



**PLDC04452**

**REVISION DATE**

December 23, 2020

**DATE**

December 23, 2020

**TECHNICAL OFFICE**

Stavale

# T290



**TECHNICAL SERVICE MANUAL**





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## WARNINGS

### **! DANGER!**

Indicates the need for attention in order to avoid a series of consequences which could cause death or damage to the health of the operator.

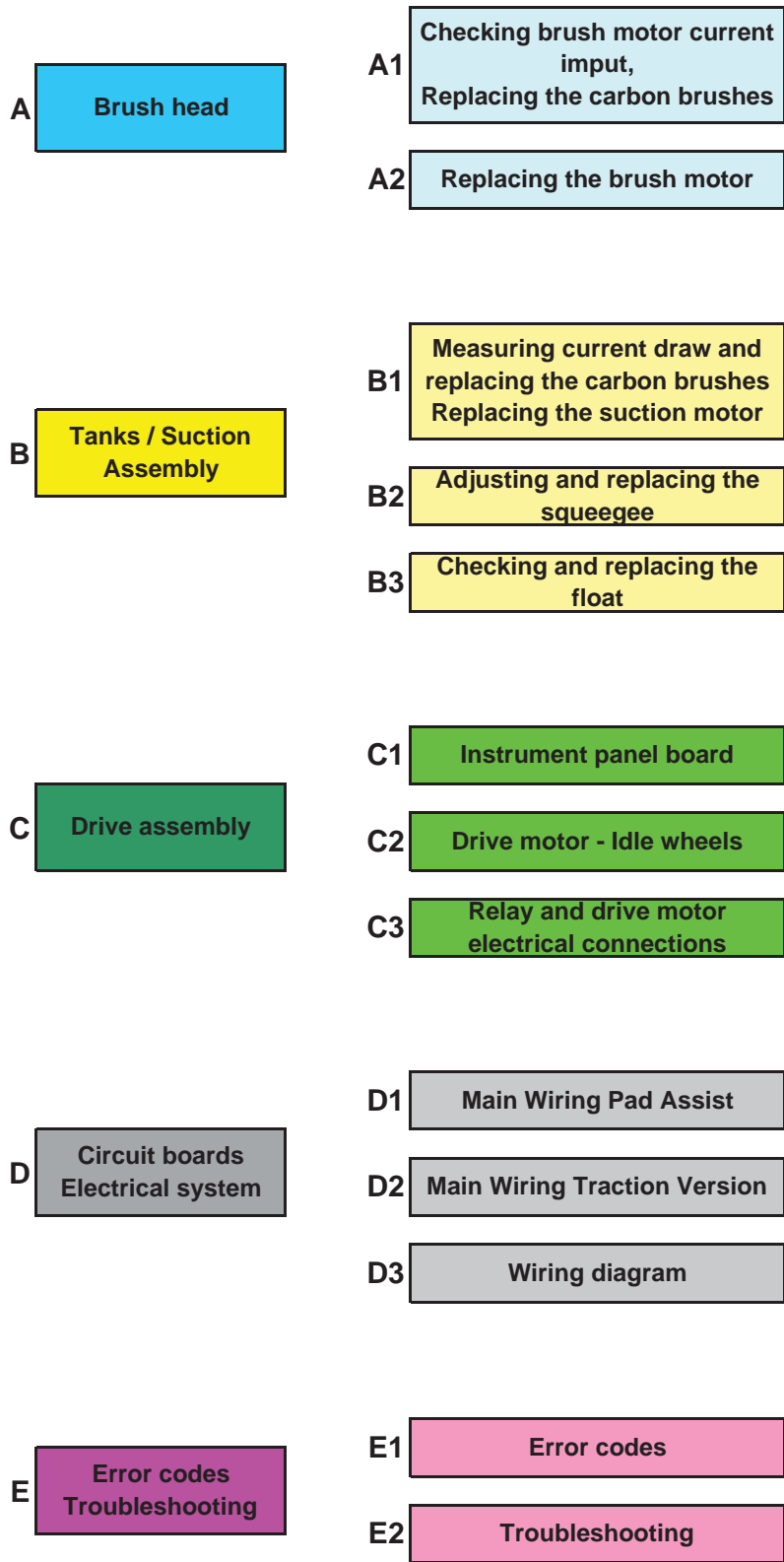
### **☞ WARNING!**

Indicates the need for attention in order to avoid a series of consequences which could cause damage to the machine or work environment or financial loss.

### **i INFORMATION**

Indicates particularly important instructions.

*In line with the company's policy of constant product development and updating, the Manufacturer reserves the right to make modifications without warning. Although your machine may differ appreciably from the illustrations in this document, safety and the information contained in this manual are guaranteed.*





## INDEX

Subject	Page
<b>A BRUSH HEAD</b>	
A1 BRUSH MOTOR	2
A1.1 Cheking brush motor current input	3
A1.2 Replacing the brush motor carbon brushes	5
A2 REPLACING THE BRUSH MOTOR	9
A2.1 Replacing the brush motor	10
<b>B SUCTION UNIT - TANKS</b>	
B1 SUCTION MOTOR	
B1.1 Checking the suction motor current input	14
B1.2 Replacing the suction motor carbon brushes	15
B1.3 Replacing the suction motor	17
B2 SQUEEGEE UNIT	19
B2.1 Adjusting the squeegee	20
B2.2 Replacing the squeegee blades	23
B3 CHECKING AND REPLACING THE FLOATS	25
B3.1 Checking operation of the solution tank float	26
B3.2 Replacing the detergent tank float	27
B3.3 Checking operation of the dirty water tank float	28
B4.4 Replacing the dirty water tank float	29
<b>C DRIVE UNIT</b>	
C1 INSTRUMENT PANEL ELECTRONIC BOARD	31
C1.1 Instrument panel board, setting the type batteries	33
C1.2 Dismantling the instrument panel board	38
C2 DRIVE MOTOR - WHEELS	41
C2.1 Checking the drive motor current input	42
C2.2 Checking and replacing the carbon brushes traction motor	43
C2.3 Replacing the drive wheels, "BT" version	45
C2.4 Replacing the idle wheels	46
C2.5 Replacing the drive motor	47
C3 RELAY AND DRIVE MOTOR ELECTRICAL CONNECTIONS	49
C3.1 Checking and replacing the drive relay	49
<b>D ELECTRONIC BOARD - ELECTRICAL SYSTEM</b>	
D1 MACHINE'S MAIN WIRING, "PAD ASSIST" version	52
D1.1 Main wiring board components, "Pad Assist" version	53
D2 MACHINE'S MAIN WIRING, "TRACTION" version	54
D2.1 Main wiring board components, "Traction" version	55
D2.2 Machine's main wiring connections, "Traction" version	56
D3 ELECTRICAL WIRING DIAGRAMS	61
D3.1 Wiring diagram, Pad Assist version	61
D3.2 Wiring diagram Traction version	62



**PLDC04452**

REVISION 00  
December 23, 2020  
TECHNICAL OFFICE  
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## INDEX

**Subject**

**Page**

**E ERROR CODES - TROUBLESHOOTING**

E1	ERROR CODES	64
E1.1	Alarm messages on the instrument panel board display	64
E2	TROUBLESHOOTING	66
E2.1	Troubleshooting	66
	Information on the revision numbers	68



**PLDC04452**

REVISION 00  
December 23, 2020  
TECHNICAL OFFICE  
Stavale

**A**

## **BRUSH HEAD**



### **WARNING**

*Go to the designated draining area and empty the solution and dirty water tanks using the drain plugs and the hose provided.*

*Move the machine onto flat ground. If necessary, place chocks under the wheels.*

*Press the emergency switch, for the version with drive, or disable the functions by moving the switch to position "0" on all other versions.*

*Disconnect the battery from the machine's electronics by simply disconnecting the negative pole only, for the battery versions, or unplugging from the mains power supply for the cable versions.*

### **i INFORMATION**

Indicates particularly important instructions.

*In this Service Manual, the terms RIGHT and LEFT are used to indicate the sides of the machine.  
These always refer to the direction of travel of the machine.*

*In this Service Manual, the machine version may be written in brackets (Traction, Pad Assist) or quotation marks "Traction - Pad Assist".  
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**A1 BRUSH MOTOR**



Fig. 1



## A1.1 Cheking brush motor current input

### Checks

- 1 Empty the solution tank and the dirty water tank.
- 2 Move the machine onto flat dry and smooth flooring.
- 3 Press the emergency switch (Traction) or switches into position "0" (Pad Assist).
- 4 **Make sure that the batteries on the machine are charged.**
- 5 Use a clamp-on ammeter with an end scale reading of at least 200 amperes, as shown in Figure 2.
- 6 Remove the power board.
- 7 Move the speed knob on the instrument panel to zero, turning it anticlockwise.
- 8 Remove the brush.
- 9 Switch the ammeter to **amperes** and **DC**



Fig. 2

- 8 Isolate the red wire **A**.
- 9 Connect the clamp to the red wire **A** as shown in Figure 3.

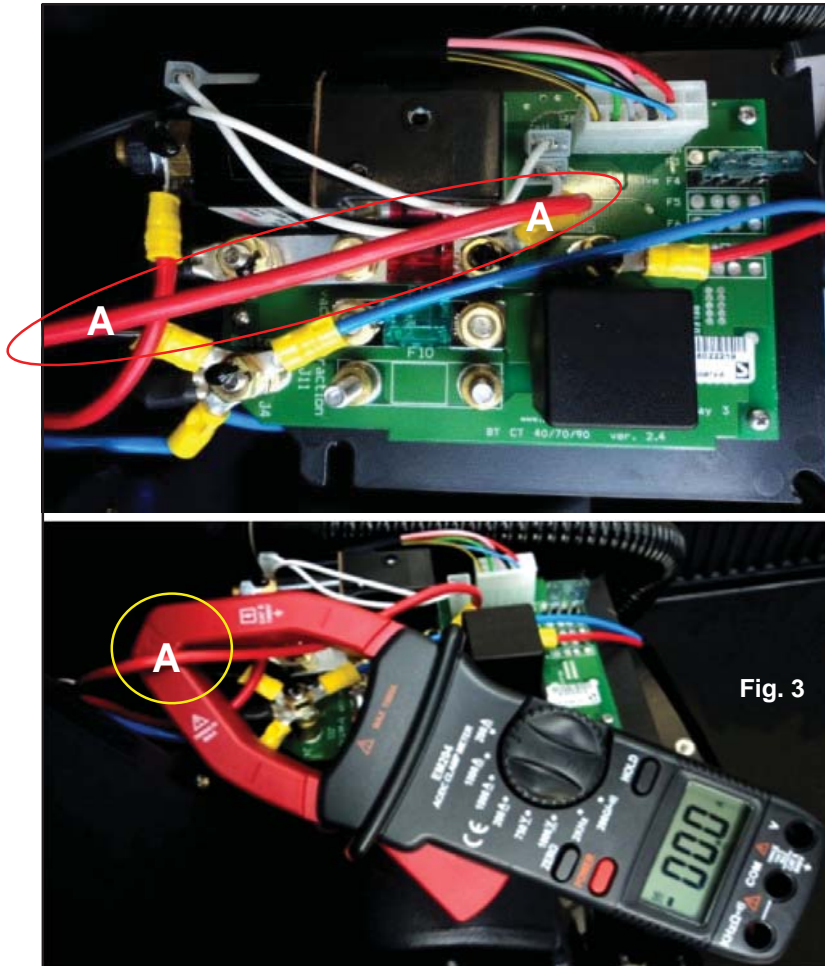


Fig. 3

- 11 **Checking the current with no load, i.e. without brushes.**
- 13 Turn the emergency button clockwise, Traction version only.
- 14 Press the button in instrument panel per the actuator of the brushes.
- 15 Controlling the rotation of the brushes using the drive lever, read the **CURRENT (A)** drawn by the brush reduction drive.
- 16 Note down the value read, and then run the following check.  
**Checking the current in operation, i.e. with the brushes.**
- 17 Replace the brushes on the reduction drive, and lower the brush head to the floor.
- 18 Repeat the readings, as described above.
- 19 Compare the values measured against the chart below.
- 20 If the values are OK, replace the brush motor cover.
- 21 If the values do not correspond to those specified (higher):
- 21a Check that the brush drive (and thus the motor) is free to rotate, without interference.
- 21b Check the power supply **VOLTAGE (V)** directly on the motor.
- 21c Check that the motor carbon brushes are intact, see paragraph A1.2, replace if necessary.
- 21d Replace the motor or the motors.

<i>Current input A (Amperes)</i>	<i>Min</i>	<i>Max</i>
<i>No load, head lifted</i>	4.0 A	6.0 A
<i>With brushes operating</i>	14.0 A	19.0 A



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## A1.2 Replacing the brush motor carbon brushes

### *Dismantling*

- 1 Move the machine to the tank draining area, and empty the solution tank and the dirty water tank.
- 2 Move the machine onto flat and dry flooring.
- 3 Press the emergency switch (Traction) or switches into position "0" (Pad Assist).
- 4 Lower the brush head using the pedal control.
- 5 Disconnect the batteries from the machine's main wiring, and from each other.
- 6 Remove the batteries from the battery compartment.
- 7 Remove the brush head cover, unscrewing the four screw.
- 8 Lay the machine on its side.
- 9 Unscrew the two front screw **A** that fasten the solution tank to the machine's chassis.
- 10 Loosen the two rear screw **B** that fasten the solution tank to the machine's chassis.

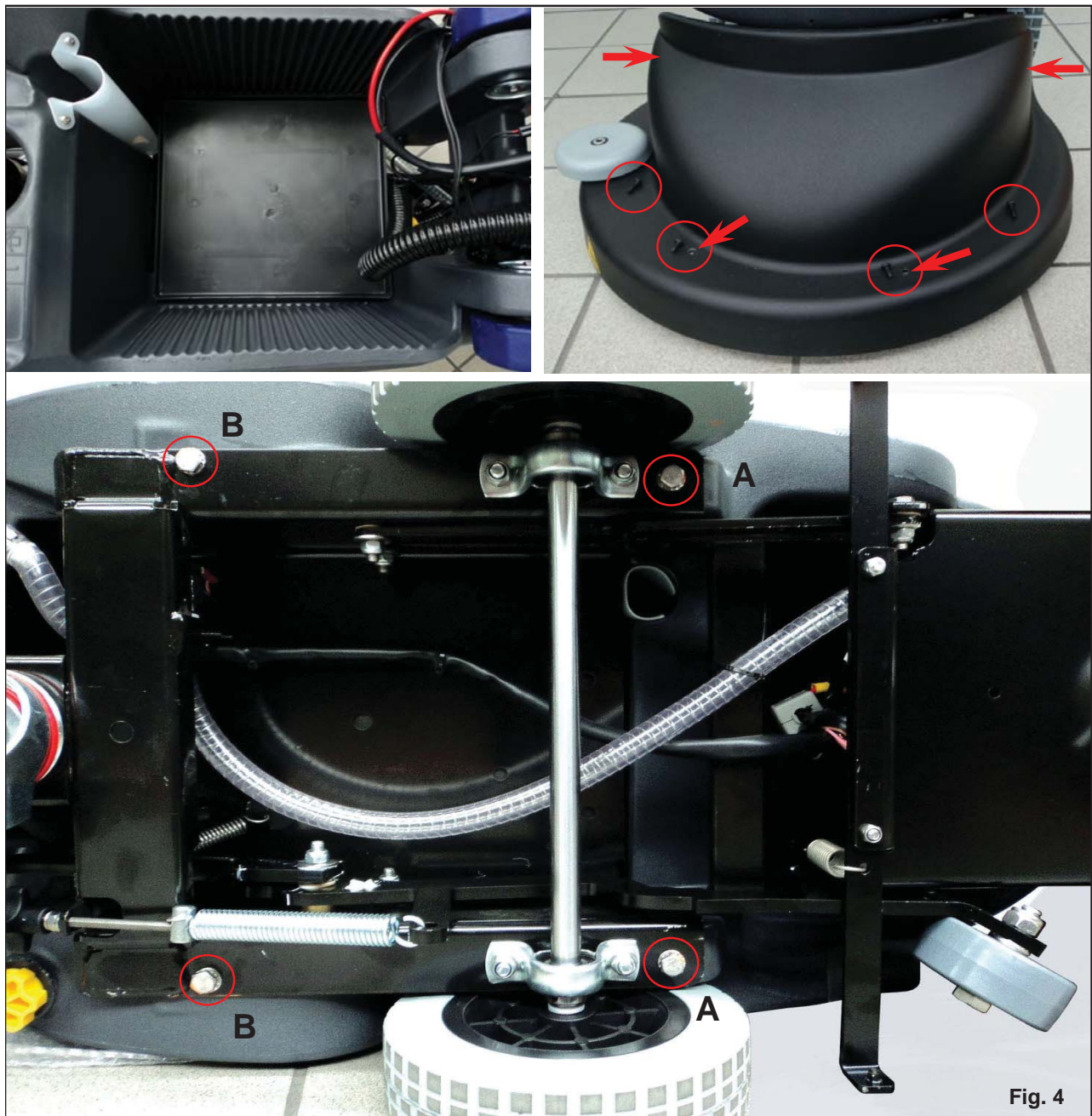


Fig. 4

- 11 Lift the solution tank from the front, keeping the dirty water tank open.
- 12 Identify the screw **C** that secures the metal band on the brush motor.

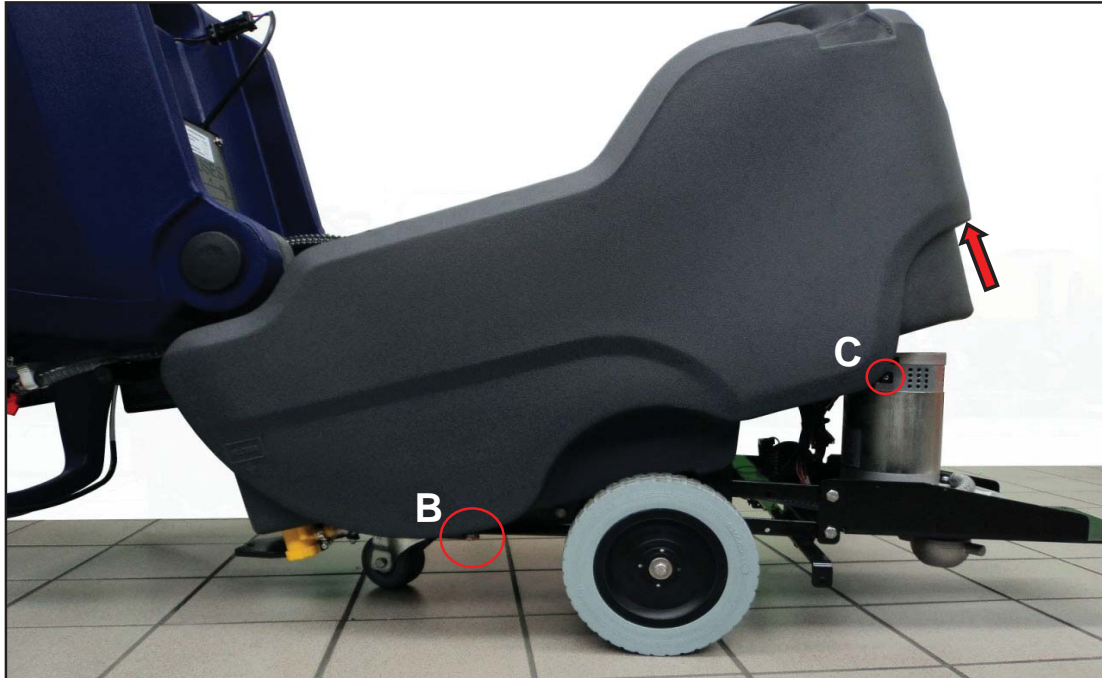


Fig. 5

- 13 Identify the four carbon brushes (for each individual motor), arranged 90° degrees apart.
- 13 Remove and check or replace the brush carbon brushes.
- 14 Using long-nosed pliers remove the fast-on **D** from its socket.
- 15 Use a hook to lift the spring **E**, and pull the carbon brush **F** outwards.

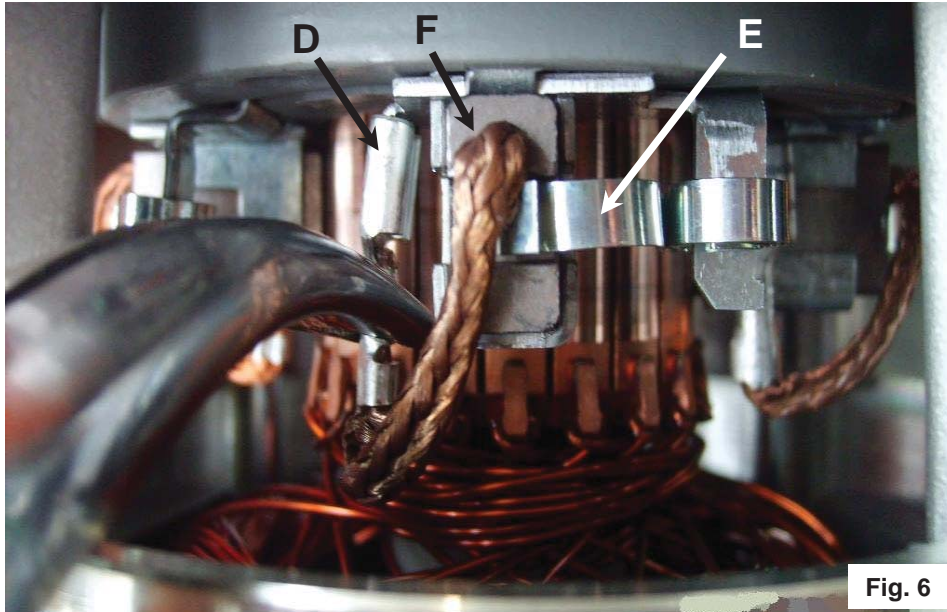


Fig. 6

- 16 Check that the dimensions of the carbon brush **F** lie within the tolerances given in the figure below. The brush must have a minimum length of 8.0 mm / 0,315 in.
- 17 Check the sliding contact surface **F1** of the carbon brushes for wear or damage. The surface must not be badly worn or burned.
- 18 When fitting new carbon brushes, compare the new ones with the old ones, or check them against the dimensions given in the figure below. Only the length must be different.



The carbon brushes must all be replaced at the same time.

When fitting the carbon brushes, make sure that they slide freely in their seats.

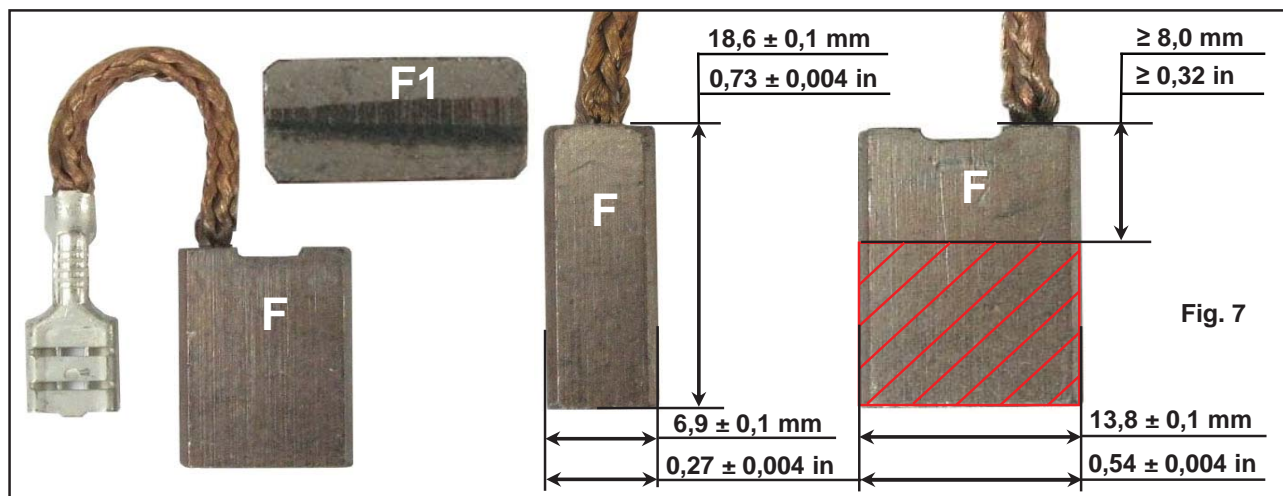
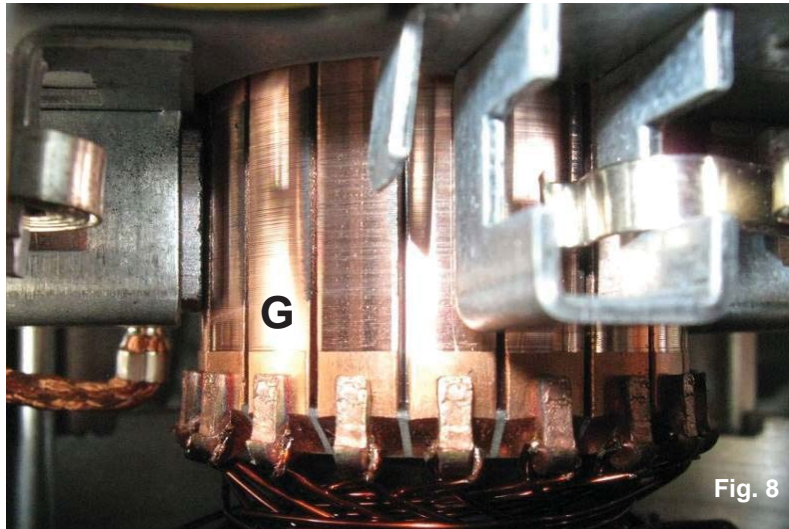
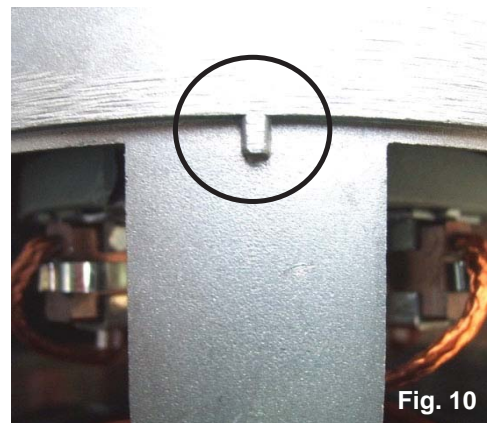
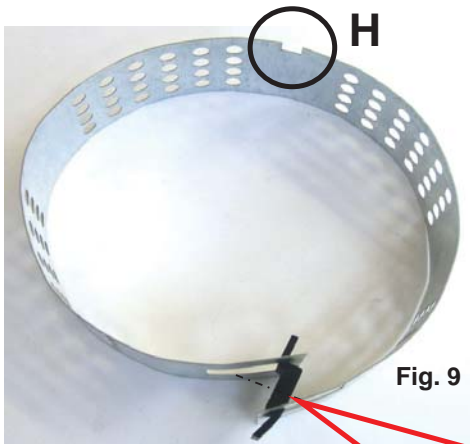


Fig. 7

- 19 Blow the inside of the motor clean with a jet of compressed air, paying particular attention to the area around the carbon brushes and to the part of the rotor **G** with which the carbon brushes come into sliding contact.
- 20 Check the rotor **M** for wear, paying particular attention to the area of contact with the carbon brushes.



- 21 When repositioning the metal strap over the carbon brushes **F**, align the notch **H** in the strap with the corresponding reference on the motor body.
- 22 Arrange the clamp **H1** of the metal strap **H** as shown in the figure below when reassembling.



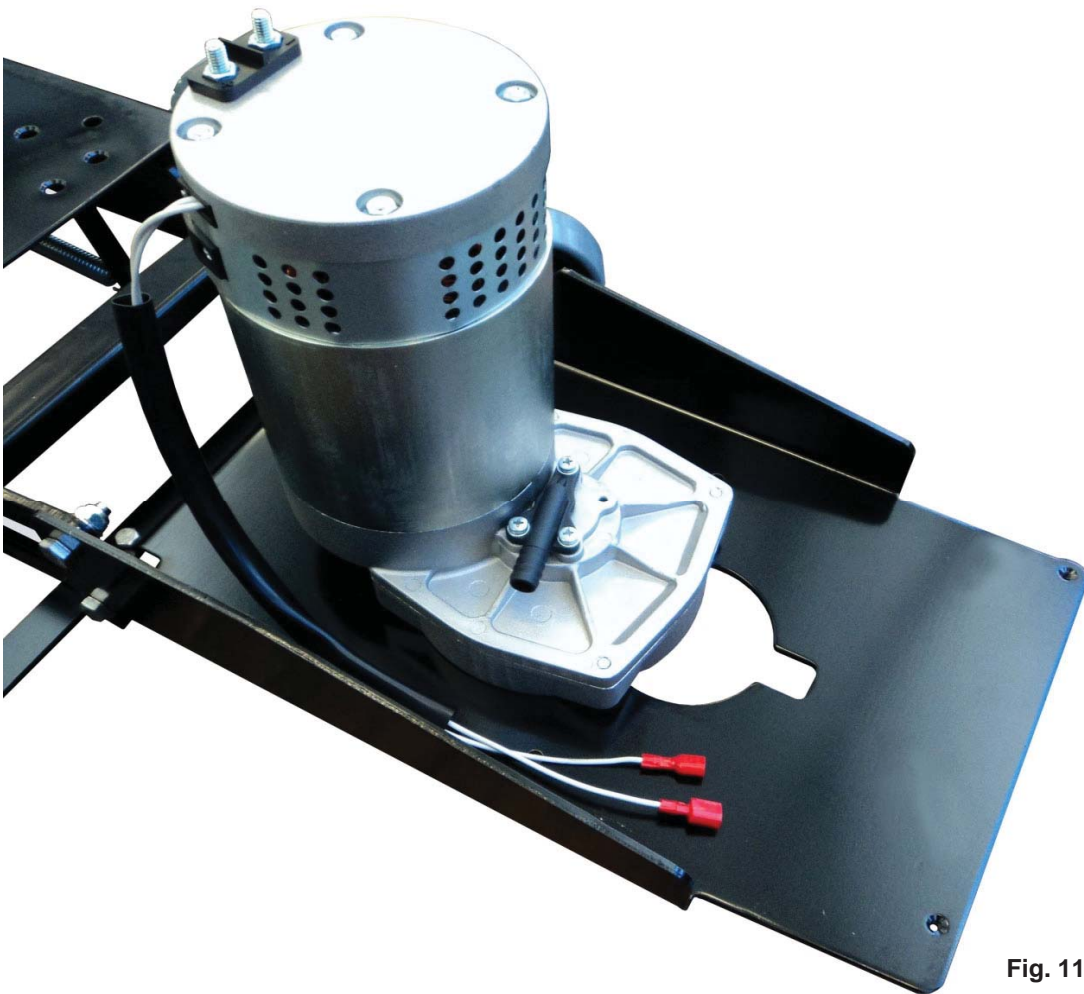
### **Reassembly**

- 1 Repeat the dismantling operations in reverse.
- 2 To reassemble the carbon brushes, perform the dismantling operations in reverse.
- 3 Reposition the protection clamp, making sure it is positioned on the catch, for correct assembly see Figure 9
- 4 To reassemble the solution tank, perform the dismantling operations in reverse.
- 5 Tighten the four screw A, B to a maximum torque of 22 Nm / ~ 195 lbf in.



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**A2 REPLACING THE BRUSH MOTOR**



**Fig. 11**

## A2.1 Replacing the brush motor

### *Dismantling*

- 1 Move the machine to the tank draining area, and empty the solution tank and the dirty water tank.
- 2 Dismantle the solution tank as described in paragraph A1.2
- 3 Disconnect the power **A** and thermal **B** of the brush motor.
- 4 Remove the metal clamp **C** from the solution hose, and remove the hose **D** from the fitting on the motor.
- 5 Lay the machine on its side.
- 6 Unscrew the seven M6 x 12 mm stainless steel bolts **E** that fasten the reduction drive to the plate.
- 7 Remove the brush motor from the gearmotor support plate.
- 8 Take the reduction drive to the bench, and then remove the drive **D**, unscrewing it clockwise.
- 9 Replace the reduction drive with a new one.

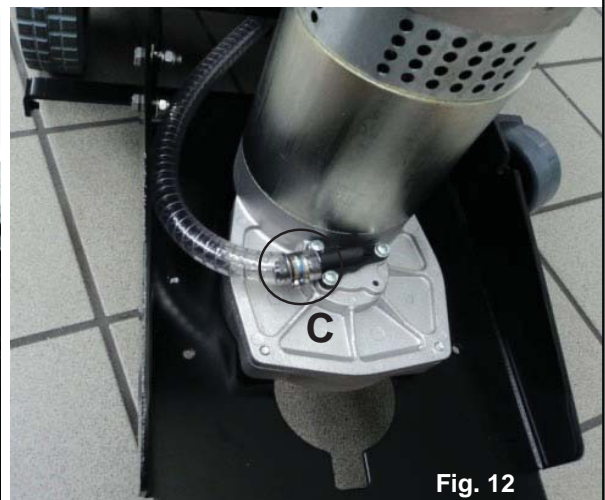
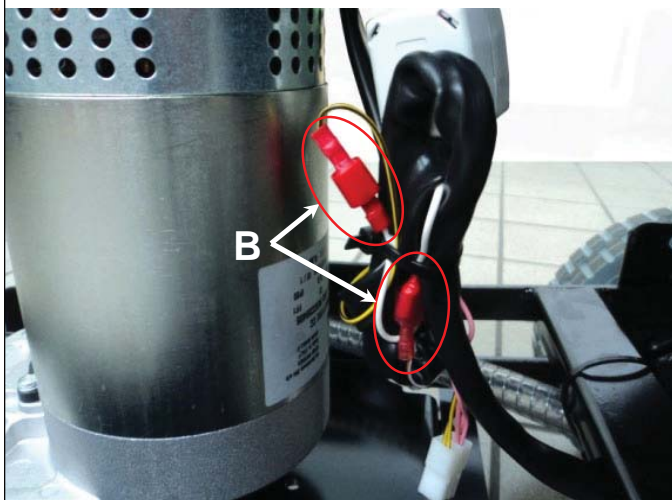
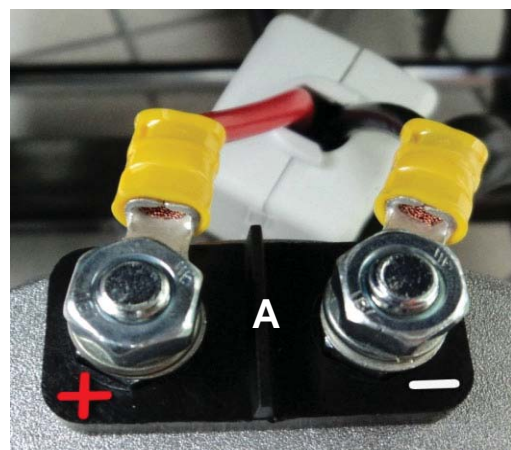
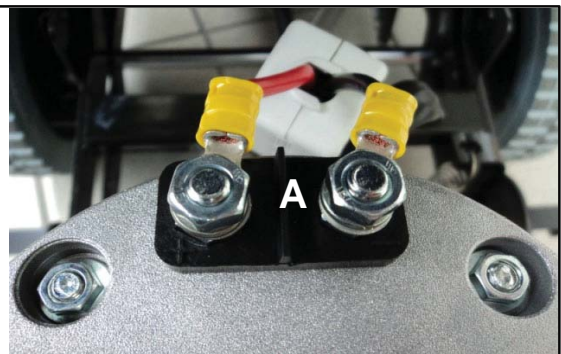


Fig. 12



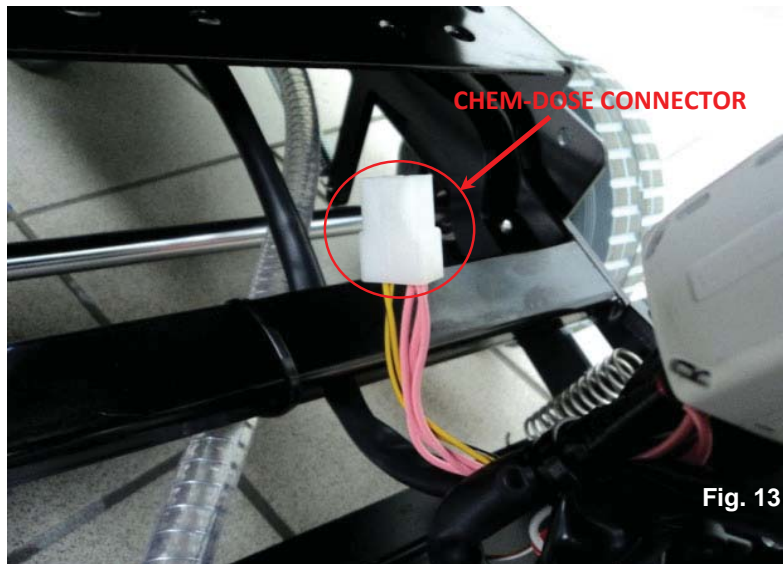


Fig. 13

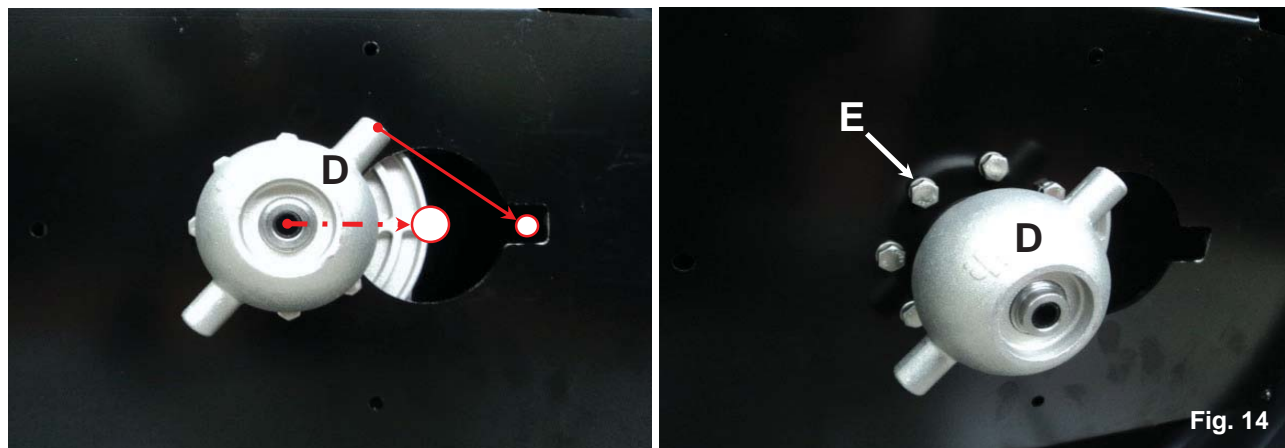


Fig. 14

## Reassembly

- 1 To assemble the new reduction drive, perform the dismantling operations in reverse.
- 2 **Warning, tighten the seven screws E to a maximum torque of 7.5 Nm / ~ 66,4 lbf in, and always place the Grover washers between the plate and the screws.**
- 3 Apply grease to the brush motor pin before screwing the driver counterclockwise



Make sure that the brush rotate in an anticlockwise direction.



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**B**

## **SUCTION UNIT - TANKS**



### **WARNING**

*Go to the designated draining area and empty the solution and dirty water tanks using the drain plugs and the hose provided.*

*Move the machine onto flat ground. If necessary, place chocks under the wheels.*

*Press the emergency switch, for the version with drive, or disable the functions by moving the switch to position "0" on all other versions.*

*Disconnect the battery from the machine's electronics by simply disconnecting the negative pole only, for the battery versions, or unplugging from the mains power supply for the cable versions.*

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**B1 SUCTION MOTOR**



**Fig. 15**



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## B1.1 Checking the suction motor current input

- 1 Move the machine onto flat and dry flooring.
- 2 Press the emergency switch (Traction) or switches into position "0" (Pad Assist).
- 3 **Make sure that the batteries on the machine are charged.**
- 4 Use a clamp-on ammeter with an end scale reading of at least 200 amperes, as shown in Figure 16.
- 5 Remove the suction hose **A** from the squeegee, see Figure 17.
- 6 Lift and turn the top dirty water tank.
- 7 Isolate one of the two power wires **B** to the suction motor.
- 8 Connect the ammeter clamp around one of the wires **B** as shown in Figure 18.
- 9 Switch the ammeter to **amperes** and **DC**.
- 10 Turn the ignition key on the mushroom-shaped switch clockwise to connect power.
- 11 Start the suction motor by pressing the corresponding button on the instrument panel.
- 12 Read the **CURRENT (A)** drawn by the suction motor.
- 13 Compare the values measured against the chart below.
- 14 If all the values are normal close the top dirty water tank again.
- 15 If the measurements do not correspond to those specified:
  - 15a Check that the suction hose **B** is in good condition, is not crushed and is not blocked inside.
  - 15b Check that the motor carbon brushes are intact, see paragraph B1.2, if necessary replace them with new ones.
  - 15c Replace the suction motor with a new one, see paragraph B1.3.



Fig. 16

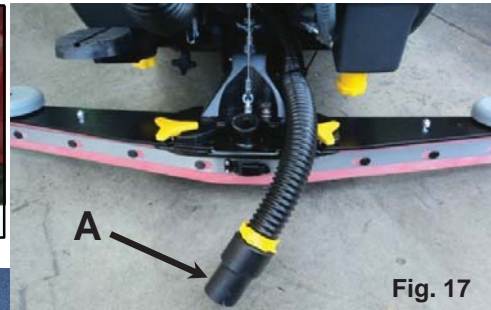


Fig. 17

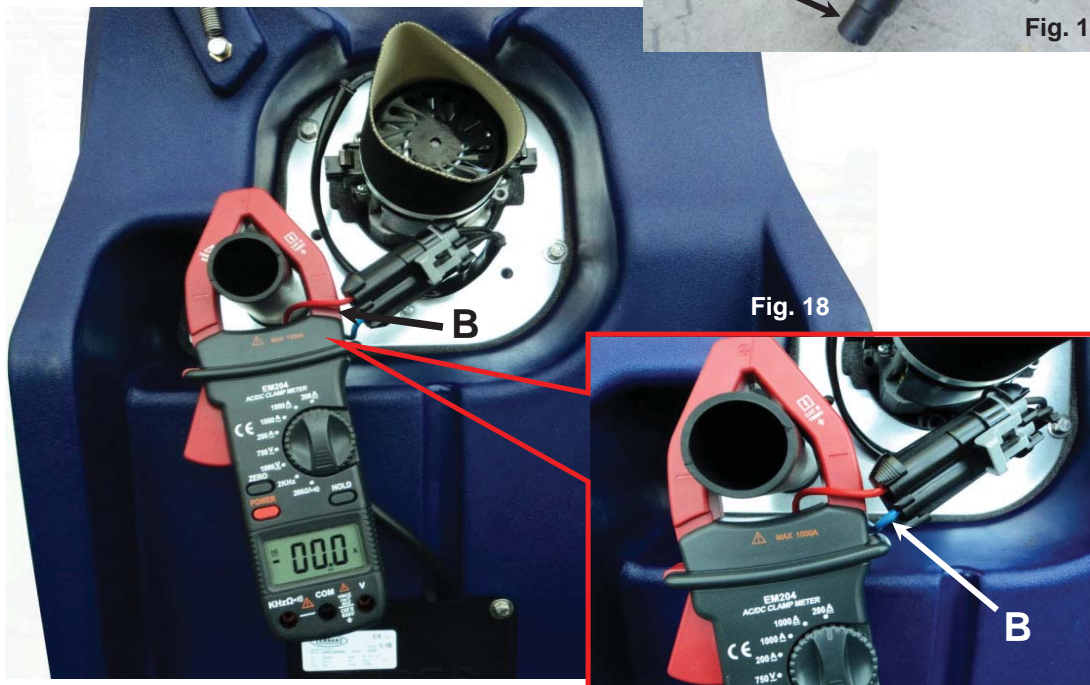


Fig. 18

Current input A (amperes)	Min	Max
No load (hose open)	15.0 A	19.0 A

## B1.2 Replacing the suction motor carbon brushes

- 1 Move the machine onto flat and dry flooring.
- 2 Press the emergency switch (Traction) or switches into position "0" (Pad Assist).
- 3 Lift and turn the top dirty water tank.
- 4 Isolate and disconnect the power connector **A** to the suction motor, see Figure 19.
- 5 Remove the top cap **B** on the suction motor; this operation can be performed without removing the air exhaust pipe.
- 6 To remove the cap **B** pull the metal catch **C** outwards and open the two tabs **D**.

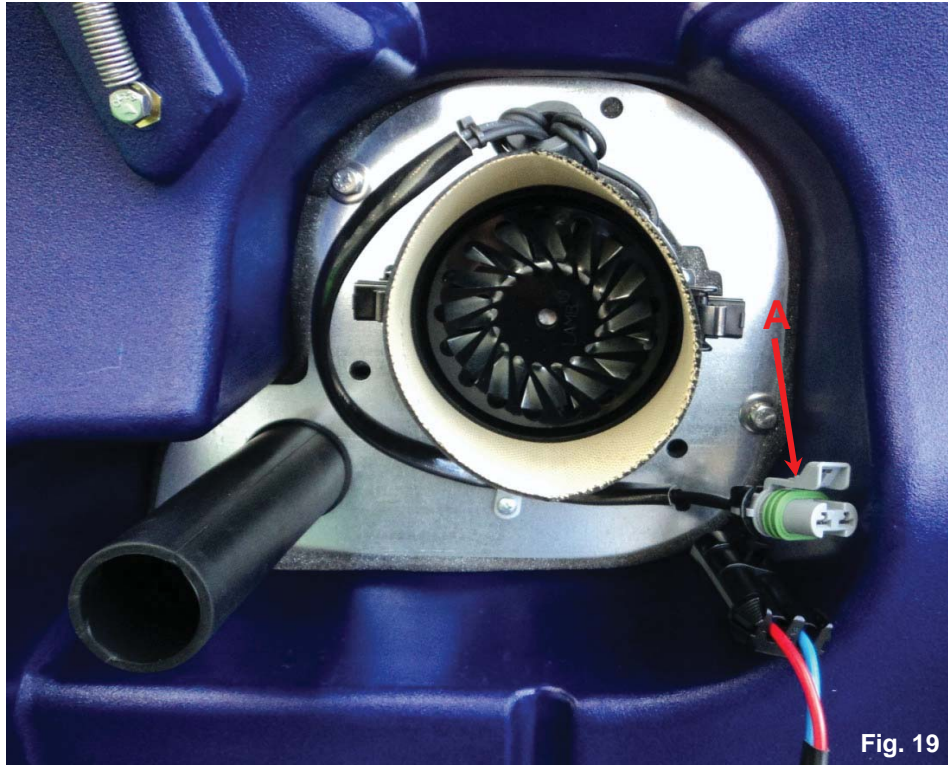


Fig. 19

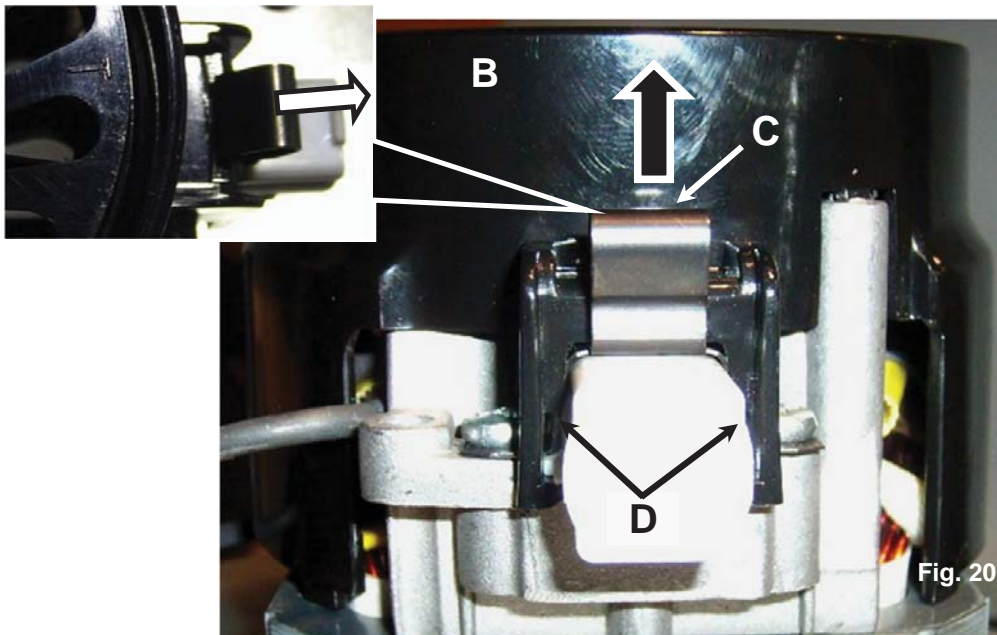
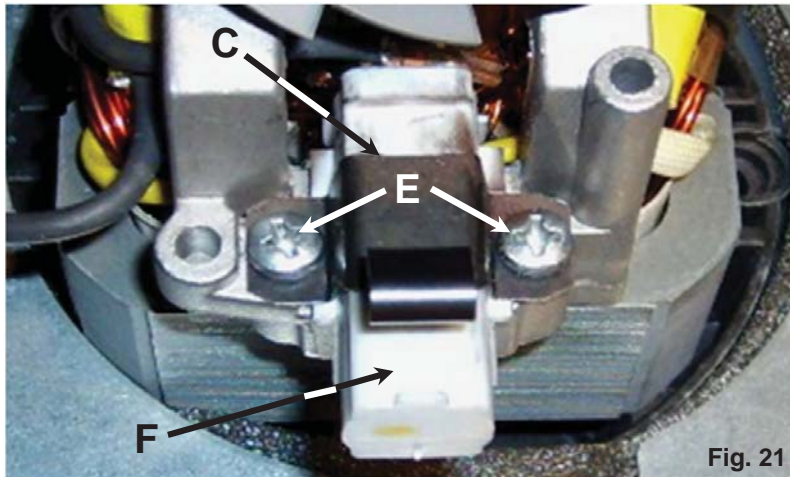
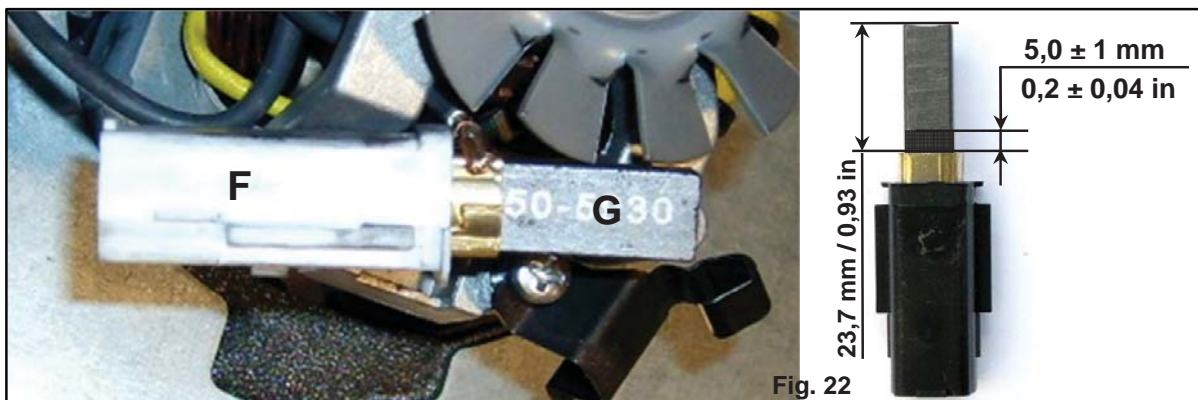


Fig. 20

- 7 Unscrew the two screw **E** that fasten the carbon brush support **F**.
- 8 Take care when handling the carbon brush support **F**, as it contains the spring that presses the carbon brush against the rotor, which may propel out the carbon brush



- 9 Lift the carbon brush support **F** and remove the motor carbon brush **G**.
- 10 Measure the carbon brush: if the length is between 23,7 mm / 0,93 in (maximum), and  $5,0 \pm 1$  mm /  $0,2 \pm 0,04$  in (minimal), the carbon brush is still working, otherwise it must be replaced.
- 11 Repeat the operation for the second carbon brush.



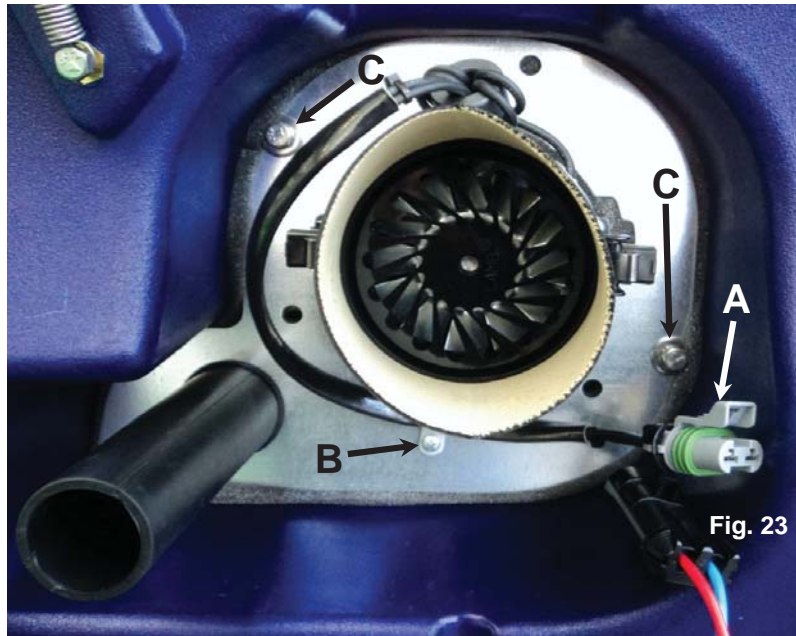
## Reassembly

- 1 Replace the suction motor performing the dismantling operations in reverse.
- 2 Test the correct operation of the suction motor, see paragraph B 1.1.

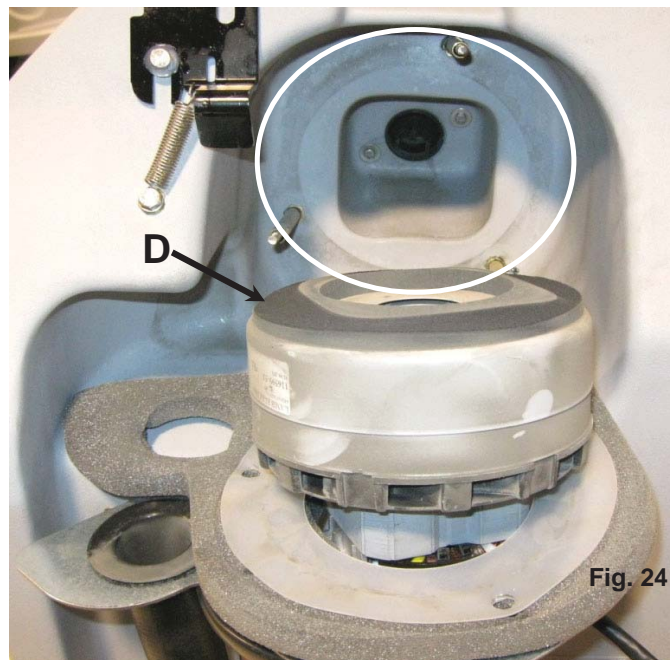
## B1.3 Replacing the suction motor

### *Dismantling*

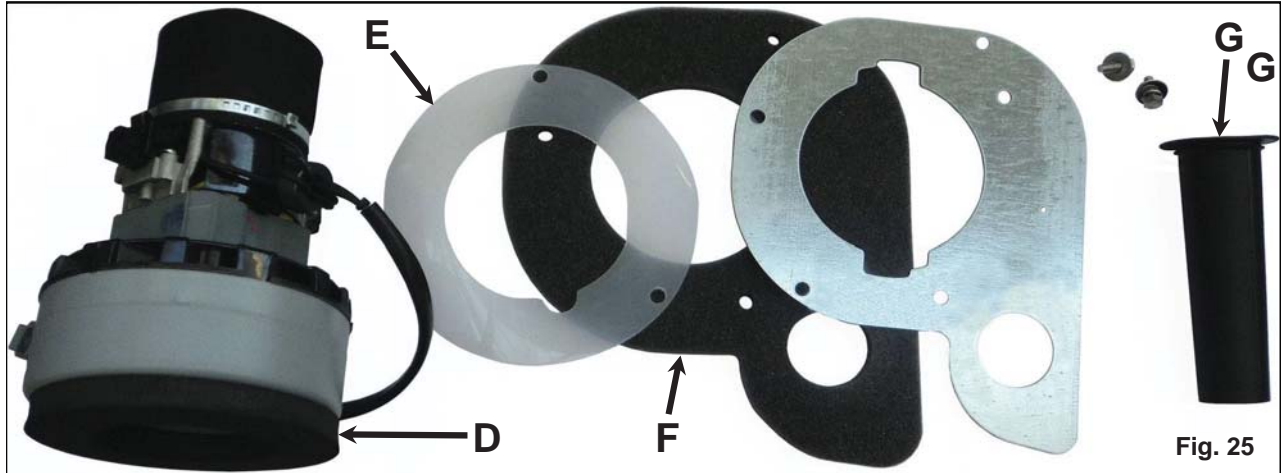
- 1 Move the machine onto flat and dry flooring.
- 2 Press the emergency switch (Traction) or switches into position "0" (Pad Assist).
- 3 Lift and turn the top dirty water tank.
- 4 Isolate and disconnect the power connector **A** to the suction motor, see Figure 23.
- 5 Remove the white plastic clamp **B** that fastens the cable to the suction motor plate.
- 6 Unscrew the two M6 screw **C** that fasten the suction unit motor to the dirty water tank.



- 7 Remove the suction motor from its compartment.
- 8 Check that the area inside the circle and the suction motor gasket **D** are not moist or wet, a sign of liquid being drawn in that may damage the bearings inside the suction motor, causing a louder metallic noise than normal.



- 9 Check that all the parts of the suction unit are in good condition: **D** suction motor gasket, **E** nylon flange, **F** sound absorbing sponge, **G** suction motor air exhaust pipe.



When replacing the motor, also replace the suction motor gasket **D** purchased separately.

- 10 Replace the motor, and assemble it as shown in Figures 25 - 26.



### Reassembly

- 1 For assembly perform the dismantling operations in reverse.
- 2 Test the correct operation of the suction motor, see paragraph B 1.1.





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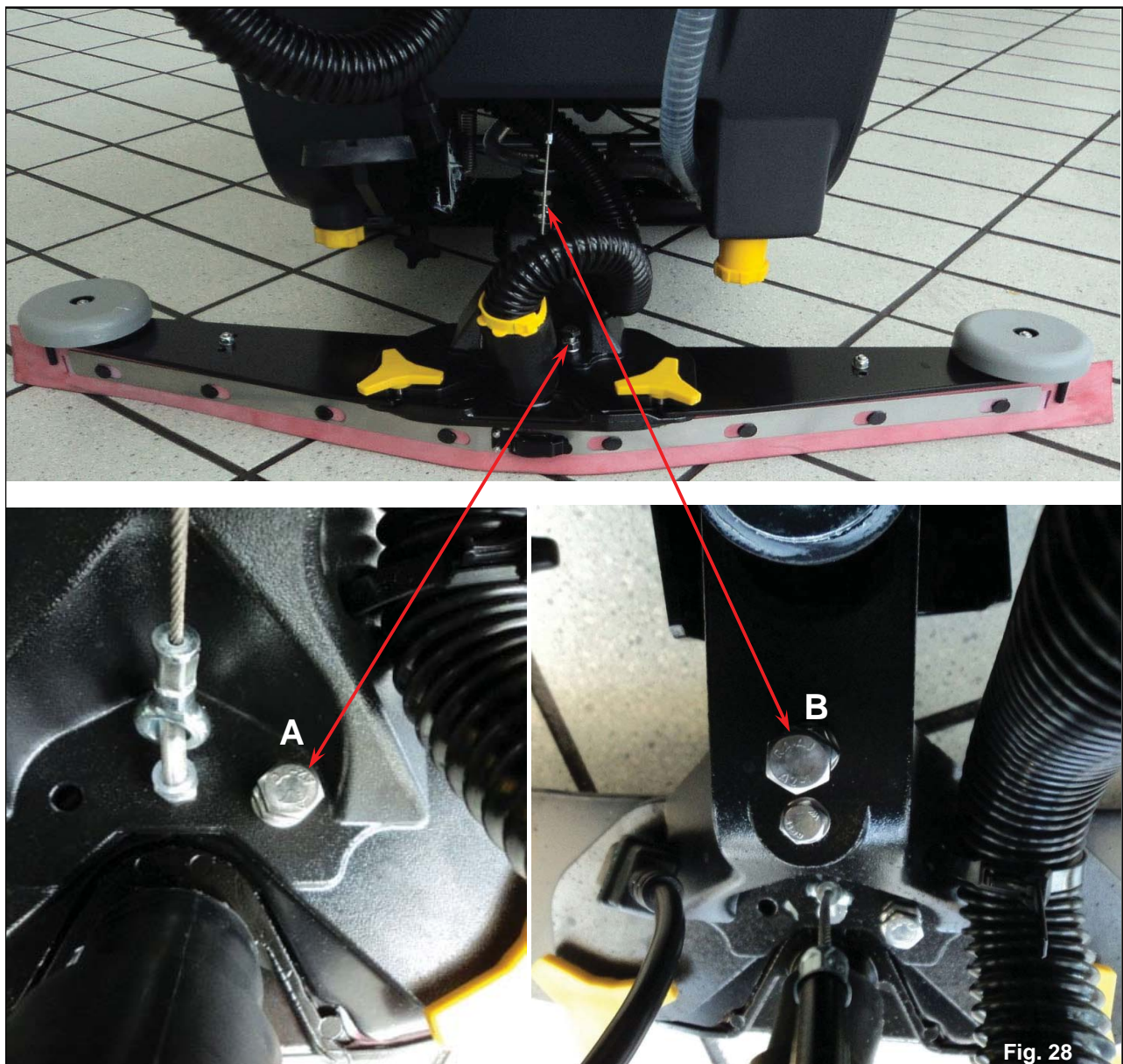
**B2 SQUEEGEE UNIT**



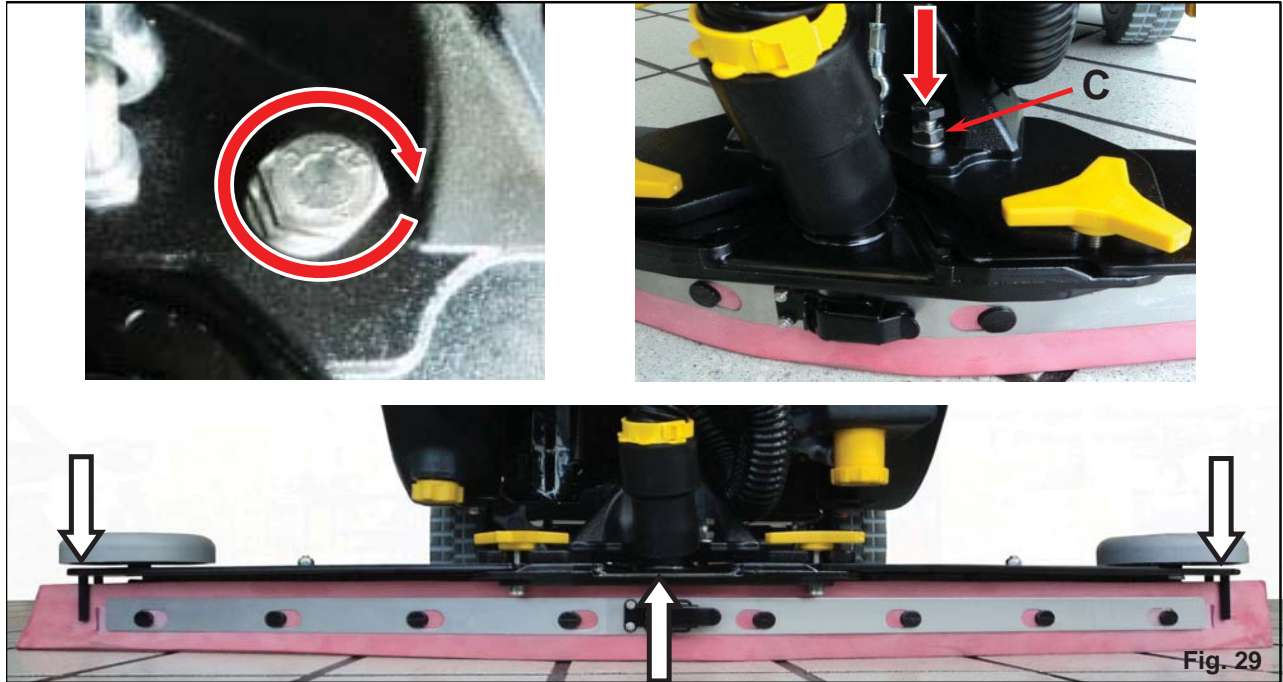
Fig. 27

## B2.1 Adjusting the squeegee

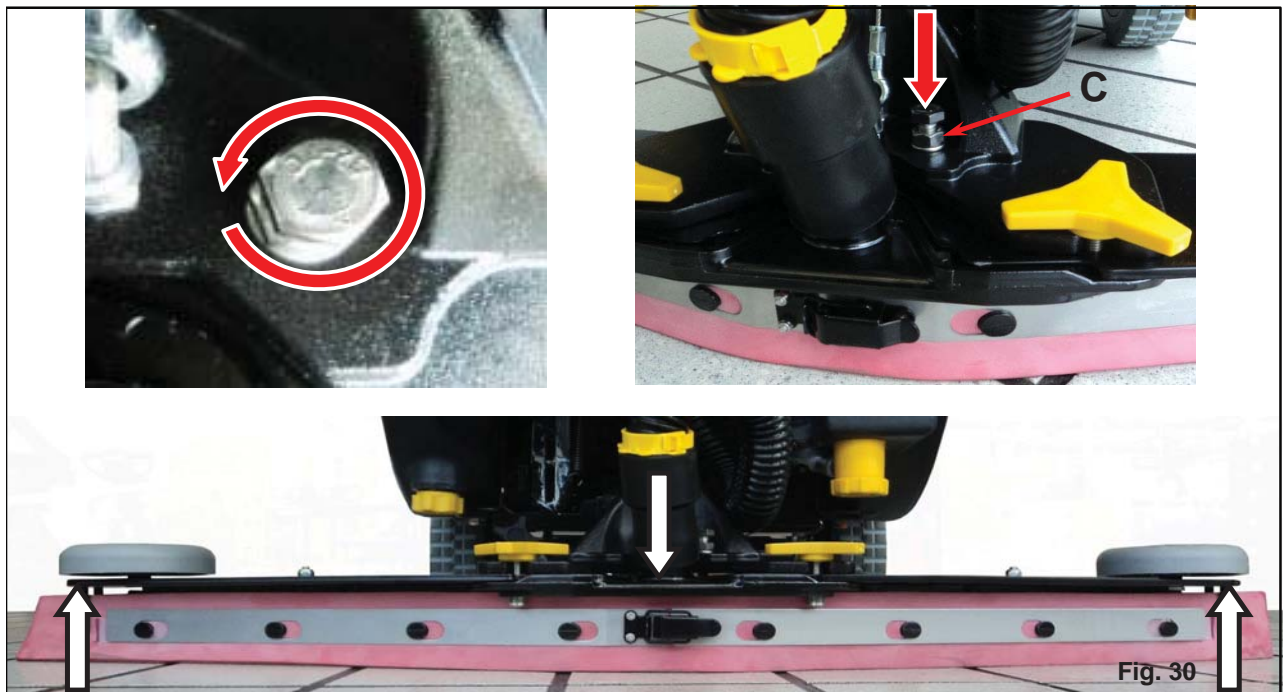
- 1 Move the machine onto flat and dry flooring.
- 2 Press the emergency switch (Traction) or switches into position "0" (Pad Assist).
- 3 Start a washing cycle in normal operation.
- 4 Travel a few metres (forwards) with the machine.
- 5 Check that the blade is in even contact with the floor, with suitable deflection across the width, Figure 28.
- 6 If this is not the case, adjust the blade.
- 7 First adjust the angle of the squeegee, using the bolt **A**, until the blade touches the flooring uniformly.
- 8 Adjust the deflection of the squeegee blade using the two wheels **B**, tightening decreases the deflection, loosening increases the deflection. Adjust until one edge of the blade is touching the flooring, see the box in Figure 28 - 29 - 30 - 31.



- 9 Screwing the screw **A**, the squeegee support lowers the edges of the squeegee, increasing the deflection (compression) on the blade at the sides of the squeegee, taking deflection off the centre.



- 10 Unscrewing the bolt **A**, the squeegee support raises the edges of the squeegee, decreasing the deflection on the blade at the sides of the squeegee and it increasing deflection on the centre.



- 11 Once having found the right angle, when the squeegee is perfectly parallel to the flooring, hold screw **A** in place lock the position with the nut **C**.

- 12** Adjust the deflection of the blade by means of the screw **D**.
- 13** By screwing the screw **D**, the squeegee rises, decreasing the deflection on the blade.
- 14** By unscrewing screw **D**, the squeegee is lowered, increasing the deflection on the blade.
- 15** Once having found the right deflection, when the blades are slanted correctly with respect to the floor, hold screw **D** in place lock the position with the nut **E**.

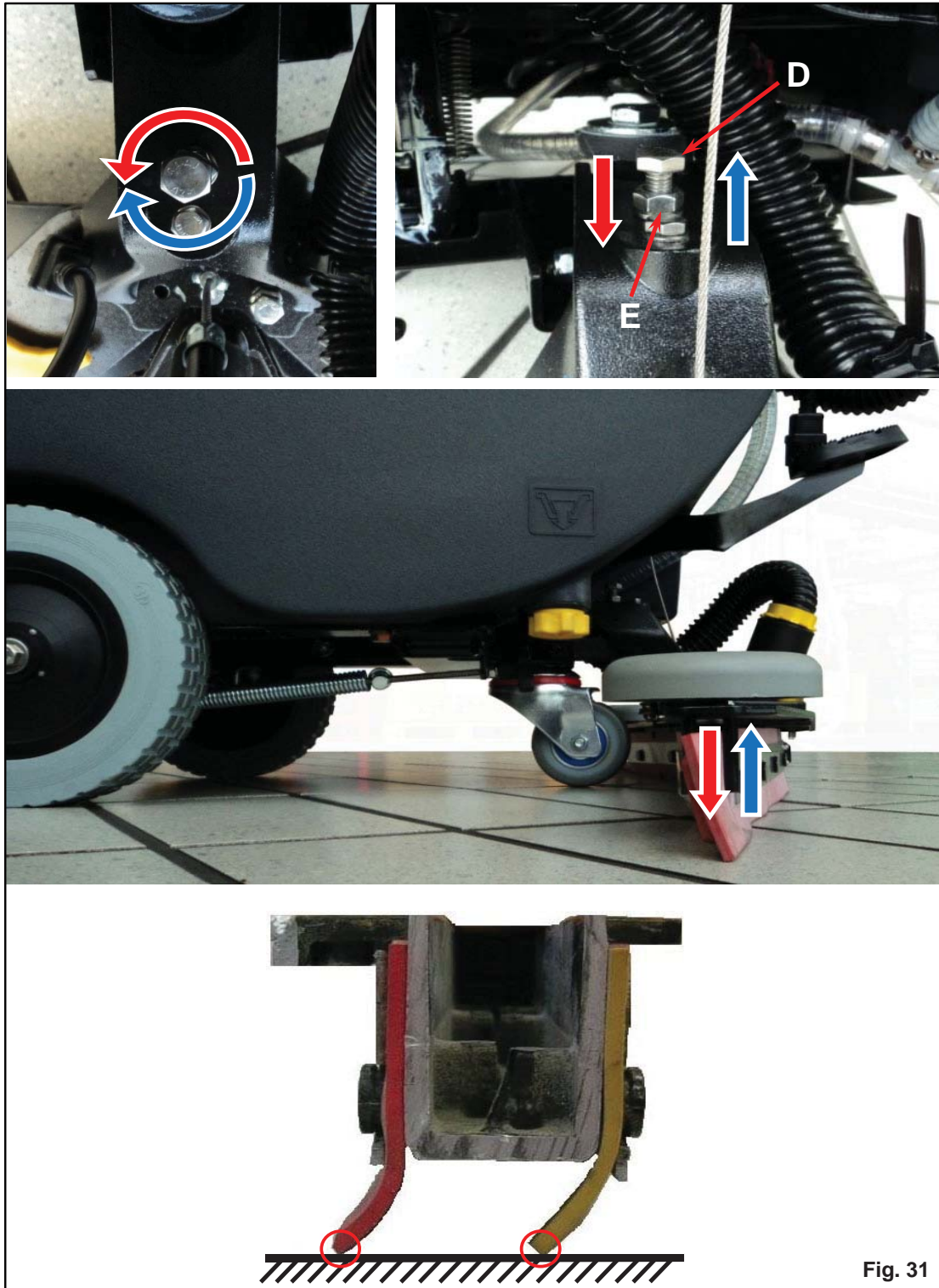


Fig. 31

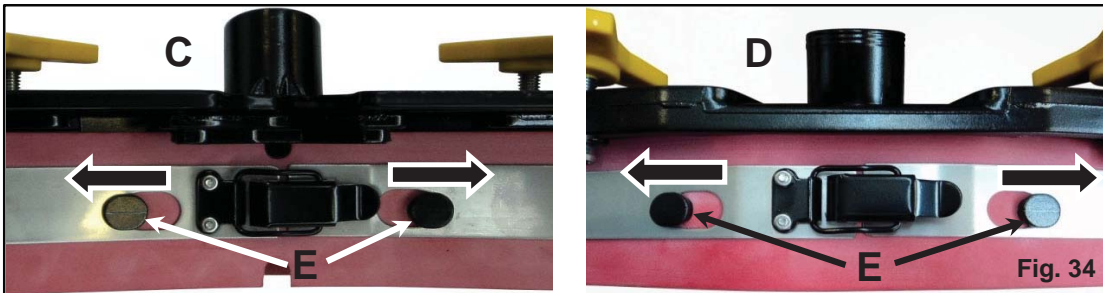
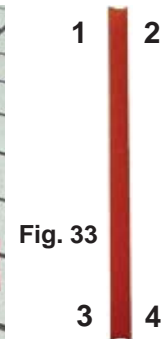
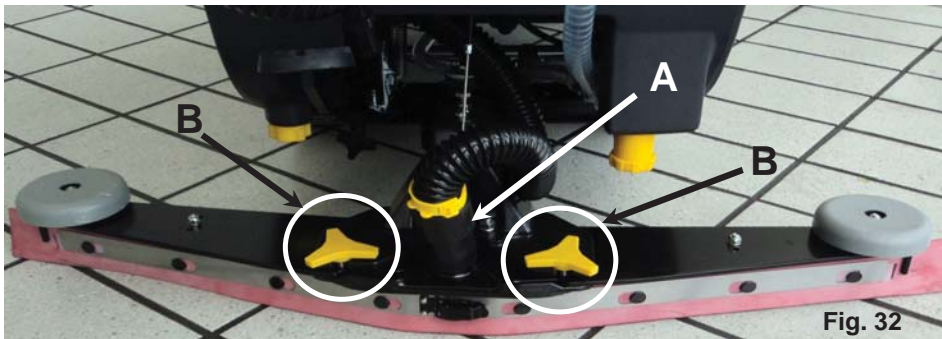
## B2.2 Replacing the squeegee blades

### Dismantling

- 1 Remove the suction hose **A** from the squeegee.
- 2 Remove the squeegee from the dedicated support, unscrewing the knobs **B**
- 3 Open the levers that lock the blade pressing devices, front **C** and rear **D**, once released slide them outwards.
- 4 Remove the blades.
- 5 **The squeegee blades have been designed symmetrically, so that they can be rotated on all four edges before being replaced, see Fig. 33.**

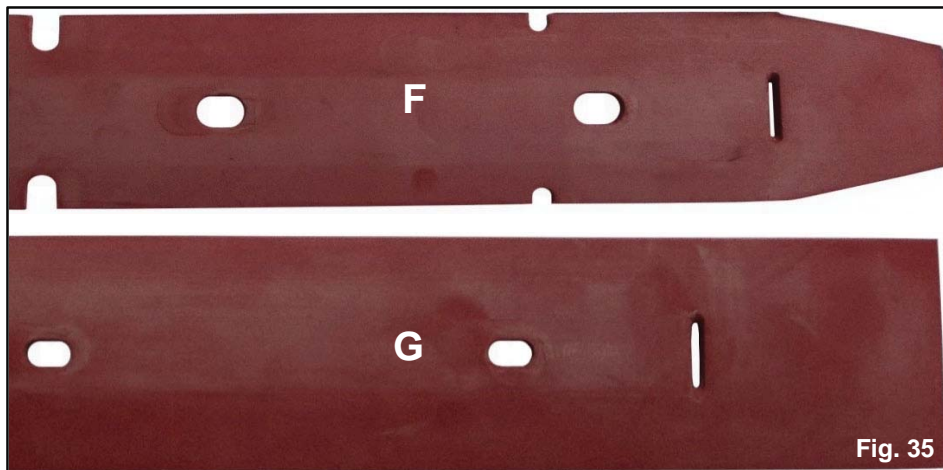


The rear squeegee blade should be turned around every 50 operating hours.

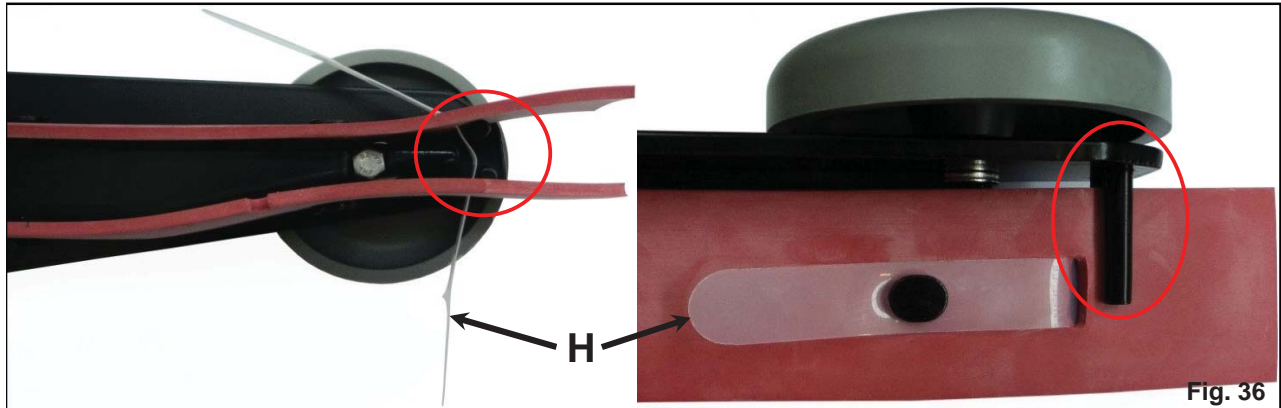


### Reassembly

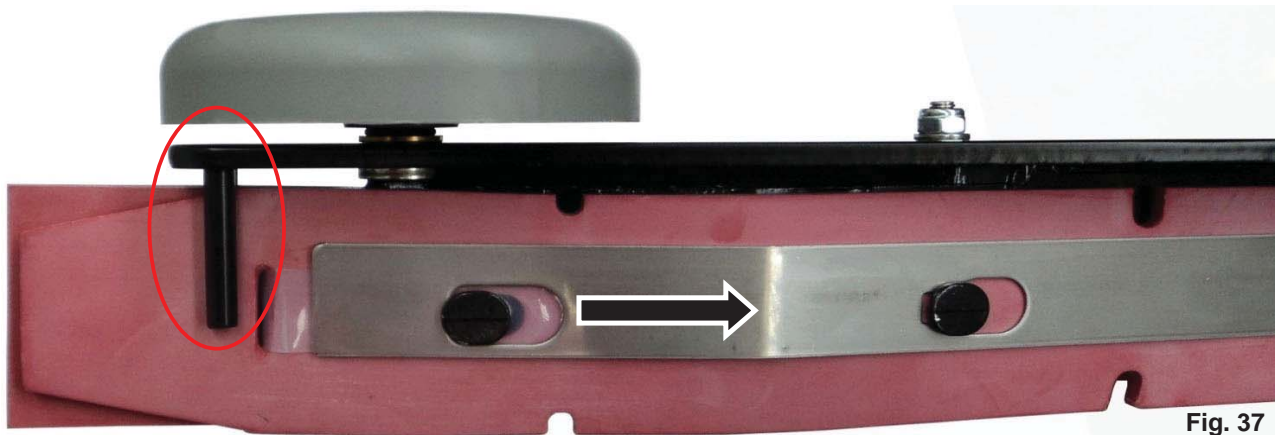
- 1 Clean the squeegee blades before reassembling them.
- 2 Clean the body of the squeegee where the old or new blades will be fitted.
- 3 Arrange the blades on the squeegee, lining up the holes with the reference pins **E**; do not exchange the front blades **F** and rear blades **G**.



- 4 Reassemble the front and rear blade by fixing the ends using the white nylon straps **H**, as shown in the photos below.



- 5 Reassemble the blade pressing devices, front and rear.
- 6 Reposition the squeegee on the support, and reassemble the suction hose.
- 7 Adjust the squeegee, as described in paragraph B 2.1.



### B2.3 Replacing the squeegee.

- 1 For the complete replacement of the squeegee, proceed as described in points B 2.1.
- 2 For the replacement of the squeegee, body only, proceed as described in points B 2.1 and B 2.2.



**B3 CHECKING AND REPLACING THE FLOATS**

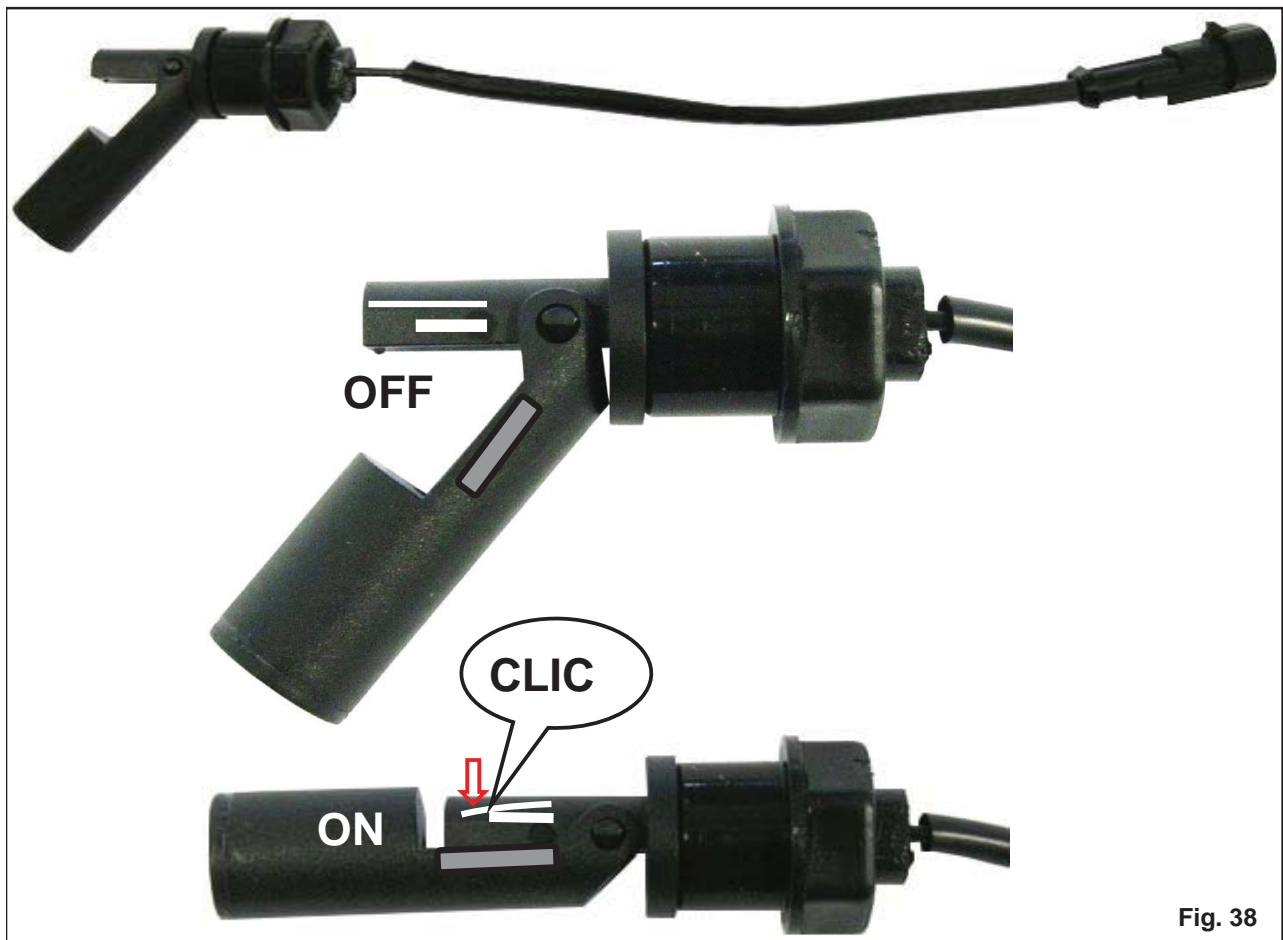


Fig. 38

### B3.1 Checking operation of the solution tank float

- 1 Use a tester set to read resistance in  $\Omega$  or check the diodes, see Figure 41.
- 2 Move the machine to the tank draining area, and completely empty the solution tank.
- 3 Move the machine onto flat and dry flooring.
- 4 Press the emergency switch (Traction) or switches into position "0" (Pad Assist).
- 5 Identify the point where the float is fitted on the solution tank.
- 6 Lift the dirty water tank to access the connector **A** on the float.
- 7 Unplug the connector **A** so as to be able to perform the check.
- 8 Connect the two tester probes to the pins on the float connector; the position is not important.
- 9 If the float is working correctly, the tester will emit a BEEP (if featured), or will display a value with just zeroes.
- 10 Plug the connector back in.
- 11 If the tester display does not change:
- 11a Remove the float to check that there is nothing stopping it from rotating completely.
- 11b Reposition the float.

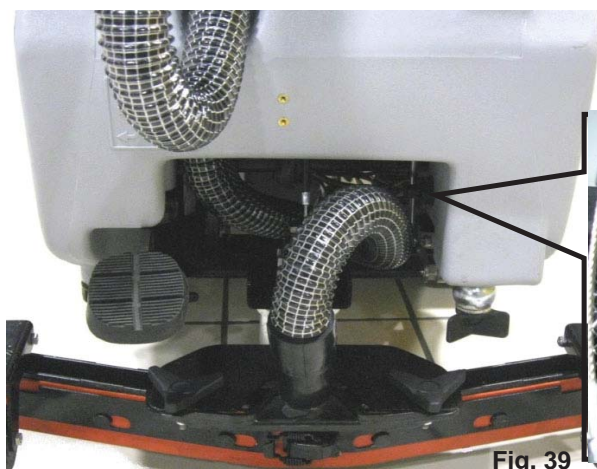


Fig. 39

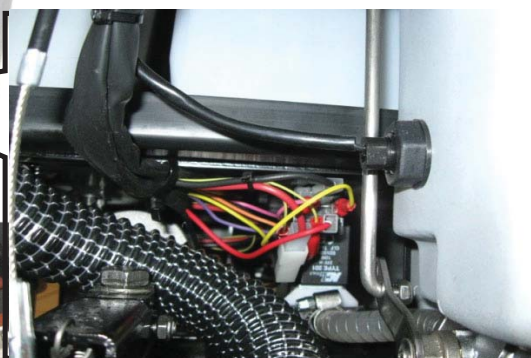


Fig. 40



Fig. 41

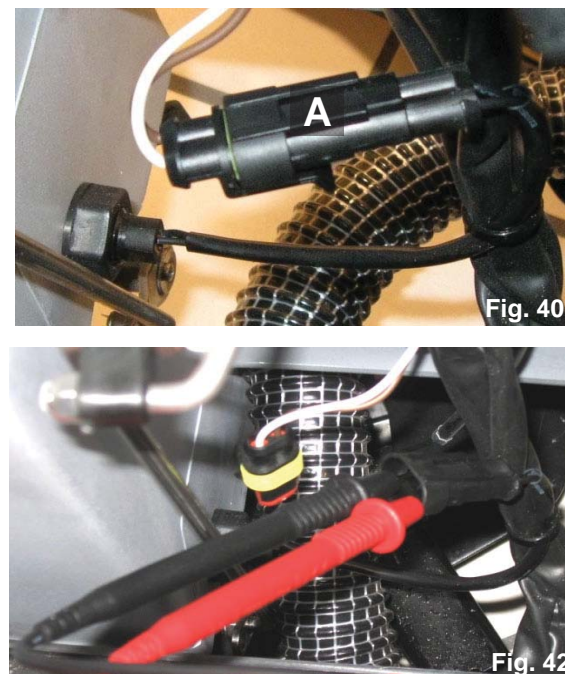


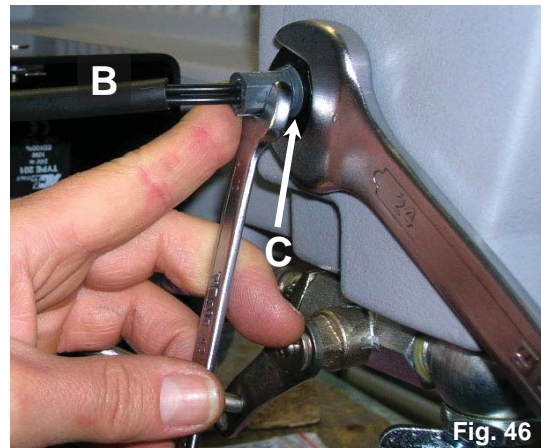
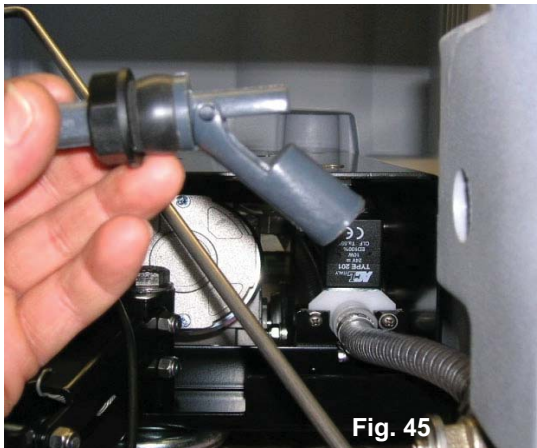
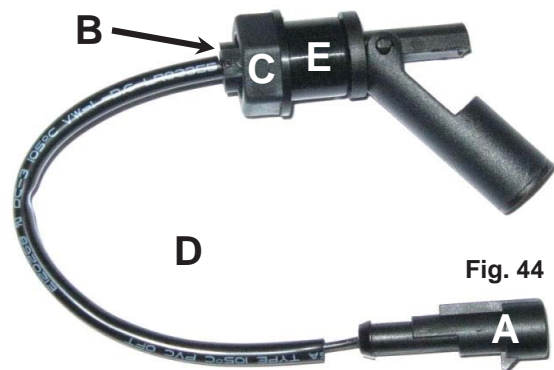
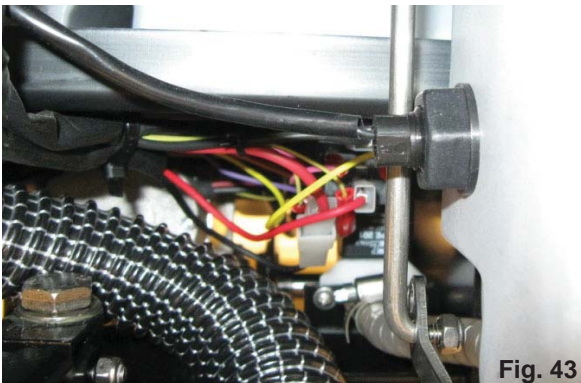
Fig. 42



## B3.2 Replacing the solution tank float

### *Dismantling*

- 1 Move the machine to the tank draining area, and completely empty the solution tank.
- 2 Move the machine onto flat and dry flooring.
- 3 Press the emergency switch (Traction) or switches into position "0" (Pad Assist).
- 4 Identify the point where the float is fitted, see paragraph B 3.1.
- 5 Unplug the connector **A** so as to allow replacement.
- 6 Cut the plastic clamp that holds the float cable to the main wiring.
- 7 Remove the float from the tank, holding the body of the float **B** and unscrewing the bolt **C**.
- 8 Remove the float from the solution tank.
- 9 Replace the float with a new one **D**.

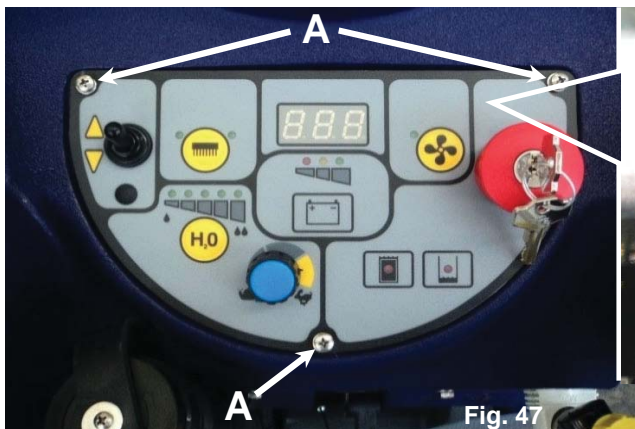


### *Reassembly*

- 1 Fit the new float performing the dismantling operations in reverse
- 2 Pay special attention to the position of the float in the tank, see Figure 45.
- 3 Pay special attention to the seal gasket **E** on the new float.
- 4 Tighten the float to the tank holding the body **B** and tightening the bolt **C**, making sure not to damage the thread on the body of the float **B** and the gasket **E**.
- 5 Use a 10 mm / 0,39 in (13/32) spanner to hold the body of the float and a 24 mm / 0,94 in (61/64) spanner to tighten the plastic nut, with moderate force.

### B3.3 Checking operation of the dirty water tank float

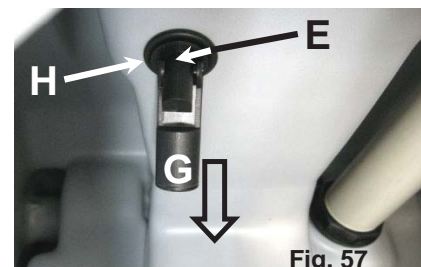
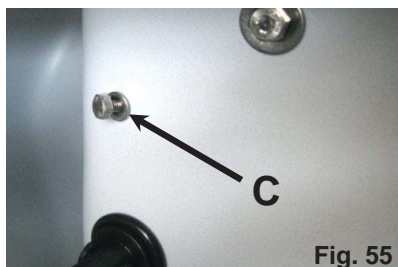
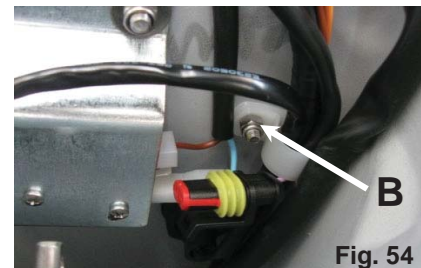
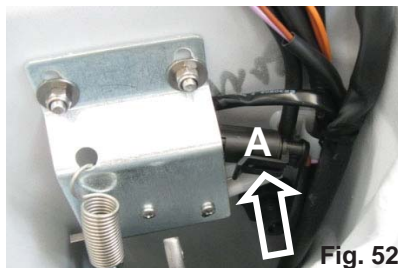
- 1 Use a tester set to read resistance in  $\Omega$  or check the diodes, see Figure 50.
- 2 Move the machine to the tank draining area, and completely empty the dirty water tank.
- 3 Move the machine onto flat and dry flooring.
- 4 Press the emergency switch (Traction) or switches into position "0" (Pad Assist).
- 5 Identify the point where the float is fitted on the dirty water tank.
- 6 Unscrew the three bolts **A** that fasten the instrument panel to the solution tank.
- 7 Identify the float connector **B**.
- 8 Unplug the connector **B** so as to be able to perform the check.
- 9 Connect the two tester probes to the pins on the float connector, the position is not important.
- 10 Keep the float raised by hand or hold it position with an elastic band, see Figure 49.
- 11 If the float is working correctly, the tester will emit a BEEP (if featured), or will display a value with just zeroes.
- 11a Plug the connector back in.
- 12 If the tester display does not change:
- 12a Check that the moving part of the float can come into contact with the fixed part.
- 12b Reposition the float.



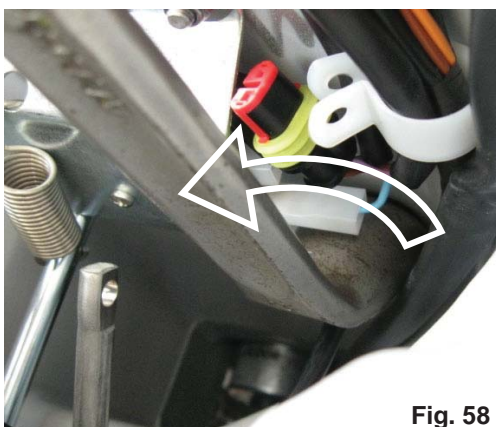
## B3.4 Replacing the dirty water tank float

### *Dismantling*

- 1 Move the machine to the tank draining area, and completely empty the dirty water tank.
- 2 Move the machine onto flat and dry flooring.
- 3 Press the emergency switch (Traction) or switches into position "0" (Pad Assist).
- 4 Identify where the float is fitted on the dirty water tank, proceed as described in paragraph B3.3.
- 5 Identify the float connector **A** and unplug it.
- 6 Unscrew the nut **B** to release the white plastic clamp and remove the cable from the float.
- 7 Make sure not to lose the bolt and the washer **C** found inside the tank.
- 8 Remove the float from the tank, holding the body of the float **E** and unscrewing the bolt **F**.



- 8 Remove the float from the dirty water tank.
- 9 Replace the float with a new one **E**.



### *Reassembly*

- 1 Fit the new float performing the dismantling operations in reverse
- 2 Position the float as shown in Figure 57, with the part **G** tilted towards the bottom of the tank.
- 3 Pay special attention to the seal gasket **H** on the new float when inserting it into hole.
- 4 Screw it onto the tank holding the body **E** and tightening the bolt **F**, making sure not to damage the thread on the body of the float **C** and the gasket **H**, tighten with moderation.



**PLDC04452**

REVISION 00  
December 23, 2020  
TECHNICAL OFFICE  
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**C**

## **DRIVE UNIT**



### **WARNING**

*Go to the designated draining area and empty the solution and dirty water tanks using the drain plugs and the hose provided.*

*Move the machine onto flat ground. If necessary, place chocks under the wheels.*

*Press the emergency switch, for the version with drive, or disable the functions by moving the switch to position "0" on all other versions.*

*Disconnect the battery from the machine's electronics by simply disconnecting the negative pole only, for the battery versions, or unplugging from the mains power supply for the cable versions.*

### **i INFORMATION**

Indicates particularly important instructions.

*In this Service Manual, the terms RIGHT and LEFT are used to indicate the sides of the machine.*

*These always refer to the direction of travel of the machine.*

*In this Service Manual, the machine version may be written in brackets (Traction, Pad Assist) or quotation marks "Traction - Pad Assist".*

*This note indicates that the instructions only refer to the version specified in brackets or quotation marks.*

**C1 INSTRUMENT PANEL ELECTRONIC BOARD**

**i** On the “Traction” version, the board also comprises the circuits that deliver power the drive motor.

**PAD ASSIST VERSION**

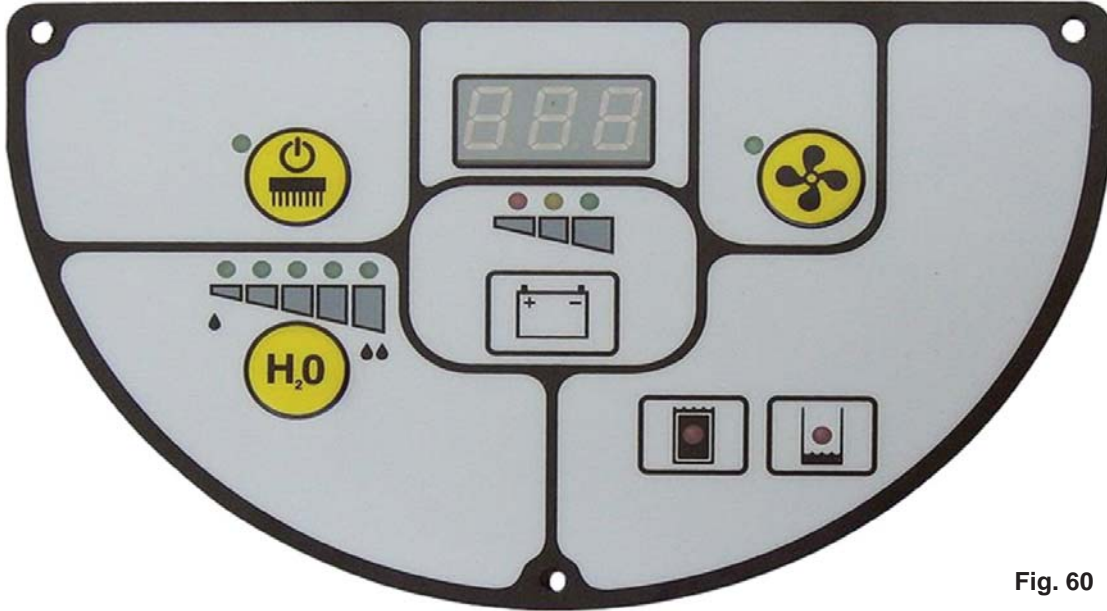


Fig. 60

**TRACTION VERSION**



Fig. 61



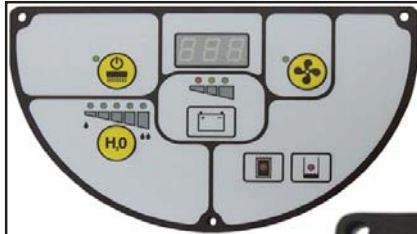
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December 23, 2020  
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### INSTRUMENT PANEL BOARD IDENTIFICATION:



The alphanumeric display is only fitted on battery version machines, "Pad Assist - Traction".



BOARDS FOR MACHINES WITHOUT DRIVE



Fig. 62





BOARDS FOR MACHINES WITH DRIVE



Fig. 63

## C1.1 Instrument panel board, setting the type of batteries and EcoMode

- 
 Set the instrument panel board according to the type of batteries (Acid or Gel) fitted or to be fitted, for best performance.  
 The discharge voltage threshold for ACID batteries is 20.5 V.  
 The discharge voltage threshold for GEL batteries is 21.5 V.

- 
 Selection of the type of battery is very important, as an incorrect selection may affect battery life and operating autonomy.  
 The type of battery is marked on the battery casing.  
 The batteries can be divided into three categories: "Pb-Acd" lead-acid, "AGM" locked acid, and "GEL", with the plates coated by gel.

### Setting on "Traction" versions with drive

- 1 Turn the ignition key **A1** on the emergency button **A** to the right.

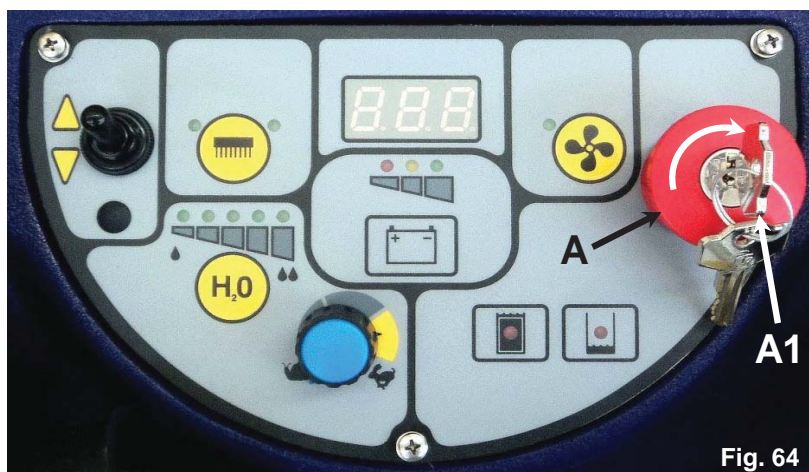


Fig. 64

- 2 Press and hold the brush button **B** and the suction motor button **C** together for around 5 seconds, and in any case until the display shows the type of batteries set.



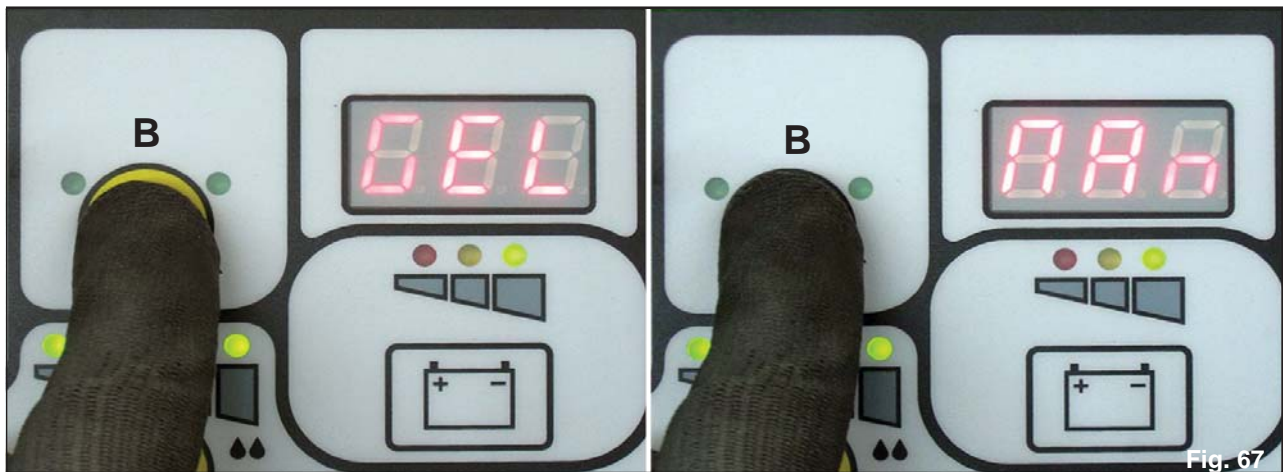
Fig. 65

- 3 Use the button **C** to select the type of battery, between GEL and ACID.



### Setting EcoMode on "Traction" versions with drive

- 4 Using the button **B**, choose whether to modify the setting of the type of batteries, or the water/solution metering mode.



**i** Water/solution is indicated, as the "clean water" tank can be filled with either a solution of water and detergent, or water only, using the special Chem-dose kit that distributes the detergent to be mixed with water directly onto the brushes, thus avoiding waste.



- 5 Pressing the button **C**, select whether to meter the water/solution manually, or automatically (EcoMode).

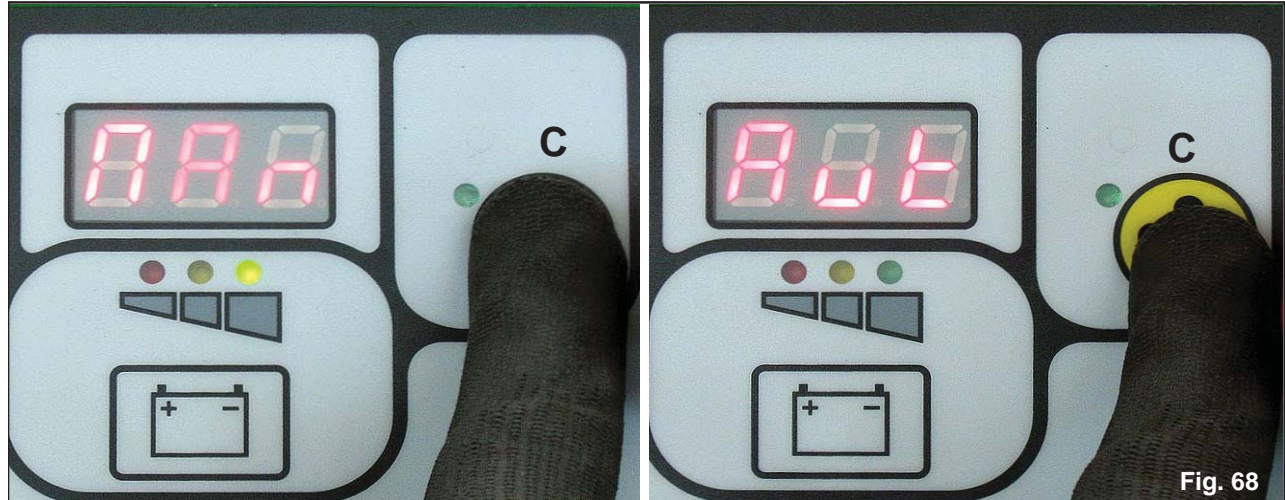


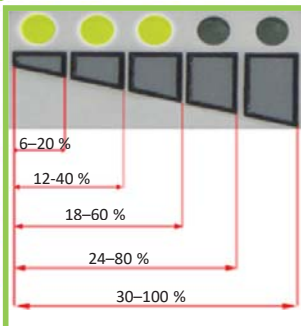
Fig. 68

- i** The EcoMode function delivers water/solution in proportion to machine travel speed and one of the five programs selected on the instrument panel. In this way, when machine speed changes, there is no need to constantly and manually adjust the quantity of water delivered.

- 6 To save the settings, simply switch the machine off using the emergency button **A** for machines with drive. For all other machines, press and hold the brush button **B** until the display switches off.



Fig. 69



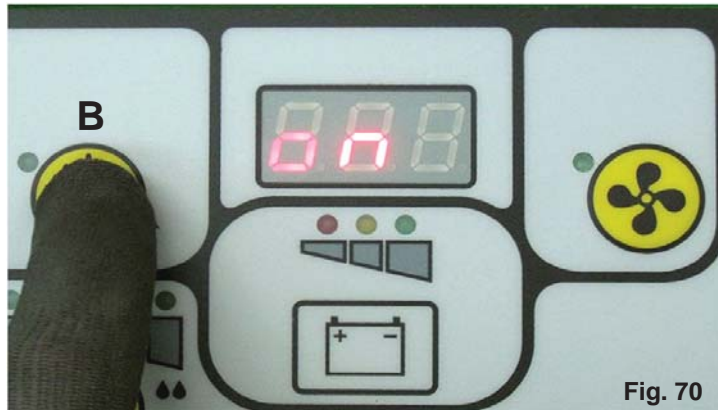
**EcoMode**, on models with electric drive, delivers a flow of solution that is proportional to machine travel speed, as is already currently available on our large ride-on machines.

- 5 different programs are available: each delivers from a minimum to a maximum amount of solution, based on machine travel speed.

(The percentages of water delivered are shown in the table on the side)

## Setting on "Pad Assist" versions without drive

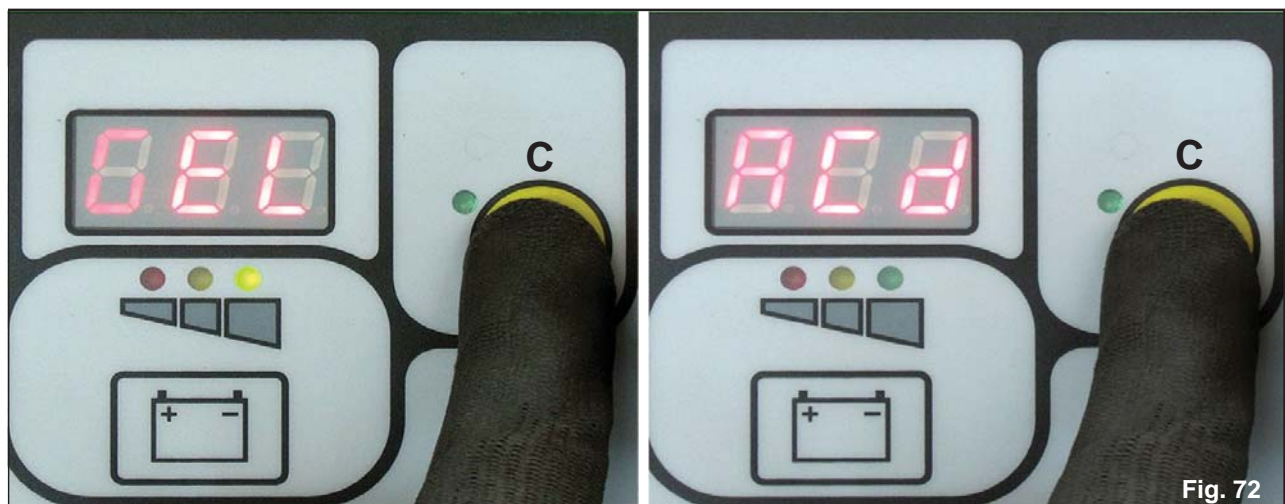
- 7 Switch the machine on using the brush button **B**.



- 8 Press and hold the brush button **B** and the suction motor button **C** together for around 5 seconds, and in any case until the display shows the type of batteries set.



- 9 Use the button **C** to select the type of battery, between GEL and ACID.





**PLDC04452**

REVISION 00  
December 23, 2020  
TECHNICAL OFFICE  
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- 10 To save the new setting, press the brush button **B** and the suction motor button **C** together for 5 seconds, or wait around 10 seconds, until the display shows the machine operating hours.



Fig. 73

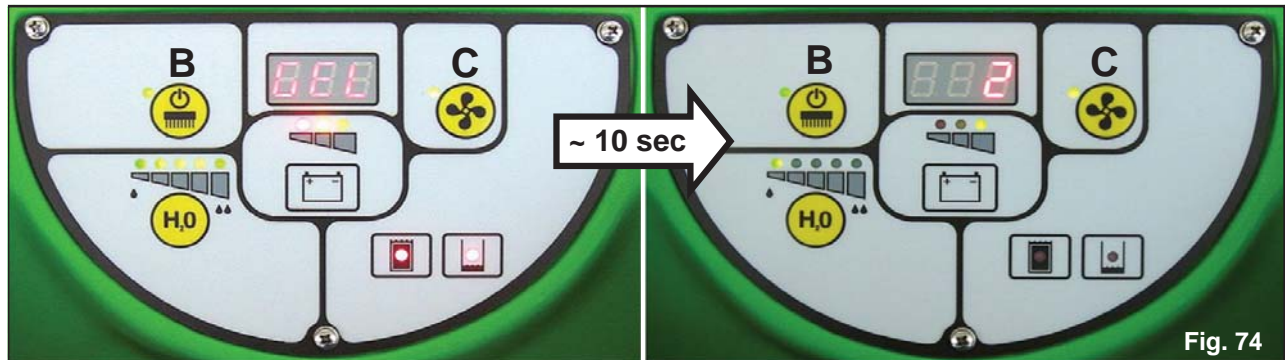


Fig. 74

- 11 Switch the machine off by pressing the brush-on/off button for more than 3 seconds.

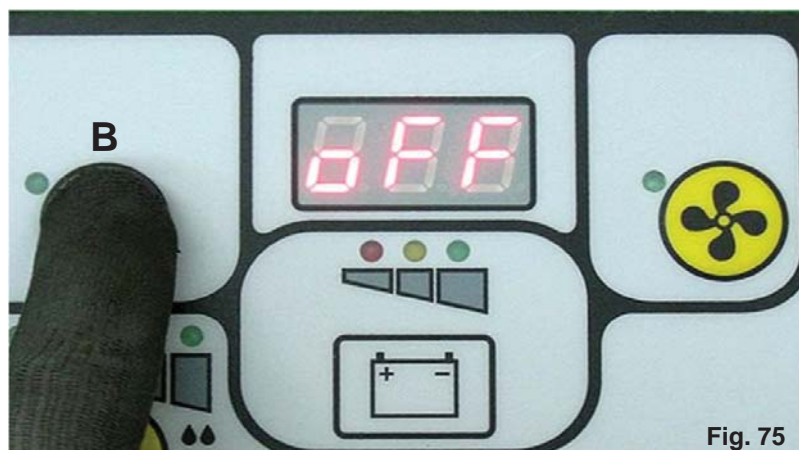


Fig. 75

## C1.2 Dismantling the instrument panel board

### Versions with drive

#### Disassembly

- 1 Switch the machine off by pressing the emergency button **A** fully in.
- 2 Disconnect the batteries that power the machine, to avoid dangerous short circuits.
- 3 Unscrew the three screws **B** that fasten the instrument panel to the dirty water tank.
- 4 Lift the board and turn it over with care.

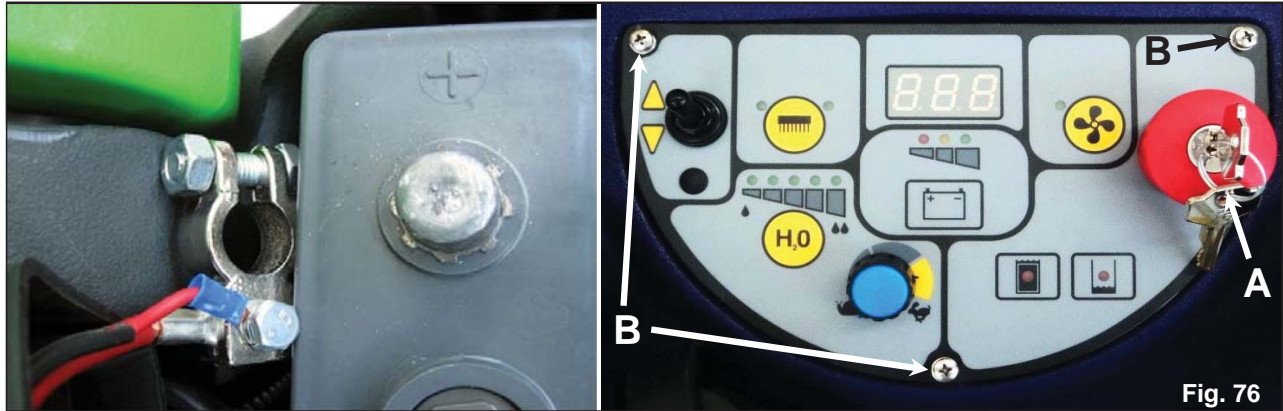


Fig. 76

- 5 Disconnect the multi-wire orientation-sensitive connectors **C**, **D**, from the electronic board with care.

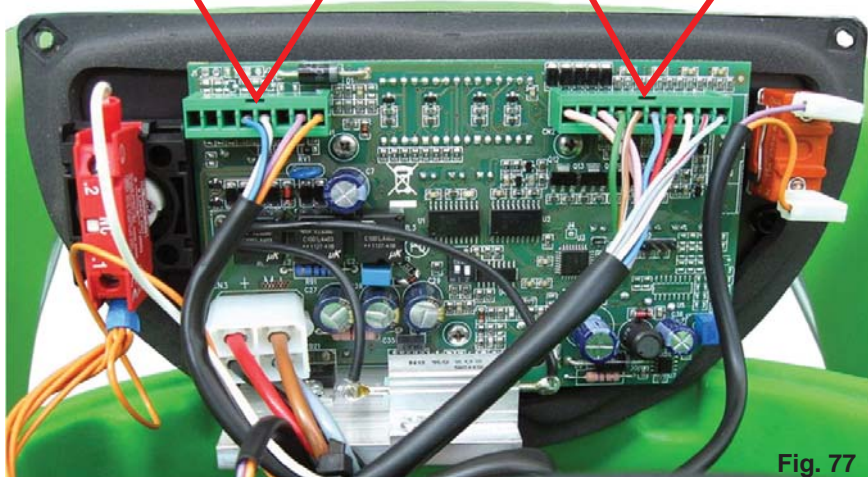
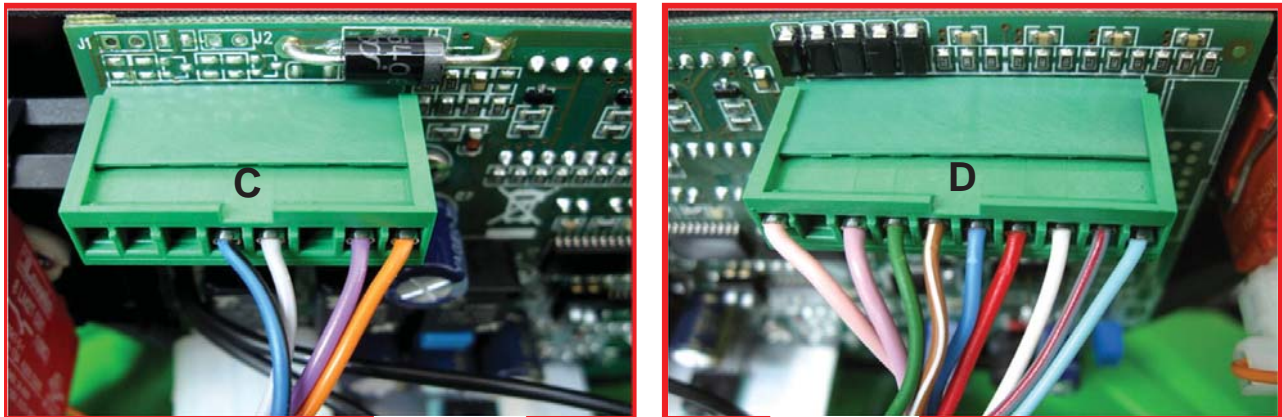


Fig. 77



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REVISION 00  
December 23, 2020  
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- 6 To remove the contact **E** from the "mushroom" head or emergency button, use a flat-head screwdriver to slightly lift the tab until it detaches from the support. Being an ON/OFF switch, when reassembling, its orientation is not important.
- 7 Detach the two wires (orange and purple) connected to the forwards-reverse switch **F**, when reassembling, being an ON/OFF contact, the position of the wires is not important.
- 8 Disconnect the four-pin connector **G** dedicated to traction motor taking special care. Assembly is orientation-sensitive by the locking connector fitted on the instrument panel board.

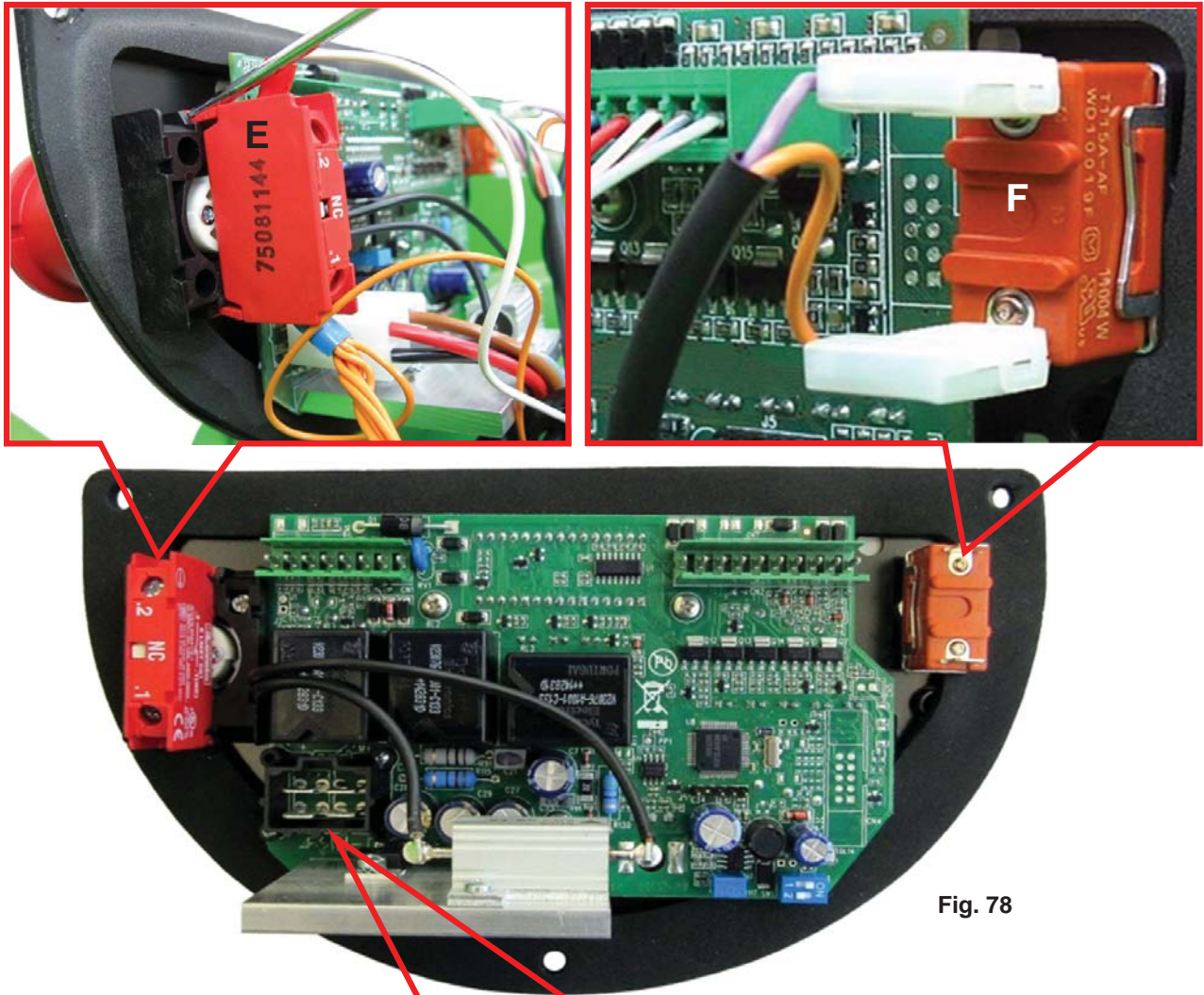


Fig. 78

## Versions without drive

### Disassembly

- 9 Switch the machine off by pressing the brush-on/off button **H** for more than 3 seconds.
- 10 Disconnect the batteries that power the machine, to avoid dangerous short.
- 11 Unscrew the three screws **I** that fasten the instrument panel to the dirty water tank.
- 12 Lift the board and turn it over with care.

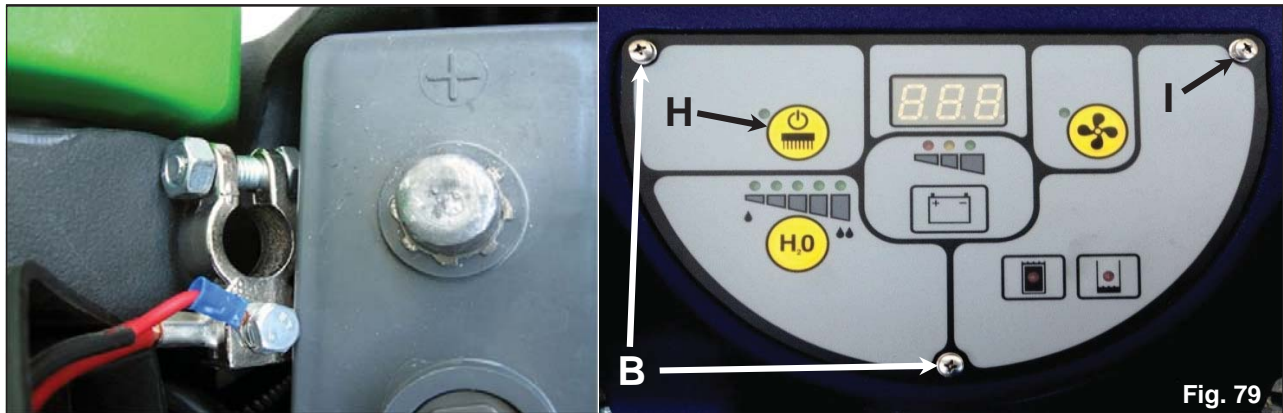


Fig. 79

- 13 Disconnect the multi-wire orientation-sensitive connectors **L**, **M** and the red fast-on terminal **N** on the black wire, from the electronic board, with care.

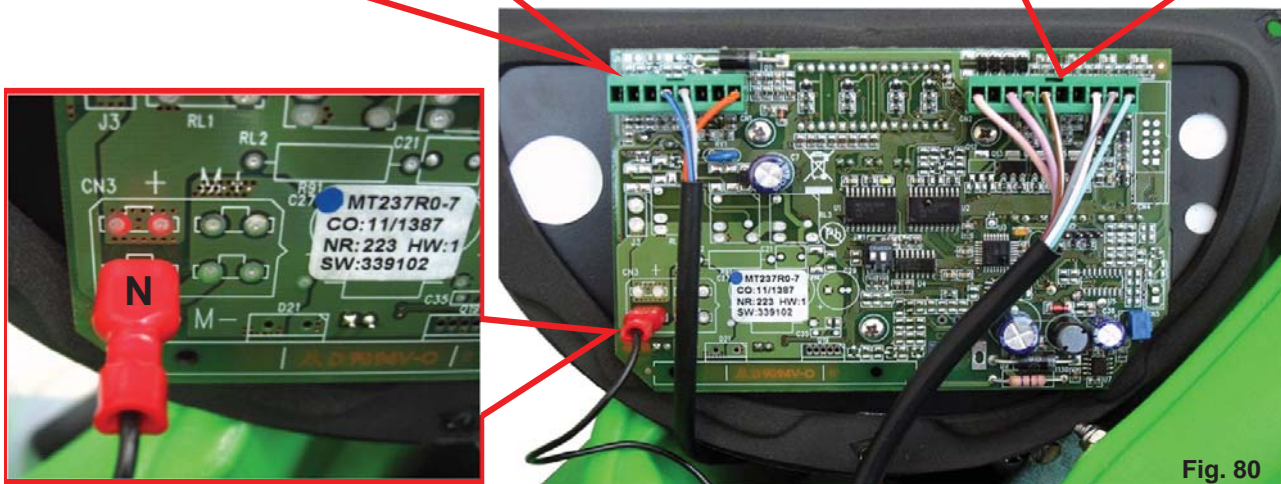
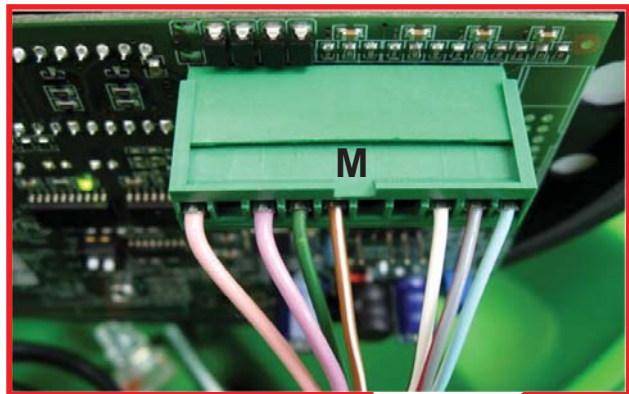
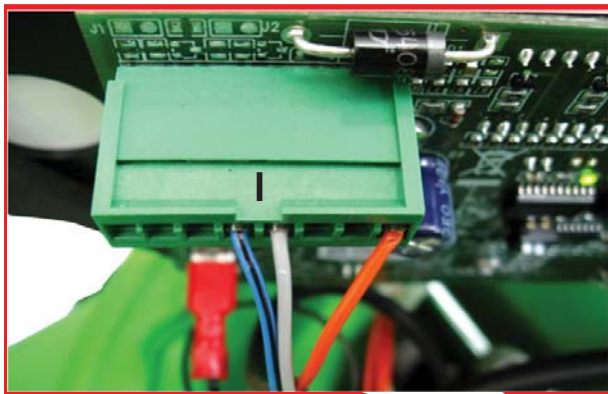


Fig. 80

### Reassembly

- 1 To assemble the new instrument panel board, repeat the disassembly operations in reverse.



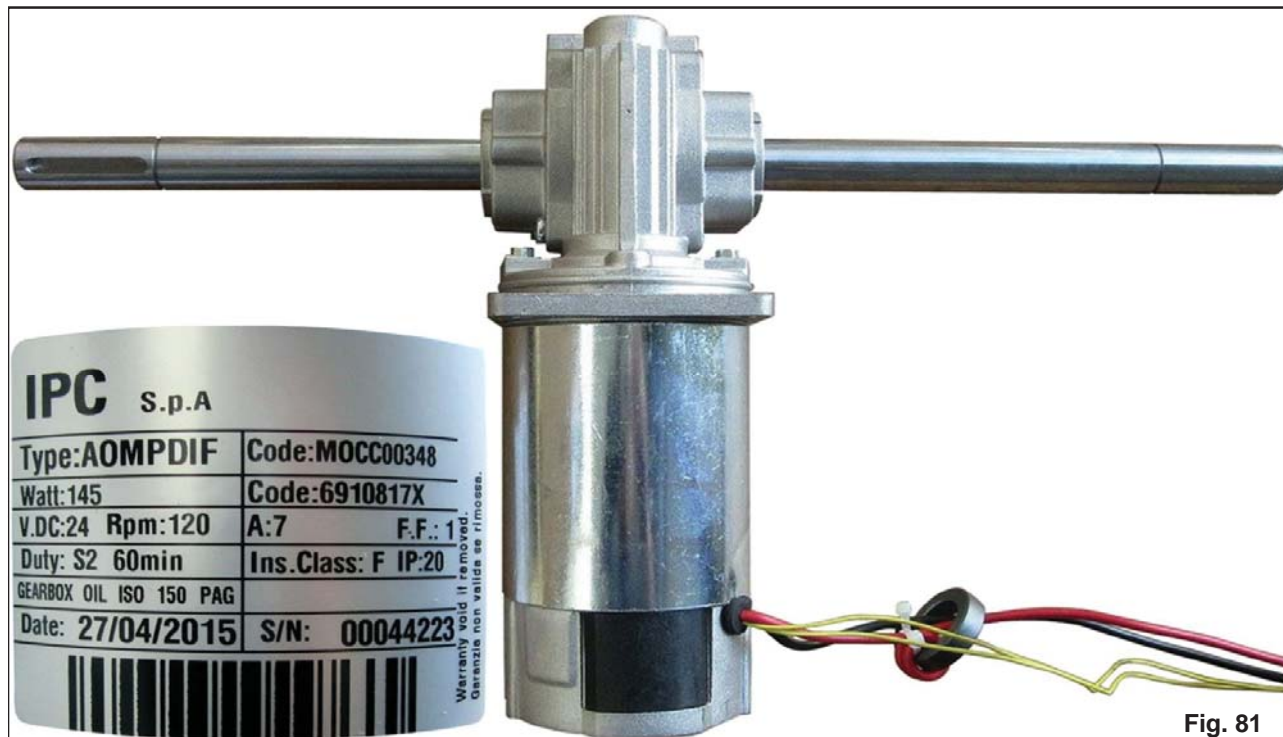
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December 23, 2020  
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## C2 DRIVE MOTOR

The drive reduction unit (BT) with the addition of a ferrite complied with the new European standards on electromagnetic compatibility.

**i** The technical specification the power motor is 145 W at 24 VDC, wheel axle speed of 120 rpm, gear ratio between the electric motor shaft speed and wheel axle speed is of 18/1 and the ingress protection against solids and liquids of IP20.



## C2.1 Checking the drive motor current input.

- 1 Make sure that the batteries on the machine are charged.
- 2 Move the machine onto flat and dry flooring.
- 3 Press the emergency switch fully in.
- 4 Use a clamp-on ammeter with an end scale reading of at least 200 amperes, as shown in Figure 82.
- 5 Lift the drive wheels, at least one of them, a few centimetres to check the current input with no load.
- 6 Isolate the drive relay located under the chassis, at the rear, on the right near the solenoid valve
- 7 Isolate the red (brown) wire on the drive board connected to the drive relay, see paragraph C 3.1.
- 8 Connect the clamp to the red (Brown) wire as shown in Figure 83.
- 9 Switch the ammeter to **Amperes** and **DC**
- 10 Turn the ignition key on the emergency switch clockwise.
- 11 Turn the speed controller on the instrument panel completely clockwise.
- 12 Press the enable brush lever.
- 13 Read the **CURRENT** with the motor at no load (without the machine operating).
- 14 Lower the wheels back to the ground and read the **CURRENT** with the machine in drive, with the tanks empty, the brush lifted and all the functions off.
- 15 Compare the values measured against the chart below
- 16 If all the values are normal, remove the clamp.
- 17 If the measurements do not correspond to those specified (higher):
  - 17a Check that the reduction drive is intact and that there is nothing to impede the rotation of the wheels.
  - 17b Check the condition of the carbon brushes, then make sure the rotor turns freely, see paragraph C 2.4.
  - 17c Replace the complete reduction drive.



Fig. 82

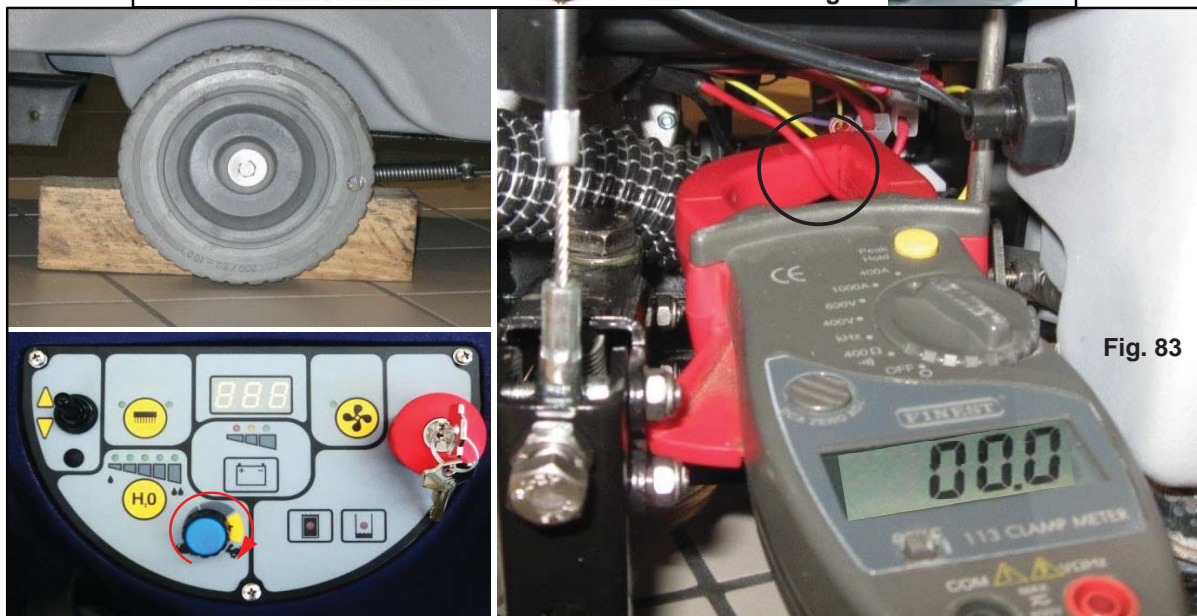


Fig. 83

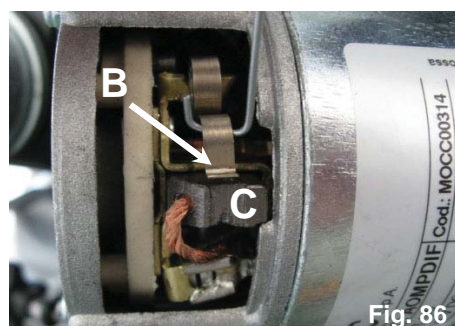
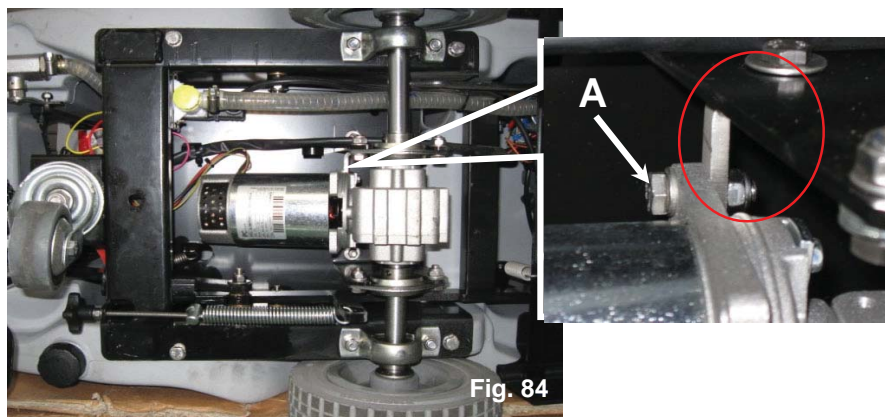
Current input A (amperes)	Min	Max
No load (wheel raised)	2,0 A	3,5 A
Load (on the floor)	3,5 A	5,0 A



## C2.2 Checking and replacing the carbon brushes traction motor.

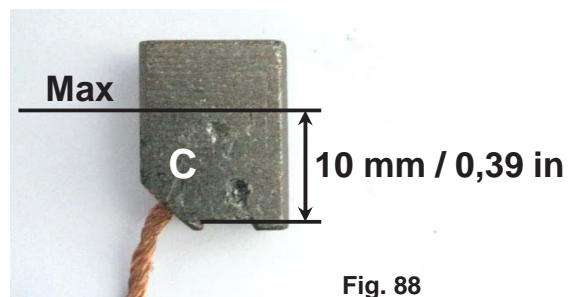
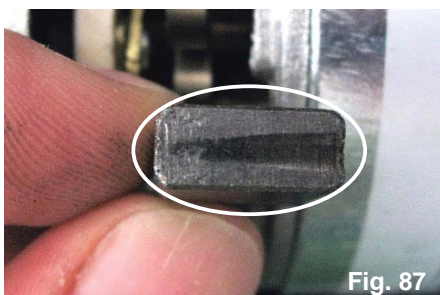
### Dismantling

- 1 Move the machine to the tank draining area, and empty the solution tank and the dirty water tank.
- 2 Move the machine onto flat and dry flooring.
- 3 Press the emergency key switch until it is held in the bottom position.
- 4 Lower the brush head using the pedal control.
- 5 Remove the squeegee from the mount.
- 6 Disconnect the batteries from the wiring and each other and remove them from the battery compartment.
- 7 Push the right side of the machine to tilt it over until it rests on the left side.
- 8 It is recommended to lay something soft between the floor and the side, to avoid damaging the side.
- 9 Identify the "L" bracket that prevents the motor from rotating on the wheel axle.
- 10 Unscrew the bolt **A** that fastens the "L" bracket to the motor.
- 11 Turn the motor so as to easily access the plastic guards on the motor carbon brushes.
- 12 Remove the guards, checking their position.
- 13 Use a hook to lift the spring **B**, remove the carbon brush **C**, repeat the operation on the opposite brush.



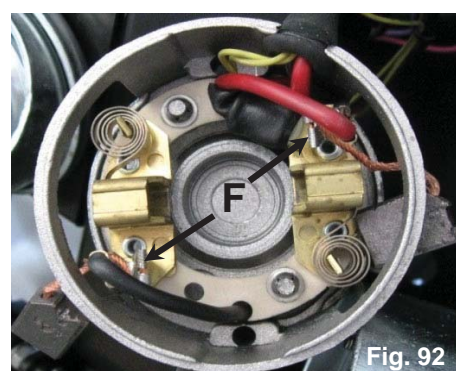
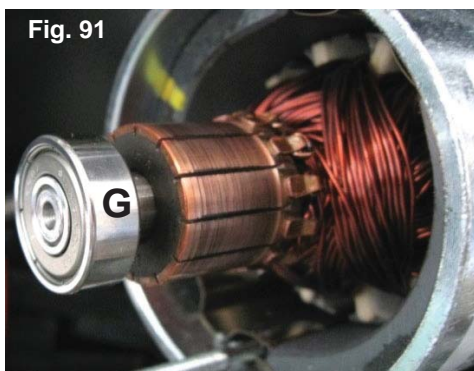
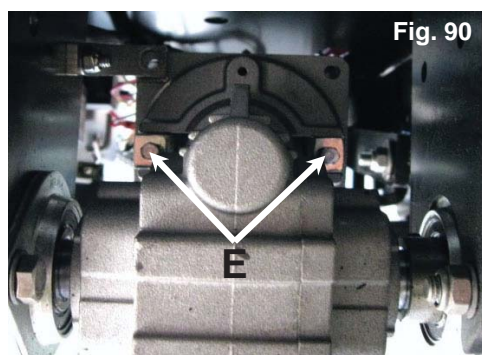
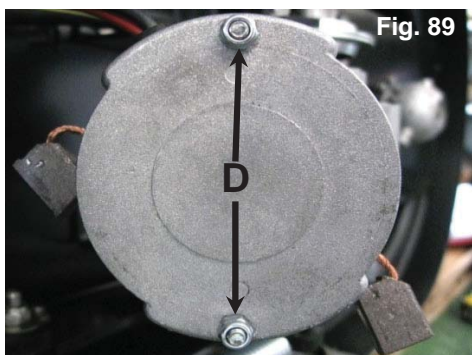
### Checks

- 1 Check that the carbon brushes (both) and the contact surface are intact, and are not excessively worn.
- 2 The length of the carbon brush should not fall below 10 mm / 0,39 in, otherwise replace them.



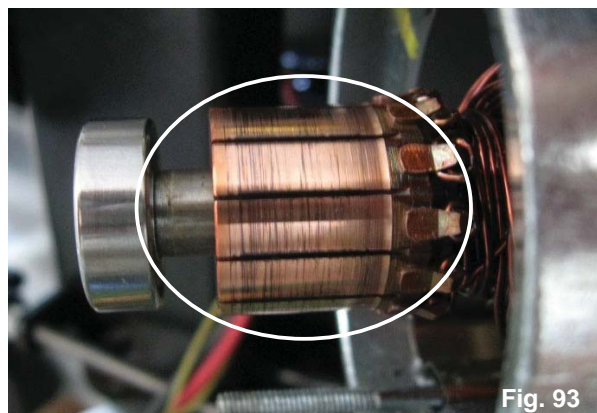
## Dismantling

- 14 With the carbon brushes removed, identify the two nuts **D** that fasten the cover to the motor body.
- 15 With a 7 mm / 0,28 in spanner, unscrew the two nuts **D**, holding the bolts **E** on the opposite side.
- 16 With a plastic mallet, tap the side of the cover to detach it from the motor body.
- 17 Holding the cover by hand, remove the spade **F** that connects the carbon brushes to the cover.
- 18 Replace the carbon brushes with new ones.
- 19 If replacing the bearing **G**, to remove it from the shaft use a special puller.



## Checks

- 1 Check where the carbon brushes slide on the rotor that there is not excessive wear.
- 2 Check that the bearing **G** is in intact, check the colour of the outside ring, if the steel tends to be purple, it has heated up excessively. Turning it by hand, make sure that there is no wear, it rotates smoothly and is not particularly noisy.
- 3 Check that the motor protector **H** is securely connected to the base, and that there are no scratches.



## Reassembly

- 1 To assemble the new carbon brushes, complete the dismantling operations in reverse.
- 2 Make sure there is slight resistance when fitting the cover, otherwise check.

## C2.3 Replacing the drive wheels, "BT" versions

### *Dismantling*

- 1 Move the machine to the tank draining area, and empty the solution tank and the dirty water tank.
- 2 Move the machine onto flat and dry flooring.
- 3 Press the emergency key switch until it is held in the bottom position.
- 4 Lower the brush head using the pedal control.
- 5 Push the side of the machine to tilt it on one side.
- 6 Place a block of wood between 90 mm / 3,54 in and 150 mm / 5,9 in high under the machine's axle.
- 7 Using a 13 mm - 1/2 in spanner unscrew anticlockwise the bolt **A** that locks the wheel to the shaft.
- 8 To assist the operation, tap the end of the spanner lightly yet firmly with a hammer.
- 9 Make sure not to lose the Grover washer **B** located behind the flat, wide washer.
- 10 Remove the old wheel, if necessary use a rubber mallet.
- 11 Position the tab **E** in place on the shaft, if necessary, to fit the new wheel.
- 12 Fit the new wheel and push it in fully, using a rubber mallet.

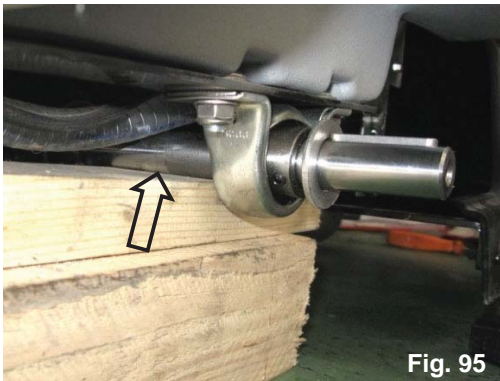
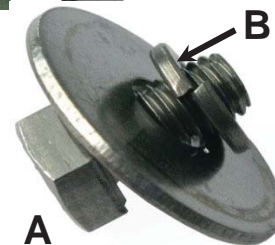


Fig. 95



Fig. 96



### *Checks*

- 1 Check that the Seeger ring **C** is intact and check the position.
- 2 Check that the two dowel pins **D** fastening the position of the drive shaft are fitted and tightened correctly.

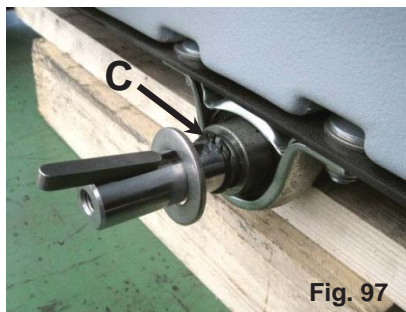


Fig. 97



Fig. 98



Fig. 99

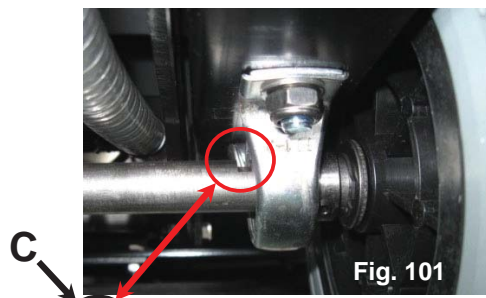
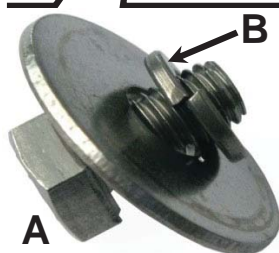
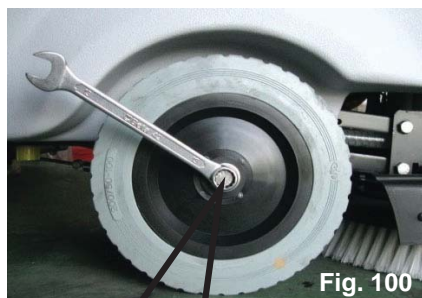
### *Reassembly*

- 1 To assemble the new drive wheels, complete the dismantling operations in reverse.
- 2 Tighten the bolt **A** using an air-driven tool or tap the end of the spanner lightly.

## C2.4 Replacing the idle wheels

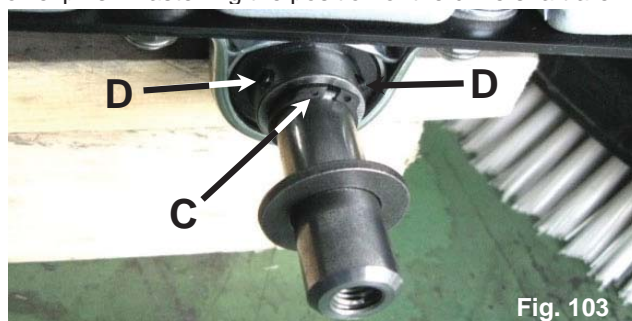
### *Dismantling*

- 1 Move the machine to the tank draining area, and completely empty the dirty water and solution tanks.
- 2 Move the machine onto flat and dry flooring.
- 3 Press the switches into position "0" to switch off all the functions.
- 4 Disconnect and remove the batteries from the battery compartment, if the machine is laid on one side.
- 5 Lower the brush head using the pedal control.
- 6 Remove the squeegee from the special support, if the machine is positioned on one side.
- 7 Slightly unscrew the screw **A** that locks the wheel to the axle, using the groove **C** to keep the axle locked.
- 8 Push the side of the machine to tilt it on one side.
- 9 Place a block of wood between 90 mm / 3,54 in and 150 mm / 5,9 in high under the machine's axle.
- 10 Completely unscrew the bolt **A**, making sure not to lose the Grover washer **B**.
- 11 Remove the wheel and replace it with a new one.



### *Checks*

- 1 Check that the Seeger ring **C** is intact and check the position.
- 2 Check that the two dowel pins **D** fastening the position of the drive shaft are fitted and tightened correctly.



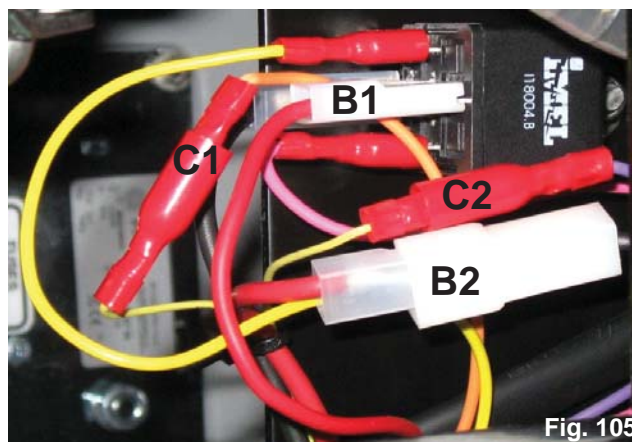
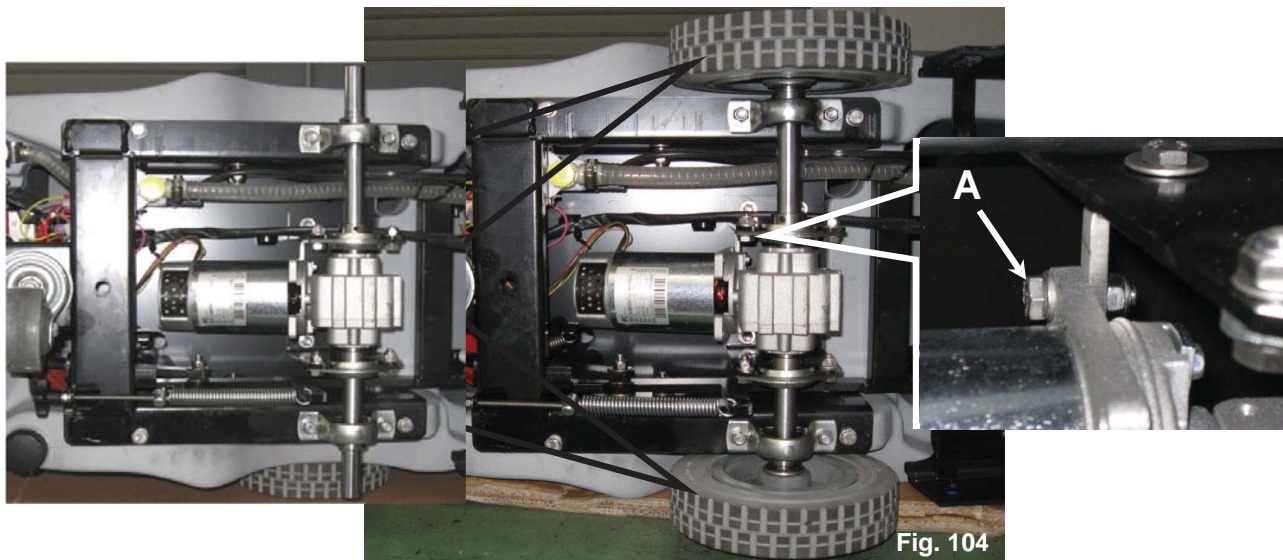
### *Reassembly*

- 1 To assemble the new drive wheels, complete the dismantling operations in reverse.
- 2 Tighten the bolt **A** using an air-driven tool or tap the end of the spanner lightly.

## C2.5 Replacing the drive motor

### *Dismantling*

- 1 Move the machine to the tank draining area, and empty the solution tank and the dirty water tank.
- 2 Move the machine onto flat and dry flooring.
- 3 Press the emergency key switch until it is held in the bottom position.
- 4 Lower the brush head using the pedal control.
- 5 Remove the squeegee from the mount.
- 6 Disconnect the batteries from the wiring and each other and remove them from the battery compartment.
- 7 Push the right side of the machine to tilt it over until it rests on the left side.
- 8 It is recommended to lay something soft between the floor and the side, to avoid damaging the side.
- 9 Start by removing the wheel at the top, then continue with the one at the bottom, see paragraph C 2.4.
- 10 Remove the keyways, the washers, and the Seeger tings fitted on the shaft, see paragraph C 2.4.
- 11 Identify the "L" bracket that prevents the motor from rotating on the wheel axle.
- 12 Unscrew the bolt **A** that fastens the bracket to the motor.
- 13 Electrically disconnect the motor, the power wires **B1 - B2** and the thermal protector **C1 - C2** wires.



- 14 Unscrew the four bolts that fasten the two self-aligning bearings **D** fitted on the "L" support brackets.
- 15 Unscrew the four nuts that fasten the two bearings with flanges **E** fitted on the machine's chassis.
- 16 Take the reduction drive to the bench and unscrew the four dowels **F** that lock the shaft to the bearings **D**.
- 17 Continue dismantling the other four dowel pins **G** that lock the shaft to the bearings **E**.
- 18 Replace the old reduction drive with a new one.

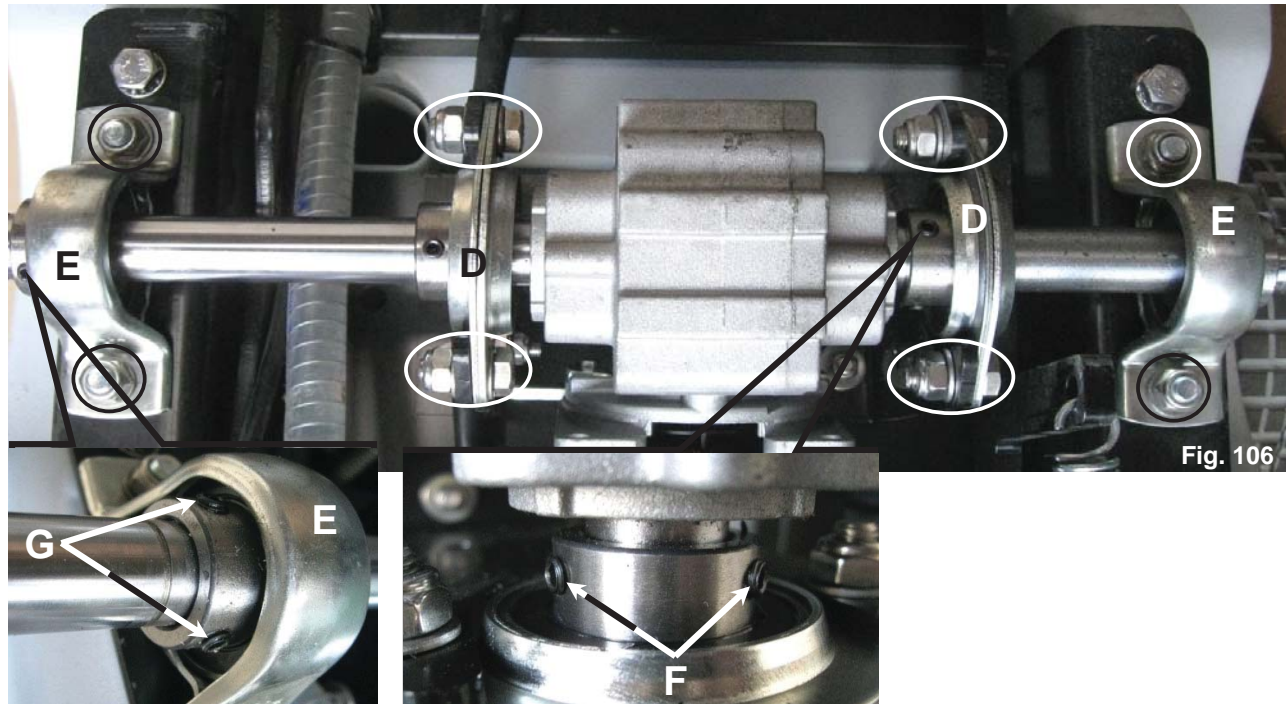


Fig. 106

## Reassembly

- 1 To assemble the new reduction drive, complete the dismantling operations in reverse.
- 2 Make sure that the dowel pins **G** and **F** are sufficiently loosened, so as to not impede the assembly of the bearings on the half-axes of the new reduction drive.
- 3 Assemble the bearings **D** and **E** on the shaft, ensuring they are inserted in the right direction.
- 4 Respect the assembly positions of the bearings **D** with the "L" brackets.
- 5 Position and tighten, max. torque 25.5 Nm / ~ 226 lbf in the two bearings with flanges **E** on the chassis.
- 6 Adjust the distance of the end of the half-axes from the edge of the bearings with flange **E** to ~ 53 mm / ~ 2,1 in.



Fig. 107

- 7 Tighten the dowel pins **G** to lock the half-axes, maximum torque 7 Nm / ~ 62 lbf in.
- 8 Screw on without tightening the four bolts that fasten the self-aligning bearings **D** to the "L" brackets.
- 9 Tighten the dowel pins **F** to lock the half-axes, maximum torque 7 Nm / ~ 62 lbf in.
- 10 Tighten the four bolts to a maximum torque of 25.5 Nm / ~ 226 lbf in.
- 11 Tighten the bolt **A** to lock the reduction drive to the chassis, maximum torque 10 Nm / ~ 88,5 lbf in.
- 12 Connecting the motor electrically, see paragraph C 3.2.
- 13 Fit the wheels on the shaft, as described in paragraph C 2.4.

## **C3 RELAY AND DRIVE MOTOR ELECTRICAL CONNECTIONS**

### **C3.1 Checking and replacing the drive relay**

#### **⬆️ WARNING**

#### **ONLY MACHINES WITH TRACTION MOTOR**

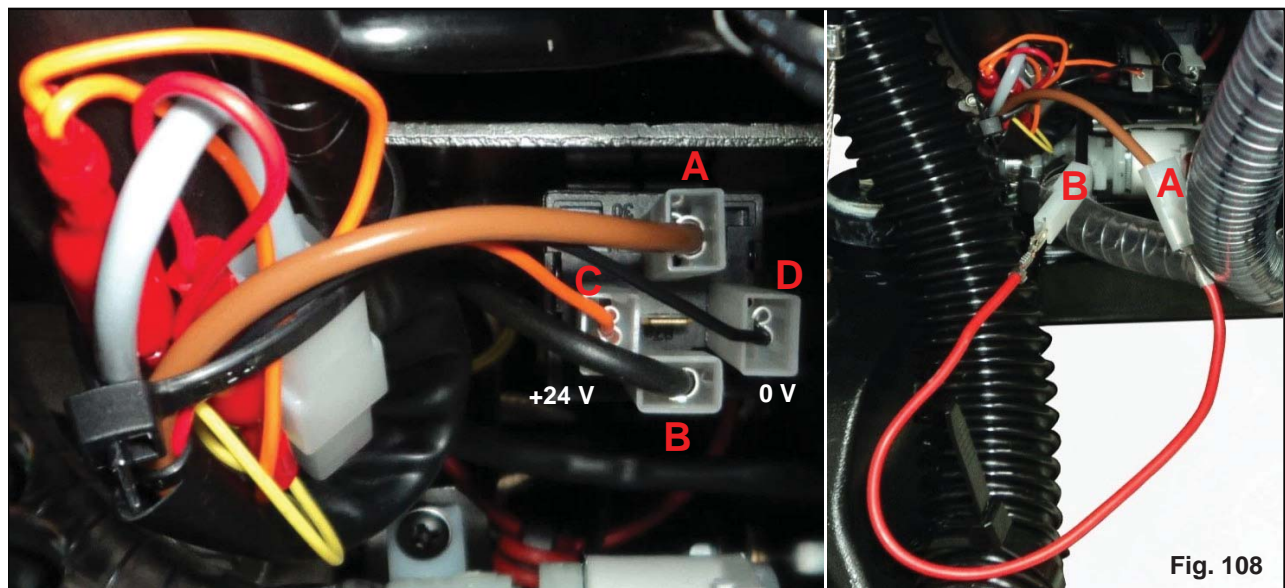
The drive relay is fitted to make the machine lighter to push, when the drive cannot be used (no batteries, flat batteries or off).

#### ***Problem / Fault***

When the machine is on, the dash board does not show any errors, the traction does not work and the machine looks like with the wheels free, the problem could be the drive relay.

#### ***Checking operation of the drive relay***

- 1** Move the machine onto flat and dry flooring.
- 2** Press the emergency switch fully in.
- 3** If possible, lift the machine by forklift.
- 4** The relay is fitted under the machine's chassis, at the rear, on the right, near the solenoid valve.
- 5** Disconnect the brown wire **A** and the black wire **B** and join them together, using a piece of wire.
- 6** Check if the relay is working correctly:
  - 6a** If the machine moves, check if there is voltage (+24V) at the wires **C** and **D**.
  - 6b** If the machine moves and there is voltage at the wires **C** and **D**, replace the relay.
  - 6c** If the machine does not move, check if there is power supply to the motor or the motor carbon brushes.

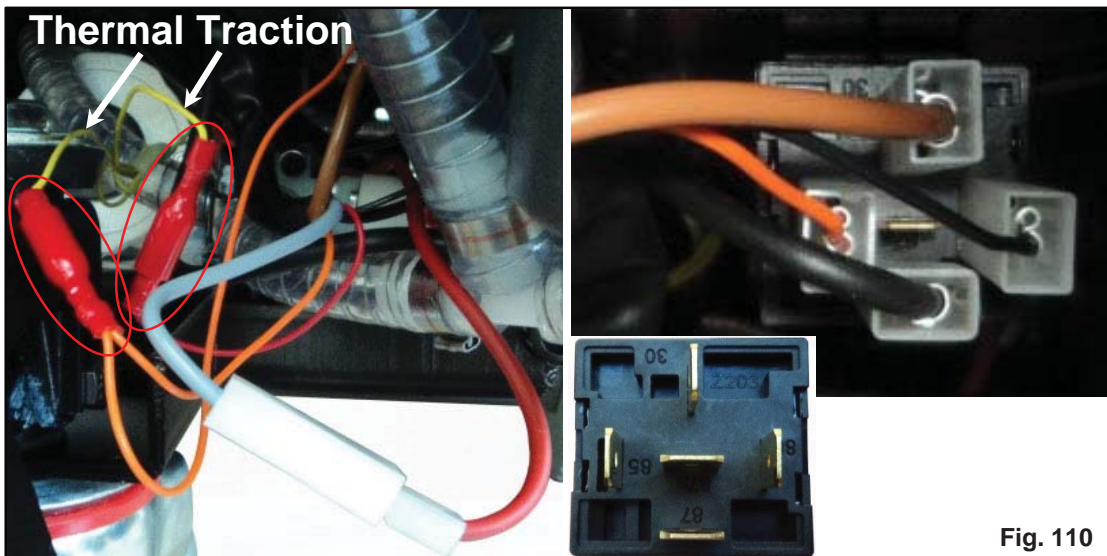
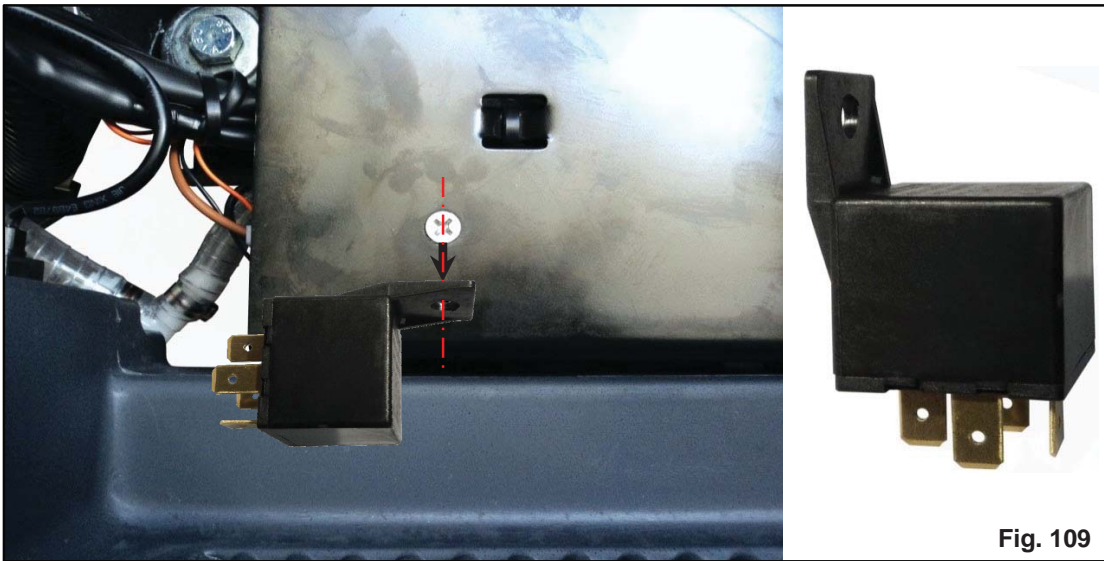


#### ***Reassembly***

- 1** If the relay works correctly, restore the connection, otherwise replace it.

## Dismantling

- 1 Move the machine to the tank draining area, and empty the recovery tank.
- 2 Move the machine onto flat and dry flooring.
- 3 Press the emergency key switch until it is held in the bottom position.
- 4 Disconnect the batteries from the wiring and each other and remove them from the battery compartment.
- 5 Remove the battery plate.
- 6 Identify the crosshead screw closest to the relay .
- 7 Unscrew the screw and proceed to replace the relay .
- 8 Proceed with the electrical connection shown below.



## Reassembly

- 1 To assemble the new relay, complete the dismantling operations in reverse.
- 2 Pay attention to the connection to the relay, the other connections are with obligated connections.





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December 23, 2020  
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**D**

**DRIVE UNIT**



## **WARNING**

*Go to the designated draining area and empty the solution and dirty water tanks using the drain plugs and the hose provided.*

*Move the machine onto flat ground. If necessary, place chocks under the wheels.*

*Press the emergency switch, for the version with drive, or disable the functions by moving the switch to position "0" on all other versions.*

*Disconnect the battery from the machine's electronics by simply disconnecting the negative pole only, for the battery versions, or unplugging from the mains power supply for the cable versions.*

## **i INFORMATION**

Indicates particularly important instructions.

*In this Service Manual, the terms RIGHT and LEFT are used to indicate the sides of the machine.*

*These always refer to the direction of travel of the machine.*

*In this Service Manual, the machine version may be written in brackets (Traction, Pad Assist) or quotation marks "Traction - Pad Assist".*

*This note indicates that the instructions only refer to the version specified in brackets or quotation marks.*



PLDC04452

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December 23, 2020  
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## D1 MACHINE'S MAIN WIRING, "PAD ASSIST" version

**i** The machine's main wiring has been modified, moving the brush contactor to the electronics mounting plate, and eliminating the general one. The board is made using an automated process, with the components or sockets soldered on top, eliminating the interconnection wires. The board includes the 2 A fuse for the functions, the board and the solenoid valve. The 40A suction motor fuse and 50A brush motor fuse. There are some variants to the wiring, such as the cable to power the current reading board used for the rollers, the wiring to power the Chem-dose pump, if featured, and the connector to assemble the on-board battery charger. The connector with safety catch has been added to the drive motor power supply cable.

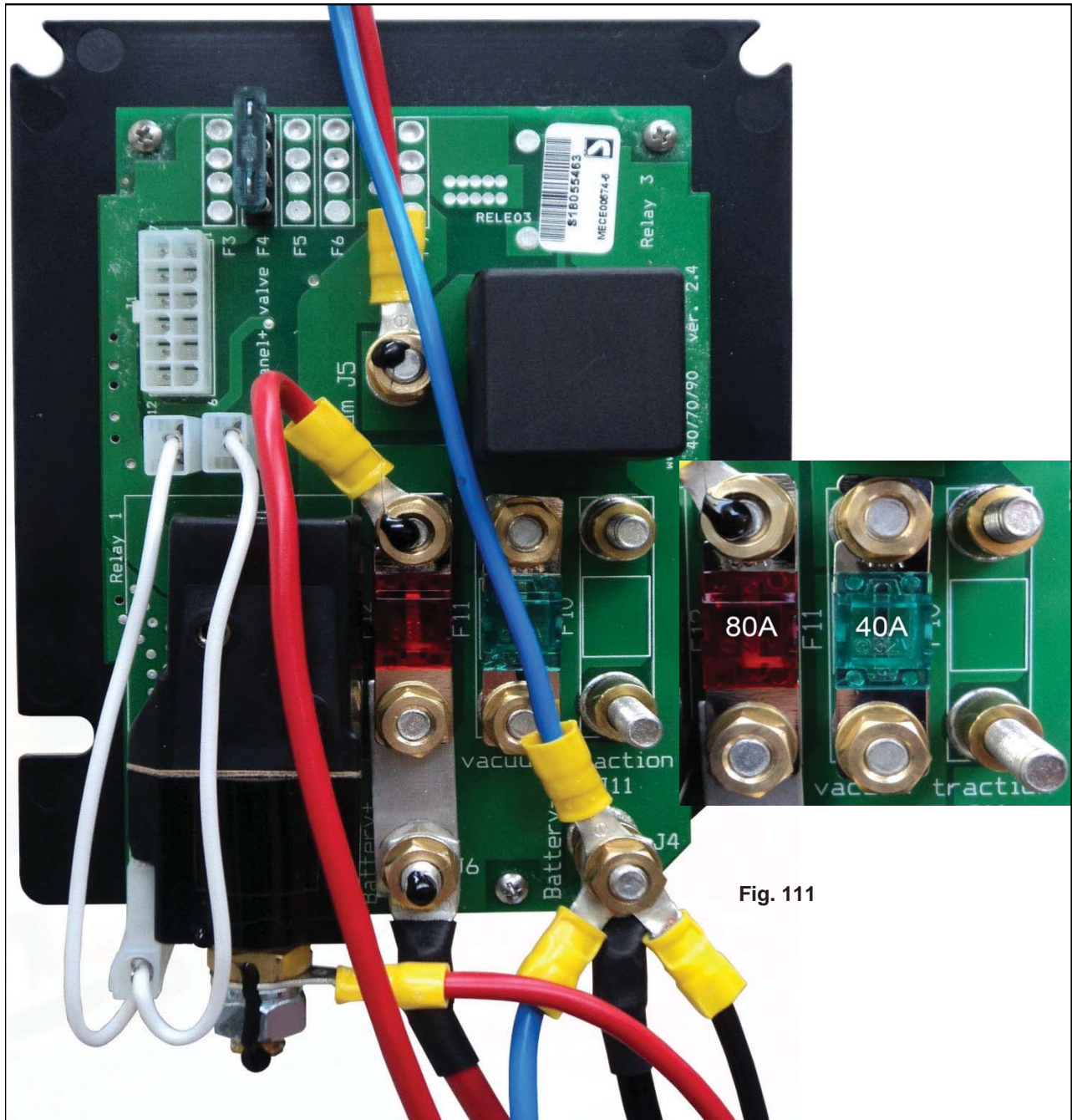


Fig. 111



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## D1.1 Main wiring board components, "Pad Assist" version

- A** Instrument panel board and solenoid valve fuse
- B** Main wiring board connector
- C** Suction motor relay
- D** Contactor brush motor
- E** Brush motor fuse
- F** Suction motor fuse
- G** Positive isolator switch
- H** Negative isolator switch

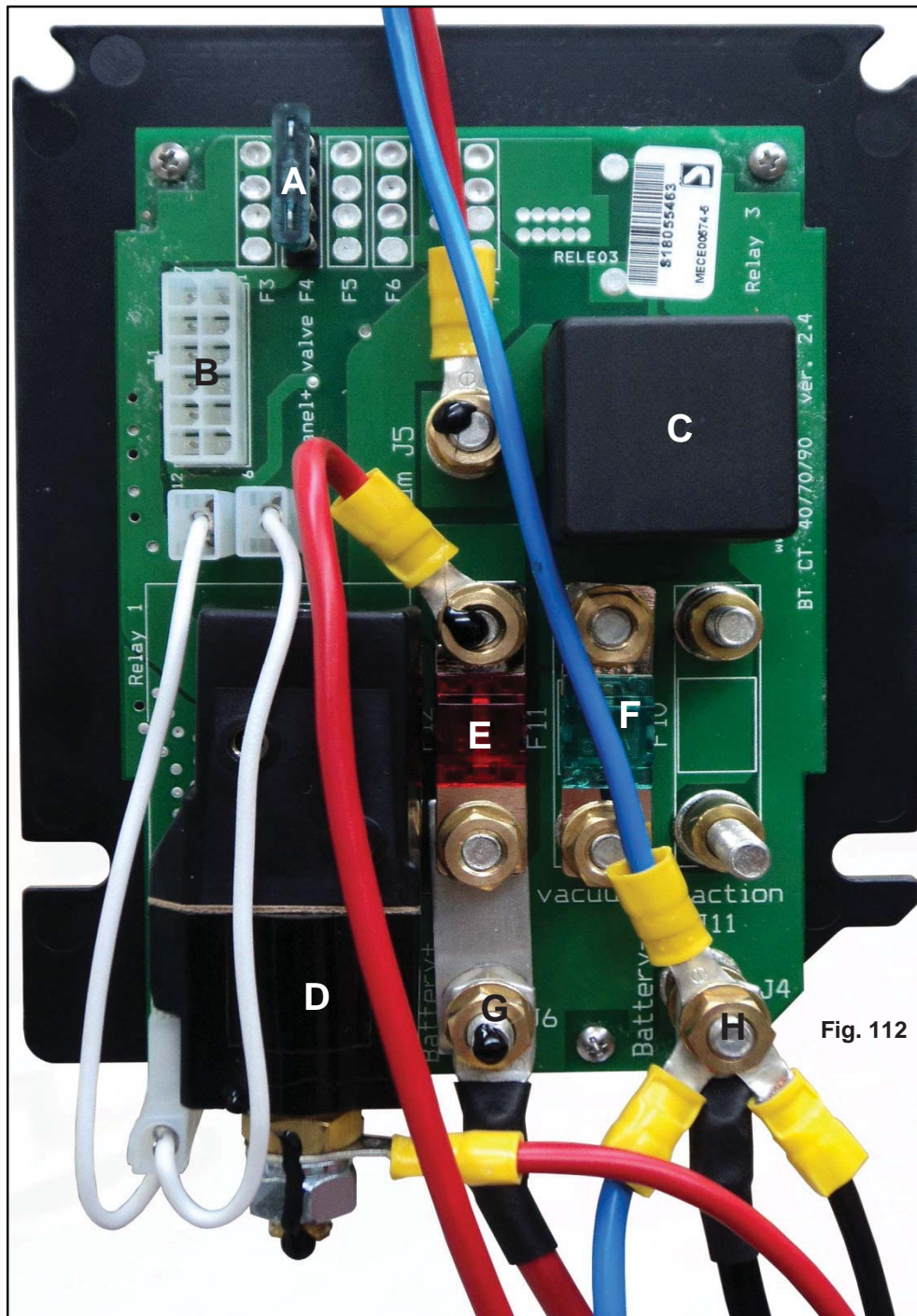


Fig. 112





**PLDC04452**

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## D2.1 Main wiring board components, "Traction" version

- A** Instrument panel board and solenoid valve fuse
- B** Main wiring board connector
- C** Suction motor relay
- D** Contactor brush motor
- E** Brush motor fuse
- F** Suction motor fuse
- G** Drive motor fuse
- H** Positive isolator switch
- I** Negative isolator switch

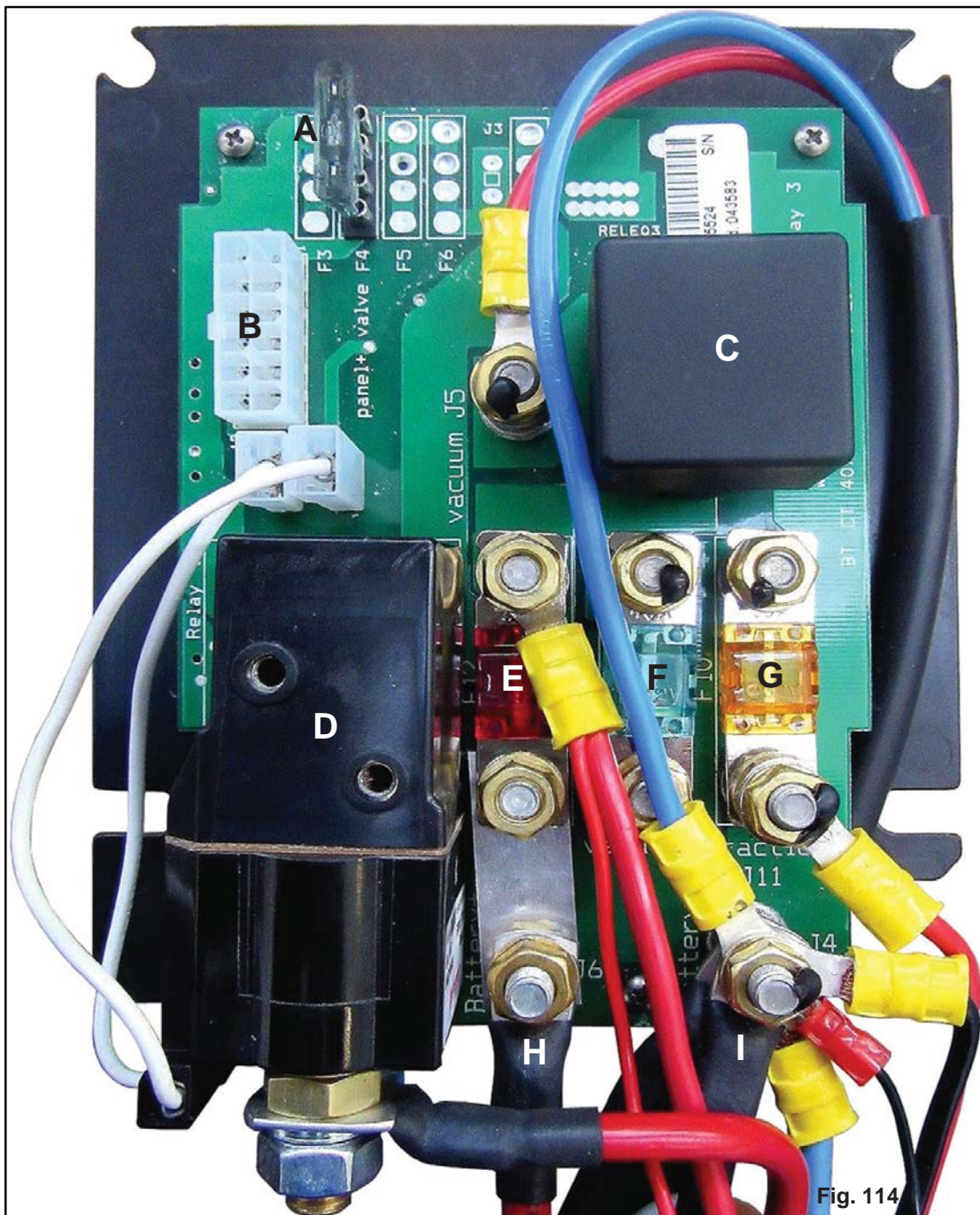

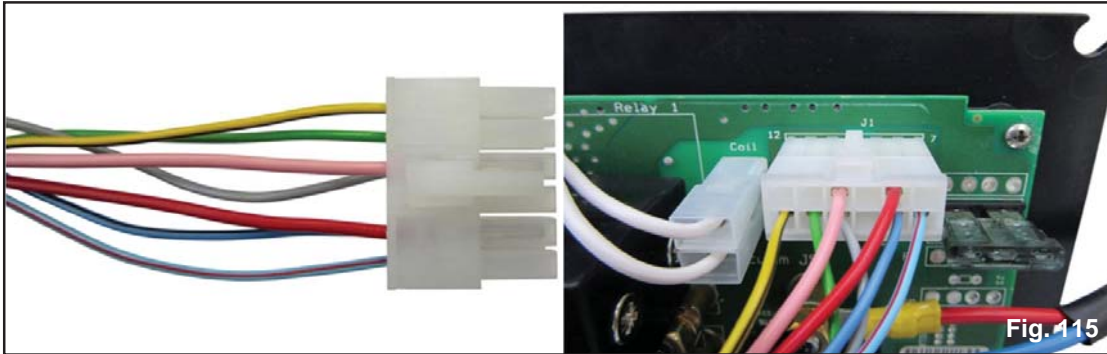


Fig. 114

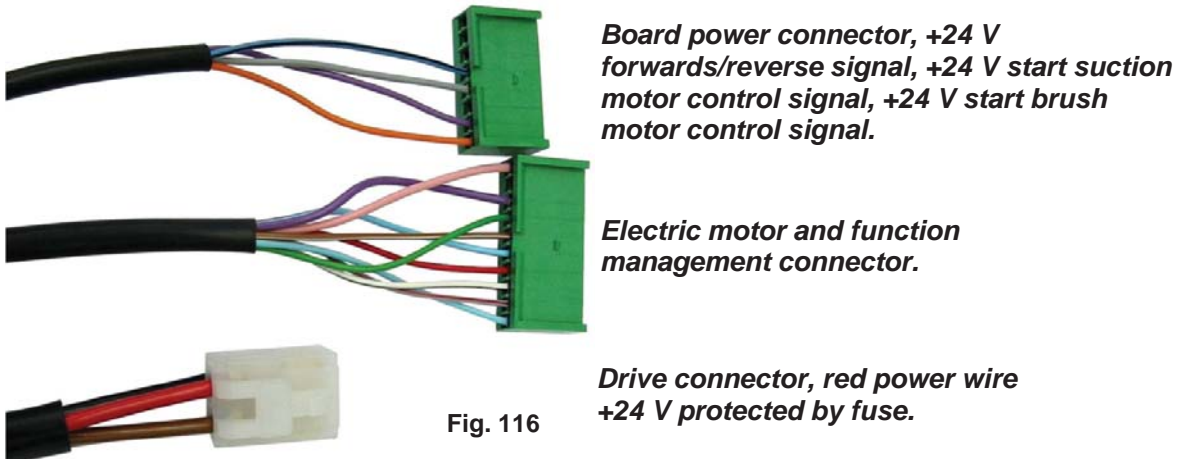
## D2.2 Machine's main wiring connections, "Traction" version

### A MULTI-PIN CONNECTOR ON PANEL BOARD

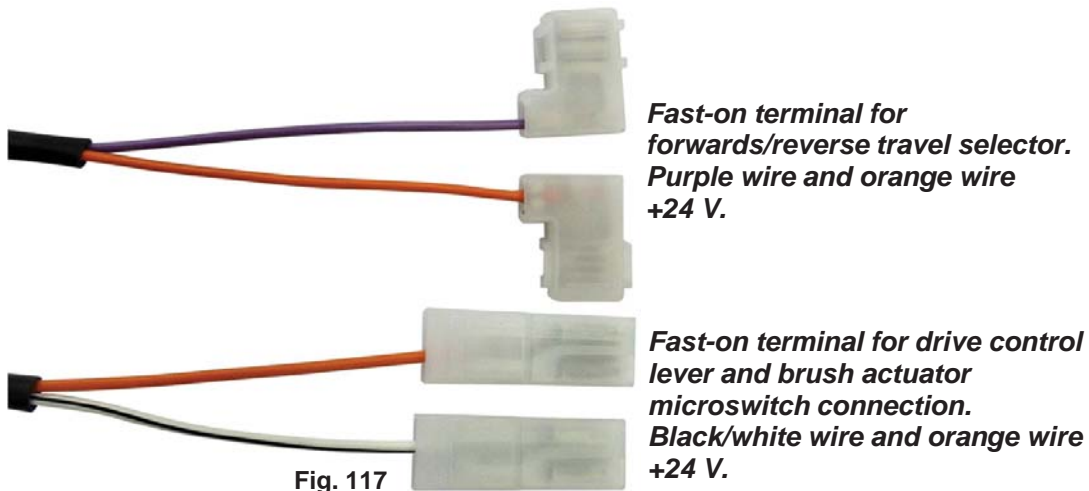
 *If replacing the machine's main wiring, or there are electrical problems on the machine, check that the connector is correctly plugged onto the board.*



### B CONNECTORS ON THE INSTRUMENT PANEL BOARD



### C FAST-ON TERMINAL CONNECTOR FOR GEAR SELECTOR AND ACTIVATION LEVER



**D FAST-ON TERMINAL CONNECTOR FOR IGNITION KEY / EMERGENCY BUTTON**



Fig. 118

*White wire with spade lugs to connect to the mushroom-head button with key, carries +24 V signal from the batteries.*

*Orange wire with spade lugs to connect to the mushroom-head button with key, carries +24 V signal to the functions.*

*Orange wire with tubular cable lugs, roller version only, powers the current reading board.*

**E SUCTION MOTOR CONNECTOR**



Fig. 119

*Suction motor connector, red wire +24 V protected by fuse and blue negative wire.*

**F BATTERY TERMINALS**



Fig. 120

*Battery terminals and terminal covers. Red wire on the positive pole "+", black wire on the negative pole "-".*

**G SEALED CONNECTOR FOR LEVEL SENSORS**

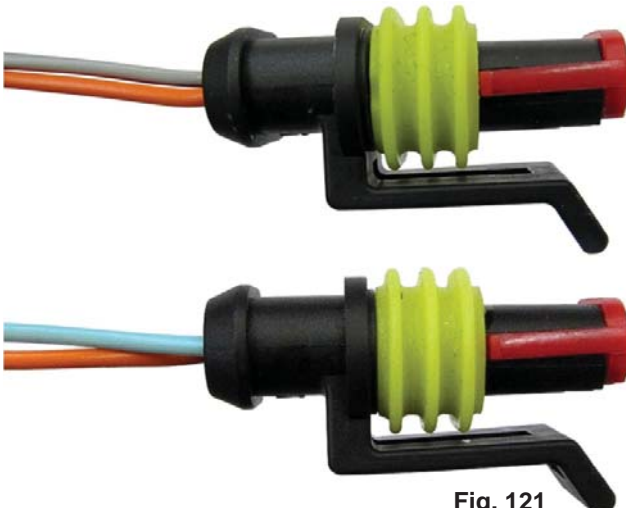


Fig. 121

*Sealed connector for dirty water tank level sensor. Grey-red wire and orange wire +24 V.*

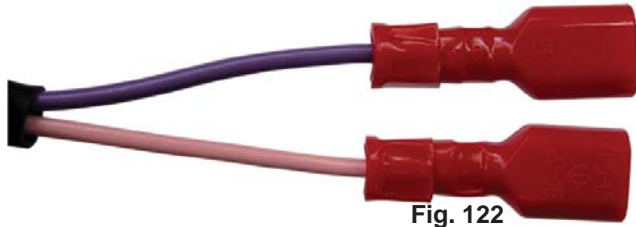
*Sealed connector for solution tank level sensor. Blue wire and orange wire + 24V.*



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December 23, 2020  
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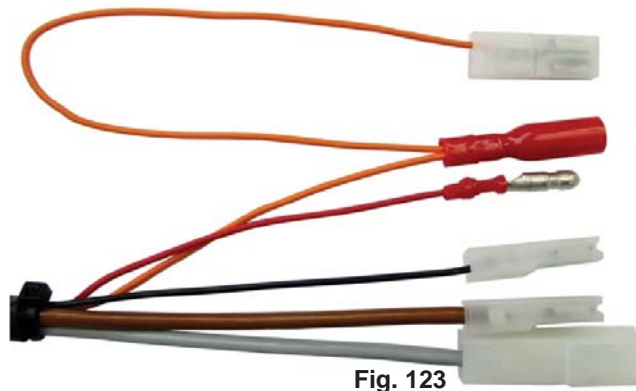
**H SOLENOID VALVE FAST-ON TERMINAL CONNECTOR**



*Solenoid valve fast-on terminal connector. Purple wire and pink wire +24 V.*

Fig. 122

**I DRIVE MOTOR, DRIVE MOTOR PROTECTOR AND RELEASE RELAY CONNECTOR**



*Relay coil connector, fast-on terminal orange wire +24 V.*

*Drive motor protector connector. Male tubular cable lugs for red wire, female tubular cable lugs for orange wire +24 V.*

*Relay coil connector, fast-on terminal black wire connected directly to the negative isolator switch +0 V.*

*Drive motor connection. Fast-on terminal brown wire and fast-in terminal grey wire.*

Fig. 123

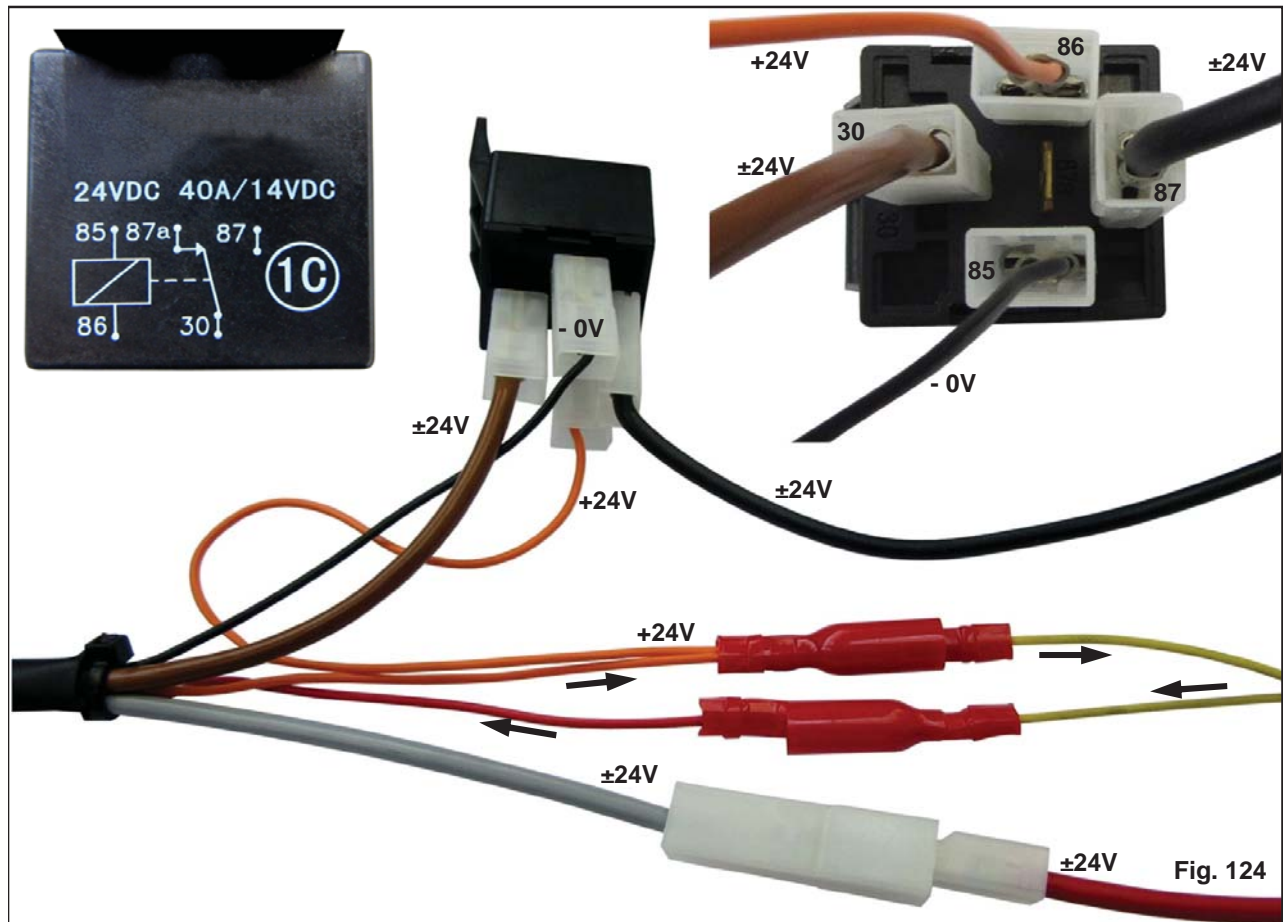


Fig. 124



**I BRUSH MOTOR AND MOTOR PROTECTOR CONNECTOR**



Fig. 125

*Brush motor connector. Ø 6 mm cable eyelet, red wire +24 V from the contactor, black wire +0 V from the negative isolator switch.*

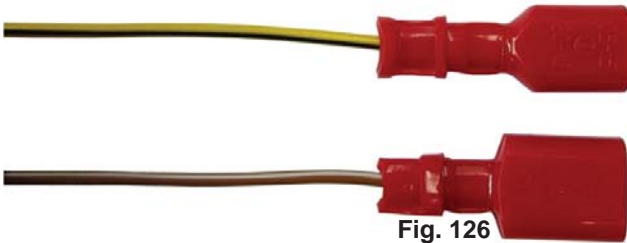


Fig. 126

*Brush motor protector fast-on terminal connector. Yellow-black wire and brown-white wire +0 V.*

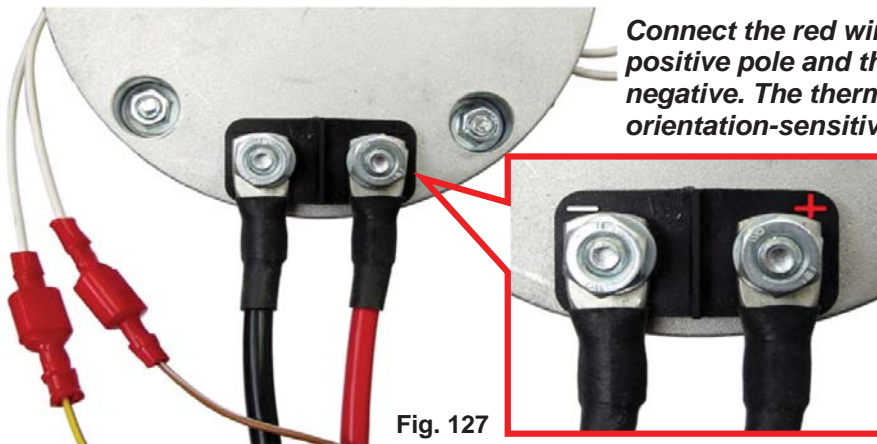


Fig. 127

*Connect the red wire to the motor's positive pole and the black wire to the negative. The thermal protector has orientation-sensitive connectors.*

**M OPTIONAL CHEMICAL PUMP CONNECTION**

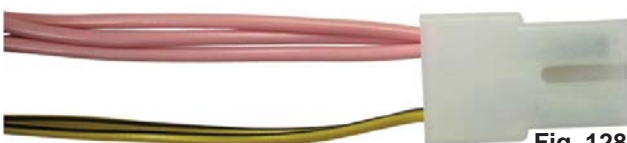


Fig. 128

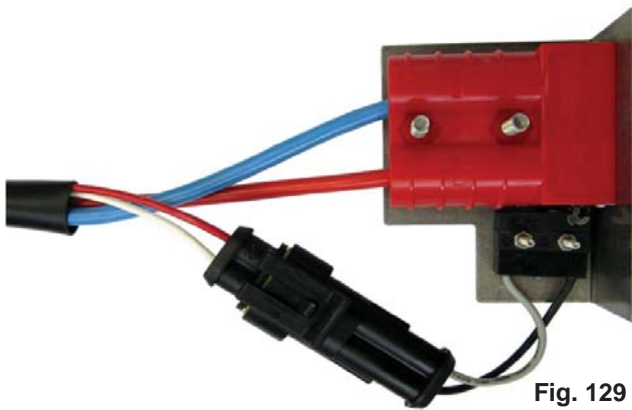
*Two-pin connector for connecting the Chem-dose pump. Pink wire +24 V, yellow-black wire +0 V, in series with the brush motor thermal protector*



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December 23, 2020  
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**N EXTERNAL BATTERY CHARGER CONNECTOR**



Connector for recharging the batteries using an external battery charger. Alongside is a microswitch that detects when the recharging connector is plugged in. When activated, the microswitch cuts off the power supply to the electronic board, thus preventing machine operation. The sealed connector provided for the on-board battery charger must be detached from the microswitch and connected to the microswitch on the battery charger.

Fig. 129

**"R" MACHINES WITH ROLLER HEAD ONLY**

**O ROLLER VERSIONS ONLY, CONNECTOR FOR ELECTROMAGNETIC COMPATIBILITY**



Connection via Ø 8 mm cable eyelet. Only used on machines with roller head, not used on the others. Red wire +24 V coming directly from the positive isolator switch. Connected directly to "ground" on the brush head arm, the purpose is to ensure machine compliance with European standards on electromagnetic compatibility.

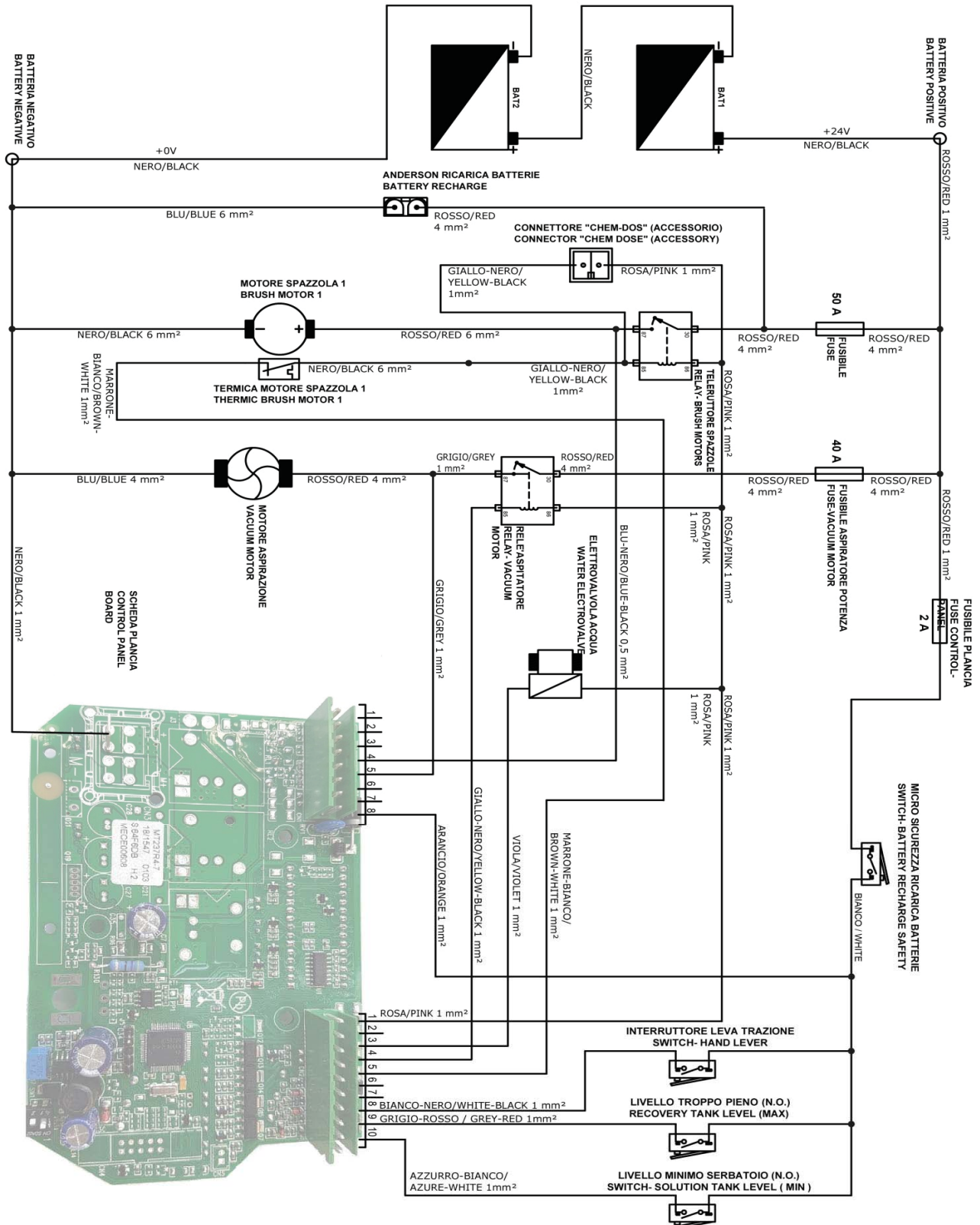
Do connect on versions with disk brushes.  
Cut off the eyelet terminal and insulate the wire.

Fig. 130

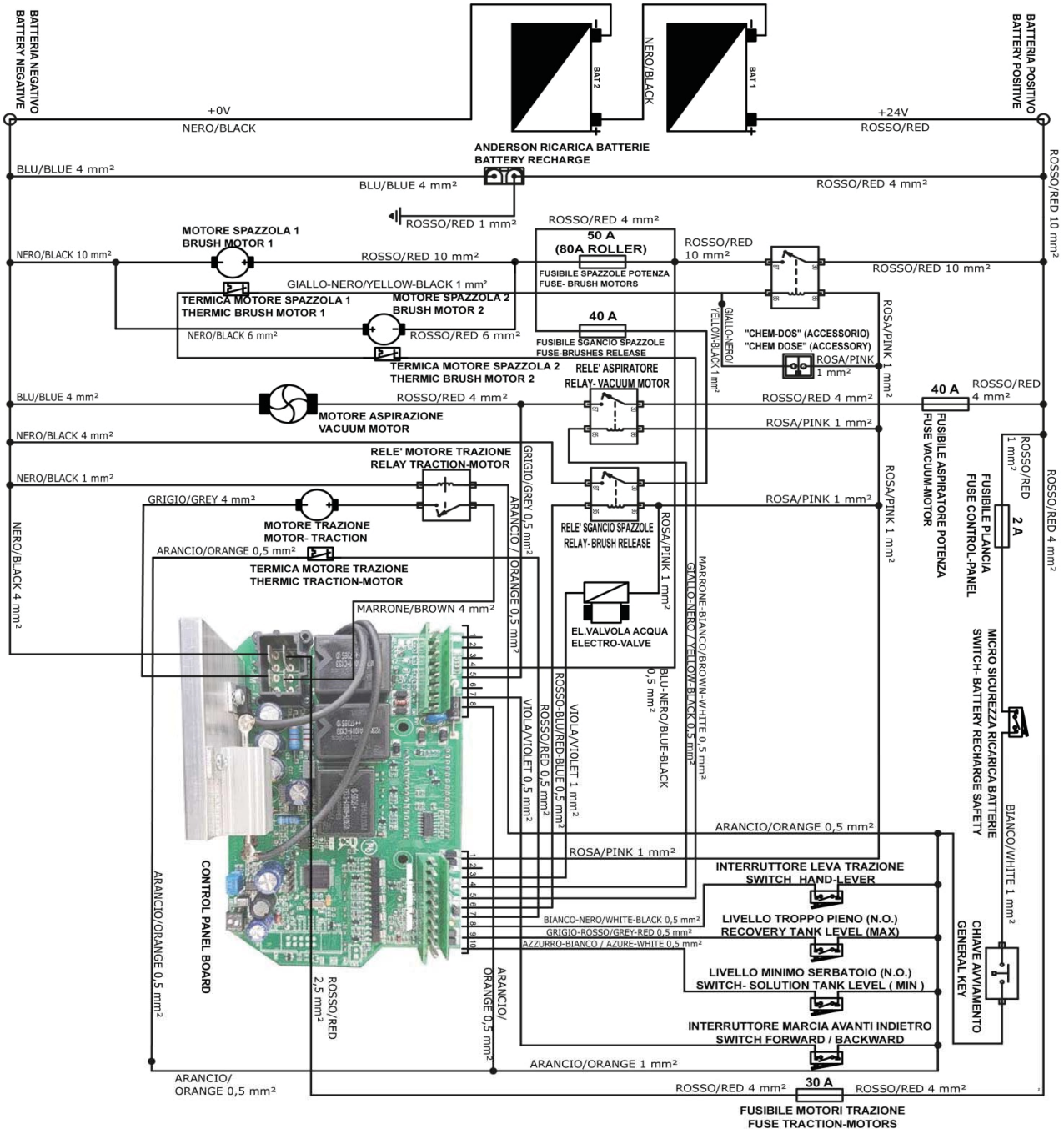


**D3 ELECTRICAL WIRING DIAGRAMS**

**D3.1 Wiring diagram, Pad Assist version**



### D3.2 Wiring diagram, Traction version





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**E**

## **ERROR CODES - TROUBLESHOOTING**



### **WARNING**

*Go to the designated draining area and empty the solution and dirty water tanks using the drain plugs and the hose provided.*

*Move the machine onto flat ground. If necessary, place chocks under the wheels.*

*Press the emergency switch, for the version with drive, or disable the functions by moving the switch to position "0" on all other versions.*

*Disconnect the battery from the machine's electronics by simply disconnecting the negative pole only, for the battery versions, or unplugging from the mains power supply for the cable versions.*

### **i INFORMATION**

Indicates particularly important instructions.

*In this Service Manual, the terms RIGHT and LEFT are used to indicate the sides of the machine. These always refer to the direction of travel of the machine.*

*In this Service Manual, the machine version may be written in brackets (Traction, Pad Assist) or quotation marks "Traction - Pad Assist". This note indicates that the instructions only refer to the version specified in brackets or quotation marks.*

## E1 ERROR CODES

### E1.1 Alarm messages on the instrument panel board display

*The instrument panel boards with display include verification of LED operation; turning the key for around 2 seconds, all the LEDs and the display will switch on. Immediately after this, the display will be show, in sequence, the firmware loaded on the electronic board "F05" (Firmware 05), the hardware version of the instrument panel board "r01" (Release 01), type of electronic board "o09" (Option 09) and finally total machine operating hours, which remain displayed until the machine is shut down.*

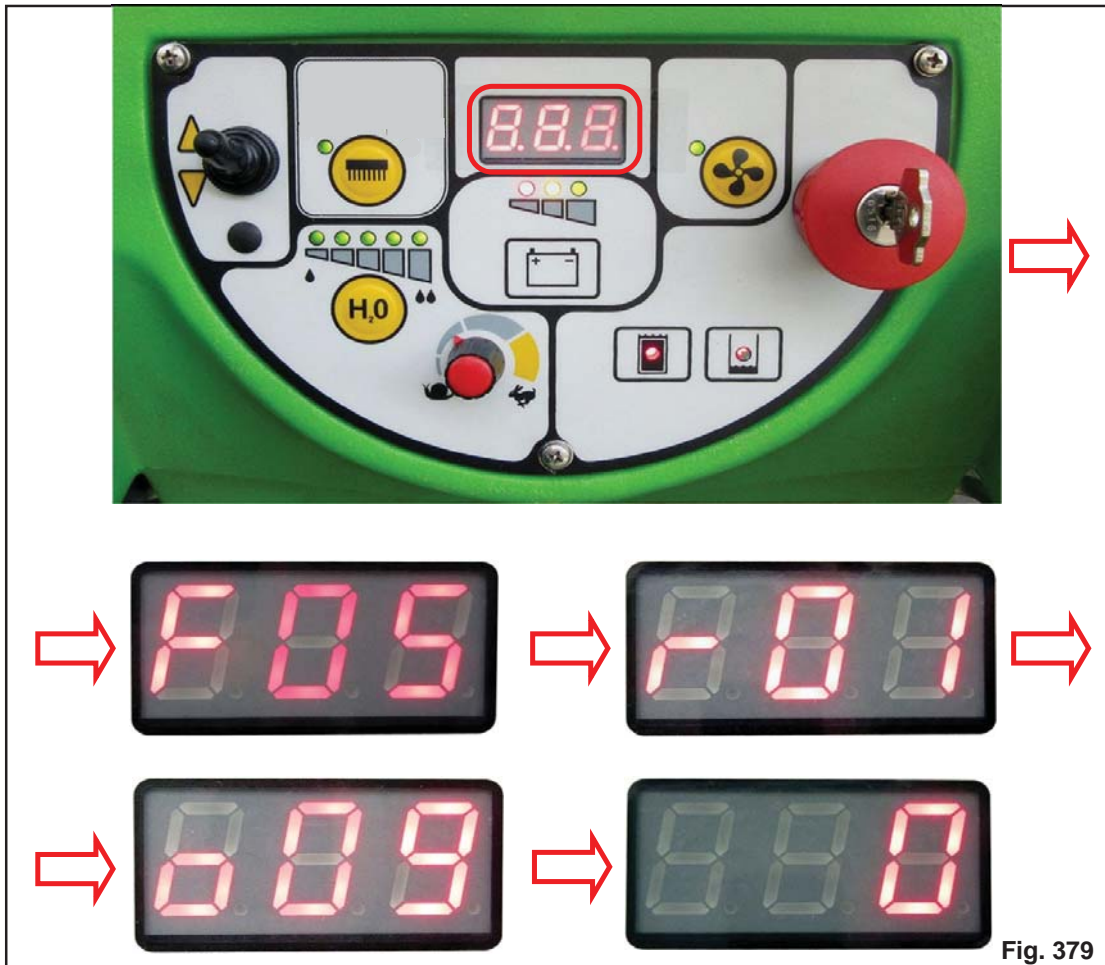


Fig. 379



**PLDC04452**

**REVISION 00**  
December 23, 2020  
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<b>ACA</b>	<b>Suction relay control fault</b>	Check the relay, disconnected or power contacts stuck in "closed" position. Instrument panel board fault
<b>ACC</b>	<b>DRIVE LEVER already pressed when starting or after emergency</b>	Release the drive lever and activate it again.
<b>ACH</b>	<b>Anomaly control solenoid valve water</b>	Check wiring, connection or short-circuit solenoid valve water.
<b>ACS</b>	<b>Brush contactor control fault</b>	Check the contactor, power contacts stuck in "closed" position. Contactor disconnected. Control signal fault from instrument panel board.
<b>BLT</b>	<b>Drive shutdown due to low battery voltage</b>	Recharge the batteries
<b>CLH</b>	<b>Clock - electronic board fault</b>	Replace the instrument panel board.
<b>FUP</b>	<b>Main fuse blown</b>	Check correct closing of the main contactor, replace if necessary. Internal control fault on instrument panel board, replace the board.
<b>HOM</b>	<b>Board MOSFET protector activated</b>	Wait for the thermal protector to cool down. Check drive motor current draw. Replace the instrument panel board.
<b>HOT</b>	<b>Drive motor protector activated</b>	Wait for the drive motor to cool down. Check motor current draw and continuity of the thermal protector. Replace the carbon brushes or thermal protector.
<b>LIM</b>	<b>Board (MOSFET) power limited</b>	Release the drive lever and activate it again. Switch the machine off for a few minutes to let it cool down. Faulty board, replace.
<b>MAN</b>	<b>DRIVE LEVER already pressed when starting or after emergency</b>	Release the drive lever and activate it again.
<b>MOF</b>	<b>Drive MOSFET open</b>	Check that the drive motor cable is not interrupted. Replace the instrument panel board.
<b>MOS</b>	<b>Electronic board MOSFET short-circuited</b>	Check correct operation of the main contactor, brush contactor, suction relay and drive relay. Replace the electronic board.
<b>POT</b>	<b>Drive speed knob faulty</b>	Drive disabled. Replace the instrument panel board.



## E2 TROUBLESHOOTING

### E2.1 Troubleshooting

#### E2.1.1 The machine won't start

1	Check battery voltage (B, BT).	If there is voltage, go to point 2 Recharge the batteries.
2	Check the key contact, "BT" only, see paragraph C 4.2, C 4.3.	If OK, go to point 3 If there is no continuity replace the key contact.
3	Check the instrument panel fuse on the wiring board, see paragraph D 5.1, D 6.1.	If the fuse is intact go to point 4. Otherwise replace the fuse.
4	Check the main contactor, see paragraph D 5.1, D 6.1.	If working correctly go to point 5. Otherwise replace the main contactor.
5	Check the continuity of the wiring.	

#### E2.1.2 The brush doesn't rotate

1	Check whether the display on the instrument panel shows error code MOS.	If shown, check that the contactor contact has not remained closed see D5. Otherwise go to point 2
2	Check the brush motor fuse E paragraph D 5.1.	If OK go to point 3. If blown, replace them.
3	Check continuity of the brush motor protector.	If there is continuity, go to point 4. Otherwise replace the protector or the motor.
4	Check operation of the brush actuator microswitch, see paragraph D 2.1.	If the microswitch is working go to point 5. Otherwise adjust it or replace it.
5	Check operation of the brush contactor, see chapter D5.	If it is working correctly, go to point 6. Otherwise replace or adjust the microswitch.
6	Check the brush actuator, refer to the wiring diagram.	If it is working correctly, go to point 7. Replace the brush switch.
7	Check the brush motor carbon brushes, see chapter A2.	If the carbon brushes are intact go to point 8. Otherwise replace the carbon brushes.
8	Check continuity of the wires.	If there is continuity go to point 9. Otherwise restore continuity.
9	Check the brush motor.	If the motor is intact go to point 10. Replace the brush motor.
10	Replace the instrument panel board, see paragraph C4.2, D6.1, D8.1.	

#### E2.1.3 No suction on the machine

1	Check that the suction hose is clean and intact B 3.2, B 3.4.	If the hose is dirty or damaged, clean it or replace it Otherwise go to point 2
2	Check that the squeegee blades are clean and intact.	If everything is OK, go to point 3. Otherwise replace the blades.
3	Check that squeegee the is clean and intact	If the squeegee is clean and intact, go to point 4. Replace the squeegee.
4	Check the lid gasket, see paragraph B 5.1.	If intact, go to point E 1.3.4 Otherwise replace it.





**E2.1.4 The suction motor isn't working**

<b>1</b>	Check whether the display on the instrument panel shows error code "AcA".	If shown, check the suction relay C paragraph D5.1 and its wiring.
		If not shown go to point 2.
<b>2</b>	Check if the "tank full" light on the instrument panel board is on.	If on, empty the dirty water tank.
		If off, go to point 3.
<b>3</b>	Check the fuse F, see paragraph D5.1.	If still intact go to point 4.
		Otherwise, replace it with a new one.
<b>4</b>	Check the connection of the suction motor.	If the connection is intact go to point 5.
		Otherwise restore the connection / connector.
<b>5</b>	Check operation of relay C, see paragraph D5.1.	Doesn't switch, replace or check wiring.
		If it switches, go to point 6.
<b>6</b>	Check the suction motor actuator, see the wiring diagram.	If it is working, go to point 7.
		Otherwise replace the instrument panel board, C4.
<b>7</b>	Check the motor carbon brushes or replace the brush motor, see chapter B1.	Check the carbon brushes or the motor, chapters A
		If everything is OK go to point 8.
<b>8</b>	Instrument panel board, chapter C1.	Check connections to the instrument panel.
		Replace the instrument panel board.

**E2.1.5 No water is released**

<b>1</b>	Check that all the LEDs on the instrument panel come on and that the solenoid valve opens.	The solenoid valve opens, go to point 2.
		The solenoid valve remains closed, go to point 3.
<b>2</b>	Check that the filter is not blocked, see paragraph B3.1.	If blocked, clean it and reassemble.
		If not blocked go to point 4.
<b>3</b>	Check that the solenoid valve is working correctly, power it at 24 V. Check that there is a voltage of 24 V at the ends of the solenoid valve wires.	If the checks on the solenoid valve are positive, check the wiring output voltage.
		If the output voltage is not 24 V, check the wiring, replace the instrument panel board.

**E2.1.6 The machine doesn't move forwards**

<b>1</b>	Check the error codes on the instrument panel board display, see chapter E 1.1.	If a code is shown, check which one.
		If no codes are shown, go to point 2.
<b>2</b>	Check the connections under the instrument panel, see paragraph C 4.2, C 4.3.	If the connections are OK, go to point 3
		Otherwise restore the connections.
<b>3</b>	Check operation of the brush actuator microswitch, see paragraph D 2.1.	If the microswitch is working, go to point 4.
		Otherwise adjust it or replace it.
<b>4</b>	Check the voltage reaches the coil and the drive relay power contact, see chapter C3.	If there is no voltage go to point 6.
		If there is voltage, go to point 5.
<b>5</b>	Check the motor carbon brushes and wiring.	If everything is OK, go to point 6.
		Replace the carbon brushes or restore the wiring.
<b>6</b>	Replace the instrument panel board, see paragraph C 4.2, C 4.3.	



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