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Operations & Maintenance Manual
For Commercial Use Only



BDSO 27/28 STAND-ON AUTOMATIC
SCRUBBER MODEL NO: 99786



Long Term Buyer Protection Limited Warranty

Tornado Industries, LLC. (Tornado) warrants to the end/user customer that the Tornado product(s) will be free from defects in material and workmanship for the duration(s) described below. This limited warranty DOES NOT cover machines and/or components subject to normal wear and tear, damage that occurs in shipping, failures resulting from modification, accident, unsuitable operating environment, misuse, abuse, neglect, or improper maintenance by you. For full details, contact your Authorized Tornado Distributor, Service Center, or the Tornado Technical Service Department. Tornado sales and service representatives are not authorized to waive or alter the terms of this warranty, or to increase the obligations of Tornado under the warranty.

10 Years*

Plastic water tanks and Rotationally-molded bodies

2 Years*

Parts on all Tornado cleaning equipment

1 Year*

Labor on all Tornado cleaning equipment

1 Year*

Warranty on batteries, one year prorated

All battery warranties are handled directly by the battery manufacturer, on a one year prorated basis

Terms subject to change without notice

1. Except all Windshears™ Blowers, Storm, TV2SS, Side and Downdraft, Insulation Blowers, CV 30, CV 38, CK14/1 PRO, CK 14/2 PRO, SWM 31/9, CK LW13/1, CK LW 13/1 ROAM, CV 38/48 Dual, PV6, PV10, PV6 ROAM, Wall Mount Vacuum and all chargers are warranted for 1 (one) year for both parts and labor.
2. All non-wear item parts purchased after warranty expiration are warranted for 90 days.
3. Warranty starts from the date of sale to the consumer or, at Tornado's discretion, 6 months after the dealer purchased the unit from Tornado, whichever comes first.
4. The EB 30 is warranted for a period of 90 days for both parts and labor.
5. The warranty on engines used on propane powered equipment is limited to motor manufacturer's warranty.
6. Ride-on Scrubbers are warranted for 24 months, parts, 6 months labor or 1,000 hours, whichever occurs first.

Note: Tornado, The Latest Dirt, Floorkeeper, Carpetkeeper, Carpetrinser, Carpetrinser/Dryer, Headmaster, Taskforce, PAC-VAC, T-Lite, Glazer, Windshear, Max-Vac and Trot-Mop are trademarks of Tornado Industries

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NOTES

Your new Tornado unit is a high quality, precision-made product. All parts used in the manufacturing of this unit have passed rigid quality control standards prior to assembly. Please safeguard the original receipt / invoice. If you experience any problems with your unit during the warranty period, the original receipt / invoice will act as proof of purchase. Contact Tornado for any warranty inquiries.

IMPORTANT SAFETY INSTRUCTIONS

READ AND UNDERSTAND ALL INSTRUCTIONS BEFORE USING THIS UNIT

Read and understand this owner's manual and all labels on the unit before operating. Safety is a combination of common sense, staying alert and knowing how your unit works. Use this unit only as described in this manual. Use only manufacturer's recommended attachments. To reduce the risk of personal injury or damage to your unit use only Tornado recommended accessories.

Thank you for having chosen our machine. This floor cleaning machine is used for the industrial and civil cleaning and is able to clean any type of floor. During its advance movement, the combined action of the brushes and the detergent solution removes the dirt which is aspirated through the rear suction assembly, giving a perfectly dry surface.

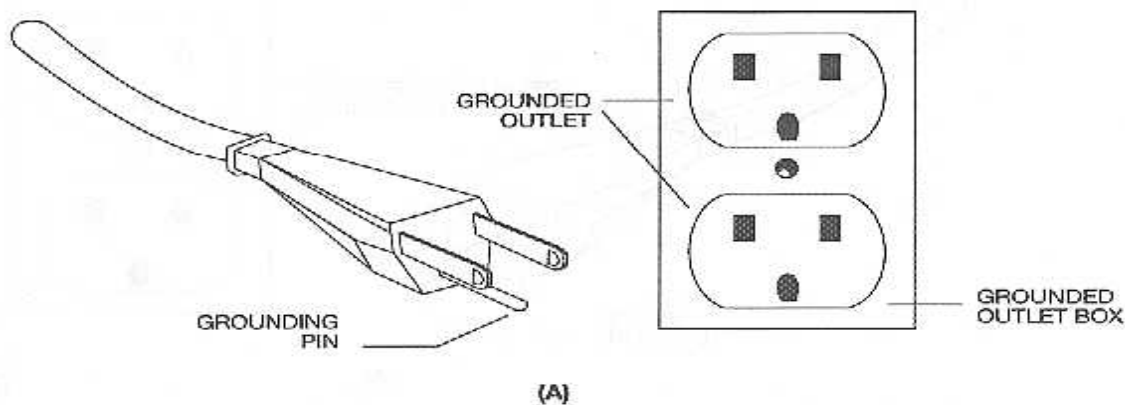
The machine must be used only for such purpose. It gives the best performance if it is used correctly and maintained in perfect efficiency. We therefore ask you to read this instruction booklet carefully whenever difficulties arise in the course of the machine's use. In case of need, we ask you to contact our service department for all advice and servicing as may prove necessary.

GROUNDING INSTRUCTIONS

This appliance must be grounded. If it should malfunction or breakdown, grounding provides a path of least resistance for electric current to reduce the risk electric shock. This machine is equipped with a cord having an equipment -grounding conductor and grounding plug. The plug must be inserted into an appropriate outlet that is properly installed and grounded in accordance with all local codes and ordinances.

WARNING: Improper connection of the equipment-grounding conductor can result in a risk of electric shock. Check with a qualified electrician or service person if you are in doubt as to whether the outlet is properly grounded. Do not modify the plug provided with the appliance - if it will not fit the outlet, have a proper outlet installed by a qualified electrician.

This appliance is for use on a nominal 120-volt circuit, and has a grounding plug that looks like the plug illustrated in sketch A.



SUMMARY		SPEED ADJUSTMENT, FORWARD	
TECHNICAL DESCRIPTION	6	AND BACKWARD	18
GENERAL RULES OF SAFETY	7	DETERGENT SOLUTION FLOW RATE	
TRANSFER	7	AND ADJUSTMENT	18
STORAGE AND DISPOSAL	7	AUTOMATIC MODE WORK	18
CORRECT USE	7	SUCTION MOTOR SILENT MODE	19
MAINTENANCE	7	STANDBY MODE	19
STEERING WHEEL PANEL	8	HORN	19
CONTROLS BOARD LEGEND	8	EMERGENCY BUTTON	19
MACHINE LEGEND	8	PARKING BRAKE	19
DISPLAY READING	9	MANUAL MOVEMENT OF	
CONTROLS DISPLAY	9	THE MACHINE	19
3S AND 3SD DISPLAY	10	BRUSHES MOTOR OVERLOAD	
MANUAL SYMBOLOGY	10	PROTECTION SYSTEM	19
NAVIGATION CONTROLS	11	OVERFLOW SYSTEM	19
GENERAL SETTINGS	11	STOP OF THE MACHINE AFTER	
DISPLAY LANGUAGE SELECTION	11	CLEANING OPERATION	20
CHANGING THE BATTERY SETTING	11	DAILY MAINTENANCE	20
DISPLAY CONTRAST	11	DRAINING AND CLEANING THE	
DISPLAY BRIGHTNESS	11	RECOVERY TANK	20
BEFORE USE	12	CLEANING THE SUCTION FILTER	20
HANDLING OF THE PACKED MACHINE	12	DISASSEMBLING THE BRUSHES	20
UNPACKING OF THE MACHINE	12	AUTOMATIC DISASSEMBLE OF	
ACCESS TO THE BATTERY COMPARTMENT	12	THE BRUSHES	21
INSTALLING THE BATTERIES	13	CLEANING THE BRUSHES	21
BATTERY CHARGER	13	CLEANING THE SQUEEGEE	21
ON-BOARD BATTERY		WEEKLY MAINTENANCE	21
CHARGER (OPTIONAL)	13	REAR SQUEEGEE RUBBER CHECK	21
BATTERIES CHARGE LEVEL INDICATOR	13	CLEANING THE SQUEEGEE HOSE	22
BATTERY CHARGING	14	CLEANING THE SOLUTION TANK	22
BATTERY CHARGING USING THE ON-BOARD		CLEANING THE OUTER FILTER	22
BATTERY CHARGER (OPTIONAL)	14	TWO-MONTHLY MAINTENANCE	22
BATTERIES DISPOSAL	14	FRONT SQUEEGEE RUBBER CHECK	22
SQUEEGEE ASSEMBLY	14	SIX-MONTHLY MAINTENANCE	23
ADJUSTING THE SQUEEGEE	15	SPLASH GUARD RUBBER CHECK	23
ASSEMBLING AND DISASSEMBLING		TROUBLESHOOTING GUIDE	23
THE SPLASH GUARDS	15	THE SUCTION MOTOR DOES	
ASSEMBLING THE BRUSHES	15	NOT WORK	23
FLOOR CLEANING	16	BRUSHES MOTOR DOES NOT WORK	23
CONNECTING THE BATTERY CONNECTOR		TRACTION MOTOR DOES NOT WORK	24
AND SWITCHING ON THE MACHINE	16	WATER DOES NOT COME DOWN ONTO THE	
RECOVERY TANK	16	BRUSHES	24
DETERGENT SOLUTION TANK	16	THE MACHINE DOES NOT CLEAN PROPERLY	24
3S SOLUTION SAVING SYSTEM		THE SQUEEGEE DOES NOT DRY PERFECTLY	24
(OPTIONAL)	17	EXCESSIVE FOAM PRODUCTION	25
WORK	17	RECOMMENDED BRUSHES	25
MANUAL MODE WORK	17		
BRUSHES PRESSURE ADJUSTMENT	18		

TECHNICAL DESCRIPTION	U/M	BDSO 27/28
Cleaning Width	in/mm	26.5/685
Squeegee Width	in/mm	34/860
Working Capacity	sqft/h/sqm/h	44,239/4,110
Brushes Diameter	in/mm	2 x 14/2 x 355
Brushes Speed	RPM	160
Brush Pressure	lbs/kg	126/57 max
Brushes Motor	W/A	2 x 350/2 x 15
Traction Motor	W/A	500/21
Vacuum Motor	W/A	570/23.75
Vacuum	mbar/in	160/64
Type of Drive		Automatic
Speed (max.)	mph/kph	5/3.7
Maximum Gradient	%	10
Solution Tank	gal/l	26.5/98
Recovery Tank	gal/l	28/106
Machine Length	in/mm	61/1544
Machine Height	in/mm	55/1388
Machine Width (w/o Squeegee)	in/mm	30/765
Weight (empty w/o batteries)	lbs/kg	470/213
Voltage	V	24
Battery Tray (Right)	in/mm	21x7.4x12.8/532x187x325
Battery Tray Left	in/mm	21x7.4x12.8/532x187x325
Sound Level	db(A)	<70
Class		III
Protection Level	IP	23

GENERAL RULES OF SAFETY

The rules below have to be followed carefully in order to avoid injury to the operator and damage to the machine.

- Read the labels carefully on the machine. Do not cover them for any reason and replace them immediately if damaged.
- ATTENTION: The machine must be used exclusively by authorized staff that have been instructed on its correct and proper use.
- ATTENTION: Do not use the machine on areas having a higher gradient than the one stated on the number plate.
- ATTENTION: The machine is not to be used by persons, children included, with reduced physical, sensorial or mental capabilities, or with lack of experience or knowledge, unless they could benefit, through the intermediation of a responsible person for their safety, by a supervision or instructions concerning to its use.
- During the operation of the machine, pay attention to other people and especially to the children.
- Children shall not play with the machine.
- Children cannot carry out cleaning and maintenance of the machine.

TRANSFER

- Do not strike shelvings or scaffoldings where there is danger of falling objects.
- Leaving the machine in parking position, take off the key.
- Do not use the machine as a means of transport.
- Adapt the working speed to the adhesion conditions: particularly, slow down before narrow curves have to be faced.

STORAGE AND DISPOSAL

- Storage temperature: between 32°F and 131°F (0°C and +55°C).
- Perfect operating temperature: between 32°F and 104°F (0°C and +40°C).
- The humidity should not exceed 95%.
- Provide for the scrapping of the material of normal wear following strictly the respective rules.
- The batteries need to be removed from the machine before its scrapping.

- When your machine has to stop activity, provide for the appropriate waste disposal of its materials, especially oils, batteries and electronic components, and considering that the machine itself has been, where possible, constructed using recyclable materials.

CORRECT USE

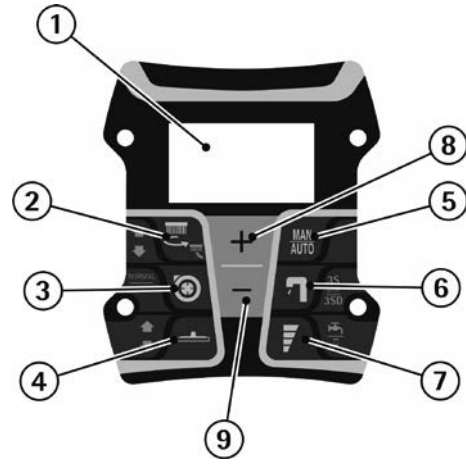
- Do not use the machine on surfaces covered with inflammable liquids or dusts (for example hydrocarbons, ashes or soot).
- In case of fire, use a powder based fire-extinguisher. Do not use water.
- Do not use the machine in explosive atmosphere.
- The machine has to carry out simultaneously the operations of washing and drying. Different operations must be carried out in restricted areas prohibited to non-authorized personnel and the operator has to wear suitable shoes.
- Signal the areas of moist floors with suitable signs.
- Do not mix different detergents, avoiding harmful odours.
- Avoid brushes operation when the machine is standing still in order to prevent floor damages.

MAINTENANCE

- If the machine does not work properly, check by conducting simple maintenance procedures. Otherwise, as for technical advice from an authorized assistance centre.
- For any cleaning and/or maintenance operation take off the power supply from the machine.
- Where parts are required, ask for ORIGINAL spare parts from the distributor and/or from an authorized dealer.
- Use only ORIGINAL brushes indicated in the paragraph “RECOMMENDED BRUSHES”.
- Do not take off the protections which require the use of tools for their removal.
- Do not wash the machine with direct water jets or with high water pressure nor with corrosive material.
- Every 200 working hours have a machine check by an authorized service department.
- Before using the machine, check that all panels and coverings are in their position as indicated in this use and maintenance catalogue.
- Restore all electrical connections after any maintenance operation.

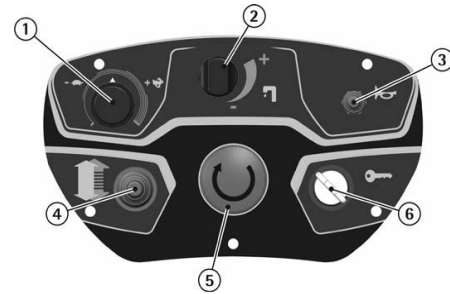
STEERING WHEEL PANEL

- 1. DISPLAY
- 2. UP/DOWN BRUSHES BUTTON
- 3. ON/OFF VACUUM MOTOR BUTTON
- 4. UP/DOWN SQUEEGEE BUTTON
- 5. AUTOMATIC/MANUAL MODE BUTTON
- 6. OPEN/CLOSE SOLENOID VALVE
- 7. SOLUTION LEVEL BUTTON (ONLY FOR 3S/3SD)
- 8. MAXIMUM SPEED INCREASE BUTTON
- 9. MAXIMUM SPEED DECREASE BUTTON



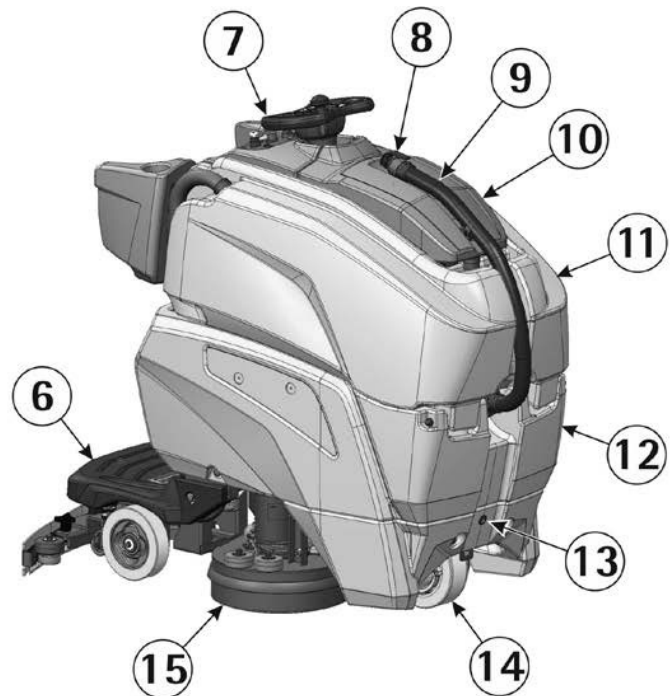
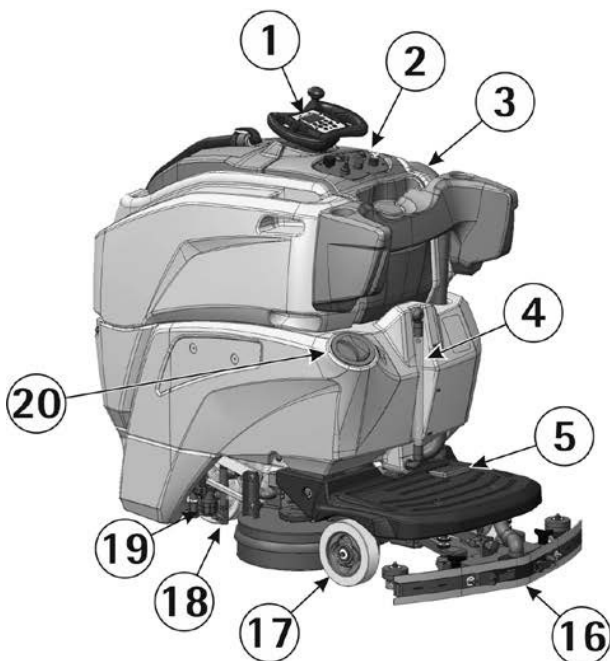
CONTROLS BOARD LEGEND

- 1. SPEED ADJUSTMENT KNOB
- 2. WATER VALVE
- 3. HORN
- 4. DIRECTION LEVER (FORWARD/BACKWARD)
- 5. EMERGENCY BUTTON
- 6. KEY SWITCH



MACHINE LEGEND

- 1. STEERING WHEEL PANEL
- 2. CONTROLS BOARD
- 3. SQUEEGEE HOSE
- 4. SOLUTION LEVEL HOSE
- 5. SPEED PEDAL
- 6. FOOTBOARD
- 7. STEERING WHEEL
- 8. DRAINING HOSE CAP
- 9. DRAINING HOSE
- 10. RECOVERY TANK COVER
- 11. RECOVERY TANK
- 12. SOLUTION TANK
- 13. HEADLIGHT
- 14. TRACTION WHEEL
- 15. BRUSH BASE ASSEMBLY
- 16. SQUEEGEE ASSEMBLY
- 17. REAR WHEELS
- 18. SOLUTION EXHAUST
- 19. DETERGENT SOLUTION FILTER
- 20. SOLUTION FILLING HOLE CAP



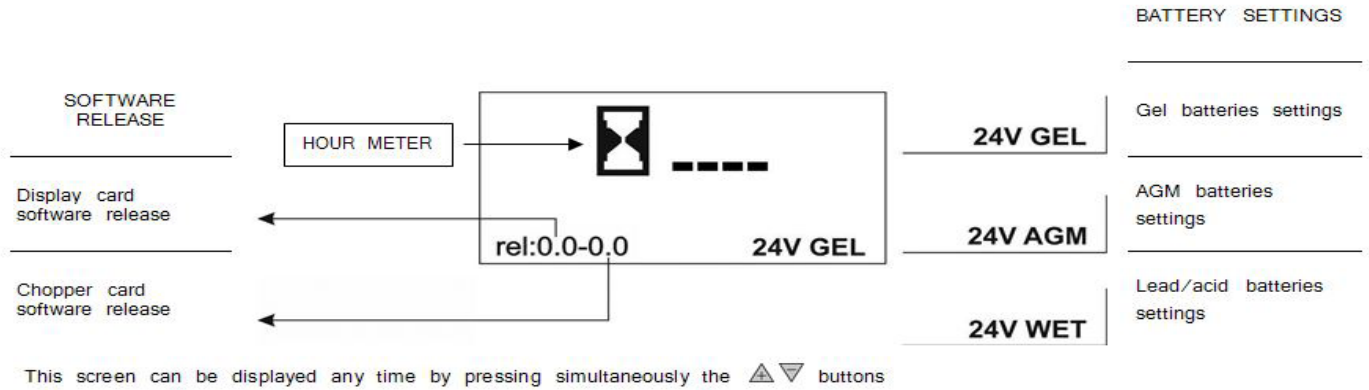
DISPLAY READING

DISPLAY WHILE SWITCHING ON

When the machine is switched on, the display shows the following screen

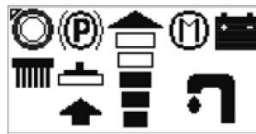
BDSO 27/28

Next screen will be displayed as follows:



CONTROLS DISPLAY

Standard Mode



Parking brake on		Suction motor off		Brush base up		Squeegee up		Maximum speed level set		Standard mode selection	
Automatic mode		Suction motor on		Brush base down		Squeegee down			Solenoid valve on		
Manual mode		Suction motor quiet mode		Brushes on						Solenoid valve off	
Battery charge level				Brush base pressure level						3S mode selection	
										3SD mode selection	

After selecting the 3S or the 3SD mode (see the 3S/3SD mode paragraph), the display will show the following controls:

3S mode

Solenoid valve on	
Solenoid valve off	
Water carried level	H1

3SD mode

Solenoid valve on		Detergent percentage 0.2%
Solenoid valve off		
Water carried level	H1	

MANUAL SYMBOLOGY



Symbol denoting the open book.
Indicates that the operator has to read the manual before the use of the machine.



Obligation symbol requiring the wear of protection glasses.



Symbol denoting the open book.
For the proper functioning of the incorporated battery recharger (optional), read the manual of the manufacturer.



Obligation symbol requiring the wear of protection gloves.



Warning symbol.
Read carefully the sections marked with this symbol, for the security of both the operator and the machine.



Symbol preceding an information about the correct use of the machine.



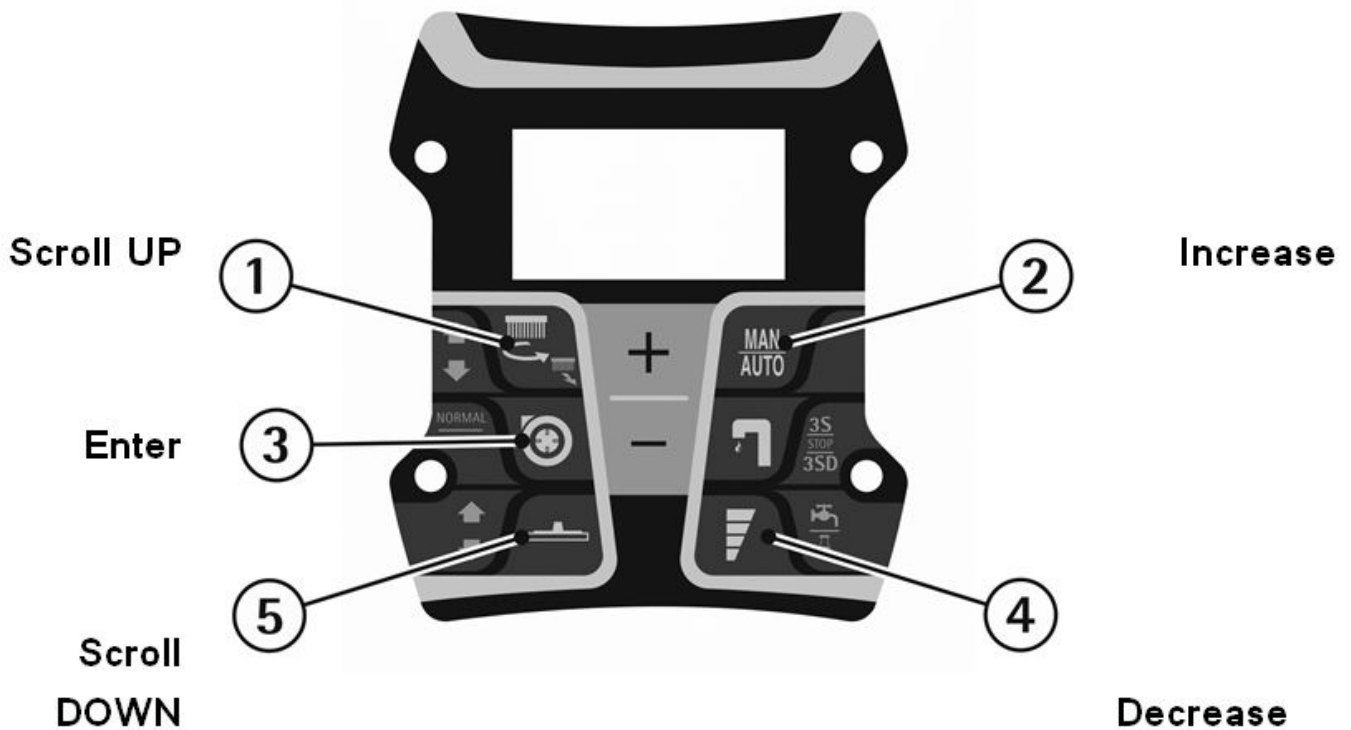
Warning symbol.
Risk of acid leakage from the batteries.



Symbol indicating operations to be carried out only by qualified personnel.



Obligation symbol, disconnect the battery before any operation on the machine.



GENERAL SETTINGS

To enter the general settings menu use the controls panel as follows:

1. Keep the buttons (1) and (4) pressed simultaneously.
2. Turn the key on.
3. When "INSERT PASSWORD:0", is displayed press the ENTER button (3).

Once in the GENERAL SETTINGS, it will be possible to change the following settings by simply scrolling the controls menu using buttons (1) and (5).

DISPLAY LANGUAGE SELECTION

English is the default language, it can be switched to Italian.

To select the language first display "Language", then select it using buttons (2) and (4). Use button (3) to confirm the change.

CHANGING THE BATTERY SETTING

Once in the general settings, it is possible to set the machine battery type depending on the batteries installed (AGM / GEL / LEAD-ACID).

To select the proper setting first display "BATTERY", then select it scrolling with buttons (2) and (4). Use button (3) to confirm the change.



A wrong setting may result in an irreversible damage of the battery.

ALWAYS check to have set the proper setting.

You can view the battery setting when the machine is switched on (see "BATTERY SETTINGS or DISPLAY READING").

DISPLAY CONTRAST

Once in the general setting, it is possible to improve the display contrast using button (2) to increase it and button (4) to decrease it.

Use button (3) to confirm the change.

DISPLAY BRIGHTNESS

Once in the general setting, it is possible to increase or decrease the display brightness using button (2) to increase it and button (4) to decrease it.

Use button (3) to confirm the change.

BEFORE USE

HANDLING OF THE PACKED MACHINE

The machine is supplied with suitable packing foreseen for fork lift truck handling.

The total weight is 590 lbs. (268kg).

Packing dimensions:

Base: 70" x 37" (178 cm x 93 cm)

Height: 54" (138 cm)

Weight (packed machine):

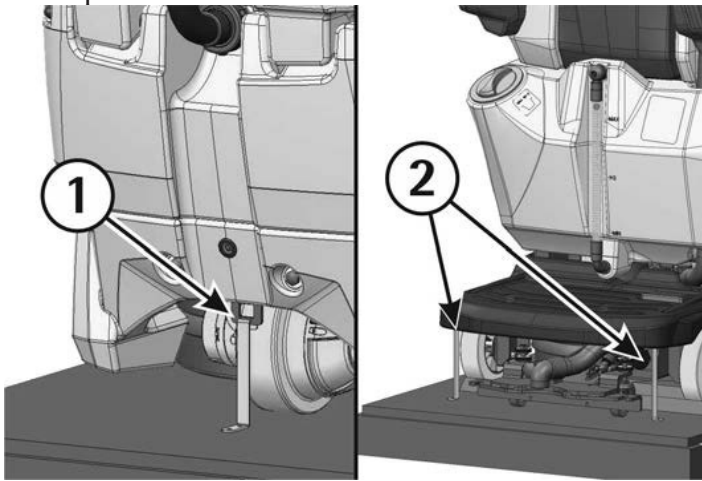
492 lbs. (223 kg)



Do not place more than 2 packages on top of each other

UNPACKING THE MACHINE

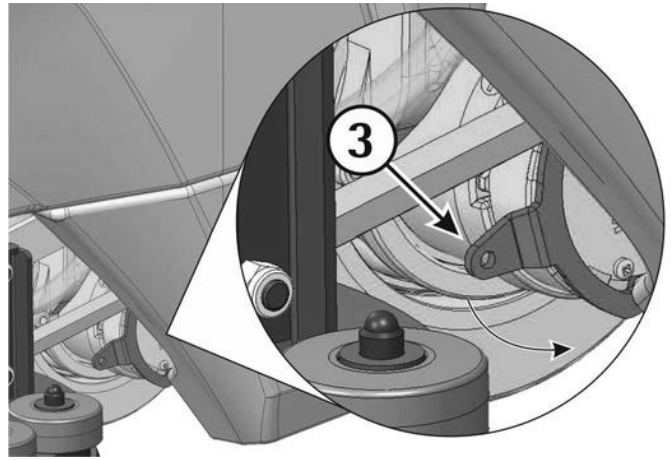
1. Remove the external packing.
2. Unscrew the brackets (1+2) that secure the machine to the pallet.



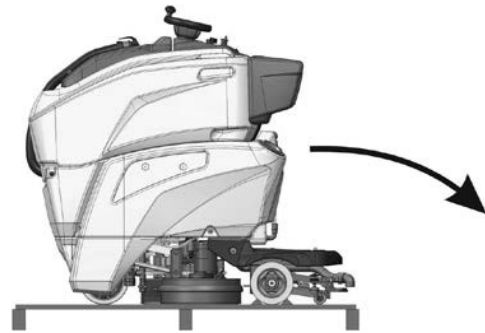
3. Before moving the machine from the pallet, it is necessary to release the parking brake that blocks the traction motor wheel. To do this, keep the lever (3) lifted. With the delivery of the machine we also supply a cord that permits the lever operation (3). After having moved the machine, take off the cord and keep it for eventual re-use.



When the parking brake is released manually, for example when the machine has to be moved without batteries, avoid covering slopes, and do not park on them.



4. Move the machine backwards, as indicated in the figure, avoiding heavy contacts to mechanical parts.

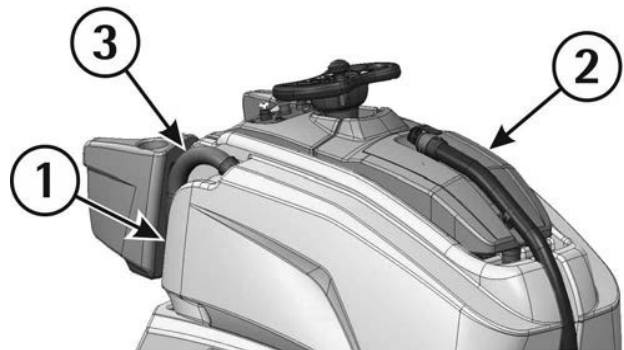


5. Keep the pallet and the brackets for eventual transport.

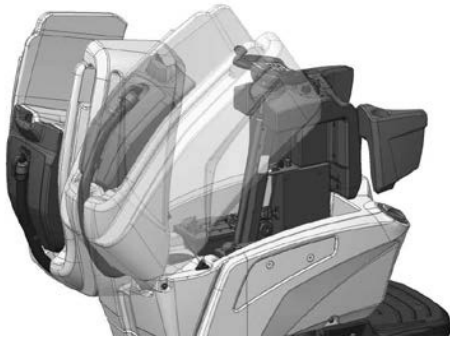
ACCESS TO THE BATTERY COMPARTMENT

To reach the battery compartment, first make sure that the recovery tank (1) is empty by opening the cover (2).

If the tank is full, proceed as indicated under "RECOVERY TANK CLEANING", otherwise take off the squeegee hose (3) and lift the tank.



Thanks to a blocking system of 2 levels, the machine allows for battery charging with the tank partially open.



INSTALLING THE BATTERIES

The standard machine is provided with the batteries set on lead/acid.

For different settings see chapter “BATTERY SETTINGS”.

The machine requires the use of serial connected batteries placed in their dedicated vans. Batteries must be handled using suitable lifting equipment (due to weight, considering the type of batteries chosen, and coupling system).

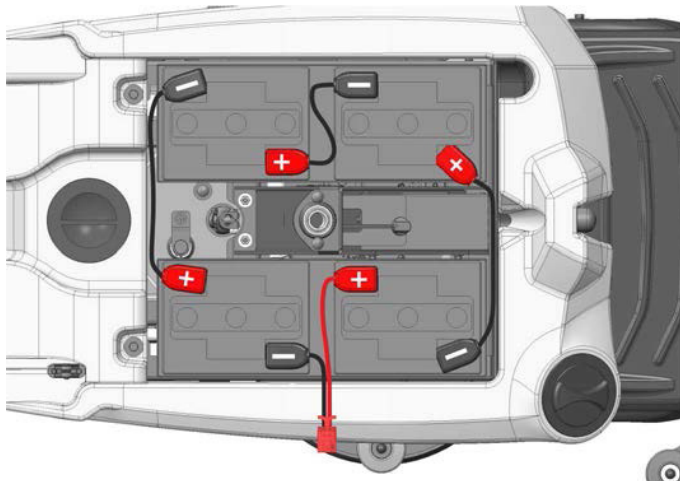
The batteries must be in accordance with CEI 21-5 Norms.



Strictly follow manufacturer/distributor indications for the maintenance and recharge of the batteries. All installation and maintenance operations must be executed by specialized staff, using suitable protection accessories.

For batteries installation, it is necessary to reach the battery compartment as indicated under paragraph “ACCESS TO THE BATTERY COMPARTMENT”.

1. Place the batteries in its compartment.
2. Connect the terminals, respecting the polarities, avoiding contact with other parts that could create short circuit.



BATTERY CHARGER



Make sure that the battery recharger is suitable for the installed batteries, both for their capacities and type (lead/acid or GEL and equivalent).

In the plastic bag containing the use and maintenance you will find the coupling connector for the recharger. It must be assembled onto the cables of your recharger, following the instructions given by the manufacturer.

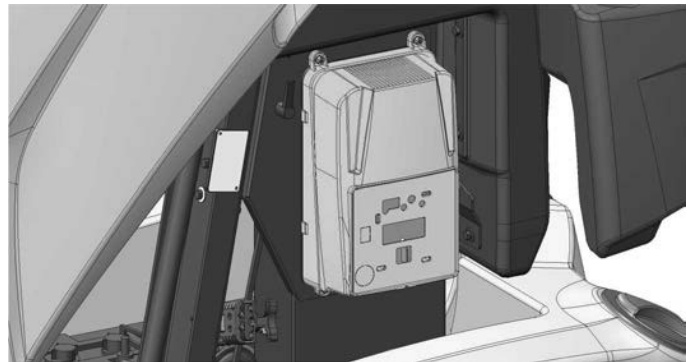
ON-BOARD BATTERY RECHARGER

If the machine is equipped with the incorporated battery recharger please refer to the instructions of the manufacturer of this accessory what the recharging operations require.

The battery recharger is connected directly to the battery poles.

During the charge, a system is activated that does not allow the machine to function.

The battery charger cable has a maximum length of 2 meters and must be connected to a single phase plug.

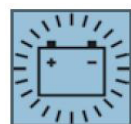


BATTERIES CHARGE LEVEL INDICATOR

The battery charge level is visualized on the display with its respective symbol (see "CONTROLS DISPLAY").



When the last segment of charge starts blinking, the battery is almost low and the suction and brushes functions are disabled.



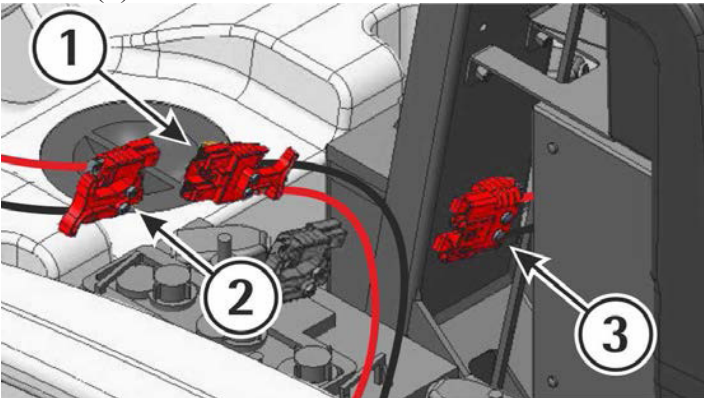
When even the last segment of charge turns off, the battery is completely low and the machine stops.

BATTERY CHARGING



BATTERIES RECHARGING

1. Plug the connector (2) of the battery recharger into the battery connector (1).
 2. Proceed with the recharging.
- Once the battery recharging is completed:
3. Disconnect the connector of the battery recharger from the battery connector (1).
 4. Connect battery connector (1) to the machine connector (3).

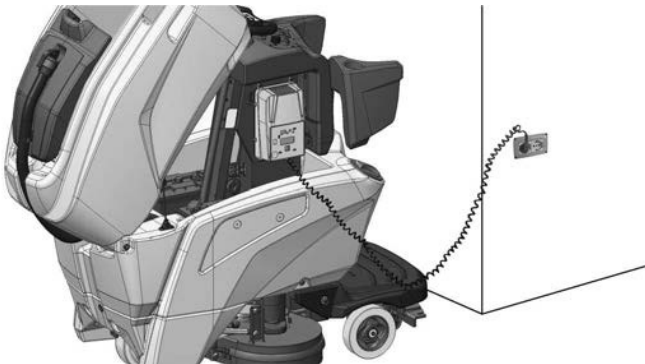


BATTERY CHARGING USING THE ON-BOARD BATTERY CHARGER



Take the machine to a level surface near a power plug.

1. Turn off the machine using the key switch.
2. Insert the plug into the mains socket.
3. Proceed to the recharging, keeping the recovery tank lifted (see paragraph "ACCESS TO THE BATTERY COMPARTMENT" in "BEFORE USE").
4. Do not take remove the plug from the mains socket until the indication of the end of charge is visualized. At the end of the recharging, remove the plug from the mains socket.



Never charge any battery with a non suitable recharger. Strictly follow the instructions supplied by the batteries and recharger manufacturer

NOTE: Never leave the batteries completely discharged for long periods, even if the machine is not used. In case of traditional batteries, please check the electrolyte level every 20 recharging cycles and eventually fill them up with distilled water. Never leave the batteries discharged for more than two weeks.



If lead/acid batteries are installed, there could be the risk of gas exhalations and emission of corrosive liquids.

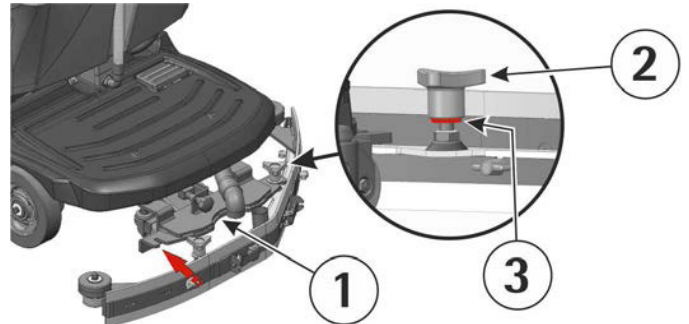
Fire danger: do not approach with free flames.

BATTERIES DISPOSAL

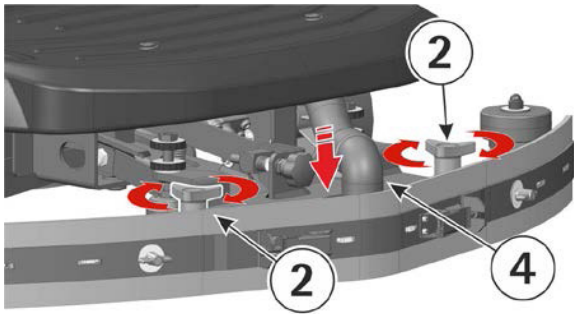
It is compulsory to hand over exhausted batteries, classified as dangerous waste, to an authorized institution according to the current laws.

SQUEEGEE ASSEMBLY

1. Maintain the squeegee support (1) slightly lifted from the floor.
2. Insert the threaded parts of the two knobs (2) making them slide inside the two slots present on the support. Pay attention to put the washers (3) into position, there are two for each knob, so that they are assembled one under and the other on top of the two slots present on the support.



3. Block the squeegee by rotating the two knobs (2) clockwise.
4. Insert the squeegee hose (4) into its coupling, respecting its position as indicated in the figure.



ADJUSTING THE SQUEEGEE

In order to have a perfect drying result through the squeegee, the rear rubber must have the lower bending uniformly adjusted in all its length. For the adjustment, it is necessary to put oneself in working condition and therefore the suction motor has to be switched on and the brushes have to function together with the detergent solution.



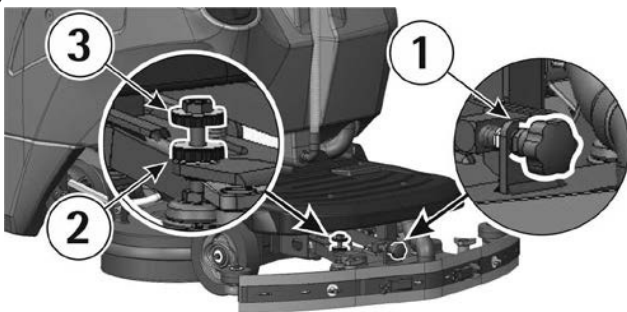
The bending is not uniform

Adjust the squeegee inclination by rotating the knob (1) counterclockwise to increase the bending in the central part, or clockwise to increase the bending on the extremities.

Height adjustment

Once the squeegee inclination has been adjusted, it is necessary to fix this optimum condition making the wheels slightly touch the floor. Release the wheels by rotating counterclockwise the register (2), rotate the register (3) to raise or to lower the wheels until the desired bending is reached.

At the end block again the wheels through the register (2).



ASSEMBLING AND DISASSEMBLING THE SPLASH GUARDS



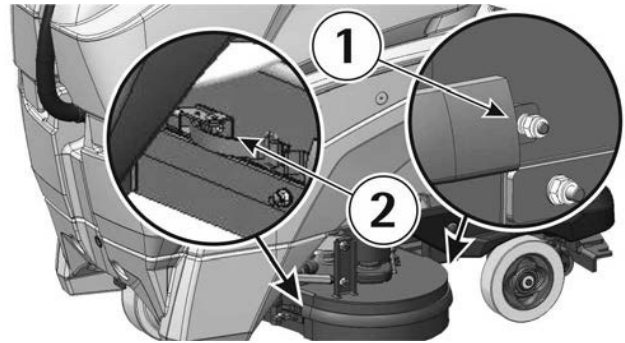
The two splash guards have to be assembled onto the brushes base group as indicated in the following figures. Insert the metal strips inside the suitable slots present on the rubber.

Attach the ends of the strip to the screw (1).

Lock the lever (2) to the ring placed at the free end of the meal strip.

These operations have to be done for both the splash guards. With the brushes assembled, the splash guards must slightly touch the floor.

To disassemble the splash guards, do the same operations in reverse order.



ASSEMBLING THE BRUSHES

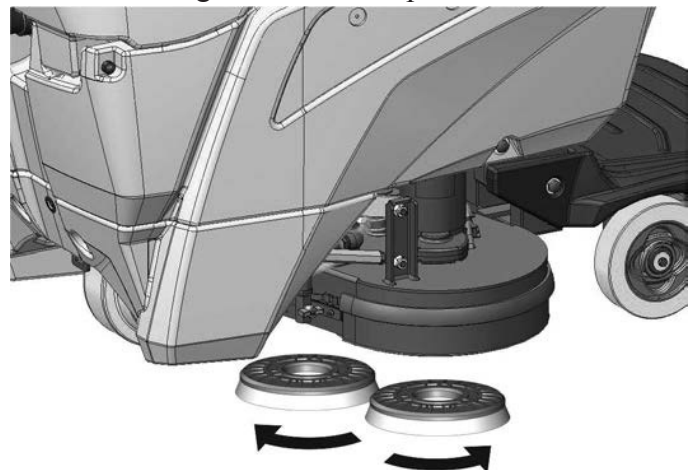


To assemble the brushes, it is necessary that the brushes base is in the lifted position. If it is not lifted, proceed as follows:

Without the operator upon the unit, turn the key switch clockwise, the display comes on and after 3 seconds all working groups are turned off automatically and are lifted from the floor.

Switch off the machine turning the key counterclockwise.

With the brushes base group in lifted position lock the brushes rotating them as in the picture below.



For a longer life of the brushes we suggest to daily invert their position. Whenever brushes result to be deformed we suggest to reassemble them in the same position, in order to avoid that the different inclination of the bristles causes excessive motor overload or troublesome vibrations.

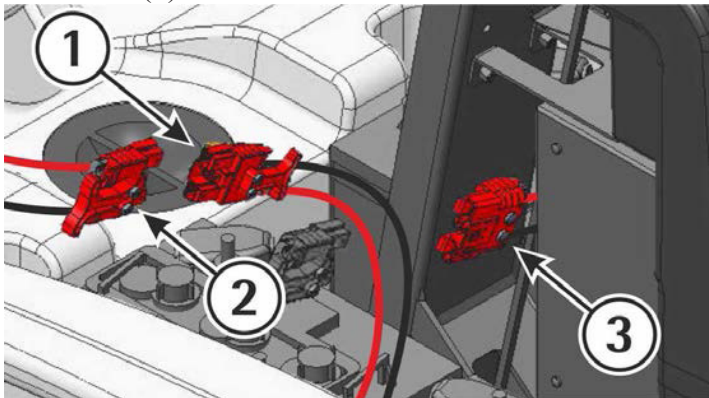


Use only brushes supplied with the machine or the ones indicated in the manual “RECOMMENDED BRUSHES”. The use of other brushes can compromise the good washing result.

**FLOOR CLEANING
CONNECTING THE BATTERY CONNECTOR
AND SWITCHING ON THE MACHINE**

Once the battery recharging has been completed:

1. Disconnect the connector (2) of the battery recharger from the battery connector (1).
2. Connect the battery connector (1) to the machine connector (3).

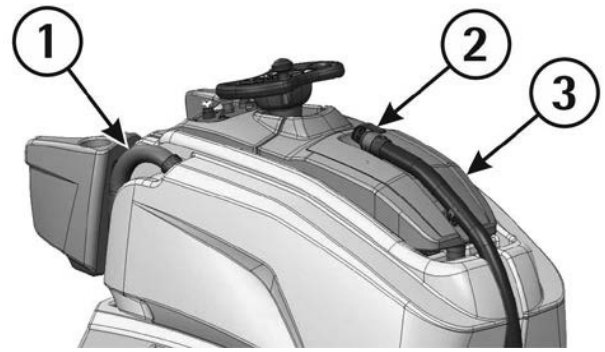


RECOVERY TANK



Verify that the squeegee hose coupling (1) is correctly inserted into its seat and that the exhaust hose plug (2) is closed.

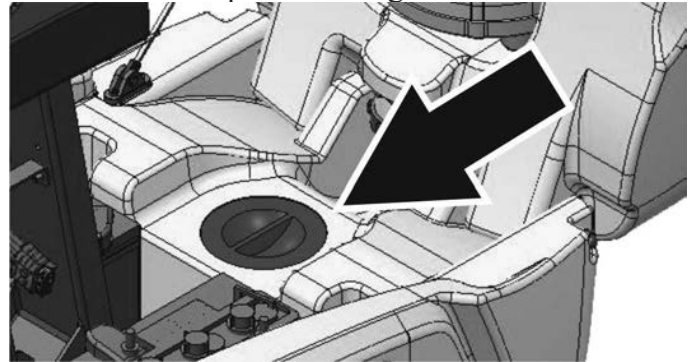
The recovery tank is provided with a cover (3) that blocks itself thanks to the vacuum created by the suction motor during use.



DETERGENT SOLUTION TANK

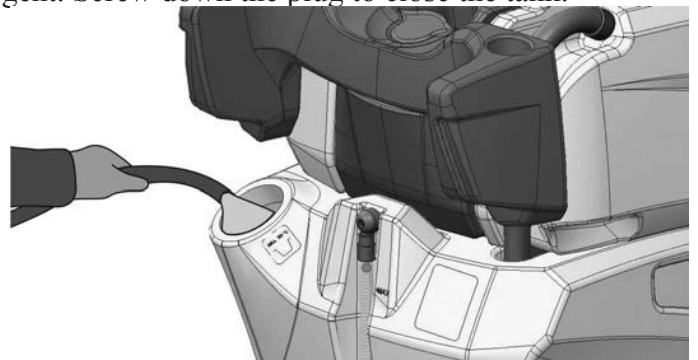
The solution tank is provided with an inspection hole. This hole allows users to clean the exit area of the detergent solution.

Be sure that the cap is closed tight.

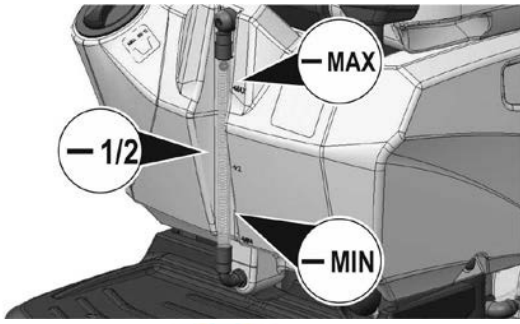


The capacity of the detergent solution tank is indicated in the technical data.

Open the screw plug placed in the left part of the machine and fill the detergent solution tank with clean water at a maximum temperature of 122°F (50°C). Add the liquid detergent in the percentage and conditions recommended by the manufacturer. To avoid excessive foam, which could cause problems to the suction motor, use the minimum percentage of detergent. Screw down the plug to close the tank.



On the rear part of the machine is placed a level hose that permits to easily see the solution quantity inside the tank both during the filling of the solution and during the working.



Always use low foam detergent. To avoid foam presence, before starting working operation, introduce into the **recovery** tank a minimum quantity of anti-foam product.

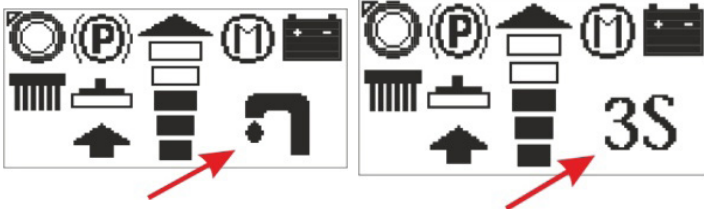
Never use pure acid.

3S SOLUTION SAVING SYSTEM (OPTIONAL)

It is a system that allows the controlled use of the detergent solution during work.

To turn it on, press button (1) two times, then on the display the water symbol will blink.

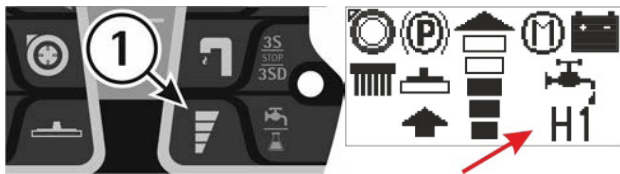
Select the 3S system using buttons (2).



When the 3S stops blinking the system is being selected.

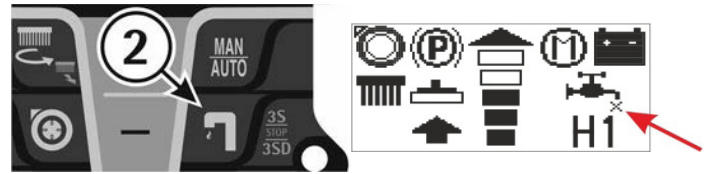
SELECTING THE FLOW RATE - 3S SYSTEM

Using the flow rate button (1) the H value can be adjusted from H1 to H7.



Even in the 3S, mode to enable the release of detergent solution, the solenoid valve button has to be pressed (2).

If the detergent solution is disabled, the display will show the disabled solenoid valve symbol.



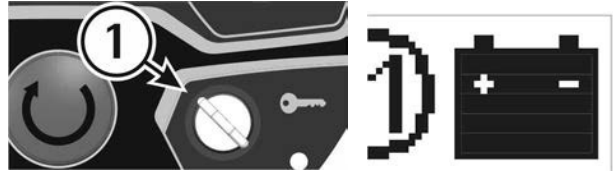
WORK

A safety device prevents the machine's movement if the operator is not properly placed on the footboard.

To turn on the machine:

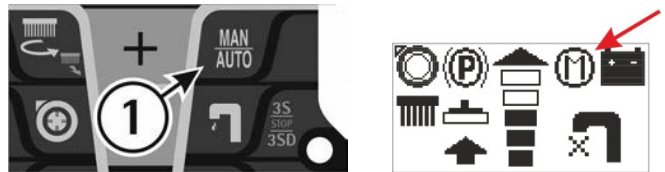
1. Step on the footboard.
2. Turn the key (1) clockwise to turn on the machine.
3. Check the battery level on the display.

The machine will go automatically in manual mode (MAN).

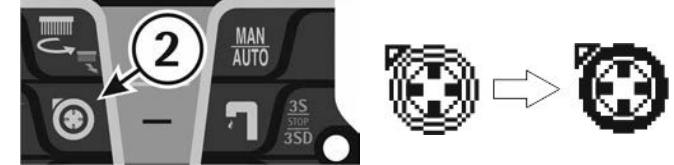


MANUAL MODE WORK

1. Check that the machine is set in manual mode, if not press button (1) and the display will show the corresponding symbol.



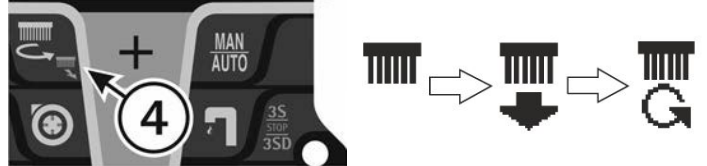
2. Press the suction motor button (2); the suction motor symbol changes depending if the motor is turned on or off, the motor will then start to work.



3. Press the solenoid valve button (3); the solenoid valve symbol changes depending if the valve is closed or open.



4. Lower the brush base to the floor pressing button (4); the display will show first the lower down symbol and then the brushes on symbol.



5. To lower the squeegee press the button (6).



6. While running the first few meters check that the squeegee adjustment guarantees a perfect drying action and that the detergent solution flow is appropriate. It has to be sufficient to wet the floor uniformly avoiding the leakage of detergent from the splash guards. Always consider that the correct quantity of solution detergent depends on the type of floor, dirtiness and machine speed.

BRUSHES PRESSURE ADJUSTMENT

The brushes pressure can be adjusted only in manual mode, if not in that mode press the button (1).



To adjust the pressure press two times button (2).

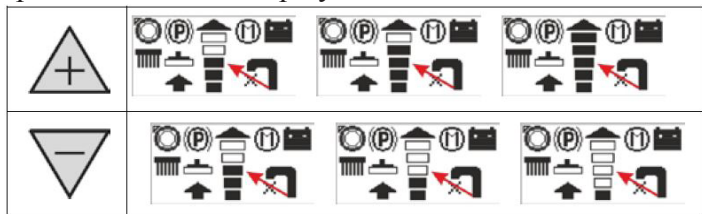
On the display value P1, P2 or P3 will blink.

Press the buttons (+) and (-) to select the pressure, the value will set once it stops blinking on the display.



SPEED ADJUSTMENT, FORWARD AND BACKWARD

Before running the machine select the maximum speed level during work. Press buttons (+) and (-) to see the speed level on the display.



To move the machine select the direction using the lever (1) on the dashboard.



Press the pedal (2) on the footboard to enable the speed.



Use the knob (3) to adjust the speed during work. The speed will change from the minimum to the maximum previously set and visible on the display.

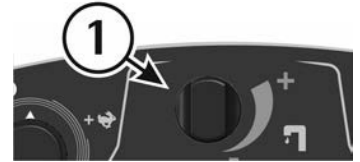


If backward movement is selected the brush base will stay down, the squeegee will lift up and the suction motor will shut itself off.

When the forward movement is selected again the squeegee will go down and the suction motor will turn back on.

DETERGENT SOLUTION FLOW RATE ADJUSTMENT

1. Turn the knob (1) to adjust the detergent solution flow rate.

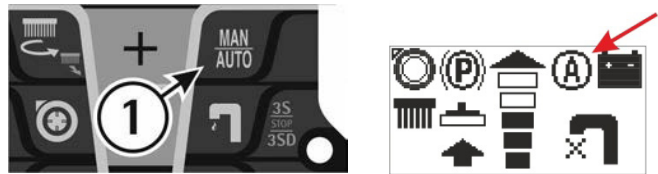


2. On the 3SD equipped models it will be necessary to press the dedicated button to activate the detergent solution supply selecting between the traditional mode using the valve or the optimal fixed supply system (see chapter "3S Solution Saving System").

AUTOMATIC MODE WORK

Automatic mode is helpful to simplify the operation of the unit.

1. Check that the machine is set in automatic mode, if not press button (1) and the display will show the corresponding symbol



2. Press the pedal placed on the footboard.

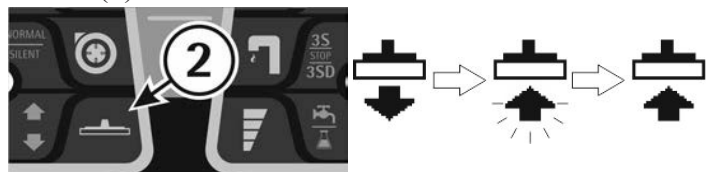
Once the pedal is pressed the machine runs forward, the brush base goes down and simultaneously the squeegee goes down, then the solenoid valve opens and brushes and suction motor start working.

Before running the machine it is possible to set the brushes pressure and the detergent solution flow rate (3S and 3SD versions).

The values set will show immediately on the display.

After releasing the pedal: the brush base goes up, the brushes motors stop, the solenoid valve closes and the suction motor shuts off.

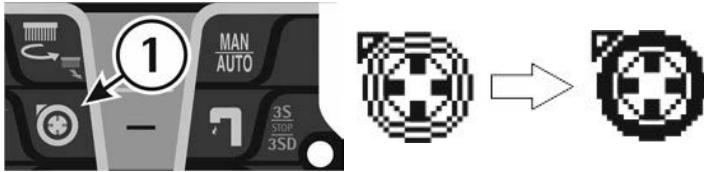
To lift the squeegee at the end of the work press the button (2).



SUCTION MOTOR SILENT MODE

It is possible to start the silent mode of the suction motor by pressing the switch-on button (1) of the suction motor for a few seconds.

When the silent mode is on the symbol on the display changes.



STANDBY MODE

After 10 minutes of inactivity, if the machine is turned on, it goes in stand-by mode and the display turns off. To start again press any button on the instrument board, the display will turn on again and after few seconds the machine returns to operation.

HORN

The machine is provided with a horn that can be activated pressing button (1).



EMERGENCY BUTTON

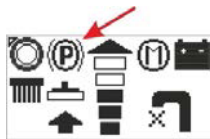
In case of emergency press button (1) placed on the dashboard. All the functions and the movement will be immediately disabled.



To reactivate them turn the button clockwise.

PARKING BRAKE

The machine is equipped with a parking brake on the traction wheel which releases when the traction motor is activated. On the display it will be shown when the brake is on.



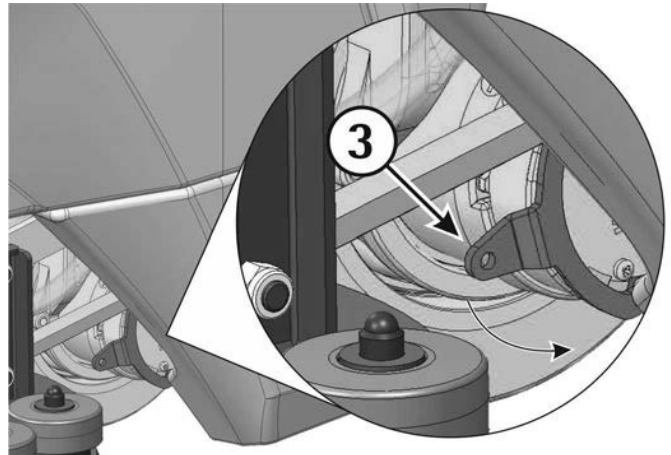
MANUAL MOVEMENT OF THE MACHINE

To move the machine manually, it is necessary to unblock the parking brake that blocks the traction motor wheel. To do this, keep the lever (3) lifted. With the delivery of the machine we also supply a cord that allows the lever operation (3).

After having moved the machine, take off the cord and keep it for eventual re-use.



When the parking brake is released manually, for example when the machine has to be moved without batteries, avoid covering slopes and do not park on them.



BRUSHES MOTOR OVERLOAD PROTECTION SYSTEM

The machine is equipped with a protection device of the brushes motor. This device blocks the motor functioning in order to protect it and indicates the overload on the display with the message "ALLARME 1". When this happens, try to reduce the brushes pressure (see under "ADJUSTMENT OF THE BRUSHES PRESSURE").

If the problem persists, contact the authorized technical assistance.



OVERFLOW SYSTEM



In order to avoid serious damages to the suction motor, the machine is equipped with a float that intervenes when the recovery tank is full. When this happens, it is necessary to empty the recovery tank. Hold the exhaust hose of the machine. Take off the plug and empty the recovery tank into appropriate containers, according to the standard norms.

STOPPING THE MACHINE AFTER CLEANING OPERATION

At the end of the work proceed as follows:

1. Press button (1) to lift the brushes.
2. Lift up the squeegee using button (2).
3. Take the machine to the place assigned for the water drainage.

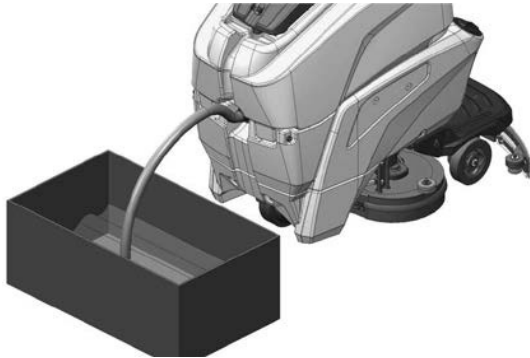


DAILY MAINTENANCE

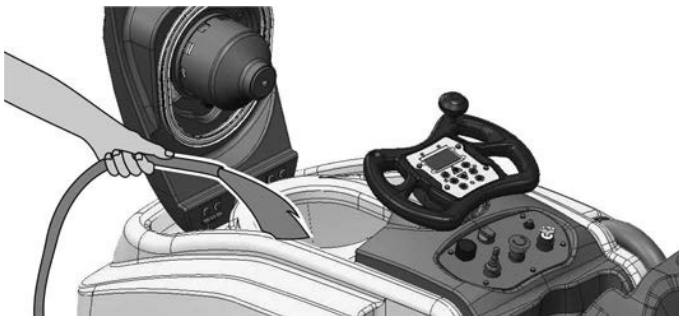
DRAINING AND CLEANING THE RECOVERY TANK



1. Hold the exhaust hose (1) placed on the front part of the machine after having taken it off from its fixing support.
2. Take off the plug (2) from the exhaust hose acting upon its lever (3) and empty the recovery tank into appropriate containers, in compliance with the respective rules concerning liquid disposal.

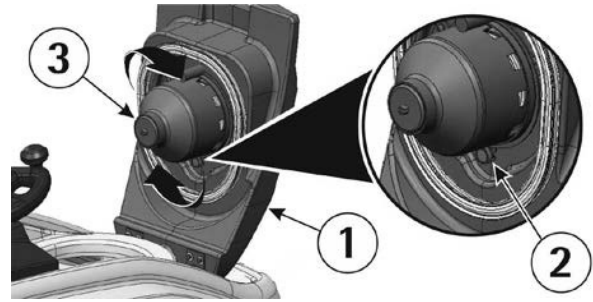


1. Clean the inside of the tank using a water jet.



CLEANING THE SUCTION FILTER

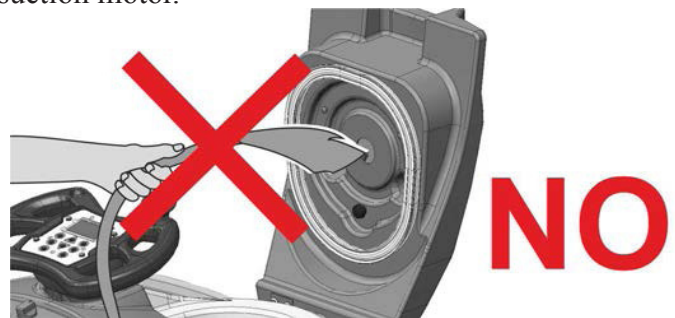
1. Open the cover (1) and unscrew the knob (2) to release the filter protection (3).
2. Rotate the filter protection clockwise to release it.



3. Take off the filter and its protection.
4. Clean with a water jet especially the bottom part and the sides of the filter.
5. Do the cleaning procedure precisely.
6. Reassemble the filter.



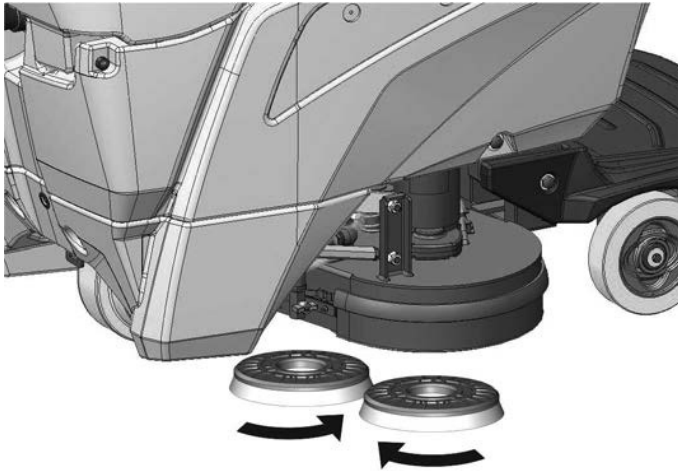
Absolutely do not clean the inside of the recovery tank cover as it may result in an irreversible damage of the suction motor.



DISASSEMBLING THE BRUSHES



With the brush base lifted up (see chapter “ASSEMBLING THE BRUSHES”) quickly rotate the brushes in order to unlock the spring button to take them off and clean them with a water jet. In the picture it shows which direction to rotate the brushes to unlock them.



AUTOMATIC DISASSEMBLY OF THE BRUSHES



Put the lever in central position.



1. Turn on the machine turning the key clockwise (2).



2. Keep the button pressed for a few seconds (3).



3. Turn off the machine.



CLEANING THE BRUSHES



Take off the brushes to clean them with a water jet (to read how to do it see chapter “DISASSEMBLING THE BRUSHES”).

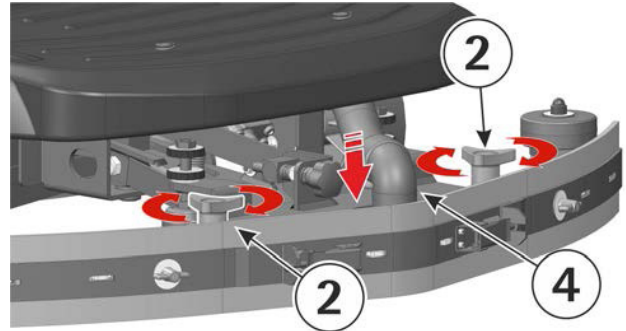
CLEANING THE SQUEEGEE



Keeping the squeegee clean guarantees the best drying result.

For its cleaning it is necessary to:

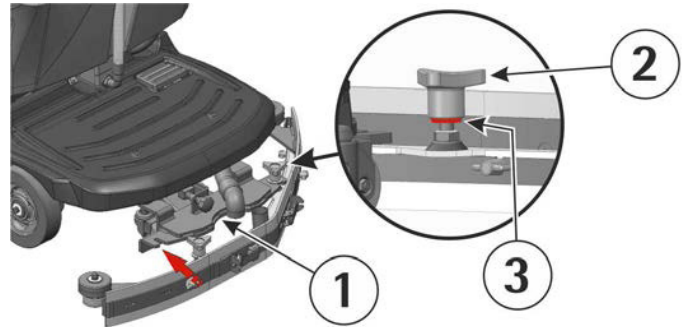
1. Take off the squeegee hose (4) from the coupling.
2. Disassemble the squeegee from its support (1) by loosening the knobs (2) counterclockwise and sliding the squeegee assembly off of the bracket.



3. Clean the internal part of the squeegee inlet eliminating any residual dirt.

4. Clean the squeegee rubbers.

5. Reassemble all parts paying attention to put the washers (3) into position, they are two for each knob, so that they are assembled one under and the other on top of each of the two slots present on the support.



WEEKLY MAINTENANCE

REAR SQUEEGEE RUBBER CHECK

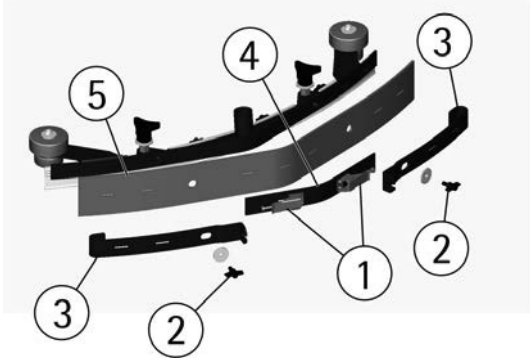


Check the squeegee rubber wearing and eventually turn it or replace it.

To replace the rubber it is necessary to:

1. Lift up the squeegee
2. Unlock the hooks (1).
3. Unscrew the wing nuts (2) to take off the outer rubber blades (3) and then the central one (4).
4. Take off the rubber (5) to turn it or replace it.

To reassemble the squeegee do these operations backwards.

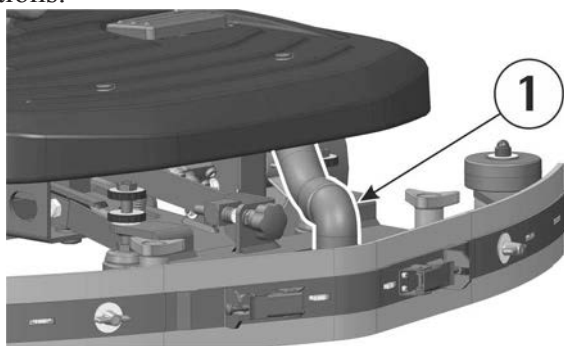


CLEANING THE SQUEEGEE HOSE



Weekly or in case of insufficient suction, it is necessary to check that the squeegee hose is not obstructed. Eventually, to clean it, proceed as follows:

1. Take off the hose (1) from the squeegee coupling.
2. Wash the inside of the hose with a water jet.
3. To reassemble the hose reverse the above operations.



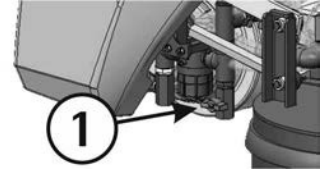
Do not clean the hose that goes from the suction motor to the recovery tank with a water jet.

CLEANING THE SOLUTION TANK

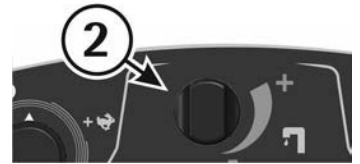


Take the machine to the place assigned for the detergent solution draining.

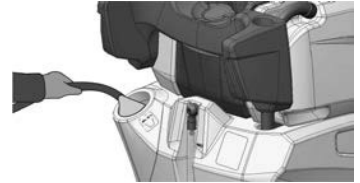
1. Unscrew the solution tank cap.



2. Open the detergent solution valve (1)



3. Open the valve (2) for the solution draining.



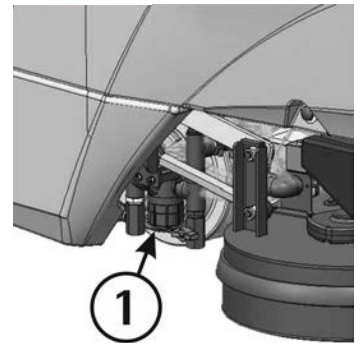
4. Clean the tank with a water jet.

5. Once the cleaning is done close the valve and the tank cap.

CLEANING THE OUTER FILTER



1. Unscrew the filter cap (1) and take off the filter.
2. Clean the filter parts with a water jet.
3. Reassemble the parts.



TWO-MONTHLY MAINTENANCE

FRONT SQUEEGEE RUBBER CHECK

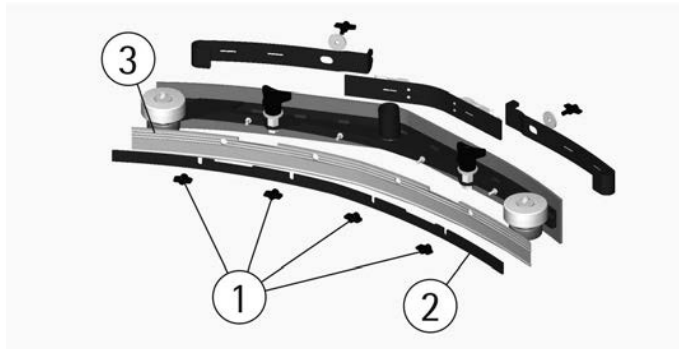


Check the wear of the squeegee rubber and eventually replace it.

For the replacement it is necessary to:

1. Take off the squeegee (see under paragraph “SQUEEGEE CLEANING”).
2. Disassemble the rear part of the squeegee (see under paragraph “REAR SQUEEGEE RUBBER CHECK”).
3. Unscrew the wing nuts (1) and take off the front rubber holder blade (2).
4. Replace the front rubber (3).

To reassemble the squeegee reverse the operations above.



SIX-MONTHLY MAINTENANCE

SPLASH GUARD RUBBER CHECK



With the brushes assembled, the splash guards must slightly touch the floor. If they are worn, they have to be replaced. Just release the lever coupler placed in the rear part of the brushes base group from the ring placed at the free extremity of the metal strip to take off the rubbers and to reinsert the new ones (see under paragraph “SPLASH GUARD ASSEMBLY”). This operation has to be carried out for both splash guards”).

TROUBLESHOOTING GUIDE



The checking of all the other foreseen machine operations is left to the authorized technical assistance. Never leave the batteries completely discharged for a long time. In case of alarm visualizations contact the technical assistance.



If, with the key switch positioned clockwise to switch on the machine, the display and other functions are not activated, it is necessary to check the batteries' connection to the machine (see under paragraph “CONNECTION BATTERIES' CONNECTION AND SWITCHING ON OF THE MACHINE”). If the problem persists, please contact the authorized technical assistance.

THE SUCTION MOTOR DOES NOT WORK

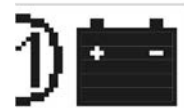
1. Check that the emergency system (1) is not activated.



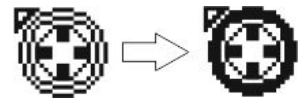
2. Use the key switch to turn off and then on the machine (2).



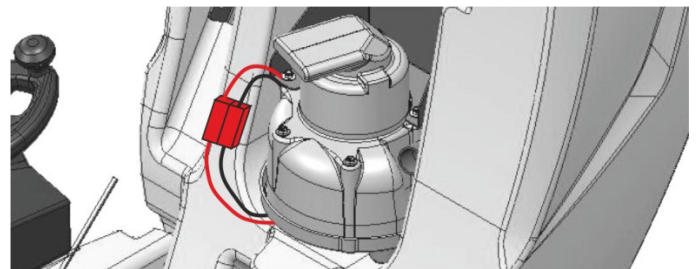
3. Check the battery charge on the display.



4. Check on the display that the starting signal of the suction motor is on.



5. Check the suction motor connections.



If the problem persists, please contact the authorized technical assistance.

BRUSHES MOTOR DOES NOT WORK

1. Check that the emergency system (1) is not activated.



2. Use the key switch to turn off and then on the machine (2).



3. Check the battery charge on the display.



4. Check on the display that the starting signal of the brushes motor is on.



5. Press the pedal on the footboard (3) to start the machine.



If the problem persists, please contact the authorized technical assistance.

TRACTION MOTOR DOES NOT WORK

1. Step on the footboard.

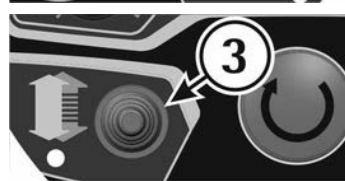
2. Check that the emergency system (1) is not activated.



3. Use the key switch to turn off and then on the machine (2).



4. Check the lever position (3).



If alarms are showed on the display it is necessary to turn off and the on the machine to restore its functions.

5. Check the battery charge on the display.



6. Press the pedal on the footboard (4) to start the machine.

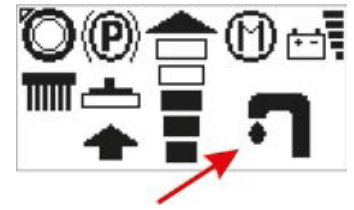


If the problem persists, please contact the authorized technical assistance.

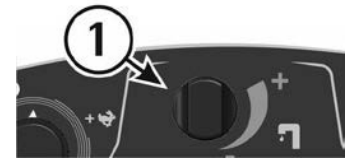
WATER DOES NOT COME DOWN ONTO THE BRUSHES

The machine is equipped with a solenoid valve so to let the solution go down onto the brushes it is necessary to make the brushes turn.

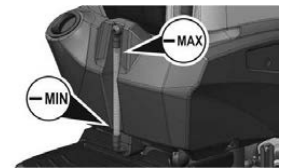
1. Check on the display that the solenoid valve is activated.



2. Check that the valve lever is open (1).



3. Check the detergent solution level in the solution tank.



4. Check that the solution filter is clean (see under paragraph "CLEANING THE OUTER SOLUTION FILTER").

If the problem persists, please contact the authorized technical assistance.

THE MACHINE DOES NOT CLEAN PROPERLY

1. The brushes do not have the suitable bristle dimension: contact the authorized technical assistance.

2. The brushes have worn bristles. Check the brushes wear condition and eventually replace them (the brushes have to be replaced when the bristles have reached a height of about 1/2" (15mm).

3. To replace the brushes, see instructions under paragraph "BRUSHES DISASSEMBLY" and "BRUSHES ASSEMBLY".

4. The detergent solution is insufficient: open the solution valve more (see under paragraph "FLOW ADJUSTMENT OF THE DETERGENT SOLUTION").

5. Check that the liquid detergent is in the recommended percentage.

6. Increase the brushes base pressure (see under paragraph "ADJUSTMENT OF THE BRUSHES PRES-SURE").

Contact the authorized technical assistance for advice.

THE SQUEEGEE DOES NOT DRY PERFECTLY

1. Check that the squeegee rubbers are clean.

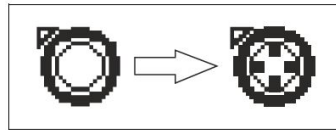
2. Check the adjustment of the height and the inclination of the squeegee (see section "ADJUSTMENT OF THE SQUEEGEE" in "BEFORE USE").

3. Check that the suction hose is correctly inserted in the proper seat on the recovery tank or that it is not obstructed.

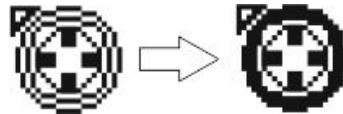
4. Clean the suction filter.

5. Replace the rubbers if worn out.

6. Check on the display that the starting signal of the suction motor is on.



7. Put the motor in standard mode if silenced.



8. Check that the suction motor cap is closed properly. If the problem persists, please contact the authorized technical assistance.

EXCESSIVE FOAM PRODUCTION

Check that low foam detergent has been used. Eventually add small quantities of anti foam liquid into the recovery tank.

Please be aware that a bigger quantity of foam is produced when the floor is not very dirty. In this case please dilute detergent solution.

RECOMMENDED BRUSHES

MATERIAL	CHARACTERISTICS
PPL	Good wear resistance. Maintains characteristics with hot water up to 122°F (50°C). It is not hygroscopic
NYLON	Excellent wear resistance, even with hot water. It is hygroscopic
TYNEX	Nylon bristles with grains of abrasive material. Use with caution in order not to mark the floor or ruin the polishing
BRISTLES THICKNESS	Thicker bristles are more rigid and must be used on smooth floor or floor with small joints. On irregular floors with deep joints or relieves, it is recommended to use softer bristles which penetrate more easily and deeper.
PAD HOLDER	The pad is recommended to clean smooth floors.

PART NO.	QTY	DESCRIPTION	USE
48914030	2	Brush, PPL 0.6 14"	Normal floors
48914040	2	Brush, PPL, 0.9, 14"	Smooth floors with small joints and persistent dirt
48914050	2	Brush, TYNEX, 14"	Floors of resistant material and very dirty
48914060	2	Brush, 5-mix, 14"	All types of floor
48803030	2	Pad holder w/center lock, 13"	For 14" pads

Warranty Registration Form

Please provide additional information on
Tornado equipment: (Check choices below)

- | | |
|---|---|
| <input type="checkbox"/> Automatic Scrubbers | <input type="checkbox"/> Sweepers |
| <input type="checkbox"/> Propane Floor Machines | <input type="checkbox"/> Rotary Floor Machine |
| <input type="checkbox"/> High Speed Burnishers | <input type="checkbox"/> Carpet Vacuums |
| <input type="checkbox"/> Carpet Extractors & Spotters | <input type="checkbox"/> Wet/Dry Vacs |
| <input type="checkbox"/> Steam Cleaners | <input type="checkbox"/> Jumbo Vacs |
| <input type="checkbox"/> Ride-On Equipment | <input type="checkbox"/> Pressure Washers |

See complete product info at www.tornadovac.com

Selling Dealer: (Required) _____

Please Print Clearly

Company/Institution	
Contact Name	Title
Address	City/State/Zip Code
Phone	Fax
Date of Purchase	Email

See white metal plate or sticker on unit for this information.

MACHINE TYPE/MODEL NUMBER:	MACHINE SERIAL NUMBER:
1. _____	1. _____
2. _____	2. _____
3. _____	3. _____
4. _____	4. _____

Facility Description (please circle all that apply)

1. School	9. Hospital	17. U.S. Govt.
2. Retail Store	10. Nursing Home	18. Other Govt.
3. Restaurant	11. Religious Institution	19. Auto Service
4. Office Building	12. Airport	20. Airport
5. Contract Cleaning	13. Warehouse	21. Non-Profit
6. Light Manufacturing	14. Apartment/Condo	22. Other (specify)
7. Heavy Manufacturing	15. Warehouse	
8. College/University	16. Supermarket	

How did you first learn about Tornado cleaning and maintenance equipment?	In square feet (<i>meters</i>)	
	Total Hard Floor Area	Total Carpeted Area Square feet (square meters)
<input type="checkbox"/> Contacted by local dealer <input type="checkbox"/> Previous experience with Tornado products <input type="checkbox"/> Reputation/ Recommendation <input type="checkbox"/> Advertising <input type="checkbox"/> Direct mail <input type="checkbox"/> Internet <input type="checkbox"/> Other	<input type="checkbox"/> 0-10,000 (0-930) <input type="checkbox"/> 10-50,000 (930-4,650) <input type="checkbox"/> 50-250,000 (4,650-23,250) <input type="checkbox"/> Over 250,000 (over 23,260)	<input type="checkbox"/> 0-10,000 (0-930) <input type="checkbox"/> 10-50,000 (930-4,650) <input type="checkbox"/> 50-250,000 (4,650-23,250) <input type="checkbox"/> Over 250,000 (over 23,260)

Damage or defect arising from abuse, neglect or other misuse is excluded from this warranty. Other items may or may not apply based on your specific machine. If any defect occurs, the warranty is voided if service is attempted by non-Authorized Tornado Service Centers.



Return to :
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Fort Worth, TX 76140
Fax: 817-551-0719
or online at
www.tornadovac.com