

READ THE USE AND MAINTENANCE MANUAL

PROGRAMMER

Programmer function

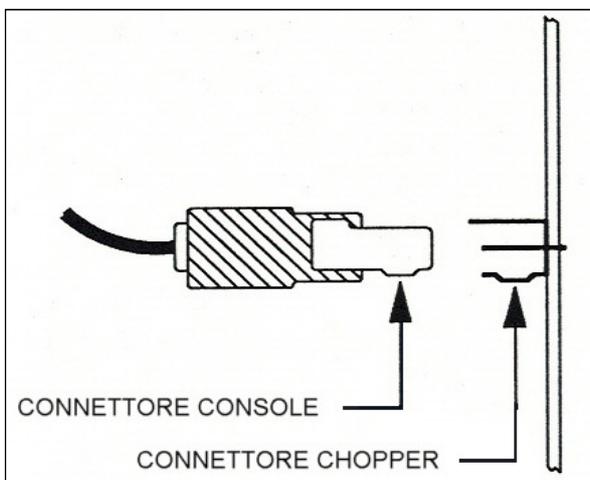
The console allows you to:

1. Set the chopper for a custom behavior of the drive motor.
2. Read the type of alarm to a correct and easy identification of the fault.
3. Test the electrical values and status of the electric circuit of the traction.

Programmer use

The use of the instrument is comparable to that of the most common electronic devices. The sequence that must always be observed for the insertion of the console is:

- TURN OFF THE KEY general machine;
- disconnecting from the chopper the connector with the LED alarms;
- connect the console to the place of the connector with the LED alarms. If the insertion operation is not easy to check that the connector is positioned in the correct direction;
- Turn the key ON and operate with the console;
- finished work with the console, exit all programs (main heading turned on) and TURN OFF THE KEY general machine;
- turn off the console connector and insert the connector with the LED alarms. THE WRONG SEQUENCE OF OPERATIONS CAN EASILY COMPROMISE THE FUNCTIONALITY OF THE CHOPPER OR CONSOLE



Menu of the console

The following illustration indicates how to move inside the menu of the console and a short description of the menu (some menus provide only necessary information's for the correct functioning of the chopper and can not be modified without written authorisation from Comac).

For a detailed description, consult the chopper handbook. In the following we give you the basis information's for the debugging of the machine.

Press ENTER to get inside of the menu, in order to move inside of the different menus use the ROLL buttons, for changing the insert values use the button PARAM SET and OUT in order to quit one program.

For every modification of values in one menu the console will ask to confirm the modification when quitting the menu (ARE YOU SURE? YES=ENTER, NO=OUT).

HEADING: One reads the main characteristics of the console and of the chopper card: the name of the machine to which one is connected, voltage and maximum current of the chopper card, the working hours of the chopper card.

PARAMETER CHANGE: In this menu the parameters can be changed to personalise the machine. The adjustable parameters are: CUT BACK SPEED 1 (first speed limit of the machine) and CUT BACK SPEED 2 (second speed limit of the machine). **All the other parameters are chosen from Comac relative to the assembled traction motor and it is forbidden to change them without previous authorisation of Comac.**

TESTER: In this menu one can read the qualities of the electric characteristics (voltage traction motor, current motor, state of power switch = on/off).

SAVE: This permits, once the parameters have been changed, to enter the new setting in the memory of the console. Attention: in the console exists already AN parameter set MOD 00, which contain the correct configurations for the assembled traction wheel.

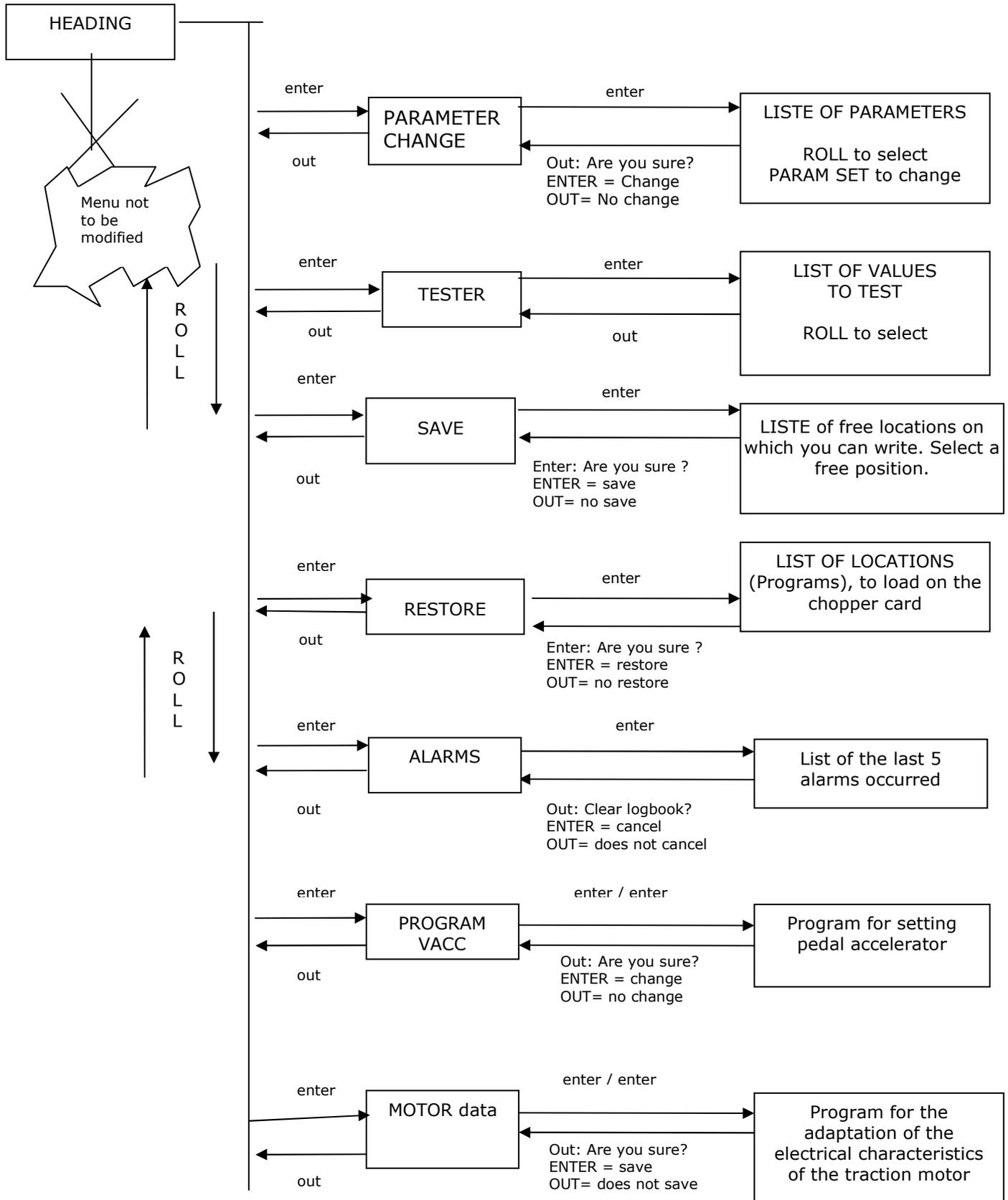
RESTORE: This permits to restore on the chopper card a parameter set, which has been entered in the console. The standard program MOD 00 refers to the standard traction wheel CIMA of the ULTRA85B.

ALARMS: Indicates a list of the last five alarms occurred on the machine; according to the alarm a specific corrective action is adopted (see following paragraph).

PROGRAM VACC: This section is used to teach the chopper about the potentiometer which is assembled on the machine; **this operation must be carried out when the alarm Vacc not ok appears or when the potentiometer or the chopper card is replaced;** a wrong recognition of the potentiometer from the chopper card will block the machine.

MOTOR DATA: This section serves for the adaptation of the parameters according to the motor characteristics.

Flow chart of the console



Alarms and decoding

The chopper card visualises an anomaly on two information levels:

1. Through a red LED alarm (on the machine's instrument board), which blinks for a quantity of times relative to the type of anomaly;
2. Through a message on the console, that specifies more details on the nature of the anomaly.

Following table reports for each alarm the possible anomaly and how to proceed on the machine.

DIAGNOSIS LIST ALARMS

(for a better understanding of the list refer also to the electrical layout of the machine)

Number of blinking	MESSAGE	NOTES
1	EEPROM KO	<p>The chopper card memory ha lost the adjustment parameters.</p> <p><u>Actions :</u></p> <ul style="list-style-type: none"> - Switch off and switch on the key. If the alarm occurs again, replace the chopper. If the alarm does not occur anymore, reprogram the chopper card (the parameters memorised were cancelled and replaced by default dates).
1	LOGIC FAILURE #1	<p>The chopper card memory ha lost the adjustment parameters.</p> <p><u>Actions :</u></p> <ul style="list-style-type: none"> - Check the batteries. - Switch off and switch on the key. If the alarm occurs again, replace the chopper. If the alarm does not occur anymore, reprogram the chopper card (the parameters memorised were cancelled and replaced by default dates).
1	LOGIC FAILURE #2	<p>The chopper memory does not work correctly.</p> <p><u>Actions :</u></p> <ul style="list-style-type: none"> - Switch off and switch on the key. If the problems occurs again, replace the chopper card.
1	LOGIC FAILURE #3	<p>The chopper memory does not work correctly.</p> <p><u>Actions :</u></p> <ul style="list-style-type: none"> - Switch off and switch on the key. If the problems occurs again, replace the chopper card.
1	WATCH-DOG	<p>Self-diagnosis of the chopper under restino or working conditions has registrate dan irregularity.</p> <p><u>Possibile causes :</u></p> <ul style="list-style-type: none"> - The logic of the chopper card is damaged. <p><u>Actions :</u></p> <ul style="list-style-type: none"> - Verify that the motor is connetced. - Verify the continuity of the 3 phases of the motor. - Replace the chopper.

Number of blinking	MESSAGE	NOTES
2	INCORRECT START	<p>Incorrect starting sequence.</p> <p><u>Possible causes:</u></p> <ul style="list-style-type: none"> - Error in the sequence made by the operator; - The pedal microswitch and/or drive-selection microswitch are sticking; - Wiring not correct. <p><u>Actions:</u></p> <ul style="list-style-type: none"> - Check, that the starting sequence was carried out as follows: <ul style="list-style-type: none"> ▪ Sit down on the machine and close the seat-microswitch ▪ Switch on the general key ▪ Select gear (forward/backward) ▪ Push the acceleration pedal - Check that the microswitch of drive and drive manipulator don't have the contacts sticked and can work corretcly; - Check the continuity in the circuit between pedal-microswitch, chopper and gear selector; - Check the continuity between the microseat and the chopper; - If you have not found any irregularities and the problem persists, replace the chopper card.
2	FORW + BACK	<p>Incorrect starting sequence.</p> <p><u>Possibile causes :</u></p> <ul style="list-style-type: none"> - Micro of forward and backward directions activated at the same time. <p><u>Actions :</u></p> <ul style="list-style-type: none"> - Check the cables until the microswitches of forward and backward directions; - Check the state of the microswitches; - Replace the chopper card.
3	CAPACITOR CHARGE.	<p>The test is executed in total conduction.</p> <p><u>Possibile causes :</u></p> <ul style="list-style-type: none"> - The voltage i low and does not increase when the main remote control switch is open. <p><u>Actions :</u></p> <ul style="list-style-type: none"> - One phase of the motor is not correctly connected at the chopper card or is broken. - If the problem continues, replace the chopper card.

Number of blinking	MESSAGE	NOTES
3	VMN LOW	<p><u>Possibile causes :</u></p> <ul style="list-style-type: none"> - General remote control switch broken; - Metal parts that make a shortcircuit; - Mosfet in shortcircuit or broken; - Sticked contacts. <p><u>Actions :</u></p> <ul style="list-style-type: none"> - Check the right wiring of the cables 9-10 and the good connections of the chopper holdfast and of the motor holdfast; - Check if there are shortcircuits; - If the problem continues, replace the chopper.
3	VMN HIGH	<p><u>Possibile causes :</u></p> <ul style="list-style-type: none"> - Wrong wiring; - Current leakage or motor shortcircuit; - Chopper power system damaged; - Sticked contacts of the remote control switch. <p><u>Actions :</u></p> <ul style="list-style-type: none"> - Check if one phase of the motor is not connected at the card or if it is broken; - Check leakage or shortcircuit taking out the cable of the phase. If the alarm disappear, replace the motor; - If the problem continues, replace the chopper.
4	VACC NOT OK	<p>The chopper checks if under resting conditions the voltage of the accelerator is under the memorised min. value with the function PROGRAM VACC. If the value exceeds 1 Volt the alarm will be released.</p> <p><u>Possibile causes:</u></p> <ul style="list-style-type: none"> - A cable of the potentiometer is interrupted; - The potentiometer is not connected; - The potentiometer is damaged. <p><u>Actions:</u></p> <ul style="list-style-type: none"> - Check the continuity of the connection between potentiometer, accelerator, and chopper; - Reprogram the chopper with PROGRAM VACC (see paragraph adjustments and inspections); - Check the functionality of the potentiometer (can be damaged) and if necessary replace this part (afterward reprogram the chopper).

Number of blinking	MESSAGE	NOTES
4	PEDAL WIRE KO	<p>The chopper checks continuously the endstroke of the accelerator pedal and appears the alarm when the minimum value is below 0,3V or the maximum value is more than 2V.</p> <p><u>Possibile causes :</u></p> <ul style="list-style-type: none"> - One wire of the potentiometer is interrupted; - The resistance of the potentiometer is broken; - The potentiometer is overcharged. <p><u>Actions :</u></p> <ul style="list-style-type: none"> - Verify the wiring of the potentiometer; - Verify the potentiometer by the function TESTER.
5	ENCODER ERROR	<p>The chopper checks the functionality of the encoder and its reading.</p> <p><u>Possibile causes :</u></p> <ul style="list-style-type: none"> - The encoder is damaged; - The encoder wiring is damaged. <p><u>Actions :</u></p> <ul style="list-style-type: none"> - Check the encoder using the TESTER function of the console; - Replace the encoder.
5	STBY I HIGH	<p>The chopper checks the closure and opening of the remote control switch of the chopper card.</p> <p><u>Possibile causes :</u></p> <ul style="list-style-type: none"> - The remote control switch is damaged; - The chopper memory s damaged. <p><u>Actions :</u></p> <ul style="list-style-type: none"> - Verify the functionality of the remote control switch of the chopper card and eventually replace it. - Replace the chopper.
5	I=0 EVER	<p>The chopper tests if working the current is more than a minimum value. In the opposite case the machine stops and appears an alarm.</p> <p><u>Possibile causes :</u></p> <ul style="list-style-type: none"> - Wrong wiring between the motorwheel and the chopper card; - The reistance of the motor is too high because of a motor problem; - The current sensor s broken. <p><u>Actions :</u></p> <ul style="list-style-type: none"> - Check the right connection of the cables of the motor on the chopper card; - Replace the motor; - If the problem continues, replace the chopper.

Number of blinking	MESSAGE	NOTES
6	COIL SHORTED	<p>There is an overcurrent due to a shortcircuit of the logic of the chopper card.</p> <p><u>Possibile causes :</u></p> <ul style="list-style-type: none"> - Overcharging of the main remote control switch of the chopper; - The chopper is damaged. <p><u>Actions :</u></p> <ul style="list-style-type: none"> - Switch off and switch on the machine; - Verify the main remote control switch of the chopper; - Replace the chopper.
6	DRIVER SHORTED	<p>There is an overcharging of the current.</p> <p><u>Possibile causes :</u></p> <ul style="list-style-type: none"> - The logici s damaged. <p><u>Actions :</u></p> <ul style="list-style-type: none"> - Switch off and switch on the machine; - Replace the chopper.
6	CONTACTOR DRIVER	<p>There i san overcharging of current due to a shortcircuit of the loc on the chopper card.</p> <p><u>Possibile causes :</u></p> <ul style="list-style-type: none"> - The logici s damaged. <p><u>Actions :</u></p> <ul style="list-style-type: none"> - Switch off and switch on the machine; - Replace the chopper.
6	CONTACTOR CLOSED	<p>One remote control switch or both don't open.</p> <p><u>Possibile causes :</u></p> <ul style="list-style-type: none"> - Remote control switch broken or overcharged - Power of the chopper broken. <p><u>Actions :</u></p> <ul style="list-style-type: none"> - Check the contacts of the remote control switch and eventually replace it; - Replace the chopper.

Number of blinking	MESSAGE	NOTES
6	CONTACTOR OPEN	<p>One or both remote control switches are not closed, when the traction is activated.</p> <p><u>Possible causes:</u></p> <ul style="list-style-type: none"> - Dirt, Dust or anything else does prevent a good connection to the remote control switch; - Motor-Isolation or interrupted contacts; - Remote control switch damaged or overloaded; - Damaged chopper. <p><u>Actions:</u></p> <ul style="list-style-type: none"> - Clean the contacts with compressed air and if necessary scrub off the dirt slightly; - Check wiring and connections to the remote control switch; - Check the motor wiring and replace if necessary; - Replace the chopper.
7	HIGH TEMPERATURE	<p>The chopper works with a temperature under 78°. After this value, the maximum current will be reduced until the value zero will be achieved at a temperature of 100°.</p> <p><u>Possible causes:</u></p> <ul style="list-style-type: none"> - If the alarm occur at environment temperature ($\pm 20^\circ$): <ul style="list-style-type: none"> ▪ Malfunction of the chopper; ▪ Machine blocked through the brakes; ▪ Thermal sensor damaged or loosened; ▪ Interrupted connections; ▪ Damaged chopper; - Stressing working conditions with high environment temperature; - Insufficient heat derivation. <p><u>Actions:</u></p> <ul style="list-style-type: none"> - Check the thermal sensor inside the chopper; - Check the brakes of the machine; - Check the connections to the motor; - Let the chopper in dormant state and let it cool down; - Check if the nuts are fixed and the right installation; - If the problem persists replace the chopper.

Number of blinking	MESSAGE	NOTES
7	MOTOR TEMPERATURE	<p>The chopper works with a temperature under 78°. After this value, the maximum current will be reduced until the value zero will be achieved at a temperature of 100°.</p> <p><u>Possible causes:</u></p> <ul style="list-style-type: none"> - If the alarm occur at environment temperature ($\pm 20^\circ$): <ul style="list-style-type: none"> ▪ Malfunction of the chopper; ▪ Machine blocked through the brakes; ▪ Thermal sensor damaged or loosened; ▪ Interrupted connections; ▪ Damaged chopper; - Stressing working conditions with high environment temperature; - Insufficient heat derivation. <p><u>Actions:</u></p> <ul style="list-style-type: none"> - Check the thermal sensor inside the chopper; - Check the brakes of the machine; - Check the connections to the motor; - Let the chopper in dormant state and let it cool down; - Check if the nuts are fixed and the right installation; - If the problem persists replace the chopper.
7	THERMIC SENS KO	<p>The chopper checks the output of the thermic sensor, that has to be between 4,95 V and 0,1 V. When it is out of that range the chopper shows an alarm.</p> <p><u>Possibile causes :</u></p> <ul style="list-style-type: none"> - The logic of the chopper is damaged. <p><u>Actions :</u></p> <ul style="list-style-type: none"> - Replace the chopper.
32	BATTERY LOW	<p>The battery voltage is going below the 10% of the charging. The machine stops.</p> <p><u>Possibile causes :</u></p> <ul style="list-style-type: none"> - The battery is discharged. <p><u>Actions :</u></p> <ul style="list-style-type: none"> - Check the charging of the batteries; - Try to restart pressing the pedal.

<p>32</p>	<p>WRONG SET BATT</p>	<p>The chopper verify the battery voltage.</p> <p><u>Possibile causes :</u></p> <ul style="list-style-type: none"> - The battery is no correct. <p><u>Actions :</u></p> <ul style="list-style-type: none"> - Check the battery and eventually replace it with a correct one.
<p>NO BLINKS</p>	<p>WRONG CONFIG</p>	<p>The chopper verify the program of the logic of the chopper card.</p> <p><u>Possibile causes :</u></p> <ul style="list-style-type: none"> - The logici s damaged; - The logic has lost the memory. <p><u>Actions :</u></p> <ul style="list-style-type: none"> - Switch off and switch on the machine and eventually reprogram the chopper; - Replace the chopper.
<p>NO BLINKS</p>	<p>CURRENT SENS KO</p>	<p>The chopper does not read the current.</p> <p><u>Possibile causes :</u></p> <ul style="list-style-type: none"> - The logici s damaged; <p><u>Actions :</u></p> <ul style="list-style-type: none"> - Replace the chopper.

Adjustments and calibrations for the motor wheel





INVERTER ZAPI ACO

PARAMETERS		PROGRAM 00
ACCELER. DELAY	ACCELERAZIONE	3
RELEASE BRAKING	FRENATURA A RILASCIO	8
INVERS. BRAKING	FRENATURA DA INVERSIONE	8
PEDAL BRAKING	FRENATURA PEDALE	9
SPEED LIMIT BRK.	FRENATURA A RILASCIO PARZ.	2
BRAKE CUTBACK	FRENATURA CON RIDUZIONE	8
MAX SPEED FORW	VELOCITÀ MAX AVANTI	155 Hz
MAX SPEED BACK	VELOCITÀ MAX INDIETRO	100 Hz
CUTBACK SPEED	RIDUZIONE VEL.	100%
CUTBACK SPEED 2	RIDUZIONE 2° VEL	75%
CUTBACK SPEED 3	RIDUZIONE 1° VEL	40%
CURVE CUTBACK	LIMITE VEL. CURVA	60%
HS CUTBACK	HARD & SOFT RIDUZIONE	10%
FREQUENCY CREEP	VELOCITA' MINIMA	1,20 Hz
MAXIMUM CURRENT	MASSIMA CORRENTE	7
INCHING SPEED	-	0 Hz
INCHING TIME	-	0
AUXILIARY TIME	TEMPO SALITA RAMPA	0,4
TOOTHs	PASSI ENCODER	1

Calibration with console

Connection with the console

1. Check, if all switches are switched off.
2. Lift the front wheel on a security stand.
3. Remove the connection of the LED alarm from the chopper.
4. Connect the console with the corresponding connection with **key in off-position**.
5. Turn the key and switch the machine on.
6. After switching on the machine appears the message "ACOT2AE CO1.01" or "*Alarm* abcdef ...".
7. Press onto the seat.
8. In any case Push ENTER in order to get access to the main menu.

For a more detailed description consult also the manual and the function description of the chopper Zapi.

Chopper programming	Display Console
1. With Cima motorwheel appears the alarm "PROG. TOOTHES".	
2. Press <i>ENTER</i> to get into the main menu. 3. It appears the menu: "PARAMETER CHANGE" = CHANGE THE PARAMETERS. 4. Press ENTER and check, scrolling with ROLL the single values, if they correspond to the above mentioned values. 5. Set the parameter "THOOTS = 1".	* MAIN MENU * PARAMETER CHANGE
6. At the end press <i>OUT</i> and confirm with <i>ENTER</i> (after the request "ARE YOU SURE?") if you changed parameters (Use the button PARAM SET on the console). ATTENTION: THE SECURITY PARAMETERS, AS ACCELERATION, BRAKING, ETC. CAN NOT BE MODIFIED ONLY THE SPEED REDUCTIONS CAN BE MODIFIED (CUTBACK SPEED 1 AND 2).	
7. Switch off and switch on the machine.	

Align the chopper card to the movement of the acceleration pedal	Display Console
1. Scroll through the list with the button <i>ROLL UP</i> to "PROGRAM VACC" and select (attention : the machine is blocked during the programming) :	* MAIN MENU * PROGRAM VACC
2. Press <i>ENTER</i> , in order to access to the function "PROGRAM VACC"; the current min. and max. values corresponding to the forward and reverse gear appear :	VACC SETTING 0,2 1,5
3. Press <i>ENTER</i> .	
4. The chopper is now prepared to record the new min. and max. values, which will be signalised from the potentiometer :	MIN VACC MAX 0.0 - 0.0

5. Select the forward gear and press the pedal, take care to move the pedal slowly at the beginning of this process and to move the pedal until stop:	<table border="1"> <tr> <td>MIN 0,2</td> <td>VACC ↑</td> <td>MAX 1,5</td> </tr> </table>	MIN 0,2	VACC ↑	MAX 1,5
MIN 0,2	VACC ↑	MAX 1,5		
6. Repeat the process for the reverse gear.	<table border="1"> <tr> <td>MIN 0,2</td> <td>VACC ↓</td> <td>MAX 1,5</td> </tr> </table>	MIN 0,2	VACC ↓	MAX 1,5
MIN 0,2	VACC ↓	MAX 1,5		
7. Press <i>OUT</i> .				
8. It appears the confirmation request in order to load the new values :	<p align="center">ARE YOU SURE? YES=ENTER NO=OUT</p>			
9. Press ENTER for confirmation.				

Function Tester



ATTENTION : lift up the traction wheel before this test.

After the connection of the console, it will appear the initial message, that show the chopper model, the machine and the working hours of the chopper.
Enter on the submenu TESTER and pass all the points with the button ROLL UP.

AC0T2AE C01.01

36V 150A 00000

Check the **batteries voltage**.
Compare the voltage read from the chopper and the voltage read by a tester set on Volt with end scale of 50V or more.

BATTERY VOLTAGE

VOLT = 37.5V

In case of anomalies it is necessary verify the connectors of the chopper card and the state of the bornes and the cables on the batteries. In case the problem is not solved, it is necessary replace the chopper card.

Check the **motor voltage**. The value shows the percentage of instantaneous voltage on the motor, with reference at the actual value of the batteries voltage.
With machine stopped, it has to be zero.

MOTOR VOLTAGE

0 %

At the maximum speed, the percentage of the voltage on the motor has to be close at 100%.

MOTOR VOLTAGE

100 %

In caso di anomalie verificare le connessioni tra chopper e motoruota, la correttezza dei parametri del chopper, le connessioni delle riduzioni di velocità.

Check the **amplification voltage**. The value indicates the percentage of the instantaneous voltage really given to the motor, with reference at the actual value of the batteries voltage that has to be added at the motor voltage.
With machine stopped, it has to be zero.

VOLTAGE BOOSTER

0 %

Increasing the speed the value goes up, then it gets stable and goes down.

VOLTAGE BOOSTER

8 %

In case of anomalies, check the connections between the chopper and the motorwheel and the correct value of the chopper parameters.

Check the **motor frequency**. The value indicates the frequency of the alternating current applied at the motor.
With machine stopped, the frequency has to be zero.

FREQUENCY

0.00 Hz

At the maximum speed, in forward direction, the value has to be the same as set on the parameter "max speed forw" of the chopper. In backward direction the value has to be the same of the "max speed back".

FREQUENCY

155 Hz

In the case of anomalies, it is necessary to verify the traction motor and eventually replace the chopper.

Verify the **frequency of the encoder**. The value shows the motor speed measured with the encoder.
With the machine stopped, the frequency has to be zero.

ENCODER

0.00 Hz

Increasing the speed, the value has to be the same as indicated on the parameter "max speed forw" of the chopper. In backward direction has to be the same at the value of "max speed back".

ENCODER

155 Hz

In the case of anomalies, it is necessary to verify the traction motor, the encoder and eventually replace the chopper.

Verify the **slipping**. The value shows the difference between the motor frequency (FREQUENCY) and the encoder frequency (ENCODER).
With the machine stopped, the value has to be zero.

SLIP VALUE

0.00 Hz

Increasing the speed, the value has to grow and then get stable.

SLIP VALUE

3 Hz

In the case of anomalies, it is necessary to verify the traction motor, the encoder and eventually replace the chopper.

Verify the **motor current**. The value indicates the efficient value of the current on the motor.
With the machine stopped, the current has to be zero.

CURRENT RMS

0 A

Increasing the speed, the value has to grow up.

CURRENT RMS

32 A

In the case of anomalies, it is necessary to verify the traction motor and eventually replace the chopper.

Verify the **batteries current**. The value indicated the approximated value of the batteries current.
With the machine stopped, the current has to be zero.

BATTERY CURRENT

0 A

Increasing the speed, the value has to grow up.

BATTERY CURRENT

42 A

In the case of anomalies, it is necessary to verify the state of the batteries, the traction motor and eventually replace the chopper.

Verify the **batteries charge**. The value indicates the residual charge of the batteries.

BATTERY CHARGE

70 %

In the case of anomalies, it is necessary to verify the state of the batteries, the batteries cables and the chopper.

Verify the **temperature** measured on the aluminium base of the chopper.

The temperature measured has to be the same of the surrounding temperature, on the case the machine, before the measure, has been switched off at least for 1 hour.

TEMPERATURE

29 °C

In the case of anomalies or high temperatures, verify the tightness of the connections and the state of the traction motor. In the case the problem stays, replace the chopper.

Verify the **motor temperature** shows by the console.

The temperature has to be the same at the surrounding one, on the case the machine, before the measure, has been switched off at least for 1 hour.

MOTOR TEMPERATURE

31 °C

In the case of anomalies or high temperatures, verify the tightness of the connections and the state of the traction motor. In the case the problem stays, replace the chopper.

Verify the **potentiometer** :

without press the pedal, the console must shows a message as in the picture.

ACCELERATION

0,2 V

Press the pedal at the top to verify the state of the potentiometer. With the pedal totally down, the message of the console has to be the same as in the picture. Verify that the value increases linearly.

ACCELERATION

1,7 V

In the case of anomalies verify the connections of the potentiometer and eventually replace it.
To do this check it is not necessary press the microseat and neither the direction joystick.

NOT AVAILABLE

LIFTING SWITCH

NOT AVAILABLE

DESCENT SWITCH

Verify the **microswitches forward direction** :

FORWARD SWITCH

OFF GND

Verify the forward direction :

- Press the direction manipulator forward;
- Press the accelerator pedal;

The console display has to show the message like in the picture.

FORWARD SWITCH

ON +VB

In the case of anomalies verify the functionality of the microseat, of the direction microswitches (on the pedal box) and the joystick for forward and backward direction.

ATTENTION : lift up the motorwheel before this check.

Verify the **microswitches backward direction** :

BACKWARD SWITCH

OFF GND

Verify the backward direction :

- Press the direction manipulator backward;
- Press the accelerator pedal;

The console display has to show the message like in the picture.

BACKWARD SWITCH

ON +VB

In the case of anomalies verify the functionality of the microseat, of the direction microswitches (on the pedal box) and the joystick for forward and backward direction.

ATTENTION : lift up the motorwheel before this check.

Verify the right functionality of the **seat microswitch**. Normally the message has to be like in the picture.

HANDLE/SEAT SW

OFF GND

Sit down on the seat and press the microswitch and verify the message on the console is like in the picture.

HANDLE/SEAT SW

ON +VB

NOT AVAILABLE

H&S CUTBACK

OFF GND

Verify the functionality of the **speed reduction 1**.

CUTBACK SWITCH 3

ON GND

Verify the functionality of the **speed reduction 2**.

CUTBACK SWITCH 2

ON GND

Verify that the value of cutback switch 1 and cutback switch 2 are as in the list below :

Speed	Switch 3	Switch 2
Minimum	ON GND	ON GND
Medium	OFF +VB	ON GND
Maximum	OFF +VB	OFF +VB

Verify the **working brake microswitch**. It appears the message as shown in the picture.

BRAKE SWITCH

OFF GND

Press the working pedal and verify that the message on the consolle display is like in the picture.

BRAKE SWITCH

ON +VB

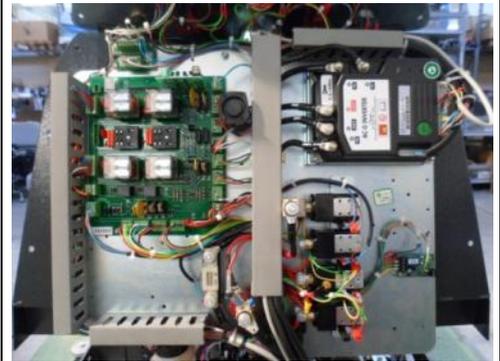
In the case of anomalies, verify the functionality of the working brake microswitch.

NOT AVAILABLE

STEER ANGLE

Electric installation verification and tests (SMG 120 Base)

- Unplug the battery connector.
- Check the cleanliness and the tightening of the connecting cables of batteries.
- Check the connection and the tightening of the **power cables: contactors, fuses, motors, relays, electronic boards** etc.
- Reconnect the battery connector.
- Turn on the machine by the key and check that the red light of the **motor brushes current control** flashes 8 times.
- Check the warning lights on the machine dashboard.
- Check the operation of the BDI;
- Check the functionality of the switch, the pressure selector and the speed selector.
- Check the operation of the micro seat;
- Check forward, reverse, acceleration and braking;
- Check hourmeter;
- Check horn;



Electric installation verification and tests (SMG 130 Base)

- Unplug the battery connector.
- Check the cleanliness and the tightening of the connecting cables of batteries.
- Check the connection and the tightening of the **power cables: contactors, fuses, motors, relays, electronic boards** etc.
- Reconnect the battery connector.
- Turn on the machine by the key and check that the red light of the **motor brushes current control** flashes 5 times.
- Check the warning lights on the machine dashboard.
- Check the operation of the BDI;
- Check the functionality of the switch, the pressure selector and the speed selector.
- Check the operation of the micro seat;
- Check forward, reverse, acceleration and braking;
- Check hourmeter;
- Check horn;

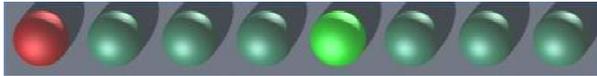


Battery Check Card Adjustment

1. Make sure that when the machine is switched on the BDI has the following boot sequence:
 - Ignition of the led corresponding to the adjustment (red led = " 0 ").
 - All leds ON (lights check)
 - led ON corresponding to the level of battery charge
 - It is possible to verify the initial setting of the battery board, turning on the machine and checking which led will illuminate immediately after the ignition. By counting the leds from the left, neglecting to count the first red led will illuminate the led equivalent to the setting. Check that with Wet Cell batteries the microswitch rotary has to be set in position 1, in this case turns the first led.

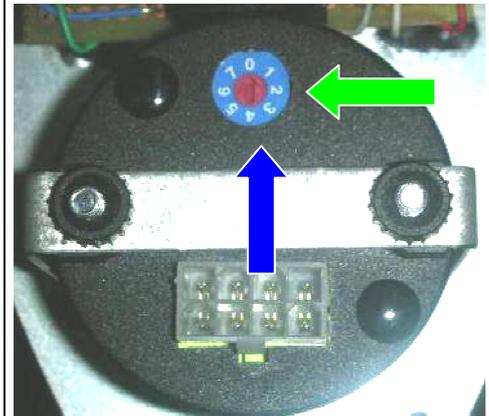
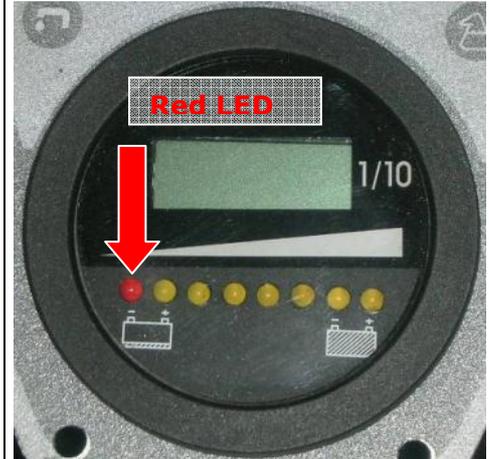


Check that with gel batteries the microswitch rotary has to be set in position 4, in this case will come on the fourth led.



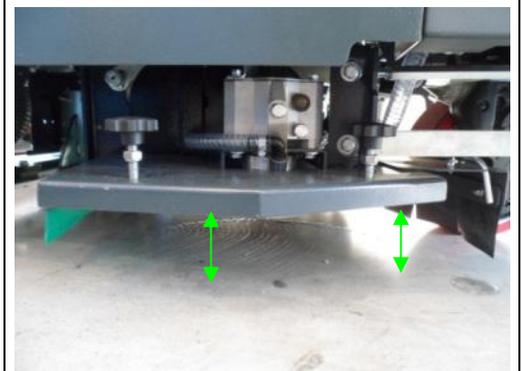
1. Check the functionality of the hour meter.

WARNING: An incorrect setting of the BDI can compromise irreparably the batteries.



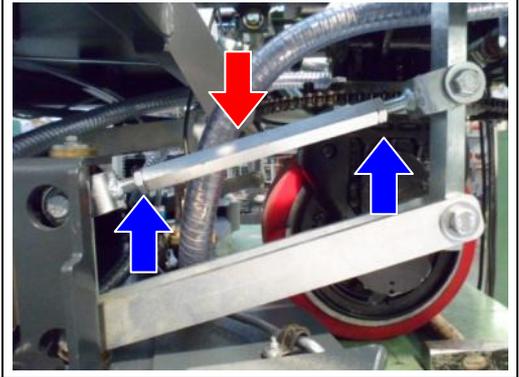
Brush deck adjustment (SMG 120 Base)

1. Check, with a complete brush deck elevation, that the **distance** between the frame of the deck and the floor is 5-7 mm higher in the front than the rear.



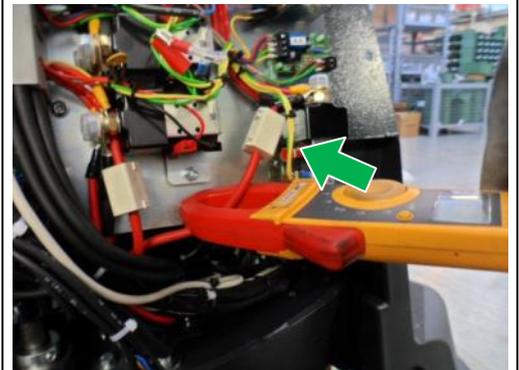
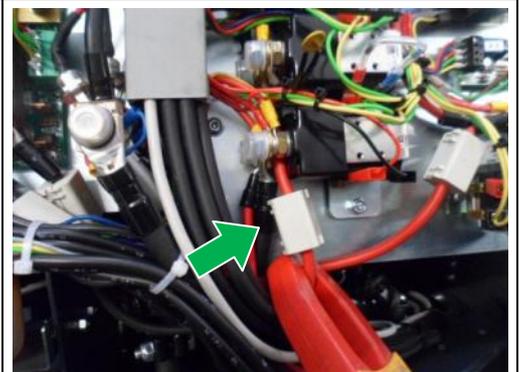
If you need to adjust the tilt of the base, act as follows:

1. Unscrew the **2 nuts** of the hex rod.
2. Turn the hex **rod** up to obtain the correct adjustment.
3. Tighten the **2 nuts** to secure the adjustment.

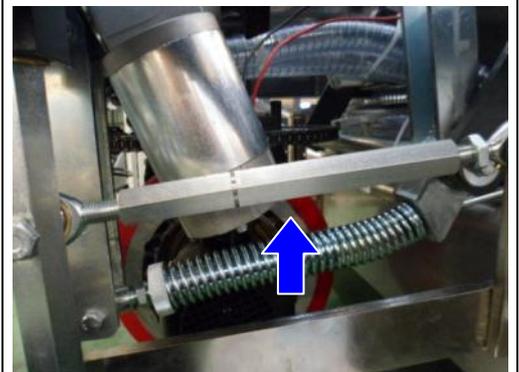


Brush deck adjustment (SMG 130 Base)

1. Connect the clamp meter to the power cables of the two **motors of the brushes** and check that the consumption of the two motors is (almost) equal

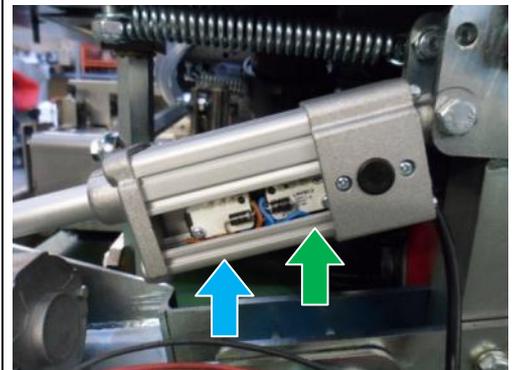


2. If necessary, adjust the inclination by acting on hex **rods** to align the motor consumptions of the front brush and rear brush.

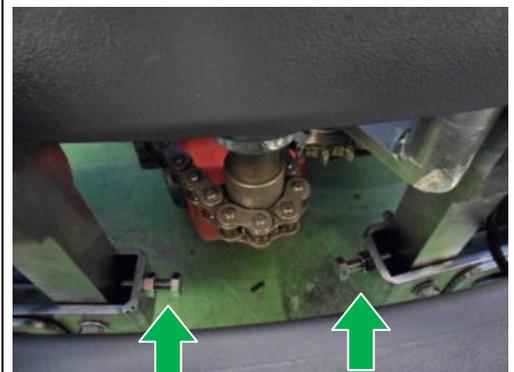
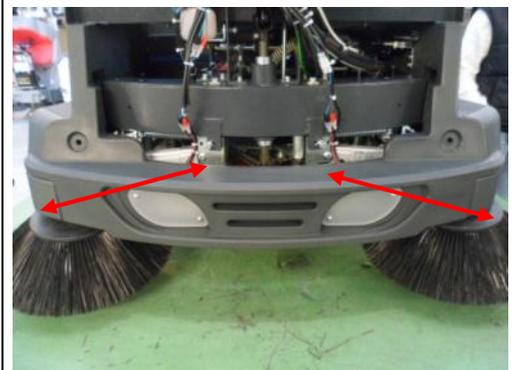


Side brush inclination adjustment (SMG 130 Base)

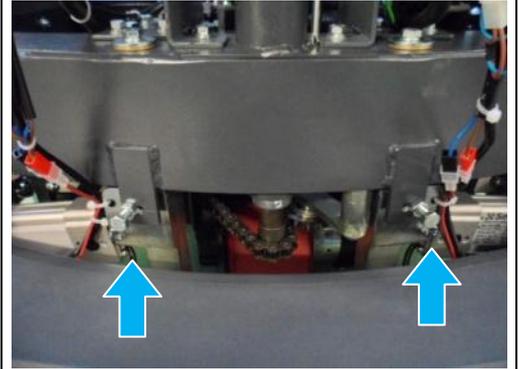
1. Check the **lateral excursion of the two jacks**. The maximum excursion, the brush must rest on the surface without which the bristles are deformed. A full and complete return, the gearmotor of the jack must not touch the **nose** of the machine.
2. To properly adjust the excursion of the jacks act on limit switches (**up** and **down**) inside to the jacks. Slide in an appropriate way, the micro switches on the rail until it reaches the conditions of point 1.



3. Check the **inclination of the side brush** on the ground. The brush must be tangent to the floor without bristles deformation. If necessary operate on the **screws** to set properly the inclination of the brushes.



4. Check the **rotation speed** of the side brush during the movement. The side brush and engine support should not impact on plastic carter during movement of the actuator. If necessary operate on the **adjusting screws** to set the angular rotation of jacks.

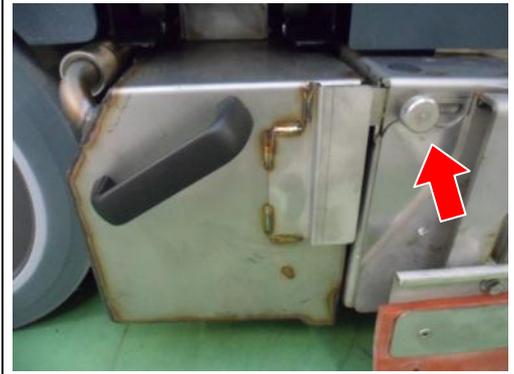


1. If you need to improve the tangency of the brushes on the floor operate on the **adjusting screws** for the brushes clutch inclination. The correct position of the brushes is shown in the picture here on the side.



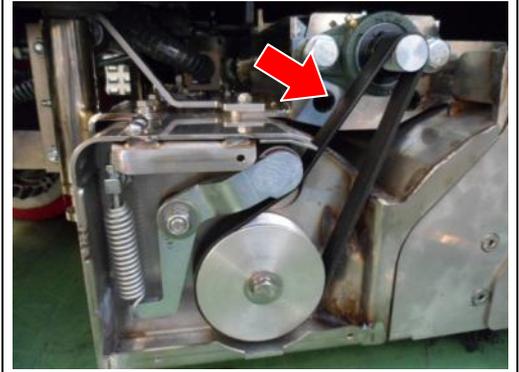
Hopper functionality verification (SMG 130 Base)

1. Make sure that, by activating the **unlock knob** of the collecting tray, is possible to easily extract the hopper from the brush deck.



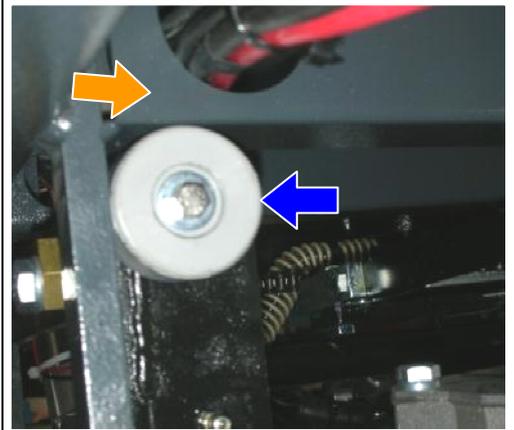
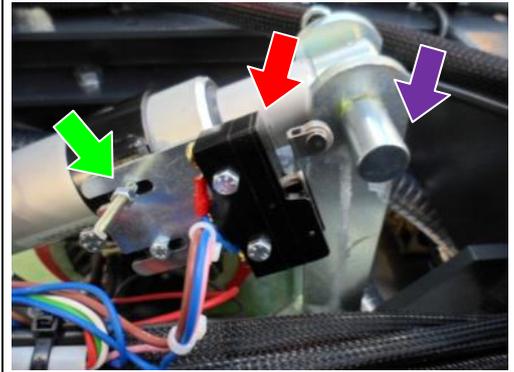
Brush deck belt tension adjustment (SMG 130 Base)

1. Check, that the brushes operate with continuity and evenly on the floor.
2. If necessary to adjust the belt of the shaft operating on the **nut and lock nut** in order to increase or decrease the tension of the drive belt



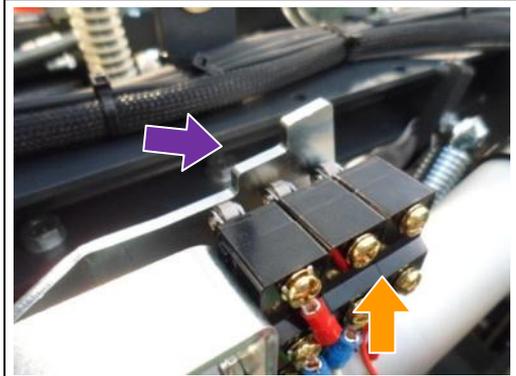
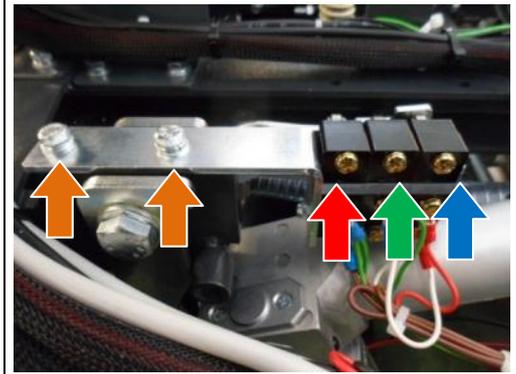
Brush deck limit switch (upper position limit switch)

1. Verify that with brushdeck in high position the small wheels touch the frame, and that the limit switch for upper position is pressed on the retainer of the jack.
2. If necessary, unscrew the screws holding the support of the switch support.
3. Raise the base so that the wheels go to rest on the frame and at the same time the actuator does not force.
4. Move the support of the switch in way that, with the base in the position just described, the wheel rests to the retainer and closes the contact.
5. Tighten the screw that secures the support of the microswitch.



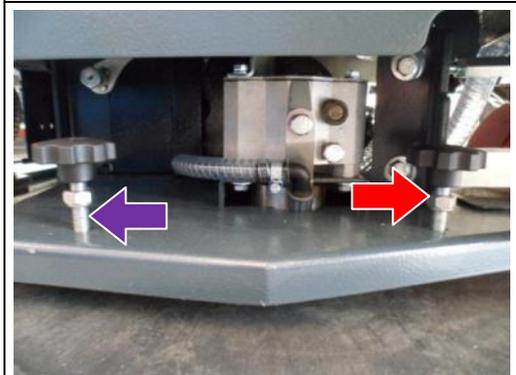
Brush deck limit switch (Extrapressure limit switch)

1. Make sure that when the machine is switched on, with selector of pressure on the first position, the brushdeck falls to the ground. In this condition only the **switch** of first pressure must be activated.
2. Verify that operating on the selector of pressure (second and third position), the switches of **second pressure** and **third pressure** are activated.
3. Verify that when the machine is off all switches are pressed by the **control bracket**.
4. To adjust the micro switches act on the adjusting screws, so as to return to the condition of point 3.



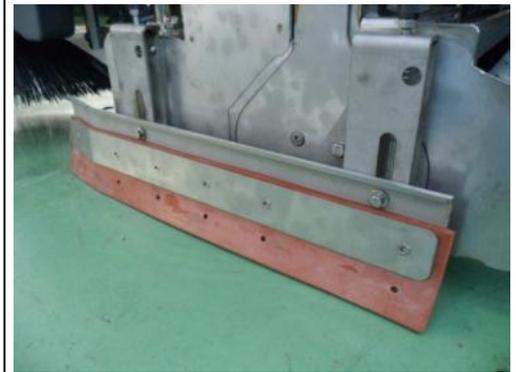
Splashguard adjustment (SMG 120 Base)

1. Verify that, with base lowered, the splashguards are touching to the floor.
2. If it is necessary to regulate them operate on the **adjusting nuts** of **support lugs** by unscrewing or screwing to appropriately adjust the tangency of the rubber on the ground.



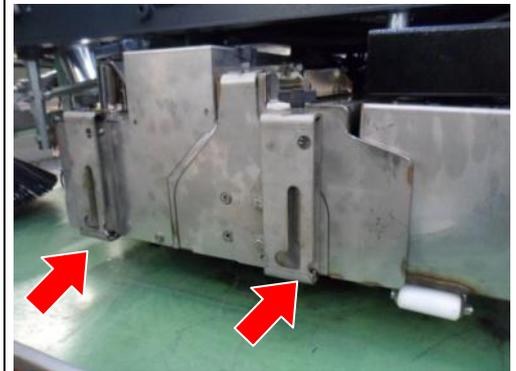
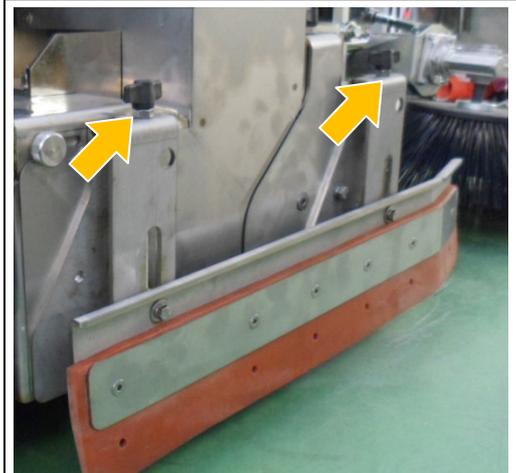
Splashguard adjustment (SMG 130 Base)

1. Make sure that, with base lowered, the splashguards are touching the floor.



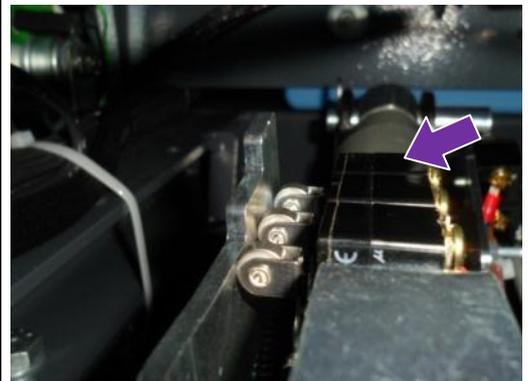
2. If it is necessary to regulate them, operate on the wing nuts to adjust by screwing or unscrewing.

Note: In order to remove the splashguard, completely unscrew the adjustment wing nuts and remove the splashguard shoe from mounting slots.

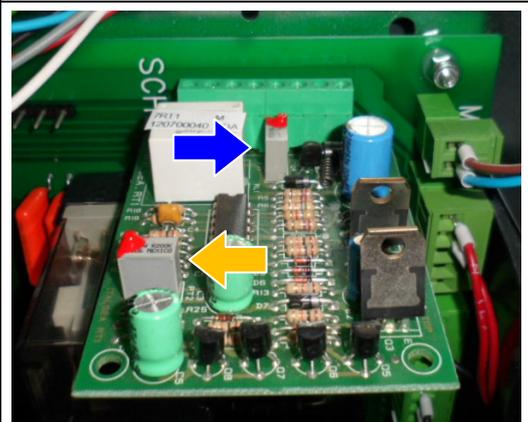


Current control card adjustment (SMG 120 Base)

1. Lower the brushdeck on the ground.
2. Rotate the selector of pressure on the maximum pressure that can be set
3. Enter the current clamp on the motor **power supply cable**.
4. Switch on the brushes.
5. Increase the pressure of the base (by pressing the base on the ground) to let the absorption of the motor is between 69 to 71 Amps.



1. Act on the **trimmer (amps)** of the control board, so that the light begins to flash to the achievement of the absorptions indicated above. The trimmers increases the threshold of intervention when turned clockwise, decreases if turned in a counterclockwise direction.
2. Adjust the **trimmer (delay intervention)** of the control board, so that the engine crankcase turns off after 15-18 flashes (ca. 15-20 Seconds). The trimmers increases the delay of intervention when turned clockwise, decreases if turned in a counterclockwise direction.
3. Once the adjustment is done, seal the trimmer with the glaze.

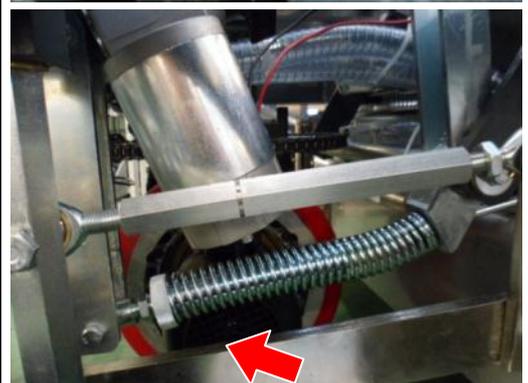
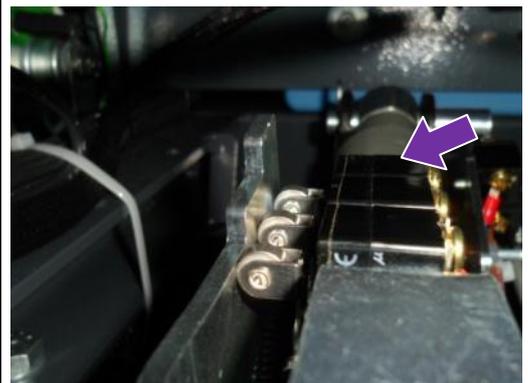
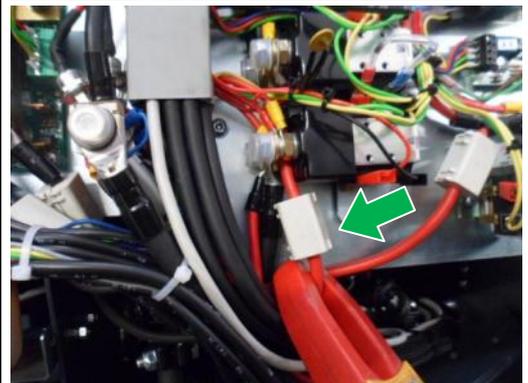
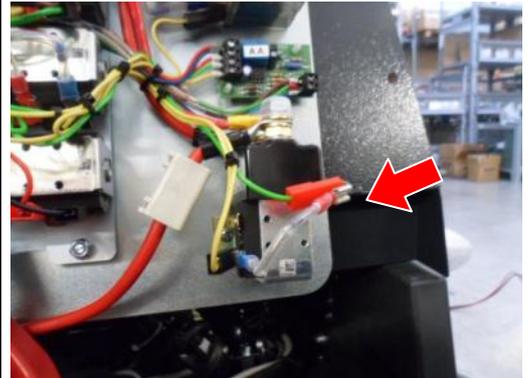


Current control card adjustment (SMG 130 Base)

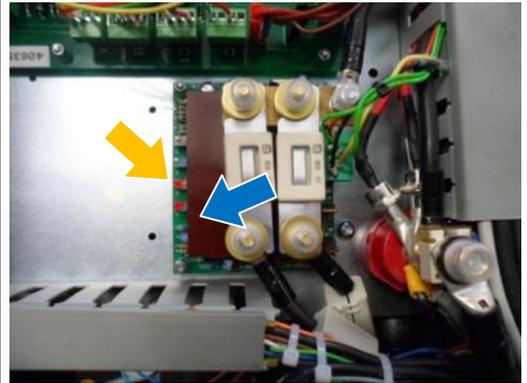
1. Place the base on the ground.
2. Rotate the selector of pressure on the maximum pressure that can be set
3. The setting of the current control card must be made individually for each of the two motors of the base (front brush and rear brush).
4. Perform the calibration for the rear brush (shown on the card with the engine right-dx).
5. Disconnect the connection cables from the contactor of the engine front brush, so that it remains the only engine of the rear brush.

6. Connect the clamp-on ammeter to the **power cable of the rear motor**.
7. Operate the motor of the rear brush.

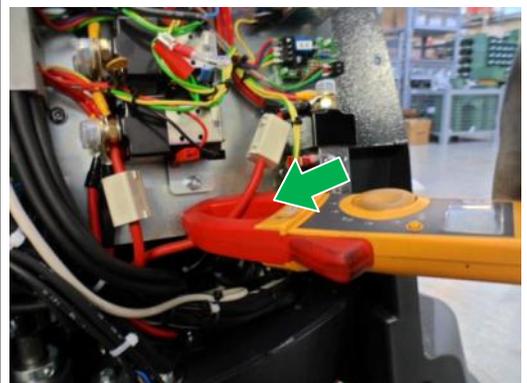
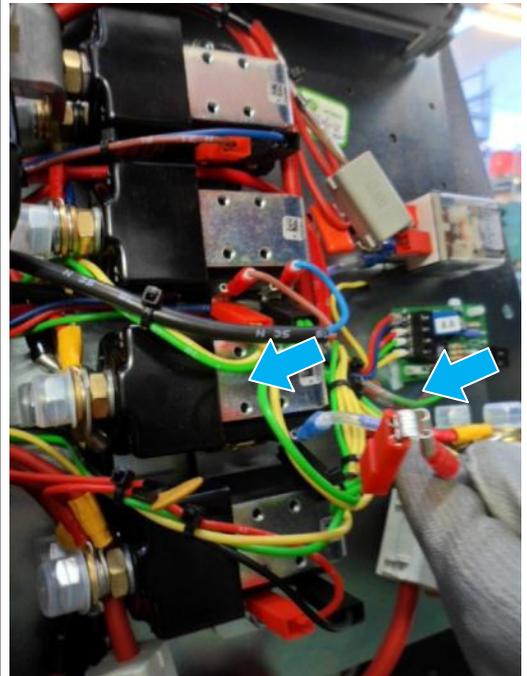
8. Increase the pressure of the base (by pressing the base on the floor) so that the absorption of the engine is equal to 40A.

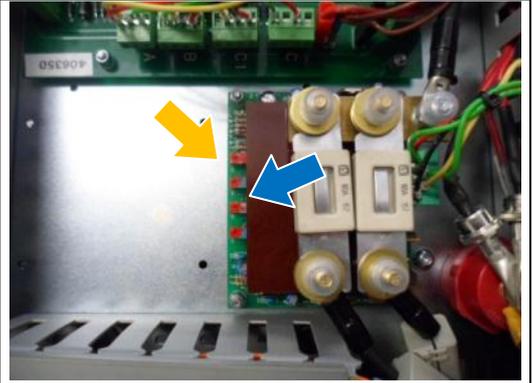


9. Adjust the **trimmer T1 (amps)** of the tab control engines, so that the light begins to flash to the achievement of the absorptions indicated above. The trimmers increases the threshold of intervention when turned clockwise, decreases if turned in a counterclockwise direction.
10. Adjust the **trimmer T2 (delay intervention)** of the engine control board, so that the brushdeck motor switches off after ca. 15 -18 Flashes (ca. 15-20 Seconds). The trimmers increases the delay of intervention when turned clockwise, decreases if turned in a counterclockwise direction. 5. Finished the adjustment, seal the trimmer with the glaze.



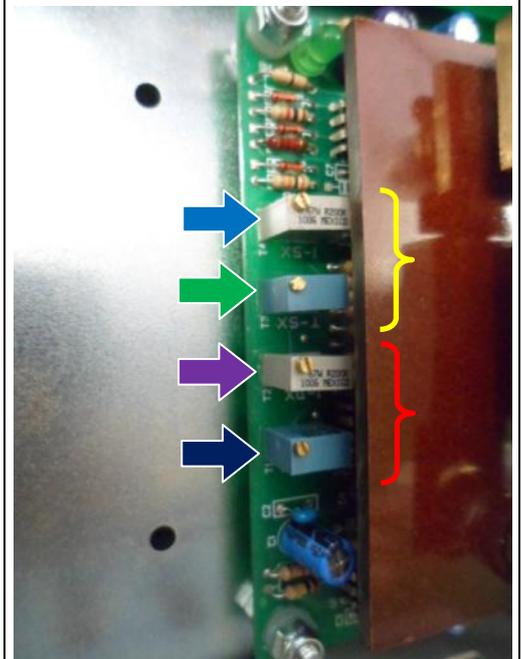
Proceed in a similar manner for the adjustment of the **motor of the front brush** (left motor - lh)





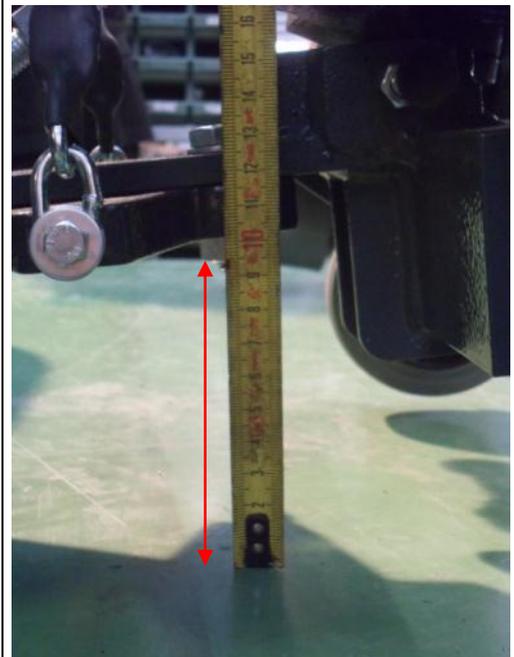
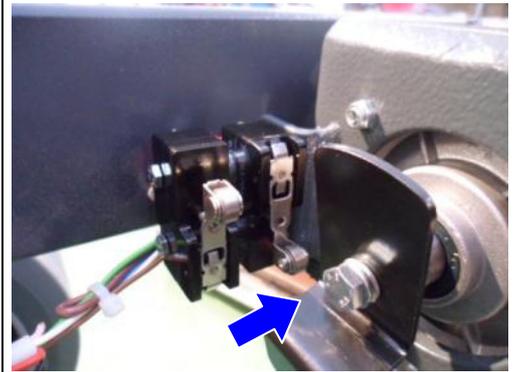
Current control card (SMG 130 Base)

1. **Left motor (Front Brush).** Trimmer **T3** = delay intervention ammeter. Trimmer **T4** = operation threshold ammeter.
2. **Right Motor (Rear Brush).** Trimmer **T1** = delay intervention ammeter. Trimmer **T2** = operation threshold ammeter.

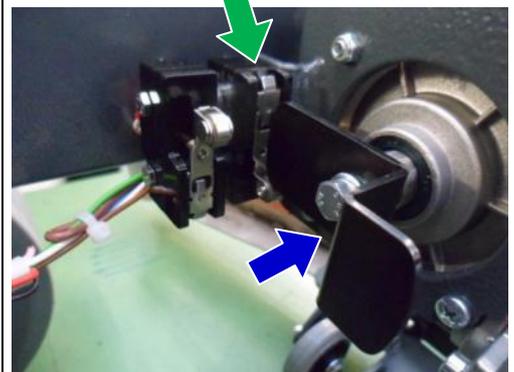


Squeegee limit switch adjustment

1. Check that the movement of the squeegee is carried out without put under stress the actuator.
2. If necessary to loosen the screw that secures the **cam** of the actuator shaft.
3. Raise the squeegee to obtain a distance of 105 mm between the floor and the squeegee support;

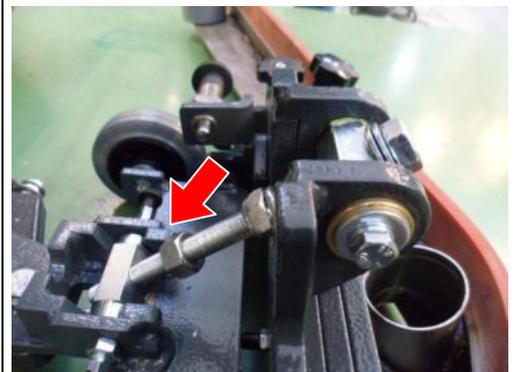
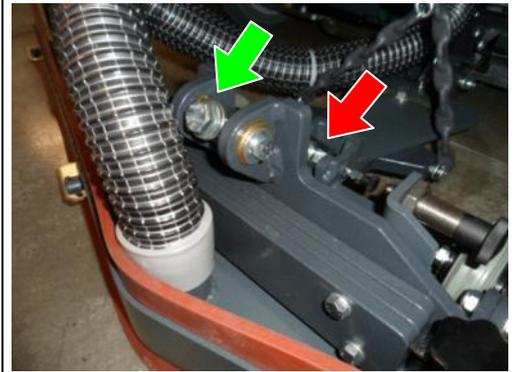


1. With squeegee in upper position rotate the **cam** up to snap the **micro switch** (micro with the wheel upwards).
2. Lock the **center screw** of the cam.
3. The other limit switch will be activated automatically at the correct instant during the lowering of the squeegee.



Squeegee Adjustment

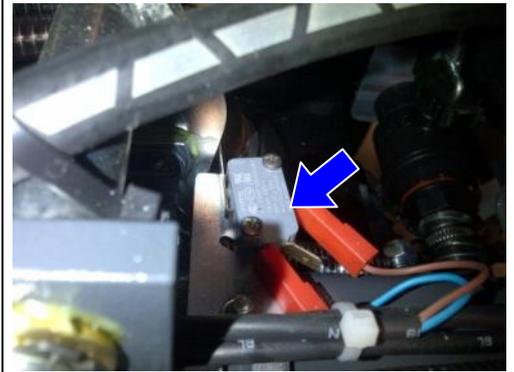
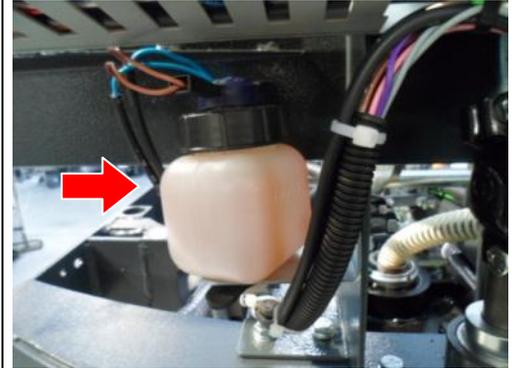
1. Adjust the inclination of the squeegee by the **knob**, loosening the **lock nut**. It is necessary that the rubber, be bent uniformly along its entire length.
2. Adjust the height of the wheels by the adjusting screws to make sure that the rubber makes with the floor an angle of 30 ° -45 °.
3. Tighten the **lock nut**.



Service brake

For a correct operation of the service brake check that:

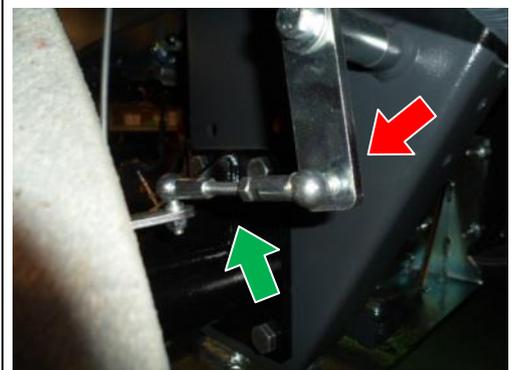
1. There is always the correct amount of **brake oil** in the reservoir and in the case reset the level using oil D. O.T. 4.
2. The **microswitch** located near the service brake functions correctly. When the pedal is pressed down the micro must open.



Parking brake

For a correct operation of the parking brake check that:

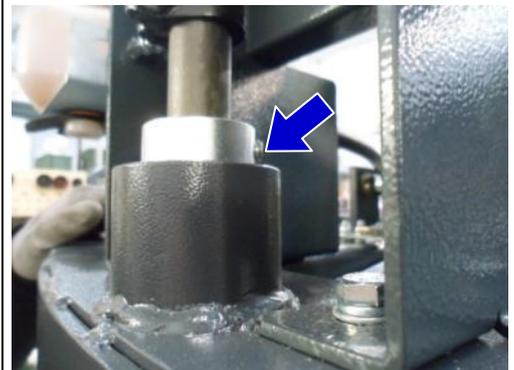
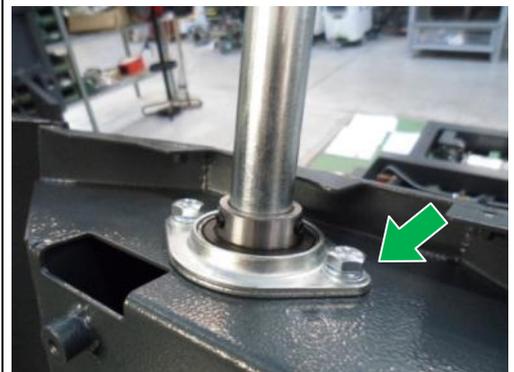
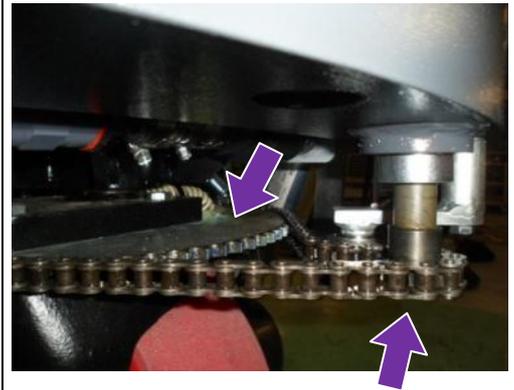
1. The microswitch located near the parking brake functions correctly. When the brake is inserted the micro should open and on the dashboard should come on the relative warning lamp.
2. The tension of the wire parking brake control is properly adjusted. With pedal positioned in neutral the machine must move. With pedal positioned in the first tooth, the machine must be partially braked. A foot pedal located on the second tooth the machine must be completely stopped.
3. If you need to adjust the tension of the braking wire act on the registers near the rear wheels. To increase the braking force increase the length of the threaded stud that protrudes from the heads knuckle.



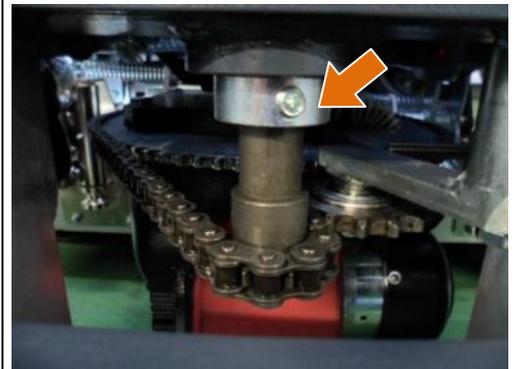
Steering wheel adjustment

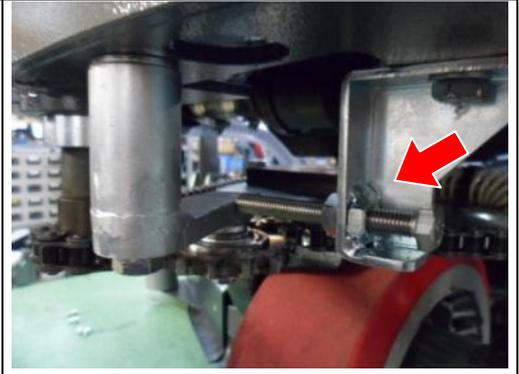
Check the correct alignment of the crowns of the steering group. If necessary to act as follows on grains of adjustment in order to obtain the correct alignment:

1. Loosen the two **grains** placed near the steering wheel.
2. Loosen the **grain** place close to the frame.
3. Loosen the **grain** located near of the crowns of the steering group.
4. Operate on the steering shaft up to obtain the correct alignment.
5. Resecure the grains loosen previously.



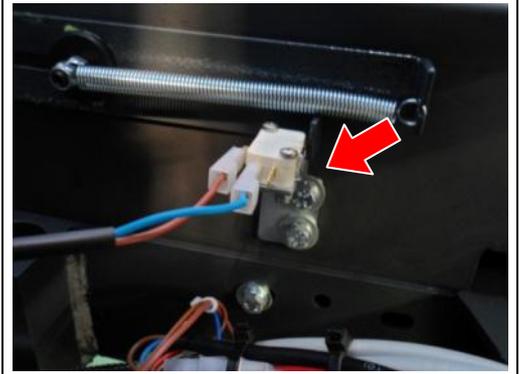
1. Check that the chain tension is correct. If adjustment is necessary act on the adjusting screw tightener to obtain the correct tension.





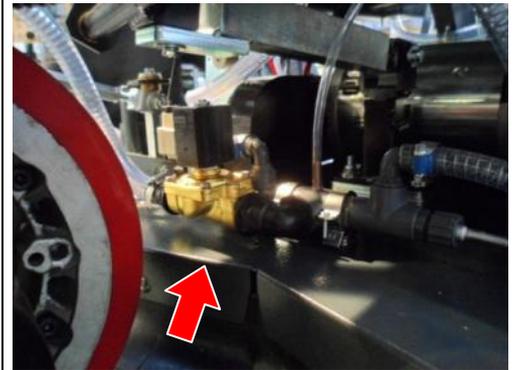
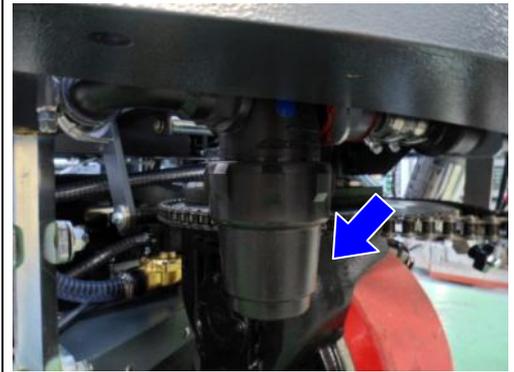
Battery charger enable switch

1. Check the operation of the micro switch. With charger cable inserted (door open) the machine should not have power supply.



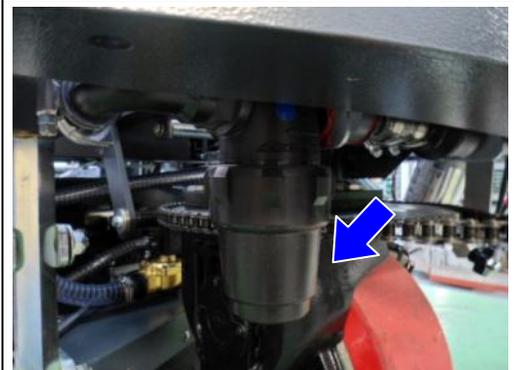
Water System (SMG 120 Base)

1. Check the cleanliness and the correct assembly of the **solution filter**.
2. Fill the reservoir with water solution and check tightness.
3. Check the sealing of the tubes, of the **solenoid valve** and adjustment of the water valve.
4. Verify that the solution, with open valve, arrives evenly on the floor, and that the fall is equal on both brushes.
5. Fill the recovery tank and check the seal
6. Check the seal of the tube and the drain plug.



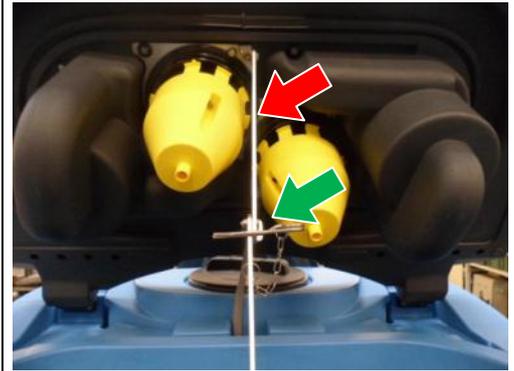
Water System (SMG 130 Base)

1. Check the cleanliness and the correct assembly of the solution filter.
2. Fill the reservoir with water solution and check sealings.
3. Check the sealing of the tubes, of the **solenoid valve** and adjustment of the tap water.
7. Verify that the solution, with open valve, arrives evenly on the floor, and that the fall is equal on both brushes.
4. Fill the recovery tank and check the seal
5. Check the seal of the tube and the drain plug.



Vacuum system test

1. Check the cleanliness and functionality of the **air filter**. To operate properly attach the **pin** to the lift rod and then remove the covers of the vacuum filter.
2. Check the connections and sealing of the tubes and squeegee vacuum hose.

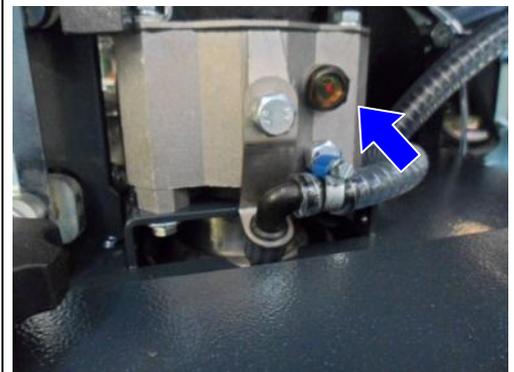


Greasing points and maintenance (SMG 120)

1. Grease the **support pins** of the base.



2. Check that the oil in the bike speed reducers is visible in the **glassy plugs**.



Greasing points and maintenance (SMG 130)

1. Grease the **support pins** of the base.



2. Grease **the pins of the lateral movement** of the base



3. Grease the **pins of the shaft** of the brush deck (it is enough to remove the black plastic cap).





Floating switch in tanks

1. Check the functionality of the float "reserve" solution tank. With condition of solution tank in the reserve (float closed) should turn on the corresponding indicator light on the instrument panel.



1. Check the functionality of the float recovery tank "empty" . With condition of recovery tank vacuum (float open) and seat elevation must be illuminated on the dashboard light of consent to overturn the tank.

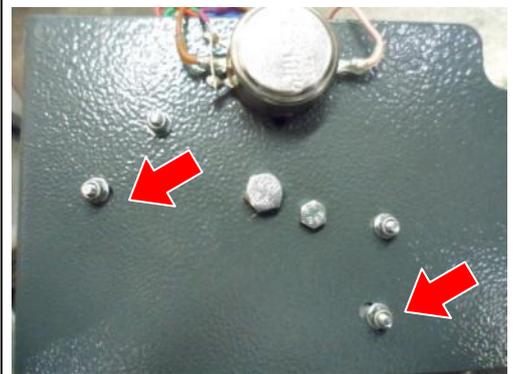
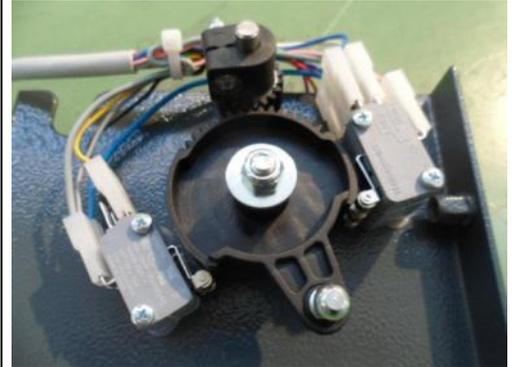


1. Check the functionality of the float recovery tank "full". With condition of recovery tank full engines intake should be switched off after 15-20 seconds.



Traction limit switches tests

1. Verify the correct operation and alignment of the microswitches control pedals gear. If necessary perform their adjustment by the **slots**.



Final Check of the machine

Check the functionality of switches and lamps;
check the functionality of the microswitch seat;
check the functionality of the accelerator pedal;
check the functionality of the base;
check the functionality of the engine brushes;
check the functionality of the solenoid valve;
check the functionality of the wiper;
check the functionality of the engine intake;
check the functionality of the service and parking brake;
check the functionality of the steering wheel;
check the status of the batteries, the terminals and cables;
check the functionality of the horn; check the functionality of the flashing.

Functional test of the machine

Fill with water tanks and check for leaks.
Check the sealing of the water system, and that the fall in the water on the two brushes is uniform.
Adjust the inclination and the wheels of the squeegee, performing a functional test.
Adjust the pressure of the brushes and the inclination of the base, by performing a functional test.
Adjust through knobs the Splashguards side of the crankcase by performing a functional test.
Check the automatic operation.
Check the operation of the micro seat.
Check the operation of the selector output water.
Check the operation of the knob that adjusts the pressure of the brushes of the base.
Check the efficiency of the parking and emergency braking: curb at the maximum speed and check that the wheels lock at the same time.
Check forward, reverse, acceleration and braking.

Final test

Check all functions: washing, drying, forward, reverse and braking.