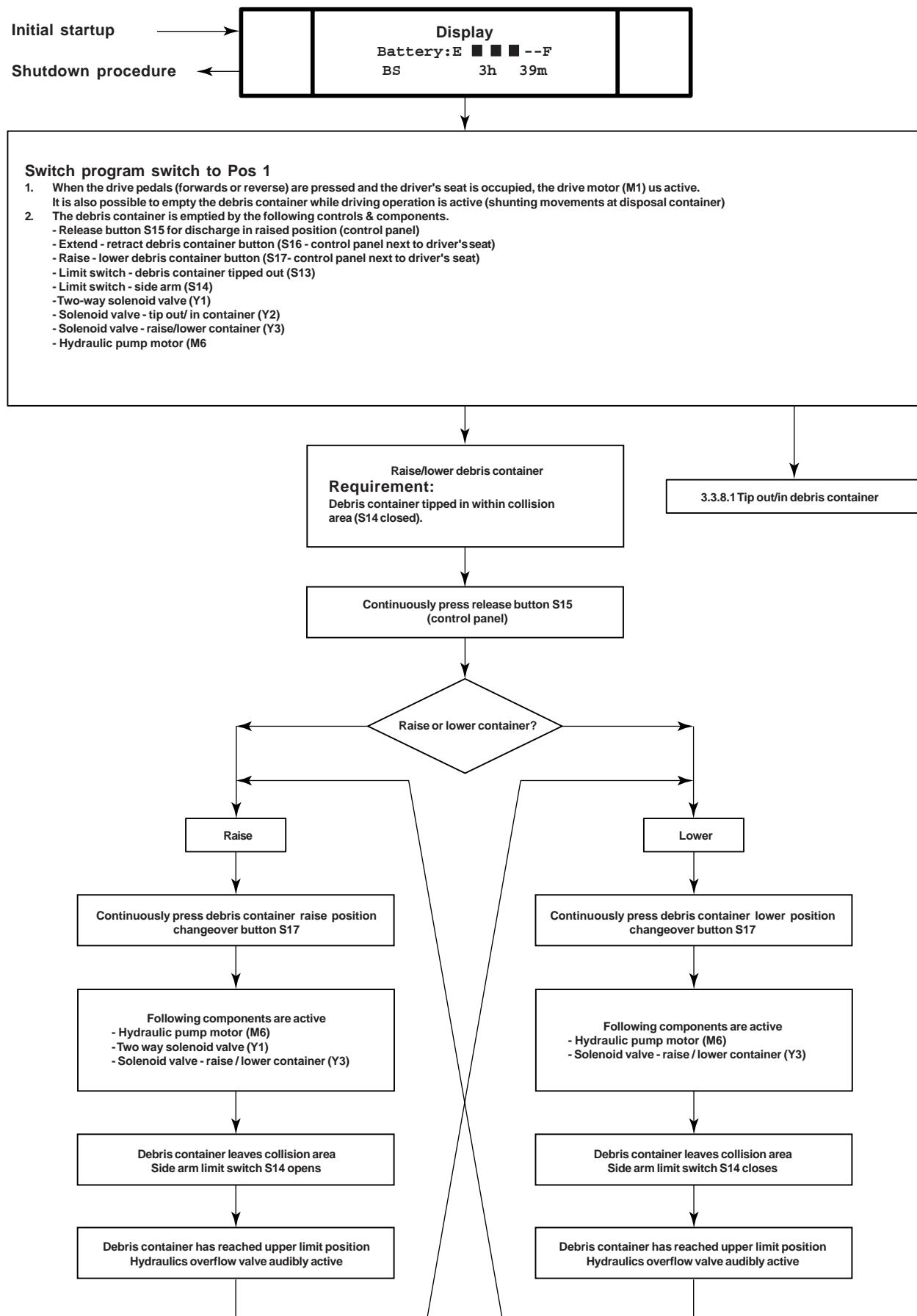
### 3.4 Sweeping with rhs side brush



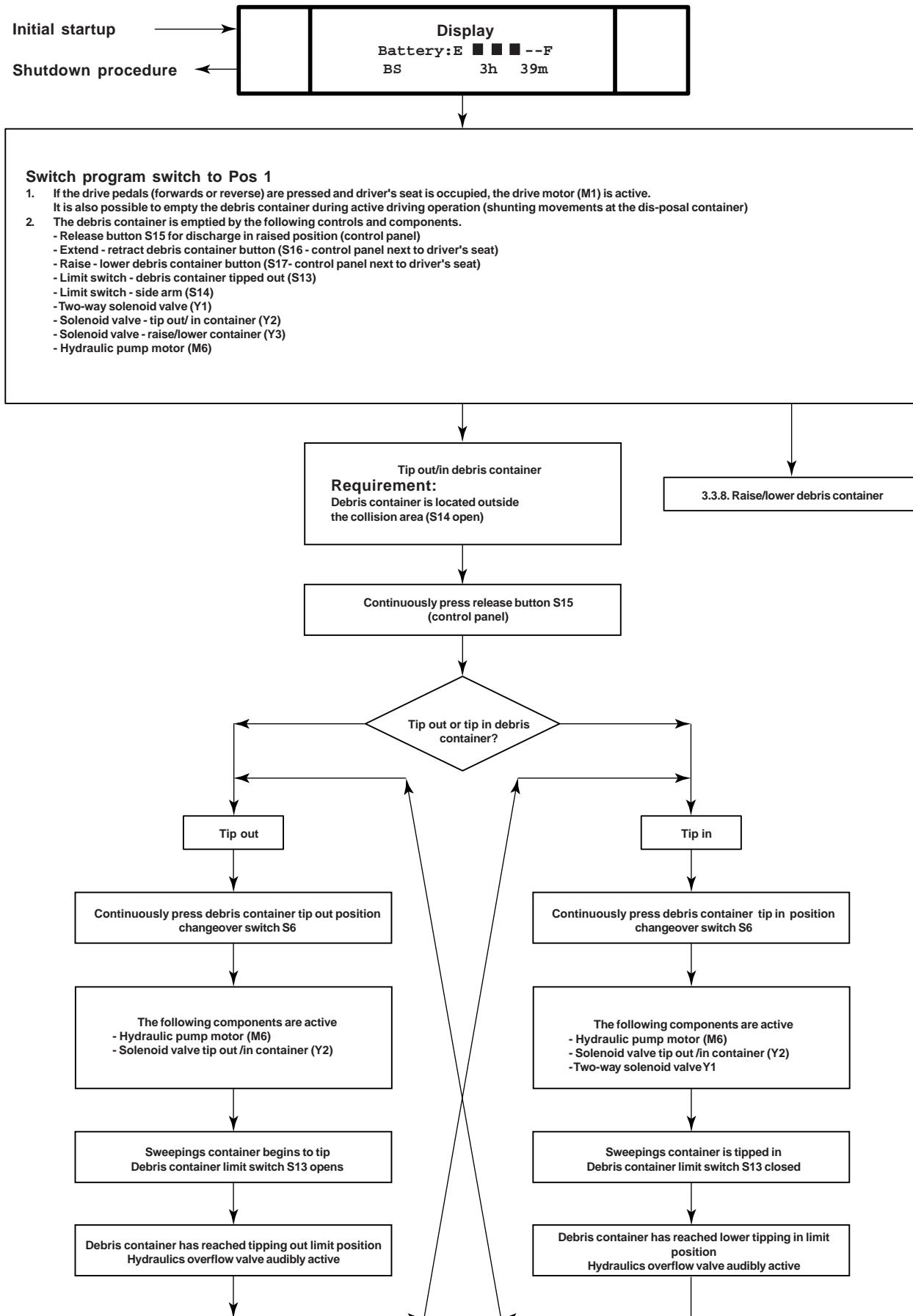
### 3.5 Manual vacuuming



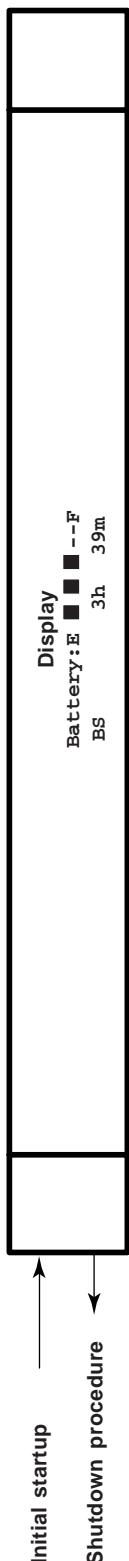
### 3.6 Emptying waste container



### 3.6 Emptying waste container



### 3.6 Emptying waste container



**Function Tables**

<b>Debris container</b> Limit switch- (S13)	<b>Side arm</b> Limit switch- (S14)	<b>Activity</b>				<b>Display</b>	<b>Notes</b>
		Raise	Lower	Tip in	Tip out		
0	0	Yes	Yes	Yes	Yes		
0	1	Yes	No	No	No	Tip in Container	active
1	0	Yes	Yes	Yes	Yes		
1	1	Yes	Yes	Yes	No	Tipping out not possible	

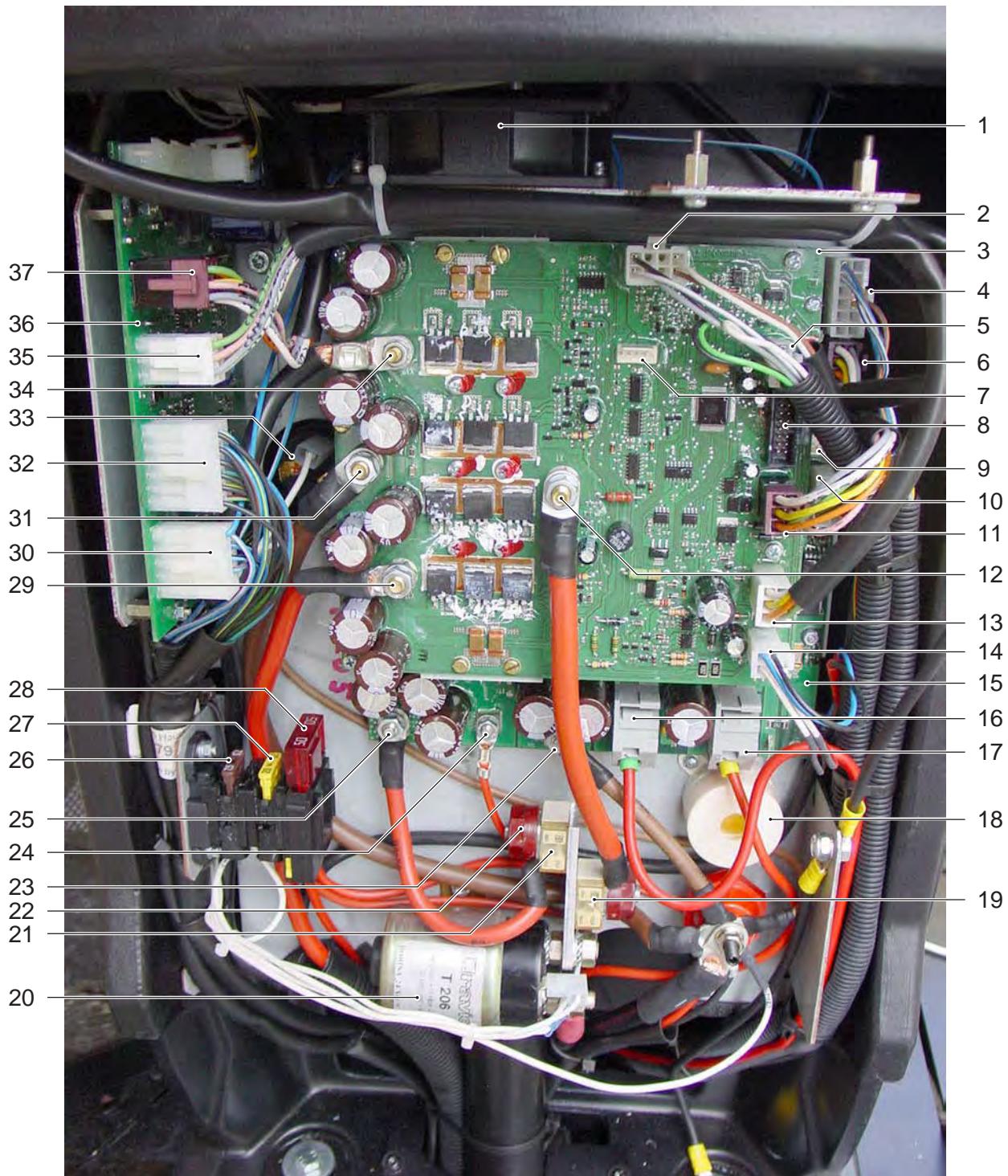
**Key:**

- 0 = Debris container tipped out, limit switch S13 open
- 1 = Debris container tipped in, limit switch S13 closed
- 0 = Side arm outside collision area, limit switch S14 open
- 1 = Side arm within collision area, limit switch S14 closed

**Note**

Program switch (S8) > Pos 1 and empty debris container: NOT possible: „Discharge in raised position in drive mode only“ (Display). Switch program switch (S8) from Pos 2 to Pos 1: Components are stopped. Discharge in raised position possible with approx 3 sec delay.

#### 4.1 Electronics, front cover removed



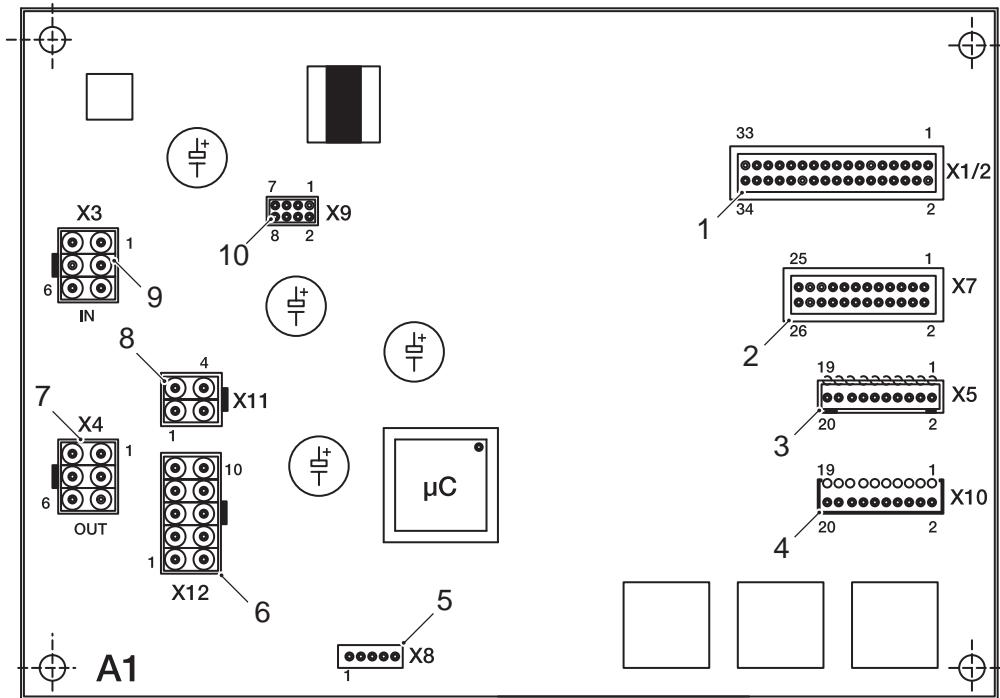
## 4.1 Electronics, front cover removed

- 1 Cooling fan electronics
- 2 Terminal strip (X5/A2), seat contact sensor and travel direction switch
- 3 Printed circuit board (A2), driving module
- 4 Terminal strip (X7/A3), microswitch manual vacuuming set (optional) (S12), limit switch - debris container tipped out (S13), side arm limit switch (S14)
- 5 Terminal strip (X4/A2), drive pedal magnetic sensor (B1)
- 6 Terminal strip (X2/A3), DATA OUT A3:A5
- 7 Terminal strip (X2/A2), not used
- 8 Terminal strip (X3/A2), not used
- 9 Terminal strip (X3/A3), not used
- 10 Terminal strip (X4/A3), DATA OUT A3:A6, filter shaker motor (M8)
- 11 Terminal strip (X8/A2), DATA OUT A2:A3
- 12 Connecting terminal (X1/A2) battery positive pole via fuse (F2)
- 13 Terminal strip (X7/A2), DATA IN A1:A2
- 14 Terminal strip (X6/A2), horn (H1), magnetic brake (Y0)
- 15 Printed circuit board (A3), cleaning module
- 16 Connecting terminal (X8/A3), main brush motor (M2)
- 17 Connecting terminal (X10/A3), blower motor (M4)
- 18 Horn (H1)
- 19 Fuse 150 A (for 180 A module), or 125 A (for 125 A module) (F2), driving module (A2)
- 20 Main relay (K1)
- 21 Fuse 100 A (F3), for cleaning module
- 22 Insulating nut
- 23 Connecting terminal (X5/A3), battery negative pole
- 24 Connecting terminal (X13/A3), right side brush motor (M3)
- 25 Connecting terminal (X6/A3) battery positive pole via fuse (F3)
- 26 Fuse 7.5 A (F1) CPU module head
- 27 Fuse 20 A (F6), accessories module
- 28 Fuse 50 A (F5), hydraulic pump motor (M6)
- 29 Connecting terminal (X11/A2), drive motor positive pole (M1)
- 30 Connecting strip (X5/A5), debris container emptying button
- 31 Connecting strip (X10/A2), battery negative pole
- 32 Terminal strip (X4/A5), solenoid valves Y1, Y2, Y3, Y5, Y6, Y7
- 33 Key switch (S0)
- 34 Connecting terminal (X12/A2), drive motor negative pole (M1)
- 35 Terminal strip (X2/A5), DATA IN A3:A5
- 36 Printed circuit board (A5), accessories module
- 37 Terminal strip (X3/A5), DATA OUT A5:A1

**Tightening torques:**

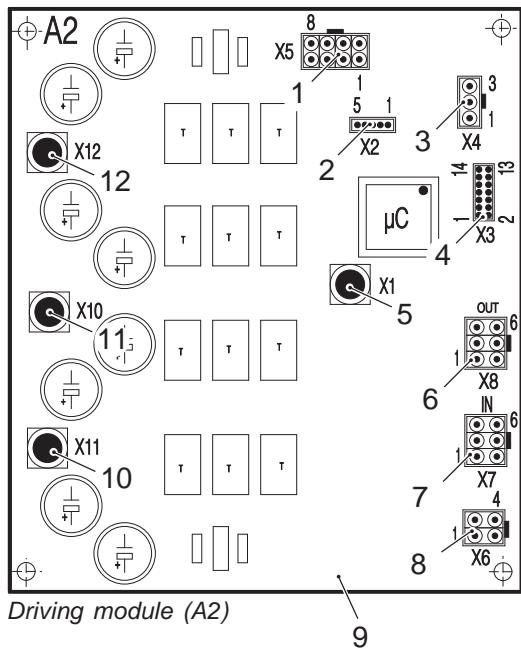
Insulating nut (22): 12.0 Nm

## 4.2 CPU head module (A1)

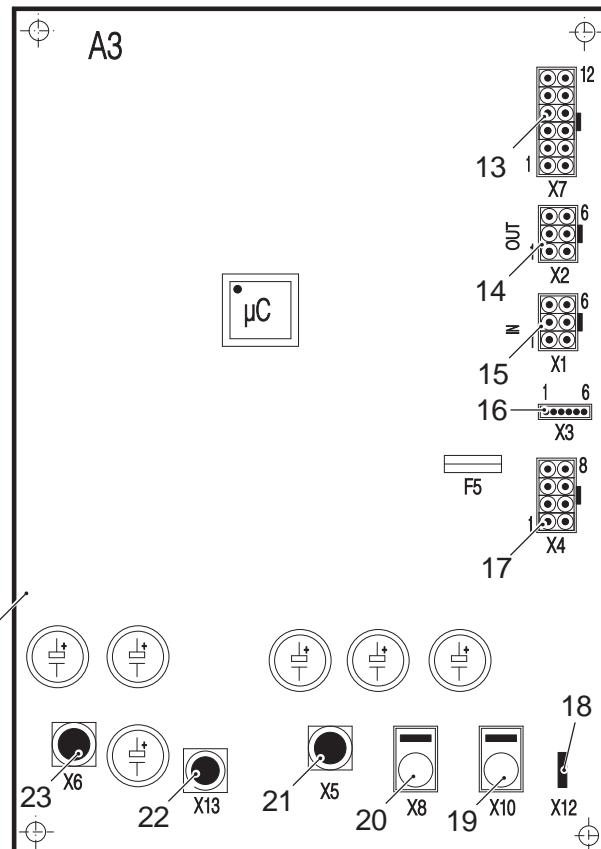


- 1 Terminal strip (X1/2/A1), LCD
- 2 Terminal strip (X7/A1), LCD
- 3 Terminal strip (X5/A1), control panel switch/button
- 4 Terminal strip (X10/A1), program switch
- 5 Terminal strip (X8/A1), not used
- 6 Terminal strip (X12/A1), cooling filter electronics (M7), key switch (S0) and emergency stop button (S1)
- 7 Terminal strip (X4/A1), DATA OUT A1:A2
- 8 Terminal strip (X11/A1), main relay (K1), battery positive pole, battery minus pole
- 9 Terminal strip (X3/A1), DATA IN A1:A5
- 10 Terminal strip (X9/A1), not used

### 4.3 Driving module (A2) and cleaning module (A3)



- 1 Terminal strip (X5/A2), seat contact sensor and travel direction switch
- 2 Terminal strip (X2/A2), not used
- 3 Terminal strip (X4/A2), drive pedal magnetic sensor (B1)
- 4 Terminal strip (X3/A2), not used
- 5 Connecting terminal (X1/A2) battery positive pole via fuse (F2)
- 6 Terminal strip (X8/A2), DATA OUT A2:A3
- 7 Terminal strip (X7/A2), DATA IN A1:A2
- 8 Terminal strip (X6/A2), horn (H1), magnetic brake (Y0)
- 9 Printed circuit board (A2), driving module
- 10 Connecting terminal (X11/A2), drive motor positive pole (M1)
- 11 Connecting strip (X10/A2), GND
- 12 Connecting terminal (X12/A2), drive motor negative pole (M1)
- 13 Terminal strip (X7/A3), microswitch manual vacuuming set (optional) (S12), limit switch - debris container tipped out (S13), side arm limit switch (S14)
- 14 Terminal strip (X2/A3), DATA OUT A3:A5
- 15 Terminal strip (X1/A3), DATA IN A2:A3
- 16 Terminal strip (X3/A3), not used
- 17 Terminal strip (X4/A3), DATA OUT A3:A6, filter shaker motor (M8)
- 18 Connection (X12/A3), left side brush motor (M5) (optional)
- 19 Connecting terminal (X10/A3), blower motor (M4)



Cleaning module (A3)

- 20 Connecting terminal (X8/A3), main brush motor (M2)
- 21 Connecting terminal (X5/A3), GND
- 22 Connecting terminal (X13/A3), right side brush motor (M3)
- 23 Connecting terminal (X6/A3) battery positive pole via fuse (F3)
- 24 Printed circuit board (A3), cleaning module

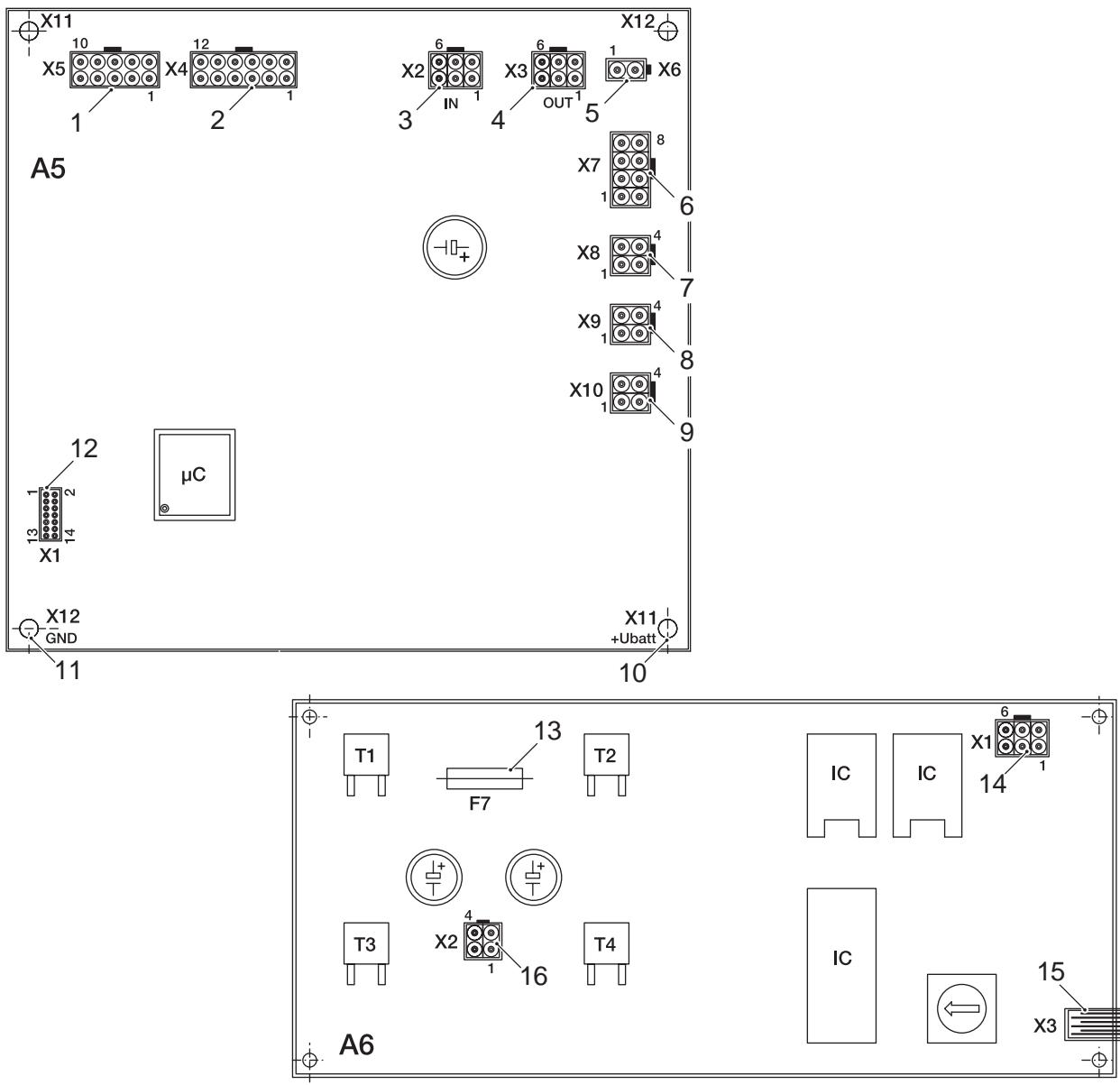
#### Note:

Connections on the relevant terminal strips and output values for fuses - see circuit diagram 0.088-875.

#### Tightening torques:

M5 (press-fitted connection) (22):	2.2 Nm
M5 (plug in connection) (5), (10), (11):	4.0 Nm
M6 (press-fitted connection) (21), (23):	3.9 Nm
M6 (plug in connection) (12):	4.0 Nm
M8 threaded bolt:	5.5 Nm
M10 threaded bolt:	17.0 Nm

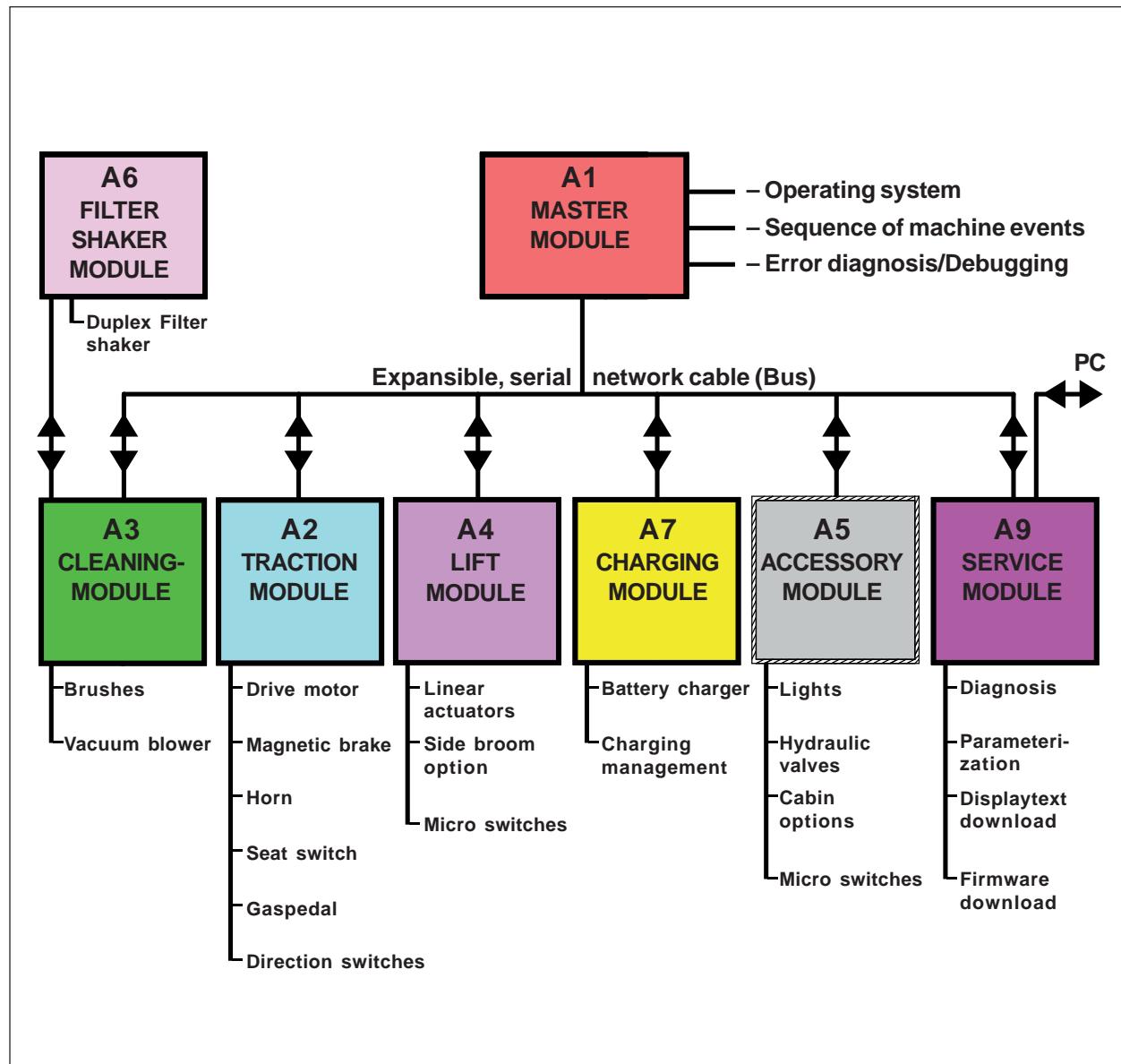
## 4.4 Accessories module (A5) and filter cleaning module (A6)



- 1 Connecting strip (X5/A5), debris container emptying button
- 2 Terminal strip (X4/A5), solenoid valves Y1, Y2, Y3, Y5, Y6, Y7
- 3 Terminal strip (X2/A5), DATA IN A3:A5
- 4 Terminal strip (X3/A5), DATA OUT A5:A1
- 5 Terminal strip (X6/A5), beacon light (optional)
- 6 Terminal strip (X7/A5), not used
- 7 Terminal strip (X8/A5), left side brush solenoid valve (Y8) (optional)
- 8 Terminal strip (X9/A5), working lamps (H3, H3.1)
- 9 Terminal strip (X10/A5), motor filter flap (M9) (optional)
- 10 Connecting terminal (X11/A5), battery positive pole
- 11 Connecting terminal (X12/A5), battery negative pole
- 12 Terminal strip (X1/A5), not used
- 13 Fuse 10 A (F7), filter cleaning module
- 14 Terminal strip (X1/A6), DATA IN A3:A6
- 15 Terminal strip (X3/A6), not used
- 16 Terminal strip (X2/A6), battery positive pole, battery negative pole, filter shaker motor (M8) (in duplex filter function only)

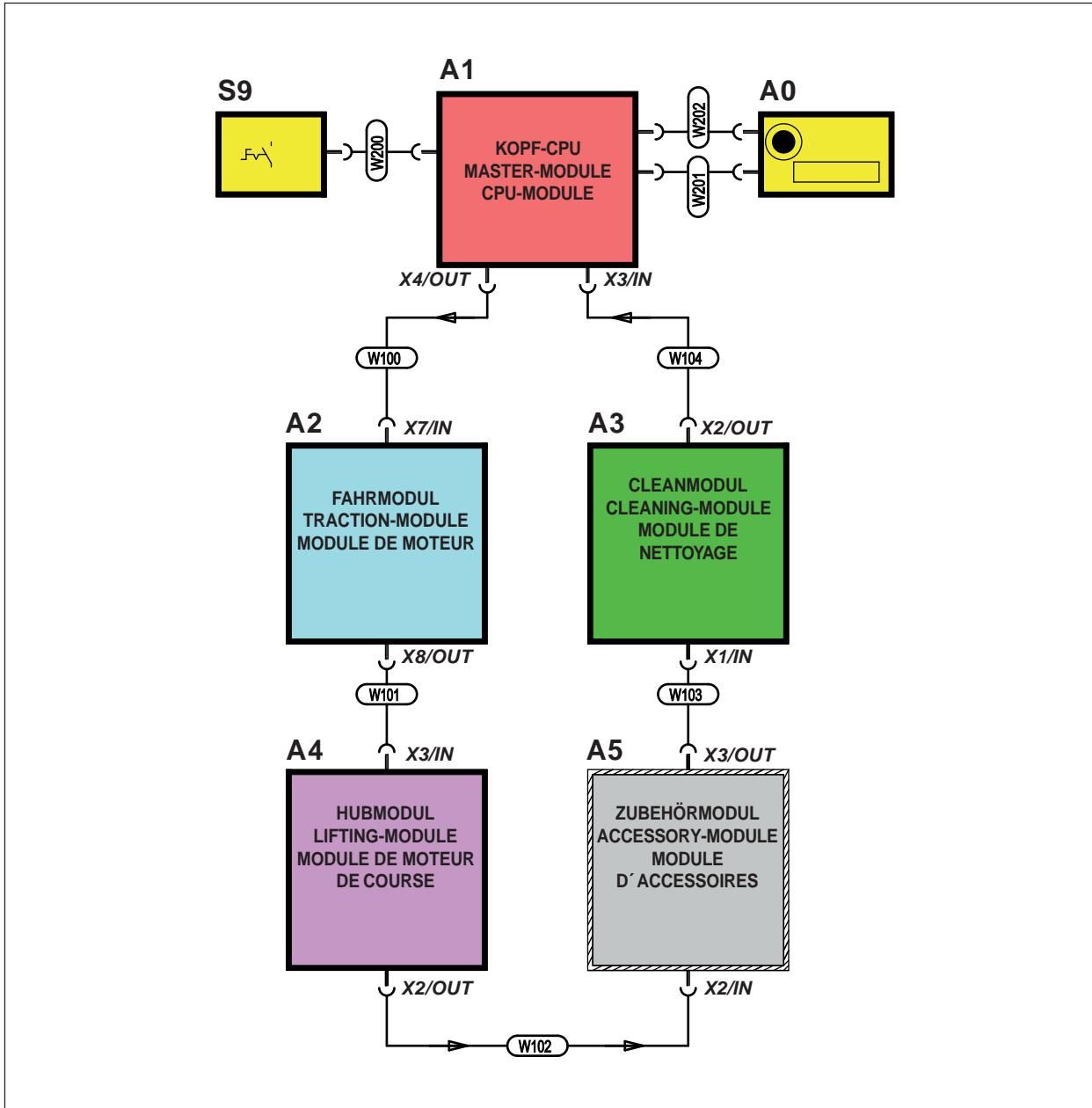
## 4.5 Modular electronic control circuits

### Module networking



Module cross-linking with all options and service module

### 4.5.1 Modular system (Standard version)



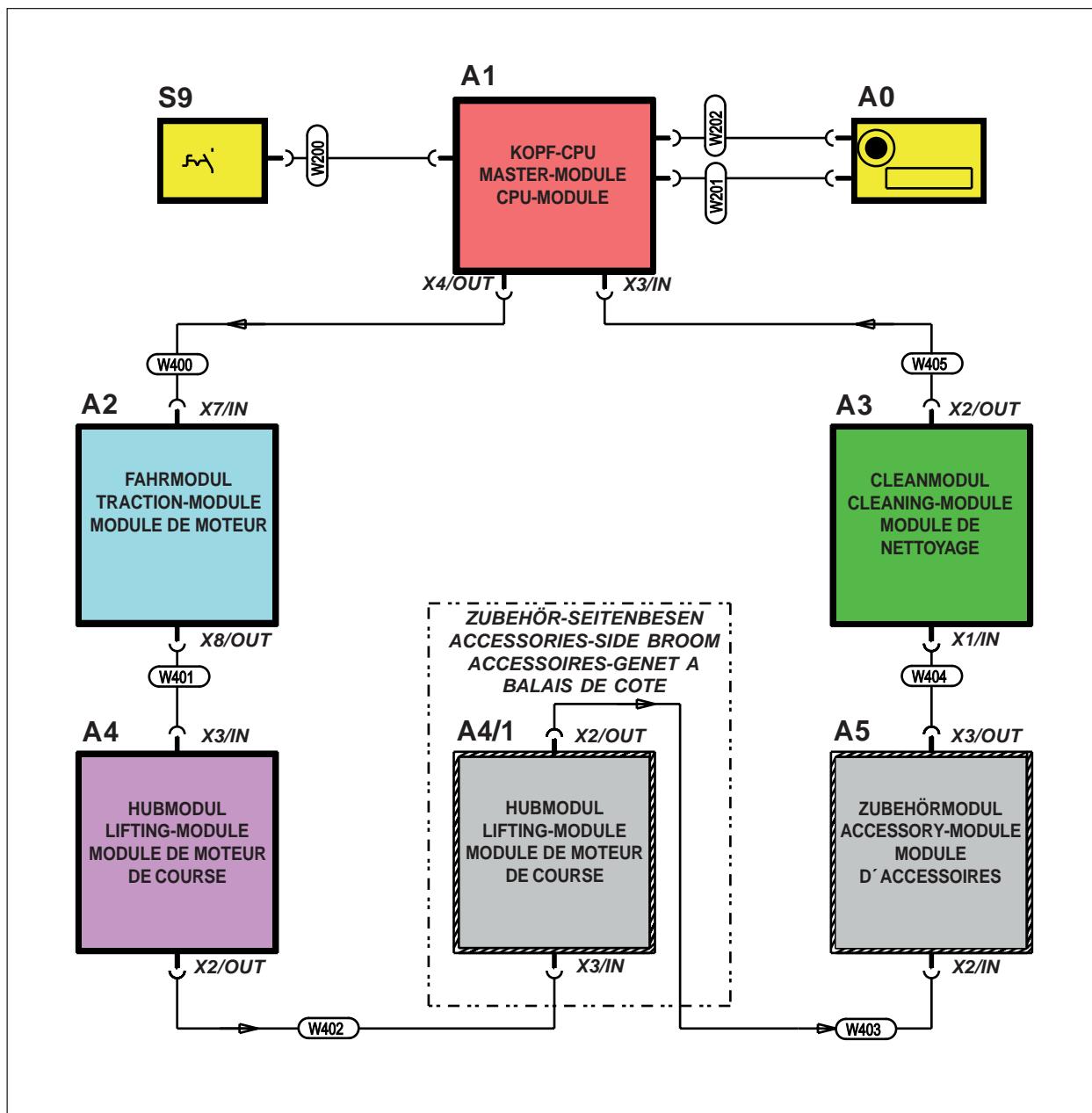
Kärcher bus with RS 485 communication core

— Basic unit

/// Accessories

**Wxxx** Kärcher bus cable 1:1, (6-pin, with integrated RS 485 bus system)

#### 4.5.2 Modular system with side brush (optional)



Kärcher bus with RS 485 communication core



Basic unit

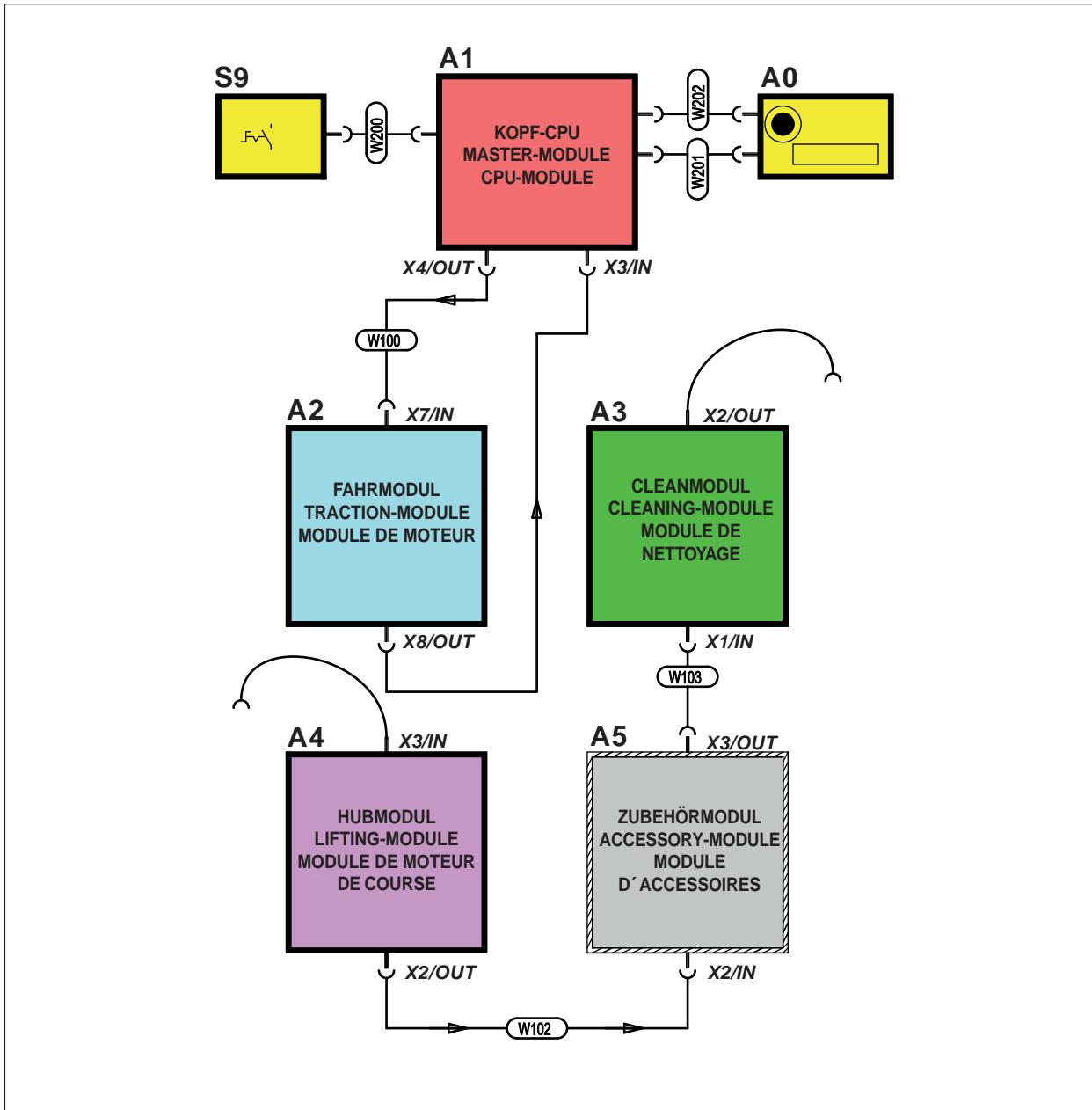


Accessories



Kärcher bus cable 1:1, (6-pin, with integrated RS 485 bus system)

### 4.5.3 Emergency operation (driving)



Kärcher bus with RS 485 communication core

— Basic unit

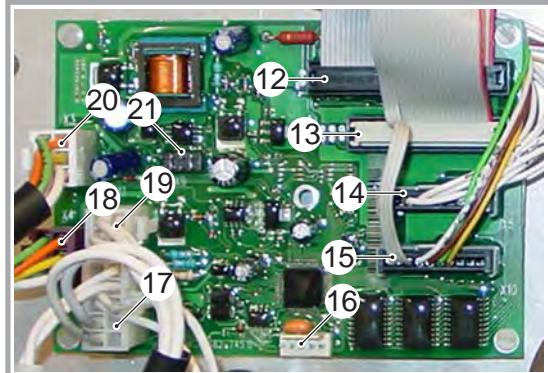
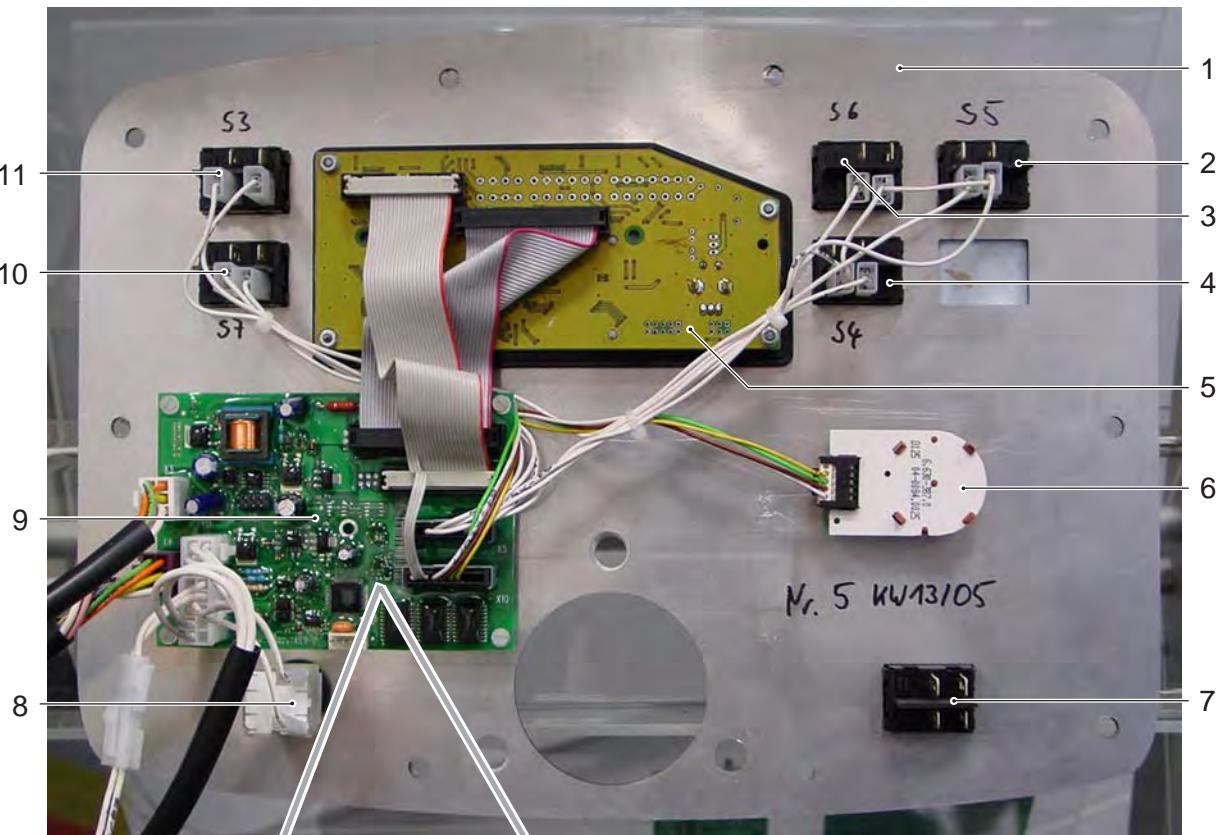
~~~~~ Accessories

**Wxxx** Kärcher bus cable 1:1, (6-pin, with integrated RS 485 bus system)

**Note:**

If modules are defective (e.g. A3, A4, A5) the unit can be driven if the driving module (A2) is directly connected to the head CPU module (A1) (see figure). Before this, however, the fuses must be removed from the connected modules (here A3, A4, A5).

## 4.6 Control panel from underneath



CPU head module (A1)

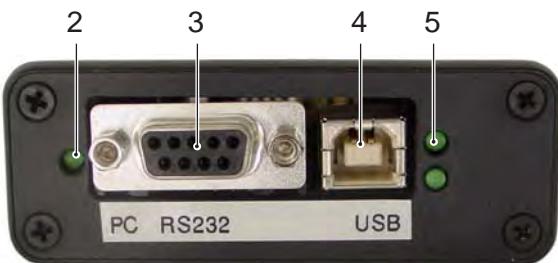
- 1 Cover, control panel
- 2 Rocker button, filter cleaning (S5)
- 3 Rocker button, floating/rigid main brush roller (S6)
- 4 Rocker button, wet cleaning mode (S4)
- 5 Info module with display, LED displays and info button
- 6 Program selector switch (S8)
- 7 Rocker button, debris container, two-hand operation (S15)
- 8 EMERGENCY STOP button (S1)
- 9 CPU head module (A1)

- 10 Rocker button, horn (S7)
- 11 Rocker button, headlight (S3)
- 12 Terminal strip (X1/2/A1), LCD
- 13 Terminal strip (X7/A1), LCD
- 14 Terminal strip (X5/A1), control panel switch/button
- 15 Terminal strip (X10/A1), program switch
- 16 Terminal strip (X8/A1), not used
- 17 Terminal strip (X12/A1), cooling filter electronics (M7), key switch (S0) and emergency stop button (S1)
- 18 Terminal strip (X4/A1), DATA OUT A1:A2
- 19 Terminal strip (X11/A1), main relay (K1), battery positive pole, battery minus pole
- 20 Terminal strip (X3/A1), DATA IN A1:A5
- 21 Terminal strip (X9/A1), not used

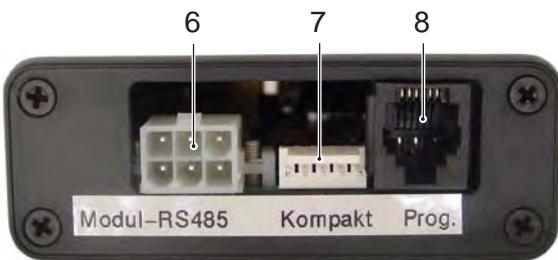
## 4.7 Service module (A9)



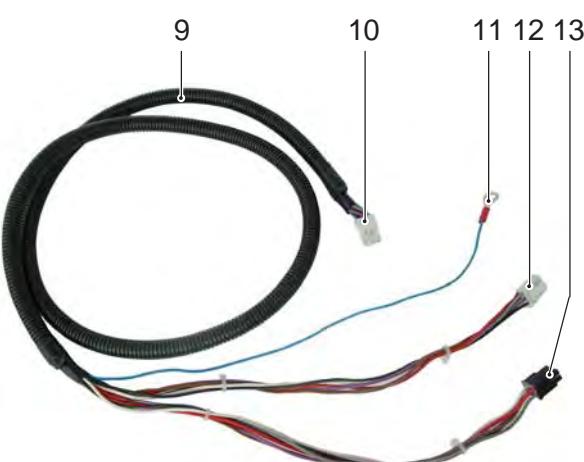
Service module (A9)



Service module (A9), view from the left



Service module (A9), view from the right



Connection cable

### Service module (A9)

The service module (A9) can be used to diagnose a unit to find errors and faults.

It is used for parameterisation, display adjustment and for downloading the firmware.

- The service module (A9) does not require a separate power supply. It is supplied with power via the ports X1 (6) or X2 (7).
- If the RS232 (3) and USB-B (4) connections of the service module (A9) are used simultaneously the RS 232 connection (3) is deactivated.

### Scope of supply - service package (2.816-117.0):

- Service module (A9)
- Software
- Connection cable for connecting to the existing module bus
- RS232 cable for operating systems Win 95-98
- USB cable for operating systems WIN 98 USB 2.0, WIN 2000, WIN XP
- Operating instructions

1 Service module (A9)

2 Power ON LED, flashes if successfully addressed by A1

3 RS232 connection (for operating systems Win 95-98, NT)

4 USB-B connection (for operating systems WIN 98 USB 2.0, WIN 2000, WIN XP)

5 Communication LEDs (USB bus)

6 Modified Kärcher module bus port X1

7 Expansion port X2 (not used)

8 Program plug for developers

9 Connection cable

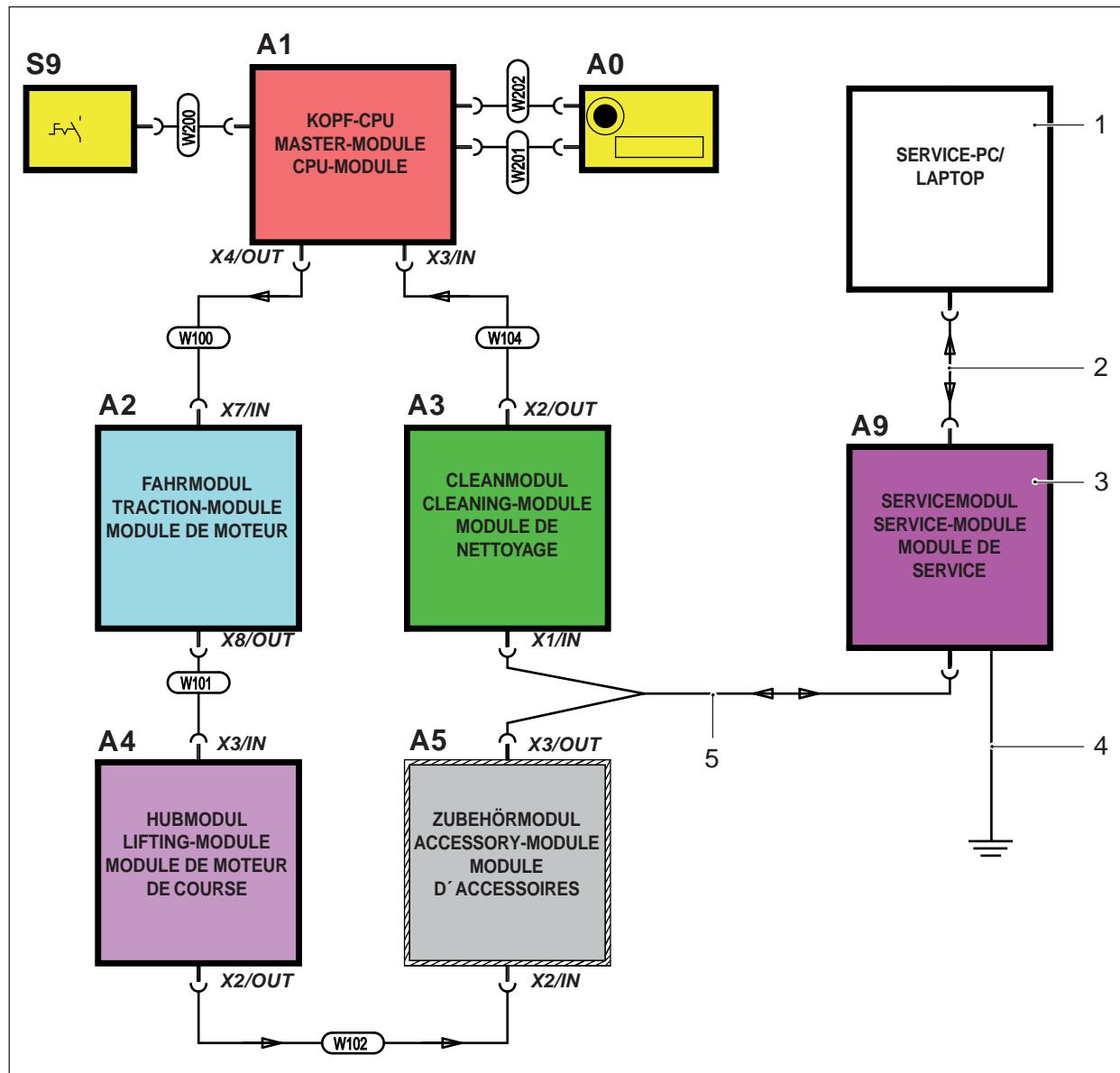
10 Connecting plug, connection to service module (A9) Item 6

11 Earth connection cable, connection to support point - battery negative post (see page 23, Item 31)

12 Connecting plug, connection to accessories module (A5), terminal strip X3/A5 (see page 26, Item 4)

13 Connecting plug, connection to cleaning module (A3), terminal strip X1/A3 (see page 25, Item 15)

#### 4.7.1 Service module (A9) Connection in module group



Kärcher bus with RS 485 communication core

1 Service-PC or laptop

2 Connection cable (USB or RS 232)

3 Service module (A9)

4 Earth connection (GND)

5 Connection cable

#### Note

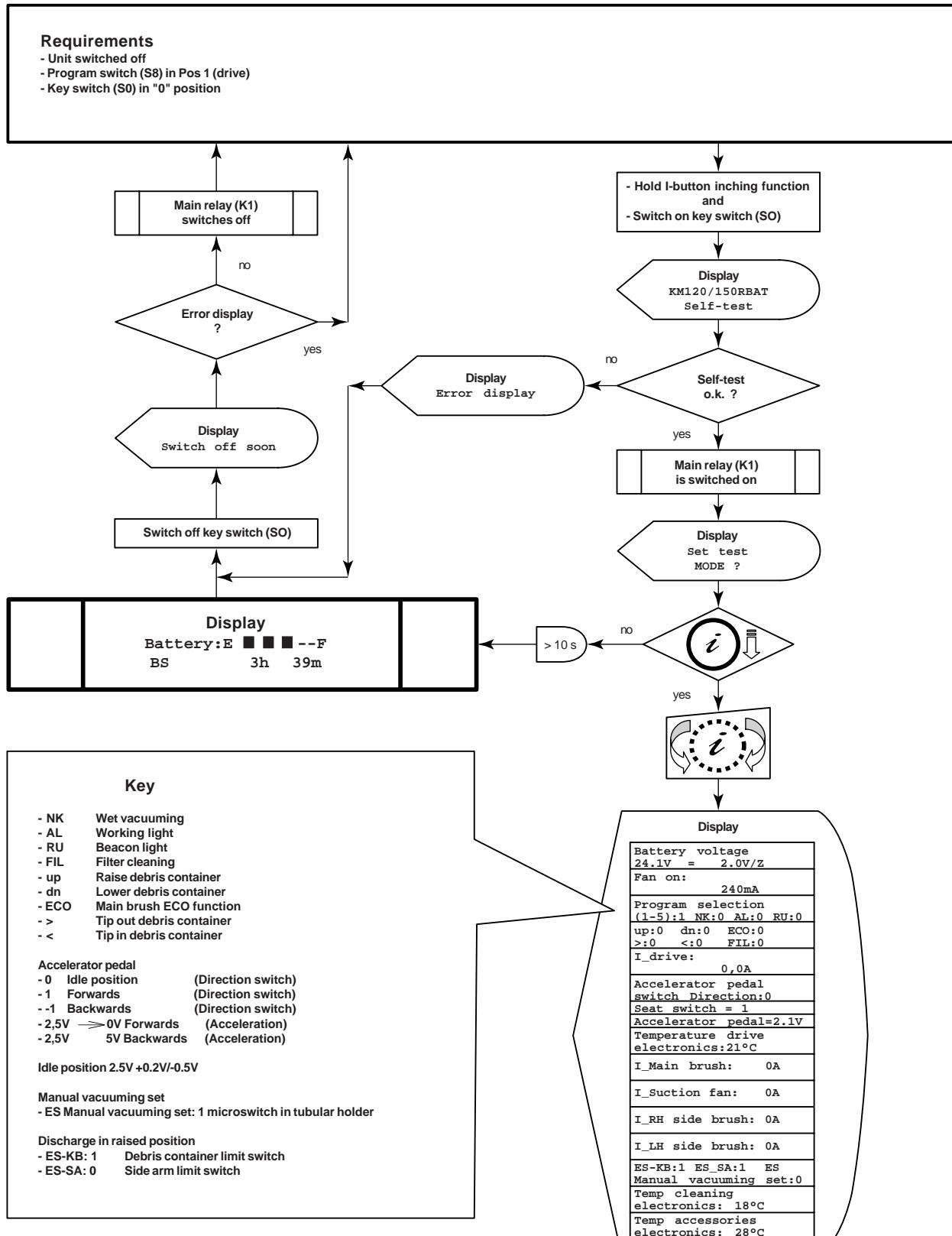
The service module (3) may only be used from a head CPU version 2.1.

If the earth connection is incorrectly connected or is not connected at all, the modules concerned (A1-A9) can be damaged or destroyed.

Separate documentation exists for the application software. The software is available via the Kärcher-Inside portal.

- The service module (3) can be integrated anywhere in the bus using the connection cable (5).
- The service module (3) can be used to connect a service PC or a laptop (1) for diagnosis purposes and parameterisation.
- The service module (3) requires its own earth connection (4) (see page 23, Item 31).

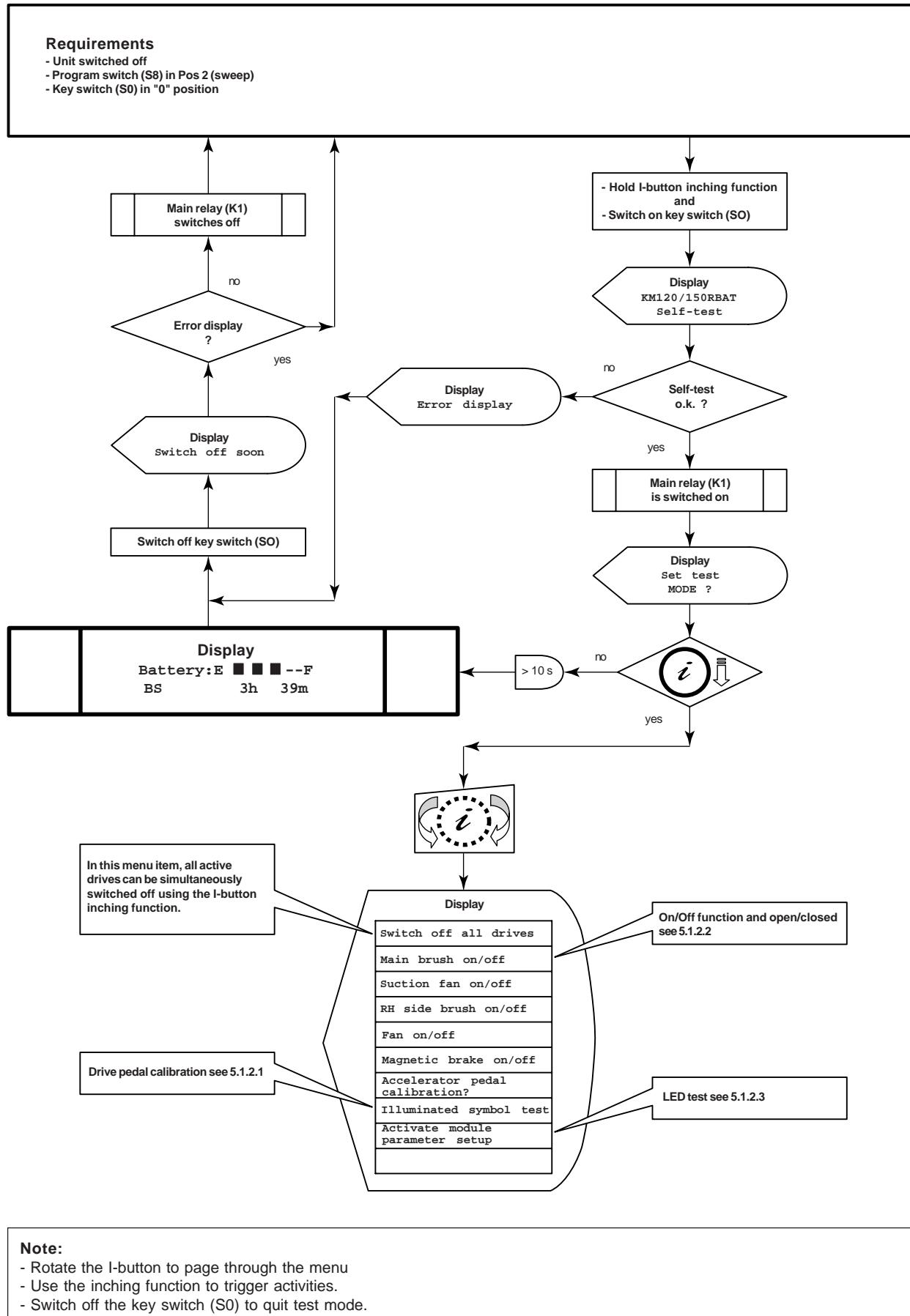
### 5.1.1 Access to test mode (S8 Item 1)

**Note:**

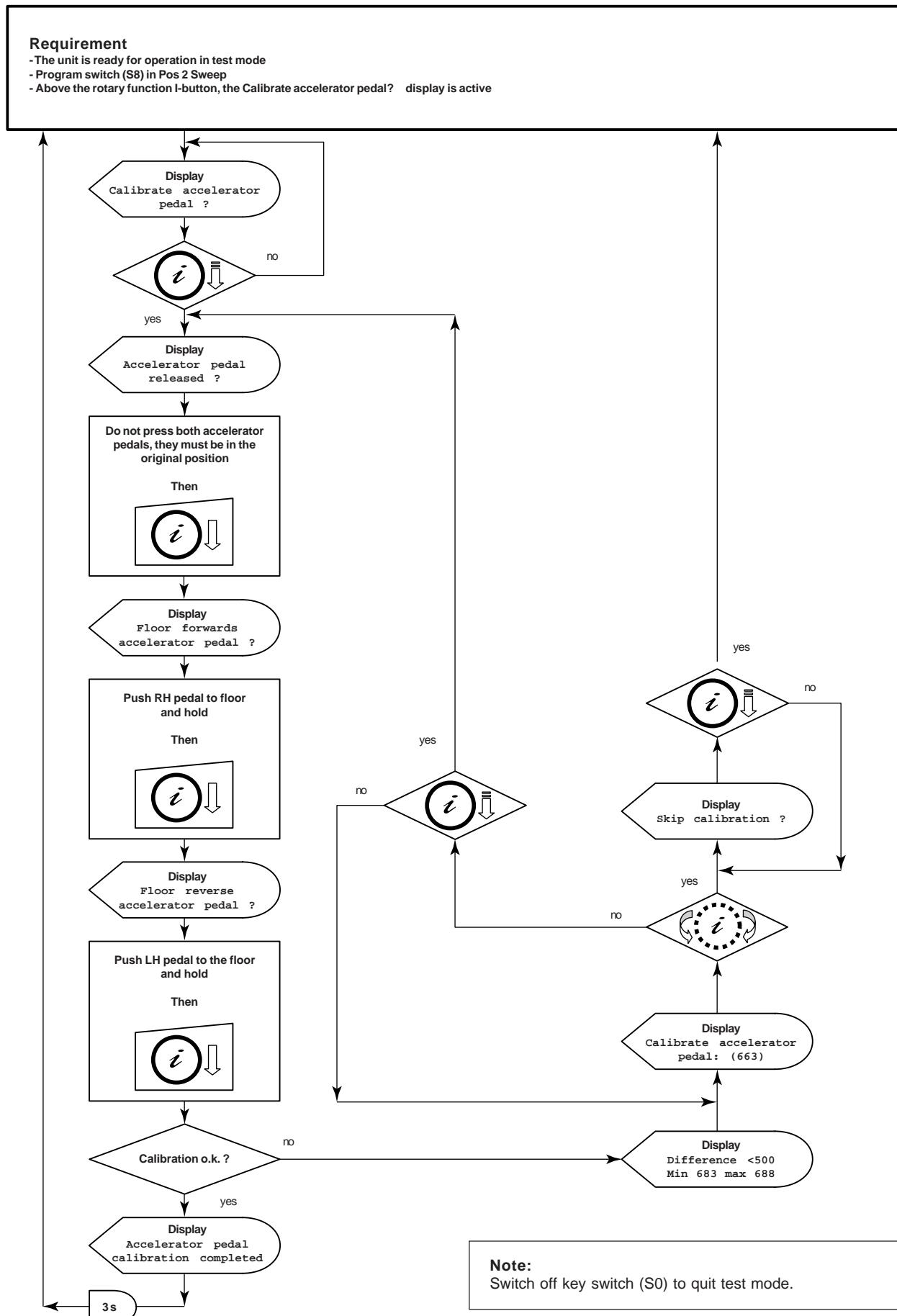
If the rotary pulse generator is turned in an anti-clockwise direction, the cursor acts in the opposite direction, i.e. the menu is called up from the last to the first parameter. The last saved cursor can be called up again after quitting the menu, e.g. by switching back to the standard display (battery display).

To quit test mode, switch off the key switch (S0).

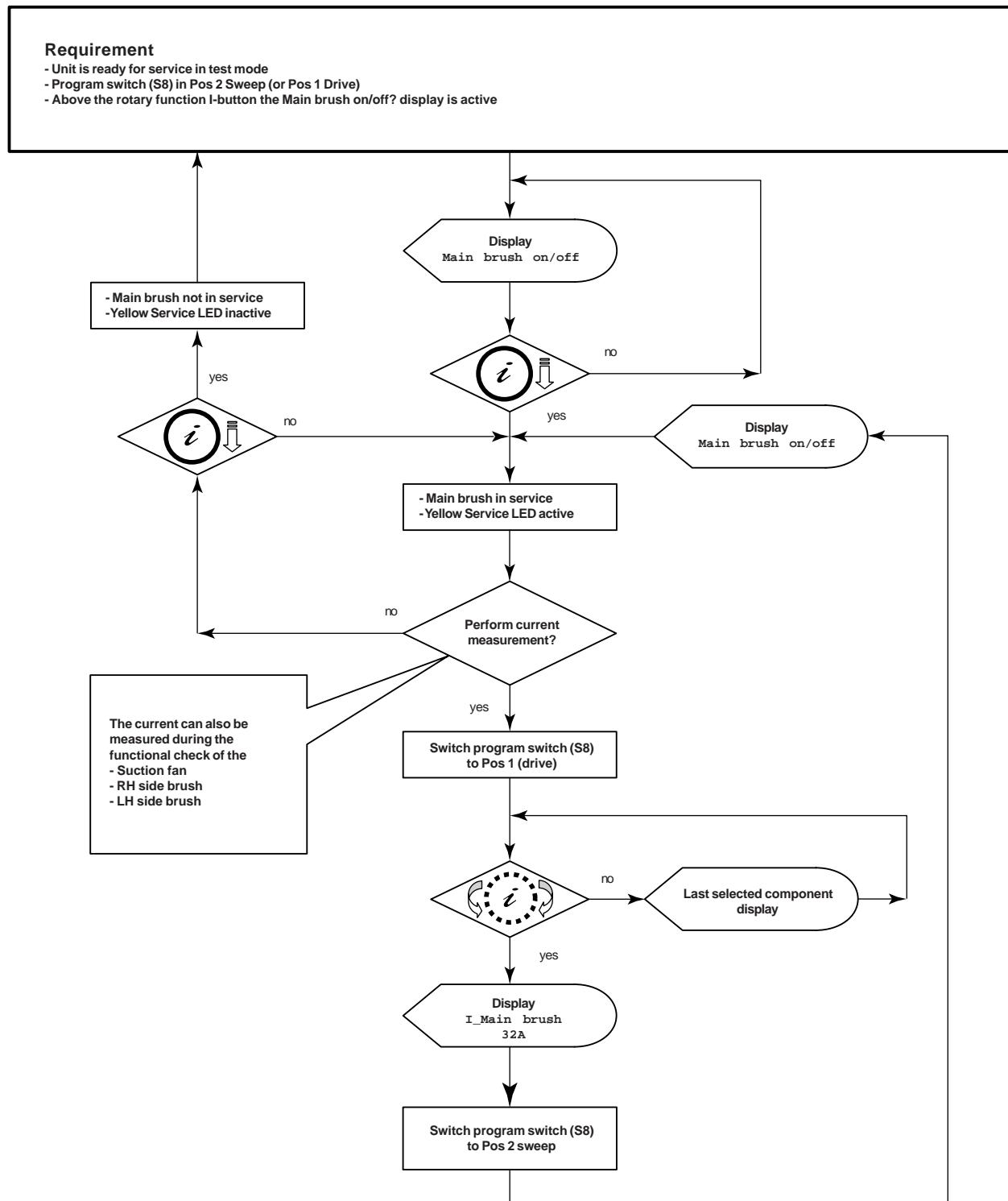
## 5.1.2 Access to test mode (S8 Item 2)



### 5.1.3 Access to test mode drive pedal calibration



### 5.1.4 Access to test mode on-off functions

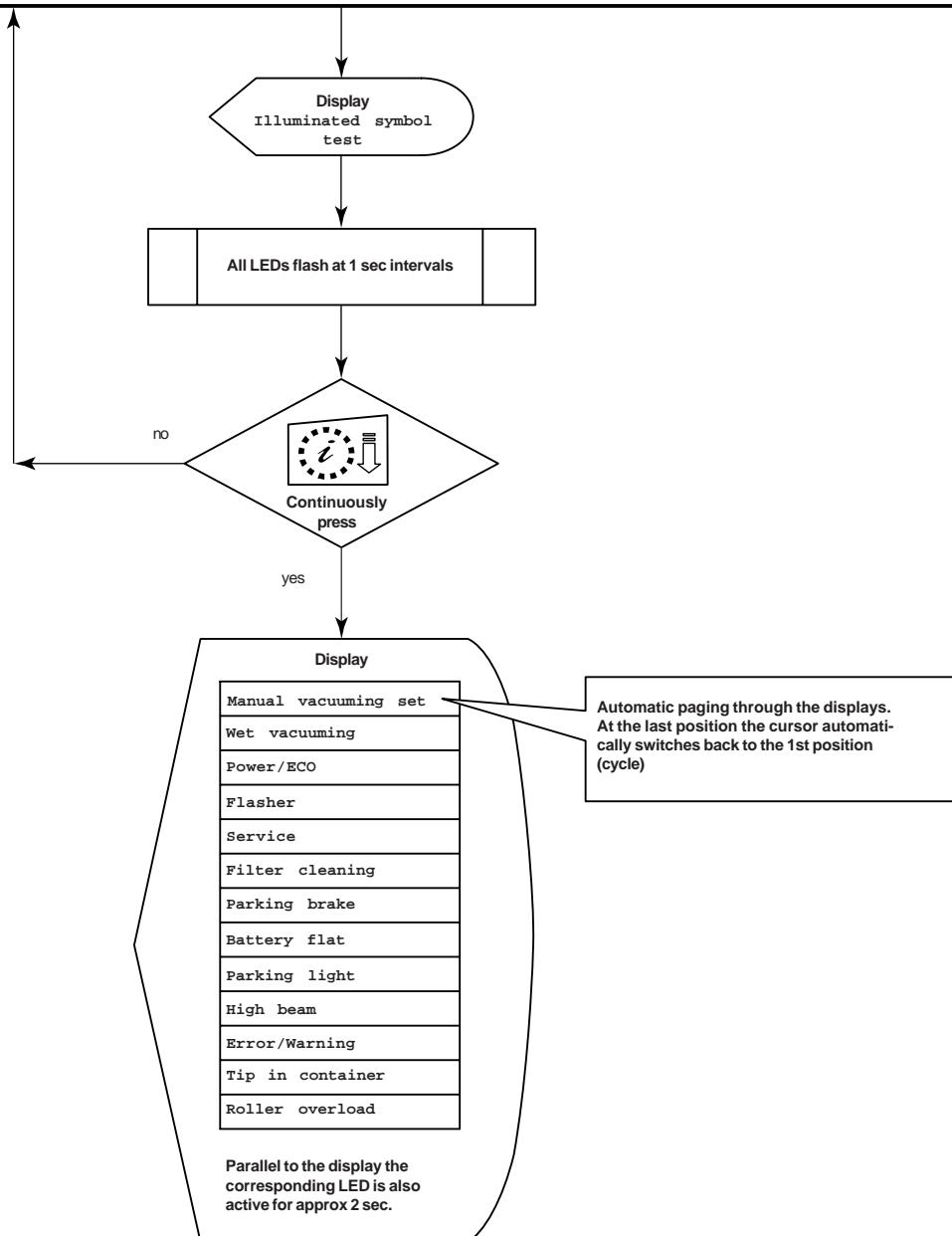


**Note:**  
Switch off key switch (S0) to quit test mode.

## 5.1.5 Access to test mode illuminated symbol test

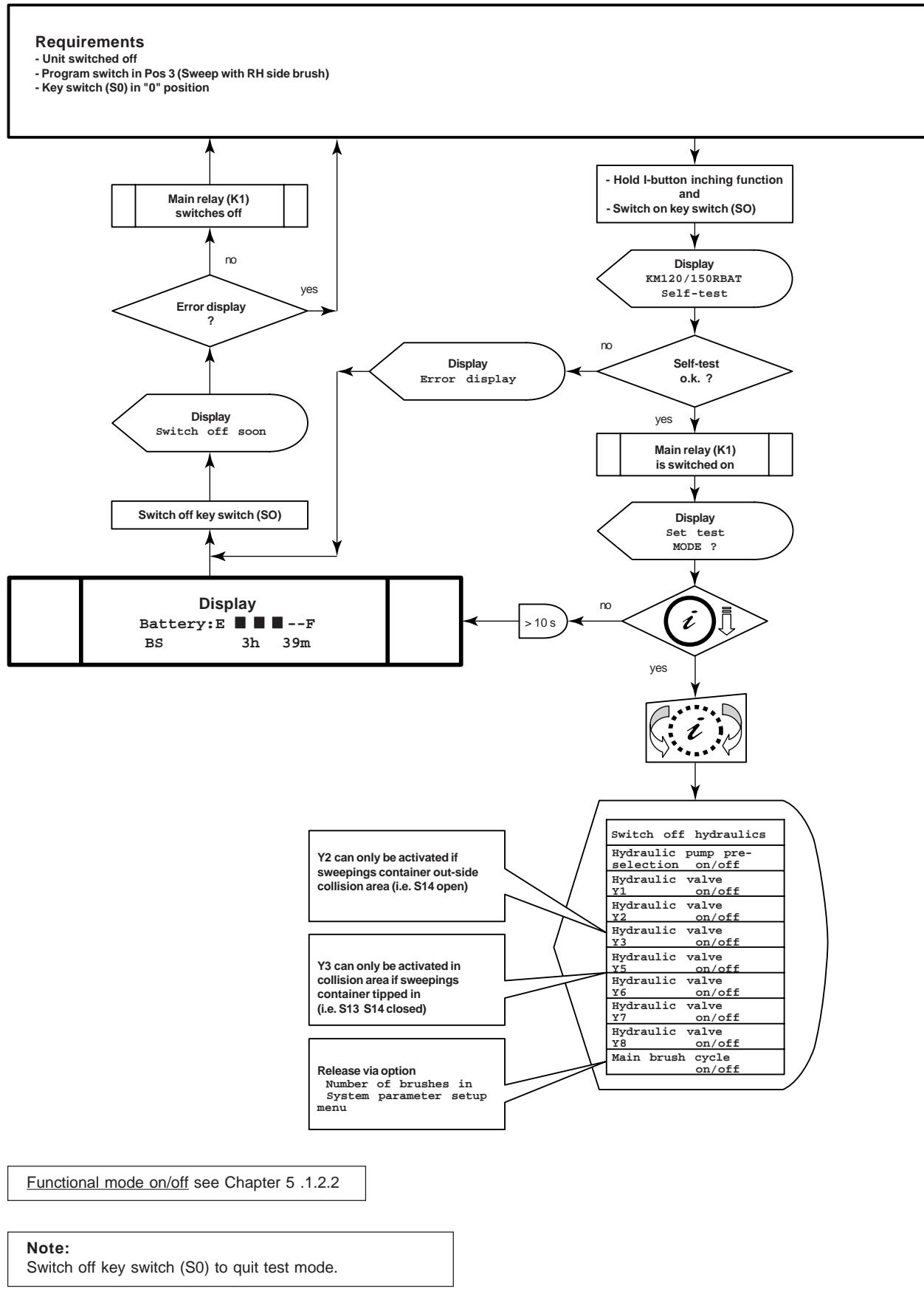
**Requirement**

- Unit is ready for service in test mode
- Program switch (S8) in Pos 2 Sweep
- Above the rotary function I-button the Illuminated symbol test display is active


**Note:**

Switch off key switch (S0) to quit test mode.

## 5.1.6 Access to test mode (S8 Item 3)



## 5.1.6 Access to test mode (S8 Item 3)

| Controlled components       | Y1 | Y2 | Y3 | Y5 | Y6 | Y7 | Y8 |
|-----------------------------|----|----|----|----|----|----|----|
| Raise sweepings container   | X  |    | X  |    |    |    |    |
| Lower sweepings container   |    |    | X  |    |    |    |    |
| Tip out sweepings container |    |    | X  |    |    |    |    |
| Tip in sweepings container  | X  | X  |    |    |    |    |    |
| Lower RH side brush         | X  |    |    |    |    | X  |    |
| Raise RH side brush         |    |    |    |    |    | X  |    |
| Lower LH side brush*        | X  |    |    |    |    |    | X  |
| Raise LH side brush*        |    |    |    |    |    |    | X  |
| Lower main brush in ECO     | X  |    |    | X  |    |    |    |
| Lower main brush in POWER   | X  |    |    |    | X  |    |    |
| Raise main brush            |    |    |    | X  | X  |    |    |

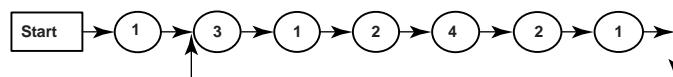
**Key**

\* Option

**Main brush cycle on/off**

The I-Button inching function can be used to start and stop the main brush cycle.

| Cycle | Position | Main brush position          | Y1 | Y5 | Y6 |
|-------|----------|------------------------------|----|----|----|
|       |          |                              |    |    |    |
|       | (1) M    | air brush raised             |    | X  | X  |
|       | (2)      | Main brush ECO position      | X  | X  |    |
|       | (3)      | Main brush POWER position    | X  |    |    |
|       | (4)      | Main brush POWER ++ position | X  | X  | X  |

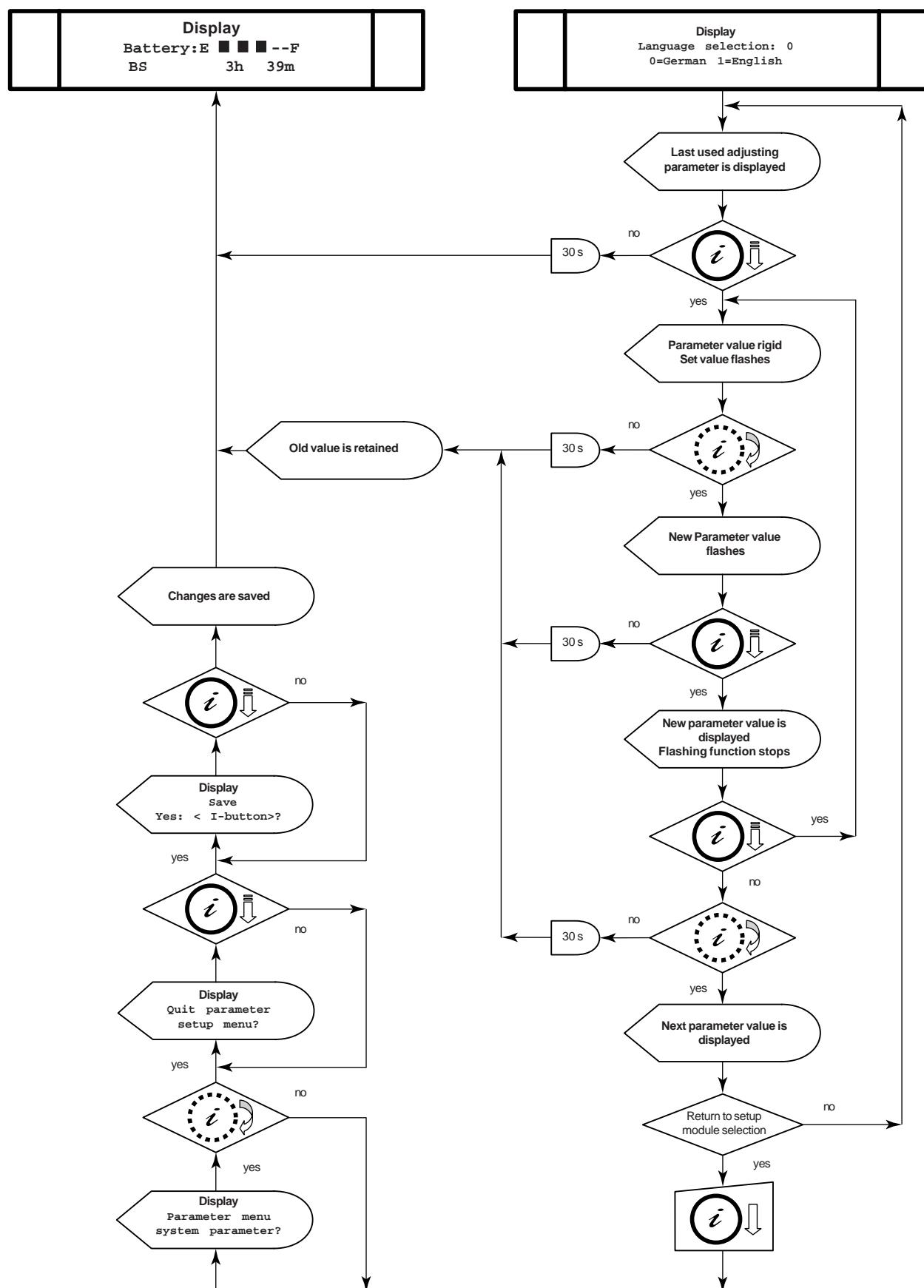
**Automatic cycle sequence**

After the cycle starts it runs automatically to the end (Pos 1), and then starts up again at (Pos 3) and runs to the end again. It then begins at (Pos 1 after Pos 3) and runs to the end again. This cyclic process runs continuously until the end and then starts again at (pos 3), if the cycle sequence has not been interrupted beforehand by pressing the I-Button inch function.

**Note:**

Switch off key switch (S0) to quit test mode.

## 5.2 Saving in setup


**Note:**

If the i-button is turned in an anti-clockwise direction, the cursor acts in the opposite direction, i.e. the menu is called up from the last to the first parameter. The last saved cursor can be called up again after quitting the menu, e.g. by switching back to the standard display (battery display).

## 5.3 Loading operating hours counter backup

**Note:**

If the CPU has been changed the operating hours counter level must be loaded back from the clean module (A3) (backed up operating hours counter).

**Operational status:**

Unit is in Setup menu and the I-button has been used in Parameter menu: System parameter? To call up

OpHrs: 123 h31m (operating hours counter saved in clean module)

Load backup?: 0

has been called up

**Important:**

Immediately after the head CPU printed circuit board has been installed the key switch (S0) must not be switched off until the operating hours counter has been reloaded from the clean module. Otherwise the reading saved in the head CPU is adopted.

**Note:**

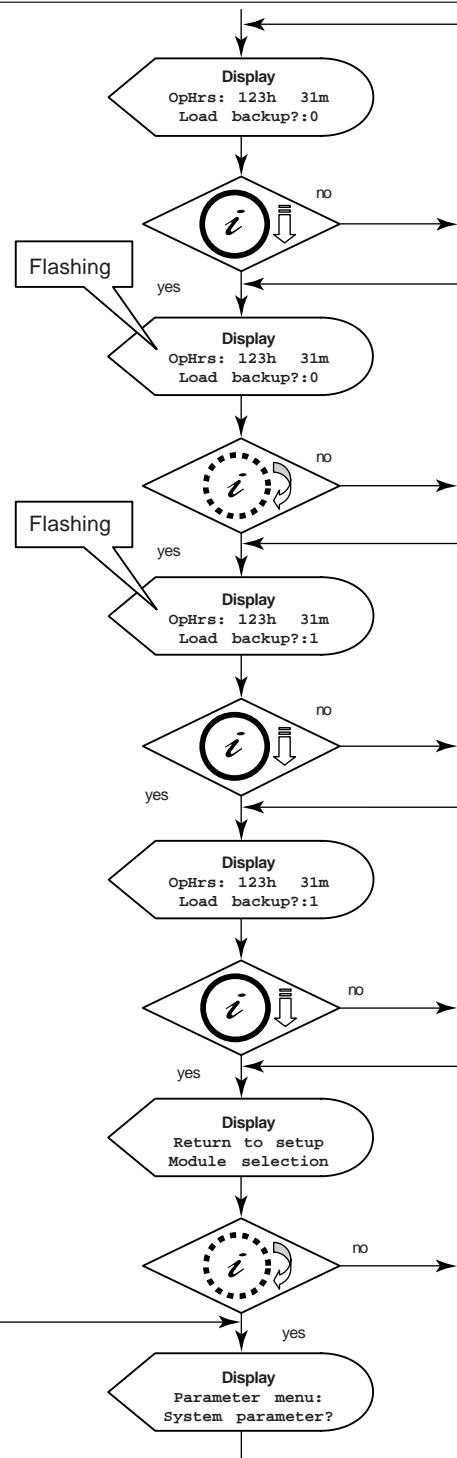
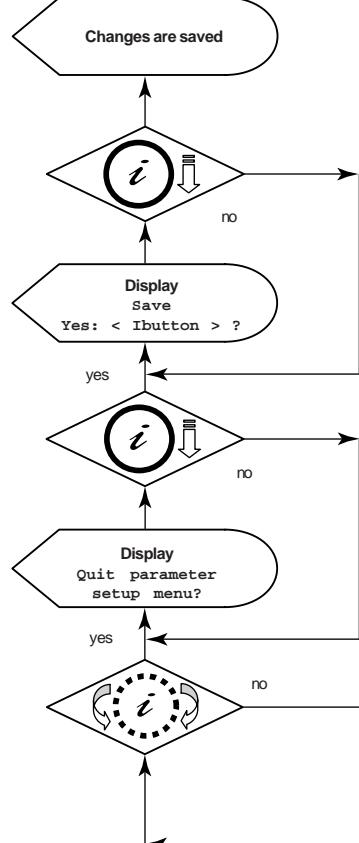
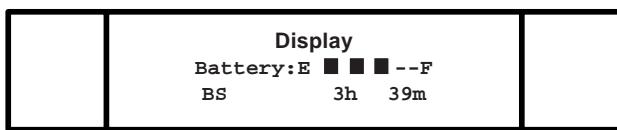
If the i-button is not pressed within 30 seconds the program automatically switches to

Battery:E ███ - -F  
OpHrs: 3h 37m

The unit must then be restarted, as described in Chapter 5.2.a

**Note:**

The reloaded operating hours level must then be checked in the information menu (Access: see Chapter 3.3.1).



## 5.4 Filter principle

### 1. Monofilter system

The monofilter system has a filter cleaning motor for round filters with one rotary direction. In the preferred rotary direction the suction channel flap closes first.

By rotating the filter lamellae in one direction, past a finger, the dust is removed from them. After the cleaning cycle has finished the suction channel opens again.

### 2. Duplex filter system

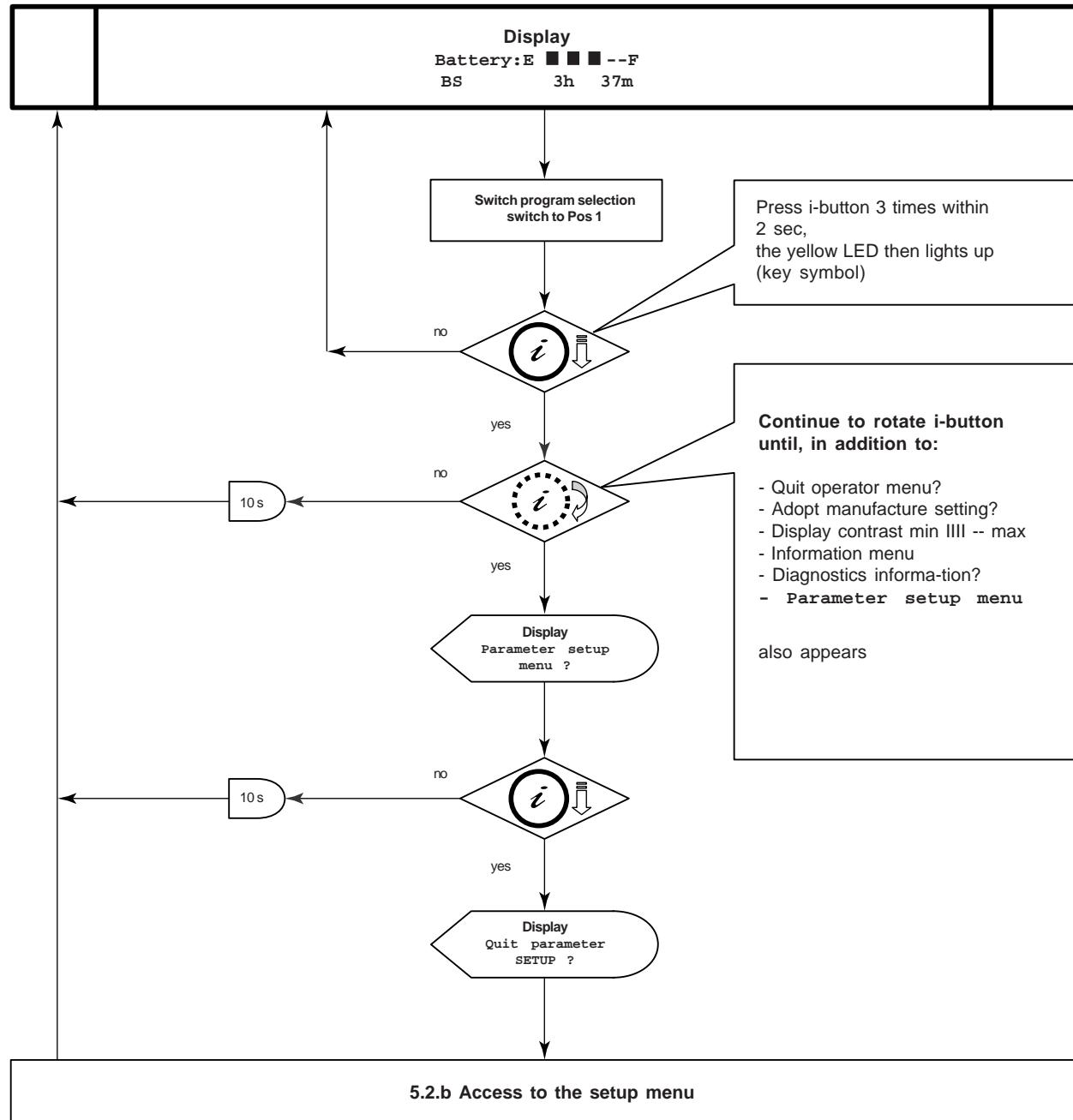
The duplex filter system has a filter cleaning motor for round filters in two rotary directions. In the preferred rotational direction the suction channel flap closes first in order to then further close 2/3 of the round filter for the shaking. By rotating the filter lamellae past a finger, the dust is removed from them. After the cleaning phase the cleaning motor briefly turns in the opposite direction to reopen the suction channel. The cleaning cycle is then finished.

Access to „Parameter menu – system parameters“ and their adjustment and saving them is described in the chapter:

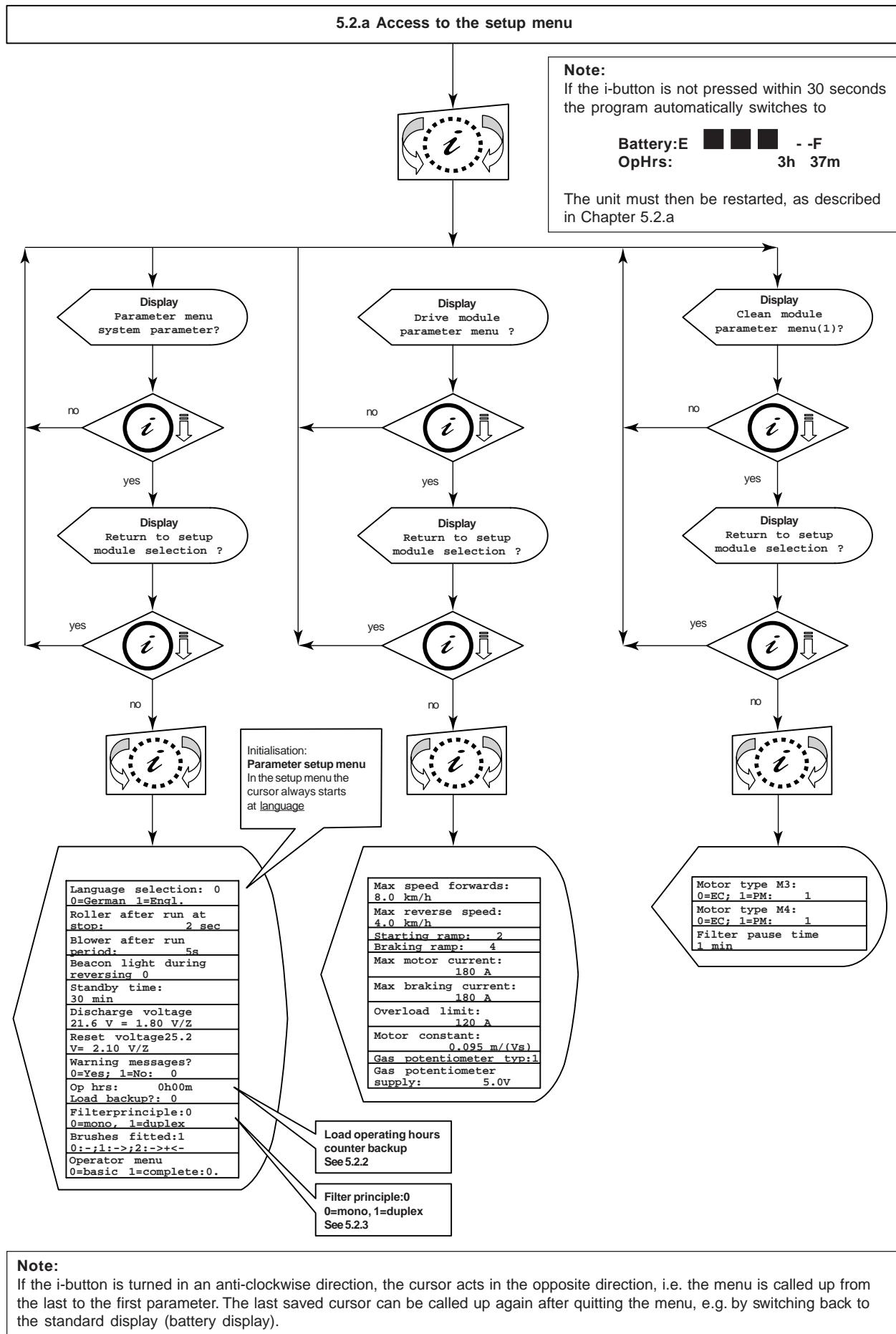
*Access to the setup menu*

– Saving.

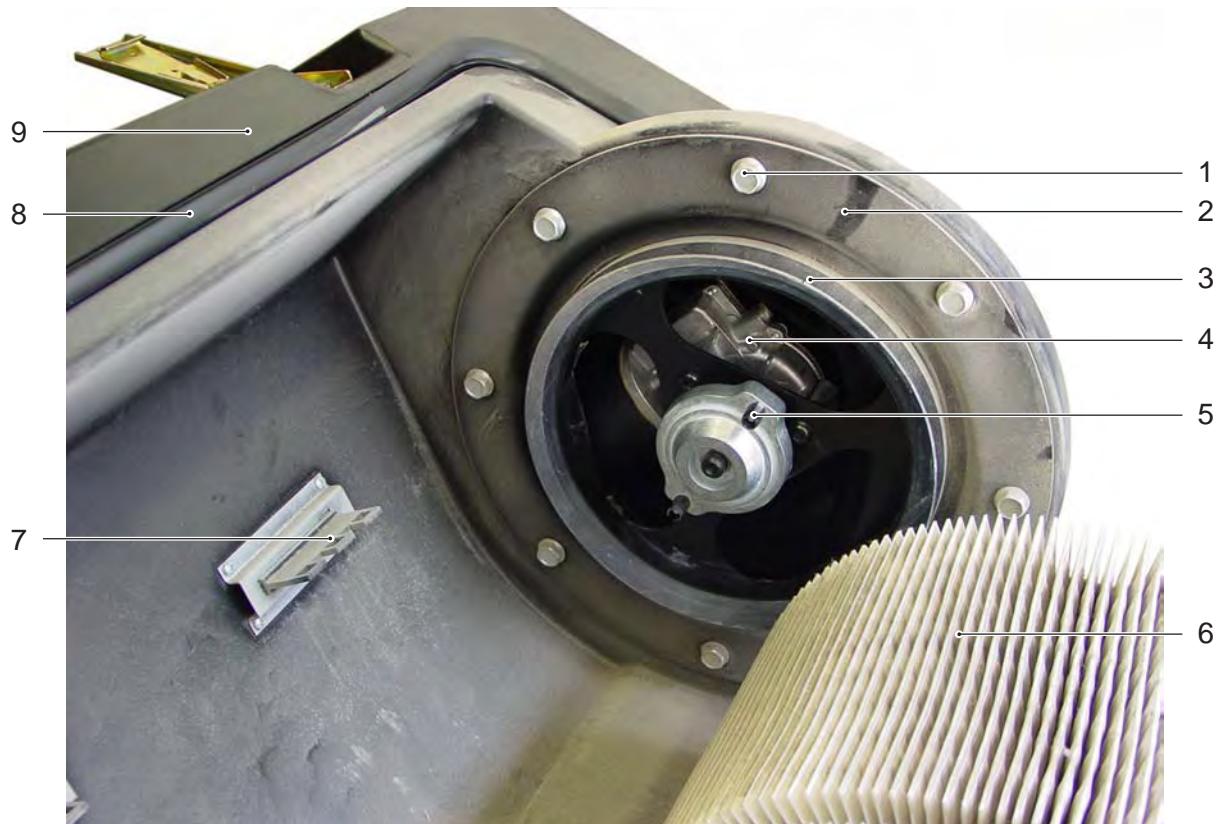
## 5.5 Access to the setup menu



## 5.5 Access to the setup menu



## 5.6 Filter cleaning



- 1 Motor flange screws (8x)
- 2 Motor flange
- 3 Seal
- 4 Motor, filter cleaning (M2)
- 5 Carrier
- 6 Dust filter
- 7 Rubber lip, filter cleaning (3x)
- 8 Filter container seal
- 9 Filter container

The sweeper is equipped with automatic filter cleaning. The motor (4) for the filter cleaning is located behind the motor flange (2) on the right-hand side in the filter container (9).

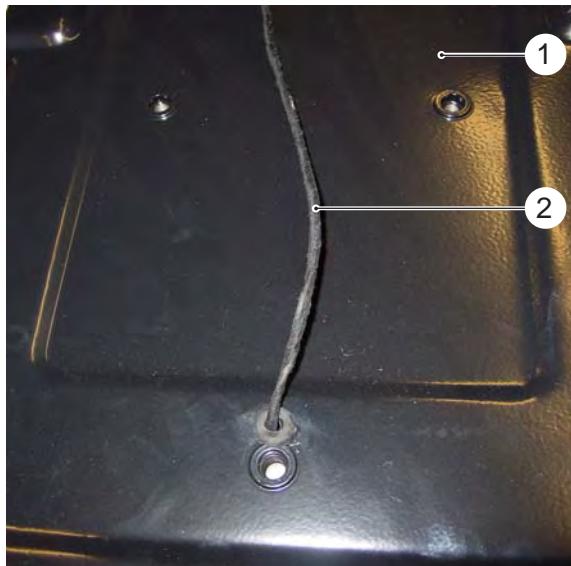
The motor (4) rotates the dust filter. At the same time, the dust filter's lamellae are stroked against the rubber lips (7).

The fine dust released as a result falls into the debris container.

**Note:**

The filter container seal (8) for the filter container (9) prevents dust getting into the motor compartment.

## 5.7 Safety elements



Connection cable, seat contact sensor

### Seat contact sensor (S11)

The motor can only be started if the driver's seat is loaded by the driver sitting on it.

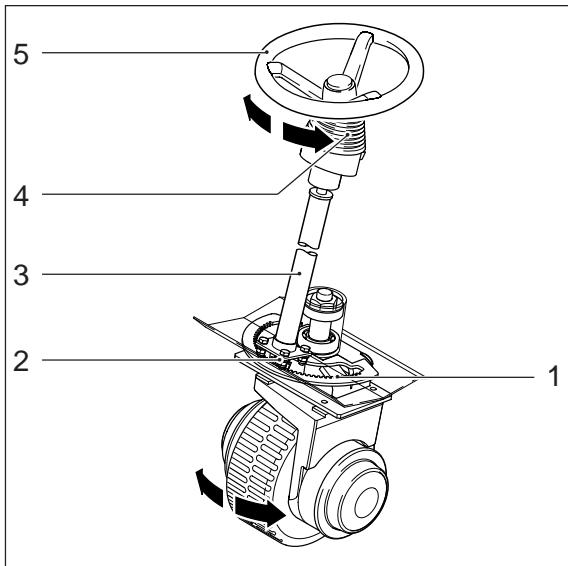
If the driver's seat is relieved, i.e. the driver gets up, the motor switches off.

#### Note

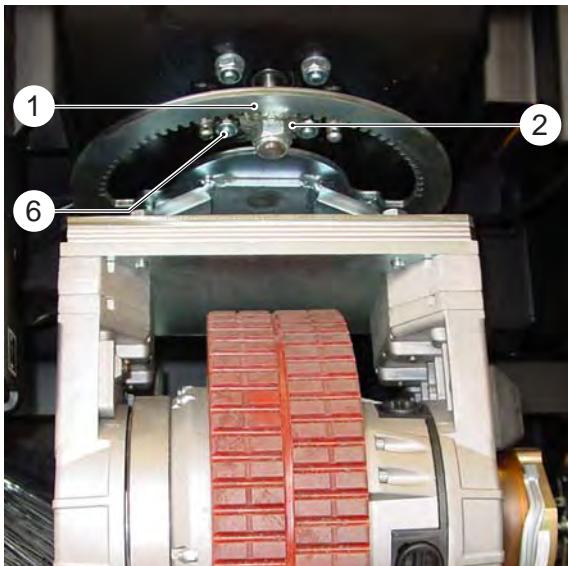
The seat contact sensor (S11) is permanently installed in the driver's seat. If the seat contact sensor (S11) is defective, the seat must be replaced.

- 1 Driver's seat, underside
- 2 Connection cable, seat contact sensor (S11)

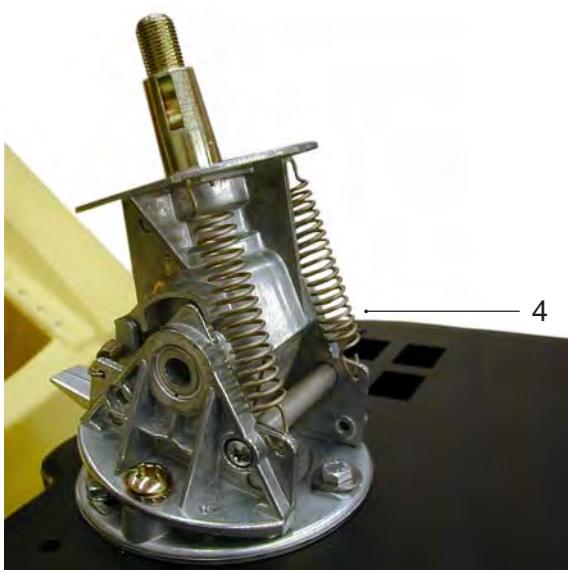
## 5.8 Steering function



*Complete steering*



*Steering wheel fork / ring gear*



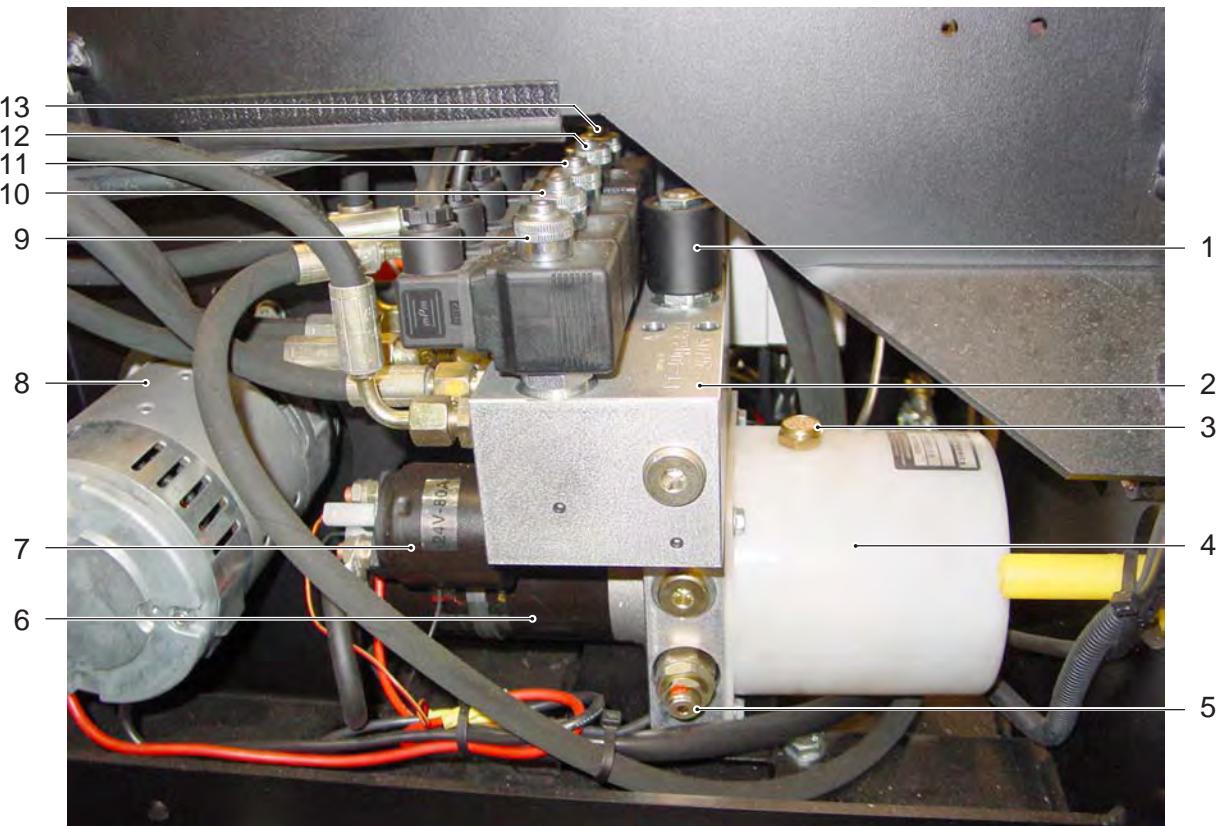
*Steering centre pivot joint*

### Centre pivot joint (4)

The centre pivot joint (4) is located under the steering wheel (5). Before the motor cover is lifted up, the steering wheel must be tilted forward at the centre pivot joint (4) (see Page 6).

- 1 Ring gear
- 2 Toothed wheel, steering rod
- 3 Steering rod
- 4 Centre pivot joint, steering wheel
- 5 Steering wheel
- 6 Retaining screws (4x), steering rod

## 5.9 Hydraulic unit

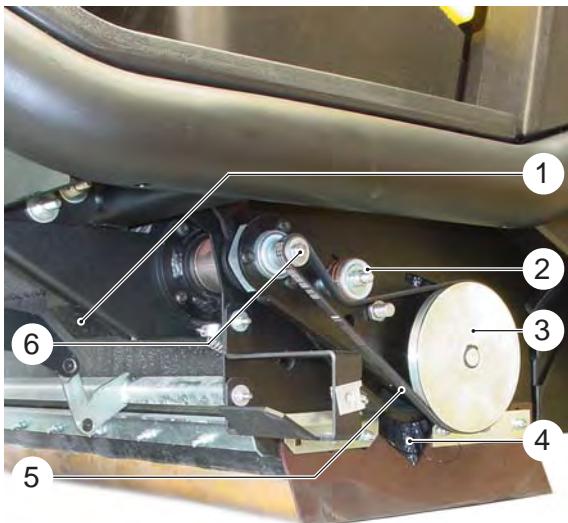


- 1 Solenoid valve (Y1), raise/lower, tip out/in changeover valve
- 2 Hydraulic control block
- 3 Hydraulic oil tank ventilation (4)
- 4 Hydraulic oil tank
- 5 Pressure relief valve
- 6 Motor, hydraulic pump
- 7 Relay (K2), hydraulic pump motor (M6)
- 8 Blower motor (M4)
- 9 Solenoid valve (Y2), tip
- 10 Solenoid valve (Y3), raise /lower
- 11 Solenoid valve (Y5), floating main brush
- 12 Solenoid valve (Y6), rigid main brush
- 13 Solenoid valve (Y7), right side brush

### Hydraulic unit

- The hydraulic unit is located behind the battery.
- It controls all the sweeper's hydraulic functions.

## 5.10 Main brush and side brush drive unit



Main brush drive unit

### Brush roller drive unit

The brush roller (4) is driven by an electric motor (1) via a ribbed V-belt.



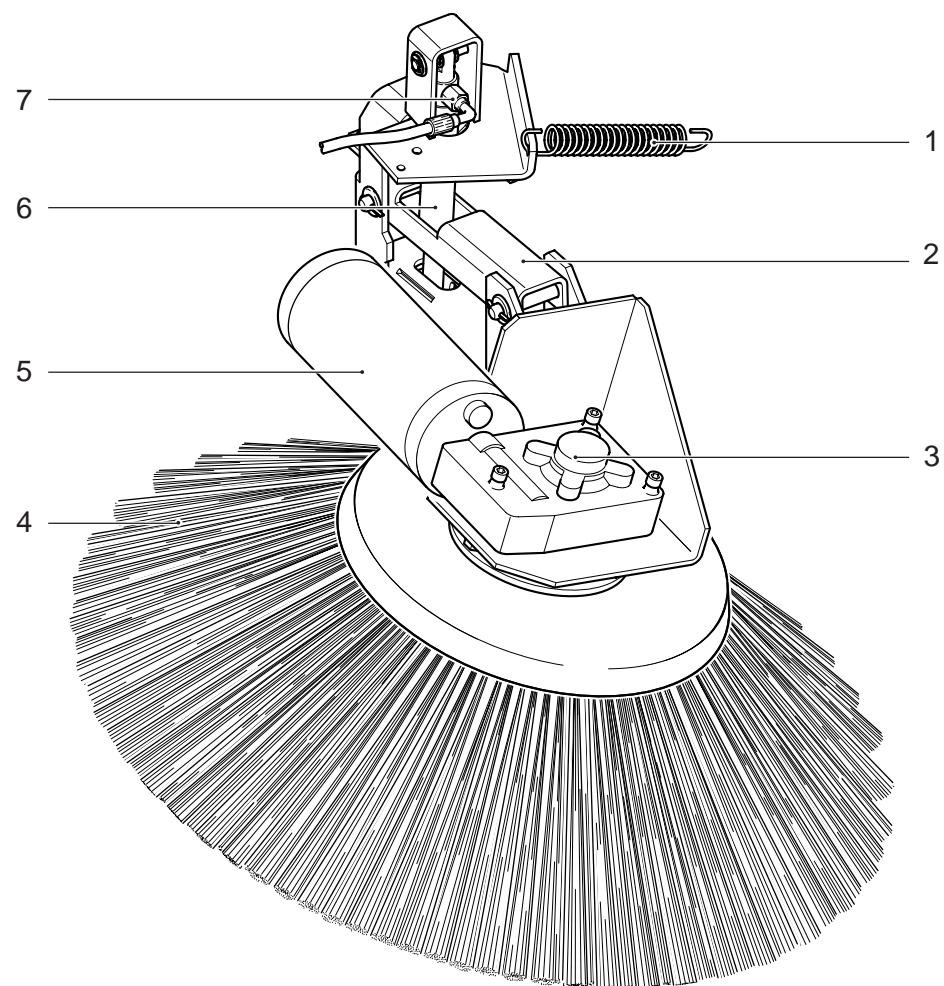
Side brush drive unit

### Side brush drive unit

The side brush (9) is driven by an electric motor (10) via a transmission (8).

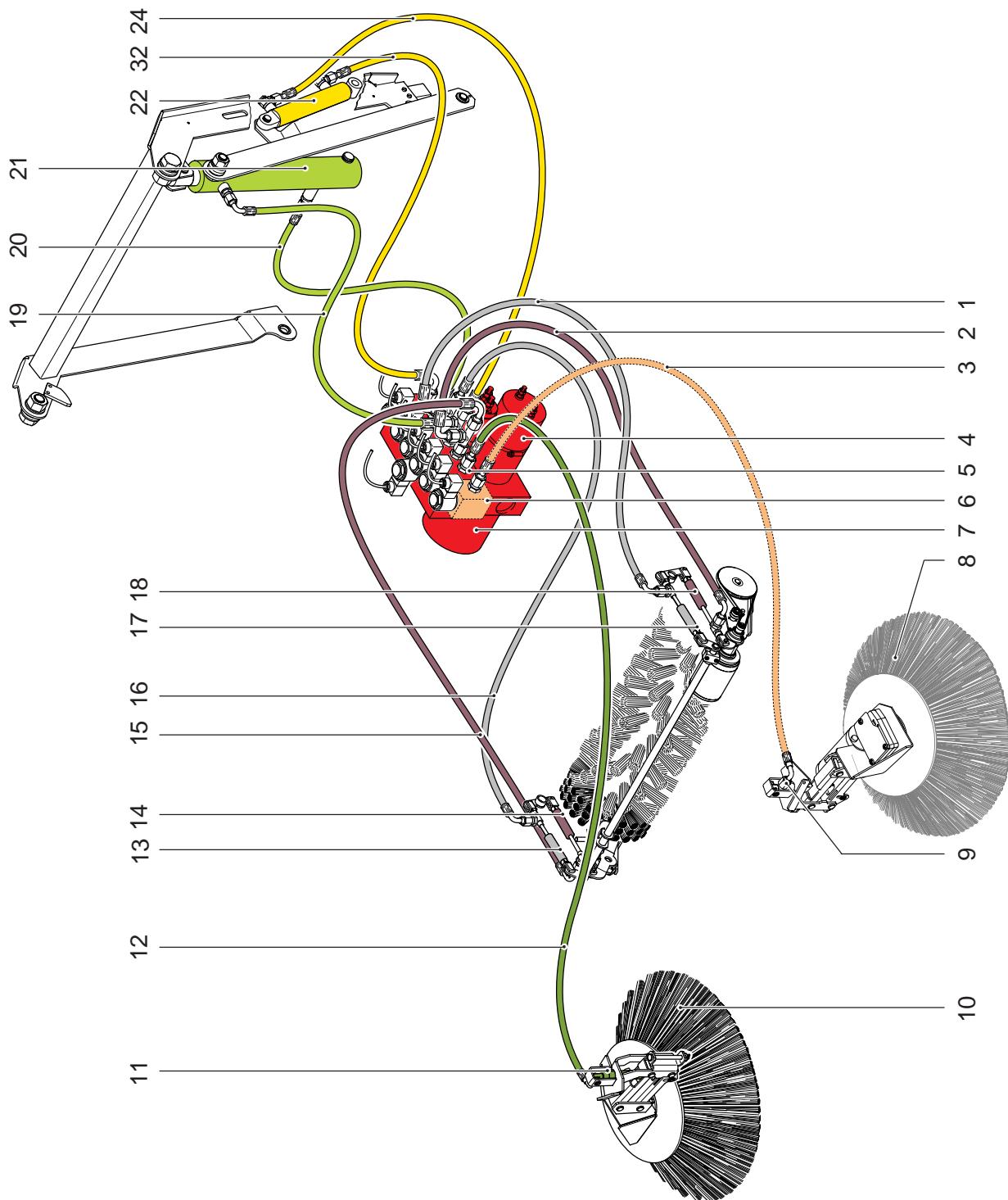
- 1 Electric motor, brush roller drive unit (M2)
- 2 Drive belt tension roller
- 3 Main brush belt wheel
- 4 Main brush
- 5 Drive belt, main brush
- 6 Drive wheel
- 7 Hydraulic cylinder, raise/lower side brush
- 8 Gear
- 9 Side brushes
- 10 Electric motor, side brush (M3)

## 5.11 Side brush suspension



- 1 Tension spring for lifting the side brush
- 2 Side brush arm
- 3 Transmission
- 4 Side brush
- 5 Electric motor
- 6 Hydraulic cylinder, raise/lower side brush
- 7 Hydraulic connection, hydraulic cylinder

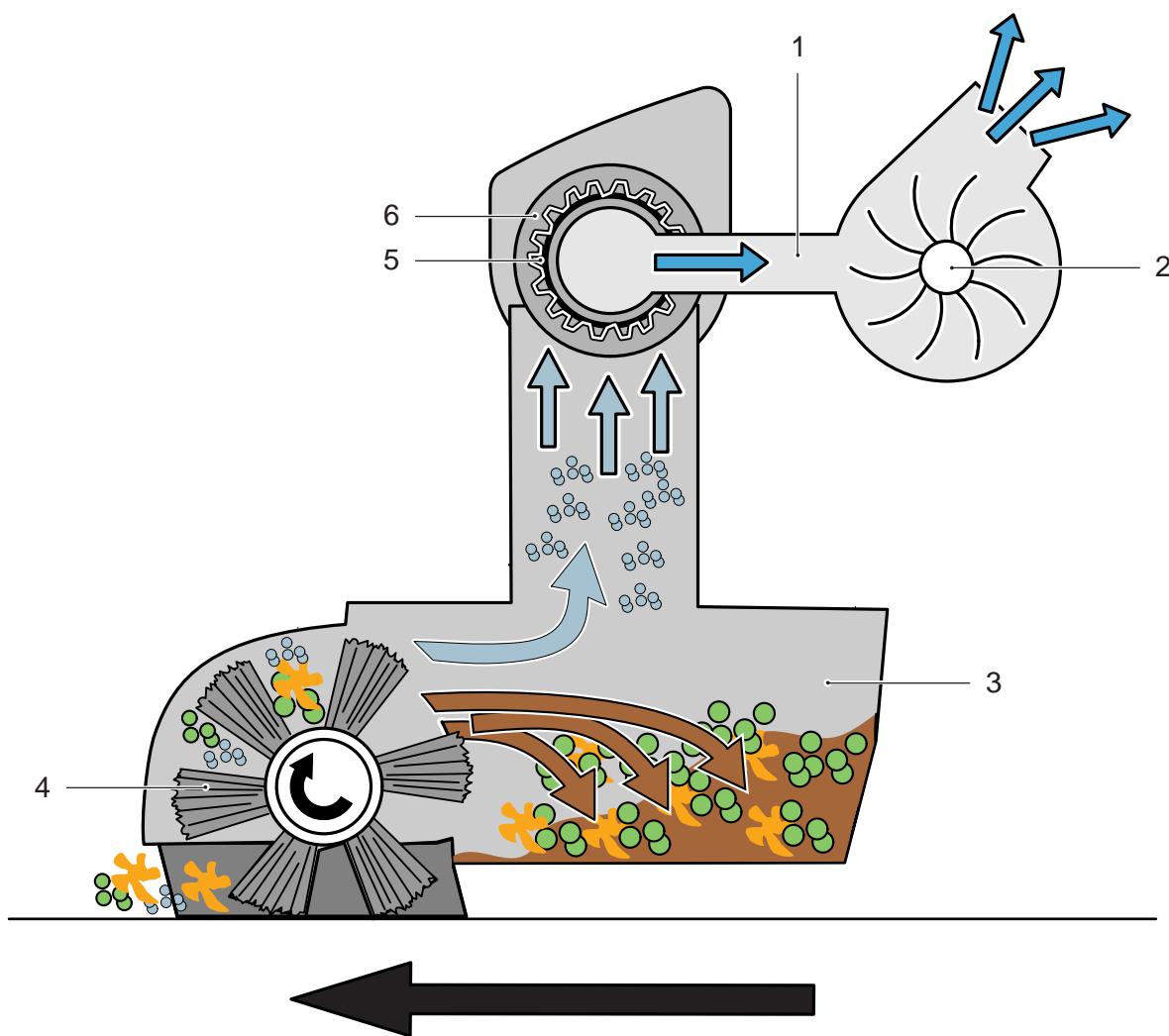
## 5.12 Unit function, hydraulics



## 5.12 Unit function, hydraulics

- 1 Hydraulic line to hydraulic cylinder, top left side, main brush floating/rigid
- 2 Hydraulic line to hydraulic cylinder, bottom left side, main brush floating/rigid
- 3 Hydraulic line, hydraulic cylinder left side, raise/lower side brush (optional)
- 4 Motor, hydraulic pump
- 5 Hydraulic control block with pump
- 6 Extension at hydraulic block, left side brush (optional)
- 7 Hydraulic oil tank
- 8 Left side brush (optional)
- 9 Hydraulic cylinder left side, raise/lower side brush (optional)
- 10 Right side brush
- 11 Hydraulic cylinder right side, raise/lower side brush
- 12 Hydraulic line, hydraulic cylinder right side, raise/lower side brush
- 13 Hydraulic cylinder top right side, main brush floating/rigid
- 14 Hydraulic cylinder bottom right side, raise/lower main brush
- 15 Hydraulic line to hydraulic cylinder, bottom right side, raise/lower main brush
- 16 Hydraulic line to hydraulic cylinder, top right side, main brush floating/rigid
- 17 Hydraulic cylinder top left side, main brush floating/rigid
- 18 Hydraulic cylinder bottom left side, raise/lower main brush
- 19 Hydraulic line, lower debris container
- 20 Hydraulic line, raise debris container
- 21 Hydraulic cylinder, raise/lower debris container
- 22 Hydraulic cylinder, tip out/in debris container
- 23 Hydraulic line, tip in debris container
- 24 Hydraulic cylinder, tip out debris container

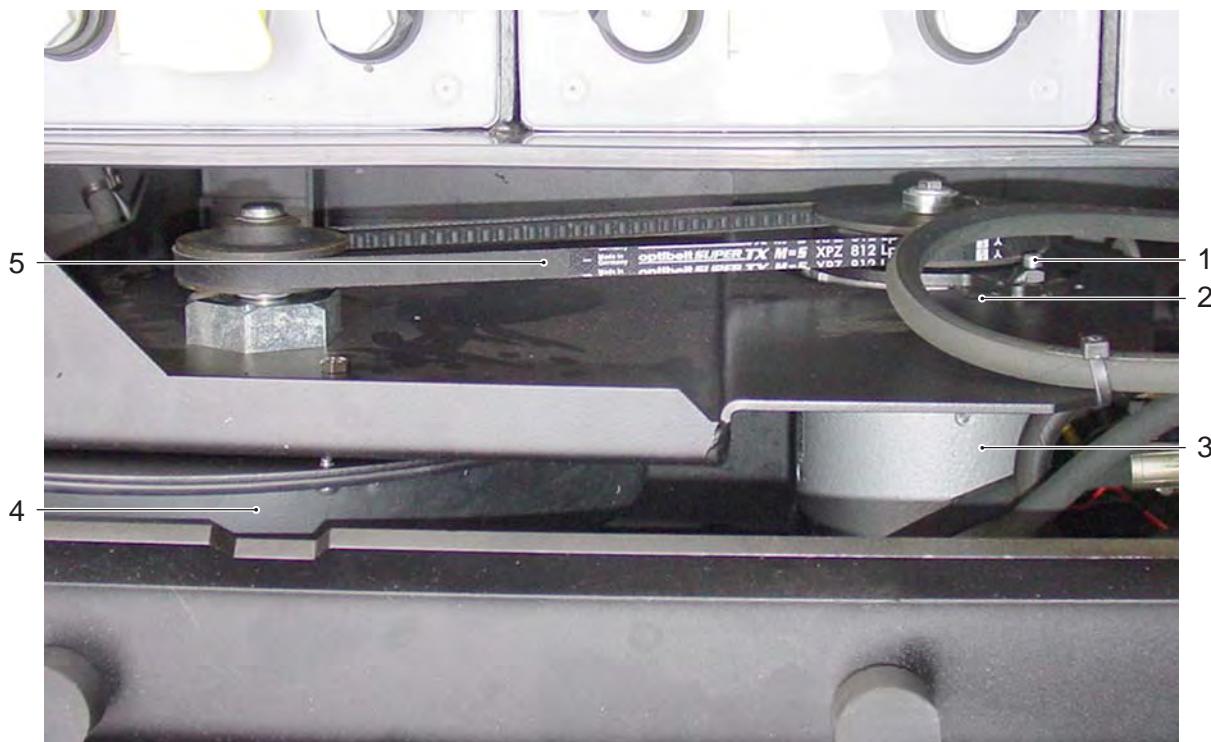
## 5.13 Unit function, sweeping system



- 1 Air duct
- 2 Suction motor
- 3 Debris container
- 4 Main brush
- 5 Round filter
- 6 Motor, filter cleaning

- The side brush moves the dirt to the main brush (4).
- The main brush (4) moves the dirt picked up into the debris container using the throw-over principle (3).
- The round filter (5) filters the dust swirled up in the debris container.
- The filtered air is drawn away by the suction motor (2).
- Fine dust settled in the round filter (5) is released during the filter cleaning and falls into the debris container (3).

## 6.1 V-belt

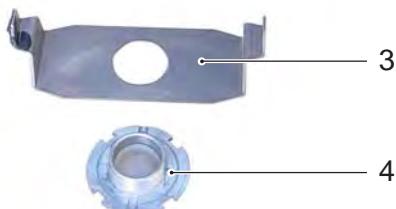
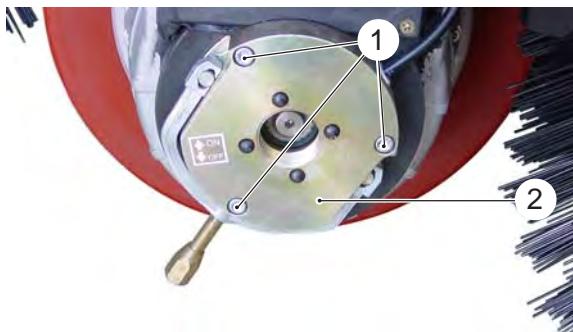


- 1 Tension/retainer bolt, suction motor drive belt
- 2 Oblong hole
- 3 Elektric suction motor (M4)
- 4 Impeller fan
- 5 V-belt, impeller fan drive

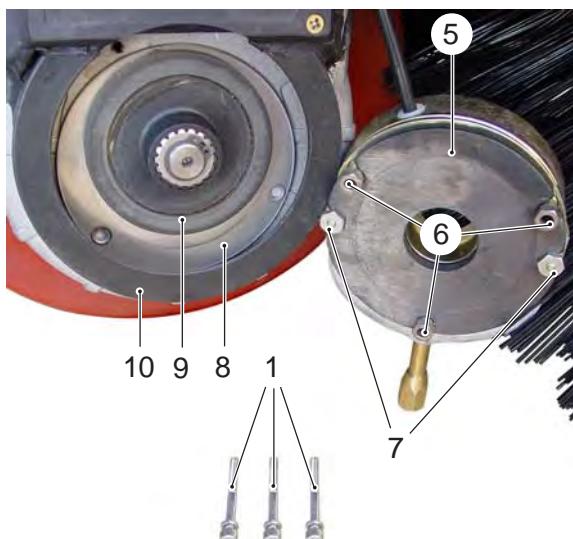
### Replacing the V-belt

- Open motor cover (see Page 6).
- Loosen retainer bolt (1) and swivel motor to the left to relieve tension in the V-belt (5).
- Remove V-belt (5).
- Install new V-belt.
- Swivel motor (3) to the right and tighten the V-belt (5) using the retainer bolt (1).

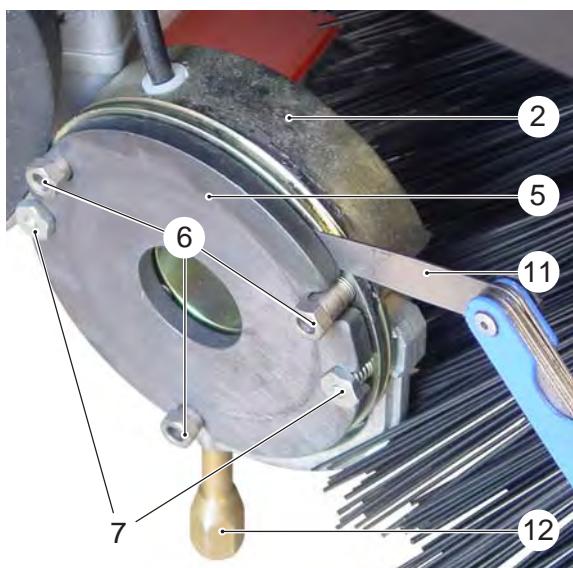
## 6.2 Magnet brake



Holding bracket removed



Magnet coil removed from the dust guard



Checking the setting

### Removing the magnet coil

The magnet brake has been correctly adjusted in the factory.

It may be necessary to readjust the brake, depending on load and operating time.

- Remove fastening screw (4).
- Remove holding bracket (3).
- Remove fastening screws (1).
- Pull out the magnet coil (2).

#### Note:

The dust guard (5) (4.040-608.0) prevents deposits of brake dust etc. from accumulating in the brake cap. It is installed in units:

KM 120/150 R Bp from serial number 10034 and

KM 120/150 R Bp/Pack from serial number 10055.

### Checking the settings

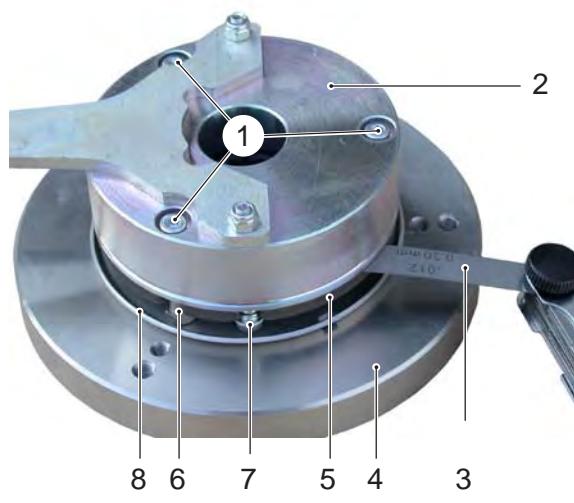
There must be a gap of 0.8 mm (0.032 in) all round between the magnet coil (2) and the pressure plate (5), measured 3x around the periphery in dismantled state.

- Switch unit off with the key switch (S0)
- Use the feeler gauge (11) to measure the gap between pressure plate (5) and magnet coil (2).

The gap can only be adjusted when the magnet coil (2) has been dismantled.

- 1 Fastening screws, magnet coil
- 2 Magnet coil
- 3 Holding bracket
- 4 Fastening screws, holding bracket
- 5 Pressure plate
- 6 Sleeve screw (3x)
- 7 Adjusting screws, freewheeling lever
- 8 Spacer washer
- 9 Brake disc
- 10 Dust guard
- 11 Feeler gauge 0.8 mm (0.032 in)
- 12 Freewheeling lever

## 6.2 Magnet brake



*Adjusting brake with mounting plate*

- 1 Fastening screws, magnet coil
- 2 Magnet coil
- 3 Feeler gauge 0.3 mm (0.012 in)
- 4 Mounting plate
- 5 Pressure plate
- 6 Sleeve screw (3x)
- 7 Adjusting screws, freewheeling lever
- 8 Spacer washer

### Checking the magnet brake (Y1) with the mounting plate

The mounting plate (4) shows the magnet brake in installed condition.

- Fasten the magnet coil (2) with brake disc (see page 54, no. 9) and spacer washer (8) on the mounting plate (4) with three fastening screws (1).
- Measure the brake gap with the feeler gauge (3). The brake gap must be 0.3 mm (0.012 in) in installed condition, measured 3x around the periphery.

### Adjusting the electromagnetic brake (Y1) with mounting plate

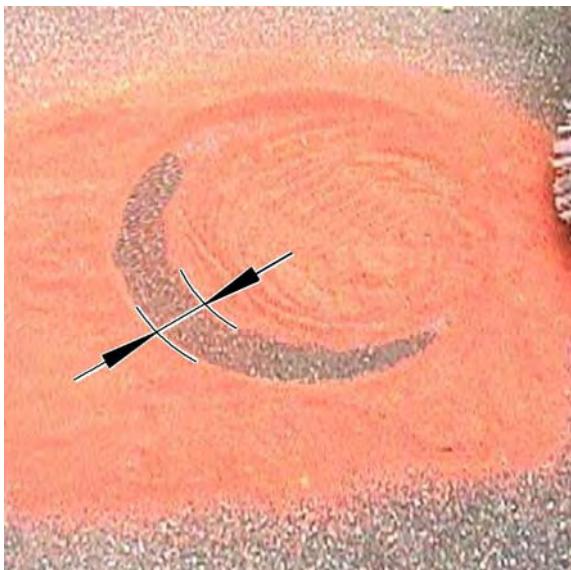
If the brake gap in installed condition is not 0.3 mm (0.012 in), then the brake gap must be adjusted as follows

- Loosen three fastening screws (1) with Allen wrench.
- Remove or tighten the sleeve screws (6) with screw wrench.
- Tighten the fastening screws (1) and measure the break gap with the feeling gauge (3) to see whether the specified gap size of 0.3 mm (0.012 in) is now fulfilled.
- Repeat the procedure until the brake gap fulfils the specified size.
- Remove magnet coil (2) with brake disc (see page 54, No. 8) and spacer washer (8) from the mounting plate (4) and fit in the magnet brake retainer on the wheel-hub motor.

#### Note:

The brake must hold the unit with max. load safely on a gradient of 10%. If the braking action decreases again in spite of being adjusted correctly, the braking disc (see page 56, No. 9) must be replaced and the complete adjusting procedure repeated.

## 6.3 Side brush



Side brush sweeping pattern

### Checking the brushing pattern

#### Note:

Due to the floating side brush, the sweeping pattern automatically readjusts itself as the bristles wear down. The side brush must only be replaced once the bristles are worn-out.

### Replacing the side brush

- Remove star grip screws (2).
- Pull the side brush (3) down.
- Install the new side brush (3) and tighten the star grip screws (2).



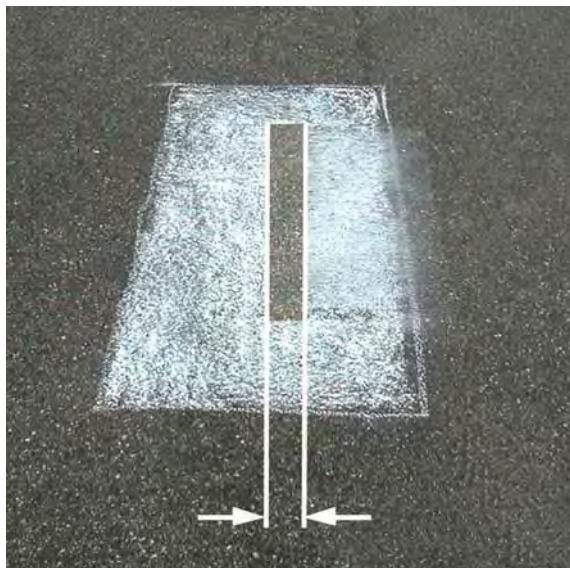
Side brush suspension



- 1 Side brush suspension
- 2 Star grip screws (3x)
- 3 Side brush

Side brush

## 6.4 Main brush



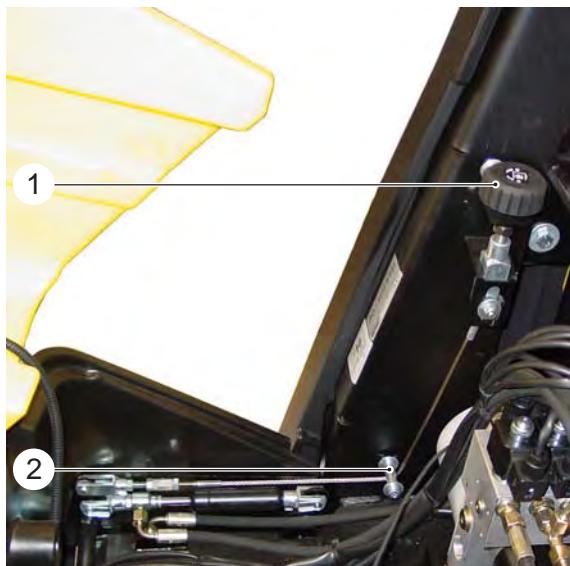
Main brush sweeping pattern

### Checking the brushing pattern

- Uniformly scatter dust on a flat surface or colour with chalk.
- Raise main brush and side brush.
- Raise coarse dirt flap.
- Drive sweeper over prepared area.
- Lower main brush and allow it to briefly rotate in rigid setting.
- Raise main brush and coarse dirt flap, reverse sweeper.

**Note:**

The shape of the sweeping pattern should form a uniform parallel rectangular, which is between 30 and 50 mm (1.18 - 1.97 in.) wide.



Sweeping pattern adjustment

### Adjusting sweeping pattern

In rigid operating mode the sweeping pattern can be adjusted using a handwheel (1).

- Open motor cover (see Page 6).
- Increasing sweeping pattern: Rotate handwheel in anti-clockwise direction (+).
- Reduce sweeping pattern: Rotate handwheel in clockwise direction (-).

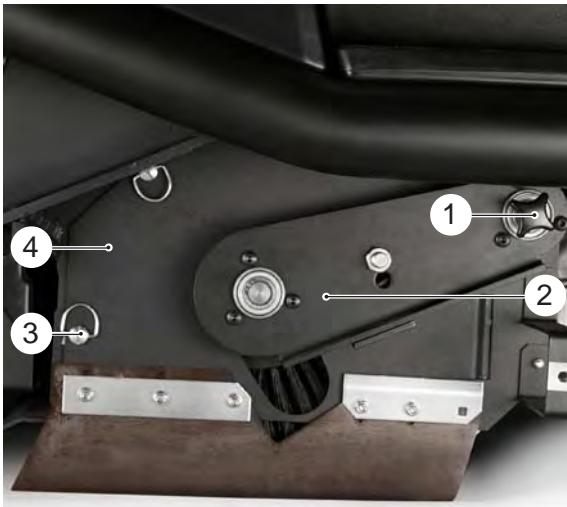


Handwheel, sweeping pattern adjustment

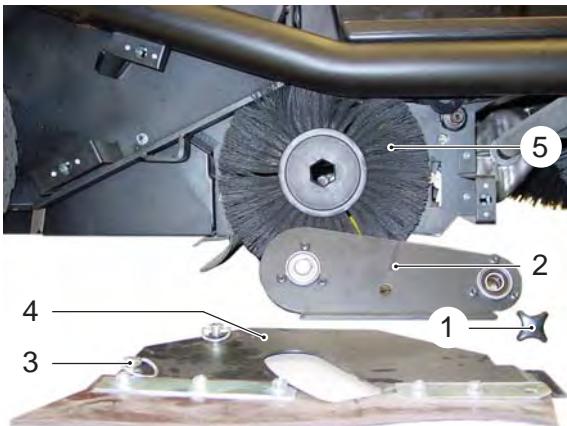
1 Handwheel, sweeping pattern adjustment

2 Deflection pulley

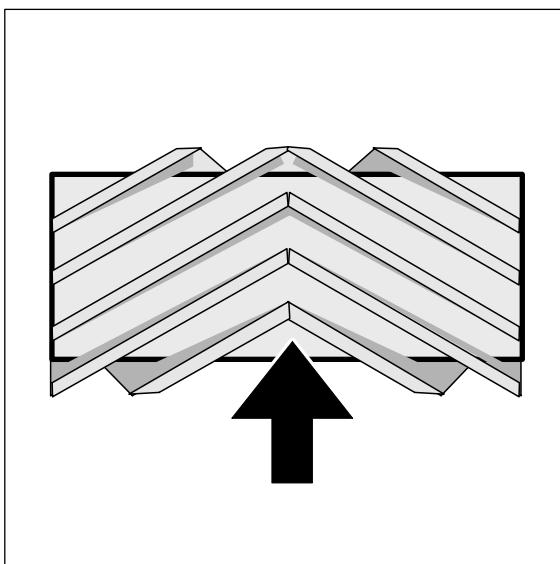
## 6.4 Main brush



*Brush assembly*



*Brush assembly, rocker arm and cover removed*



*Installation position of roller brush in direction of travel*

### Replace main brush

- Remove sweeper's right side panel.
- Remove star grip screw (1).
- Pull off rocker arm (2).
- Open quick-release fastenings (3) (2x) and remove side cover (4).
- Pull out main brush.
- Push in new main brush, with the depressed hub side in the direction of the hydraulic motor.

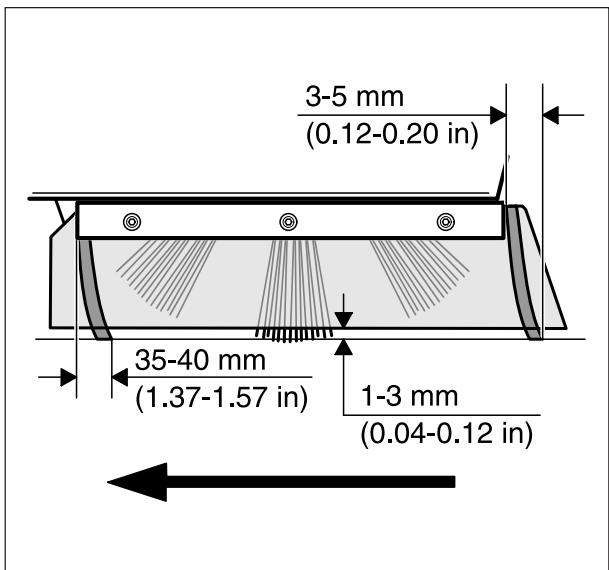
#### Note:

The main brush can only be installed in one direction.

Once the new main brush has been installed, the sweeping pattern must readjusted (see Page 59).

- 1 Star grip screw
- 2 Rocker arm
- 3 Quick-release fastenings (2x)
- 4 Side cover
- 5 Main brush

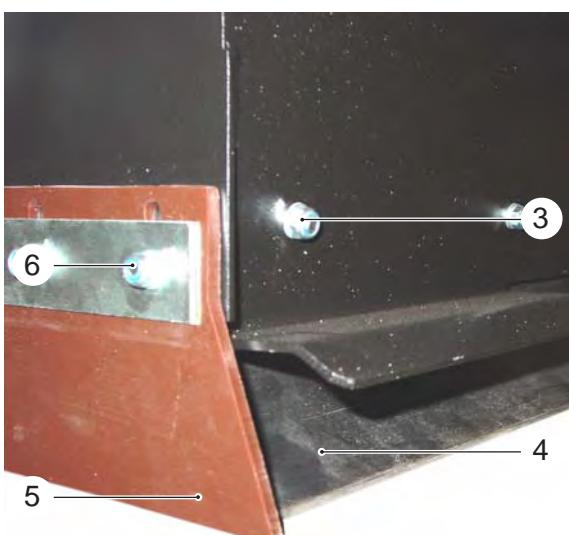
## 6.5 Sealing lips / strips



Sealing lips/strips, brush assembly



Front sealing lip



Rear sealing lip and side sealing strips

### Check sealing lip / strip setting

Drive the sweeper a short distance forward.

- The front sealing lip (2) (sealing lip of the coarse dirt flap) must have a trailing of approx 35 - 40 mm (1.37 - 1.57 in.).
- The rear sealing lip (4) must have a trailing of approx 3 - 5 mm (0.12 - 0.20 in.).
- The side sealing strips (5) must have a floor clearance of 1 - 3 mm (0.04 - 0.12 in.).

### Adjust/replace front sealing lip

- Loosen retaining screws (1).
- Adjust sealing lip (2) by pushing it in the oblong holes, replace if necessary.
- Tighten retaining screws (1).
- Drive sweeper forward a short distance and check the trailing of the sealing lip (2).

### Adjust/replace rear sealing lip

- Remove left side and right side panels.
- Loosen retaining screws (3).
- Adjust sealing lip (4) by pushing it in the oblong holes, replace if necessary.
- Tighten retaining screws (3).
- Drive sweeper forward a short distance and check the trailing of the sealing lip (4).

### Adjust/replace side sealing strip

- Remove left side and right side panels.
- Loosen retaining screws (6).
- Adjust sealing strip (5) by pushing it in the oblong holes, replace if necessary.
- Tighten retaining screws (6).

1 Retaining screws (5x), front sealing lip

2 Front sealing lip

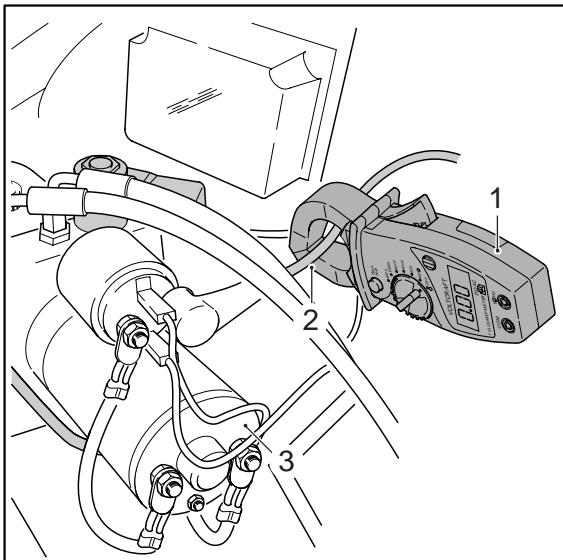
3 Retaining screws (5x), rear sealing lip

4 Rear sealing lip

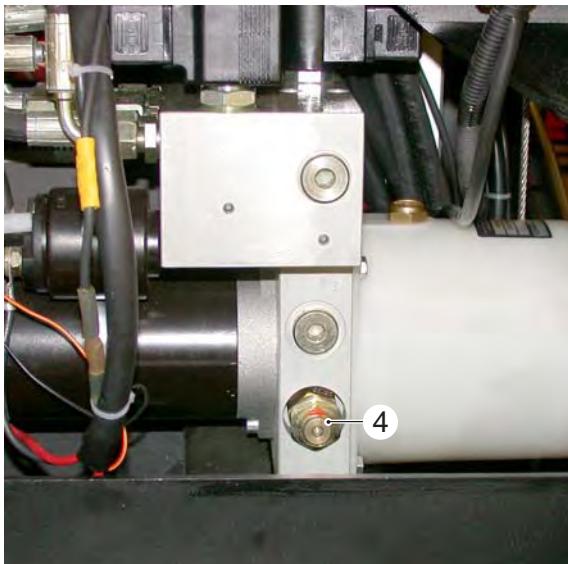
5 Side sealing strip

6 Retaining screws (5x each left and right), side sealing strips

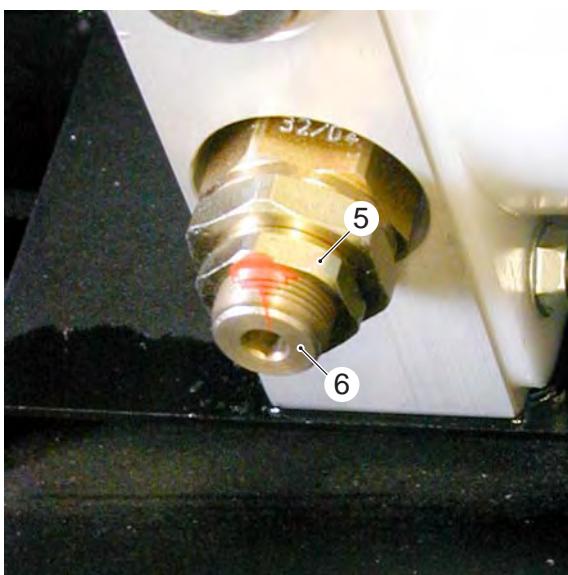
## 6.6 Hydraulics



Check hydraulic unit



Hydraulic unit



Pressure relief valve

### Check pressure relief valve (4)

- Raise the debris container to the maximum height when empty or full (two-hand operation).
- In this position, keep the buttons pressed and at the same time measure the current consumption using an ammeter (1) at the connection cable (2) from the hydraulic unit (3) (see technical specifications for value).

The current consumption is a measure of the pressure relief valve's opening pressure.

### Adjust pressure relief valve (4)

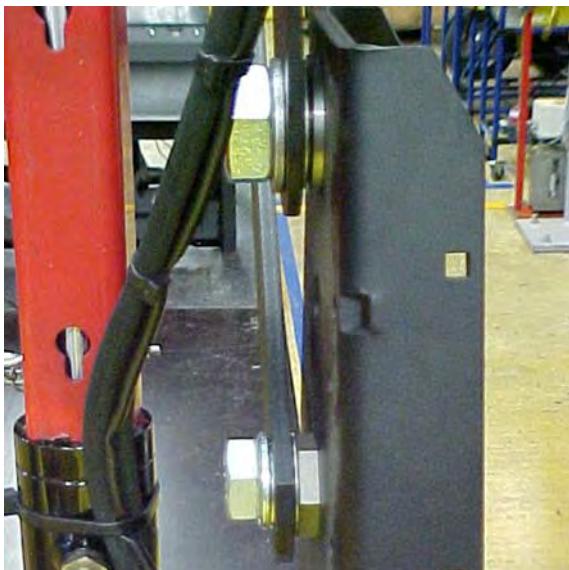
- Loosen locking nut (5) and use a suitable Allen key to turn the adjusting screw (6):  
A half-turn in a clockwise direction increases the current consumption by approx 4 - 5 A (approx 10 bar/145 psi).
- Secure adjustment with locking nut (5).
- Carry out functional test, measuring current consumption.

- 1 Ammeter
- 2 Connection cable, hydraulic unit
- 3 Hydraulic unit
- 4 Pressure relief valve
- 5 Locking nut
- 6 Adjusting screw

#### Note:

Regularly check the hydraulic units and hydraulic lines for leaks.

## 6.7 Adjusting the debris container

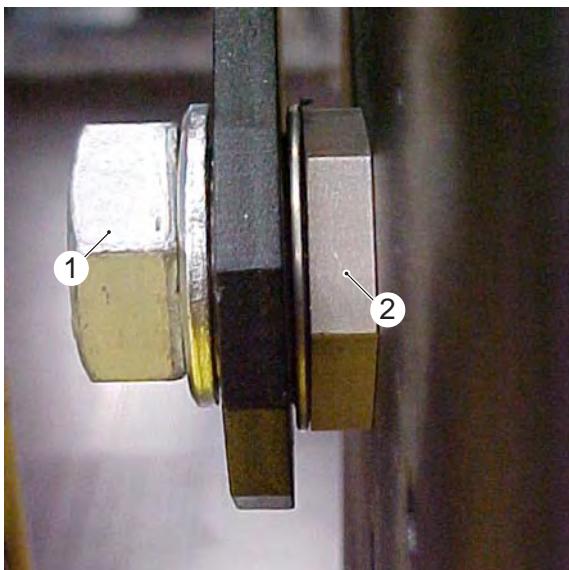


Debris container connection

### Adjust position of debris container

The position of the debris container can be adjusted using an eccentric (cam) (2) to ensure that the intake nozzle of the debris container properly fits to the impeller fan housing connection when retracted.

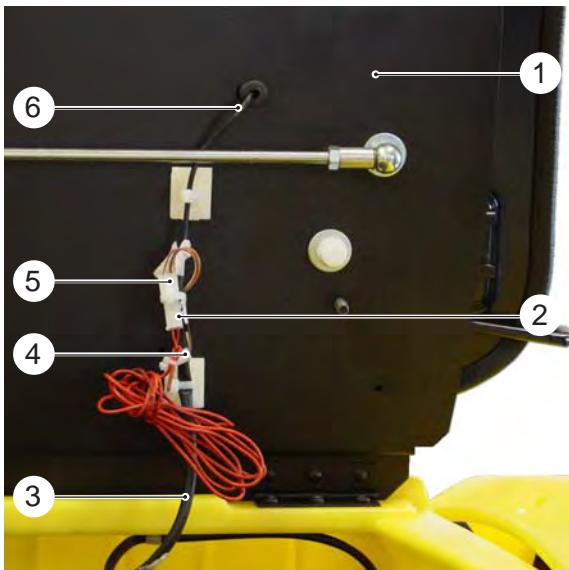
- Loosen locking nut (1).
- Use a suitable open end wrench to adjust the eccentric/cam (2) until the intake nozzle of the debris container sits precisely in front of the impeller fan housing connection so when the debris container is retracted the intake nozzle is aligned with the impeller fan housing connection.
- Secure adjustment with locking nut (1).



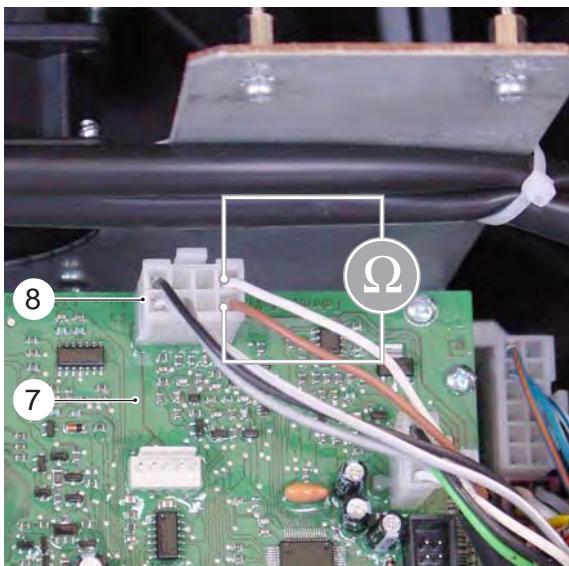
Eccentric (cam) for debris container adjustment

- 1 Locking nut
- 2 Eccentric

## 6.8 Seat contact sensor



Connecting plug, seat contact sensor (B1)



Seat contact sensor (S11) resistance test

### Jumping the switch-off function of the seat contact sensor (S11)

In order to jump the switch-off function of the seat contact sensor (S11), the connecting plug of the seat contact sensor (4) must be disconnected from the connecting plug (5). A jumper (2) is connected instead.

The unit can now be operated with all its functions, without the seat being loaded by a driver sitting on it.

### Check seat contact sensor (S11)

The function of the seat contact sensor (S11) can be checked by connecting an ohm meter to the connecting plug A2/X5 (8) (see Figure).

#### Note:

The plug (8) must be disconnected from the driving module (9) before the measurement can be taken!

- 1 Seat plate
- 2 Jumper
- 3 Connection cable to driving module (A2) (8)
- 4 Connecting plug, seat contact sensor (S11)
- 5 Terminal strip (XS10), seat contact sensor (S11)
- 6 Connection cable, seat contact sensor (S11)
- 7 Driving module (A2)
- 8 Terminal strip (X5/A2)

## 6.9 Replacement times

| Wearing part                              | Part number | Replacement time in minutes |
|-------------------------------------------|-------------|-----------------------------|
| Drive motor carbon brushes                | 6.610-239.0 | 10                          |
| Side rubber lip                           | 5.365-250.0 | 10                          |
| Rear rubber lip                           | 5.365-255.0 | 20                          |
| Front rubber lip                          | 5.365.256.0 | 20                          |
| Blower belt D10                           | 6.348-381.0 | 30                          |
| Brush belt                                | 6.348-414.0 | 10                          |
| Filter element                            | 6.414-554.0 | 10                          |
| Brush contact pressure rope               | 6.431-234.0 | 15                          |
| Bowden cable, drive unit                  | 6.431-239.0 | 30                          |
| Bowden cable, brake                       | 6.431-240.0 | 30                          |
| Rear wheel                                | 6.435-731.0 | 15                          |
| Side brush motor                          | 6.454-188.0 | 25                          |
| Main brush gas pressure cylinder          | 6.504-074.0 | 20                          |
| Main brush gas pressure cylinder          | 6.504-075.0 | 20                          |
| Brush drive assembly motor carbon brushes | 6.610-239.0 | 15                          |
| Brush drive assembly motor                | 6.613-004.0 | 35                          |
| Blower motor                              | 6.613-004.0 | 50                          |
| Filter motor                              | 6.613-079.0 | 30                          |
| Drive motor                               | 6.613-091.0 | 45                          |
| Position switch KB                        | 6.630-170.0 | 10                          |
| Main brush                                | 6.906-624.0 | 10                          |
| Side brush                                | 6.906-705.0 | 10                          |
| Brush ball bearing                        | 7.401-105-0 | 25                          |

## 7.1 Troubleshooting without displays

| Fault not shown on the display                                | Repair                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|---------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Unit can not be switched on.</b>                           | <ul style="list-style-type: none"> <li>– Check/charge/replace battery (G1).</li> <li>– Check fuses (F1) and (F2)/replace defective fuse.</li> <li>– Check/replace key switch (S0).</li> <li>– Check/unlock/replace EMERGENCY STOP switch (S1).</li> <li>– Check/replace CPU head module.</li> </ul>                                                                                                                                                                                                                                                                                                                                                          |
| <b>Unit won't run</b>                                         | <ul style="list-style-type: none"> <li>– Check/replace driving module fuse (F2).</li> <li>– Check/replace seat contact sensor (S11).</li> <li>– Check drive control (B1) and travel direction switches (S9) and (S10) using test mode/replace.</li> <li>– Check/replace program selection switch (S8).</li> <li>– Check module connection cables A0/A1/A2 using test mode.</li> <li>– Check/replace control panel printed circuit board A0.</li> <li>– Check driving module printed circuit board (A2) using test mode/replace.</li> <li>– Check driving module (M1) using test mode/replace.</li> <li>– Replace main printed circuit board (A1).</li> </ul> |
| <b>Side brushes lower unintentionally</b>                     | <ul style="list-style-type: none"> <li>– Check/replace hydraulic cylinder with pressurised gas spring.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Main brush and side brush won't rotate</b>                 | <ul style="list-style-type: none"> <li>– Check whether mechanically blocked/remove blockage.</li> <li>– Check/replace program selection switch (S8).</li> <li>– Check/replace cleaning module fuse (F3).</li> <li>– Check/replace brush motors (M2, M3, M5).</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Main brush cannot be raised/lowered</b>                    | <ul style="list-style-type: none"> <li>– Check/replace accessories module fuse (F6).</li> <li>– Check/replace hydraulic pump.</li> <li>– Check/replace program selection switch (S8).</li> <li>– Check/adjust pressure relief valve.</li> <li>– Check/replace solenoid valve (Y5).</li> <li>– Check / replace hydraulic cylinder (17A, 17B).</li> </ul>                                                                                                                                                                                                                                                                                                      |
| <b>Main brush cannot be switched over to rigid mode</b>       | <ul style="list-style-type: none"> <li>– Check/replace accessories module fuse (F6).</li> <li>– Check/replace program selection switch (S8).</li> <li>– Check/replace rocker button (S6), floating/rigid brush roller.</li> <li>– Check/adjust pressure relief valve.</li> <li>– Check/replace solenoid valve (Y5).</li> <li>– Check / replace hydraulic cylinder (16A, 16B).</li> </ul>                                                                                                                                                                                                                                                                     |
| <b>Side brushes, right and left, cannot be lowered/raised</b> | <ul style="list-style-type: none"> <li>– Check/replace accessories module fuse (F6).</li> <li>– Check/replace program selector switch (S8).</li> <li>– Check/adjust pressure relief valve.</li> <li>– Check/replace solenoid valve (Y7, Y8).</li> <li>– Check, replace hydraulic cylinder (18, 19).</li> </ul>                                                                                                                                                                                                                                                                                                                                               |
| <b>Debris container cannot be raised</b>                      | <ul style="list-style-type: none"> <li>– Check/replace accessories module fuse (F6).</li> <li>– Check/replace program selector switch (S8).</li> <li>– Check/replace rocker button (S15, S17).</li> <li>– Check/adjust pressure relief valve.</li> <li>– Check/replace solenoid valve (Y1, Y3).</li> <li>– Check/replace hydraulic cylinder (15).</li> </ul>                                                                                                                                                                                                                                                                                                 |

## 7.1 Troubleshooting without displays

| Fault not shown on the display               | Repair                                                                                                                                                                                                                                                                                                                                                       |
|----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Debris container cannot be tipped out</b> | <ul style="list-style-type: none"> <li>– Check/replace accessories module fuse (F6).</li> <li>– Check/replace program selector switch (S8).</li> <li>– Check/replace rocker button (S15, S16).</li> <li>– Check/adjust pressure relief valve.</li> <li>– Check/replace solenoid valve (Y1, Y2).</li> <li>– Check/replace hydraulic cylinder (14).</li> </ul> |
| <b>Debris container cannot be tipped in</b>  | <ul style="list-style-type: none"> <li>– Check/replace accessories module fuse (F6).</li> <li>– Check/replace program selector switch (S8).</li> <li>– Check/replace rocker button (S15, S16).</li> <li>– Check/adjust pressure relief valve.</li> <li>– Check/replace solenoid valve (Y1, Y2).</li> <li>– Check/replace hydraulic cylinder (14).</li> </ul> |
| <b>Debris container cannot be lowered</b>    | <ul style="list-style-type: none"> <li>– Check/replace accessories module fuse (F6).</li> <li>– Check/replace program selector switch (S8).</li> <li>– Check/replace rocker button (S15, S17).</li> <li>– Check/adjust pressure relief valve.</li> <li>– Check/replace solenoid valve (Y1, Y3).</li> <li>– Check/replace hydraulic cylinder (15).</li> </ul> |
| <b>Unit causes dust/does not vacuum</b>      | <ul style="list-style-type: none"> <li>– Check/replace cleaning module fuse (F5).</li> <li>– Check/replace cleaning module (A3).</li> <li>– Check/adjust/replace impeller fan drive belt.</li> <li>– Check/replace debris container filter case seal.</li> <li>– Check/replace round filter.</li> <li>– Check/adjust/replace sealing lips/strips.</li> </ul> |

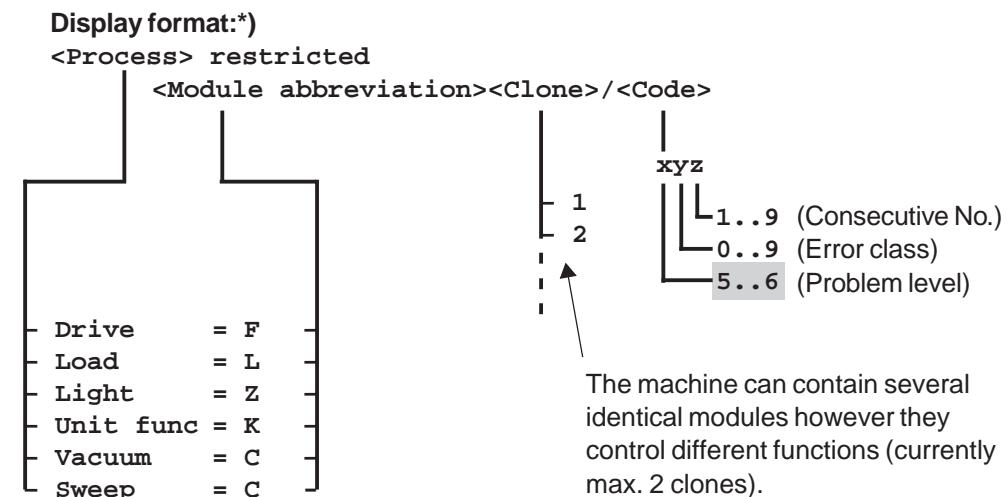
## 7.2 Troubleshooting with displays

### Note

If a fault message occurs, reset the key switch (S0). Before the key switch (S0) is switched back on, wait for approx 10 seconds to empty the energy store (capacitors) and to ensure correct system

restart. If the fault message occurs again, read out the error code in accordance with the error/fault group (Page 71- Page 81) and take the measures to rectify the fault.

### Structure of warning messages



\*) Note: Words in bold print represent the standard display text.

### Meanings of the 3-digit warning code

Examples: **Driving**      **Scrubbing**  
**restricted**      **restricted**      **F1/511**      **C1/111**

| Warning code | Description of the warning classes                                                                                                                                                                       |                                                                                                                             |
|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| <b>5yz</b>   | Hardware warnings, which expect the testing of peripheral errors first (E.g. checking possible interruptions in performance). If the warnings continue we recommend replacing the corresponding modules. |                                                                                                                             |
|              | y=0                                                                                                                                                                                                      | Not used.                                                                                                                   |
|              | y=1                                                                                                                                                                                                      | Load short circuit, which does not affect the quality of the machine's operation (e.g. horn short circuit).                 |
| <b>y=1</b>   | Warnings which display an impermissible operating mode due to peripheral errors.                                                                                                                         |                                                                                                                             |
|              | y=0                                                                                                                                                                                                      | Not used.                                                                                                                   |
|              | y=1                                                                                                                                                                                                      | Not used.                                                                                                                   |
|              | y=2                                                                                                                                                                                                      | Implausible operating mode (e.g. lifting motors runs in blockage, although it should have switched off via a limit switch!) |
|              | y=3                                                                                                                                                                                                      | Temporary voltage failure in load circuit.                                                                                  |
| <b>999</b>   | A module returns an error/warning code not stored in the database of the head CPU. It might be useful to update the head CPU firmware.                                                                   |                                                                                                                             |

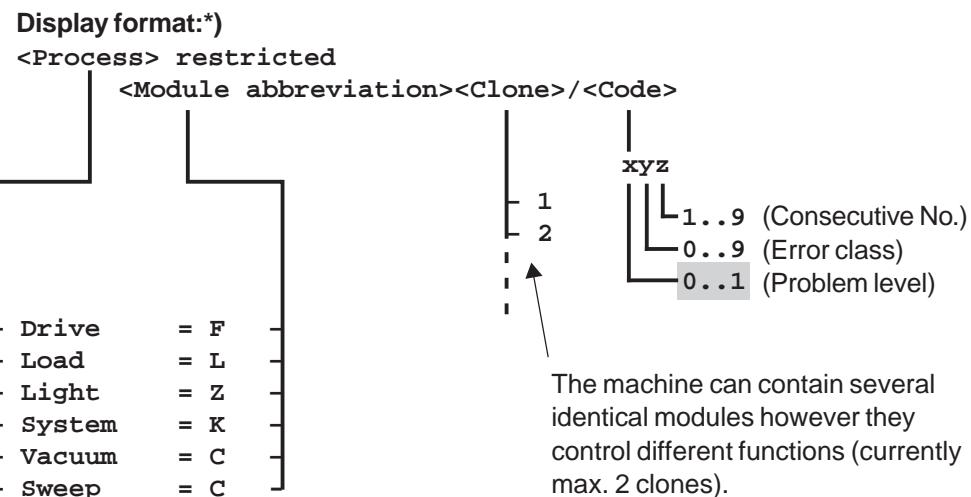
### Warning messages:

Warning messages (**highlighted in yellow in the following tables**) affect operation of the machine in different ways. Therefore, warnings have to be reacted to in different ways.

A short circuit in the horn does not require immediate replacement of the driving module (A2) or the horn. It only generates a warning message.

## 7.2 Troubleshooting with displays

### Structure of error messages



\*) Note: Words in bold print represent the standard display text.

### Meanings of the 3-digit error code

#### Examples:

Drive function fault F1/141

Drive function fault F1/022

System function fault K1/111

| Error code | Description of the error classes                                                                 |                                                                                                                                                            |
|------------|--------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
|            | Hardware error, which requires replacement of the module or a key switch reset.                  |                                                                                                                                                            |
| 0yz        | y=0                                                                                              | Cannot be corrected µC memory error.                                                                                                                       |
|            | y=1                                                                                              | Damaged/distributed supply of processor and drivers.                                                                                                       |
|            | y=2                                                                                              | Damaged/distributed power levels (FETs).                                                                                                                   |
|            | y=3                                                                                              | Damaged/distributed module sensors (temperature, U/I measurement).                                                                                         |
|            | Peripheral errors, which can be removed using the key switch reset or by the service technician. |                                                                                                                                                            |
| 1yz        | y=0                                                                                              | Correctable memory error, watchdog error.                                                                                                                  |
|            | y=1                                                                                              | Communications error between modules <-> head CPU.                                                                                                         |
|            | y=2                                                                                              | Failure of the voltage supply to the load circuit and/or modules.                                                                                          |
|            | y=3                                                                                              | Load output short circuited or overloaded.                                                                                                                 |
|            | y=4                                                                                              | Cable interruption for loads or external sensors.                                                                                                          |
|            | y=5                                                                                              | Wiring error in external sensor <-> signal input.                                                                                                          |
|            | y=6                                                                                              | Illogical external system status (e.g. accelerator pedal measurement outside the calibrated limits).                                                       |
|            | y=7                                                                                              | Illogical system status determined during bus communication from head CPU (e.g syntactically incorrect bus reply, time exceeded during telegram transfer). |

#### Cumulative errors:

A single fault can often cause error messages in many modules (cumulative error).

For example:

Short circuit in the main relay (K1): Fault messages and warnings K1/131, F1/121, H1/631, Z1/631 are generated. It is decisive that the cause is always a fault, i.e. with number group "0xx" or "1xx". In this example the main relay short circuit "K1/131" prevents the driving module (A2) from receiving a load circuit voltage (the main relay does not pick up). The driving module then reports the self-test error "F1/121".

- If a module reports several different errors, the respective most recent queued error of the module concerned is shown in the display. The error history of a module can be called up using the „diagnosis information“ menu item, either immediately or at a later time (with 6 error events per module).
- If fault messages and warning messages occur from different modules, these are displayed at 4 second spacings in the order they occur. If the error buffer has been worked through, the error display is repeated.

#### Note

Warnings are only shown once. They then disappear with the repeated error display.

## 7.2 Troubleshooting with displays

### Procedure:

- When a fault display appears, a key switch reset should first be performed. Before the key switch is switched on again, wait for a time of approx. 10 seconds to empty the energy storage device (condensers), which guarantees a clean system restart. If the fault continues, proceed according to the numbered action sequence of a fault group of the following tables (pages 71-81).
- If a module delivers several faults, only the last fault in queue of the particular module is shown in the display! The fault history of a module may be called up immediately via menu item "diagnostics information" at a fault event depth of 6 per module or a later time.
- If faults and warnings of various modules appear, they will be displayed at an interval of 4 seconds in the sequence of their occurrence. If the fault buffer has been processed, the fault display is repeated.

### Caution!

Since warnings are only displayed once, they will disappear when the fault display is repeated!

### Note:

Frequently, a single event can cause faults from many modules!

Example: Main relay coil (K1) short-circuits. Faults and warnings K1/131, F1/121, H1/631, Z1/631 are generated! Decisive is that the cause always is a fault, therefore has a number circuit "0xx" or "1xx". The main relay coil short-circuit "k1/131" in this example has the result that the drive module A2 does not receive any load circuit voltage (the contactor does not activate). Drive module A2 then reports the self-test fault "F1/121".

- Warnings (highlighted in the following tables on pages 71-81) affect the operation of the machine in various ways. A short-circuit in a horn, for example, is relatively harmless and does not require an immediate replacement of drive module A2 or the horn itself. However, periphery faults of the horn module are critical, for example, if the limit switches of the suction beam lifting motor deliver contradictory results. This prevents the suction beam from moving, which considerably inhibits the cleaning process. Both cases show that warnings require various sensitive reactions.

### 7.3.1 Error messages from the driving module (A2)

Modules involved: A2

Module clone: There is no other module clone

Display code: F1/xxx for errors/warnings from driving module

| <b>Module</b>           | <b>Fault class</b>                                             | <b>Error code</b> | <b>Action</b>                                                                                                                                                                                                                                                                                                                                                                        |
|-------------------------|----------------------------------------------------------------|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Driving module F</b> | Non-rectifiable memory error                                   | <b>F1/001</b>     | 1. Replace A2.                                                                                                                                                                                                                                                                                                                                                                       |
|                         | Printed circuit board supply defective                         | <b>F1/011</b>     | 1. Check whether 13-14V applied at A2/X7, in this case replace A2.<br>2. Search for error in bus cable1 or on A1/X4-1.                                                                                                                                                                                                                                                               |
|                         | Drive pickup supply overloaded                                 | <b>F1/012</b>     | 1. Completely disconnect plug A2/X4.<br>2. Carry out key reset.<br>3. If error remains, replace A2.<br>4. Search for overload to drive pickup, remove.<br>5. If necessary, replace drive pickup.                                                                                                                                                                                     |
|                         | Error detected in power electronics for drive motor (M1)       | <b>F1/022</b>     | 1. Disconnect drive motor (M1) from A2/X11,X12.<br>2. Reset key switch (S0) .<br>3. If error remains, replace A2.<br>4. Look for possible incorrect connection between chassis and battery earth. Eliminate connection.<br>5. Clear carbon dust (M1) from drive motor.<br>6. Check drive motor (M1) for penetrated moisture (HP cleaning?).<br>7. Possibly replace drive motor (M1). |
|                         | Short-circuit detected on main relay (K1)                      | <b>F1/024</b>     | 1. Check whether pin A2/X7-4 and A2/X7-8 is short-circuited in the bus.<br>2. Eliminate short-circuit in bus.<br>3. If error remains, replace A2.                                                                                                                                                                                                                                    |
|                         | Temperature sensor defective                                   | <b>F1/031</b>     | 1. Replace A2.                                                                                                                                                                                                                                                                                                                                                                       |
|                         | Error while saving setup parameters in the driving module (A2) | <b>F1/101</b>     | 1. Switch to parameter setup menu.<br>2. Switch to setup of driving module (A2).<br>3. e.g test by changing „Max. speed forwards“ to new value.<br>4. Quit setup menu, acknowledge save.<br>5. Carry out key reset (S0).<br>6. If error remains, replace A2, otherwise<br>7. reinstate the original parameters in setup.                                                             |

### 7.3.1 Error messages from the driving module (A2)

| Module           | Fault class                                                       | Display code | Action                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|------------------|-------------------------------------------------------------------|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Driving module F | Error in double processor monitoring                              | F1/102       | <ol style="list-style-type: none"> <li>Carry out key reset.</li> <li>If error remains, replace A2.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                  | Communications error between driving module (A2) head CPU (A1)    | F1/111       | <ol style="list-style-type: none"> <li>Check whether bus connectors A2/X7 and A2/X8 are firmly plugged in.</li> <li>Check whether the bus lines A2/X7-2, A2/X8-2, A2/X7-5, A2/X8-5 have continuous contact with the head CPU (A1).</li> <li>Search for and remove error in bus cables.</li> <li>If error remains, replace A2.</li> </ol>                                                                                                                                                                                                                                                                                    |
|                  | Driving module (A2) receives no voltage at the power electronics. | F1/121       | <ol style="list-style-type: none"> <li>Check fuse F2.</li> <li>Check whether battery voltage of between 14 .. 50V is present. If not, check battery.</li> <li>Possible short-circuit in another module.<br/>Disconnect all -/+ lines from the module and start to connect up again, starting with the drive module, until the affected module has been found.</li> <li>If relay error K1/131 occurs, then swap +/- at the relay coil (K1).</li> <li>Check whether the main relay (K1) is closed and relay coil leads have a continuous connection with the head CPU (A1).</li> <li>If error remains, replace A2.</li> </ol> |
|                  | Driving module (A2) receives no 12-14V control voltage            | F1/122       | <ol style="list-style-type: none"> <li>Check whether 13-14V applied at A2/X7, in this case replace A2.</li> <li>Search for error in bus cable1 or on A1/X4-1.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                  | Overload or short-circuit between A2/X11 -12                      | F1/131       | <ol style="list-style-type: none"> <li>Disconnect drive motor (M1) from A2/X11.</li> <li>Carry out key reset (S0).</li> <li>Press down on accelerator pedal (B1). Another error, then replace drive motor (M1).</li> <li>If error remains, replace A2.</li> </ol>                                                                                                                                                                                                                                                                                                                                                           |
|                  | Error detected in power electronics for brake (Y0).               | F1/132       | <ol style="list-style-type: none"> <li>Completely disconnect plug A2/X6.</li> <li>Reset key switch (S0).</li> <li>If error remains, replace A2.</li> <li>Depress accelerator pedal (B1). Other error: then replace magnet brake (Y1).</li> <li>If error remains, check whether magnet brake (Y1) has low impedance (&lt; 10 ohm), if so, replace the brake.</li> <li>Look for direct connection between magnet brake (Y1) and battery earth. Eliminate connection.</li> </ol>                                                                                                                                               |

### 7.3.1 Error messages from the driving module (A2)

| Module           | Fault class                                                    | Display code                    | Action                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|------------------|----------------------------------------------------------------|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Driving module F | Motor protection has been triggered                            | Drive motor hot! Let cool down! | <ol style="list-style-type: none"> <li>1. Switch off key switch (S0).</li> <li>2. Allow drive motor (M1) to cool down at least for 15 minutes.</li> <li>3. Find cause of high current consumption, correct (e.g. blocked magnetic brake (Y0), demanding driving on slopes with overloaded machine.)</li> <li>4. Switch on key switch (S0) and preferably continue driving on flat surface.</li> </ol>                                                                           |
|                  | Cable break drive pickup (B1)<br>A2/X4-3                       | F1/141                          | <ol style="list-style-type: none"> <li>1. Check ground from A2/X4-3 to drive pickup (B1).</li> <li>2. Check plug A4/X3 at driving module (A2).</li> <li>3. If error remains, replace A2.</li> </ol>                                                                                                                                                                                                                                                                             |
|                  | Cable break A2/X11-12                                          |                                 | <ol style="list-style-type: none"> <li>1. Check that all cable connections fit firmly.</li> <li>2. Disconnect A2/X11 and A2/X12. Check low impedance of drive motor (M1):             <ul style="list-style-type: none"> <li>– Check that carbons are fitted properly.</li> <li>– Check drive motor connection terminals.</li> </ul> </li> <li>3. Check motor lead cables for signs of crushing, buckling or shearing off.</li> <li>4. If error remains, replace A2.</li> </ol> |
|                  | Cable break A2/X6-3, 4                                         |                                 | <ol style="list-style-type: none"> <li>1. Check that all cable connections fit firmly.</li> <li>2. Disconnect A2/X6 and check low impedance of brake (Y0) (20-40 ohm).</li> <li>3. Check cables for signs of crushing, buckling or shearing off.</li> <li>4. If error remains, replace A2.</li> </ol>                                                                                                                                                                           |
|                  | Wiring error switch inputs A2/X5                               | F1/151                          | <ol style="list-style-type: none"> <li>1. Check that all the connected switches (S9, S10, S11) at A2/X5-1..4 are without exception also all supplied by A2/X5-5..8!</li> <li>2. Check whether fault voltages are coupled via the connected switches e.g. through contact against ground or Ubatt short-circuited chassis and remove.</li> <li>3. If error remains, replace A2.</li> </ol>                                                                                       |
|                  | Error in double processor monitoring                           | F1/161                          | <ol style="list-style-type: none"> <li>1. Carry out key reset (S0).</li> <li>2. If error remains, replace A2.</li> </ol>                                                                                                                                                                                                                                                                                                                                                        |
|                  | Drive pickup values not within the calibrated tolerance window | F1/162                          | <ol style="list-style-type: none"> <li>1. Recalibrate accelerator pedal (B1).</li> <li>2. Carry out key reset (S0).</li> <li>3. If the error remains, then check permissible pedal tension in parameter setup for machine and reset if necessary.</li> <li>4. Repeat 1 and 2.</li> <li>5. If error remains, replace A2.</li> </ol>                                                                                                                                              |

### 7.3.1 Error messages from the driving module (A2)

| Module           | Fault class                                                   | Display code                                  | Action                                                                                                                                                                                                        |
|------------------|---------------------------------------------------------------|-----------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Driving module F | Driving module (A2) registers external contactor release (K1) | <b>Contactor open? Emergency-stop button?</b> | 1. Carry out key reset (S0).<br>2. Check modules, module possibly defective.                                                                                                                                  |
|                  | Drive motor (M1) power electronics overloaded                 | <b>Controls hot! Let cool down!</b>           | 1. Switch off key switch (S0).<br>2. Allow controls to cool down at least for 5 minutes.<br>3. Switch on key switch (S0) and preferably continue driving on flat surface.<br>4. If error remains, replace A2. |
|                  | Horn (H1) faulty                                              | <b>F1/511</b>                                 | 1. Completely disconnect plug A2/X6.<br>2. Press horn button (S7) again.<br>3. If error remains, replace A2, otherwise<br>4. Check whether the horn (H1) has low resistance (< 10 Ohm), i.e. replace.         |

### 7.3.2 Error messages from accessories module (A5)

Modules involved: A5

Module clone: generally only 1 accessory module is used at present

Display code: Z1/xxx for errors/warnings from accessories module

| Module               | Fault class                                                            | Display code | Action                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|----------------------|------------------------------------------------------------------------|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Accessories module Z | Non-rectifiable memory error                                           | Z1/001       | 1. Replace A5.                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                      | Printed circuit board supply defective                                 | Z1/011       | 1. Check whether 13-14V applied at A5/X2-1, in this case replace A5.<br>2. Search for error in bus cable1 or on A1/X4-1.                                                                                                                                                                                                                                                                                                                          |
|                      | Temperature sensor defective                                           | Z1/031       | 1. Replace A5.                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                      | Error while saving setup parameters in the accessories module          | Z1/101       | 1. Carry out key reset (S0).<br>2. If error remains, replace A5.                                                                                                                                                                                                                                                                                                                                                                                  |
|                      | Communications error between accessories module (A5) and head CPU (A1) | Z1/111       | 1. Check whether bus connectors A5/X2 and A5/X3 are firmly plugged in.<br>2. Check whether the bus lines A5/X2-2, A5/X3-2, A5/X2-5 and A5/X3-5 have continuous contact with the head CPU (A1).<br>3. Search for and remove error in bus cables.<br>4. If error remains, replace A5.                                                                                                                                                               |
|                      | Accessories module (A5) receives no voltage at the power electronics   | Z1/121       | 1. Check whether general contact (K1) closed and contactor coil lines have continuous connection with head CPU (A1).<br>2. Check fuse (F6) to accessories module and replace if necessary.<br>3. Check whether short circuit between Ubatt and GND downstream of the contactor (K1). Localise and remove short-circuit.<br>4. Check whether battery voltage applied is between 14..50V, if not check battery.<br>5. If error remains, replace A5. |
|                      | Accessories module receives no 12-14V control voltage                  | Z1/122       | 1. Check whether 13-14V applied at A5/X2-1, in this case replace A5, otherwise.<br>2. Search for error in bus cable1 or on A1/X4-1.                                                                                                                                                                                                                                                                                                               |

### 7.3.2 Error messages from accessories module (A5)

| Module               | Fault class                                                      | Display code                                | Action                                                                                                                                                                                                                                                                                                                     |
|----------------------|------------------------------------------------------------------|---------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Accessories module Z | Wiring error<br>switch inputs<br>A5/X5                           | Z1/151                                      | <p>1. Check that all the connected switches (S15, S16, S17) at A5/X5-1-5 are without exception also all supplied by A5/X5-6 - 10!</p> <p>2. Check whether fault voltages are coupled via the connected switches e.g. through contact against ground or Ubatt short-circuited chassis and remove.</p> <p>3. Replace A5.</p> |
|                      | Drive motor<br>power<br>electronics<br>overloaded                | <b>Controls hot!<br/>Let cool<br/>down!</b> | <p>1. Switch off key switch (S0).</p> <p>2. Allow controls to cool down at least for 5 minutes.</p> <p>3. Switch on key switch (S0) and preferably continue driving on flat surface.</p> <p>4. If error remains, replace A5.</p>                                                                                           |
|                      | Cable break or<br>short circuit at<br>A5/X6, X8, X9,<br>oder X10 | Z1/511                                      | <p>1. Check supply lines to the connected loads A5/X6..X10 for continuity and short-circuit.</p> <p>2. Check whether loads (H2, Y8, H3, H3.1, M9) have too high resistance or are short-circuited and replace if necessary (e.g. lamps, motors).</p> <p>3. If error remains, replace A5.</p>                               |
|                      | Cable break or<br>short circuit at<br>A5/X4                      | Z1/512                                      | <p>1. Check supply lines to the connected loads for continuity and short-circuit, correct.</p> <p>2. Check whether loads (Y1-7) A5/X4-1...6 have too high resistance or are short-circuited and replace if necessary (e.g. relay, valves).</p> <p>3. If error remains, replace A5.</p>                                     |
|                      | Supply in load<br>circuit has failed                             | Z1/631                                      | <p>1. Check supply connection A4/X11 for secure fit.</p> <p>2. Check feed lines and fuses to module for secure connection.</p>                                                                                                                                                                                             |

### 7.3.3 Error messages from cleaning module (A3)

Modules involved: A3

Display code: Cy/xxx for errors/warnings xxx from cleaning module

C1 = Clean module A3 for sweeping and vacuuming

| Module   | Fault class                                                         | Display code                            | Action                                                                                                                                                                                                                                                                                                                          |
|----------|---------------------------------------------------------------------|-----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>C</b> | Non-rectifiable memory error                                        | <b>C1/001</b>                           | 1. Replace A3.                                                                                                                                                                                                                                                                                                                  |
|          | Error while saving setup parameters in the cleaning module          | <b>C1/101</b>                           | 1. Switch to parameter setup menu.<br>2. Switch to setup of cleaning module (A3).<br>3. „Test by changing „Motor type M4“ to another value.<br>4. Quit setup menu, acknowledge save.<br>5. Carry out key reset (S0).<br>6. If error remains, replace A3, otherwise<br>7. ensure you reinstate the original parameters in setup. |
| <b>K</b> | Communications error between cleaning module (A3) and head CPU (A1) | <b>C1/111</b>                           | 1. Check whether bus connectors A3/X1 and A3/X2 are firmly plugged in.<br>2. Check whether the bus lines A3/X2-2, A3/X1-2, A3/X2-5 and A3/X1-5 have continuous contact with the head CPU (A1).<br>3. Search for and remove error in bus cables.<br>4. If error remains, replace relevant A3 clone.                              |
| <b>C</b> | Cleaning module power electronics too hot                           | <b>Controls hot!<br/>Let cool down!</b> | 1. Switch off key switch (S0).<br>2. Allow controls to cool down at least for 5 minutes.<br>3. Switch on key switch (S0) and if necessary, considerably reduce brush pressure on rough floors.<br>4. If error remains, replace A3.                                                                                              |
|          | Short-circuit or overload at A3/X8                                  | <b>C1/131</b>                           | 1. Disconnect motor (M8) A3/X8.<br>2. Carry out key reset (S0). If error is triggered by another, then search for short-circuit in wiring and remove. If necessary replace motor (M8) at A3/X8.<br>3. If error remains, replace A3.<br>4. Check fuse (3) 100A, replace if necessary.                                            |
|          | Short-circuit or overload at A3/X13                                 | <b>C1/132</b>                           | see C1/131, however for A3/X13 (M3).                                                                                                                                                                                                                                                                                            |
|          | Short-circuit or overload at A3/X10                                 | <b>C1/133</b>                           | see C1/131, however for A3/X10 (M4).                                                                                                                                                                                                                                                                                            |

### 7.3.3 Error messages from cleaning module (A3)

| Module | Fault class                             | Display code | Action                                                                                                                                                                                                                                                                                                                                                                       |
|--------|-----------------------------------------|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| C      | Short-circuit or overload at A3/X12     | C1/134       | see C1/131, however for A3/X12 (M5).                                                                                                                                                                                                                                                                                                                                         |
|        | Short circuit or overload at A3/X4, 3-7 | C1/135       | <ol style="list-style-type: none"> <li>1. Disconnect A3/X4, 3-7..</li> <li>2. Reset key switch (S0). If error replaced by another one, look for and eliminate short-circuit in cables. If necessary, replace motor (M8) at A3/X4, 3-7.</li> <li>3. If error remains, replace A3</li> </ol>                                                                                   |
|        | Fuse F7 shaker module (A6)              | C1/136       | <ol style="list-style-type: none"> <li>1. Check 24VDC power supply at A6/X2,4 (+) and A6/X2,1 (-) with multimeter.</li> <li>2. Check that cable connections are firmly fitted, also check for signs of crushing, buckling or shearing off.</li> <li>3. Check function of fuse (F7) (glass tube fuse, shaker module A6).</li> <li>4. If error remains, replace A6.</li> </ol> |
|        | Short-circuit or overload at A6/X2/2-3  | C1/511       | <ol style="list-style-type: none"> <li>1. Disconnect motor A3/X8.</li> <li>2. Reset key switch (S0). If error replaced by another one, look for and eliminate short-circuit in cables. If necessary, replace motor at A6/X2/2-3.</li> <li>3. If error remains, replace A6.</li> </ol>                                                                                        |
|        | Cable break at A6/X2/2-3                | C1/512       | <ol style="list-style-type: none"> <li>1. Check that all plug-and-socket connections and all cable connections between A3/X7/1 A3/X4/5,7,8 and A6/X1/1,2,3,6 are firmly fitted, also check for signs of crushing, buckling or shearing off.</li> <li>2. If error remains, replace A6.</li> </ol>                                                                             |
|        | Power release for motors not set        | C1/631       | Non-critical error. Please notify developer.                                                                                                                                                                                                                                                                                                                                 |
|        | Programming shaker time has failed      | C1/632       | <ol style="list-style-type: none"> <li>1. Reset key switch (S0).</li> <li>2. Re-adjust clean module shaker time in setup menu and save in the module (A6) by leaving the menu.</li> <li>3. If error remains, replace A6.</li> </ol>                                                                                                                                          |

### 7.3.4 Error messages from head CPU (A1)

Modules involved: A1

Module clone: There is no other module clone

Display code: K1/xxx for errors/warnings from head CPU

| Module   | Fault class                                                         | Display code | Action                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|----------|---------------------------------------------------------------------|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Head CPU | Short-circuit in general contactor control (K1)                     | K1/021       | <ol style="list-style-type: none"> <li>1. Ensure that general contactor coil (K1) connected at A1/X11-3 and A1/X11-4.</li> <li>2. Check whether fault voltages are coupled via the connected switches e.g. through contact (feed cable) against Ubatt short-circuited chassis and remove.</li> <li>3. If error remains, replace A1.</li> </ol>                                                                                                                                                                                                                                                             |
|          | Error in parameter memory backed up numerous times                  | K1/101       | <ol style="list-style-type: none"> <li>1. Carry out key reset (S0).</li> <li>2. If error remains, replace A1.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|          | No module detectable in bus, bus damaged                            | K1/111       | <ol style="list-style-type: none"> <li>1. Check whether bus connectors A1/X3 and A1/X4 are firmly plugged in.</li> <li>2. Check whether bus cables A1/X3-2 to A1/X4-2 AND A1/X3-5 to A1/X4-5 all have continuous contact.</li> <li>3. Search for and remove error in cables No. 2 and No . 5 of all bus cables.</li> <li>4. Test individual module coupling, to do this, connect head CPU (A1) with one module only, at random, as direct bus. If error triggered by another, test with other modules until faulty module found. Replace this module.</li> <li>5. If error remains, replace A1.</li> </ol> |
|          | BUS-ATTN<br>– missing during self-test<br>– Failed during operation | K1/112       | <ol style="list-style-type: none"> <li>1. Check whether bus connectors A1/X3 and A1/X4 are firmly plugged in.</li> <li>2. Check whether bus connectors are securely connected to all modules.</li> <li>3. Search for and remove error in cable No 6 of all bus cables.</li> <li>4. Test individual module coupling, to do this, connect head CPU (A1) with one module only, at random, as direct bus. If error triggered by another, test with other modules until faulty module found. Replace this module.</li> <li>5. If error remains, replace A1.</li> </ol>                                          |
|          | No driving module found for emergency operation                     | K1/113       | <ol style="list-style-type: none"> <li>1. Couple driving module (A2) directly with head CPU (A1).</li> <li>2. If error remains, replace A2.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

### 7.3.4 Error messages from head CPU (A1)

| Module   | Fault class                                                   | Display code | Action                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|----------|---------------------------------------------------------------|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Head CPU | Wrong module configuration                                    | K1/114       | <ol style="list-style-type: none"> <li>1. Impermissible sequence control (head CPU A1) installed in wrong machine, (e.g. floor cleaner sequence in sweeper) -&gt; Install correctly programmed head CPU.</li> <li>2. Modules found, which make no sense for model (e.g. lift module in sweeper) -&gt; Establish correct configuration.</li> </ol>                                                                                                                                                                                                                                           |
|          | Battery voltage over 45V                                      | K1/121       | <ol style="list-style-type: none"> <li>1. Check whether correct battery (24V or 36V system) is connected.</li> <li>2. If operating with test system parts, maximum 45V allowed!</li> <li>3. If error remains despite correct voltages, replace A1.</li> </ol>                                                                                                                                                                                                                                                                                                                               |
|          | Adhere contacts main relay coil (K1)                          | K1/122       | <ol style="list-style-type: none"> <li>1. Reset key switch (S0).</li> <li>2. If error remains, replace main relay (K1).</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|          | Overload, short-circuit general contactor coil (K1)           | K1/131       | <ol style="list-style-type: none"> <li>1. Disconnect a cable at the general contactor coil (K1).</li> <li>4. Carry out key reset (S0). If error is triggered by another, then search for and remove short-circuit in cabling from coil to connector A1/X11.</li> <li>5. If error remains, replace A1.</li> <li>6. If another error, check whether <ul style="list-style-type: none"> <li>– cables at general contactor coil (K1) have been connected incorrectly</li> <li>– freewheeling diode at general contactor coil (K1) is short-circuited. Replace contactor.</li> </ul> </li> </ol> |
|          | Head CPU (A1) automatically switches on (without key)         | K1/161       | <ol style="list-style-type: none"> <li>1. Fault on bus when key switched off (S0) or switched off head CPU (A1) in standby mode.</li> <li>2. Notify developer, if necessary replace A1.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                          |
|          | Other module has released contactor in operation              | K1/162       | <ol style="list-style-type: none"> <li>1. Carry out key reset (S0).</li> <li>2. If error remains, determine module by testing the GS cable at each module plug (input = Ubatt, output = 0).</li> <li>3. Remove module from the bus and test with remaining configuration.</li> <li>4. If another error results, replace removed module.</li> </ol>                                                                                                                                                                                                                                          |
|          | Both forward drive and reverse drive present at the same time | K1/163       | <ol style="list-style-type: none"> <li>1. Check functions of direction of travel switch (S9, S10) and check for contact adhesion.</li> <li>2. Check cables from (S9, S10) to module (A2) or to module (A1) for short-circuit root fault at X5/8.</li> <li>3. Check correct wiring to (A2).</li> <li>4. If error remains, replace (A2) or (A1).</li> </ol>                                                                                                                                                                                                                                   |

### 7.3.4 Error messages from head CPU (A1)

| Module   | Fault class                        | Display code | Action                                                                                                                                                                                                                                                                               |
|----------|------------------------------------|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Head CPU | Parameter buffer overflow          | K1/171       | 1. Software error in sequence control -> notify developer<br>2. Replace A1 for A1 with new firmware.                                                                                                                                                                                 |
|          | Protocol error in bus transmission | K1/172       | 1. Carry out key reset (S0) several times.<br>2. If errors remain, test individual module coupling, to do this, connect head CPU (A1) with any one module only as direct bus. If error triggered by another, test with other modules until faulty module found. Replace this module. |
|          | Module status query not possible   | K1/173       | 3. If error remains, notify developer.<br>4. Replace A1 for A1 with new firmware.                                                                                                                                                                                                    |
|          | Command buffer overflow            | K1/174       | 1. Reset key switch (S0).<br>2. If error remains, replace A1.<br>3. Do not constantly press program switch (S8), i.e. do not persistently change the program in intervals of less than 1 - 2 seconds!                                                                                |

### 7.3.4.1 Information about hardware errors on the head CPU (A1)

- Flash/RAM errors in PIC do not permit any reliable operating mode, so that head CPU is stuck in continuous loop without any data output to display or LED port.
- Defective 5V supply is detected by brown out detect and results in a processor reset. Own monitoring is not suitable for TÜV because of the inner-processor AD measurement.
- A defective GS-FET must always be tested for shorting to generate a warning. If a shutdown then does not cause the GS contactor to drop within e.g. 15 seconds, then the modules intervene.
- After 2 seconds of no bus communication, all modules switch their drives off. After another 5 seconds, the GS is dropped by the clean module or drive module (TÜV!).
- Each module only drops the GS when there is a risk of fire (smoke detector)!

### 7.3.5 Hydraulics error messages

| Error message                                                                              | Cause                                                                                                                                                                        | Action                                                                                                                                                                                                                                                                   |
|--------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Cleaning interrupted</b><br><b>Check limit position of discharge in raised position</b> | The microswitches S13 and S14 supply contradictory information. E.g. container lowered and simultaneously tipped out.                                                        | Check wiring and function of microswitches S13 and S14. Test the microswitch signals at X7/5 and X7/6. If everything is o.k., check microswitch supply Ubatt at X7/9 and X7/10 of cleaning module A3. If missing, replace A3.                                            |
| <b>Tip in container</b>                                                                    | Microswitch S13 supplies „tipped out“ signal. Due to risk of collision during the container's lowering phase the lowering is interrupted and the above message is generated. | If necessary fully tip in container. If this is the case, check wiring and function of the microswitch S13 at X7/5 of cleaning module A3. If everything is o.k., check microswitch supply Ubatt at X7/10 of cleaning module A3. If missing, replace A3.                  |
| <b>Hydraulics time-out</b>                                                                 | To protect the hydraulic pump against overloading, it is switched off after (¹) seconds uninterrupted running.                                                               | Do not press switches S15, S16, S17 longer than the time given above to operate the discharge in raised position. If this is the case, check whether the series circuit from S15, S16 or S15, S17 is interruptible (check all switches and wiring for correct function). |
| <b>Discharge in raised position only in driving mode</b>                                   | Discharge in raised position may not be actuated in cleaning mode.                                                                                                           | Turn program selector switch to position „Transport = 1“. If this is the case, check whether program selector switch is ok (e.g. by querying via test mode).                                                                                                             |
| <b>Tipping out not possible</b>                                                            | In discharge in raised position mode the container is inadequately extended, in order to ensure collision-free tipping out.                                                  | Press switches S15, S17 in „raise“ mode until the debris container releases the microswitch S14 (side arm). If this is the case, check whether wiring and function of switches S15-S17 is correct.                                                                       |
| <b>Filter cleaning not possible</b>                                                        | When the debris container is extended the filter cleaning may not be carried out for dust reasons.                                                                           | Check that the debris container is fully retracted. If this is the case, check whether wiring and function of switches S15, S17 is correct.                                                                                                                              |

<sup>¹</sup> Switch off while tipping out container: 25 seconds.

Switch off while raising container: 45 seconds.

Switch off during both functions: 25 seconds.

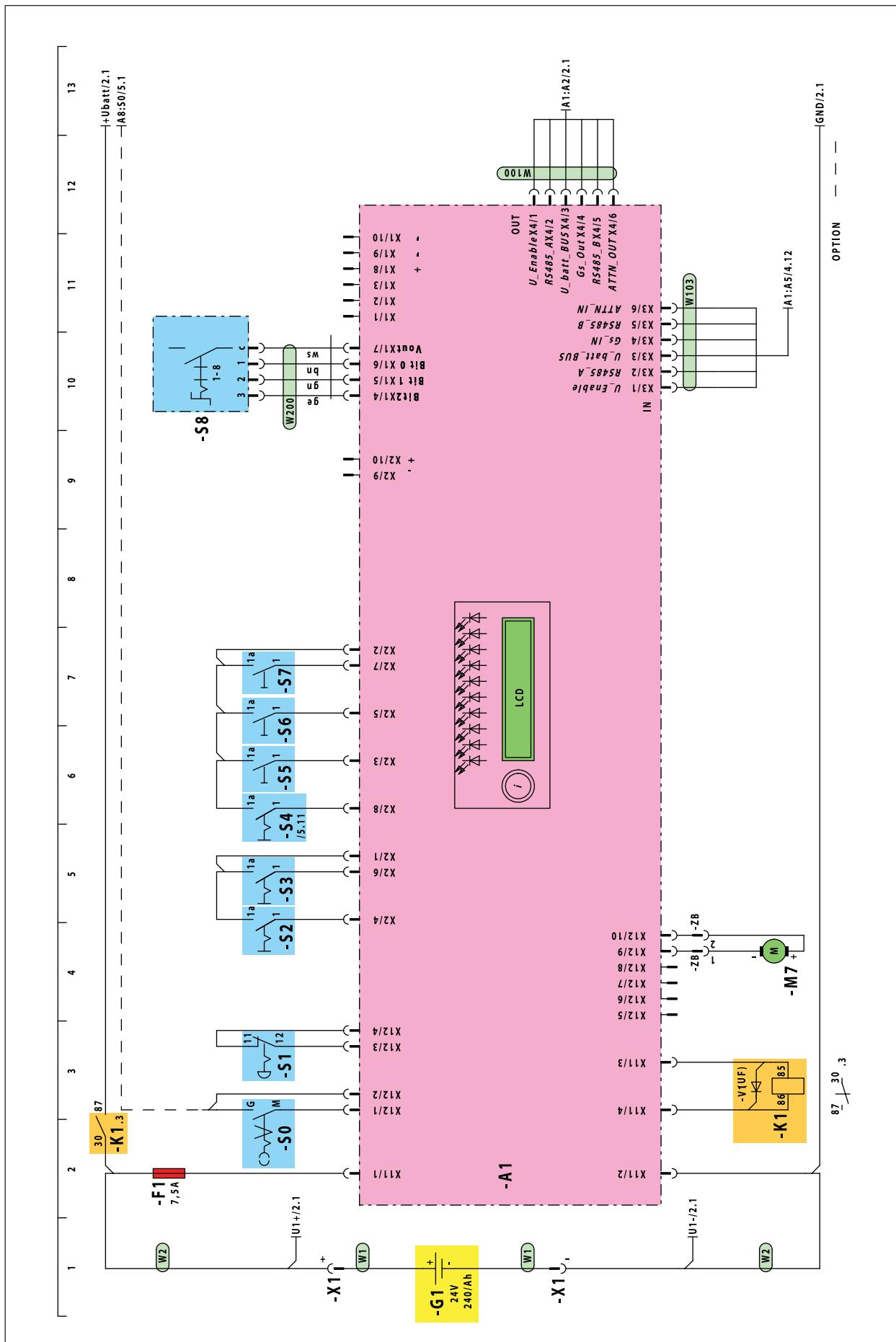
### 7.3.6 Error message „Filter shaking module damaged“

The filter cleaning module A6 either does not communicate with the cleaning module A3 or returns an error status to the cleaning module A3.

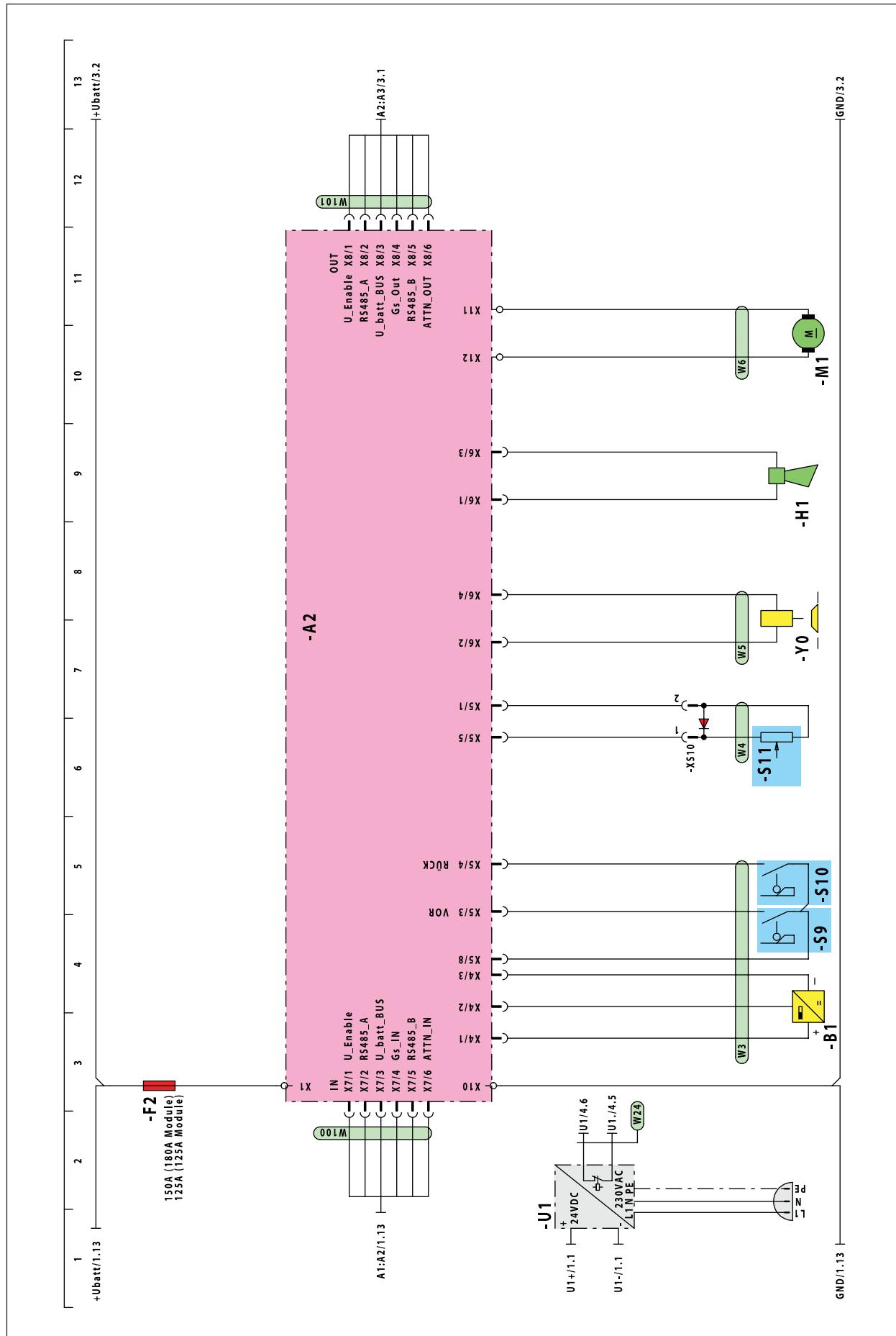
The SMD-DUO-LED on module A6 provides information of errors in module A6:

| LED indicator                                    | Cause                                                                                                                                                                                                                                                | Action                                                                                                                                                                                                                                                           |
|--------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. LED = continuously red:                       | <b>1. Filter motor blockage:</b><br>Motor current is controlled at 10 A for longer than 10 sec.                                                                                                                                                      | Check filter shaker for sluggishness and remove blockage. Carry out key switch reset. If error recurs, measure (test) motor in idle mode ( $I < 3A$ ), if motor current higher, replace motor. If this is not the case, replace A6.                              |
|                                                  | <b>2. Filter shaker module defective:</b><br>The shaker module self-test failed.                                                                                                                                                                     | Check whether fuse F7 = 10 A on the shaker module A6 is defective, replace if necessary. If this is not the case, disconnect the shaker module and carry out key switch reset. If error still exists, replace A6.                                                |
| 2. LED = red/green alternating flashing (1s):    | Filter motor interruption.                                                                                                                                                                                                                           | Check wiring to motor for interruption, check carbon contact in motor. If this is the case, replace shaker module A6.                                                                                                                                            |
| 3. LED = yellow/green alternating flashing (1s): | Batter voltage not between 9..30V.                                                                                                                                                                                                                   | Check battery voltage, check supply connections to module A6.                                                                                                                                                                                                    |
| 4. LED = yellow/red alternating flashing (1s):   | The pause time has been changed in the parameter setup of the cleaning module of the KM 120/150 R Bp and transferred to A6 via the cleaning module using the „Quit setup?“ command. An error occurred while transferring from cleaning module to A6. | Change the programming of the pause time in cleaning module parameter setup again and save again. If the error occurs again, check whether the wiring W102 of connector X1 at A6 (shaker module) to the connectors X4 and X7 at A3 (cleaning module) is correct. |

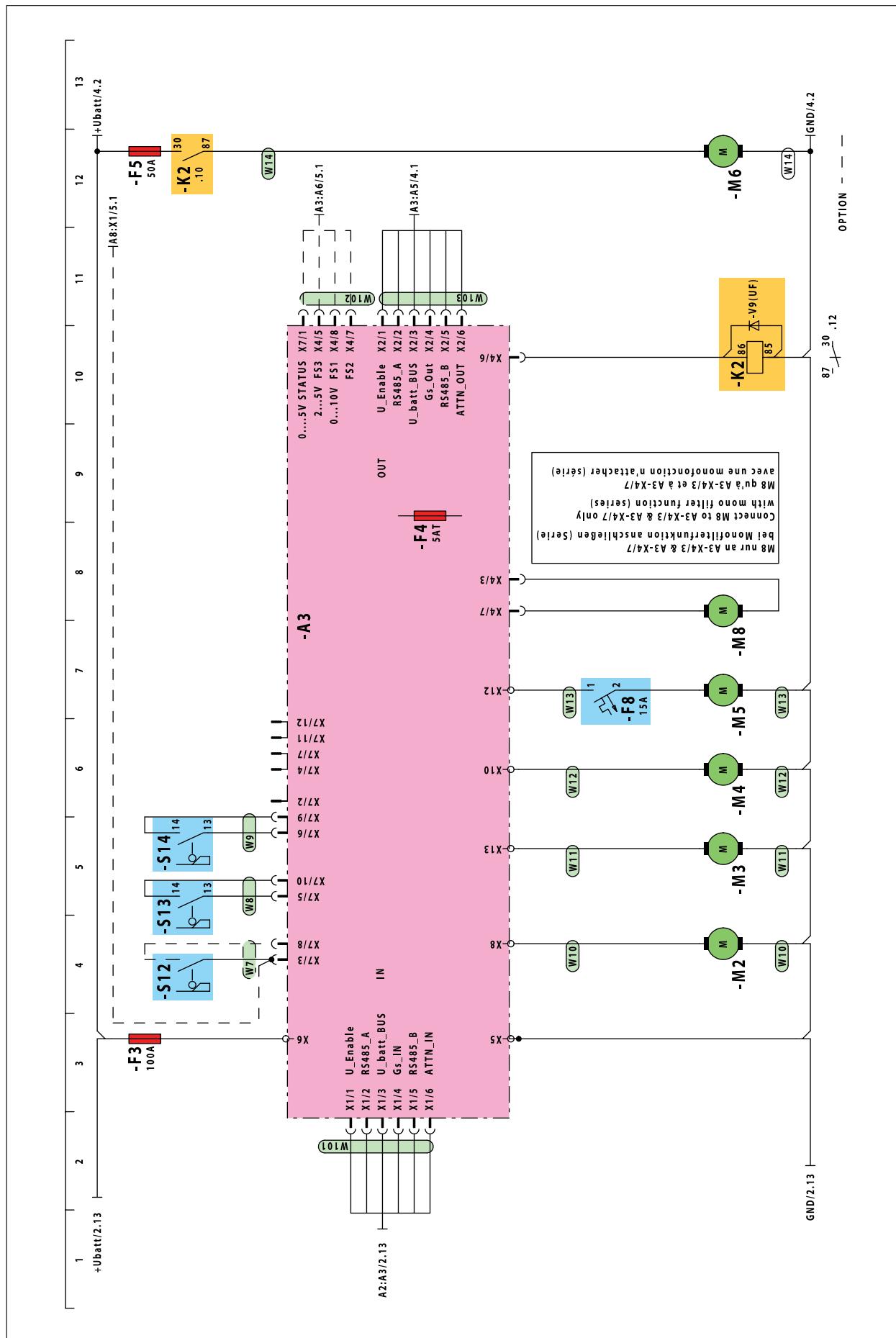
## 8.1 Circuit diagram 0.088-875.0, Head CPU (A1)



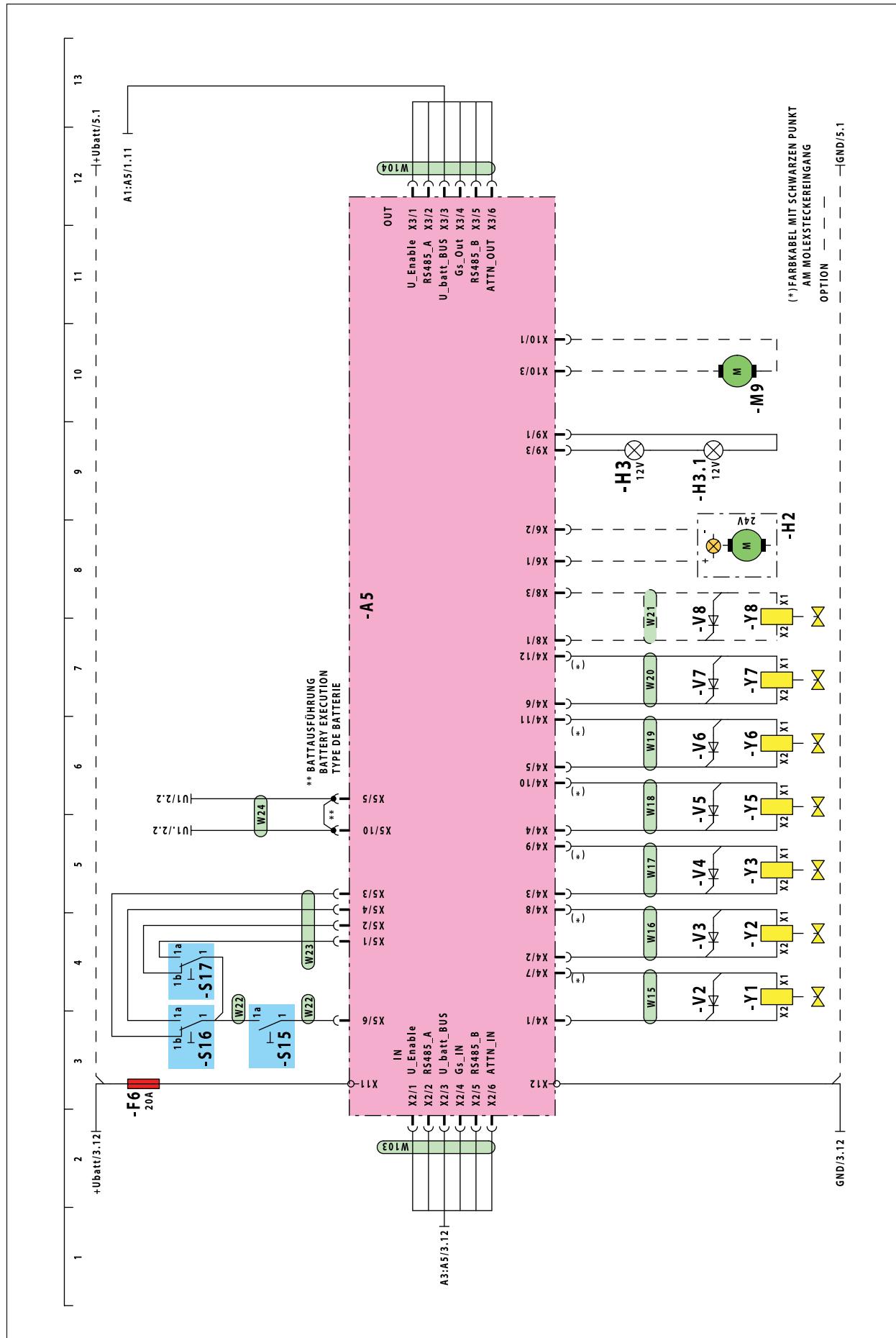
## 8.2 Circuit diagram 0.088-875.0, Driving module (A2)



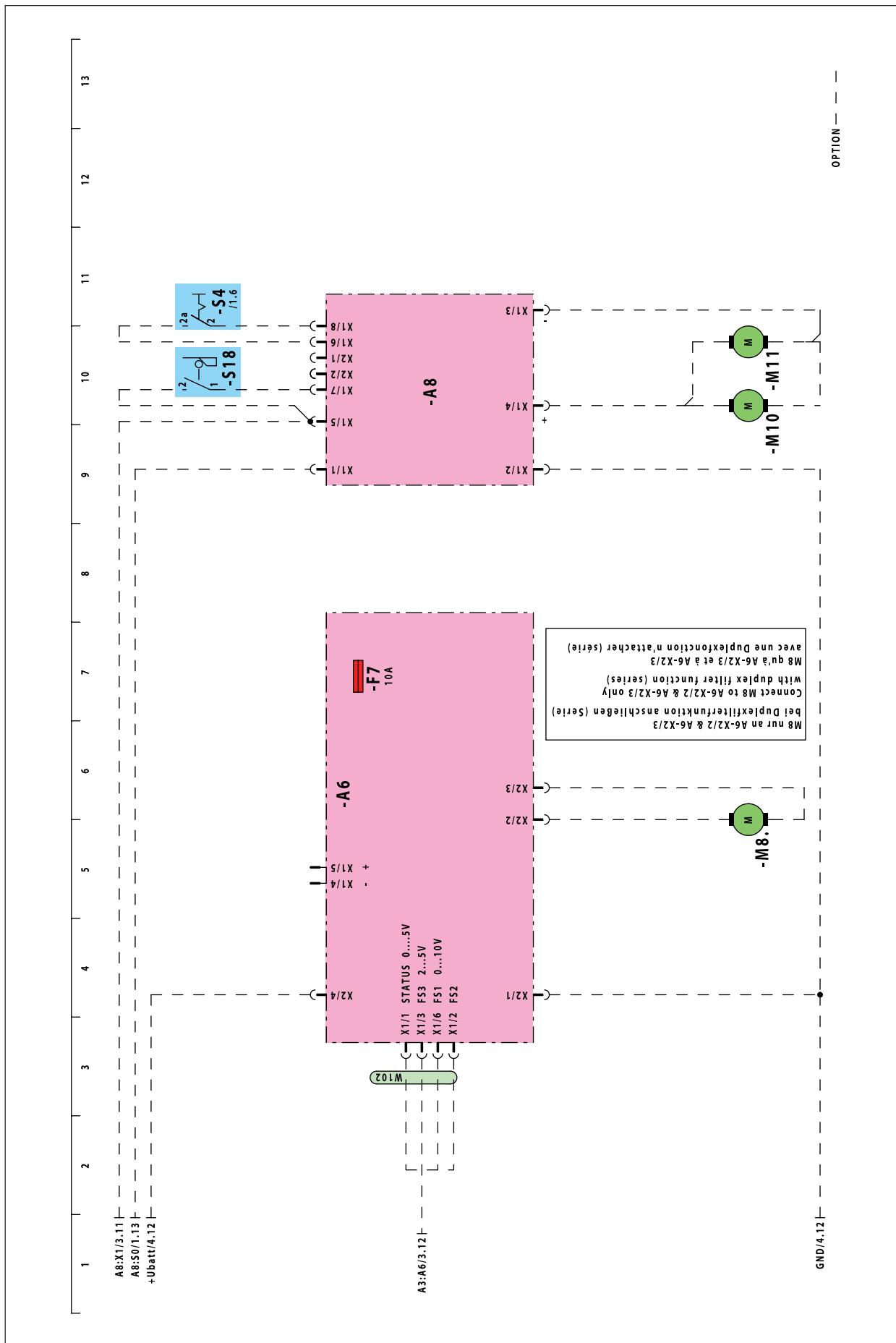
### 8.3 Circuit diagram 0.088-875.0, Cleaning module (A3)



## 8.4 Circuit diagram 0.088-875.0, Accessories module (A5)



## 8.5 Circuit diagram 0.088-875.0, Filter cleaning module (A6)



## 8.6 Circuit diagram 0.088-875.0, Listing

|                                          |                                                   |
|------------------------------------------|---------------------------------------------------|
| A1 Head CPU                              | S0 Key switch                                     |
| A2 Driving module                        | S1 Button, Emergency stop                         |
| A3 Cleaning module                       | S2 Switch, Rotating beacon (Optional)             |
| A5 Accessories module                    | S3 Switch, Work light                             |
| A6 Filter cleaning module                | S4 Switch, Wet sweeping                           |
| A8 Electronics dust extraction hose      | S5 Push button, Filter cleaning                   |
| B1 Magnetic sensor for driving operation | S6 Push button, Eco/Power                         |
| F1 Fuse, Head CPU                        | S7 Push button, Horn                              |
| F2 Fuse, Driving module                  | S8 Program selection switch                       |
| F3 Fuse, Cleaning module                 | S9 Micro switch, Driving direction forward        |
| F4 Fuse supply X4 Cleaning module        | S10 Micro switch, Driving direction backward      |
| F5 Fuse, Motor Hydraulic pump            | S11 Seatsensor                                    |
| F6 Fuse, Accessories module              | S12 Micro switch, Suction nozzle (Optional)       |
| F7 Fuse, Filter cleaning module          | S13 Limit switch, Hopper tilted                   |
| F8 Protective switch left side brush     | S14 Limit switch, Hopper lifted                   |
| G1 Battery 24V / 480 Ah                  | S15 Push button to release highload dump          |
| H1 Horn                                  | S16 Push button to tilt/retract hopper            |
| H2 Rotating beacon                       | S17 Push button to lift/lower hopper              |
| H3 Working light                         | S18 Limit switch, Dust extraction hose (Optional) |
| H3.1Working light                        | X1 Battery plug                                   |
| M1 Drive motor                           | U1 Battery charger (Package)                      |
| M2 Motor roller brush                    | Y0 Magnetic break                                 |
| M3 Motor right side brush                | Y1 Solenoid valve, Bidirectional valve            |
| M4 Suction motor                         | Y2 Solenoid valve, retract hopper                 |
| M5 Motor left side brush                 | Y3 Solenoid valve, lower hopper                   |
| M6 Motor, Hydraulic pump                 | Y5 Solenoid valve, lower roller brush (Eco)       |
| M7 Cooling fan                           | Y6 Solenoid valve, power roller brush (Power)     |
| M8 Filter shaker motor                   | Y7 Solenoid valve, right side broom               |
| M9 Motor-shaker shade                    | Y8 Solenoid valve, left side broom                |
| M10 Lifting motor (Optional)             | V1-V8 Diode                                       |
| M11 Lifting motor (Optional)             |                                                   |
| K1 Main contactor                        |                                                   |
| K2 Relais, Motor hydraulic pump          |                                                   |

## 9 Technical specifications

| Unit type            | Unit No.    | Circuit diagram | Operating instructions | Spare parts list |
|----------------------|-------------|-----------------|------------------------|------------------|
| KM 120/150 R Bp      | 1.511-104.0 | 0.088-875.0     | 5.961-597.0            | 5.970-468.0      |
| KM 120/150 R Bp Pack | 1.511-105.0 | 0.088-875.0     | 5.961-597.0            | 5.970-468.0      |

The technical data sheet and circuit diagram are included on the next release of the spare parts CD-ROM (DISIS) and also in kaercher-inside (<https://kaercher-inside.com>).

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

## 10 Special tools

|                                                 |             |
|-------------------------------------------------|-------------|
| Multimeter                                      | 6.803-022.0 |
| Scope of supply - service package (see Page 32) | 2.816-117.0 |
| Mounting plate for brake adjustment             | 5.116-199.0 |
| Voltage regulator                               | 6.803-025.0 |
| Fuse 1A                                         | 6.644-126.0 |

## 11 Tightening torques

|                                  |                       |
|----------------------------------|-----------------------|
| Cleaning module and drive module | also refer to page 25 |
| M5 (press-fitted connection)     | 2.2 Nm                |
| M5 (plug in connection)          | 4.0 Nm                |
| M6 (press-fitted connection)     | 3.9 Nm                |
| M6 (plug in connection)          | 4.0 Nm                |
| M8 threaded bolt                 | 5.5 Nm                |
| M10 threaded bolt                | 17.0 Nm               |
| Insulating nut (see Page 23)     | 12,0 Nm               |

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