STIGA

Troubleshooting Manual

BATTERY LAWN MOWER

60V series

Year of manifacture 2018 → 2020

Revision 1 (3/09/2019)

1. Summary

2. Introduction

This Manual deals with the problems and checks connected with the electrical system.
All work can be done using a tester without having to use special equipment.

The electrical diagrams can be useful to you for understanding how the system works and to facilitate the pinpointing of any problems.

Faulty electronic cards, batteries and battery chargers must always be replaced without trying to repair them or replace single components.

2.1 Electrical Components

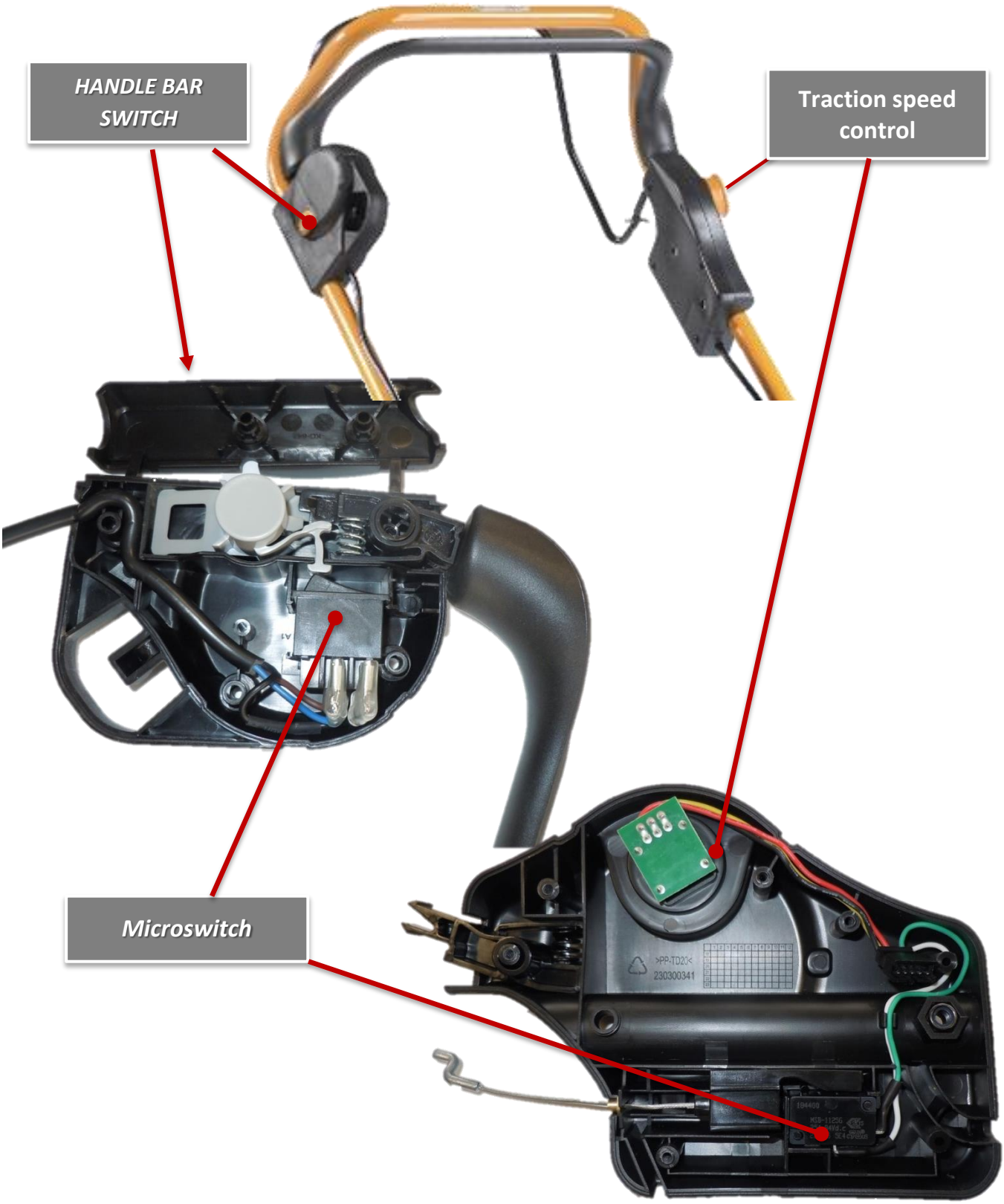
General information:
We can divide electric components into 3 main groups:

- Handlebar with “Starting Switch and Wheel Traction speed knob *(if equipped)”* ;
- POWER HEAD;
- Electric traction *(if equipped)*

This section details the position of the electrical components:

2.1.1 HANDLE - Starting Switch and Knob Wheel Traction speed knob *(if equipped)*

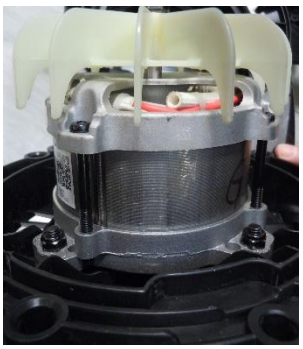
The handle of the lawn mower is fitted with starter switch and, if provided, traction speed variator for the selection of the requested speed.



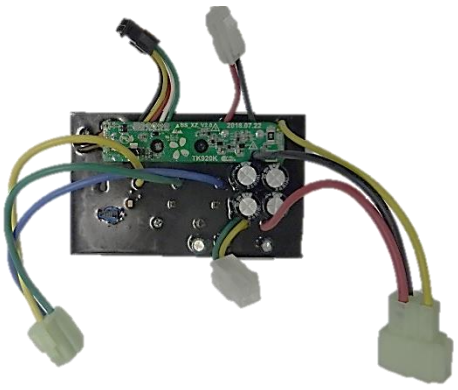
2.1.2 POWER HEAD

The element named “POWER HEAD” consists of three main components: Battery, Motor and Printed Circuit Board (PCB).

BATTERY

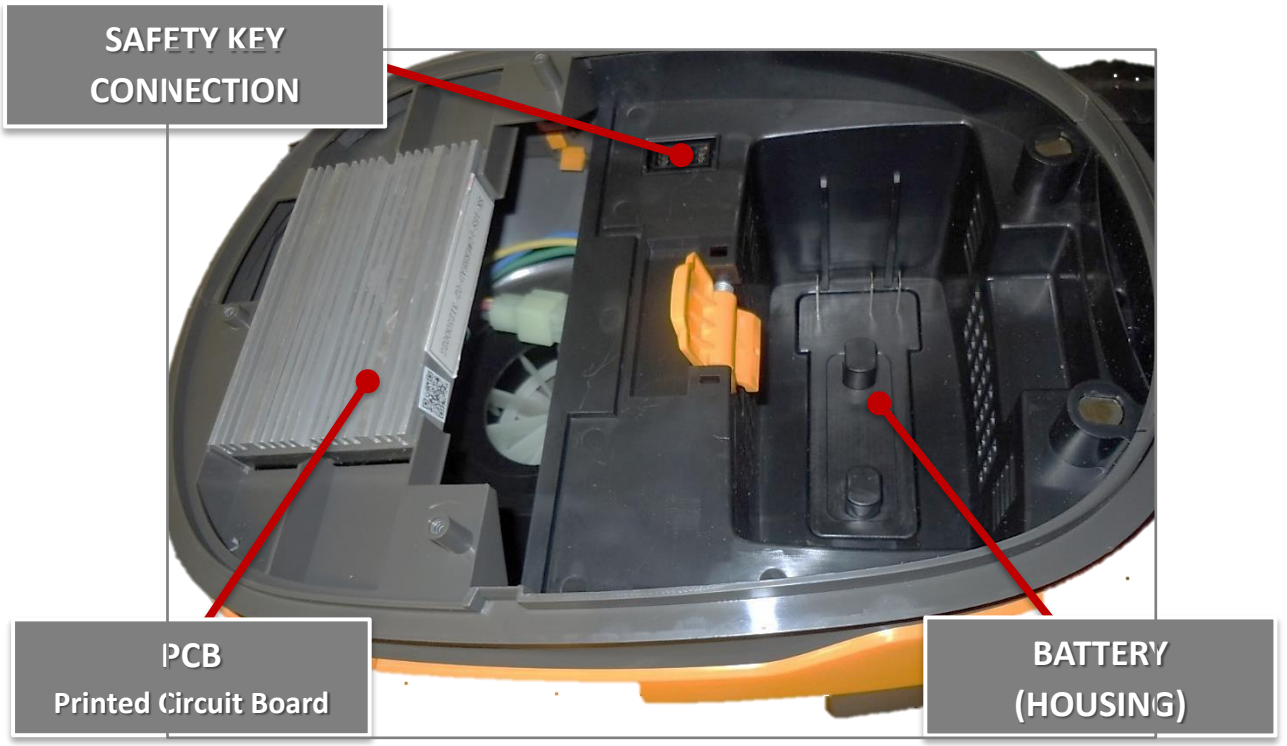


MOTOR

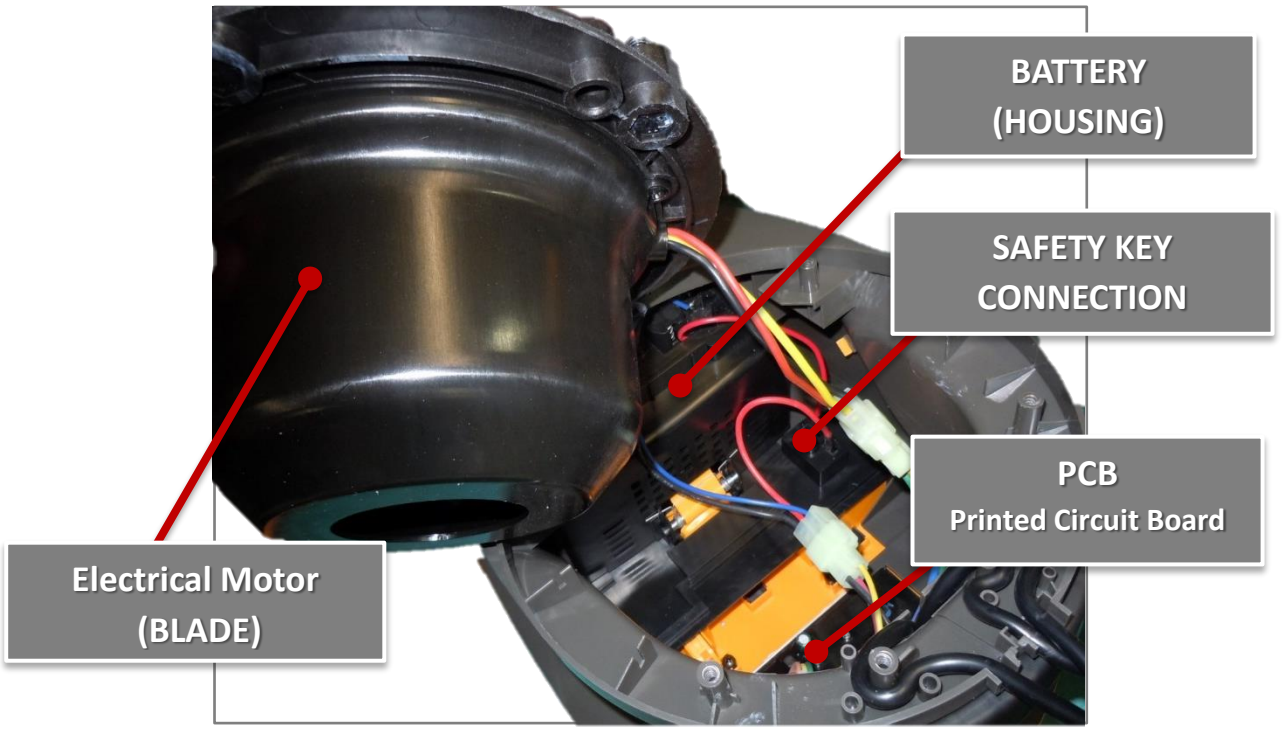


PCB
(Printed Circuit Board)

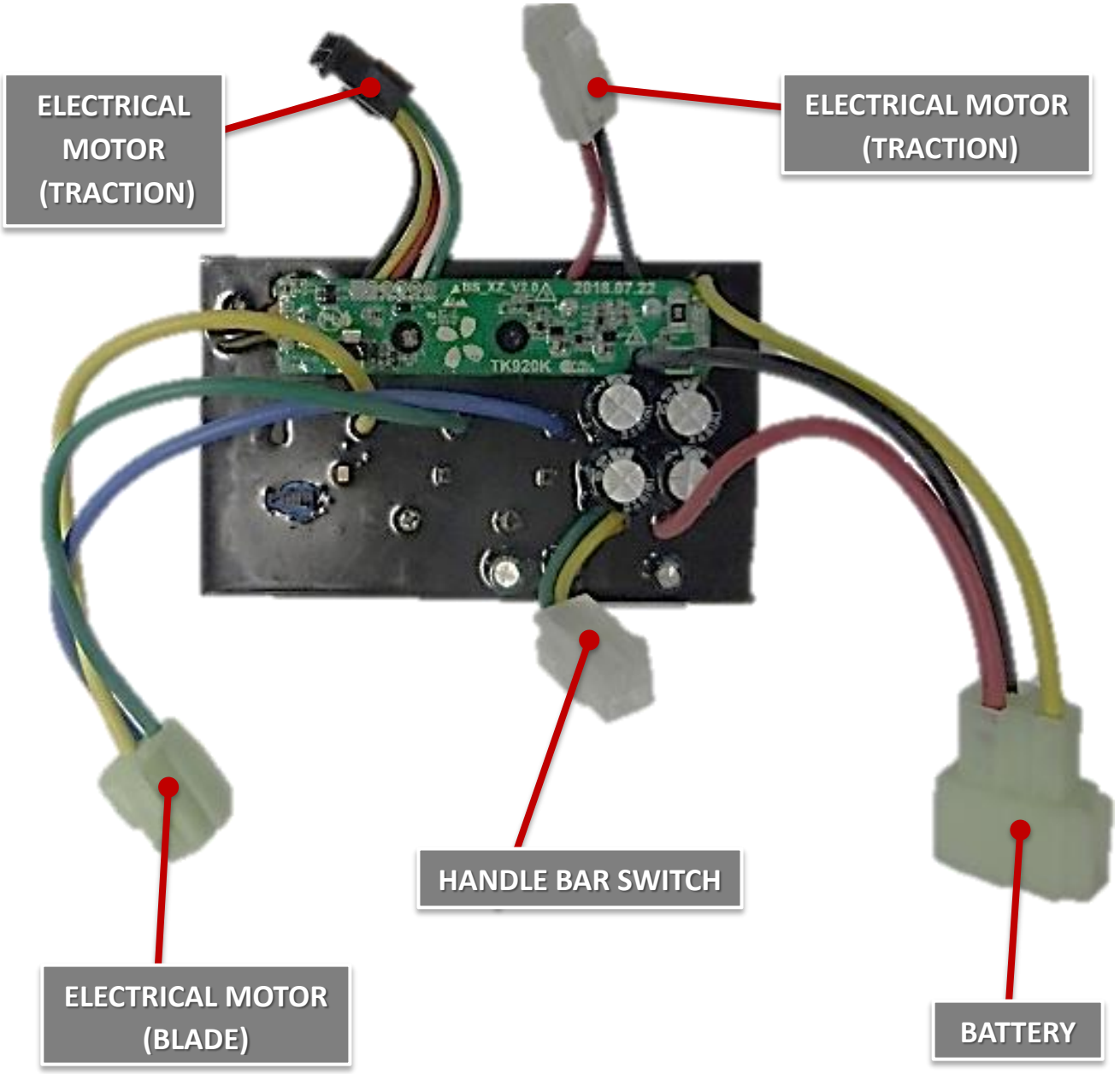
UPPER SIDE



LOWER SIDE



PCB Cables, Connectors and Components

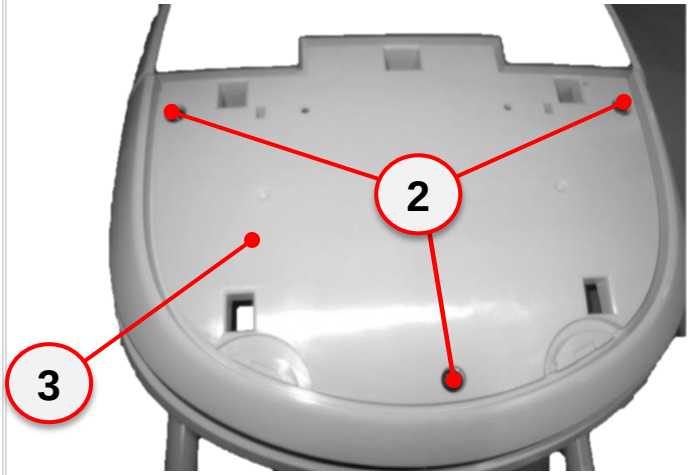
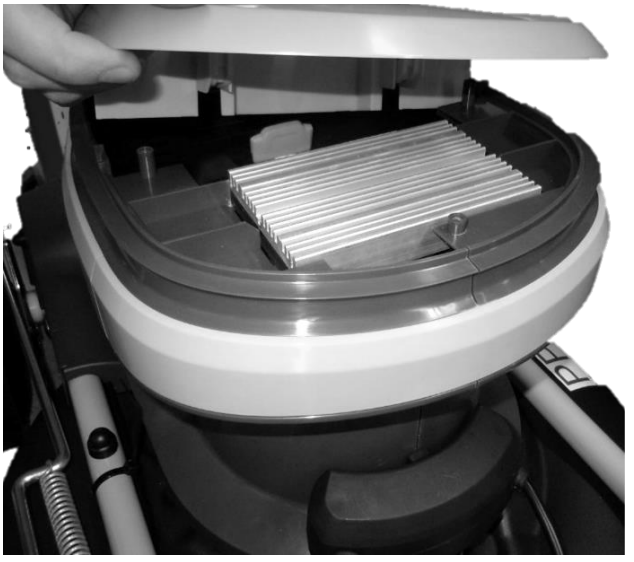


3. Disassembly of the Power Head's components

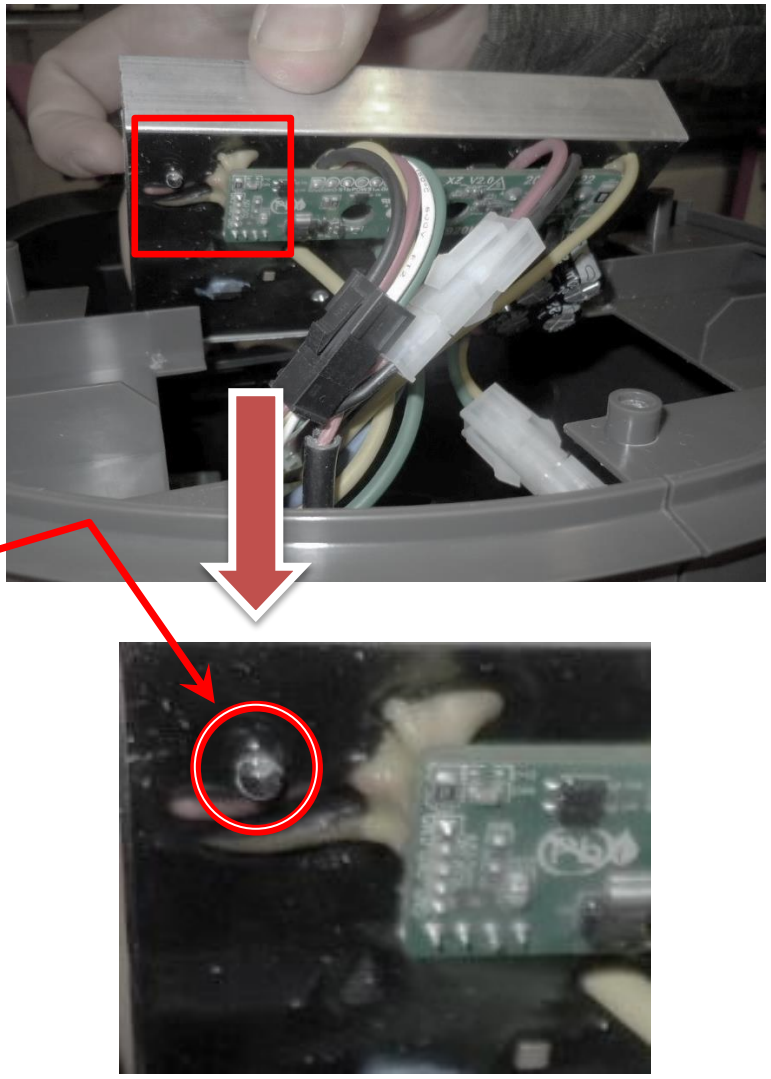
*This section gives the guidelines for the disassembly of the main **Power Head** components.*

3.1 Disassembly of the top Cover

The disassembly of the top cover allows the visual access to the PCB and to main connections to electric components (battery, motor and handle bar switch); this will allow to carry out the troubleshooting procedures described on the following chapters. (*see 4 e 5*).

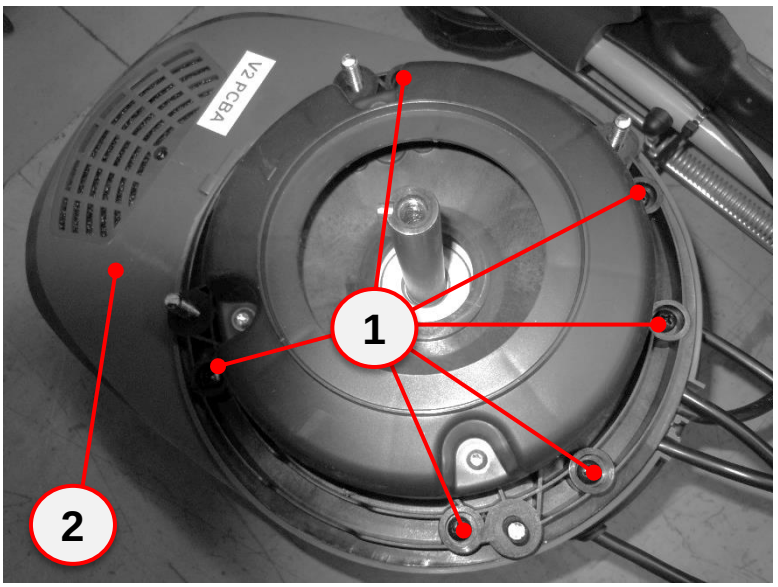
Remove the external cover **(1).**	
Unscrew the three screws **(2)** and remove the top cover **(3)**.	 

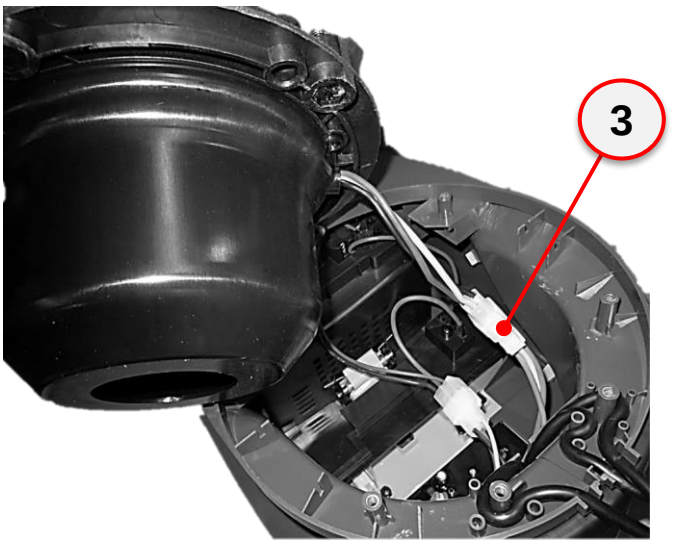
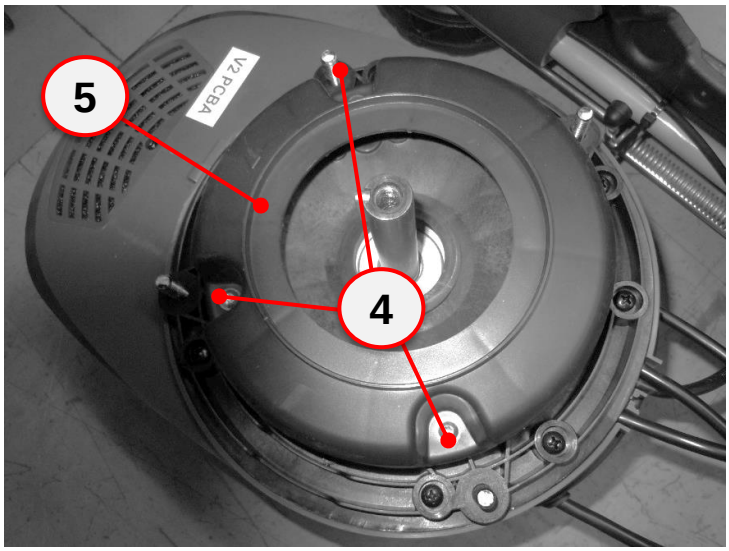
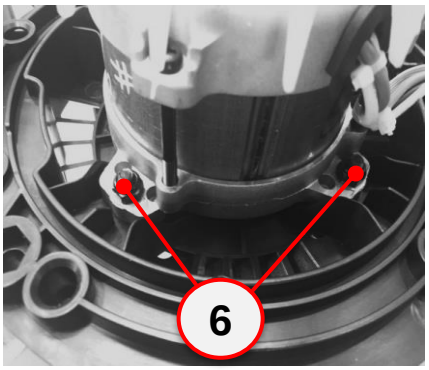
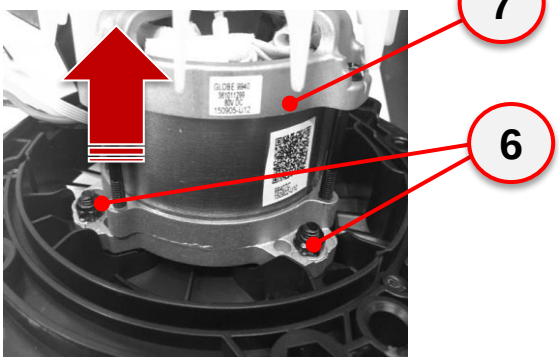
PCB Error Indicator LED **position**



3.2 Removal of the Electrical Motor

Unscrew the six screws **(1)** and remove the Motor support **(2)** from ***Power Head***.



Disconnect the three-phase line connector **(3).**	
Unscrew the three screws **(4)** and remove the Motor conveyor **(5)**.	
Unscrew the four screws **(6)** and remove the Electrical Motor **(7)**.	 

3.3 Removal of the Electronic Card (PCB)

Remove the top Cover *3.1Disassembly of the top Cover* Disconnect all the terminals that connect the electronic card to the various users (motors, battery, starter switch, etc .....).	

4. Electrical Troubleshooting

Here below some of the problems connected to the malfunctioning of the electrical system, with their probable cause and the remedial action to be taken.

4.1 Troubleshooting (machine)

General information

This chapter deals with the problems connected to the malfunctioning of the machine and with their probable cause and the remedial action to be taken.

The owner's manual already gives a basic troubleshooting guide to help out the user in solving the most common possible malfunctions.

The printed circuit board (PCB) has a LED with various flashing sequences and has an acoustic alarm (buzzer) with various intermittent sequences. These two devices (LED + buzzer) provide useful indications to recognise failures on the electric system.

Alarm BUZZER (BIP) String configuration:

Nr.	"BIPS" STRING	CAUSE
1	3/cycle	Over current
2	5/cycle	Over temperature (whole machine or battery)
3	2/cycle	Others failures

Note: cycle means the number of close "Bips" cyclically repeated. Example: 3/cycle means 3 close Bips, short pause, 3 close Bips and so on.

LED Flash String configuration:

Nr.	FLASH STRING	CAUSE
1	1/cycle	The PCB self-checking failed
2	3/cycle	The communication between PCB and battery pack failed
3	4/cycle	Over current protection
4	5/cycle	Low voltage protection
5	6/cycle	High temperature protection or over current on three phase protection
6	7/cycle	Motor rotation detector
7	8/cycle	Locked-rotor protection

Note : cycle means the number of close flashings cyclically repeated. Example: 3/cycle means 3 close flashings, short pause, 3 close flashings and so on.

PROBLEM	CYCLE		PROBABLE CAUSE	REMEDY
The motor does not start when the Handle Bar Switch is pressed	-	-	Safety key is not inserted or is inserted incorrectly.	Insert the key.
	-	-	Battery is not inserted or is inserted incorrectly.	Open the hatch and check that the battery is fitted into its housing correctly.
	-	-	Motor start-up is slow.	Press and hold the safety button and control lever for 1-3 seconds.
	-	-	Bad connection in Handle Bar Switch connector.	Make sure the Handle Bar Switch connector is properly assembled, dry, not damaged and free from corrosion (*see 5.1*).
	-	-	Internal damage to Handle Bar Switch.	Replace the Handle Bar Switch.
	-	-	Connectors (Motor and Battery) not correctly assembled.	Make sure the connectors are correctly assembled.
	-	-	Short circuit in PCB	Check the PCB *(see 5.3)* and replace if necessary.
When the Handle Bar Switch is pressed Electric motor jerks shortly then stops and the machine alarm buzzer is triggered.	**2**	**5**	Low Battery	Check the battery status and recharge if necessary.
	2	**7**	Motor rotation detector (PCB) not connected to Control Unit.	Make sure the motor rotation detector connector is correctly assembled.
	2	**7**	Motor rotation detector (PCB) failure.	Replace the Electric Motor (*see 3.2*)
	5	**6**	The thermal protection has tripped due to overheating of the motor.	Wait for at least 5 minutes and then restart.

PROBLEM	CYCLE		PROBABLE CAUSE	REMEDY
The motor shuts down whilst working and the machine alarm buzzer is triggered	**3**	**4**	Current Sensor has tripped due to excessive current absorption caused by: • excessively high grass cutting • obstructions that prevent rotation of the cutting means • too much grass debris accumulated in the chassis and discharge channel	Set a higher cutting height when the grass is very tall, then set a lower height and cut the lawn again. • Remove the obstructions. • Clean the machine. Wait for at least 5 minutes and then restart the machine.
	2	**5**	Low Battery	Check the battery status and recharge if necessary.
	5	**6**	The thermal protection has tripped due to overheating of the motor.	Wait for at least 5 minutes and then restart.

4.2 Troubleshooting (BATTERY and CHARGER)

General information:
This chapter deals with the problems connected to the malfunctioning of BATTERY & BATTERY CHARGER and with their probable cause and the remedial action to be taken.
The Operator's Manual of BATTERY & BATTERY CHARGER already include most of common possible malfunctions highlighted in this table.

PROBLEM	PROBABLE CAUSE	REMEDY
No LED´s light up on battery when pressing the status button	Low Battery	Recharge immediately the battery
	Faulty battery (*see 5.5*)	Replace battery.
The battery charger is not recharging the battery (NO LEDs on the charger are shown when battery is inserted)	Bad connection between charger and battery	Check it is correctly inserted. Make sure power connectors between charger and battery are not damaged and free from dirt.
	The battery charger is not energized	Check it is plugged in and the power socket is energized
	Faulty battery charger	Disconnect charger from power socket for >1 min then reconnect it to power socket. Make sure the fan and the green LED lights up. If not, replace with an original spare part.
Fixed Red LED on charger when battery is inserted.	Battery out of temperature range	Make sure ambient temperature is between 7 °C and 40°C.
Flashing red LED on charger when battery is inserted.	Bad connection between charger and battery	Check it is correctly inserted. Make sure power connectors between charger and battery are not damaged and free from dirt.
	Faulty battery (*see 5.5*)	Replace battery.
	Broken charger	Disconnect charger from mains for >1 min. then reconnect to mains outlet. Make sure the fan and the green LED lights up. If not, replace with an original spare part.
Green LED on charger for approx. 5-15 seconds when battery is inserted, thereafter flashing red LED. The behaviour then repeats from the beginning.	Faulty battery	Place the battery in a **functioning charger.** If same problem occur replace battery.
	Broken charger	Place a **functioning battery** in the charger. If same problem occur, replace charger.

5. Operating check of Electrical components (Handlebar Switch, PCB, Battery)

This section completes and develops the previous one "Electrical Troubleshooting".

The purpose is to provide a step by step guide to identify faulty components avoiding the disassemble of the entire machine. All checks can be done with a multimeter without need of special equipments

5.1 Operating check of Handlebar Switch (ON/OFF)

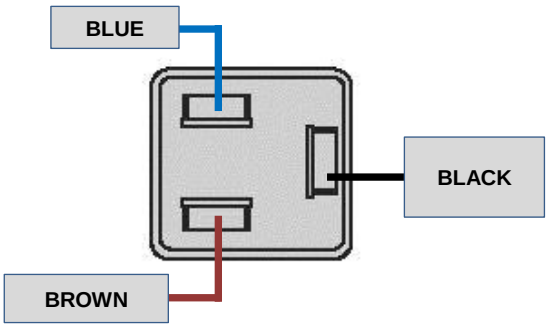
This check has to be done by unplugging the connector of the handlebar switch (**pic.3**) contained inside the connector case (**part 1 on pic. 1**). Use the multimeter in Ohmmeter function.

Pic.1


Pic.2


Pic.3

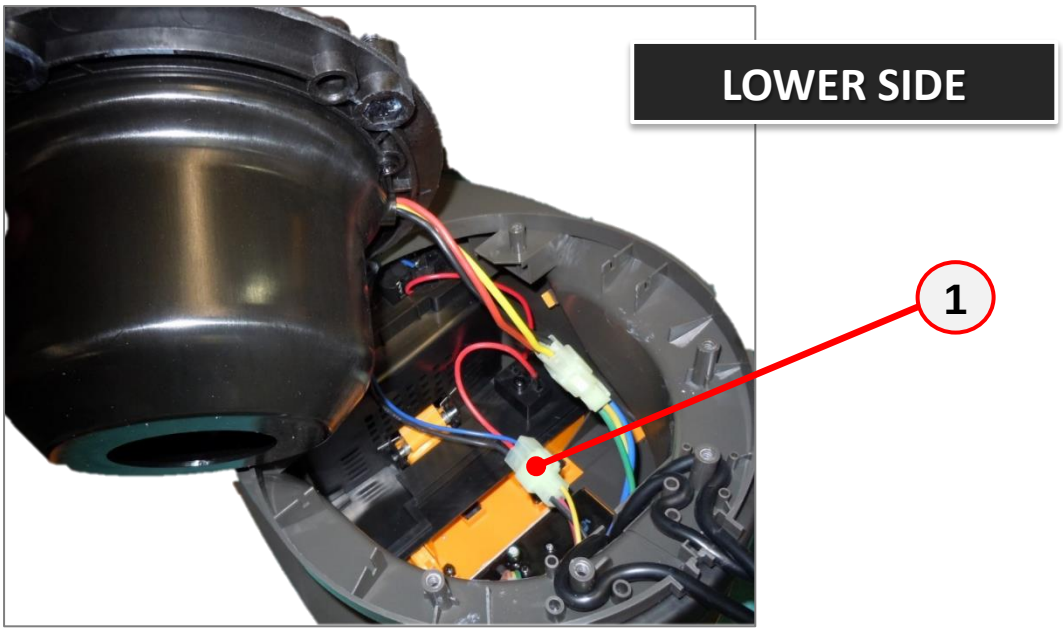
Check should give this result:



CABLE COLOR	TESTER READING AND HANDLE BAR SWITCH CONDITION (ON/OFF)	
Brown - Blue	∞ (released)	0 (pressed)
Black - Brown	∞ (released)	0 (pressed)
Black - Blue	∞ (released)	0 (pressed)

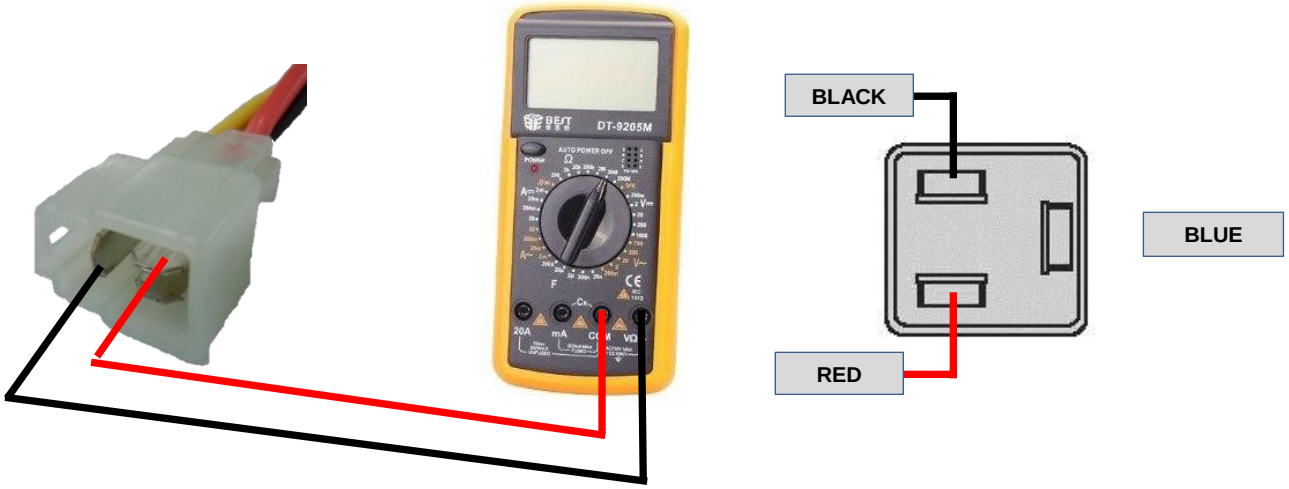
If the values do not comply with the above table, make sure that the electric cable is not damaged and check the integrity of the handlebar switch.

5.2 Checking the voltage on the battery connector (power supply)



This check has to be done by unplugging the connector between battery and PCB (**part 1 in pic. 1**).
Battery and safety key must be in working position.
Set the multimeter in voltmeter function (DC 0-200V)

Check should give this result:



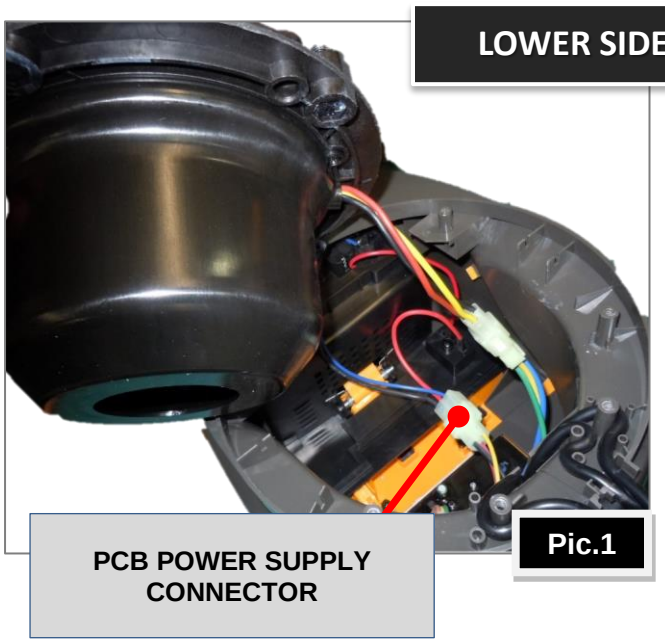
CABLE COLOR	TESTER READING (Volt)
Blue - Red	Battery voltage
Blue - Black	0 *
Black - Red	Battery voltage

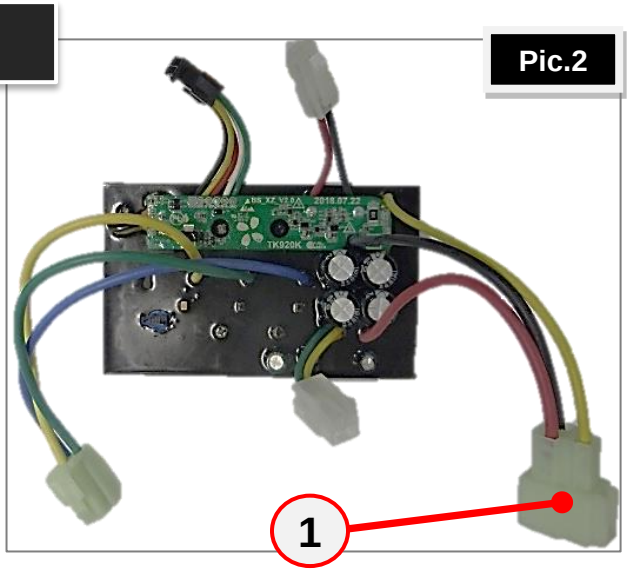
***** with multimeter in Ohmmeter function, the impedance must be **147Kohm (±10Kohm)**

IMPORTANT: before performing the test make sure that the battery is charged and in order.

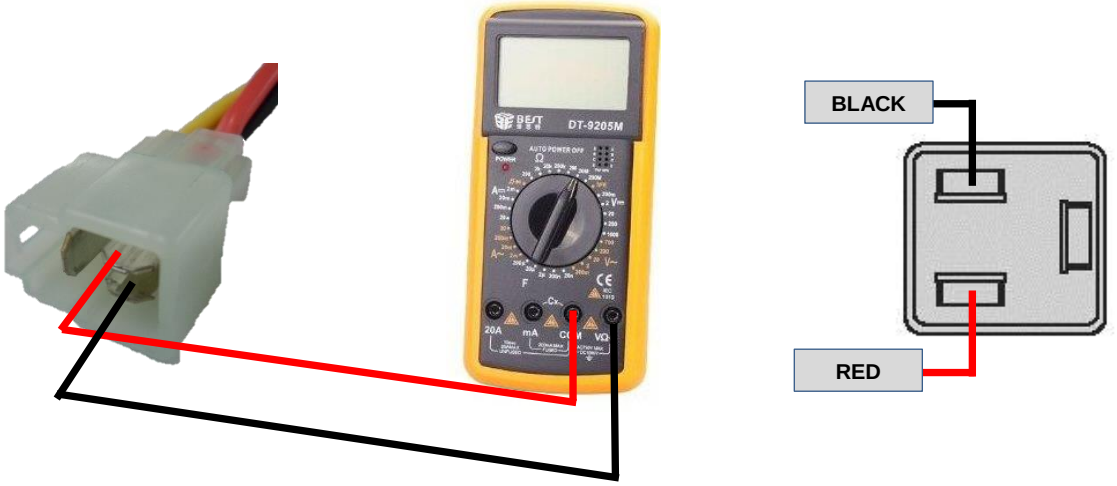
5.3 Impedance Checking on the electronic card (PCB)

This check has to be done by unplugging the PCB power supply connector **(Pic.1**).
Perform the check on the PCB side connector (**part 1, pic. 2**) by measuring the impedance between positive and negative with multimeter in Ohmmeter function (KOhm)





Check should give this result:

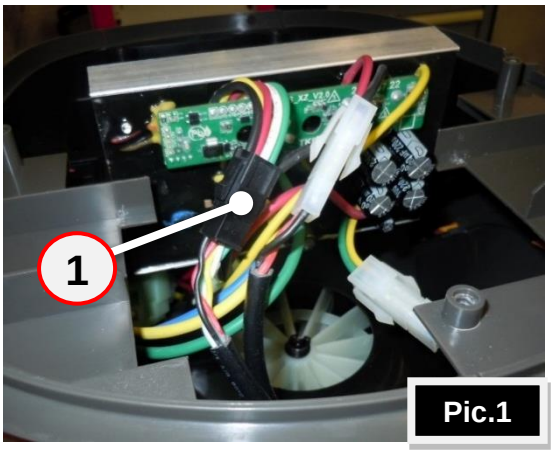


CABLE COLOR	TESTER READING (Ohm)
Black - Red	**Open circuit**

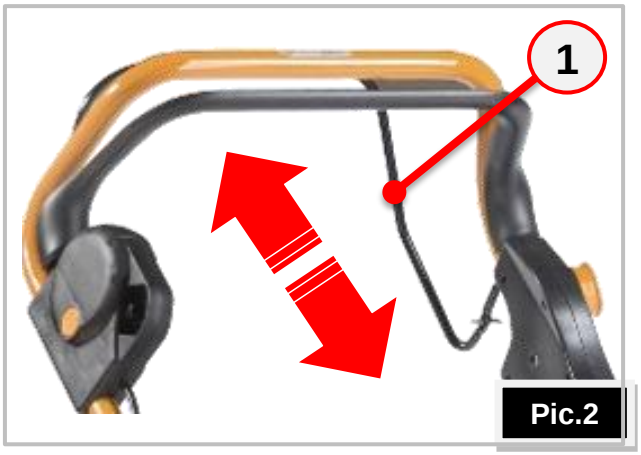
IMPORTANT: if the measured value is 0 it means that the PCB is damaged.

5.4 Operating check of the traction speed variator

This check has to be done by unplugging the connection cable between the Electronic card and the Speed variator on the 6-pole connector (**part 1, pic. 2**), with multimeter in Ohmmeter function (KOhm).

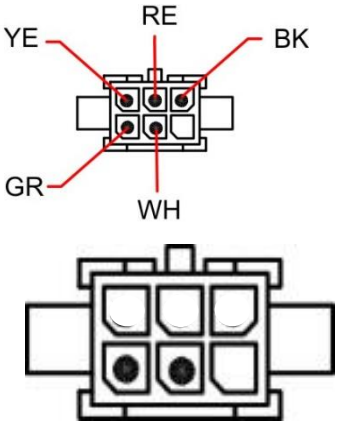


Pic.1



Pic.2

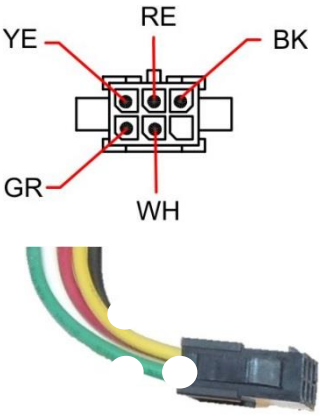
The first check with the traction engagement lever (**part 1, pic. 2**) released or pressed must give the following results:



CABLE COLOR	TESTER READING AND DRIVE ENGAGED LEVER CONDITION	
Green - White	∞ (released)	0 (Pressed)

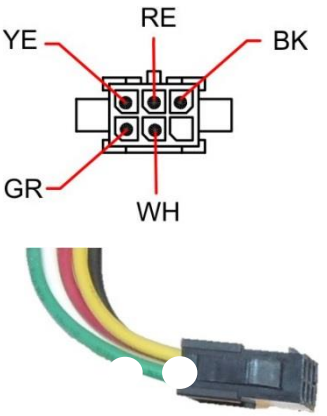
If the values do NOT correspond, check that the cable is intact and that the traction speed variator is functioning (See next steps)

With the second check the impedance value will be found and the result should be as follows:



CABLE COLOR	TESTER READING (Ohm)
Black - Red	**10 KΩ** +/- 5%

With the third test, the traction speed variator is tested and the result should be as follows:

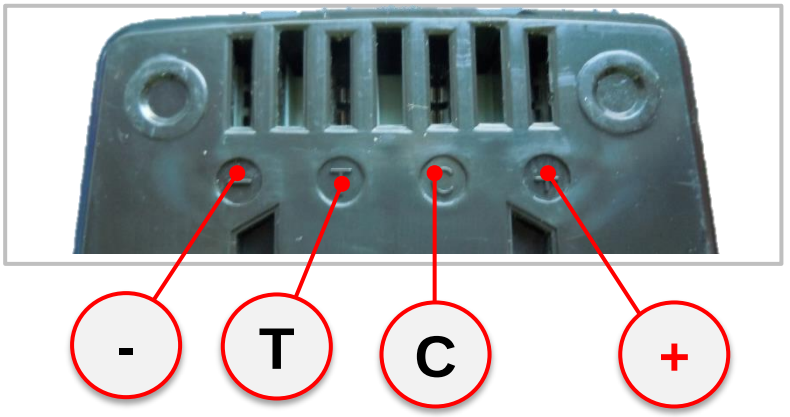


CABLE COLOR	TESTER READING AND TRACTION SPEED CONTROL CONDITION	
Black - Yellow	<100 **Ω**	10 KΩ

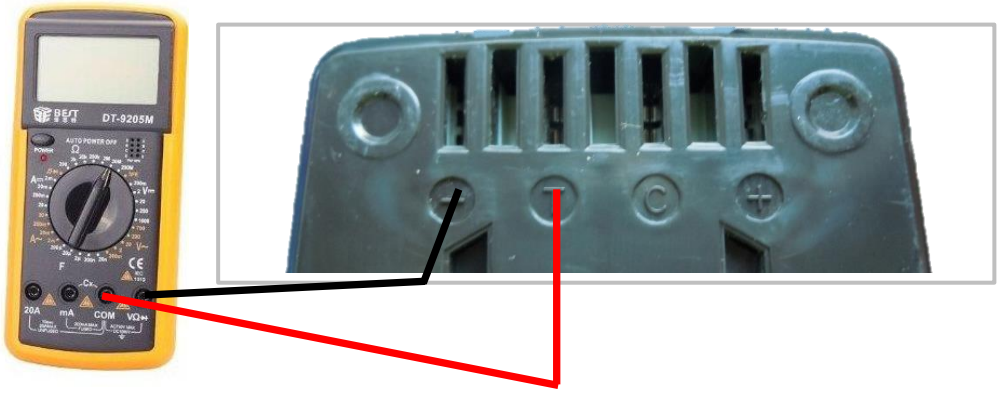
NOTA: each increase or decrease in speed (knob notch) corresponds to +/- 1.2 KΩ.

5.5 Battery TEST

In the event that the battery can not be recharged it is recommended to perform the following check with the multimeter.

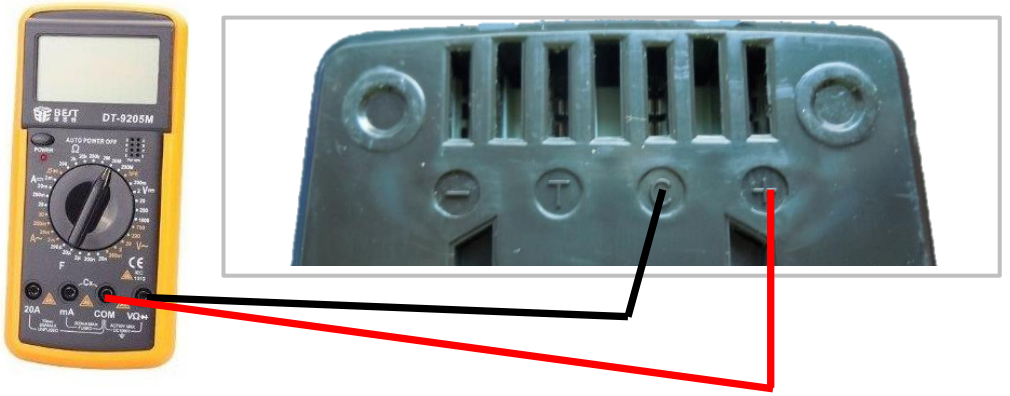


1. Measure the impedance with multimeter in Ohmmeter function between terminals "**T**" and "**-**": The measured value must be **147Kohm (±10kohm)**



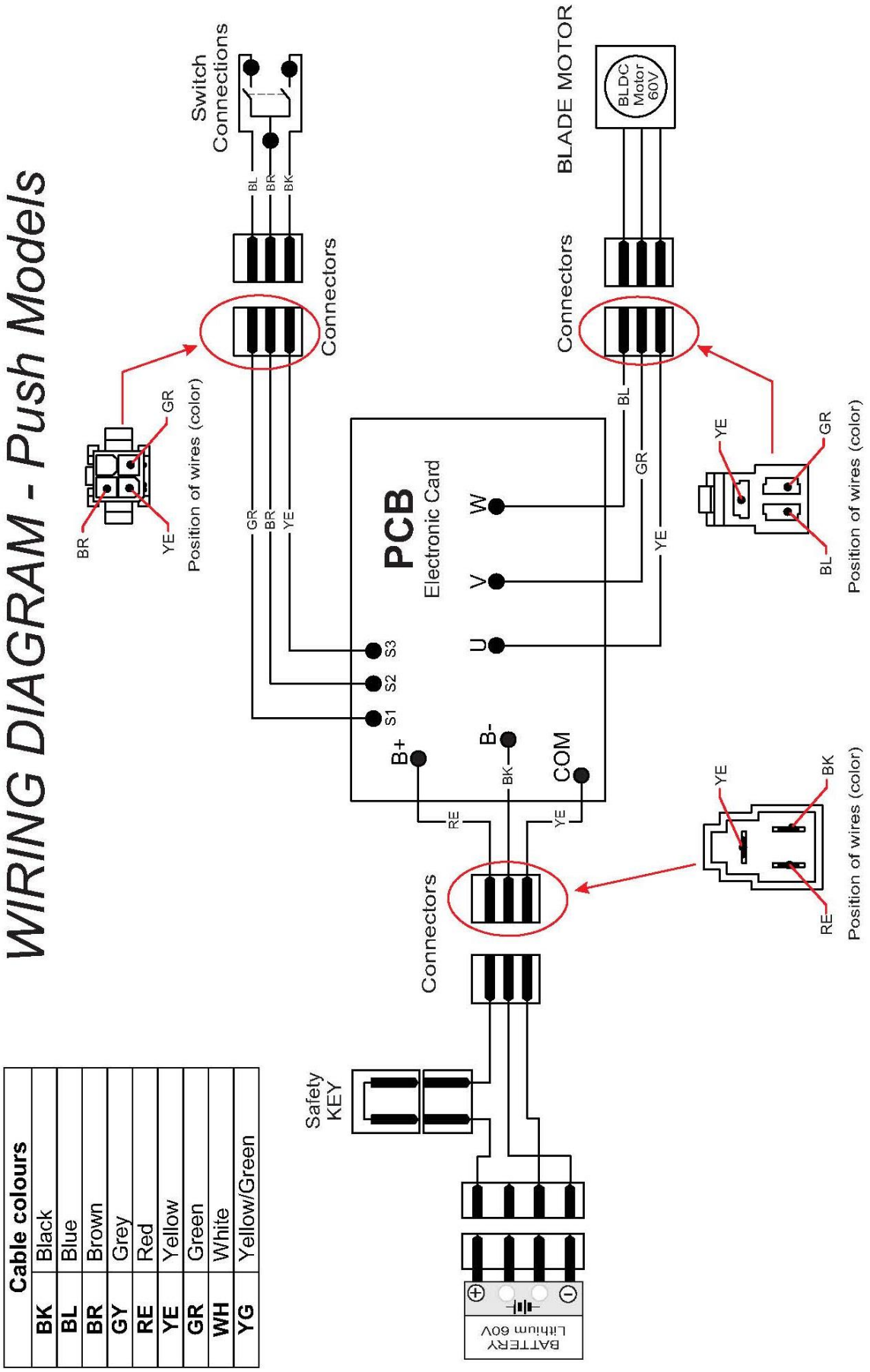
If the measured value is out of the range given it means that the battery is damaged.

2. Measure the voltage with multimeter in Voltmeter function between terminals "**C**" e "**-** o **+**", the measured value is variable (at the beginning it is around 20V, then it gradually decreases up to 0V);

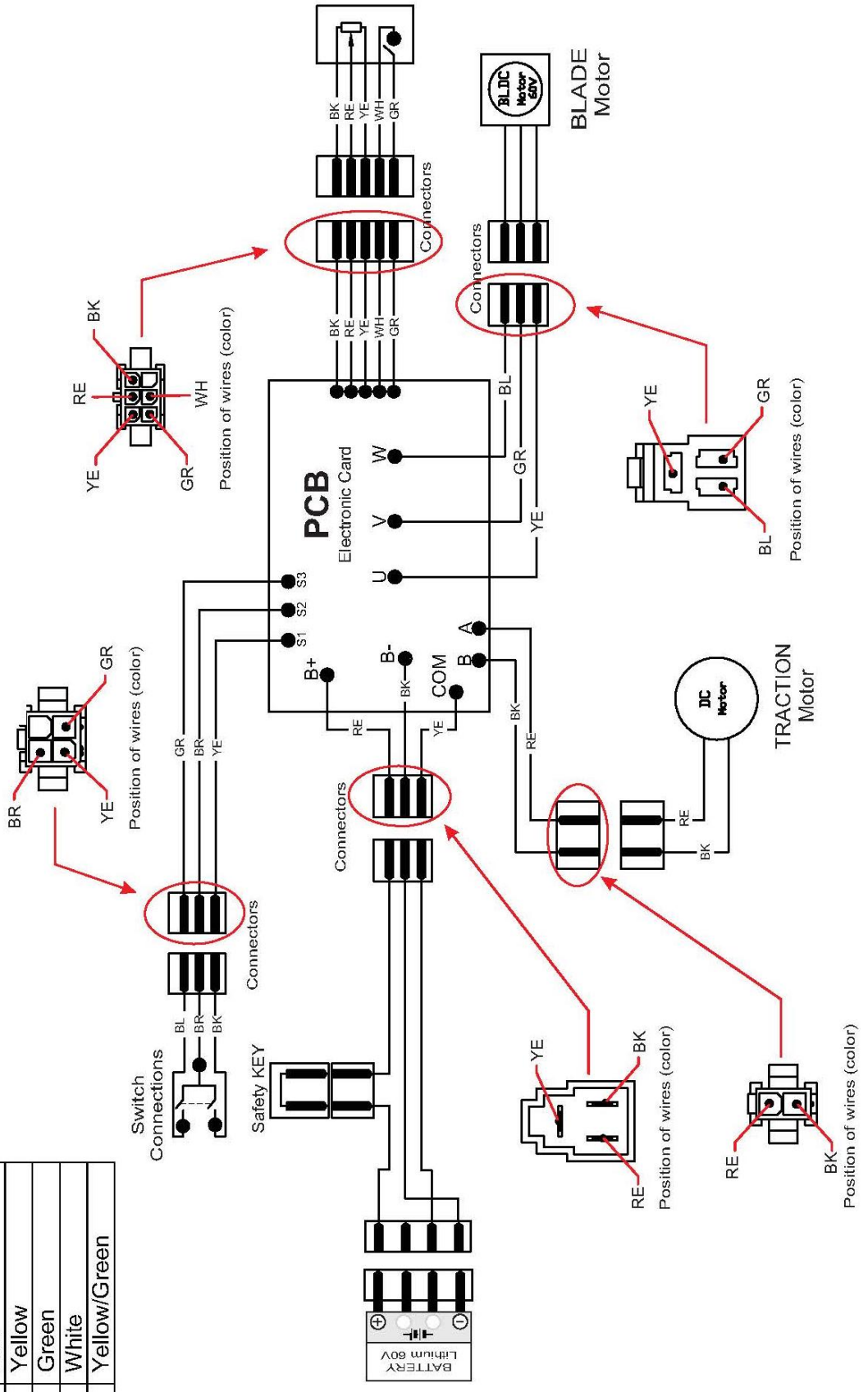


If the measured value is similar to the voltage between terminals "+" and "-", the battery is faulty.

6. Electrical diagram



WIRING DIAGRAM - Self Propelled Models



Cable colours	
BK	Black
BL	Blue
BR	Brown
GY	Grey
RE	Red
YE	Yellow
GR	Green
WH	White
YG	Yellow/Green