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S6 / Scout 6

TECHNICAL SERVICE MANUAL

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☝ IMPORTANT

Take the machine to the waste disposal area, clean the suction filter and empty the dirt bin.

Move the machine onto flat ground and apply the brake. If necessary, place chocks under the wheels.

Switch the machine off by turning the ignition key anticlockwise and/or pressing the emergency switch

Disconnect the electronic circuit from the batteries by detaching one or both battery connectors.

i INFORMATION

Important information

When consulting this Service manual, the reader will encounter the expressions RIGHT and LEFT indicating the side of the machine. These indications always refer to the direction of movement of the machine.

In this Service Manual, the version of the machine may be written in brackets “()”, i.e. (E, DP-P, P, D). This note indicates that the instructions only refer to the model or version specified in brackets.

A1 CENTRE BRUSH MOTOR

The electric motor driving the centre brush is a standard brushed type, fitted internally with two carbon brushes. More exactly, the motor is a 12V DC unit of maximum rated power 80W and maximum speed 2500 rpm. The motor is of totally enclosed design affording optimum protection against the penetration of solids, but not against the ingress of liquids; accordingly, the machine should be used only in dry surroundings. The motor is driven by the power circuit board, the functions of which include ramp start and continuous monitoring of power draw, so that the ground pressure of the brush selected at the control panel can be maintained constant.

A1.1 Checking centre brush motor current draw

1. Undo the fixing screws of the top cover, and remove the cover.
2. **Make sure that the batteries on the machine are charged (12 V ± 1 V).**
3. **Use a clamp-on ammeter with a full scale reading of at least 200 A (amperes).**
4. **Move the machine onto a flat and smooth floor to ensure a correct current reading.**
5. Pick out the Red wire of the centre brush motor and apply the clamp-on ammeter to it.
6. Run the brush at speed 2, selected by way of the control panel.
7. Take note of the reading on the ammeter display and compare it with the values in the table.
8. If the value falls within the range indicated in the table, disconnect the instrument and reinstate the top cover of the machine.
9. Conversely, if the value is at variance with those indicated in the table, proceed to make the following checks.
10. Disassemble the side brush and check that the current draw under no-load conditions is within the values in table.

10a. Should the reading indicate a value different to those in the table (typically higher), check for wear on the carbon brushes of the motor, also for wear on the drive belts and cleanliness of the relative pulleys, and for noise from the pulley bearing.

10b. If the reading is within the range of values indicated in the table, check that the brush is not rubbing on the sides or on the roller, and that there is no abnormal noise coming from the centre brush free wheel bearings.

10c. Replace the brush motor with a new one.

Uncouple the side brush to ensure a more accurate reading.

Carry out the test with the machine at standstill to ensure the brush is not rotated 'against' the drive, as this could result in a higher current draw reading.

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Current draw A (amperes)	*Min*	*Max*
No load (without brushes)	***2.7 A***	***3.3 A***
Load applied (brushes operating)	***5.5 A***	***6.5 A***

A1.2 Checking for wear on centre brush drive belt, and replacement

The drive belt will need replacing typically when worn to the point of breaking. However, in order to avoid machine downtime, it may be useful to replace the belts in advance, before they break. Belt wear can be seen on the surface in contact with the pulleys, which is smoother and shows small cracks, as well as by fraying at the top edge of the belt.

Disassembly

1. **Move the machine onto flat and dry flooring.**
2. **Make sure that there is enough room around the machine to perform the dismantling operations safely.**
3. If necessary, clean the working area with a jet of compressed air.
4. Undo the fixing screws of the top cover, and open the cover.
5. Disconnect the two connectors (red and black).
6. Undo the 2 safety straps securing the battery.
7. Remove the battery.

8 Loosen the fixture of the left hand arm and remove the pivot, then proceed to detach the fixture.

9 Remove the bush from the left hand arm.

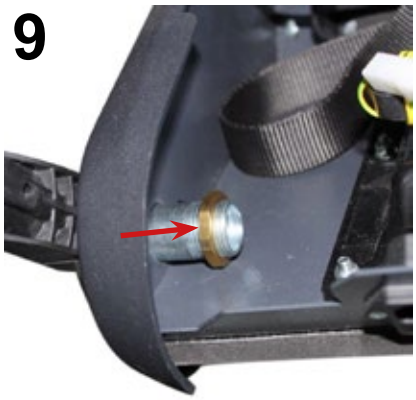
10 Remove the left bottom lateral guard and shift the arm, drawing it way from its usual position.

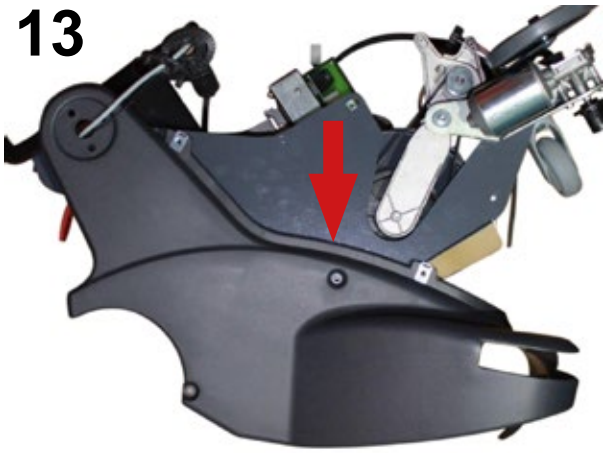
11 Position the machine on its left hand side and loosen the fixture of the right hand arm, removing the pivot so that the fixture can then be detached.

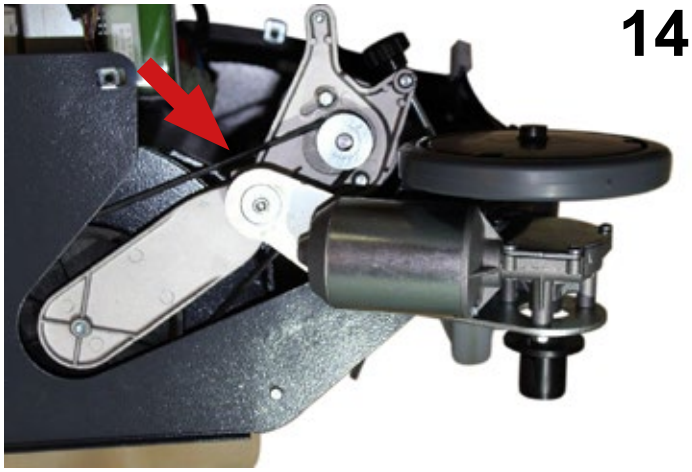
12 Undo the 2 screws of the right lateral guard.

13 Shift the right bottom guard downwards.

14 Check the belt condition.







Reassembly

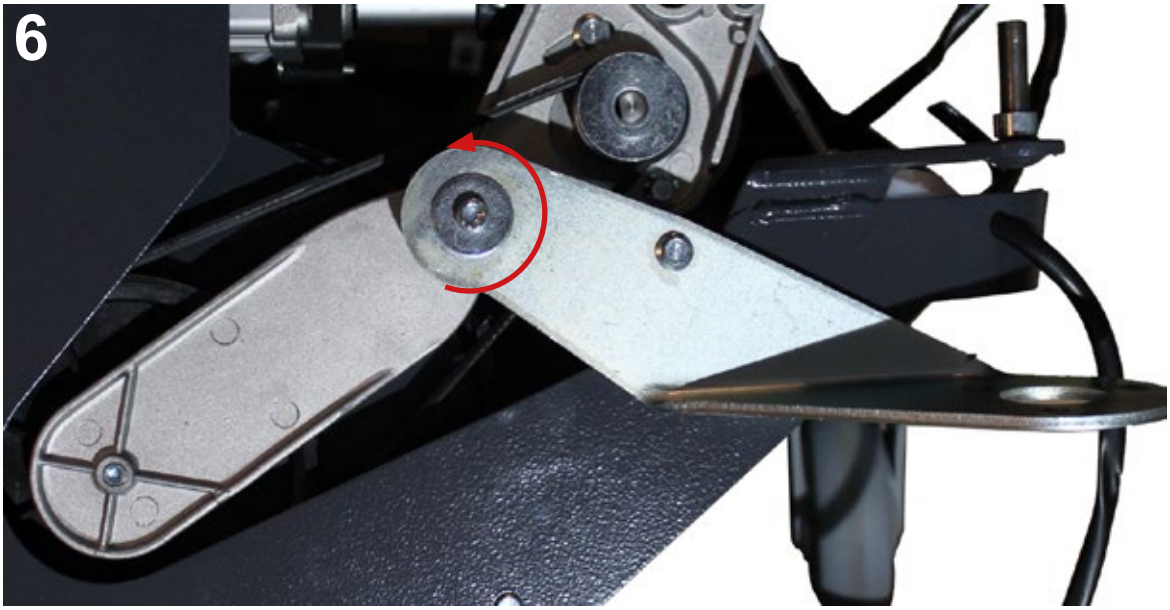
1 To reassemble, repeat the disassembly operations in reverse order.

A1.3 Replacing the centre brush transmission belt

Take care when removing and assembling the belt from/onto the pulley; use protective leather work gloves.

Disassembly

1. **Move the machine onto flat and dry flooring.**
2. **Make sure that there is enough room around the machine to perform the dismantling operations safely.**
3. If necessary, clean the working area with a jet of compressed air.
4. Remove the battery.
5. Access the belt as explained in the previous heading.
6. Remove the side brush motor and loosen the hex head screw to remove the bracket.
7. In order to release the belt, the motor pulley must be moved toward the pulley of the centre brush; accordingly, loosen the two hex head screws and ease the motor toward the brush.
8. Remove the belt from the motor pulley, then proceed to unseat it from the pulley of the centre brush. Once the belt is completely clear of the pulley groove, it can be removed.



Reassembly

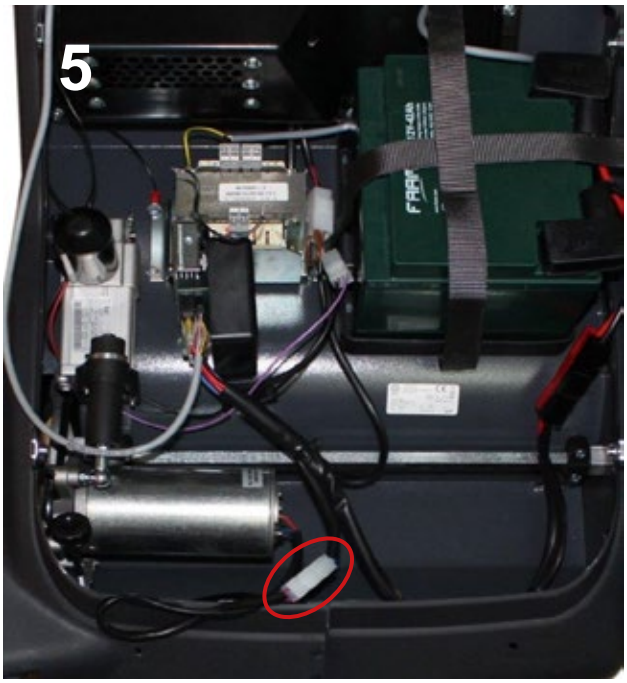
1. To refit the belt, repeat the disassembly operations described above in reverse order.

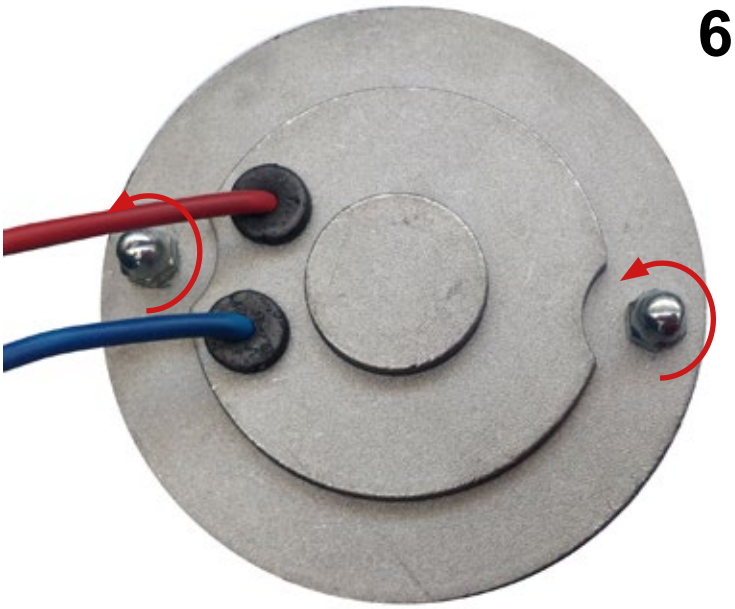
A1.4 Inspecting and replacing the centre brush motor carbon brushes

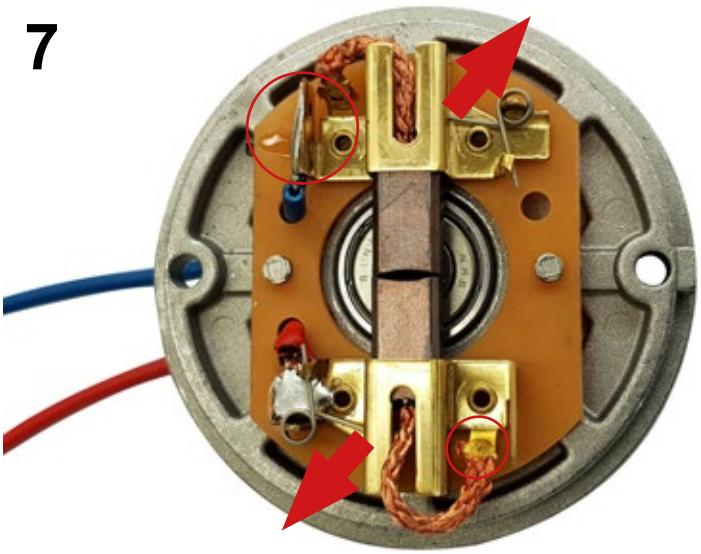
To inspect the extent of wear on the carbon brushes and effect their replacement, if necessary, simply remove the motor end cap.

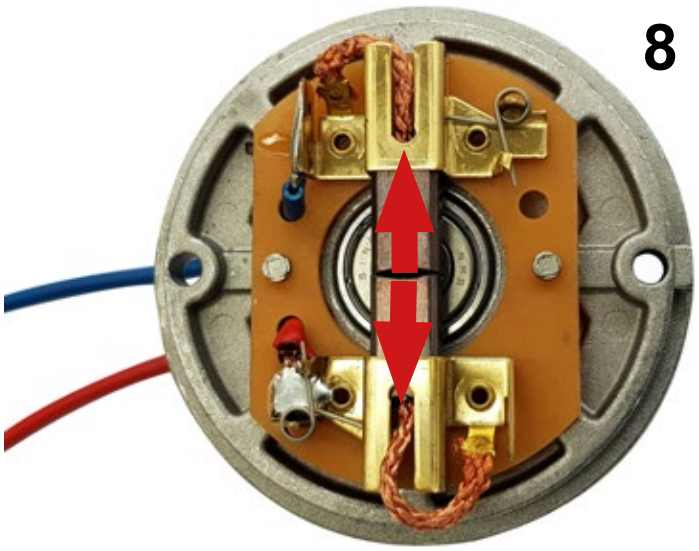
Disassembly

1. **Move the machine onto flat and dry flooring.**
2. **Make sure that there is enough room around the machine to perform the dismantling operations safely.**
3. If necessary, clean the working area with a jet of compressed air, or a vacuum cleaner.
4. Remove the battery.
5. Identify the white connector of the brush motor and disconnect it.
6. Unscrew the two nuts and remove the motor end cap.
7. Shift the springs so that the carbon brushes can be removed and their dimensions checked against the measurements indicated.
8. Unsolder the carbon brush leads from their respective tags and remove.









Checks

10 Measure the carbon brushes to establish the extent of wear, and compare the values with those illustrated below.

11 The length of the carbon brush must be no less than ≤ 8.3 mm (0.33 inches).

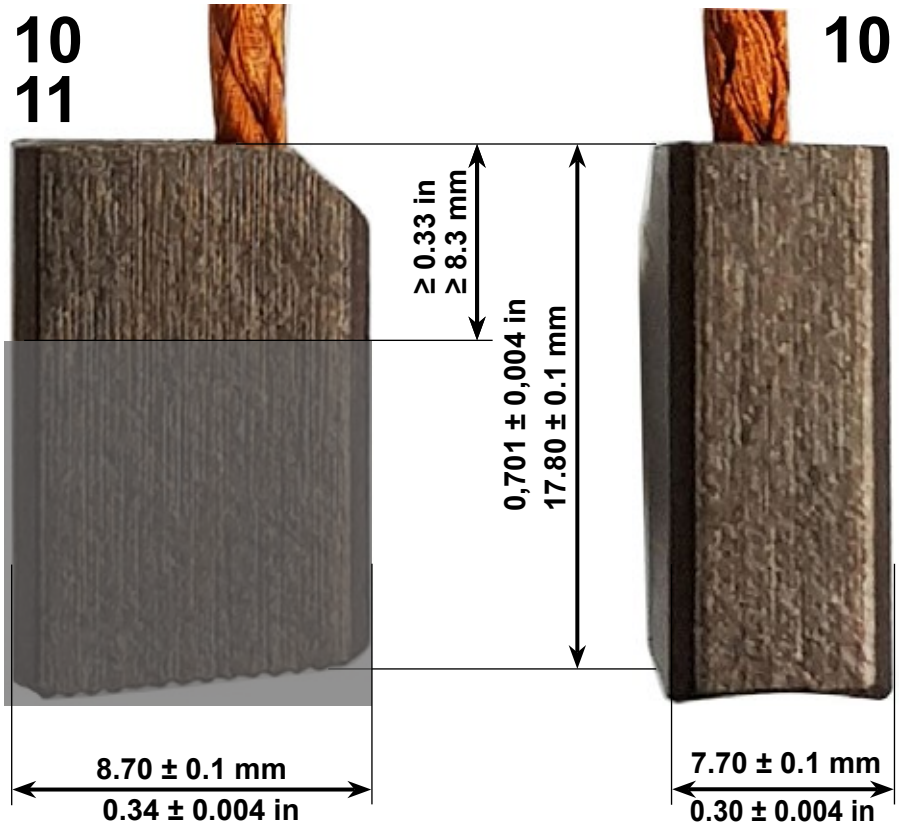
12 In the event that the measurement, even of one carbon brush only, is close to the value indicated as necessitating replacement, proceed to remove both brushes from the end cap.

13 Even if the carbon brushes appear still to be in good condition, check each one for the state of wear and the integrity of the sliding contact surface, which must present no indications of abnormal wear, or of scorching.

14 Blow the inside of the motor clean with a jet of compressed air, paying particular attention to the area around the carbon brushes and the rotor where the carbon brushes slide.

15 Check wear in the places where the carbon brushes slide before replacement. A damaged rotor would cause premature wear of the new carbon brushes.

The carbon brushes must always be replaced as a pair, at one and the same time.



Always check that the new carbon brushes are the same shape and size as those being replaced, apart from the length needless to say, and that they slide freely in their seats.

Reassembly

1. Solder the leads of the carbon brushes to the same power supply tags from which the old leads were removed.
2. Shift the springs to facilitate the insertion of the new brushes.
3. Offer the end cap to the motor frame and slide almost fully into place, then position the springs correctly so that each one exerts pressure on the relative carbon brush.
4. Proceed with reassembly, repeating the steps of the disassembly sequence in reverse order.

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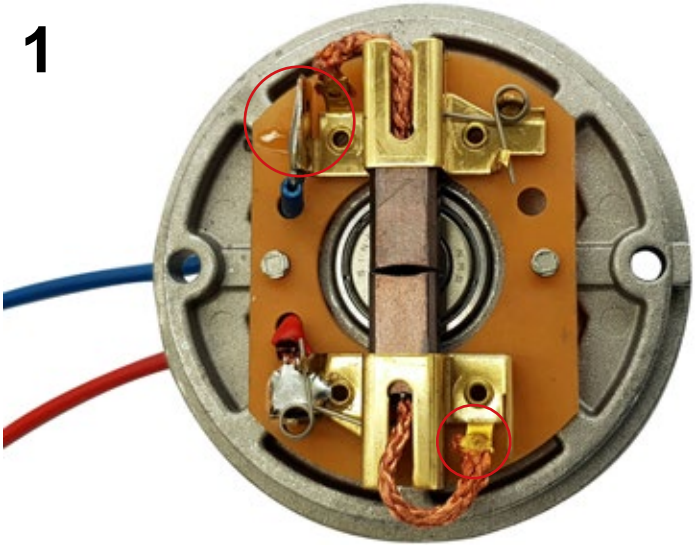

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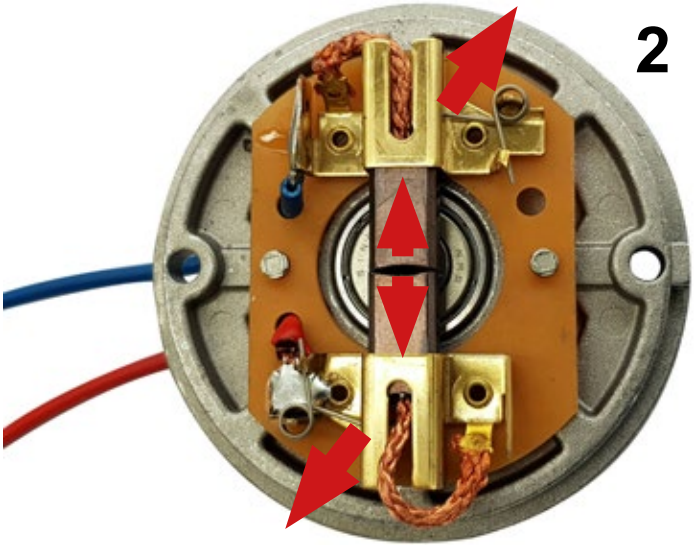

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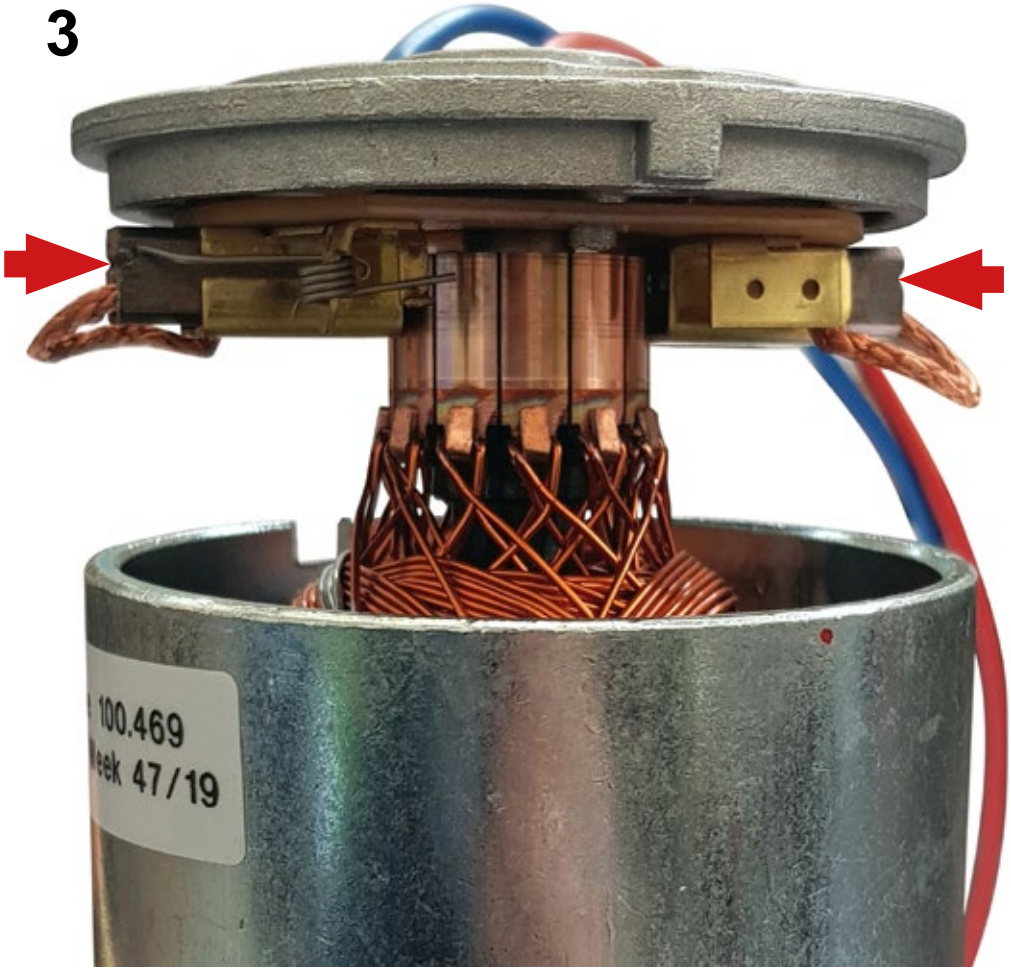
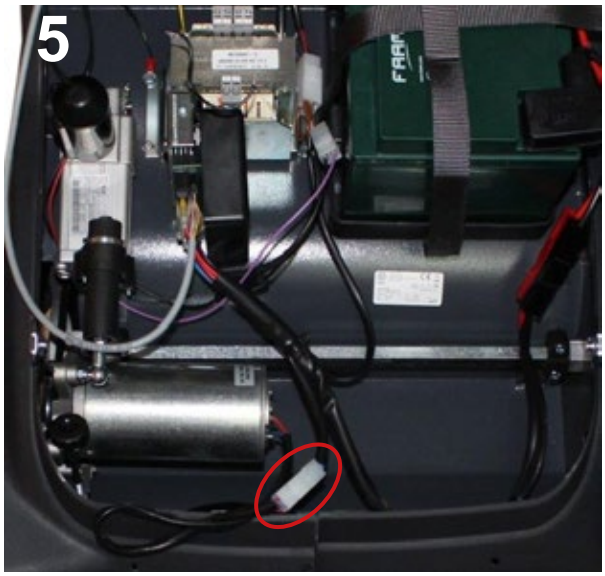


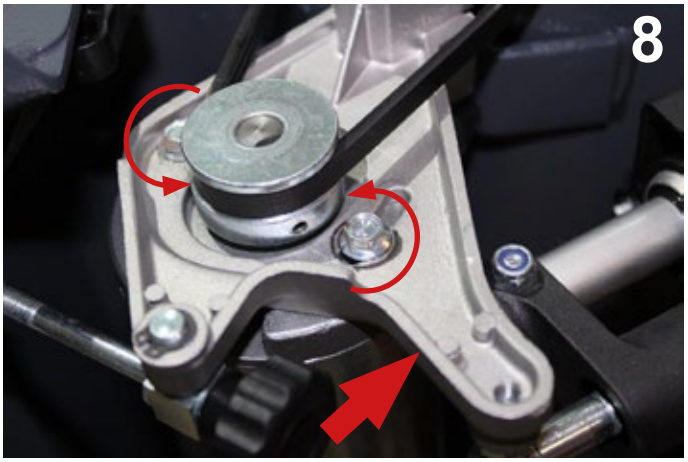
A1.5 Replacing the centre brush motor

Disassembly

1. **Move the machine onto flat and dry flooring.**
2. **Make sure that there is enough room around the machine to perform the dismantling operations safely.**
3. If necessary, clean the working area with a jet of compressed air, or a vacuum cleaner.
4. Remove the battery.
5. Identify the white connector of the brush motor and disconnect it.
6. Position the machine on its left side and undo the 2 screws of the right lateral guard.
7. Shift the right bottom guard downwards.
8. Undo the 2 hex head screws securing the motor to the mounting. Shift the motor toward the centre brush so as to slacken off the drive belt.
9. Remove the motor and pulley, separating the belt from the pulley groove.

To free the motor completely, either cut the wires and fit two Faston clips for the subsequent reconnection, or remove the pins directly from the connector.





Reassembly

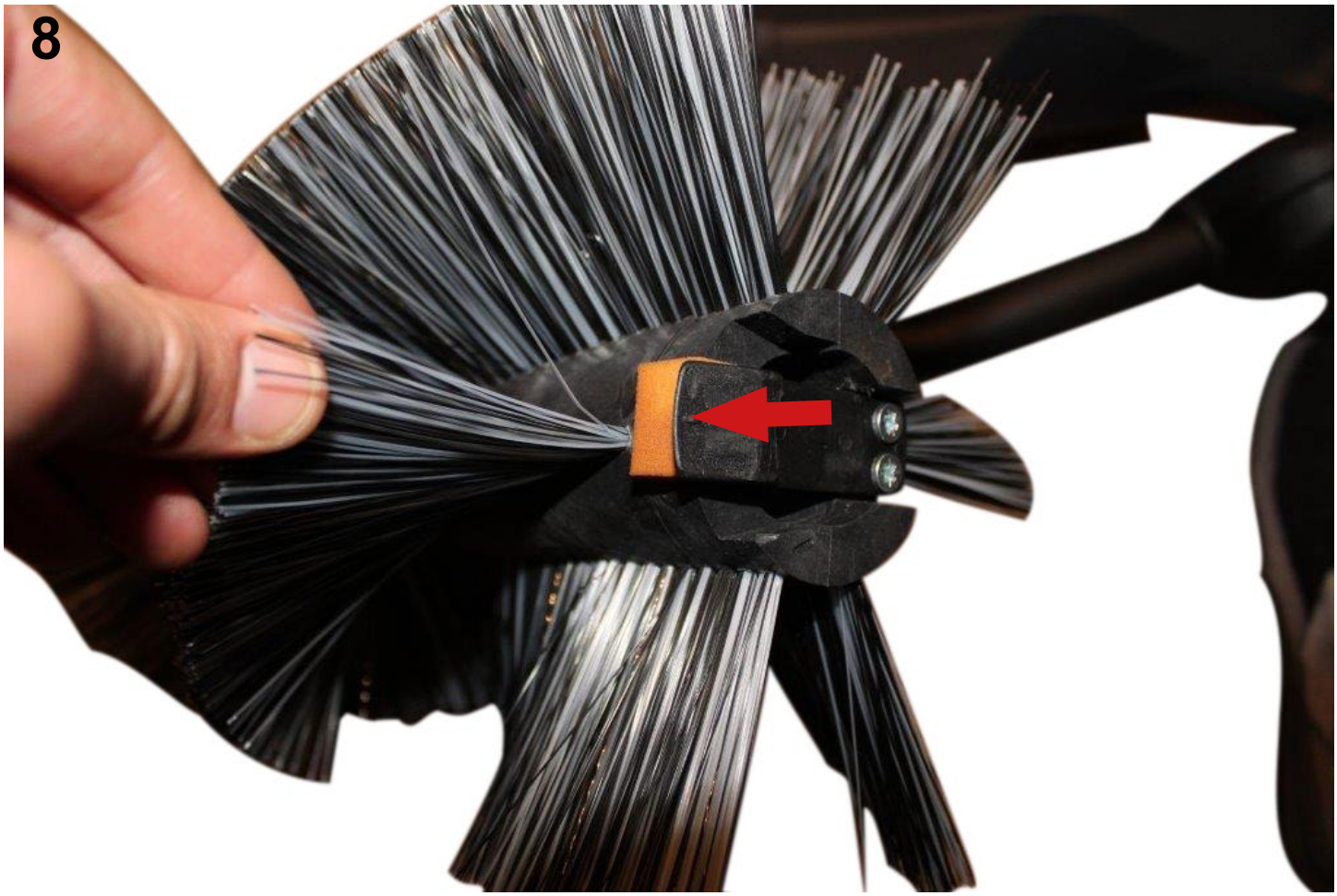
1. To reassemble, repeat the disassembly operations in reverse order.
2. Remove the pulley from the old motor and fit to the replacement motor.
3. Apply threadlocker to the 2 screws securing the motor to the mounting. Check that the direction of rotation of the brush is correct.

A1.6 Replacement of centre brush

The brush will need to be replaced generally as the result of normal wear.

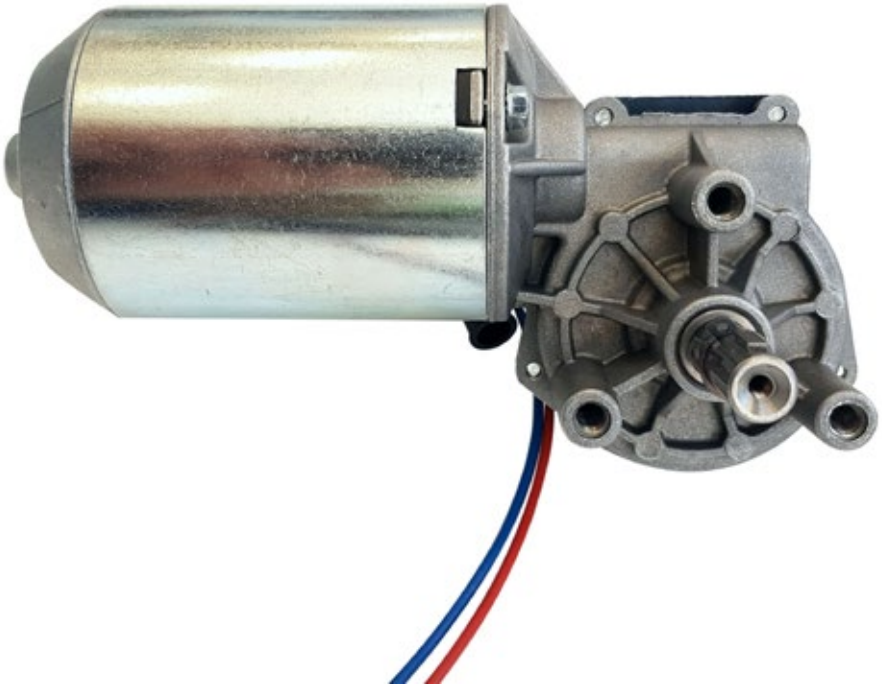
Disassembly

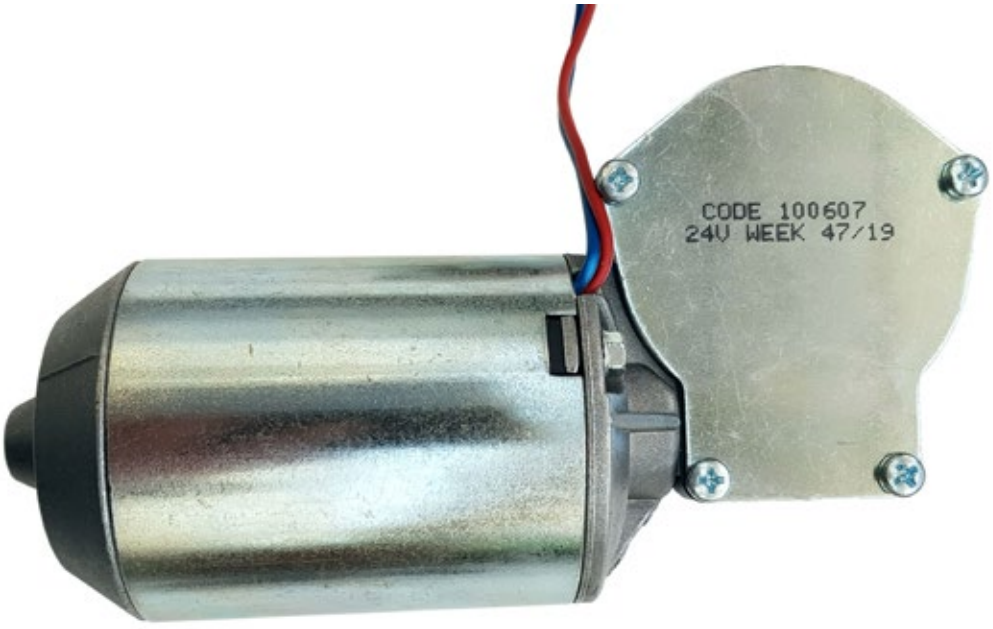
1. **Move the machine onto flat and dry flooring.**
2. **Make sure that there is enough room around the machine to perform the dismantling operations safely.**
3. If necessary, clean the working area with a jet of compressed air, or a vacuum cleaner.
4. Remove the battery.
5. Release the fixture of the arm on both sides.
6. Lay the machine down so that the brush compartment is exposed.
7. Turn the brush to the point at which a black key positioned at the left hand end can be seen.
8. Depress the black key and push the brush inwards.
9. Remove the worn centre brush and proceed to fit the new brush, making certain that it is locked in place by the black key.



A2 SIDE BRUSH MOTORS

The motor dedicated to the side brush is equipped with a plain angle drive or with a right angle worm gear unit, the rotor shaft having a double start thread, maximum speed of rotation at the output shaft 220 rpm. The rated power of the motor is 30W, whilst the voltage is 24 Vdc, albeit a 12 Vdc input is utilized as in the case of the centre brush motor; in effect, the two motors are connected together but wired with the polarity of the power cables reversed.
Other specifications of the motor are insulation class 'F' and protection IP30 against ingress of solids and liquids. The motor is equipped with replaceable carbon brushes. With the motor mounted to the machine, the brush must be driven in rotation anticlockwise, otherwise it will not operate correctly.





A2.1 Checking the power draw of the side brush motor

1. Undo the fixing screws of the top cover, and remove the cover.
2. **Make sure that the batteries on the machine are charged (24 V ± 1 V).**
3. **Use a clamp-on ammeter with a full scale reading of at least 200 A (amperes).**
4. **Move the machine onto a flat and smooth floor to ensure a correct current reading.**
5. Pick out the Red wire of the side brush motor and apply the clamp-on ammeter to it.
6. Run the brush at speed 2, selected by way of the control panel.
7. Take note of the reading on the ammeter display and compare it with the values in the table.
8. If the value falls within the range indicated in the table, disconnect the instrument and reinstate the top cover of the machine.
9. Conversely, if the value is at variance with those indicated in the table, proceed to make the following checks.
10. Disassemble the side brush and check that the current draw under no-load conditions is within the values in table.

10a. Should the reading indicate a value different to those in the table (typically higher), check for wear on the carbon brushes of the motor, and that there is no abnormal noise coming from gear unit.

10b. If the reading is within the range of values indicated in the table, check that the brush is not rubbing on the sides.

10c. Replace the brush motor with a new one.

Uncouple the centre brush to ensure a more accurate reading.

Carry out the test with the machine at standstill to ensure the brush is not rotated 'against' the drive, as this could result in a higher current draw reading.

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Current draw A (amperes)	*Min*	*Max*
No load (without brushes)	***0.8 A***	***1.2 A***
Load applied (brushes operating)	***1 A***	***1.5 A***

A2.2 Inspecting and replacing the side brush motor carbon brushes

To inspect the extent of wear on the carbon brushes and effect their replacement, if necessary, the motor must be removed completely from the machine and disassembled.

Disassembly

1. **Move the machine onto flat and dry flooring.**
2. **Make sure that there is enough room around the machine to perform the dismantling operations safely.**
3. Clean the work area thoroughly if need be, either blasting with compressed air or using a vacuum cleaner.
4. Remove the battery.
5. Shift the right bottom guard downwards.
6. Proceed to detach the brush motor as described in the heading below.
7. Record the position of the gear unit on the motor by making a witness mark on the end cap.
8. Undo the two screws and remove the gear unit.
9. Remove the complete rotor assembly.

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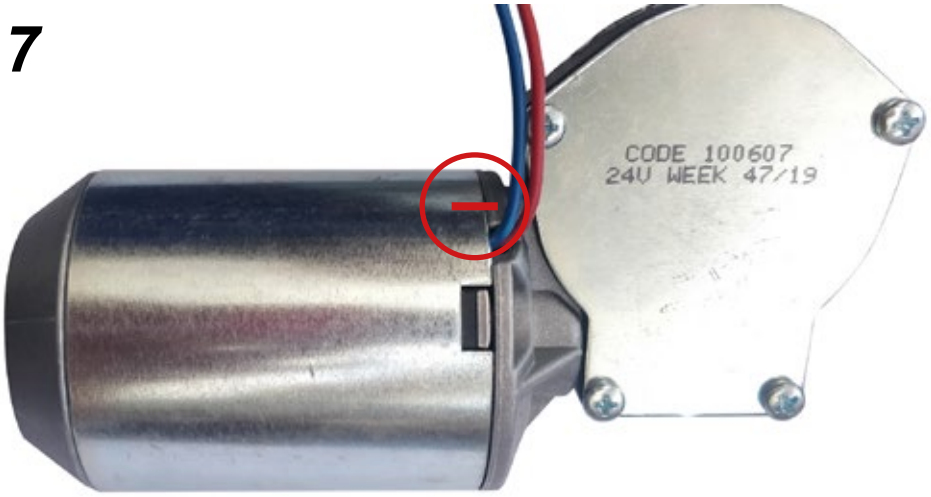

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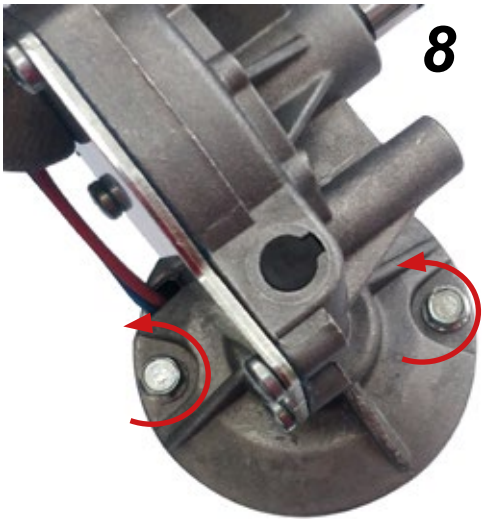

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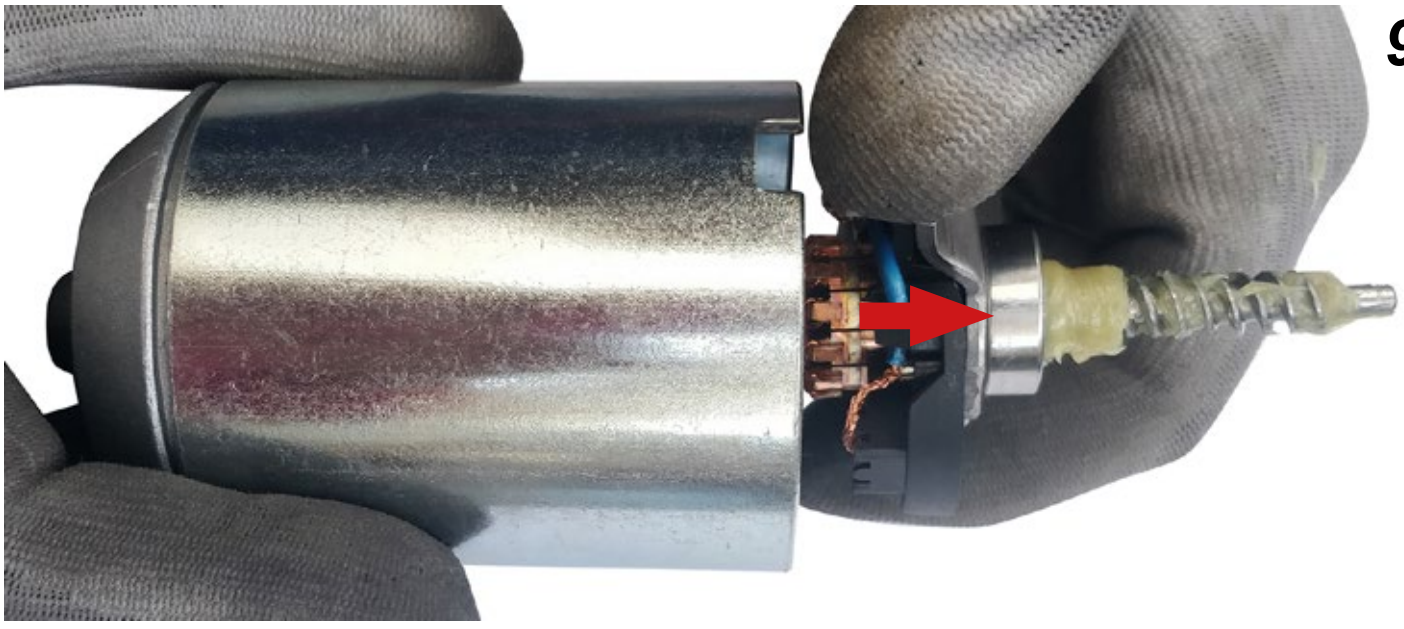

10 Release the power leads from the retainers.

11 Remove the circlip from the face of the bearing.

12 Remove the bearing from its seat, using two screwdrivers as levers to apply pressure from beneath; should the bearing prove difficult to dislodge from the shaft, use a small puller.

13 Remove the carbon brushes from their slots, taking care not to damage the springs.

14 Cut away a small portion of cable and remove the carbon brushes.

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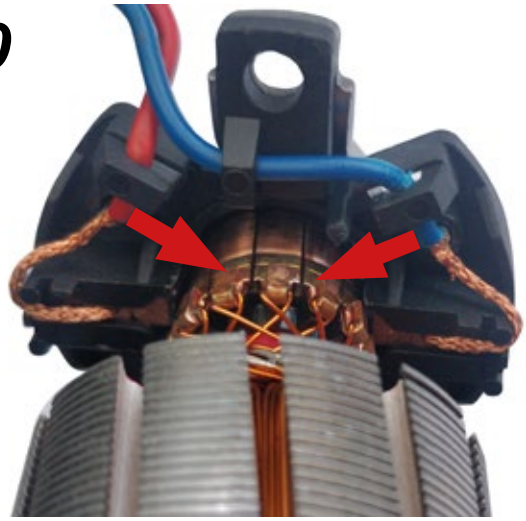

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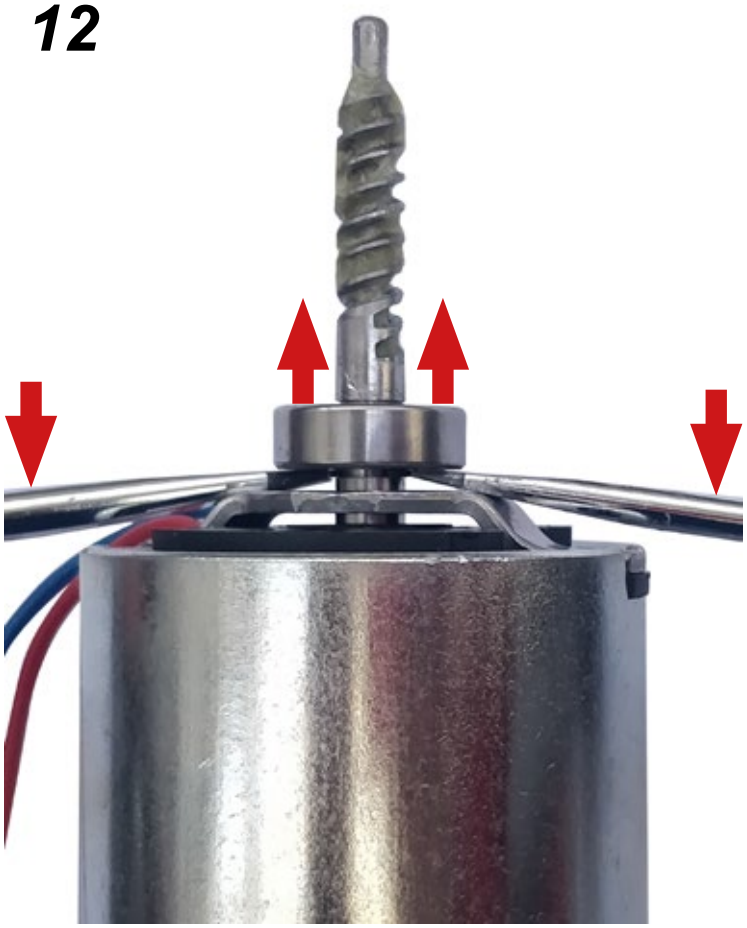

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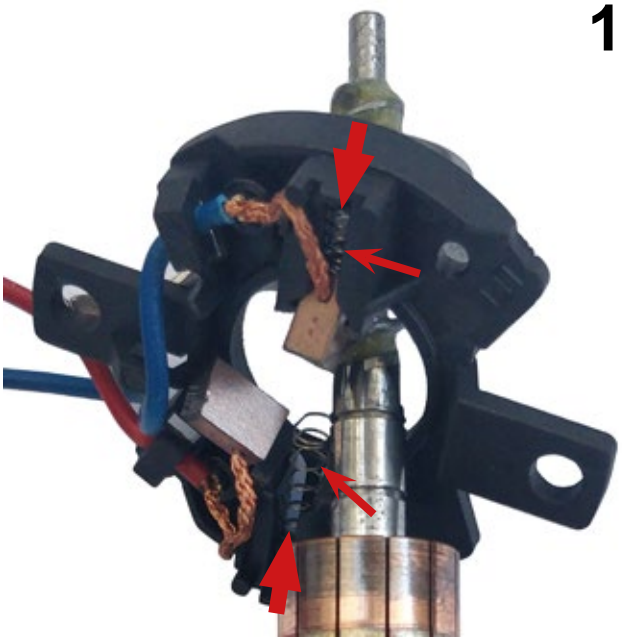

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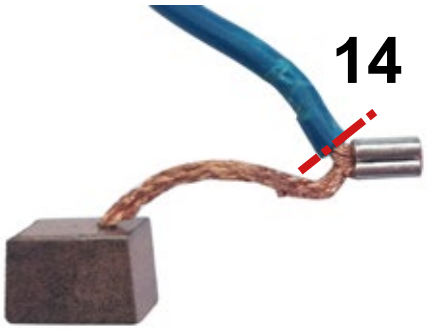


Checks

14 Measure the carbon brushes to establish the extent of wear, and compare the values with those illustrated below.

15 The length of the carbon brush must be no less than ≤ 4.7 mm (0.19 inches).

16 In the event that the measurement, even of one carbon brush only, is close to the value indicated as necessitating replacement, proceed to detach the brushes from the power leads.

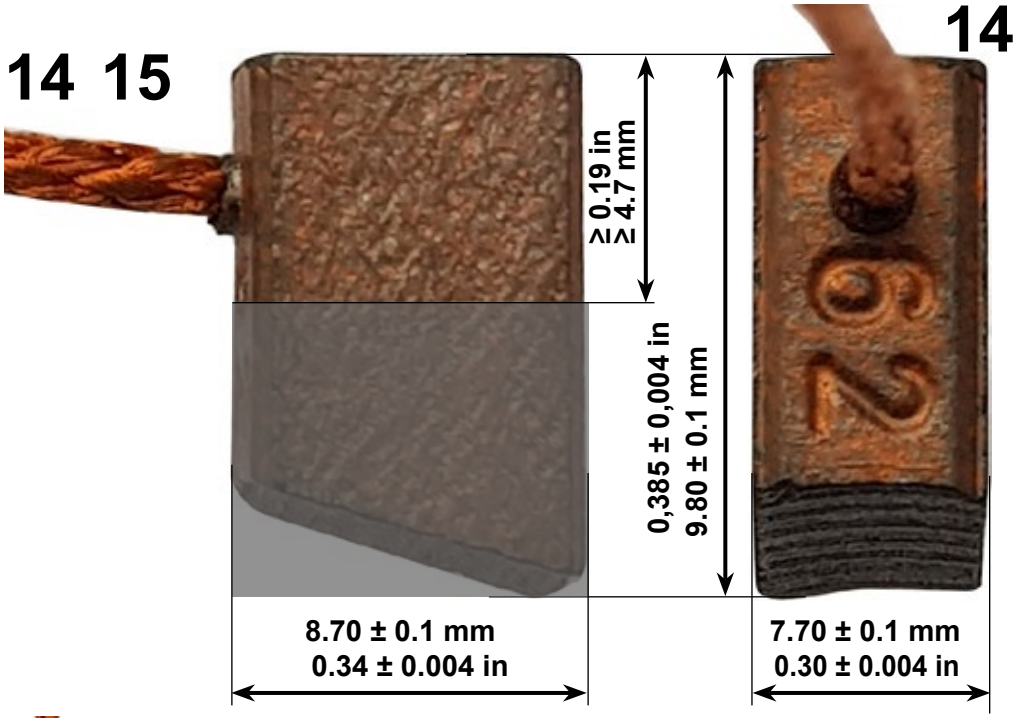
17 If the carbon brushes appear still to be in good condition, check each one for the state of wear and the integrity of the sliding contact surface, which must present no indications of abnormal wear, or of scorching.

18 Blow the inside of the motor clean with a jet of compressed air, paying particular attention to the area around the carbon brushes and the rotor where the carbon brushes slide.

19 Check wear in the places where the carbon brushes slide before replacement. A damaged rotor would cause premature wear of the new carbon brushes.

The carbon brushes must always be replaced as a pair, at one and the same time.

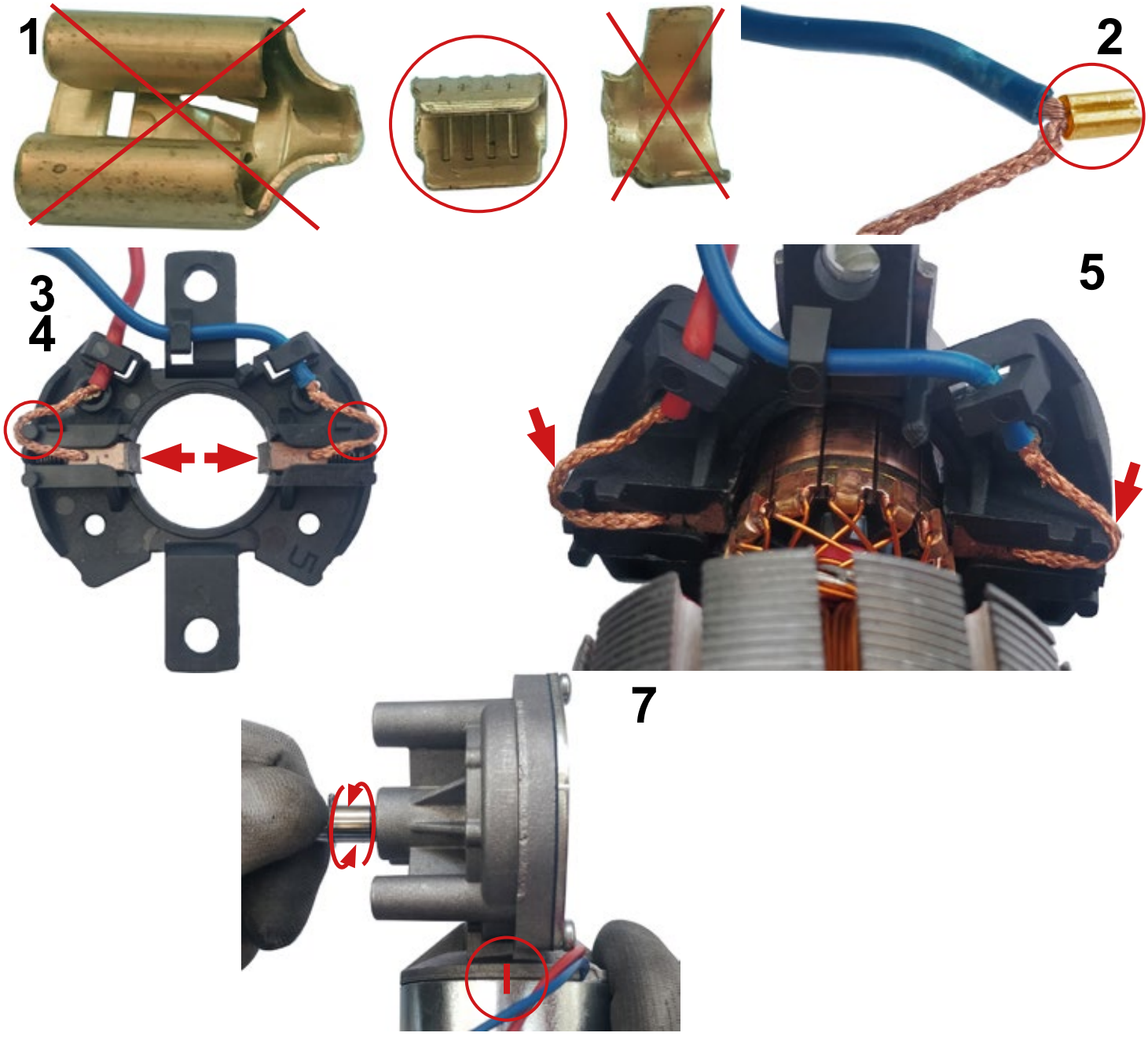
Always check that the new carbon brushes are the same shape and size as those being replaced (naturally apart from the length) and that they slide freely in their seats.



Reassembly

1. Cut through a Faston clip as illustrated, retaining only the middle part.
2. Join the power lead and the cable of the carbon brush, crimping them with the Faston clip fragment obtained previously.
3. Locate the carbon brushes in their slots, taking care not to damage the springs.
4. Lock the carbon brushes in position, retracting them fully into the slots so as to facilitate reassembly.
5. Offer the carbon brushes to the rotor and free them from the slots, ensuring that they bear against the rotor.
6. Refit the bearing to the motor shaft and reposition the circlip in its groove.
7. Refit the gear unit to the motor, referring to the witness mark made earlier on the end cap, and turn the shaft of the gear unit so that it engages with the motor shaft.
8. Proceed with reassembly, repeating the steps of the disassembly sequence in reverse order.

Before refitting the motor to the machine, test it briefly by connecting the leads directly to the battery terminals.

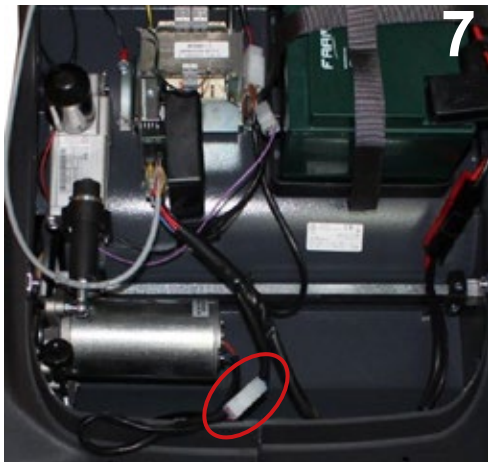


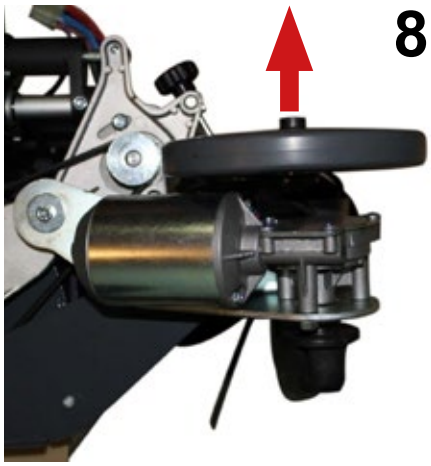
A2.3 Replacing the side brush motor

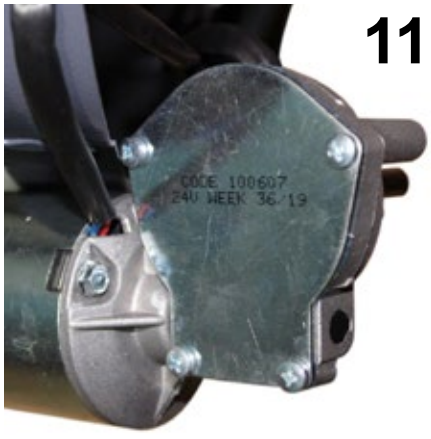
Disassembly

1. Move the machine onto flat and dry flooring.
2. Make sure that there is enough room around the machine to perform the dismantling operations safely.
3. If necessary, clean the working area with a jet of compressed air, or a vacuum cleaner.
4. Remove the battery.
5. Shift the right bottom guard downwards.
6. Remove the brush from the side brush motor
7. Identify the connector of the side brush motor and disconnect it.
8. Remove the wall bumper wheel by sliding it off the relative pivot.
9. Undo the hex head screw securing the plastic hub of the side brush to the motor, and remove the plastic bushing.
10. Undo the 3 hex head screws securing the motor to its mounting.
11. Remove the motor outwards from the support, and replace it with a new one.

To free the motor completely, either cut the wires and fit two Faston clips for the subsequent reconnection, or remove the pins directly from the connector.







Reassembly

1. To reassemble, repeat the disassembly operations in reverse order.
2. Should it be necessary to remove the motor from the machine, be sure to apply threadlocker to the screws indicated in steps 9 and 10 when the motor is refitted.

A2.4 Adjusting the height of the side brush

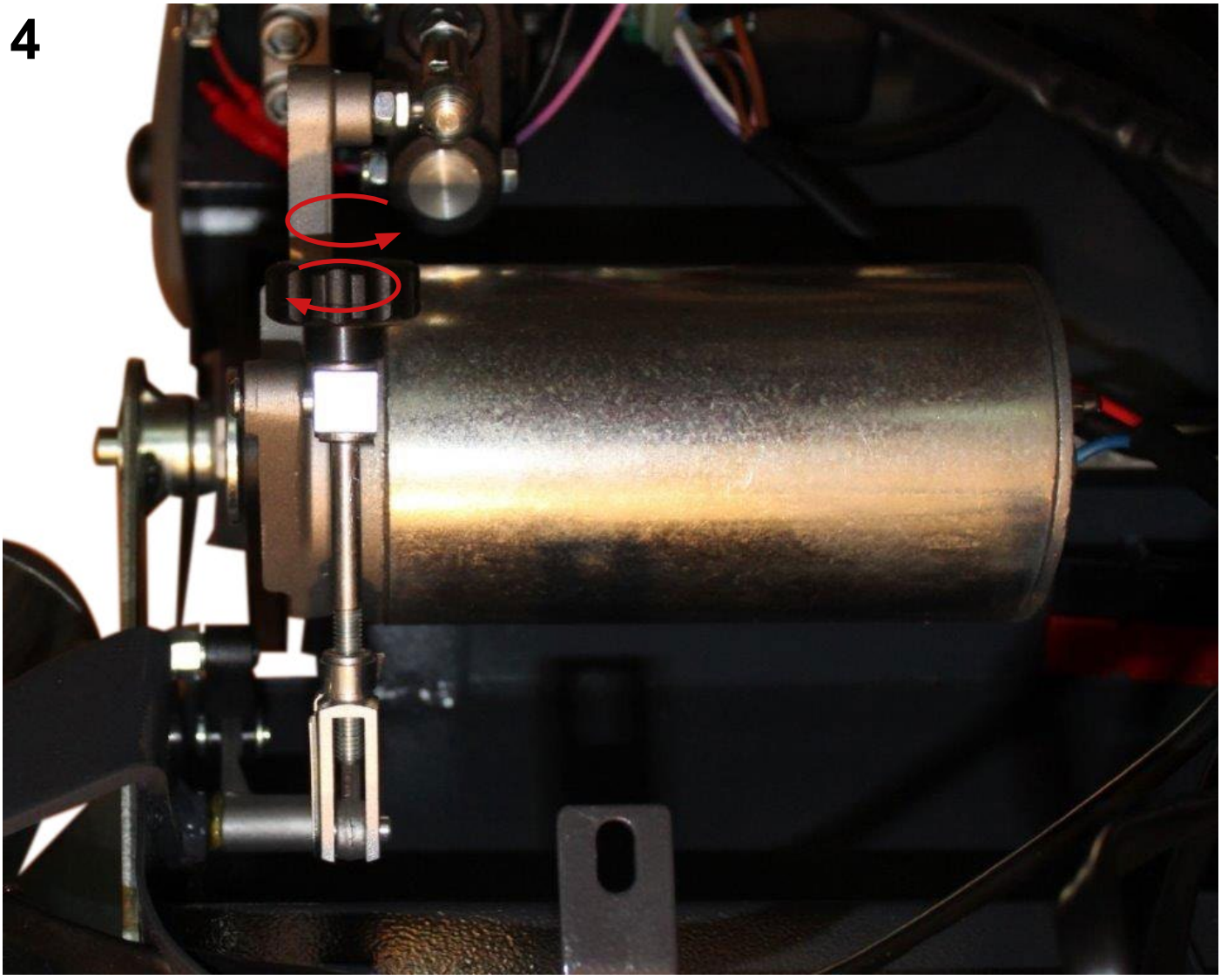
Adjustment

1. **Move the machine to flat, dry flooring.**
2. **Make sure that there is enough room around the machine to perform the adjustments safely.**
3. Undo the fixing screws of the top cover, and remove the cover.
4. Turn the height adjustment knob to raise or lower the side brush to the correct position.
5. When adjustment is complete, the position of the brush bristles.

The more wear there is on the brush, the less flexible the bristles will be, making the brush harder to adjust.

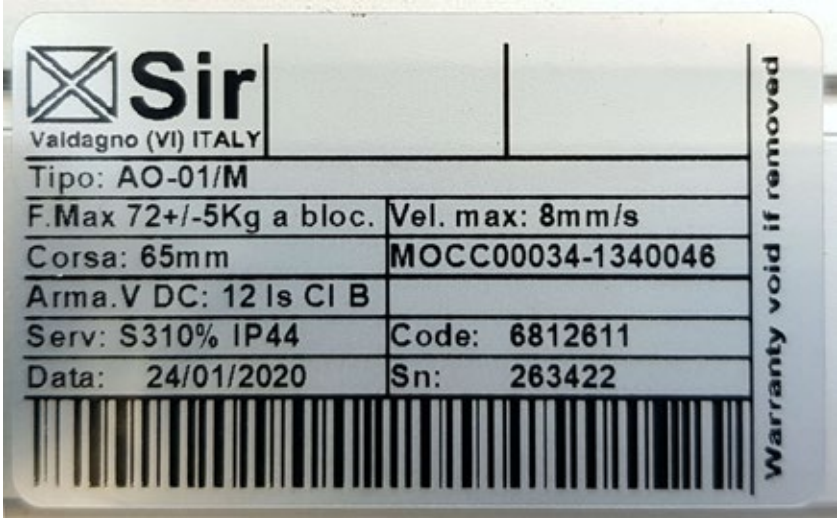
Whenever a worn brush is replaced with a new one, remember to return the height adjustment mechanism to the original position.

4



A3 BRUSH UP/DOWN ACTUATOR

The centre brush and the side brush are raised and lowered by an electromechanical actuator. Its function is to bring the brushes into the operating position when set in rotation, and maintain a constant pressure on the bristles. The actuator is operated from a 12 Vdc power source and its movement controlled by the power circuit board, according to the program selected at the controls and the type of surface being swept. The degree of protection against ingress of solids and liquids is IP44. The maximum force applicable when raising and lowering the brushes is 72 kg ± 5 kg. The stroke of the actuator rod is factory set to 65 mm by means of two internal travel limit microswitches (adjustment is not recommended). To check for correct operation of the actuator, connect the red wire to positive and the black wire to negative and the rod should extend. Invert the connection of red and black and the actuator rod should retract.
Maximum current draw at maximum force is approximately ~2A. The power cable of the actuator is provided at about mid point along its length with an in-line fuse holder, on the black conductor, fitted with a fast acting F5 glass fuse rated 2.5A to protect against overloads.



A3.1 Checking the power draw of the brushes Up/Down actuator

If the brushes fail to descend when started up, but are rotating correctly, check the fuse of the actuator.

1 **Move the machine to flat, dry flooring.**

2 **Make sure that there is enough room around the machine to perform the dismantling operations safely.**

3 Remove the top cover of the machine and locate the connector of the actuator.

4 Separate the connector of the actuator from the main wiring loom.

5 Locate the in-line fuse-holder connected to the black wire, unscrew it and take out the F5 fuse.

6 **Use a digital multimeter and select "Continuity" mode.**

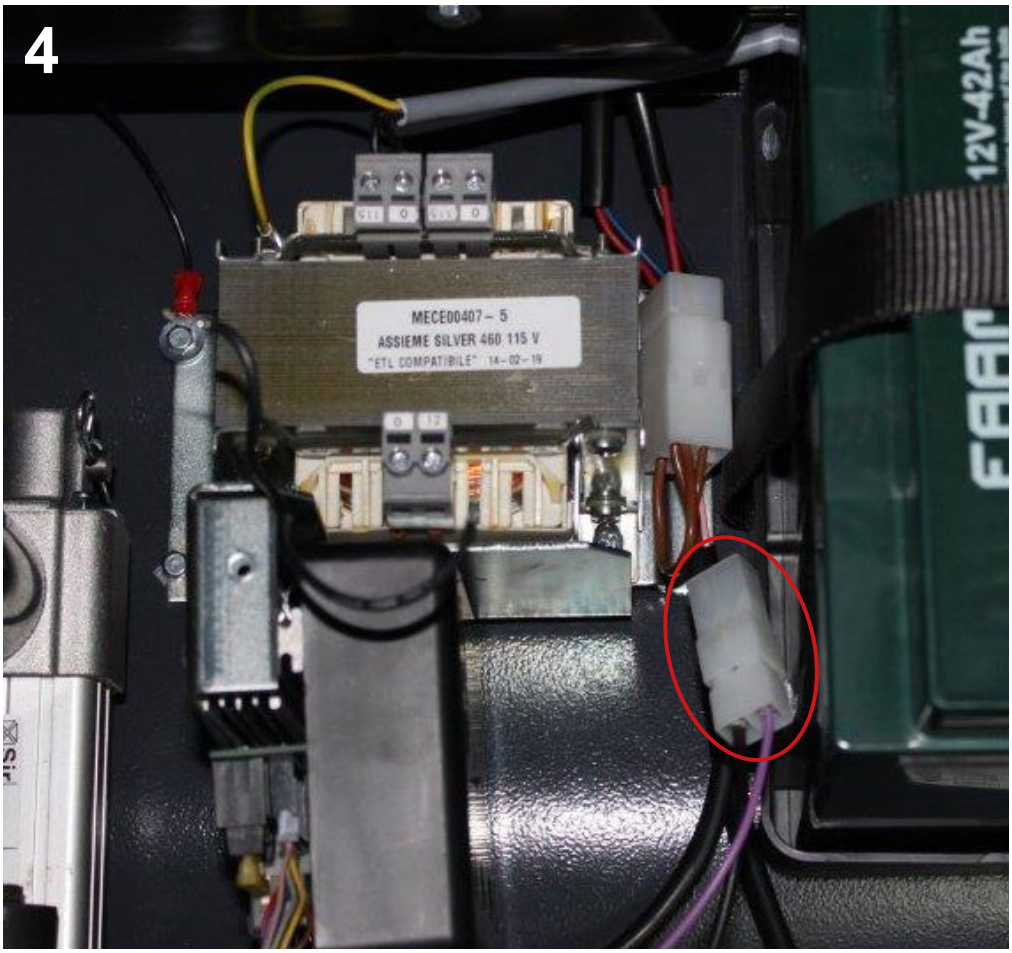
7 Position the red probe on one end of the fuse, the black probe on the other end and check that the multimeter emits a continuous sound.

7a If there is no sound from the multimeter, then the fuse is broken (burnt out) and must be replaced.

7b If the multimeter emits a continuous beep, this means that the fuse is sound; accordingly, proceed to check the power draw.

8 **Make sure that the batteries on the machine are charged (12 V ± 1 V).**

9 **Use a clamp-on ammeter with a full scale reading of at least 200 A (amperes).**



11 Pick out the purple wire of the actuator and apply the clamp-on ammeter to it.

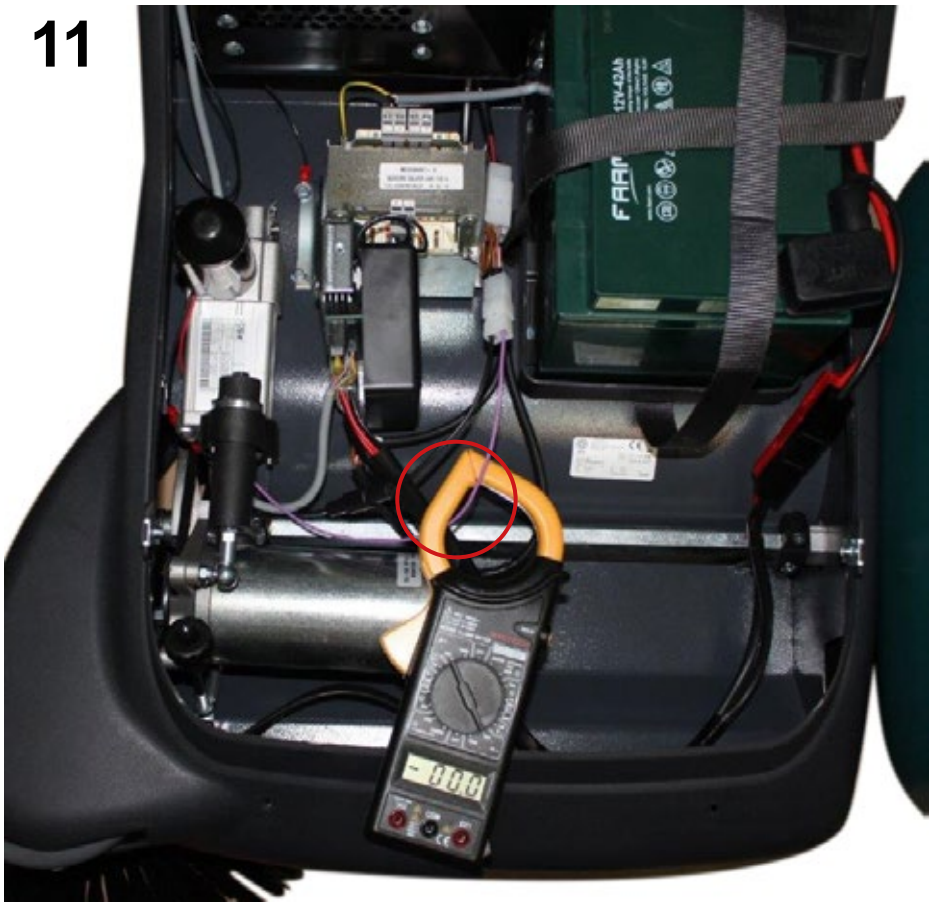
12 Run the brushes at speed 2, selected by way of the control panel.

13 If the brush is not lowered when started up or not raised when shut off and there is no power draw, check the continuity of all wires in the intercable connecting the display pcb to the power pcb.

14 If there is no fault on any of the wires in question, replace the actuator.

15 On completion, reinstate the top cover of the machine.

11

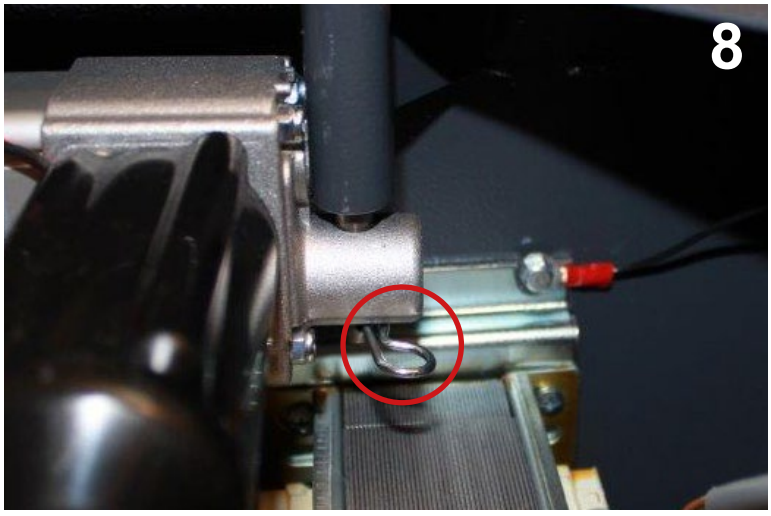


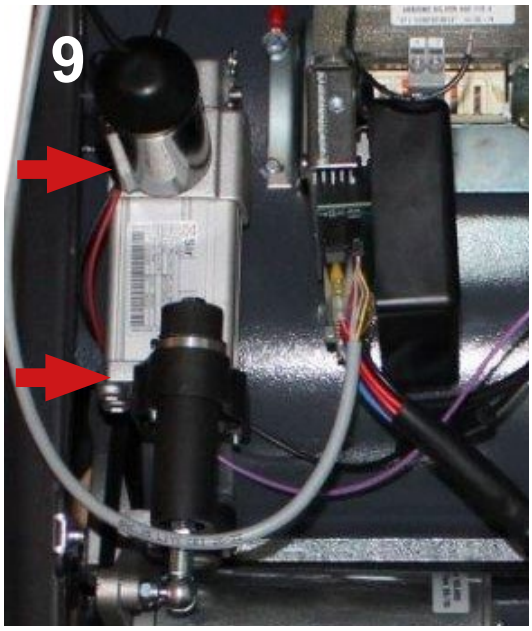
12

A3.2 Replacing the brushes actuator

Disassembly

1. **Move the machine onto flat and dry flooring.**
2. **Make sure that there is enough room around the machine to perform the dismantling operations safely.**
3. If necessary, clean the working area with a jet of compressed air, or a vacuum cleaner.
4. Undo the fixing screws of the top cover, and open the cover.
5. Disconnect the two battery connectors (red and black).
6. Locate the power connector of the actuator and disconnect it.
7. Remove the safety clip from the ball joint.
8. Remove the spring clip from the actuator pivot.
9. To remove the actuator, equal force must be applied to the two ends of the component.
10. Replace the actuator with a new component.





Reassembly

1. To reassemble, repeat the disassembly operations in reverse order.

☝ IMPORTANT

Move the machine to the waste disposal area, clean the suction filter and empty the dirt bin.

Move the machine onto flat ground and apply the brake. If necessary, place chocks under the wheels.

Switch the machine off by turning the ignition key anticlockwise and/or pressing the emergency switch

Disconnect the electronic circuit from the batteries by detaching one or both battery connectors.

i INFORMATION

Important information

When consulting this Service manual, the reader will encounter the expressions RIGHT and LEFT indicating the side of the machine. These indications always refer to the direction of movement of the machine.

In this Service Manual, the version of the machine may be written in brackets “()”, i.e. (E, DP-P, P, D). This note indicates that the instructions only refer to the model or version specified in brackets.

B1 SUCTION MOTOR

The function of the suction motor is to vacuum up the dust raised by the revolving brush during operation, and direct it through a special filter so as to make the air cleaner.
The suction unit is a centrifugal type with a rated flow of ~67 litres/s / 142 CFM and vacuum capability of 5,0 mm H2O / 0.2 in H2O / 0,007 PSI. The motor is a "brushed" type, equipped with two non-replaceable carbon brushes. In the event of the suction unit malfunctioning, it must be replaced, having first verified power draw. The standard current draw of the motor is ~4.8A with a peak value of ~14A on starting.
Replacement of the suction unit requires no particular precautions.

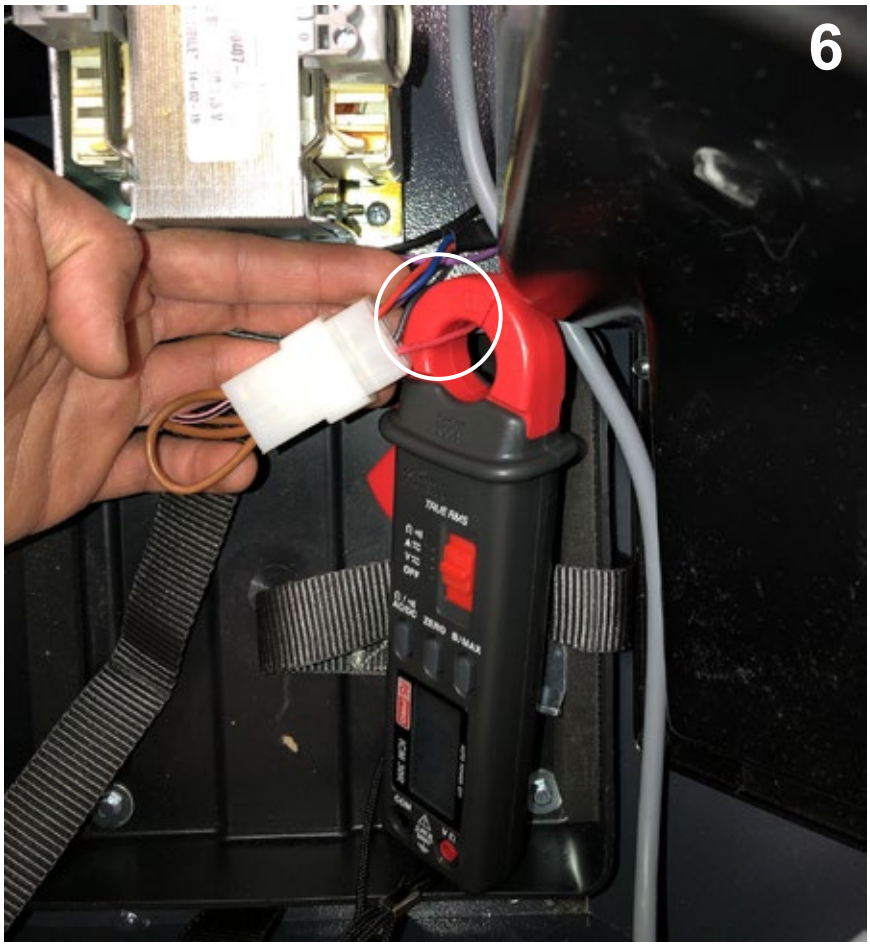
B1.1 Checking suction motor current draw

1. **Move the machine onto flat and dry flooring.**
2. **Make sure that there is enough room around the machine to perform the dismantling operations safely.**
3. Undo the fixing screws of the top cover, and remove the cover.
4. **Make certain that the battery of the machine is charged 12 V ± 1 V.**
5. **Use a clamp-on ammeter with a full scale reading of at least 200 A (amperes).**
6. Pick out the Red wire of the suction motor and apply the clamp-on ammeter to it.
7. Run the suction motor by selecting the relative key on the control panel.
8. Take note of the reading on the ammeter display and compare it with the values in the table.

8a If the value falls within the range indicated in the table, disconnect the instrument and reinstate the top cover of the machine.

8b Conversely, if the value is at variance with those indicated in the table, check that the centrifugal fan rotor turns freely and/or proceed with replacement of the suction motor.

To ensure the test will be reliable, remove the air filter beforehand.

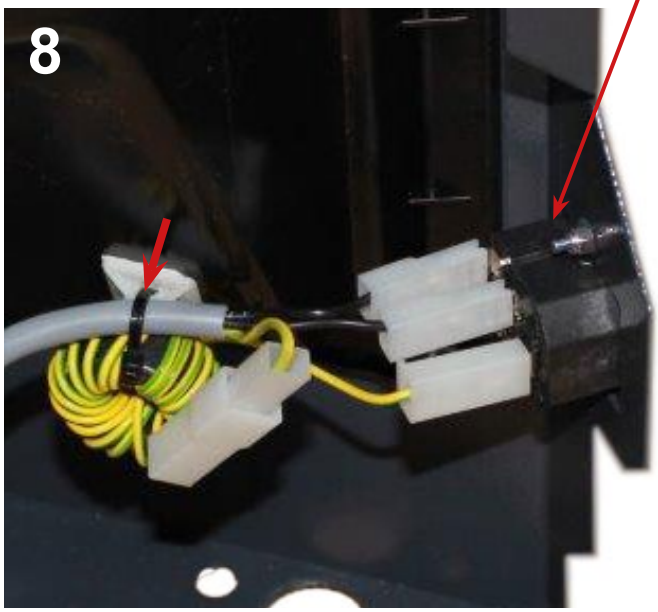


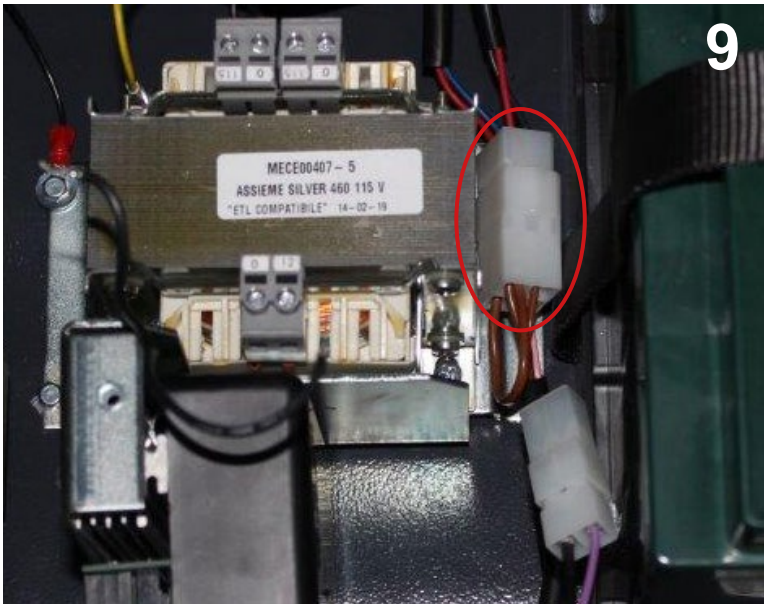
Current draw A (amperes)	*Min*	*Max*
No load (without filter)	***2 A***	***2.5 A***

B1.2 Removing the suction motor

Disassembly

1. **Move the machine to flat, dry flooring.**
2. **Make sure that there is enough room around the machine to perform the dismantling operations safely.**
3. If necessary, clean the working area with a jet of compressed air, or a vacuum cleaner.
4. Undo the fixing screws of the top cover, and remove the cover.
5. Remove the battery.
6. Remove the dirt bin.
7. **Remove the suction filter.**
8. Cut through the plastic tie holding the wires to the air duct of the suction motor.
9. Detach the connector of the suction motor and the connector of the filter shaker motor.
10. Set the machine down carefully on its right hand side.





11 Remove the 2 foam seals of the filter shaker frame.

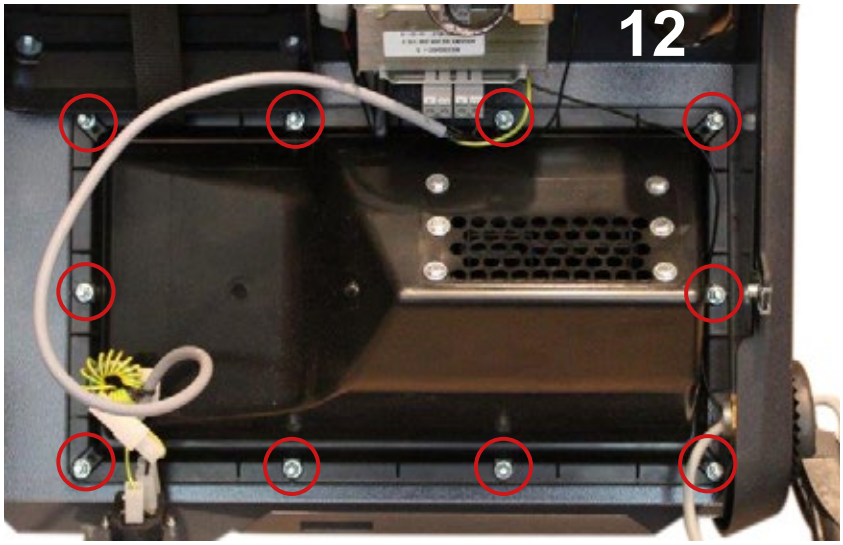
12 Undo the 10 screws by which the fan housing is secured to the mounting plate.

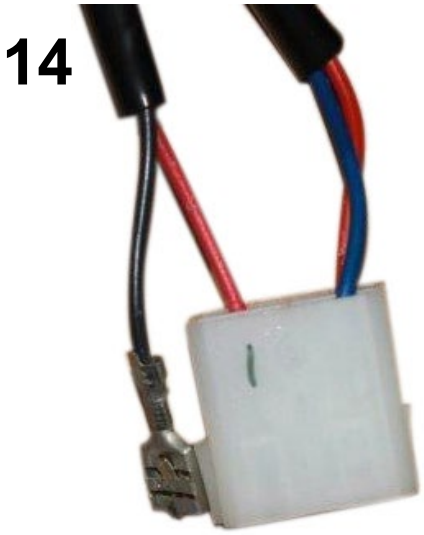
13 Transfer the fan housing and the relative frame to a bench, and proceed with disassembly.

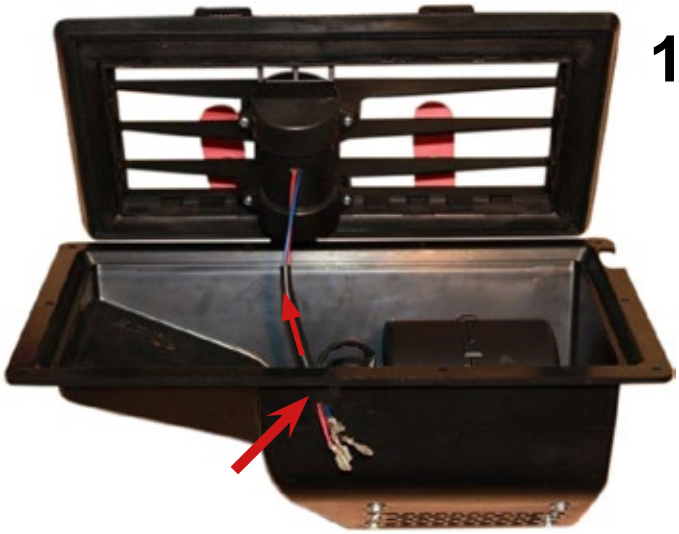
14 To separate the shaker frame from the fan housing, the 4 wires must be detached from the connector and drawn through the hole. Mark the colours of the wires on the connector, using a felt-tip pen.

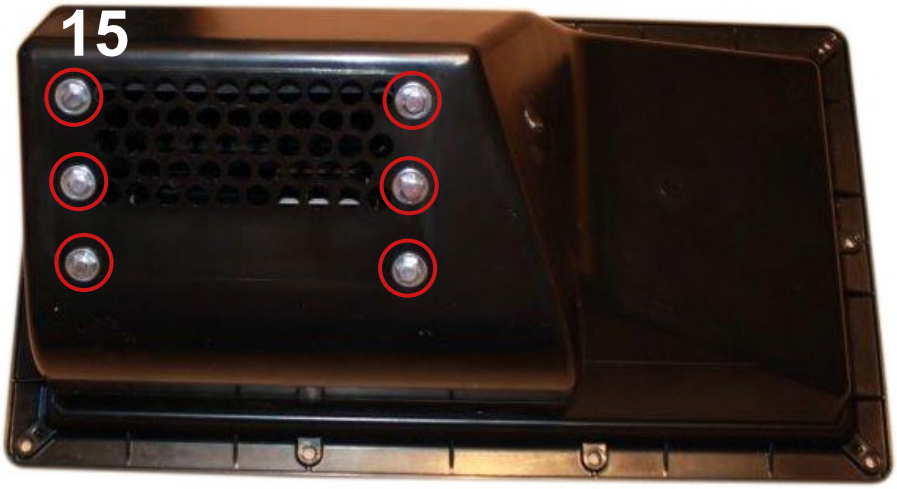
15 Using a hex socket wrench, undo the 6 screws securing the suction motor to the fan housing.

16 Replace the complete suction motor with a new unit.





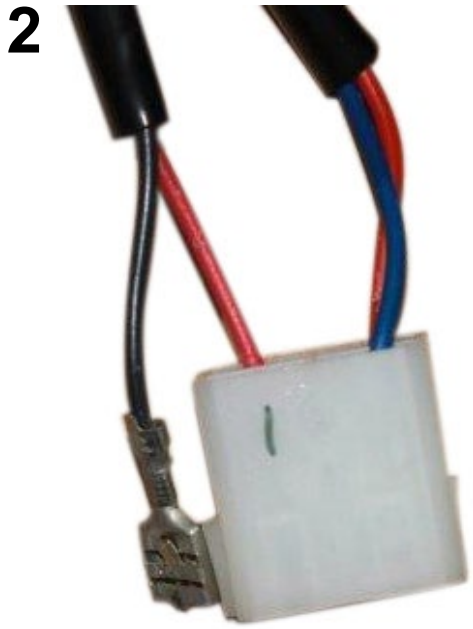




Reassembly

1 To refit the suction motor, repeat the disassembly steps described above in reverse order.

2 Take care when locating the pins of the filter shaker motor and the suction motor in the connector.



B2 FILTER SHAKER MOTOR

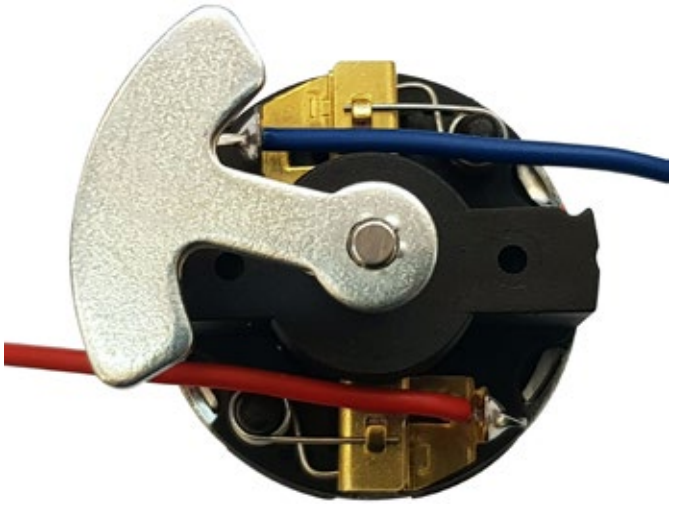
The function of the filter shaker is to free the air filter of dust via forcible vibratory motion, so as to prolong its effectiveness and extend the intervals between replacements, for a paper element, or between washes in the case of polyester fabric (optional). The shaker operates in alternation with the fan. In effect, for the shaker to give best results, the suction motor must shut off temporarily so that the dust vacuumed and retained during operation can be freed from the folds of the filter material. The filter shaker comprises an electric motor and two eccentric weights mounted outside of the motor frame on opposite sides of the rotor shaft, which when set in rotation produce an accentuated vibratory motion transmitted to the entire filter.

The filter shaker can be operated in "manual" mode using the dedicated button on the control panel, and/or in "automatic" mode if programmed using the relative facility provided by the display pcb. The display offers the user the option of activating the shaker function "automatically" and if selected, indicating how many seconds must elapse between one shake and the next; at each activation, naturally, the suction motor will be paused.

The filter shaker motor is controlled and driven at 12Vdc by the power circuit board and has a nominal current draw of 1.6A; the rated power of the motor is 10.5W. Maximum rated speed at the rotor shaft is 5000 rpm.

Following a routine check on the current draw, the carbon brushes are easily accessible for the purposes of visual inspection, although it is unlikely they will ever need replacing because of wear. In the event of malfunction, in any event, the filter shaker motor must be replaced as a complete unit.

Since the motor has minimal protection against ingress of solids and liquids, care must be taken during inspection and/or disassembly.



B2.1 Checking filter shaker current draw

1. **Move the machine onto flat and dry flooring.**
2. **Make sure that there is enough room around the machine to perform the test safely.**
3. Undo the fixing screws of the top cover, and remove the cover.
4. **Make certain that the battery of the machine is charged 12 V ± 1 V.**
5. **Use a clamp-on ammeter with a full scale reading of at least 200 A (amperes).**
6. Pick out the Red wire of the filter shaker motor and apply the clamp-on ammeter to it.
7. Activate the filter shaker with the relative key on the control panel.
8. Take note of the reading on the ammeter display and compare it with the values in the table.

8a If the value falls within the range indicated in the table, disconnect the instrument and reinstate the top cover of the machine.

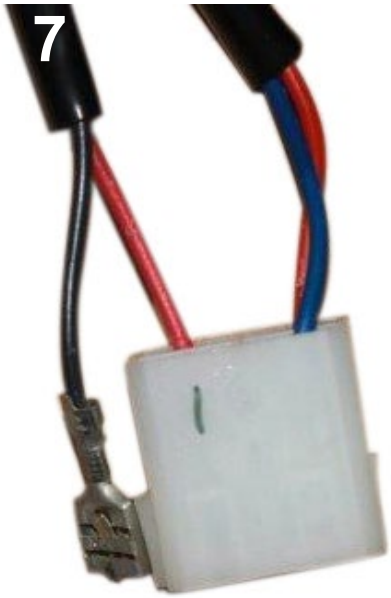
8b Conversely, if the value is at variance with those indicated in the table, proceed with replacement of the filter shaker motor.

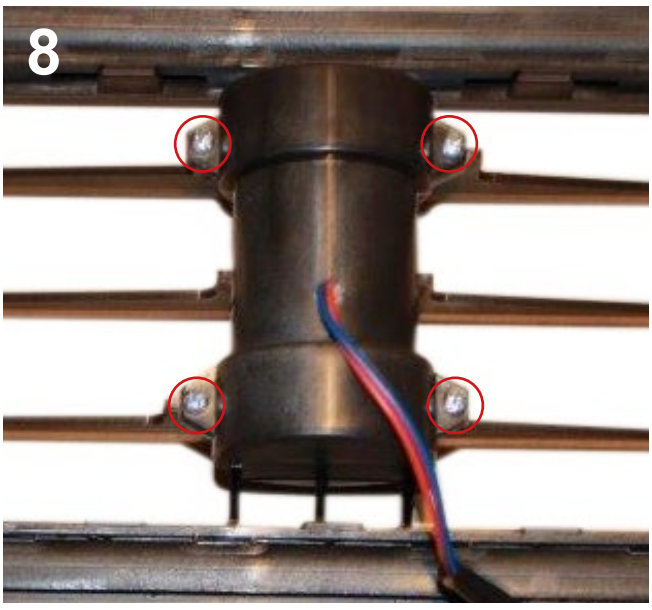
Current draw A (amperes)	*Min*	*Max*
Without air filter	***1.7 A***	***2.2 A***

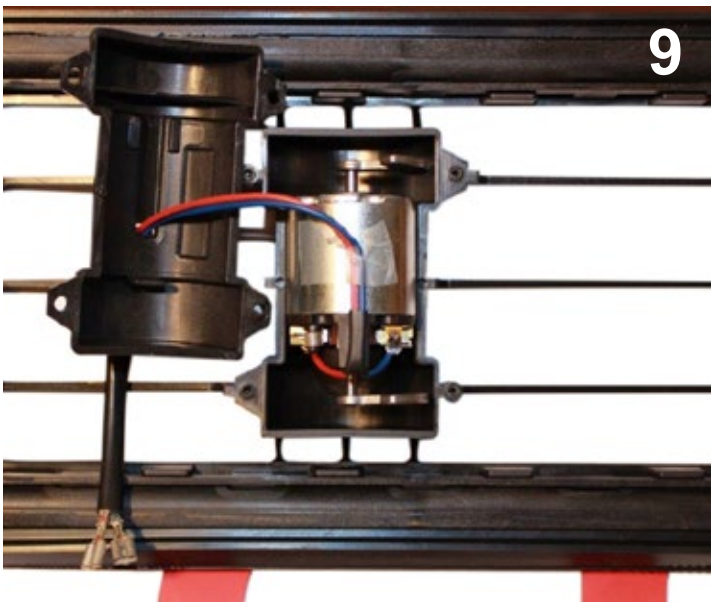
B2.2 Removing the filter shaker motor

Disassembly

1. **Move the machine to flat, dry flooring.**
2. **Make sure that there is enough room around the machine to perform the dismantling operations safely.**
3. If necessary, clean the working area with a jet of compressed air, or a vacuum cleaner.
4. Undo the fixing screws of the top cover, and remove the cover.
5. Disassemble the suction unit so as to access the filter shaker, as described in heading B1,2.
6. Transfer the suction unit, complete, to a bench.
7. To separate the shaker frame from the fan housing, the 4 wires must be detached from the connector so they can be drawn through the hole. Mark the colours of the wires on the connector, using a felt-tip pen.
8. Undo the 4 screws to access the motor of the filter shaker.
9. Replace the filter shaker motor.







Reassembly

1. To reassemble, repeat the disassembly steps in reverse order.

☝ IMPORTANT

Move the machine to the waste disposal area, clean the suction filter and empty the dirt bin.

Move the machine onto flat ground and apply the brake. If necessary, place chocks under the wheels.

Switch the machine off by turning the ignition key anticlockwise and/or pressing the emergency switch

Disconnect the electronic circuit from the batteries by detaching one or both battery connectors.

i INFORMATION

Important information

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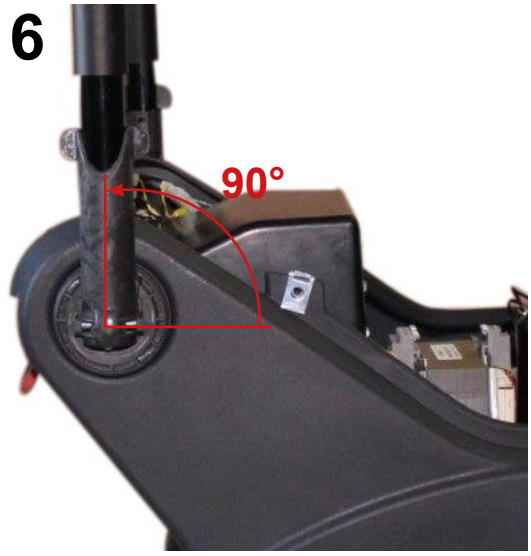
C1 FRONT WHEEL

C1.1 Replacing the front wheel

Disassembly

1. **Move the machine onto flat and dry flooring.**
2. **Make sure that there is enough room around the machine to perform the dismantling operations safely.**
3. If necessary, clean the working area with a jet of compressed air, or a vacuum cleaner.
4. Undo the fixing screws of the top cover, and remove the cover.
5. Remove the battery.
6. Raise the arm and lock in the upright position, at 90° to the fully closed position
7. Lay the machine down so that the brush compartment is exposed.
8. Clean the wheel hub, by blasting with compressed air if possible.
9. Undo the screw and the hex head nut to remove the wheel.
10. Replace the wheel.



Reassembly

1. To reassemble, repeat the disassembly operations in reverse order.

☝ IMPORTANT

Move the machine to the waste disposal area, clean the suction filter and empty the debris bin.

Move the machine onto flat ground and apply the brake. If necessary, place chocks under the wheels.

Switch the machine off by turning the ignition key anticlockwise and/or pressing the emergency switch

Disconnect the electronic circuit from the batteries by detaching one or both battery connectors.

i INFORMATION

Important information

When consulting this Service manual, the reader will encounter the expressions RIGHT and LEFT indicating the side of the machine. These indications always refer to the direction of movement of the machine.

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D1 PRINTED CIRCUIT BOARDS

POWER CIRCUIT BOARD

The power pcb located internally of the machine performs a number of functions: in addition to controlling and supplying power to the centre brush, side brush, suction unit and filter shaker motors and to the actuator, it also operates as a battery charger. Accordingly, in the event of the battery being replaced with another of non standard specification, the type of the new battery must be entered via the display pcb so that the charge curve can be adapted as necessary.

The motors are activated in 'soft-start' mode to avoid current peaks that could have the undesirable effect of causing the battery charge to deplete faster than normal. The power board delivers a maximum current of 15A and is protected by a fuse rated 20A, mounted directly to the pcb. Another function of the pcb is to monitor the power draw of the centre and side brush motors, thereby determining the pressure on the bristles in accordance with the setting selected at the control panel. Program 1 or Program 2. Consequently, the current draw will be different for each of the two settings, greater in the case of Program 2. The instantaneous power draw of the brushes can be viewed on the display, if function UB.1 is enabled in the settings menu.

When the brushes are set in motion, the power pcb takes a reading of the current draw at the motors before the bristles touch the floor, to determine a 'TARE' value, and thereafter, when contact is made with the floor, the pcb will read the overall power draw and subtract the TARE value to obtain the power draw indicating the ground pressure of the brush: the power draw is maintained steady at the display pcb setting. Another function of the power pcb is that of selecting automatic activation of the filter shaker, with the setting made by way of the display pcb.

The power pcb also performs the function of detecting errors affecting the brush motors and the charge status of the battery. Yellow Led alight: indicates that the battery voltage is lower than 10.9V for GEL, AGM or SLA types, and 10.5V for conventional Lead Acid. Red Led alight: indicates that the battery voltage is lower than 10.2V for GEL, AGM or SLA types, and 9.3V for conventional Lead Acid.

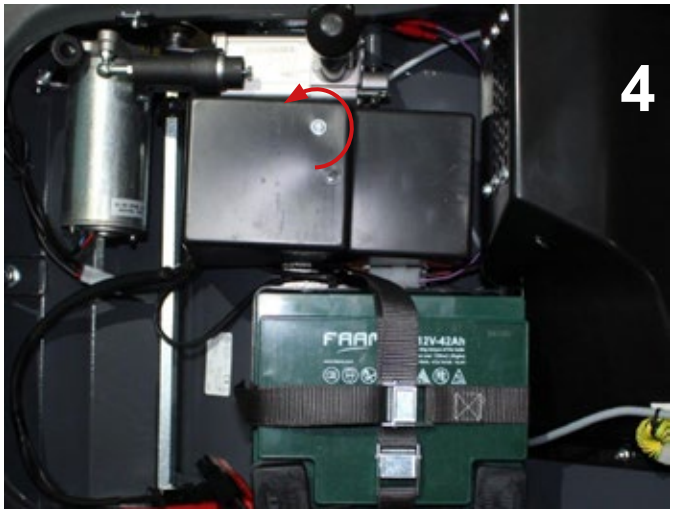
D1.1 Preliminary checks

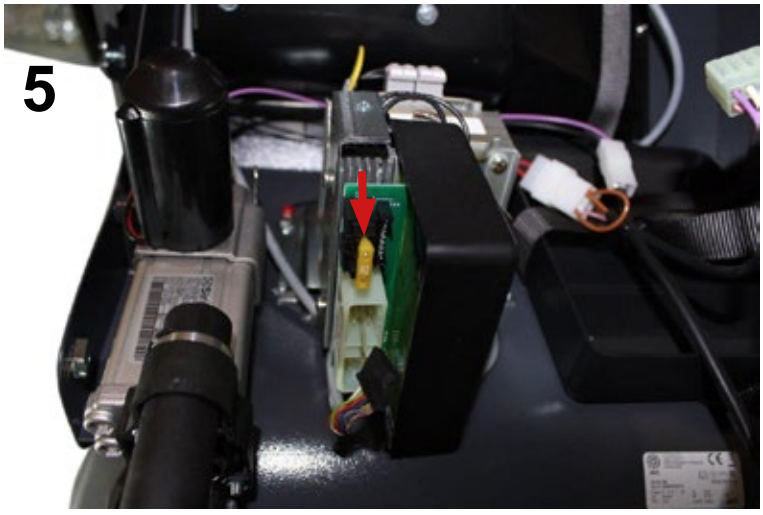
Depending on the direction in which the current crosses the callipers, and therefore on the wire chosen for the measurement, the instrument may read negative values. This is not an error. The absolute value must be used (without + or -). In case of a negative value, to read the positive value, simply turn the callipers.

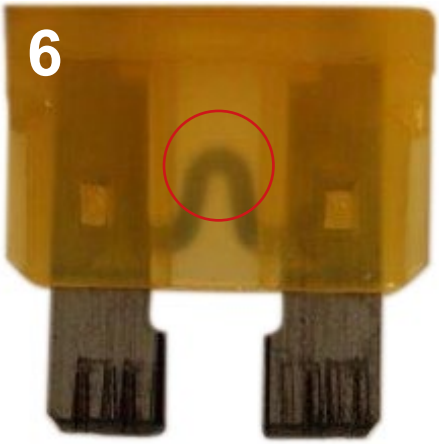
Should the machine fail to start when pressing the ON-OFF button, with batteries fully charged, proceed to check the fuse F1 (20A) and replace if necessary.

Checking fuse F1 (20A)

1. **Move the machine to flat, dry flooring.**
2. **Make sure that there is enough room around the machine to perform the dismantling operations safely.**
3. Undo the fixing screws of the top cover, and remove the cover.
4. Undo the hex head screw and remove the protective plastic cover of the power circuit board.
5. Remove the fuse from the pcb.
6. Visually check that the filament is intact.
7. Use a digital multimeter and select “Continuity” mode.
8. Position the red probe on one end of the fuse, the black probe on the other end and check that the multimeter emits a continuous sound.
9. If the fuse is burnt out, replace it.



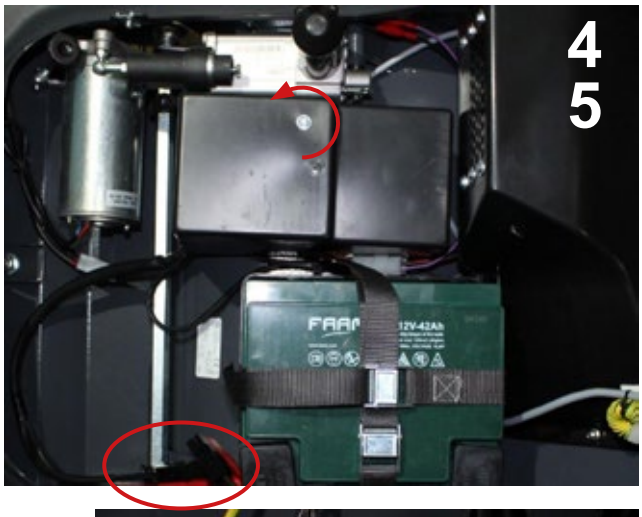


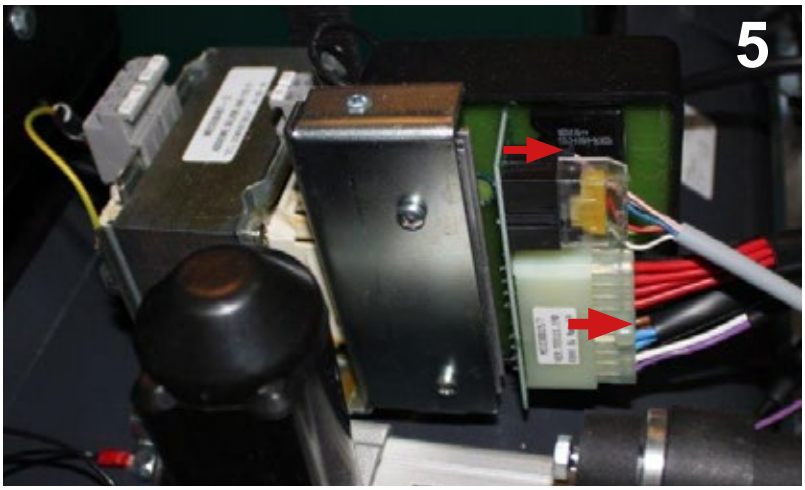


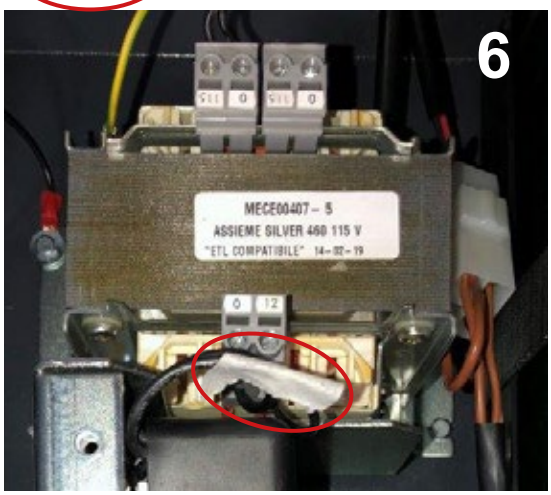
D1.2 Disassembly and electrical connection of the power circuit board

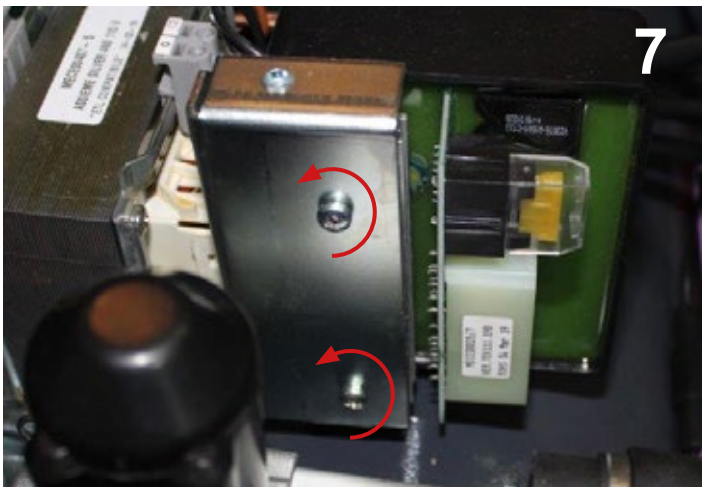
Disassembly

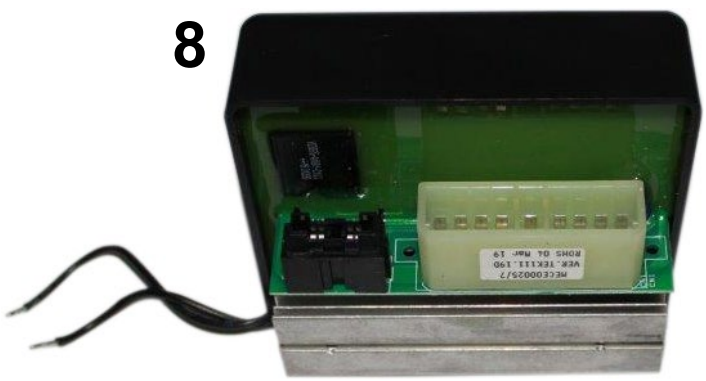
1. **Move the machine onto flat and dry flooring.**
2. **Make sure that there is enough room around the machine to perform the dismantling operations safely.**
3. Undo the fixing screws of the top cover, and remove the cover.
4. **Disconnect the two battery connectors (red and black).**
5. Undo the hex head screw to remove the protective plastic cover, and disconnect the two connectors on the pcb.
6. Before loosening the 2 screws (0 and 12) to remove the 2 wires of the power pcb from the transformer, apply tape to one of the two wires to serve as a reference for reassembly.
7. Undo the 2 screws to free the power circuit board.
8. Remove the power circuit board





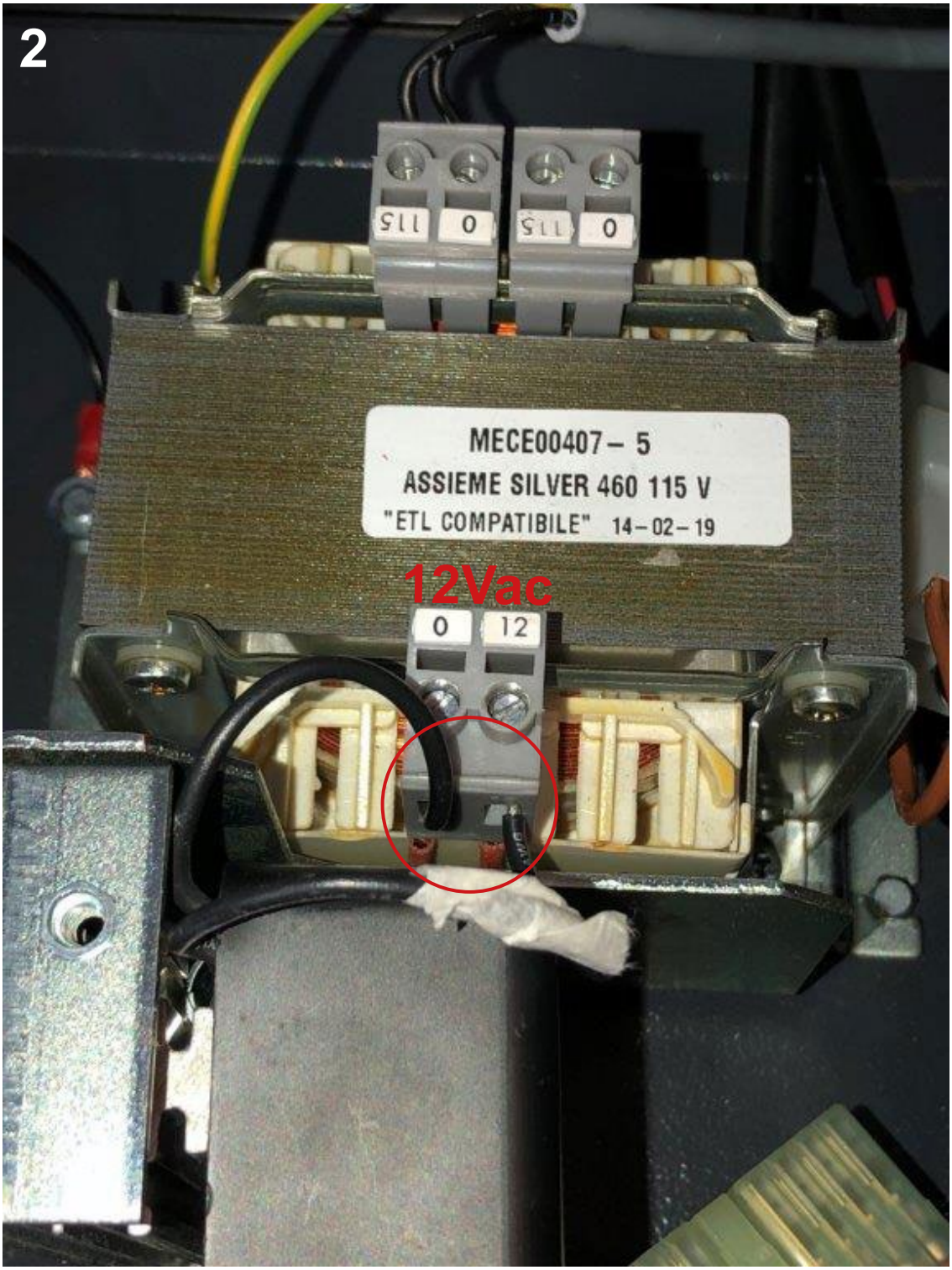






Reassembly

1. To reassemble the power circuit board, repeat the disassembly steps in reverse order.
2. Take care when connecting the 2 wires of the circuit board to the transformer.



D1.3 Power board programming

The power board incorporates the electronics for programming the optimal operating settings and storing the set parameters. The parameters are set by default directly in the factory. However, it may be necessary to verify that these settings are correct or change some parameters to adapt the machine to the user's needs. To verify or modify the parameters, with the exception of the technical settings that have a number between the letter and the dot (example: U1.X, U2.X, y0.X, y1.X, y2.X, y3.X) and should not be modified, see the "User Programming" and/or "Technical Programming" operating instructions.
When replacing the power board, it is always recommended to check the factory values and, if necessary, modify the settings based on the user's needs.

The programming procedure is divided into two parts: a simpler part, for users, to set the brush pressure in the two programs (however it is not recommended to modify these), and the filter shaker activation times. There is then another more technical part: to change some essential parameters, such as the type of battery installed or check current draw of the brush motor; in this case too, it is not recommended to change the values of parameters indicated as non-modifiable.

The display shows the information in a predefined order: at start-up, it first displays any ERRORS, followed by the BATTERY VOLTAGE indicated with two whole numbers and one decimal XX.X, then the TOTAL HOURS of machine operation, three whole numbers XXX, and MINUTES with two decimals .XX. If the "Technical Display" function (UB.1) is enabled, the CURRENT DRAWN BY THE BRUSHES, the HEAT SINK TEMPERATURE, the CURRENT SETTING and the MAXIMUM HEAT SINK TEMPERATURE will be displayed flashing, following the standard indications.
The possible errors shown on the display are C22 - problems with the brush MOSFETs, C14 - heatsink MOSFET high temperature, FS0 - centre brush worn, SP1 - brush motor overcurrent, and CP (cP) - communication error between the display board and the power board. For troubleshooting, see the corresponding paragraph.

User Programming

PROCEDURE

1. Switch the machine on using the ON-OFF button **A** and (with no functions active) press the DISPLAY button **B** and hold it for at least 5 seconds, the display will show the first parameter - P1.0.
2. To increase the value press the SUCTION button **C**, while to decrease the value press the FILTER SHAKER button **D**.
3. To move to the next parameter, press the DISPLAY button **B**, the display will then show P2.1, SF3 etc. in a cycle back to P1.0.
4. To save the changes and exit, press for at least 5 seconds the DISPLAY button **B**, or hold it until the display shows the battery voltage.
5. To exit without saving the changes, press the ON-OFF button **A** until the display switches off.

Parameter Indications and Available Values

P1.X Brush pressure program 1 with value X from 0 to 5. It is not recommended to change the default value.

P2.X Brush pressure program 2 with value X from 0 to 5. It is not recommended to change the default value.

SF.X Filter shaker activation frequency with value X from 0 to 9. Modifiable according to customer needs.

SF.0 MANUAL filter shaker activation.
SF.1 AUTOMATIC filter shaker activation every 60 seconds.
SF.2 AUTOMATIC filter shaker activation every 120 seconds.
SF.3 AUTOMATIC filter shaker activation every 180 seconds.
SF.4 AUTOMATIC filter shaker activation every 240 seconds.
SF.5 AUTOMATIC filter shaker activation every 300 seconds.
SF.6 AUTOMATIC filter shaker activation every 360 seconds.
SF.7 AUTOMATIC filter shaker activation every 420 seconds.
SF.8 AUTOMATIC filter shaker activation every 480 seconds.
SF.9 AUTOMATIC filter shaker activation every 600 seconds.

Versions with 115 VAC / 230 VAC Power Supply

DEFAULT VALUES

P1.0

P2.1

SF3

Technical Programming

PROCEDURE

1. Switch the machine on using the ON-OFF button **A** and then switch it off, holding the ON-OFF button **A** until the first parameter is shown - U1.3.
2. To modify the parameter on the display, press the SUCTION button **C** to increase the value or press the FILTER SHAKER button **D** to decrease the value.
3. To move to the next parameter, press the DISPLAY button **B**, the display will then show U2.4, UA.1, UB.0, Y0.3, Y1.2, Y2.5, Y3.1 in a cycle back to U1.3.
4. To save the changes and exit, press the DISPLAY button **B** until the display switches off.
5. To exit without saving the changes, press the ON-OFF button **A** until the display switches off.

Parameter Indications and Available Values

U1.X	Actuator reaction time program 1 with value X from 0 to 9. It is not recommended to change the default value.
U2.X	Actuator reaction time program 2 with value X from 0 to 9. It is not recommended to change the default value.
UA.X	Type of battery installed: 0 = Acid / 1 = Sealed Acid - AGM / 2 = Gel. This is modified based on the battery installed, if different from the one supplied with the machine.
UB.X	Enable display of technical parameters. 0 = Not enabled / 1 = Enabled
Y0.X	Brush adjustment tolerance with value X from 0 to 9. It is not recommended to change the default value.
Y1.X	(Jack lowering speed with value X from 0 to 9) Not used.
Y2.X	Jack rising speed with value X from 0 to 9. It is not recommended to change the default value.
Y3.X	Reset hour counter. Press for 10 seconds the BRUSH 1 button **E** to reset. If reset is successful, the buzzer will sound continuously for 3 seconds.

Versions with 115 VAC / 230 VAC Power Supply

DEFAULT VALUES

U1.3

U2.4

UA.1

UB.0

Y0.3

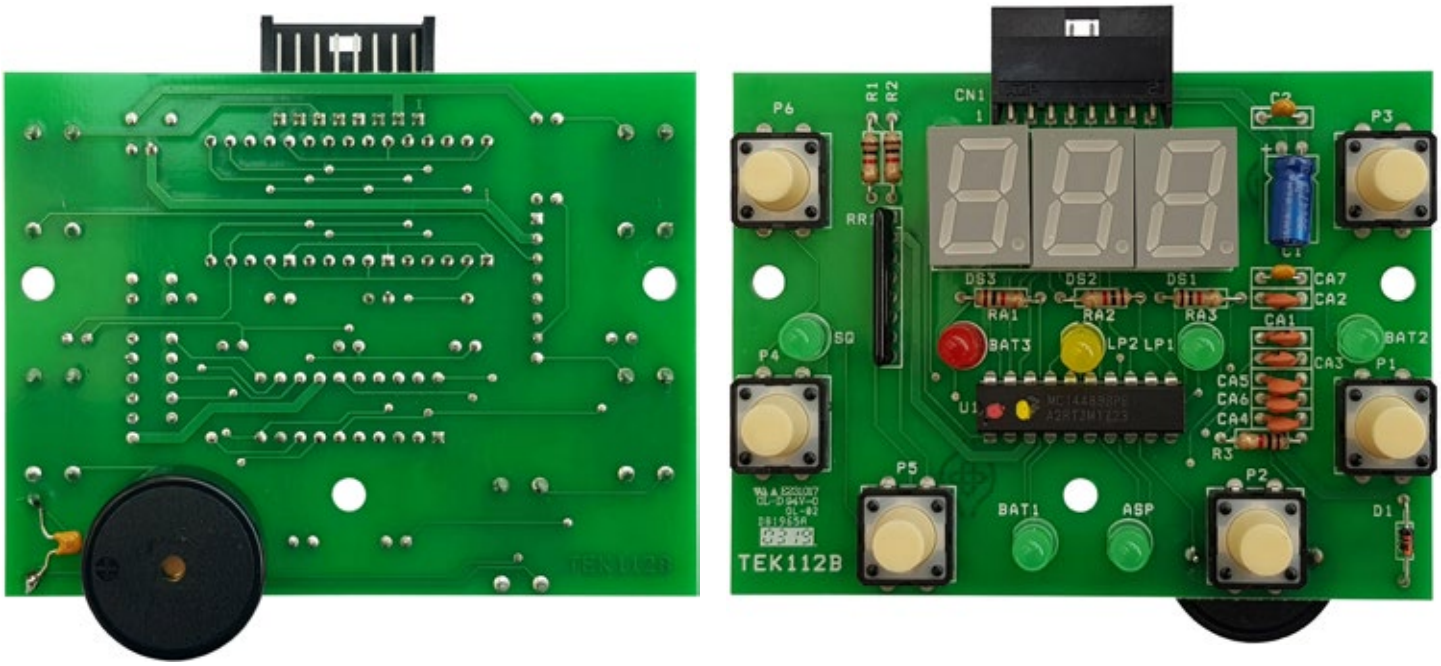
Y1.2

Y2.5

Y3.1

DISPLAY CIRCUIT BOARD

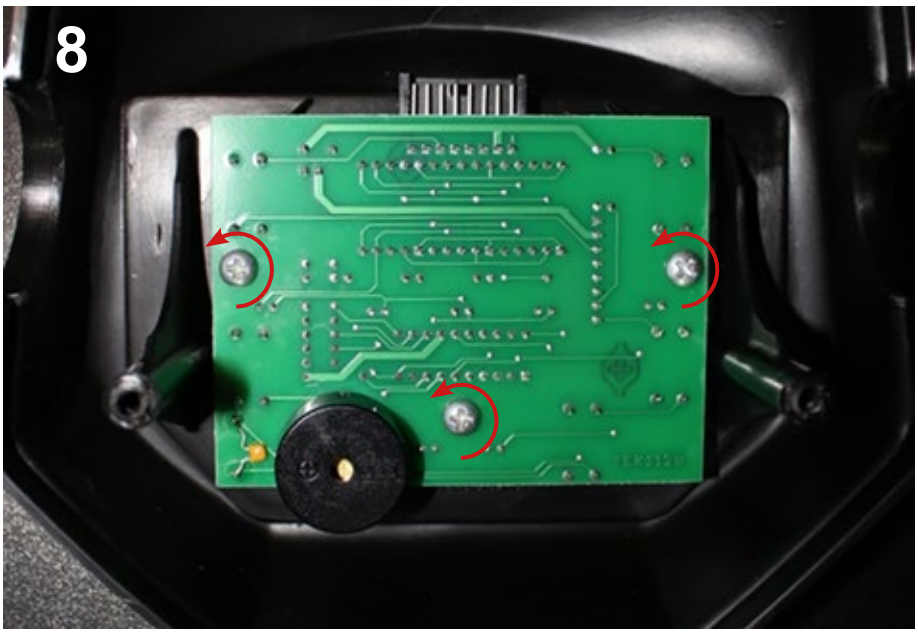
The sole function of the display pcb is to select and show activated functions and any errors that the power pcb may detect when the machine is started up and/or in operation.
During operation, the battery charge Leds keep the user informed on the charge level of the battery: Green indicates maximum charge level and Yellow indicates reserve level; when the colour is Red and blinking, this indicates that battery power is low and all activated functions will be suspended until the battery has been recharged. During recharge, the Leds indicate the charge progress: Yellow denotes that the battery is recharging, and Green denotes that the battery is fully charged.
The display circuit board is interfaced with the power circuit board by way of the 8-pin connector "AMP 2" and supplied with power directly from the power pcb; the input voltage at connector "AMP 2" is 5Vdc, measured across PIN 1 Vdc and PIN 2 GND.
The buzzer mounted on the display pcb is supplied with power directly from the power pcb; its operation can be tested by connecting an input voltage of 5Vdc to PIN 7 +5Vdc and PIN 8 GND.
To check the connection between the display pcb and the power pcb, apply a jump across PIN 1 and PIN 6: if the machine starts up, then the connection is good; if not, there is a problem with the display pcb.
The display circuit board is used to set the basic operating parameters of the machine, such as frequency and duration of the filter shaker function, the sweeping pressure applied by the brushes (2 different programs) and the type of battery installed.



D1.4 Disassembly and electrical connection of the display circuit board

Disassembly

1. **Move the machine onto flat and dry flooring.**
2. **Make sure that there is enough room around the machine to perform the dismantling operations safely.**
3. Undo the fixing screws of the top cover, and remove the cover.
4. **Disconnect the two battery connectors (red and black).**
5. Undo the 5 screws securing the top shroud of the control panel to the bottom shroud.
6. Raise the top shroud and detach the connector of the display pcb.
7. Position the top shroud on a worktop and remove the 3 screws retaining the display pcb
8. Replace the display circuit board.



Reassembly

1. To reassemble the control panel shroud, repeat the disassembly steps in reverse order.

D1.5 Testing the display pcb buzzer

Test

1 **Move the machine onto flat and dry flooring.**

2 **Make sure that there is enough room around the machine to perform the test safely.**

3 Undo the fixing screws of the top cover, and remove the cover.

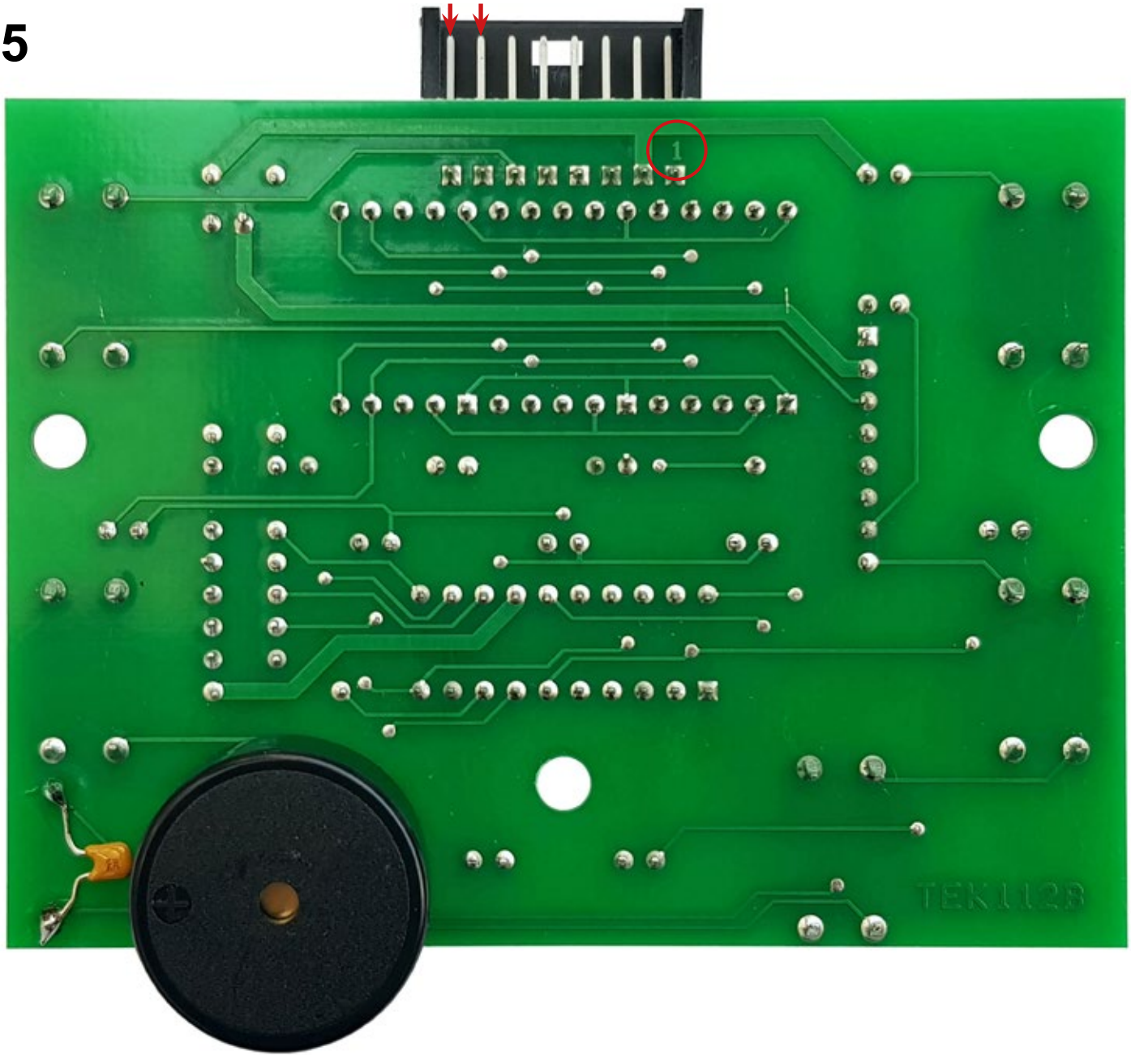
4 **Disconnect the two battery connectors (red and black).**

5 Expose the display circuit board as described in the previous heading.

6 Apply a voltage of 5Vdc to **PIN 7** +5Vdc and **PIN 8** GND, and check that the buzzer sounds.

6a If there is no sound from the buzzer, replace the display circuit board.

5



D1.6 Checking the connection between display circuit board and power circuit board

Checks

1 **Move the machine onto flat and dry flooring.**

2 **Make sure that there is enough room around the machine to perform the test safely.**

3 Undo the fixing screws of the top cover, and remove the cover.

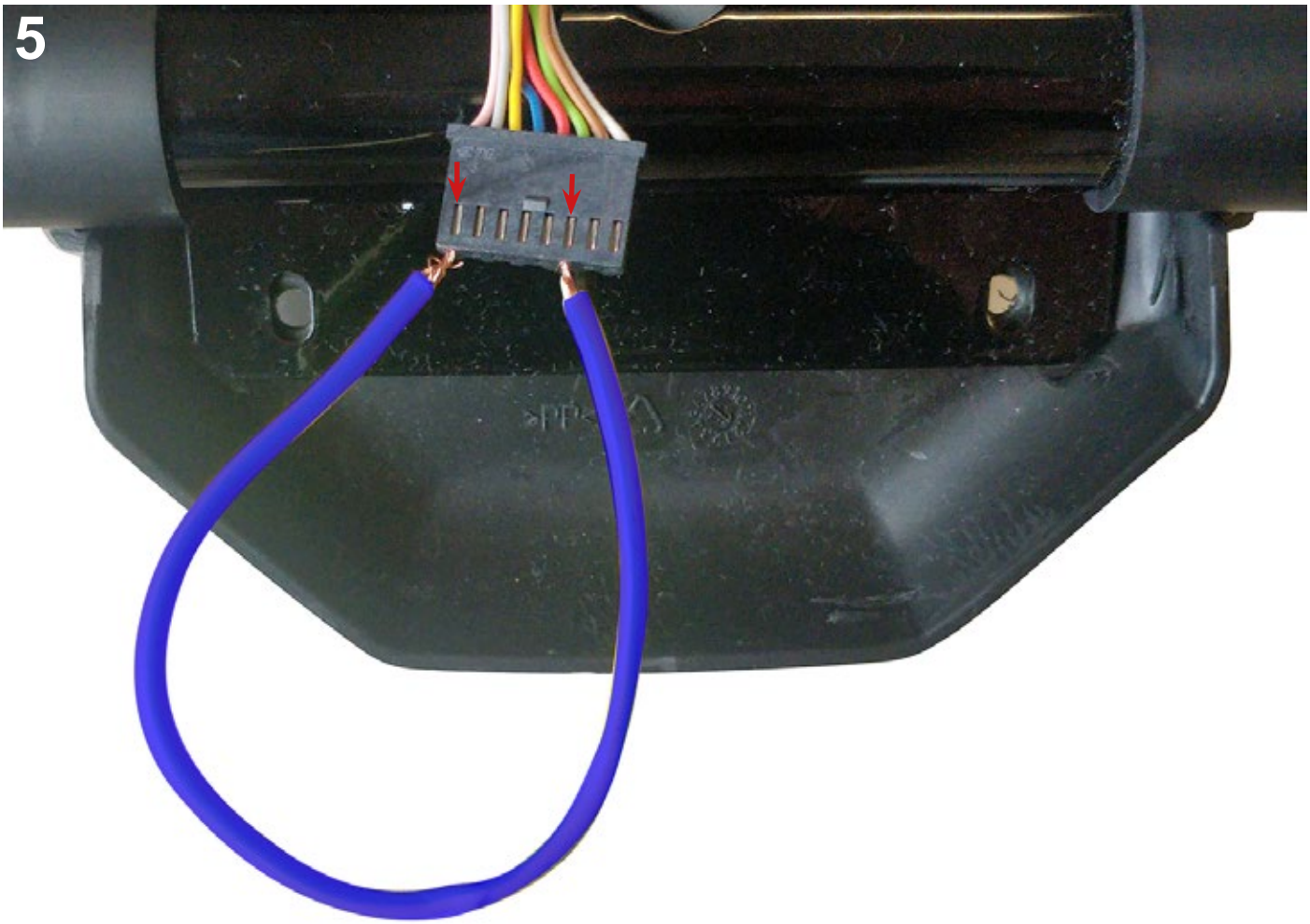
4 **Disconnect the two battery connectors (red and black).**

5 Expose the display circuit board as described in the previous heading.

6 **Reconnect the two battery connectors (red and black).**

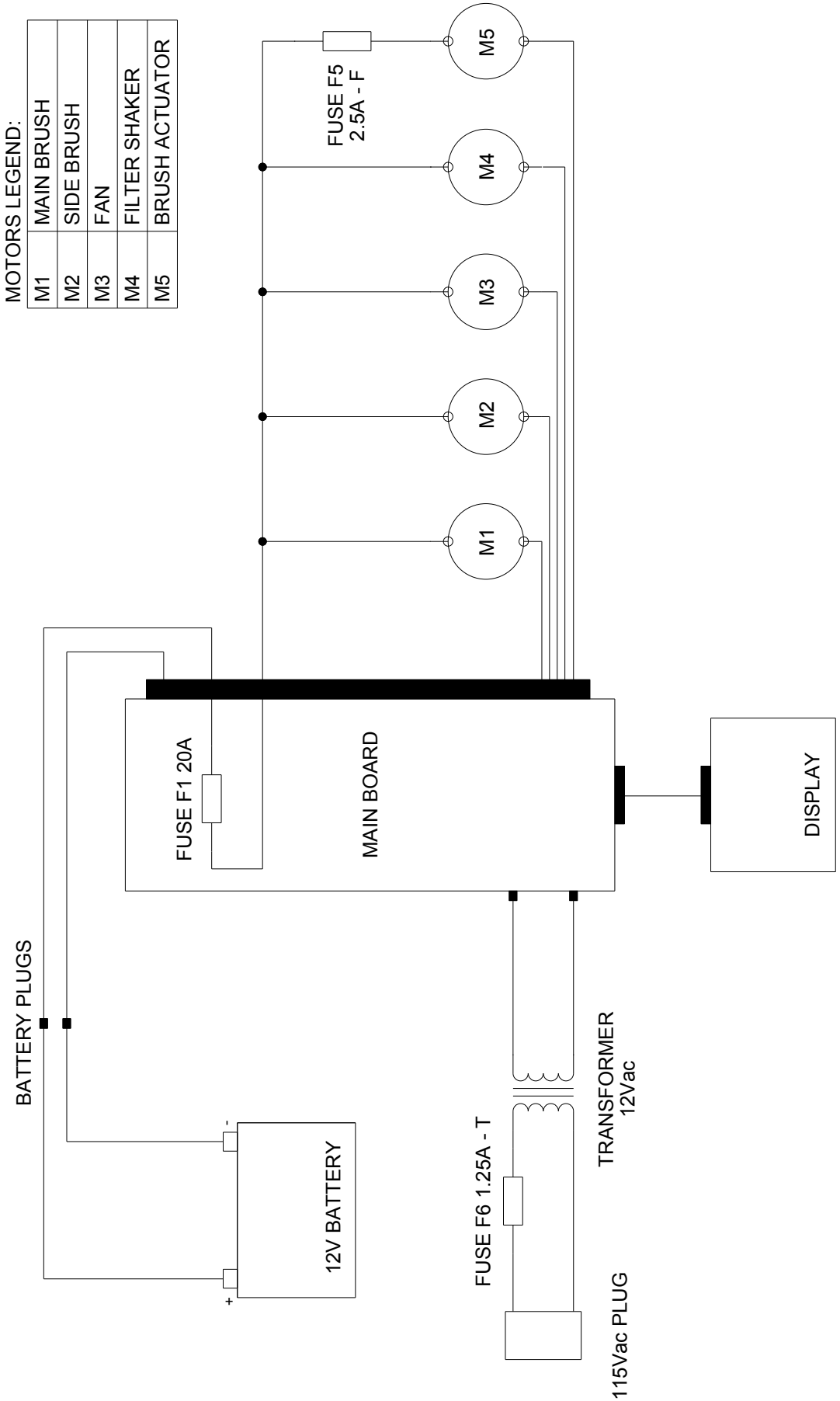
7 Apply a jump across **PIN 1** and **PIN 6** of the display circuit board wiring connector.

7a If the machine starts up, then the connection is good; if not, there is a problem with the display pcb.



D2 ELECTRICAL SYSTEM

D2.1 Wiring Diagram



☝ IMPORTANT

Move the machine to the waste disposal area, clean the suction filter and empty the dirt bin.

Move the machine onto flat ground and apply the brake. If necessary, place chocks under the wheels.

Switch the machine off by turning the ignition key anticlockwise and/or pressing the emergency switch

Disconnect the electronic circuit from the batteries by detaching one or both battery connectors.

i INFORMATION

Important information

When consulting this Service manual, the reader will encounter the expressions RIGHT and LEFT indicating the side of the machine. These indications always refer to the direction of movement of the machine.

In this Service Manual, the version of the machine may be written in brackets “()”, i.e. (E, DP-P, P, D). This note indicates that the instructions only refer to the model or version specified in brackets.

E1 TROUBLESHOOTING

E1.1 Troubleshooting

E1.1.1 The machine does not switch on

1	Make certain that the battery of the machine is charged (12V ± 1V).	**A**	If charge is low, recharge the battery. If battery is spent, replace it.
		B	If battery does not charge, go to point 2.
2	Check fuse F6 (1.25A - T)	**A**	If fuse is burnt out, replace it.
		B	If fuse is intact, go to point 3.
3	Check fuse F1 (20A)	**A**	If fuse is burnt out, replace it.
		B	If the fuse is intact, go to point 4.
3	Check battery wiring.	**A**	If wiring is damaged, repair or replace as necessary.
		B	If wiring is intact, go to point 5.
4	Check battery charge circuit (transformer and power pcb)	**A**	If transformer works as normal, replace power circuit board.
		B	If transformer is not working, replace it.

E1.1.2 No suction on the machine

1	Switch on the suction motor only.	**A**	If motor starts up, go to point 2.
		B	If motor fails to start, go to point 5.
2	Check for correct assembly of filter.	**A**	If assembly is wrong, reassemble correctly.
		B	If assembly is correct, go to point 3.
3	Check filter for clogging.	**A**	Disassemble filter and ensure dirt is not excessive, then proceed with cleaning and/or go to point 4.
		B	Replace filter element if damaged.
4	Check that all flaps are intact and/or not excessively worn	**A**	If flaps are intact and levels of wear acceptable, replace the air filter.
		B	Replace flaps if damaged or worn excessively.
5	Connect suction unit directly to battery.	**A**	If suction is working, go to point 6.
		B	If suction is not working, replace the unit.
5	Proceed to conduct test described in heading D1.5.	**A**	If suction is not working, check wiring between power pcb and display pcb.
		B	If suction is working, replace the display circuit board.

E1.1.3 Machine leaves the floor dirty

1	Check that brush rotates and rotates in the proper direction: counter to the direction of motion.	**A**	If brush rotates correctly, go to point 2.
		B	If brush rotates but in the wrong direction, invert the wires at the connector (only if brush motor has been replaced).
		C	Only if centre brush does not rotate but side brush does rotate, go to point 5.
		D	If neither centre brush nor side brush rotates, go to point 8.
2	Check whether or not brushes are lowered when expected.	**A**	If no, see heading F1.1.4.
		B	If yes, go to point 3.
3	Check extent of wear on centre brush.	**A**	Replace brush if worn excessively.
		B	If not worn, go to point 4.
4	Check integrity and wear of front flap.	**A**	Replace flap if degraded or worn.
		B	If centre brush is replaced, replace front flap as well even if in acceptable condition
5	Check integrity of drive belt.	**A**	Replace belt if degraded.
		B	If belt is intact, go to step 6.
6	Check continuity of wiring between connector and motor.	**A**	Restore continuity of wiring if broken.
		B	If wiring is intact, go to point 7.
7	Check integrity of carbon brushes; see heading A1.4.	**A**	Replace carbon brushes if worn.
		B	If carbon brushes are in good condition, replace the motor.
8	Connect centre and side brush motors directly to battery to verify rotation.	**A**	If motors turn, go to step 9.
		B	If neither motor turns, replace both.
9	Check integrity of wiring.	**A**	If wiring is damaged, repair or replace as necessary.
		B	If wiring is intact, replace the power circuit board.

E1.1.4 Brushes are not lowered

1	Check the integrity of fuse F5 (2.5 A - F) on the actuator wiring.	**A**	Replace the fuse if burnt out.
		B	If fuse is working, go to point 2.
2	Disconnect actuator and connect directly to battery to verify operation. For connection of the actuator, read indications on page 24.	**A**	Replace the actuator if not working. Test both at the output and at the input (rod).
		B	If actuator is working, go to point 3
3	At this juncture, verify current draw so as to exclude mechanical problems.	**A**	If current draw is high, clean, lubricate or replace the actuator.
		B	If current draw is correct, go to point 4.
4	Check integrity of the machine wiring.	**A**	If machine wiring is faulty, effect the necessary repair.
		B	If machine wiring is intact, go to point 5.
5	Connect the actuator of the machine and proceed with test of current draw.	**A**	If actuator does not work and there is no current draw, replace the power circuit board.
		B	If there is current draw but actuator responds with difficulty, replace actuator.

E1.1.5 Centre brush not rotating.

1	Disconnect centre brush motor from main wiring loom and connect directly to battery.	A	If motor does not turn, go to point 2.
		B	If motor turns, go to point 4.
2	Check integrity of motor carbon brushes. See heading A1.4.	A	Replace carbon brushes if worn.
		B	If carbon brushes are intact, go to point 3.
3	Check continuity of the brush motor wiring from connector to carbon brushes.	A	If continuity is unaffected, replace the motor.
		B	If continuity is broken, restore efficiency of the wiring.
4	Check integrity of drive belt.	A	Replace belt if degraded.
		B	If belt is intact, go to step 5.
5	Check continuity of the wiring between brush motor and power circuit board.	A	If wiring is damaged, repair or replace as necessary.
		B	If wiring is intact, go to point 6.
6	Check continuity of the wiring between display circuit board and power circuit board.	A	If wiring is damaged, repair or replace as necessary.
		B	If wiring is intact, go to point 7.
7	Apply tester to PIN 6 +5Vdc and PIN 2 GND of the display pcb: pressing the brush controls, the voltage reading should be 2.5Vdc for Brush 1 and 1.67Vdc for Brush 2.	A	If voltage readings are as expected, replace the power circuit board.
		B	If voltage readings are not as expected, replace the display circuit board.

E1.1.6 Side brush not rotating.

1	Disconnect side brush motor from main wiring loom and connect directly to battery.	A	If motor does not turn, go to point 2.
		B	If motor turns, go to point 4.
2	Check integrity of motor carbon brushes. See heading B2.2.	A	Replace carbon brushes if worn.
		B	If carbon brushes are intact, go to point 3.
3	Check continuity of the brush motor wiring from connector to carbon brushes.	A	If continuity is unaffected, replace the motor.
		B	If continuity is broken, restore efficiency of the wiring.
4	Check continuity of the wiring between brush motor and power circuit board.	A	If wiring is damaged, repair or replace as necessary.
		B	If wiring is intact, go to point 5.
5	Check continuity of the wiring between display circuit board and power circuit board.	A	If wiring is damaged, repair or replace as necessary.
		B	If wiring is intact, go to point 6.
6	Apply tester to PIN 6 +5Vdc and PIN 2 GND of the display pcb: pressing the brush controls, the voltage reading should be 2.5Vdc for Brush 1 and 1.67Vdc for Brush 2.	A	If voltage readings are as expected, replace the power circuit board.
		B	If voltage readings are not as expected, replace the display circuit board.

E1.1.7 Suction not working

1	Disconnect suction motor from main wiring loom and connect directly to battery.	**A**	If motor does not turn, go to point 2.
		B	If motor turns, go to point 3.
2	Check continuity of the suction wiring	**A**	If continuity is unaffected, replace the motor.
		B	If continuity is broken, restore efficiency of the wiring.
3	Check continuity of the wiring between connector of suction motor and power circuit board.	**A**	If wiring is damaged, repair or replace as necessary.
		B	If wiring is intact, go to point 4.
4	Check continuity of the wiring between display circuit board and power circuit board.	**A**	If wiring is damaged, repair or replace as necessary.
		B	If wiring is intact, go to point 5.
5	Apply tester to PIN 6 +5Vdc and PIN 2 GND of the display pcb: pressing the suction control, the voltage reading should be 5Vdc. See section D1.5.	**A**	If voltage reading is as expected, replace the power circuit board.
		B	If voltage reading is not as expected, replace the display circuit board.

E1.1.8 Filter shaker not working

1	Disconnect filter shaker motor from main wiring loom and connect directly to battery.	**A**	If motor does not turn, go to point 2.
		B	If motor turns, go to point 3.
2	Check continuity of the filter shaker wiring	**A**	If continuity is unaffected, replace the motor.
		B	If continuity is broken, restore efficiency of the wiring.
3	Check continuity of the wiring between connector of filter shaker and power circuit board.	**A**	If wiring is damaged, repair or replace as necessary.
		B	If wiring is intact, go to point 4.
4	Check continuity of the wiring between display circuit board and power circuit board.	**A**	If wiring is damaged, repair or replace as necessary.
		B	If wiring is intact, go to point 5.
5	Apply tester to PIN 6 +5Vdc and PIN 2 GND of the display pcb: pressing the filter shaker control, the voltage reading should be 4.2Vdc.	**A**	If voltage reading is as expected, replace the power circuit board.
		B	If voltage reading is not as expected, replace the display circuit board.

E1.2 Display circuit board troubleshooting

ALARM	PROBLEM	SOLUTION
C22	Brush protection short circuit: inhibits all functions.	Resettable only by pressing the OFF button of the machine.
C14	Thermal overload cutout: trips when the temperature rises above 194 °F	Error condition resets automatically when the temperature drops below 176 °F
FS0	Brushes worn	Replace brushes.
SP1	Brushes KO	Error resettable only by switching off the machine. Trips if the brushes cut out (SHUTDOWN) three times within the space of one minute.
cP	Communication Problem	Communication error between power and panel boards, check the connection cable and power board.
Yellow Led alight	Battery reserve charge	Error condition that does not inhibit any function: the condition is indicated by the yellow Led lighting up.
Red Led blinking	Reserve charge depleted	Error condition inhibiting all functions: resettable only by pressing the OFF button of the machine.