

BUONO simply

COMPUTER FOR SPRAYERS

INSTRUCTIONS FOR USE

Item No.:
-82.8380.97.3 Buono Simply 2-way
-82.8381.97.3 Buono Simply 3-way
-82.8339.97.3 Buono Simply 5-way
-82.8382.97.3 Buono Simply 7-way

Year of manufacture: 2015

EN

IDROMECCANICA BERTOLINI
Reggio Emilia - Italy

BUONO SIMPLY

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MANUFACTURER'S DECLARATION

Machinery Directive 2006/42/EC
EMC Directive 2004/108/EC
ISO 14982

Idromeccanica Bertolini S.p.A.
declare under our own responsibility that the computer belonging to series

BUONO SIMPLY

with Serial No.
(to be carefully indicated by the Buyer as shown on the ID plate)

- is designed to be incorporated in a machine or to be assembled with other machinery to form a machine considered by Directive **2006/42/EC**;

- compliance to all the provisions of this Directive is the responsibility of the machine Manufacturer who incorporates the computer.

- it meets compliance requirements covered by Directive 2004/108/EC (Electromagnetic Compatibility) and ISO 14982 (Agricultural and forestry machines - Electromagnetic compatibility Test methods and acceptance criteria);

- it meets compliance requirements covered by RoSH Directive.

It is therefore declared that the above-mentioned product may not be commissioned for use until the machine in which it is to be incorporated or of which it will become a part has been identified and has been declared as conforming to the provisions of Directive **2006/42/EC**, i.e. until the product which is the object of this declaration forms an integral part with the final machine.

Reggio Emilia 14.02.06

Luigi Quaretti
(Managing Director – Idromeccanica Bertolini S.p.A.)

BUONO SIMPLY

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INTRODUCTION

1 INTRODUCTION

1.1 RULES AND GENERAL RECOMMENDATIONS

This instruction manual provides all the specific information necessary to understand and correctly use the equipment in your possession.
It must be read carefully at the time of purchasing the equipment and consulted every time you have doubts regarding the use or for carrying out maintenance activities.
The Manual must be kept onboard the machine, or, at least, when this is not possible, it must be kept in a familiar, accessible place for easy consultation.

ALL RIGHTS RESERVED. THIS MANUAL IS STRICTLY MEANT FOR USE BY THE CLIENT. ALL OTHER USE IS FORBIDDEN.

1.2 ASSISTANCE

Assistance can be obtained in all countries where the machine is officially distributed by ***Idromeccanica Bertolini*** (during and after the warranty period).
All intervention required on the *BUONO SIMPLY* Computer must be done in compliance with the instructions in this Manual or in accordance with other agreements made with ***Idromeccanica Bertolini.***
Failing this, the relative warranty conditions may become void.

1.3 WARRANTY

Idromeccanica Bertolini S.p.A. undertakes to supply the spare to replace the part having manufacturing defects within **a year** from the date on which the product was delivered.

The warranty is only valid when the defect can be ascertained by the "*Assistance Service*" and when it is not ascribable to improper use or negligent maintenance of the product.

The warranty does not cover parts subject to normal wear through operation (rubber and plastic parts, seals), labour costs or any other request for damages or indemnities (e.g. for faults or down times).

"Idromeccanica Bertolini S.p.A." **SHALL NOT** be liable, as regards warrantees and reimbursements, for damage caused by:

- Transport (breakages, scratches, dents and similar)

Use of the product differing from that indicated in the Manual

Use contrary to the specific laws in force

Incorrect installation or defects due to deficiency or inadequacy of the electrical system, or alterations deriving from environmental or climatic or other conditions

- Use of unsuitable liquids
- Negligence, carelessness, tampering, incompetence or repairs by unauthorized persons

Poor maintenance

- Modifications or interventions that have not been explicitly authorised by ***"IDROMECCANICA BERTOLINI S.p.A."***
- Use of non original spare parts and accessories or ones that have not been specifically made for the product
- Use of pipes or connections that are not indicated in this Manual or that are not fit for the product and its use.

The warranty also does not cover:

- Installation and adjustment
- Plant consultancy or inspections
- Miscellaneous maintenance operations (such as cleaning filters, nozzles, etc.)
- Normal wear through use

In any case:

The machine will be repaired as soon as the Assistance centre's organizational commitments allow.

- Products requiring repairs must first be washed and all residues of the chemicals used must be removed.
- Repairs under warranty do not prolong or renew the warranty itself
- NO ONE is authorized to modify the warranty terms and conditions or to issue other verbal or written terms or conditions.
- Parts replaced under warranty remain the property of ***"IDROMECCANICA BERTOLINI S.p.A".***

Tampering with the product will relieve ***"Idromeccanica Bertolini S.p.A."*** of all warranty obligations.

Absence of the safety valve, or tampering with the pressure regulator valve or the regulator will relieve Idromeccanica Bertolini S.p.A. of all warranty obligations, as does use of accessories that have not been supplied by the same.

For every inspection, the products may only be returned if authorized by ***Idromeccanica Bertolini S.p.A.*** in writing and only carriage paid.



SAFETY WARNINGS:

TO AVOID RISKS FOR THE OPERATOR AND DAMAGE TO THE SPRAYING SYSTEM, ALWAYS SWITCH ON THE **BUONO SIMPLY** FIRST AND THEN START UP THE PUMP. IF THE PUMP IS STARTED UP WITH THE **BUONO SIMPLY** SWITCHED OFF THE PRESSURE CANNOT BE CONTROLLED.

2 GENERAL DESCRIPTION AND ASSEMBLY

2.1 GENERAL DESCRIPTION

Buono Simply Computer consists of the following components (see Fig.1)
• Computer
• SD card
• Cables

The computer is fitted in the tractor cab and also contains the spraying treatment controls.
The pressure regulator, section valves, main valve, the signals of the sensors such as the wheel sensor, flow meter etc. are transmitted directly to the computer by means of the cable included in the supply.

2.1.1 SD CARD



The SD card is a commercial card easily available on the market and has several advantages for the working of the computer, especially:

- Rapid export and import of the machine configuration during the initial installation (number of sections/nozzles/sensors/etc.)

- Rapid export and import of treatment programs (Nozzles/Litres per hectare/drops/etc.)

- Update of the firmware inside the computer (can be sent by mail) in such a manner as to ensure that the latest version is always available or to create specific customisation for the client depending on the computer application

BUONO SIMPLY

- **Buono Simply**

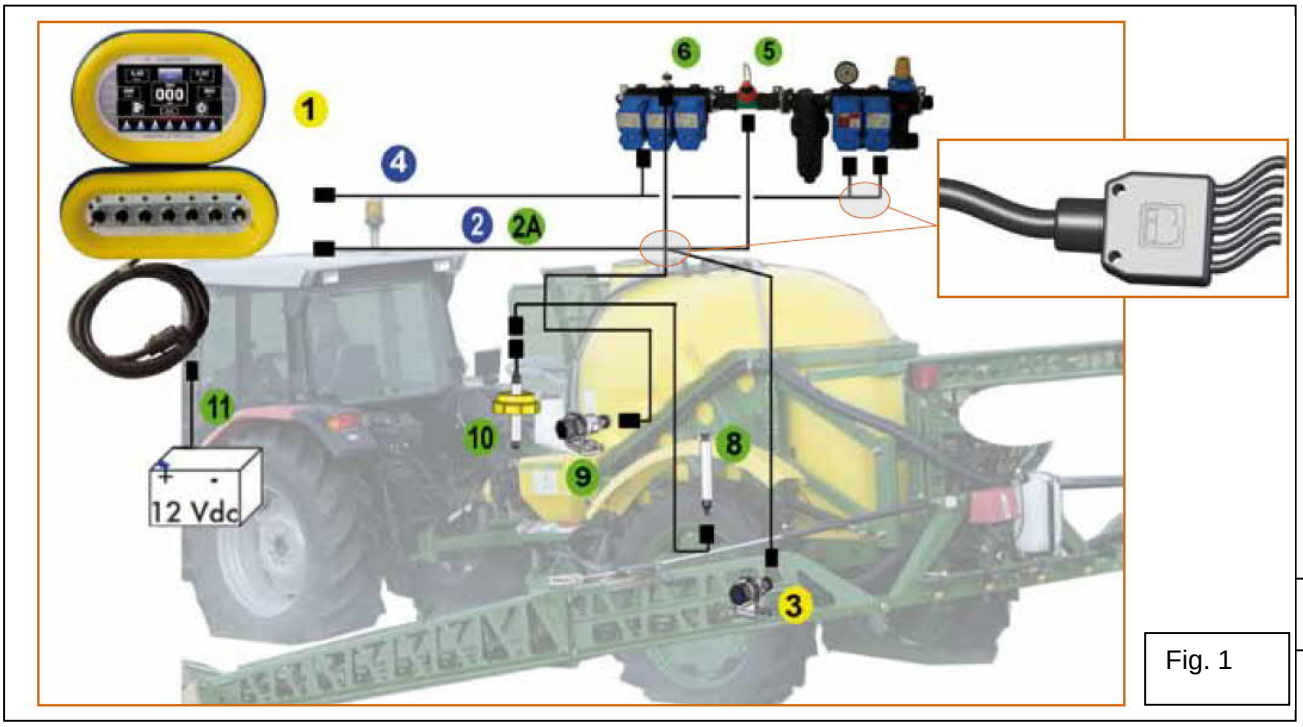


Fig. 1

COMPUTER KIT			
POS.	DESCRIPTION	Cable length (m)	Code
1	Control panel	-Power supply 2.5 -Valves and sensors 0.3	82.8380.97.3 (2 sect.) 82.8381.97.3 (3 sect.) 82.8339.97.3 (5 sect.) 82.8382.97.3 (7 sect.)
3	Speed sensor	/	
CABLES KIT			
POS.	DESCRIPTION	Cable length (m)	Code
4	Connector cable VG+VV+2 sections	4	82.8035.10.A
	Connector cable VG+VV+3 sections		82.8036.10.A
	Connector cable VG+VV+5 sections		82.8107.00.2
	Connector cable VG+VV+7 sections		82.8155.00.2
2	Sensors connection cable	4+ 1.5 (pressure/flow rate) 3 (speed)	82.8304.97.3

OPTIONAL				
POS.	DESCRIPTION	Cable length (m)	Features	Code
5	Flow meters	1.5	10 - 100L/min - 20bar – turbine – G.1”1/4F.	82.8286.97.3
			10 - 100L/min -50bar– electromagnetic – G.1”1/4F.	82.8298.97.3
			3 - 60L/min -50bar – electromagnetic – G.1”1/4F.	82.8299.97.3
			3 - 60L/min -50bar – electromagnetic – G.3/4F.	82.8300.97.3
6	Pressure transducer	/	0-40Bar	82.7765.20.2
2A	Sensors connection cable	3	Cable for connecting 3 supplementary sensors	82.8308.00.2
8	Tank level sensor	/	Range 0-4M –Signal 4-20mA – Connection G.1/4”	82.8315.00.2
9	Pump/fan rpm sensor	/	Complete with supporting bracket	82.8212.00.2
10	Oil level sensor	2	Complete with ring nut for fixing to oil tank cap	82.8013.00.2
11	Battery cable	4.5	Three-pin Cobo connector – eyelet terminals	82.8168.00.2

2.2 ASSEMBLY

Connect the cables supplied with the computer according to the connection diagram shown below.

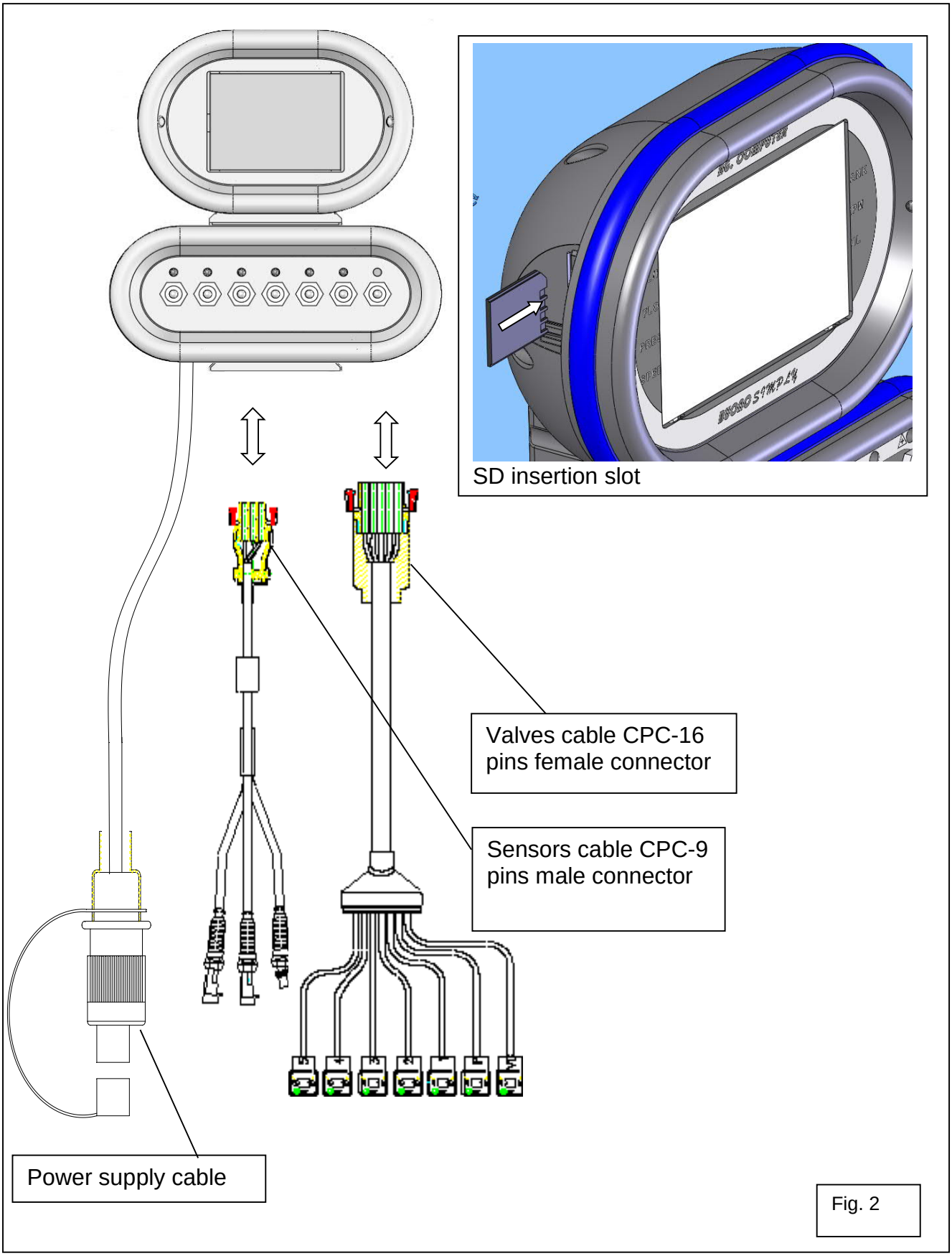


Fig. 2

Install the computer in the tractor cab using the material supplied. Make sure the position selected is convenient for the operator.
The operating unit is turned on by means of the switch present on the back.

2.2.1 Power supply

On more recent tractor models which are provided with a DIN 9680 power socket, the BUONO SIMPLY power cable can be inserted directly in the DIN socket present in the tractor. (see general description)

In older tractors that do not have the DIN power socket, the battery cable (11) is required (See page 8) and it must be connected directly to the battery. The battery cable is not standard and must be ordered separately.
Using the battery cable fitted with a 30 A fuse ensures that the BUONO SIMPLY is always powered sufficiently.

When connecting the battery, take care to connect the poles correctly.

The red wire with 30A fuse must be connected to the + pole, while the black wire must be connected to the - pole.
Make sure the contacts are clean!

Never use the cigarette lighter as it cannot supply the current required!
The other part of the cable is fitted with a standard plug, which must be connected in a dry protected area at the back of the tractor or in the tractor cab.

Before connecting the BUONO SIMPLY to the 12-volts system:
- Check to make sure the electric components and the cables are not damaged. Damaged cables are no longer water-resistant and can cause short circuits.
- Check the length of the cables; it must be long enough to allow bends
- Check to ensure the operating unit plug is connected correctly.
- Naturally, the 12V battery must be sufficiently charged (at least 10.8V)

Note: Make sure the cables (power supply, valves cable and sensors cable) are placed correctly between the tractor and sprayer during the working so that no one can stumble or the cable does not get entangled.
In any case, the cable should not be too taut, as otherwise it may get ripped during steering or other movements.
Also make sure the cables do not come in contact with moving or overheated parts of the tractor.



If the powered parts or cables are damaged, there may be a short circuit. Therefore, the power cable should always be fitted with a 30A fuse. Without a suitable fuse, the short circuit can cause a fire.

2.2.2 Valves cable

Secure the part of the valves cable carrying the valves connectors to the metal frame of the sprayer, in such a way that there are no hanging parts. Check to ensure that the connection between the valves cable and the computer is positioned suitably for inserting and disinserting the connectors, since every time the sprayer is disconnected, this connection must also be interrupted.

2.2.3 Sensors cable

Secure the part of the sensors cable to the metal frame of the sprayer, in such a way that there are no hanging parts. Make sure the connections between the cable and the various transducers are in positions protected from water, dust, oil, etc..
Check to ensure that the connection between the sensors cable and the computer is positioned suitably for inserting and disinserting the connections, since every time the sprayer is disconnected, this connection must also be interrupted.

2.2.4 Fitting the speed sensor

If a sensor with a ring (count) is used for calculating the speed, it should be fixed to the non-drive wheel as far as possible. If an additional application is used, the parts are adapted in the RH wheel of the tractor.
If a towed sprayer with a computer is ordered, the speed sensor with ring is fitted at the factory. In this case, the system only needs to be calibrated. (see Section 5.9 – Calibration of driving speed).

Proceed as described below to fit the (supporting) ring

• To begin with, wheel (5) on which ring (6) is to be fitted should be removed (Fig. 3)
• Push the jig along the 4 long screws of ring (6) and align the ring in the central position in relation to the edge of the rim, to the hub opening and to all the other circular forms of the wheel with the help of rims and jig. This can be done in the outer as well as the inner part of the wheel (Fig. 3)

• The holes (8) must then be marked, centred and drilled at 10.5mm. (Fig.3)
• Screw the ring in the inner part of the wheel and fix the spacers between the ring and rim.
• Check to make sure the ring is aligned perfectly parallel to the rim (Fig. 4)

NOTE: Longer spacers are required for towed sprayers.

• Having done this, refit the wheel on the tractor or on the sprayer.

Note: In most 4-wheel drive tractors, the speed sensor can be fitted on the cardan shaft without problems, using a simple “homemade” bracket. The sensor may not be compatible with the metal parts of the shaft (clamps or welded nuts). The ring should not be removed!

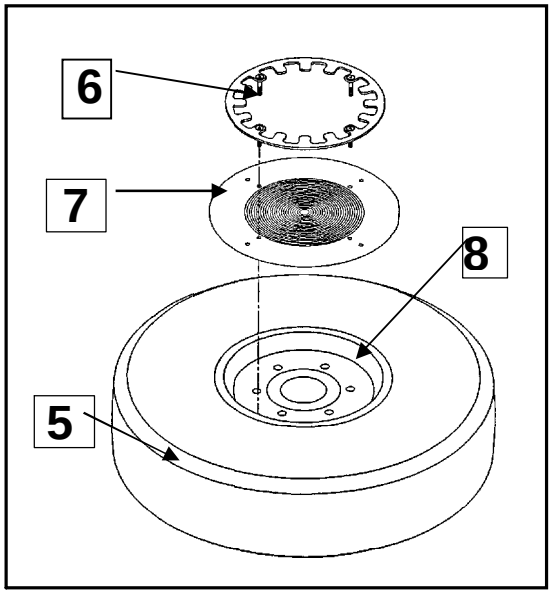


Fig.3

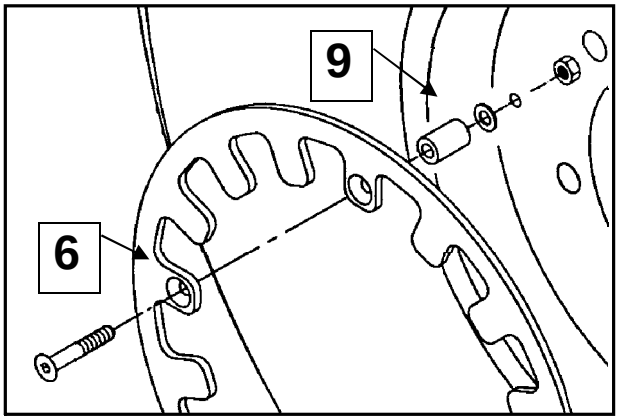


Fig.4

2.2.5 Installation of the sensor

• The speed sensor should be installed as close as possible to the ring (6). The towed units have their bracket in the sprayer frame. In case of extension of the machine, the bracket for the speed sensor should by fitted on the outer area of the front axle of the tractor so that it rotates during steering (Fig. 5)
As a matter of principle, make sure the plants in the field or other objects are protected from the sensor.
• If suitable screws or clamps are not available, the centring holes of the wheel axis or the steering pin should be drilled and threaded inside the hole. Make sure the sensor transmits at least 50 pulses beyond a distance of 20 m.

Note: Clamp (11) should be fitted using at least 2 screws in such a way as to prevent the sensor from vibrating or falling out of the ring.

THE SENSOR SHOULD NOT TOUCH THE RING IN ANY MANNER WHATSOEVER!

• Bar (12) can be used for fitting the sensor in the front wheel of the tractor.
• Fit the sensor in the clamp-holder and adjust all possible inclination of the ring using shims (13). (Fig. 7)
• Shift the sensor in the clamp-holder in such a way that the distance from the ring is from 3 to 6 mm (Fig. 6 and 8).
• The speed sensor should be positioned on the cam in such a way that the centre of the sensor is opposite the inner edge (14) of the cam (Fig. 8).

Note: If the sensor is fitted too far away from the outer edge of the ring, it cannot recognise the individual cams. In this case, no pulses are transmitted and the system does not count.

• Check to see that the sensor counts every cam; the lamp on the sensor should flash each time. This is checked by lifting the tractor axle or the empty machine using a jack and turning the wheel by hand.

When raising the wheel, always apply the hand brake of the tractor and use wedges to hold the machine steady.
Calibration of the speed sensors described in the "**Calibration of driving speed**" section.
• Place the sensor cable in the driver's cab and connect the plug to the computer (Fig. 1)

Note: When positioning the sensor cable, also take the maximum steering angle into consideration.

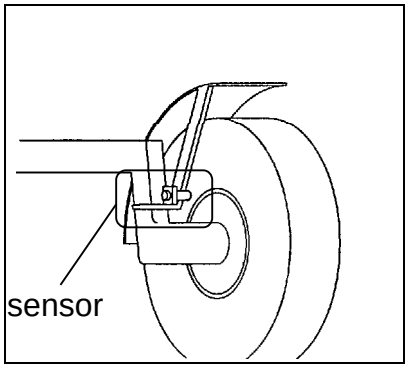


Fig. 5

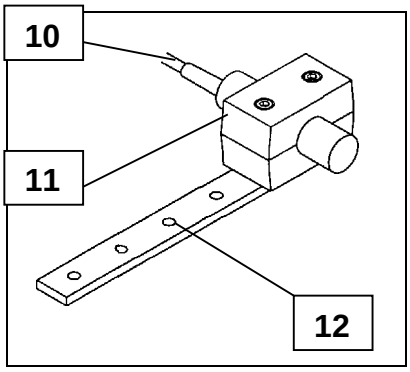


Fig. 6

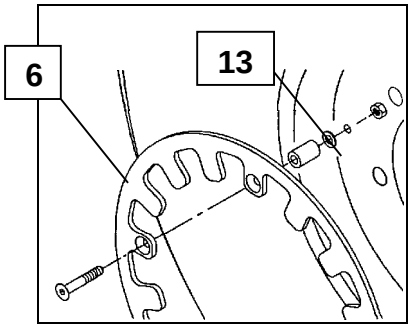


Fig. 7

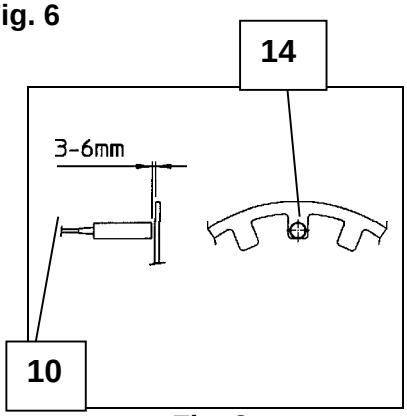


Fig. 8

2.2.6 Installation of the pressure sensor

Fit the sensor as close as possible to the utilities terminals, or on the pressure-gauge connector on the distributor valves unit and, in any case, as far away as possible from the pressure regulator valve.
Position the pressure sensor as shown in Fig. 9 so that it measures the pressure of the flow in the sections.

The pressure sensor should be installed in a position protected from pressure peaks.
Since its working is of vital importance for regular reading of the pressure parameters, protect the cable from breakage and/or abrasion which may occur during use.
If a cable-sensor extension is to be provided, contact the *"Bertolini Technical Service".*

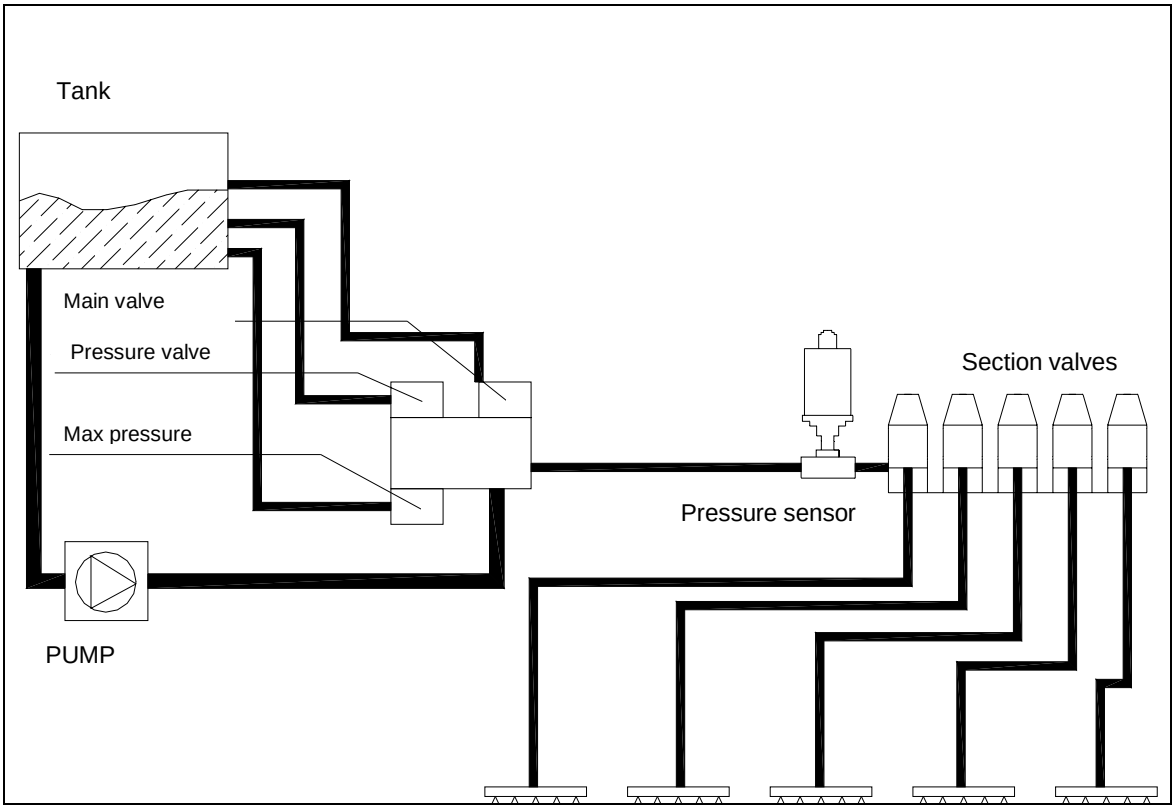


Fig. 9 Installation of the pressure sensor

Caution! The pressure sensor is oversized for the purpose for which it is meant; however, it is advisable to install it in an area protected from water hammer which could damage it.
The Manufacturer shall not accept liability for sensors damaged by water hammer or overpressures, in general.

3. COMPUTER

The operating unit of the BUONO SIMPLY (Fig. 10) consists of two parts:

- Computer.
- Switches block

The Switches block directly controls the opening and closure of the valves with the exception of the volumetric valve).
The computer takes the readings of the sensors present and displays the parameters and adjustment of the volumetric valve.

3.1 SAFETY AT START-UP



Caution! Every time the Buono Simply is started up by pressing the button present on the back of the main box, make sure the main valve pilot switch (Pos.1 Fig. 10) is in the Off position (turned downwards).

3.2 ACTIVATION MECHANISMS

The following spraying functions can be controlled electrically in remote on the operating unit (Fig. 10):

“Spraying” On/Off " MAIN" Switch (1)
When the main valve switch (1) is Off, all the section valves (7) (Fig. 11) are in the closure position independently of the status of the relative switch. On the other hand, if the main valve switch is in the On position, the open/closed status of each valve is determined by the position of the relative switch; in this condition, it is possible to operate each section (Switch turned up = valve open and LED On)



Section switches (2)
When the section switch (2) is in the Off position, the section valves (7) (Fig. 11) are closed, when it is in the On position, the section valves are open (Switch up = valve open and LED On)

"PRESSURE" Switch for pressure regulation +/- (3)
When switch (3) is used, the computer automatically changes from Automatic to Manual. At the same time, the motor for pressure regulation (6) (Fig. 11) is started up in the required direction (+o -) as long as the switch is held down. The l/ha outlet flow rate can then be modified manually. During this function, the volumetric valve moves at a low speed compared to normal control to allow the operator greater regulating accuracy.

BUONO SIMPLY

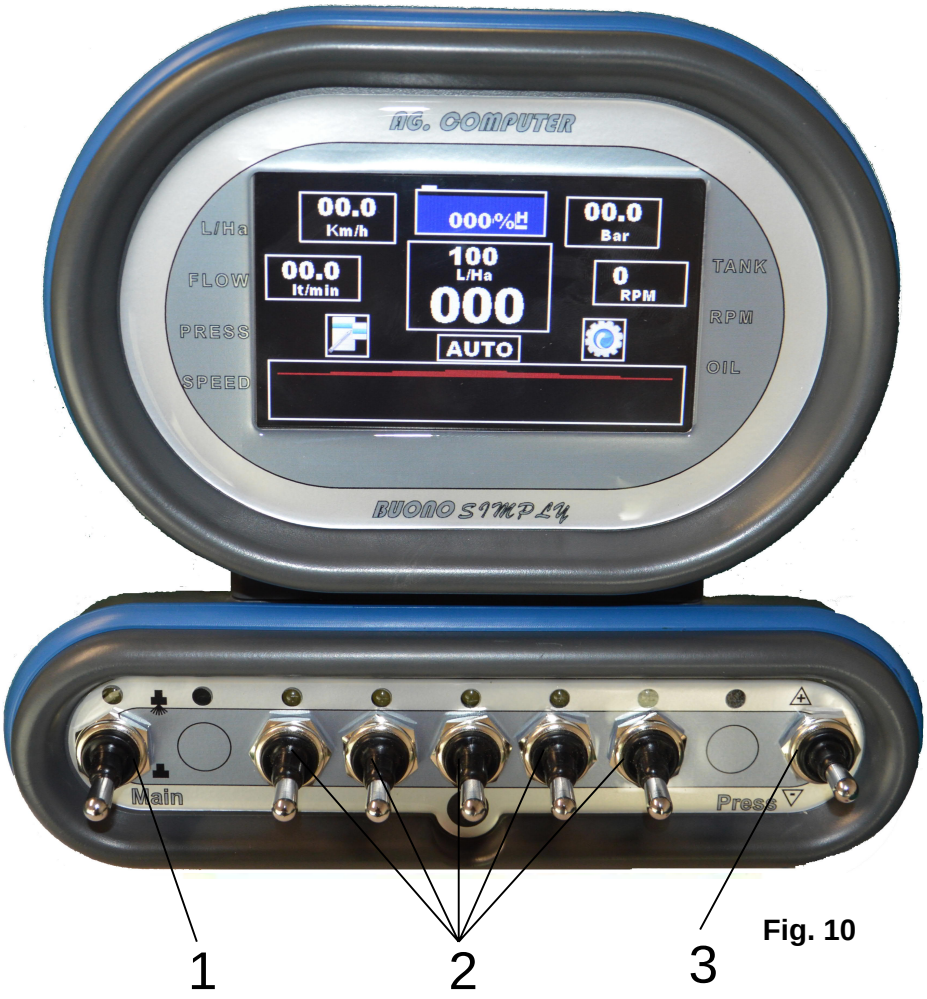


Fig. 10

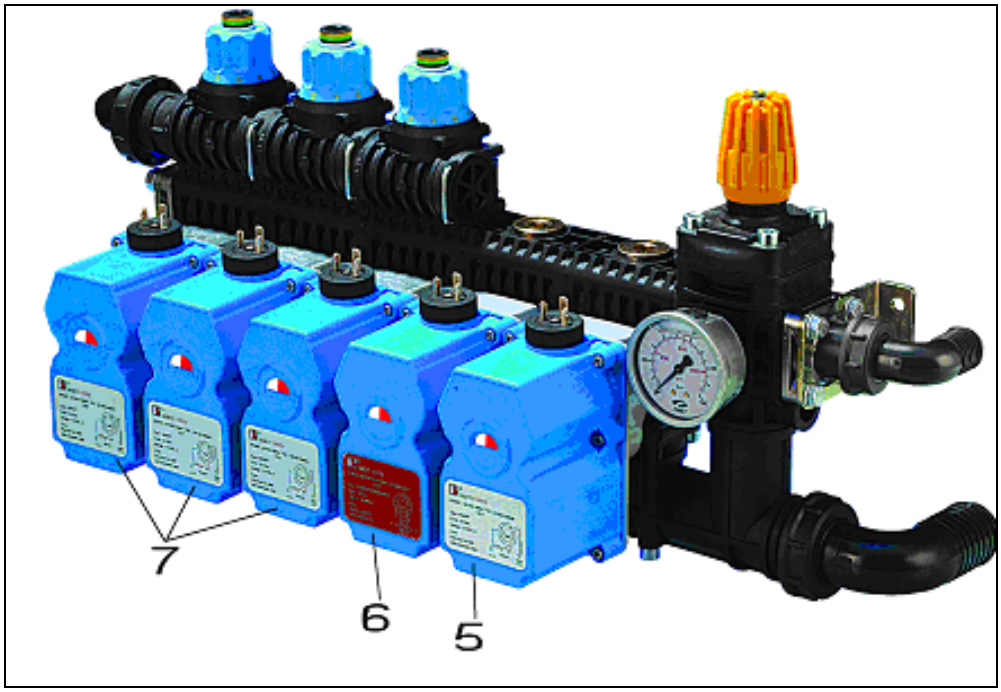


Fig. 11

3.3 COMPUTER FOR SPRAYING

3.3.1 General

The BUONO SIMPLY computer ensures that the flow rate in litres/ha, independently of the driving speed and the size of the work area, always corresponds precisely to the nominal data programmed.

The computer always calculates the necessary flow rate (l/min) which should be transmitted to the nozzles on the basis of the l/ha programmed, the current dirving speed (km/h) and the current work area.
The flow rate necessary Q (l/min) can be calculated using the following formula:

$$Q\ (l/min) = \frac{\text{work area (m)} \times \text{driving speed (km/h)} \times l/ha}{600}$$

The flow rate thus calculated is compared to the actual flow rate of liquid from the nozzles.
The actual value is established by the flow meter installed between the pressure regulator and the section valve.
If the actual flow rate does not correspond to the calculated flow rate, the pressure regulator is activated as long as the 2 data are identical to the calculated flow rate.
The liquid flow rate is immediately adjusted by the pressure regulator if the driving speed or the size of the active work area (conversion of section) are modified. The flow rate in litres/hectare always remains constant.

The quantity of product distributed in certain parts of the field can be modified manually. Just press the key to return to automatic mode, then maintain the nominal data set in the program.

The BUONO SIMPLY computer has four types of alarms: one for maximum and minimum pressure thresholds, one for maximum and minimum flow rate thresholds, one for maximum and minimum speed and one for minimum level of oil in the pump. Any anomalies that may occur are indicated by means of an acoustic alarm as well as by means of text on the display together with flashing, to draw the operator's attention,

During normal working of the treatment 7 operating parameters can be monitored **at the same time**.

- *Advancement speed*
- *Operating pressure (measured or calculated)*
- *Operating flow rate*
- *Pump rpm*
- *Liquid in tank*
- *Dosage setting*
- *Dosage delivered*

The computer can adjust the dosage irrespective of the pressure and flow rate. If both instruments are present, the flow rate is adjusted and the pressure value indicated is the datum read by the relative transducer. Passage from one regulating mode to another is automatic, depending on the inputs detected, without the need for any programming.

3.3.2 Main screen page - Weeding

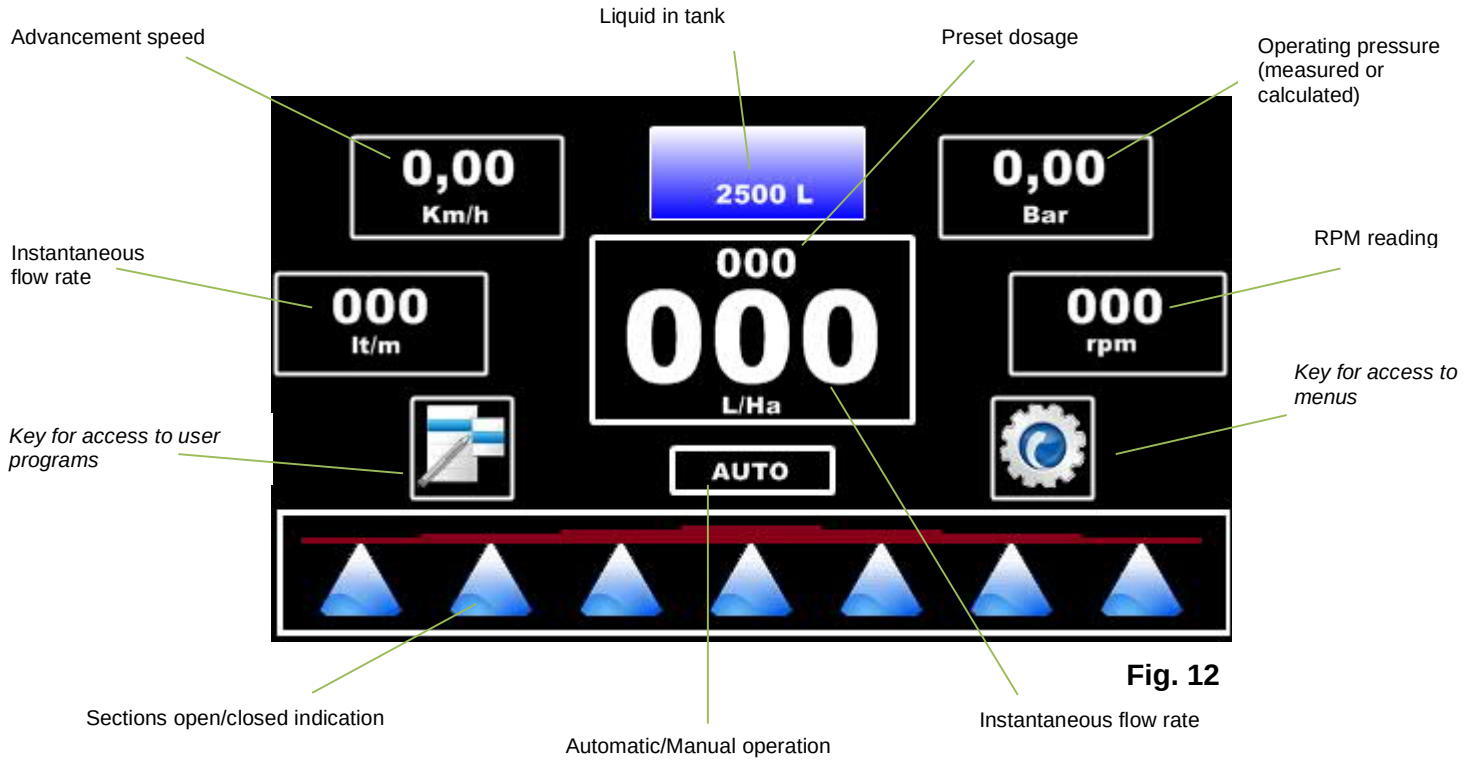
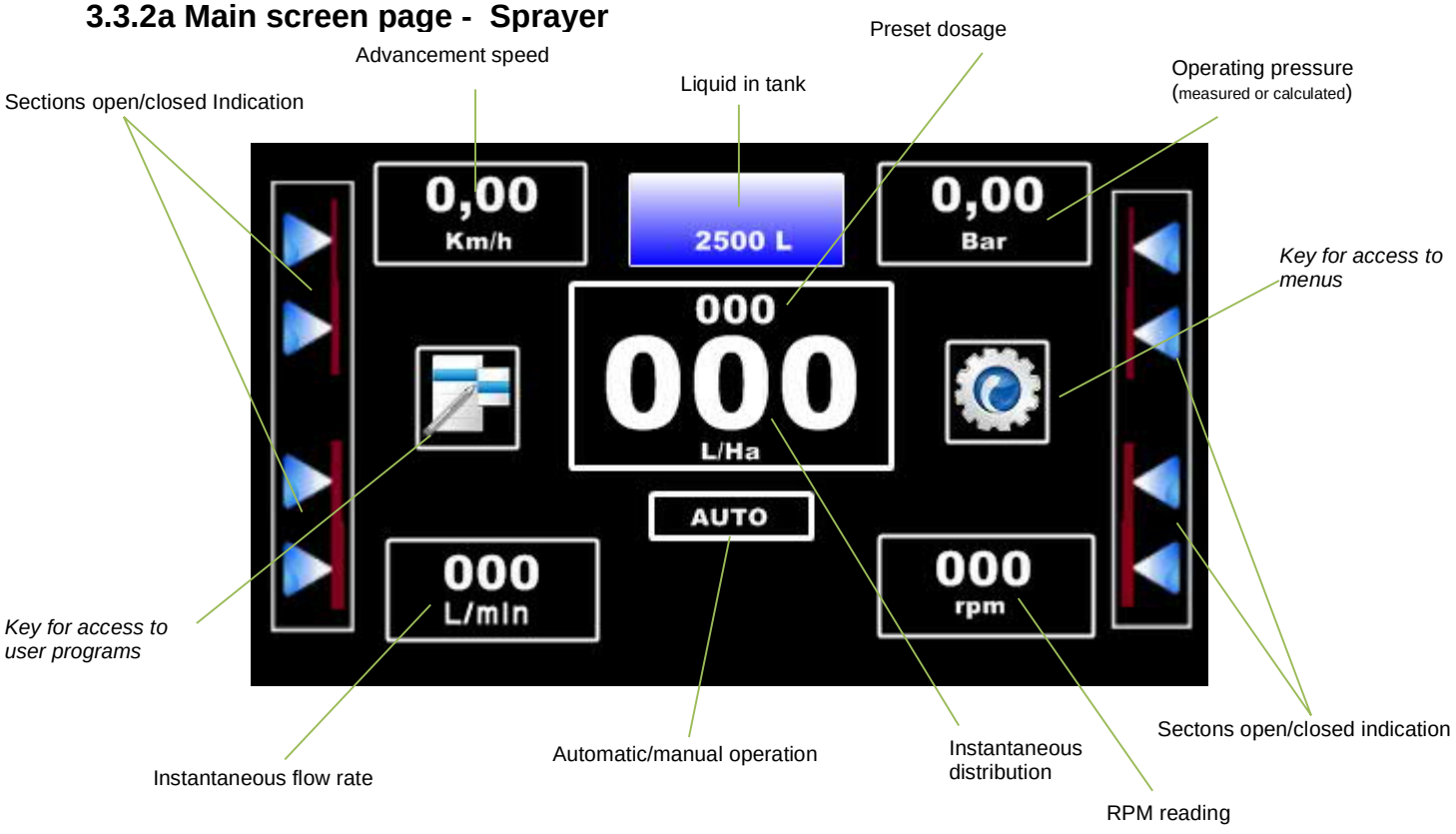


Fig. 12

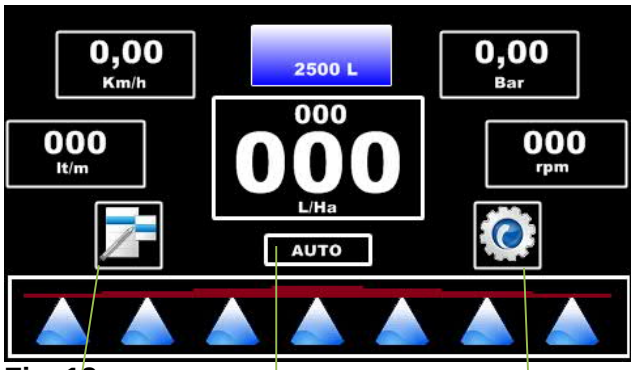
The display of the quantity of residual liquid is expressed in percentage if a loading curve has not been entered or in litres if the curve is present. The measurement units displayed vary according to the international system adopted (EU/US)

3.3.2a Main screen page - Sprayer



3.3.3 Access to the menus

Since the computer display is a touch screen, there is no external key; all operations are managed by pressing directly in the corresponding areas on the screen.



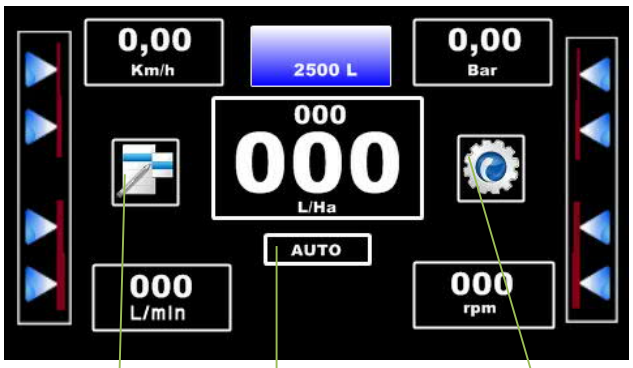


Fig. 13

Enabling/Disabling manual/automatic operation

Access to programs creation menus

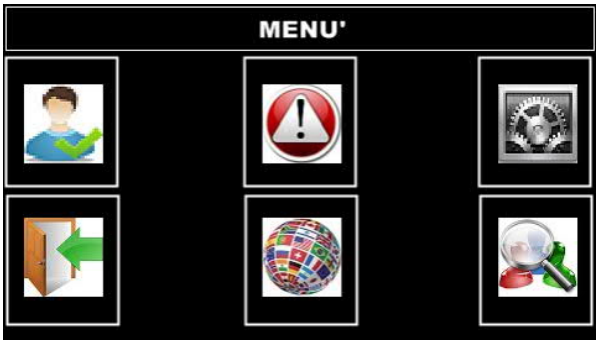
Access to configuration menus

Enabling/Disabling manual/automatic operation

Access to programs creation menus

Access to configuration menus

To access the configuration menus, press the key on the RH on the display **(Fig. 13)**
To access the programs creation menus press the key on the screen **(Fig. 13)**



CONFIGURATION MENUS

Fig. 14



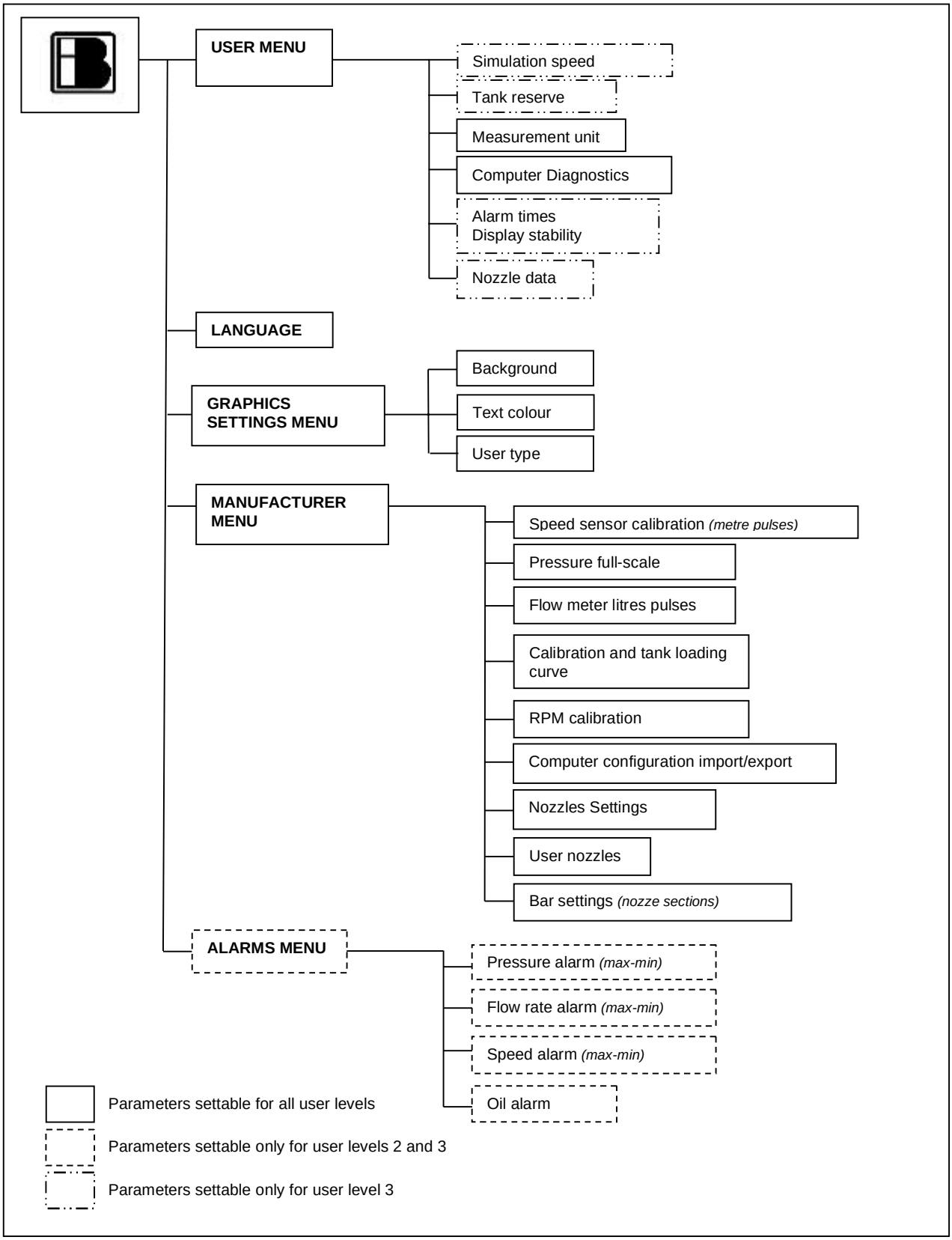
PROGRAMS MENU

Fig. 15

3.3.4 Structure of the menus

The program structure consists of 4 types of menus:

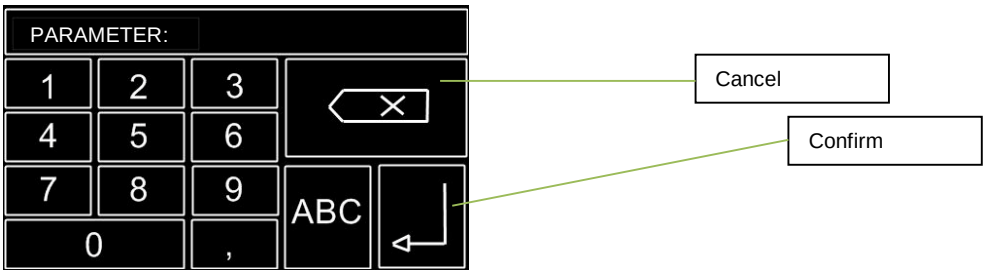
- User menu.
- Manufacturer menu (password-protected).
- Alarms settings menu.
- Graphic menu.



3.4 ENTERING AND CHANGING DATA

Recording and changing the data is done in the same manner in all the screen pages of the menu.
The parameter to be modified is selected by pressing on it on the touch screen.

The value can be modified with the help of the numeric keypad on the display.



(Fig. 17)

4 OPERATING MODES

To use the Buono Simply computer, select the mode, as there are two types of computers on the same system: one for weeding treatment and the other for treatment of orchards. It is also possible to set a “user level” to filter the display and the management of certain parameters.

4.1 SELECTING THE OPERATING MODES

When the BUONO SIMPLY computer is switched on, **the screen page shown below is displayed** in which it is possible to use the computer in the weeding version by pressing the icon or in the sprayer version by pressing the icon.

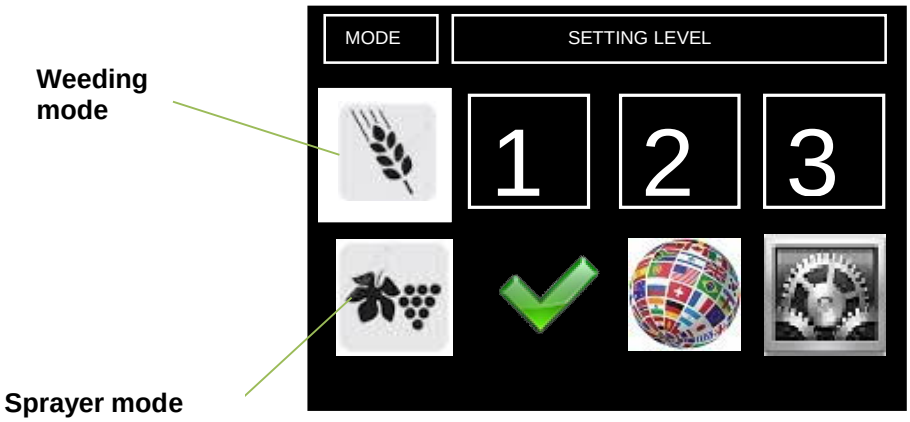


Fig.18

In this phase the user type can also be set by pressing on keys 1, 2 and 3; there are three user levels.

Level 1: this is the simplest user level the user menu is reduced to the minimum the dosing programs creation menu is simplified and very little information is displayed the system monitoring alarms cannot be programmed.

Level 2: this is the intermediate user level the user menu is reduced to the minimum the dosing programs creation menu is simplified and very little information is displayed but the treatment monitoring alarms can be used.

Level 3: this is the complete user level the menu is complete the dosing programs creation menu makes it possible to carry out simulations and the information displayed is complete.

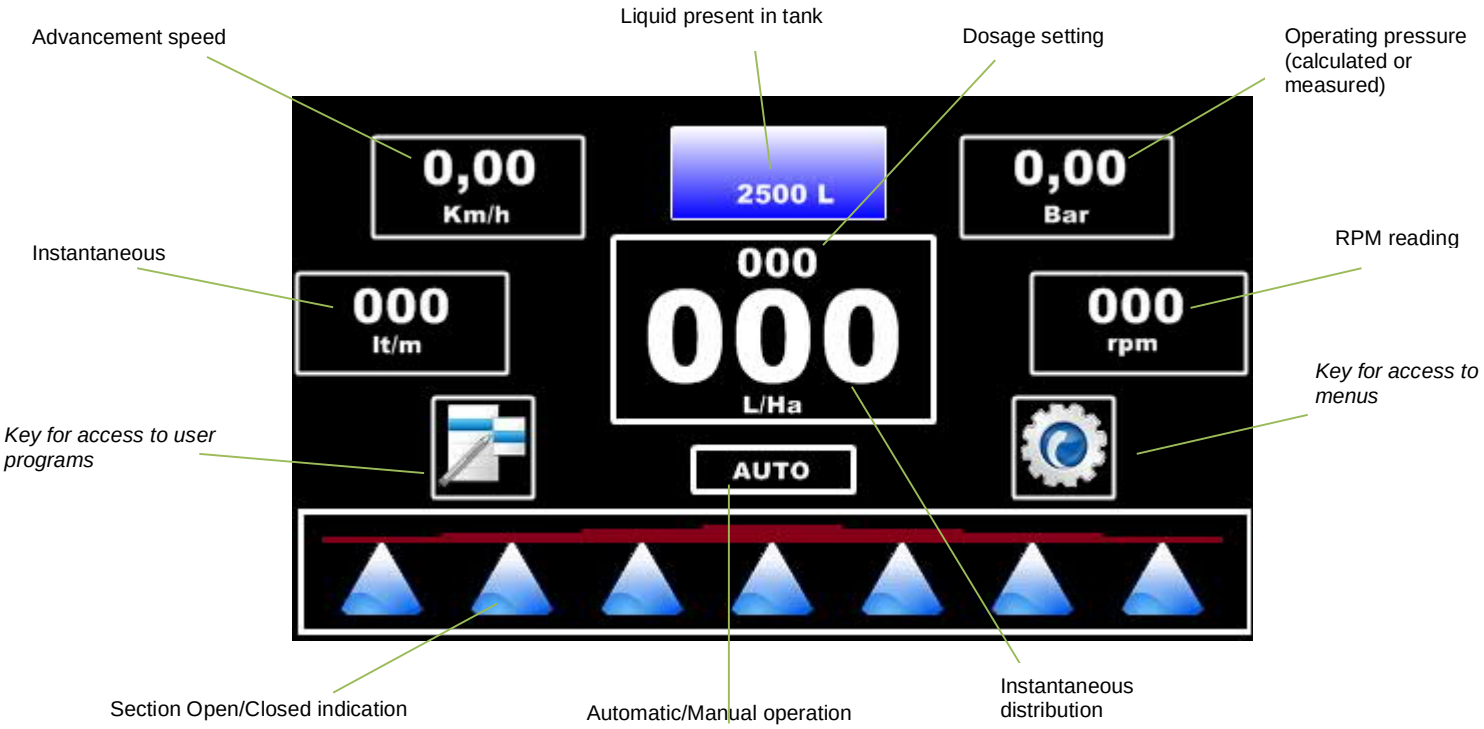


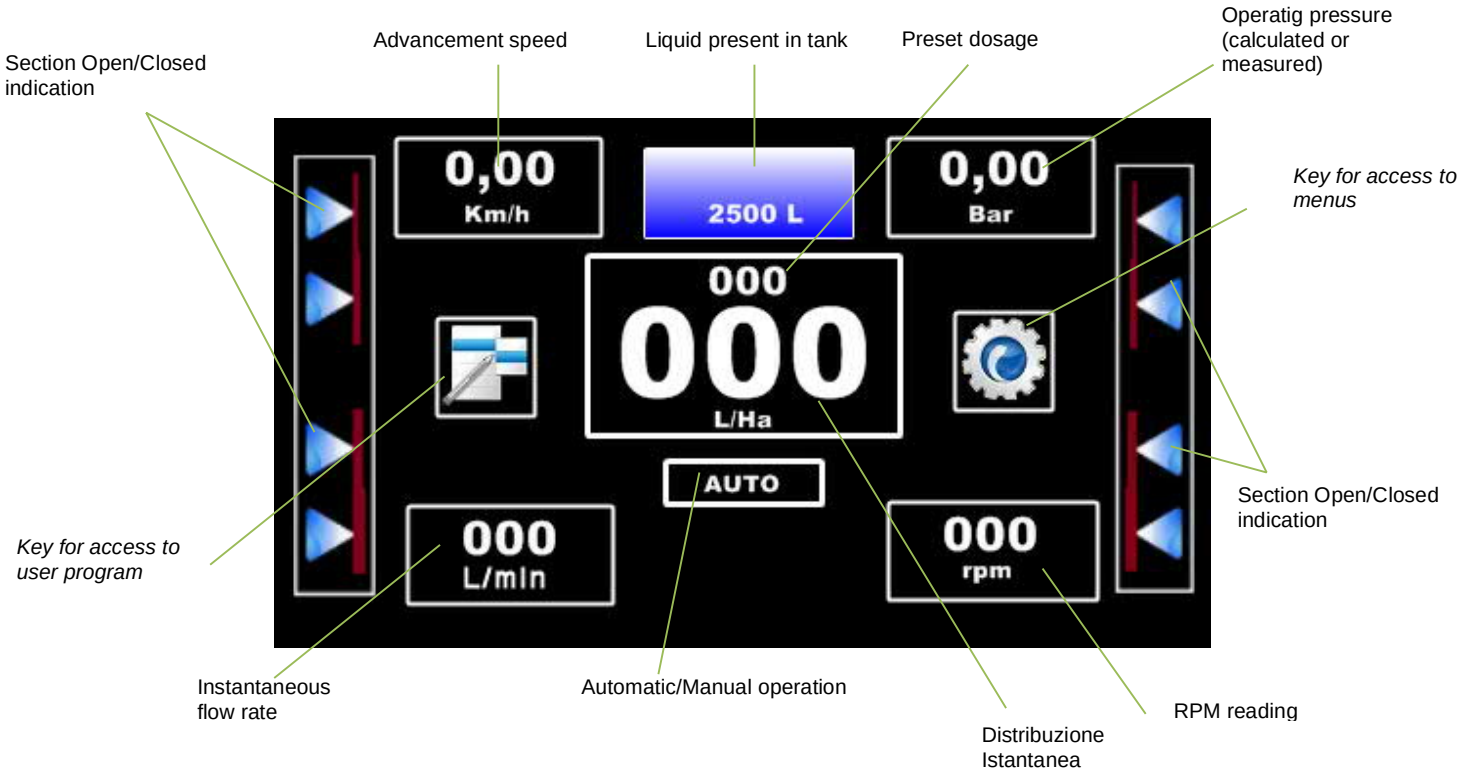
Fig.19

5 MAIN MENU

The main menu is the menu level used during treatment; it consists of a single screen page which contains all the information concerning the treatment in progress.

5.1 MAIN SCREEN PAGE





5.1.1 Sections

The cone shaped symbols at the bottom of the display indicate the sections that have been activated and deactivated.

 closed sections

 open sections

5.1.2 Operating mode

The operating mode is displayed in the centre of the display.

AUTO
MAN

Automatic or manual mode

When the operating unit is working, the computer automatically selects the automatic mode.

To change to manual mode, press the **PRESS** switch in the required direction (+o-) and hold it down until the required flow rate is reached.

On the display, AUTO is replaced by MAN and the surrounding area is shadowed in black, while at the same time the litres per hectare are shaded. In manual mode, the flow rate can be increased partially for some parts of the field. It must be specified that the movements of the volumetric valve in this mode are slowed down to allow the operator greater precision in adjusting the required parameters.

To exit the MANUAL mode press MAN on the display.

5.1.3 Driving speed

The driving speed is indicated by measuring the pulses read on the proximity sensor positioned on a non-drive wheel.

If the speed sensor is not present or is damaged, the computer automatically assumes as instantaneous speed the value saved in the simulation speed parameter and will make the necessary dosing corrections starting with this datum. It is the operator's duty to adjust the machine advancement speed in a manner consistent with the datum assumed by the computer. This parameter can be modified in the user menu.

5.1.4 Dosage l/ha

During the treatment the actual dose dispensed is shown in the centre of the display. The nominal programmed datum is shown slightly in the upper part. If the control system works in automatic mode (see above), the nominal and effective data should be more or less identical. If the data do not coincide check the "Trouble-shooting" Table.

The nominal datum can be modified temporarily by entering manual mode.

The nominal datum can be modified definitively by modifying the value in the relative user program.

5.1.5 Flow rate l/min

During the treatment the display shows the instantaneous value of the flow rate read by the flow meter if present. If the system adjustment involves the pressure instead of flow rate, the flow rate value is calculated on the basis of the operating parameters present.

5.1.6 Pressure Bar

During the treatment the display shows the instantaneous pressure value read by the pressure transducer, if present. If the system adjustment involves the flow rate instead of the pressure, the pressure value is calculated on the basis of the operating parameters present.

5.1.7 Rpm

During treatment, the display shows the instantaneous rpm value of the PTO (or other rotating components, depending on the position of the sensor) read by the transducer, if present.

5.1.8 Liquid in tank

During treatment, the display shows the value of the residual liquid poresent in the tank; this value may be displayed in two ways – in percentage (%) if no tank loading curve has been entered in the computer parameter settings, in litres (L) if the loading curve is present in the system. When the reserve value setting is reached, the residual liquid value changes to red.

5.2 ALARM SCREEN PAGE

The main page displays the treatment alarm status if any. The generic alarm symbol is seen in the centre of the display and the type of alarm is shown at the bottom of the display.



Fig. 21

When an alarm occurs a single intermittent sound is activated and the backlighting of the display starts flashing. To mute the alarm, press on the display in a part that is not active (e.g. speed or pressure). Even if the alarm has been muted, the flashing of the backlighting persists until the fault disappears.

The alarms that can be set/displayed are:

- Maximum pressure alarm;
- Minimum pressure alarm;
- Maximum flow rate alarm;
- Minimum flow rate alarm;
- Maximum speed alarm;
- Minimum speed alarm;
- Oil alarm;
- Drop alarm;

The alarm texts are translated in the selected language.

<u>The drop alarm is an atypical alarm since it is not indicated by a warning sound or flashing display but only by the drop symbol as shown in the Fig.</u>

PROGRAMMING MENUS

6 CONFIGURATION MENUS

To access the configuration menus section, press the display area in the main screen page.

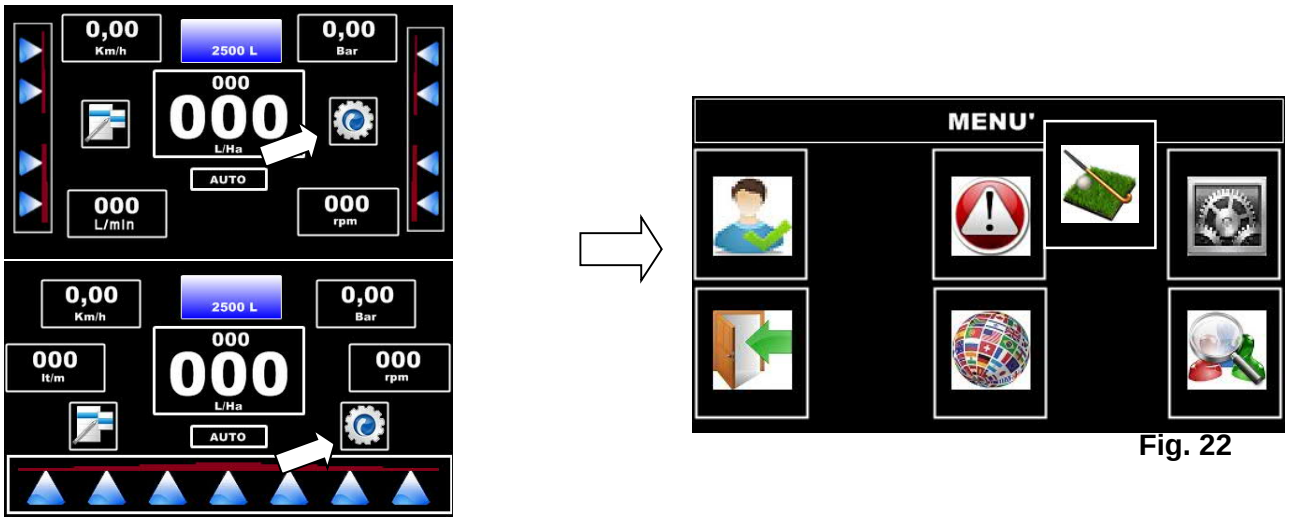


Fig. 22

User

Language selection menu

Manufacturer menu (password-protected)

Alarms

Graphic aspect menu

Totalizator reset

Exit

6.1 USER MENU

In the user menu it is possible to make all the settings necessary for final management of the computer and which make the use as functional as possible for the operator.

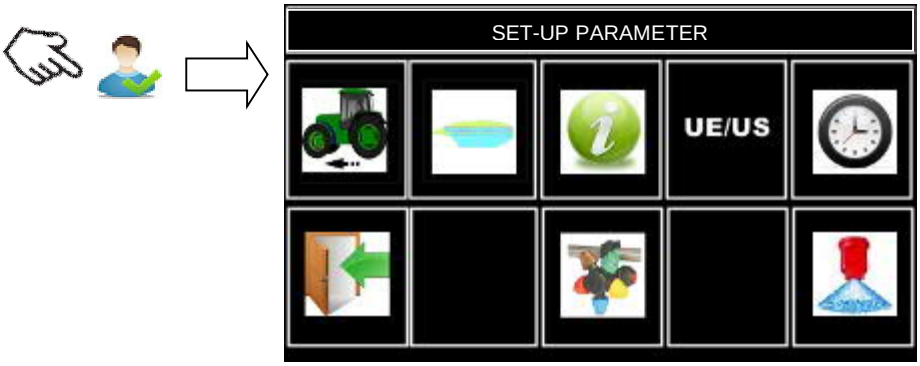


Fig. 23

Simulation speed

Tank reserve

Nozzles programming

UE/US Setting Unit of measurement

System Hardware status

Exit

Filters/alarm activation delay settings

Nozzles preselection

6.1.1 Simulation speed setting

If possible, the speed simulation should be the speed at which treatment is normally carried out. Speed simulation is used automatically as the substitute data if no speed signal is available, for e.g. breakage of the speed sensor.

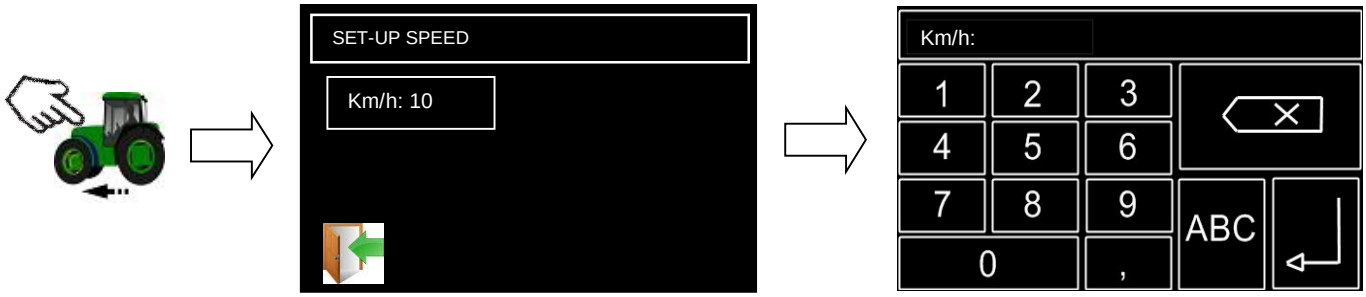


Fig. 24

In this menu it is possible to set the required simulation speed. Press on the parameter to enable the modification; a window is displayed for entering data in which the new parameter value can be entered. By pressing enter to confirm the modification is enabled.
In this section it is also possible to preset the speed, below which all sections will be automatically shut (MIN parameter)

6.1.2 Tank Reserve Set-up



Fig. 25

In this menu it is possible to set the value of the liquid reserve present in the tank. Press on the parameter to enable the modification; a window is displayed for entering data in which the new parameter value can be entered. By pressing Enter to confirm the modification is enabled.

6.1.3 System Hardware Info

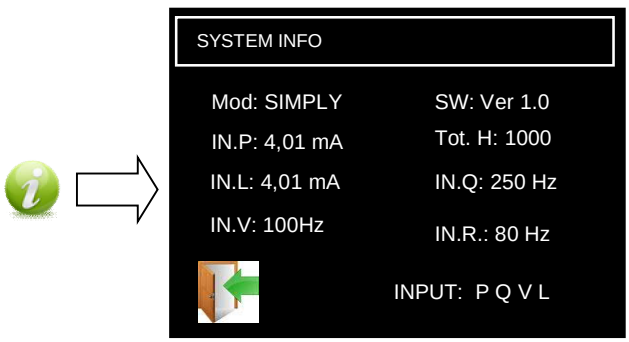


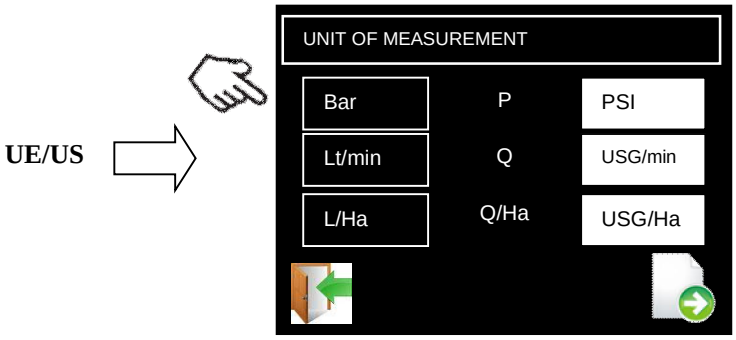
Fig. 26

This is a read-only menu, no modification or programming is possible.

This page shows the computer model and firmware version, the status of the system inputs and the total hours of work.

Mod..: Identifies the computer model
SW: Identifies the software version installed on the computer
IN.P : Identifies the pressure transducer current value.
Tot.H: Identifies the total number of hours worked by the computer
IN.L : Identifies the current value of the tank liquid transducer.
IN.Q : Identifies the flow rate transducer frequency value.
IN.V : Identifies the speed transducer frequency value.
IN.R : Identifies the frequency value of the pump RMP transducer.
INPUT: Identifies the inputs that have been detected.
(P pressure, Q flow rate, V speed, L tank, R pump rpm)

6.1.4 Measurement unit Set-up



In this menu it is possible to select the required unit of measurement associating it to each quantity. Just press on the required measurement unit to make the modifiaction. Then press Exit to return to the higher level of the menu. Press the Down arrow to proceed to the next page.

Fig. 27

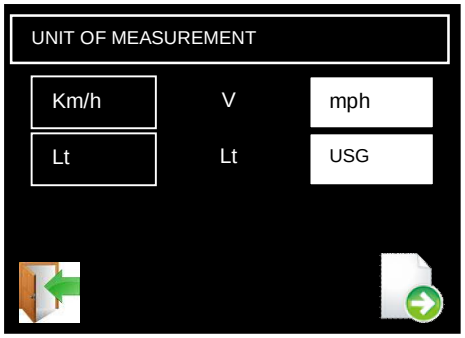


Fig. 28

P	pressure
Q	Flow rate
Q/Ha	Dosage
V	Speed
Lt	Tank liquid quantity

6.1.5 Filters and alarm delay Set-up

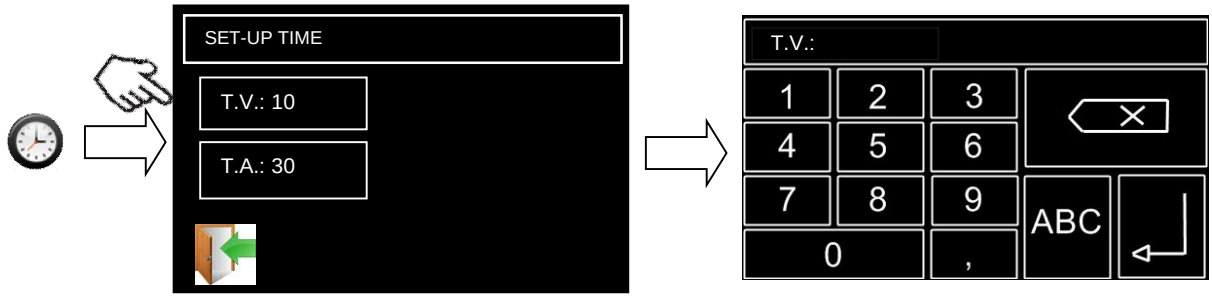


Fig. 29

In this menu a filter can be set for the display stability of the parameters displayed in the **T.V.** main page; this value ranges between 1 and 99, the higher the number the more stable the display. ***The parameter variation does not cause slowdown of the proportional valve regulation times.***
Press on the parameter to enable the modification; a window is displayed for entering data in which the new parameter value can be entered. By pressing Enter to confirm the modification is enabled.

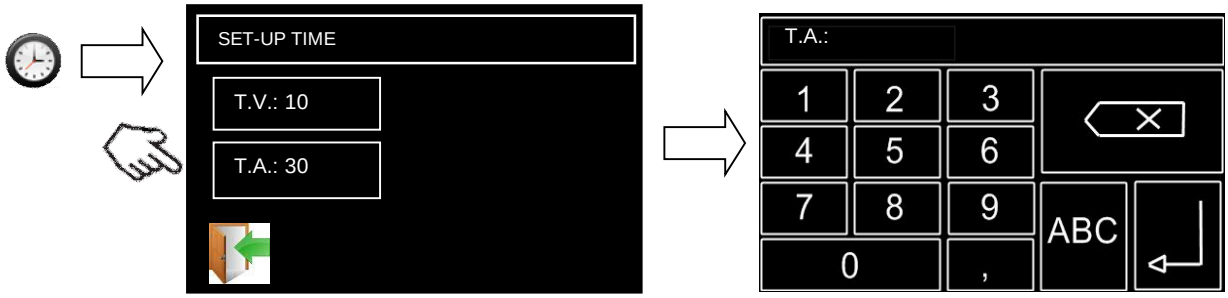


Fig. 30

In this page it is also possible to set the delay time of the signalling of the **T.A.** alarm status espressed in seconds; the delay in signalling the alarm serves to make sure the system or the operator do not have incorrect signals due to system transients, for example, during the product delivery start and end phases.
Press on the parameter to enable the modification; a window is displayed for entering data in which the new parameter value can be entered. By pressing enter to confirm the modification is enabled.

6.1.6 Nozzles Set-up

In this menu the nozzles database is created; the data entry structure is the same as that given in the technical specifications of the nozzles issued by the manufacturers. It is possible to enter a maximum number of 7 nozzles to which a name with a maximum of 11 characters can be associated. For each nozzle it is possible to enter 6 operating ranges plus any drop type in each range.

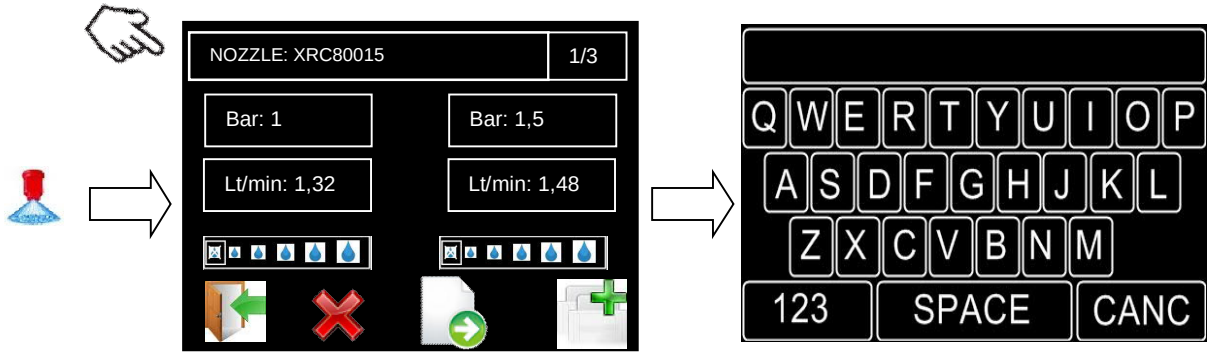


Fig. 31

Press “NOZZLE” on the display: it is possible to assign the name to the nozzle which is being entered (max. 11 characters). Numbers and letters can be entered by means of the data entry keypad. For reasons of space the keypad is divided into two parts, press the ABC and 123 keys to enable the part of letters that are not displayed or the numeric keypad.

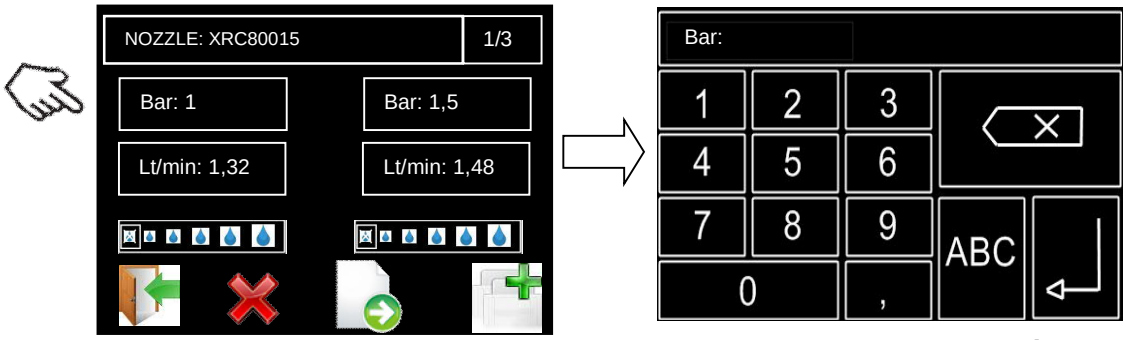


Fig. 32

Press on the Bars parameter on the display and enter the first operating pressure indicated by the manufacturer.

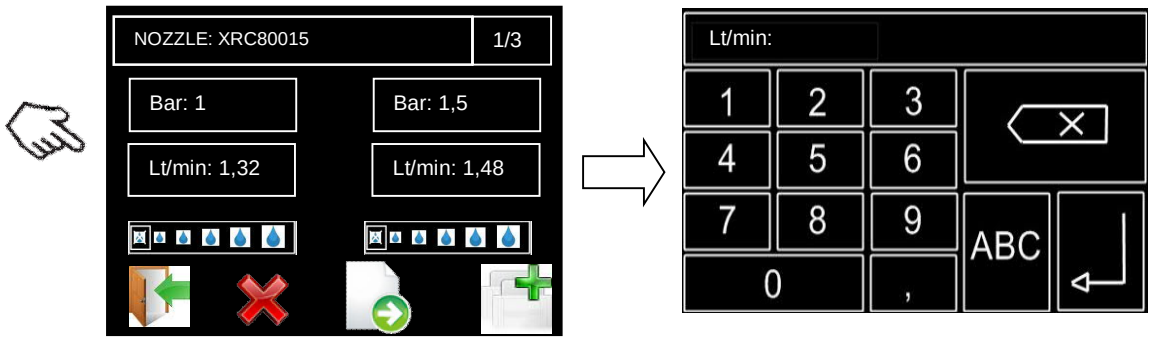


Fig. 33

Press on the BarL/min parameter on the display and enter the flow rate on the first operating pressure indicated by the manufacturer.

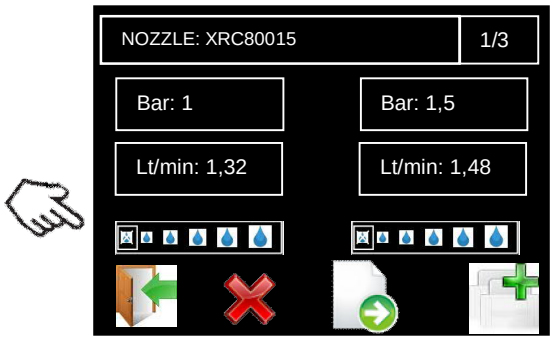


Fig. 34

Press the drop type parameter on the display and enter the dimension of the drop indicated by the manufacturer in the fields entered earlier. The operations described above can successively be repeated for the remaining fields of the screen page. Since it is possible to enter 6 operating ranges and only two are displayed for each screen page, press to enable entry of the successive fields. **It is not obligatory to enter all the 6 operating ranges of the nozzle, just 2 are sufficient.**
If the type of drop is not present or the drop alarm is not to be enabled for this nozzle, just set in all the fields the drop with the symbol. After filling in the fields, to make the parameters effective, press .

It is possible to scroll through and display all the nozzles loaded by means of the key.

6.2 ALARMS MENU

The various alarms available can be activated and deactivated in the alarm menu. The alarms can be deactivated by setting the value of the parameters of each submenu as 0.
If a value other than 0 is set, the alarm becomes active.

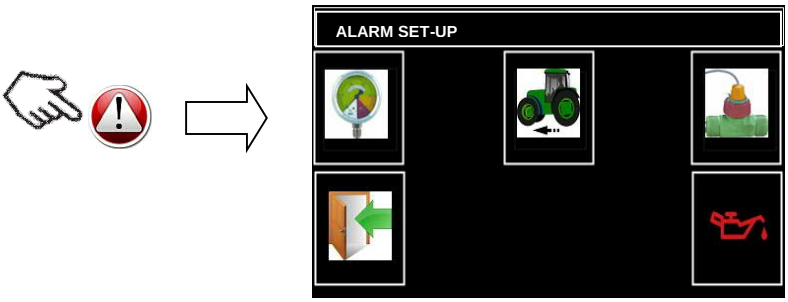


Fig. 35

Pressure alarm setting

Speed alarm setting

Flow rate alarm setting

Oil alarm setting

Exit

6.2.1 Pressure Alarm Setting

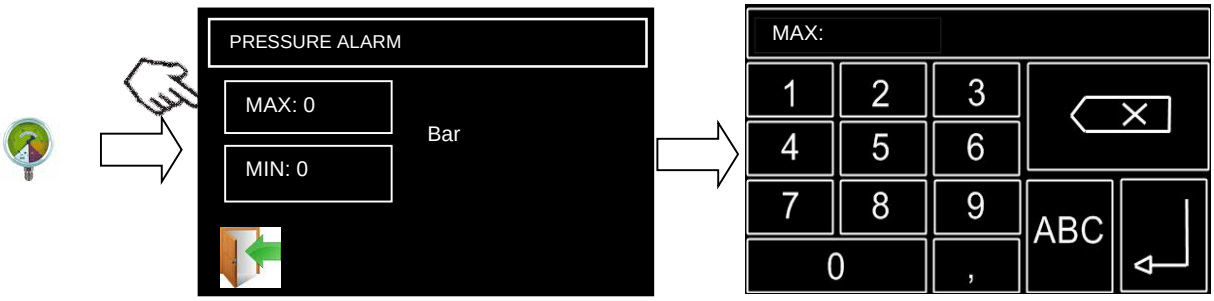


Fig. 36

In this menu it is possible to set the pressure value beyond which the alarm will be activated. Press on the parameter to enable the modification; a window is displayed for entering data in which the new parameter value can be entered. By pressing Enter to confirm the modification is enabled.

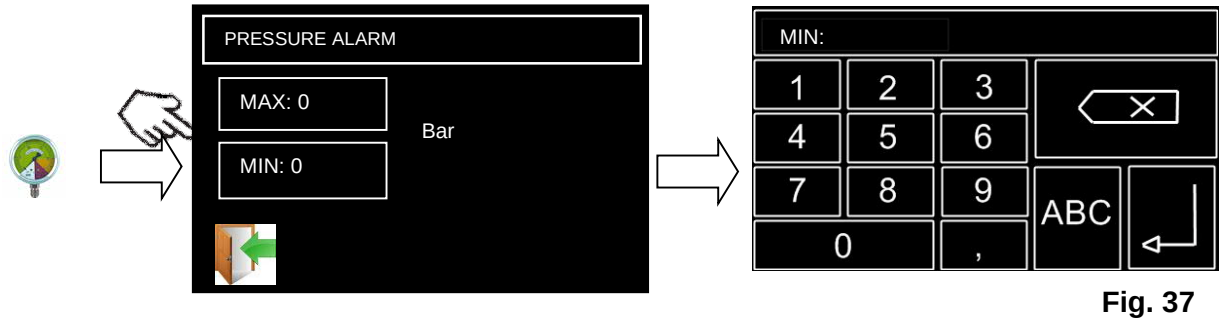


Fig. 37

In this menu it is possible to set the pressure value below which the alarm will be activated. Press on the parameter to enable the modification; a window is displayed for entering data in which the new parameter value can be entered. By pressing Enter to confirm the modification is enabled.

6.2.2 Flow rate Alarm Setting

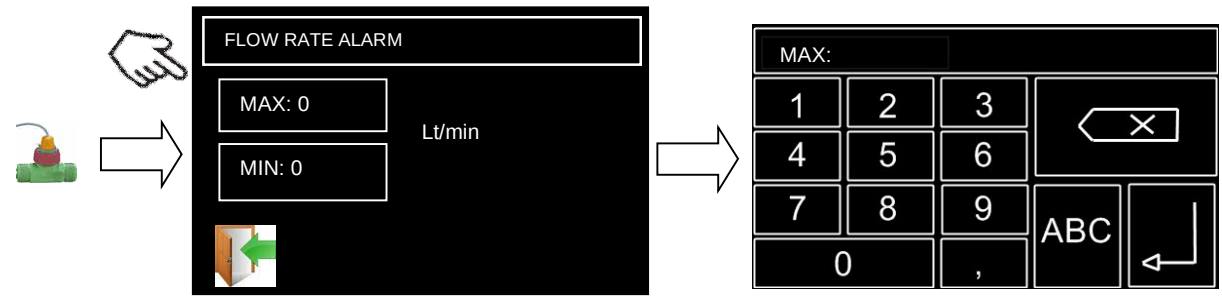


Fig. 38

In this menu it is possible to set the flow rate value beyond which the alarm will be activated. Press on the parameter to enable the modification; a window is displayed for entering data in which the new parameter value can be entered. By pressing Enter to confirm the modification is enabled.

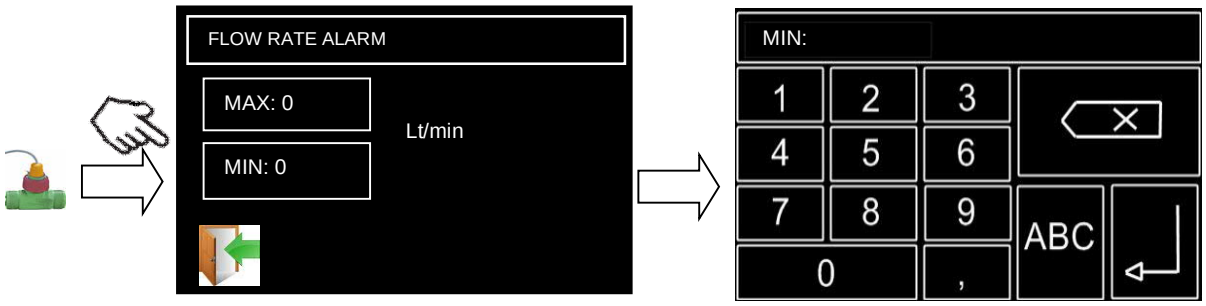


Fig. 39

In this menu it is possible to set the flow rate value below which the alarm will be activated. Press on the parameter to enable the modification; a window is displayed for entering data in which the new parameter value can be entered. By pressing Enter to confirm the modification is enabled.

6.2.3 Speed Alarm Setting

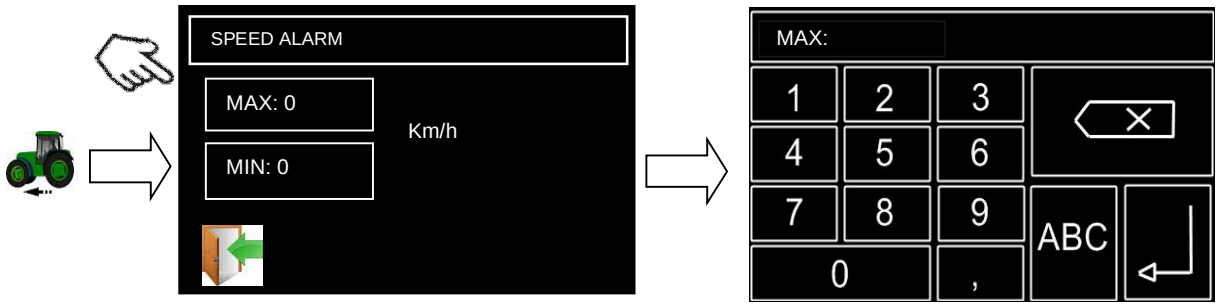


Fig. 40

In this menu it is possible to set the speed value beyond which the alarm will be activated. Press on the parameter to enable the modification; a window is displayed for entering data in which the new parameter value can be entered. By pressing Enter to confirm the modification is enabled.

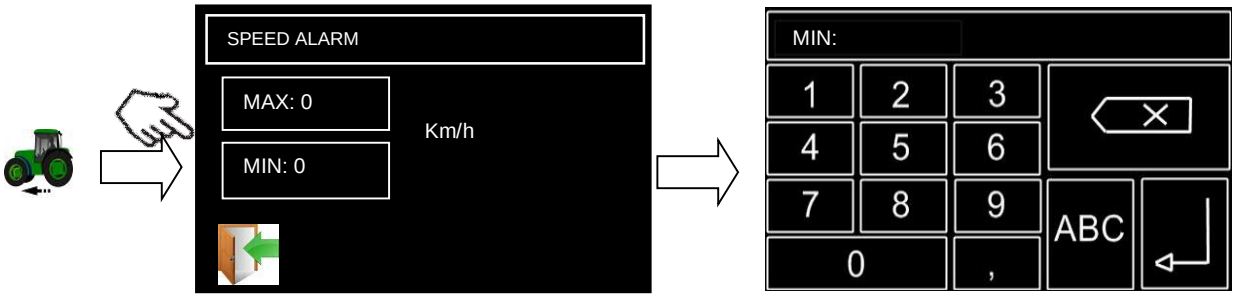


Fig. 41

In this menu it is possible to set the speed value below which the alarm will be activated. Press on the parameter to enable the modification; a window is displayed for entering data in which the new parameter value can be entered. By pressing Enter to confirm the modification is enabled.

6.2.4 Oil Alarm Setting

It is not necessary to enter any parameter to enable the oil alarm. Just press on the oil icon which will change its status according to activation and deactivation.

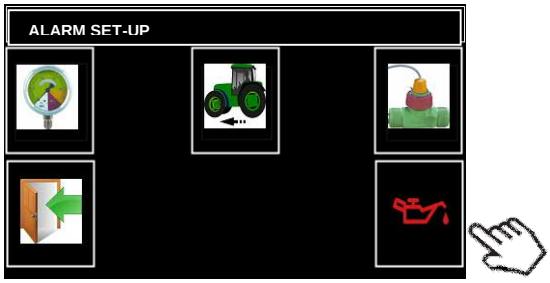


Fig. 42

Oil alarm not active

Oil alarm active

6.3 MANUFACTURER'S MENU

The Manufacturer's menu is the menu in which it is possible to configure the machine's mechanical parameters. For reasons of safety, this menu is password-protected so it cannot be accessed freely by the final operator.



Fig. 43

Speed transducer setting

Tank loading curve and level transducer setting

Exit

Bar/sprayer configuration

Pressure transducer configuration

Rpm sensor configuration

Nozzles preselection

Flow meter configuration

Computer Configuration Import/Export

User Nozzles Creation

6.3.1 Pressure transducer setting

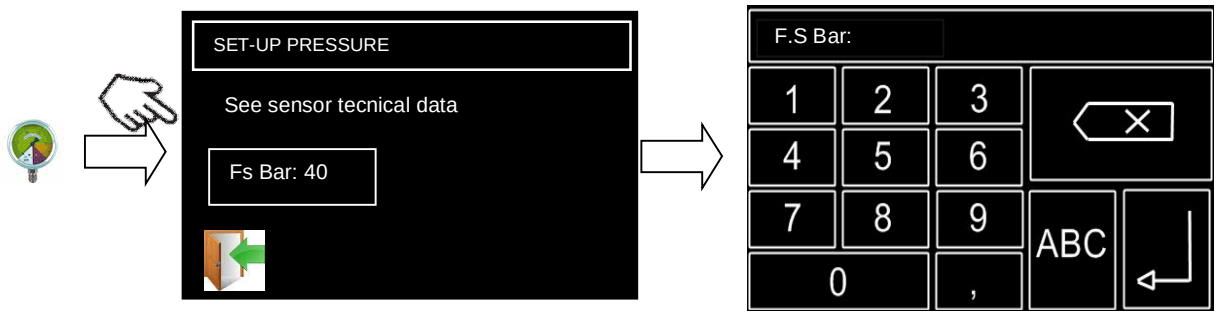


Fig. 44

In this menu it is possible to set the full-scale value of the pressure transducer. Press on the parameter to enable the modification; a window is displayed for entering data in which the new parameter value can be entered. By pressing Enter to confirm the modification is enabled. This value is indicated on the transducer ID plate.

6.3.2 Flow meter Setting

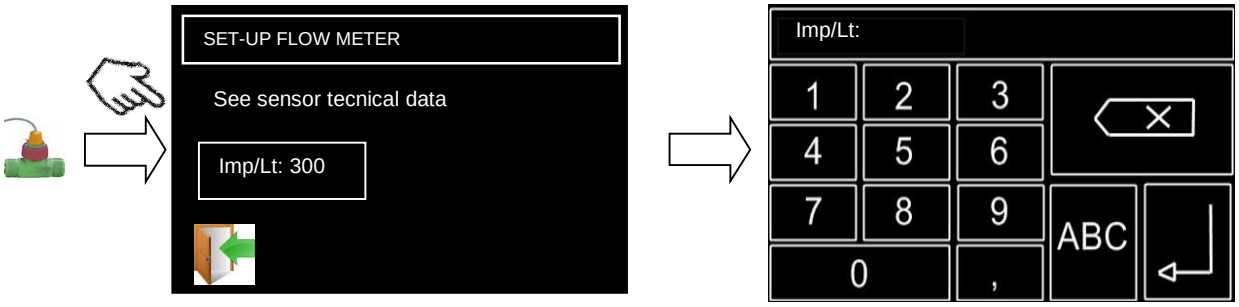


Fig. 45

In this menu it is possible to set the litre pulses value of the flow meter. Press on the parameter to enable the modification; a window is displayed for entering data in which the new parameter value can be entered. By pressing Enter to confirm the modification is enabled. This value is indicated on the transducer ID plate.

6.3.3 Speed transducer setting

The speed transducer is a sensor capable of transmitting a certain number of pulses per metre travelled. Various types of sensors are available for performing this function; the most common one is a proximity sensor which reads a certain number of metallic bodies (e.g. wheel bolts) at each turn. A GPS antenna can also be used provided it is capable of providing a pulse signal as indication of the speed value. As an alternative, a radar sensor fitted on a tractor can be used; in this case, the number of pulses must be set manually on the basis of the information present in the transducer Use and Maintenance Manual.
Starting from firmware version 2.1 a GPS antenna can be used to transmit the signal directly to computer Buono Simply (through serial communication) of the speed value as received by GPS. For the use of GPS speed sensor, refer to paragrapf 6.3.5.

To calculate the driving speed, the system should recognise the number of pulses emitted by the speed sensor for every metre of distance travelled. The number of pulses depends on the wheel circumference and the number of sensors read at reach turn. (*For calculation, see section 8.5*)

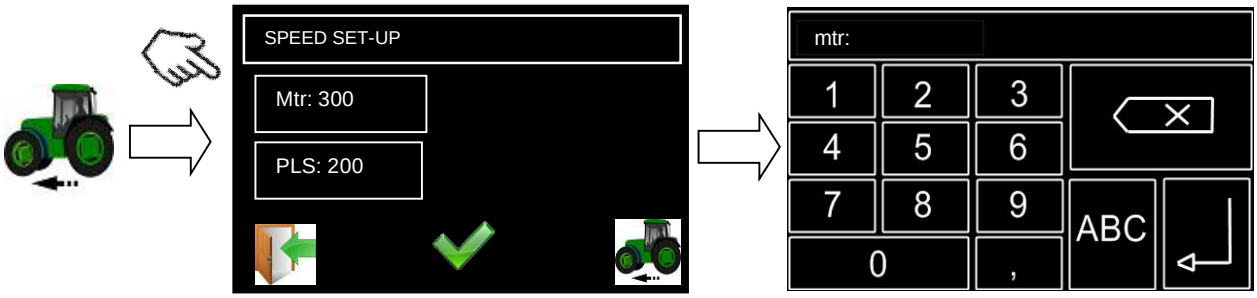


Fig. 46

In this menu it is possible to set the value of the metres in which the number of pulses is known. Press on the parameter to enable the modification; a window is displayed for entering data in which the new parameter value can be entered. By pressing Enter to confirm the modification is enabled.

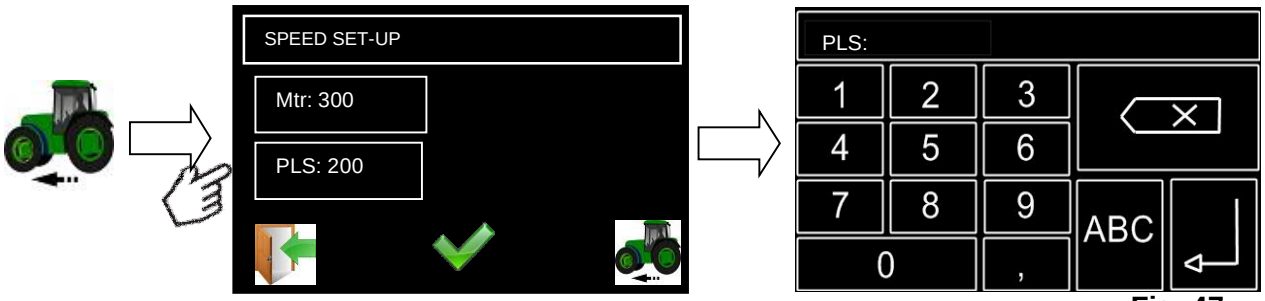


Fig. 47

In this menu it is possible to set the value of the pulses read in the metres indicated earlier. Press on the parameter to enable the modification; a window is displayed for entering data in which the new parameter value can be entered. By pressing Enter to confirm the modification is enabled.

6.3.4 Speed transducer Self Calibration

It is also possible to carry out self calibration of the speed sensor.
For self calibration, enter the value of the metres to be travelled.

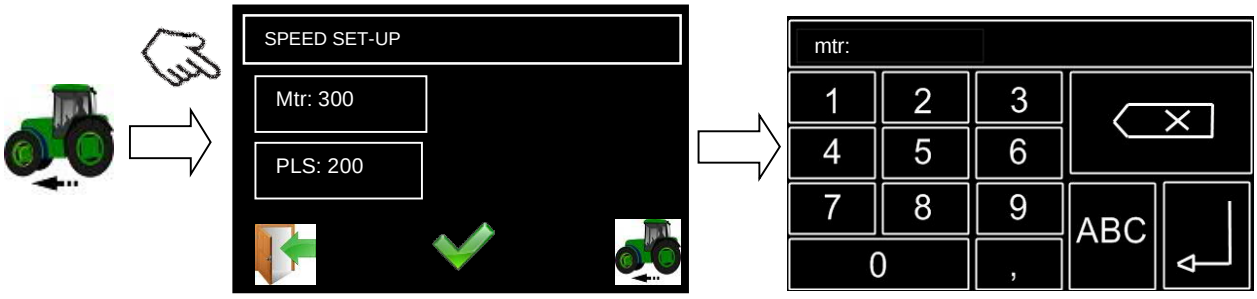


Fig. 48

Then press the key with the tractor symbol; the beginning of the procedure is preceded by an intermittent sound of the buzzer, when the display shows GO!! Proceed with moving the vehicle forwards.

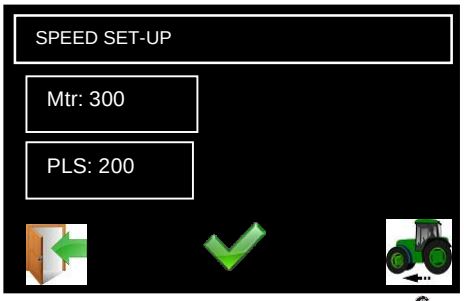


Fig. 49

During advancement the PLS box on the display shows the number of pulses measured. After travelling the distance set for completing the acquisition of the number of pulses, just press any point on the screen. From this moment onwards even if more metres are covered, the number of pulses measured will not increase.

To complete the acquisition and save the data measured, press ✔ .

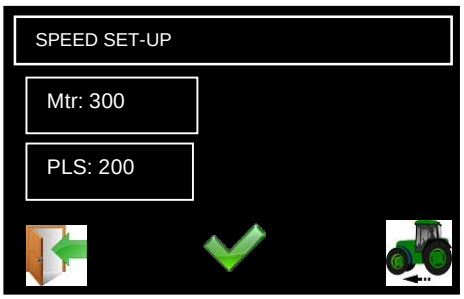
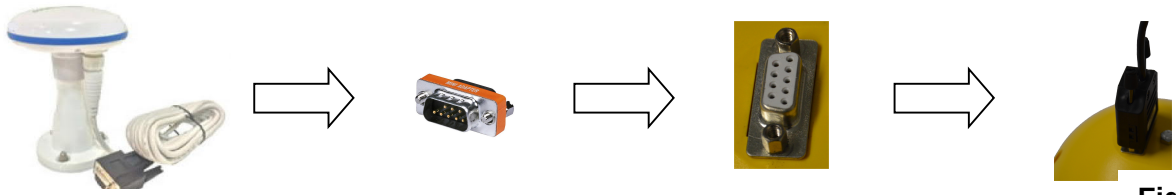


Fig. 50

6.3.5 GPS sensor Speed

To connect the computer to the GPS speed sensor just plug the cable from the sensor in the RS-232 port on the back of the display case (fig.86) by means of a serial adapter DB9 male/male type null-modem.



GPS sensor speed Serial adapter DB9 Serial connector

Fig. 50A

The recognition of the connection and the subsequent activation is automatic. No programming is required. After the two devices will be synchronized, on the Buono display will show "GPS".

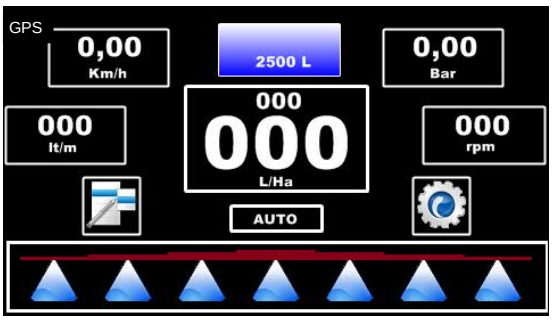


Fig. 50B

6.3.6 Tank parameters setting

To calculate the quantity or level of residual liquid in the tank, a pressure transducer must be used to read the water column present in the tank. The system must recognise the full-scale of the transducer (expressed in bar) and the height of the tank (expressed in metres). **These two data are sufficient to be able to display the percentage of the height of liquid present.**
To know the value of the litres contained in the tank, enter the tank loading curve. The loading curve is divided into 10 percentage points to which it is possible to associate the relative quantity of liquid.

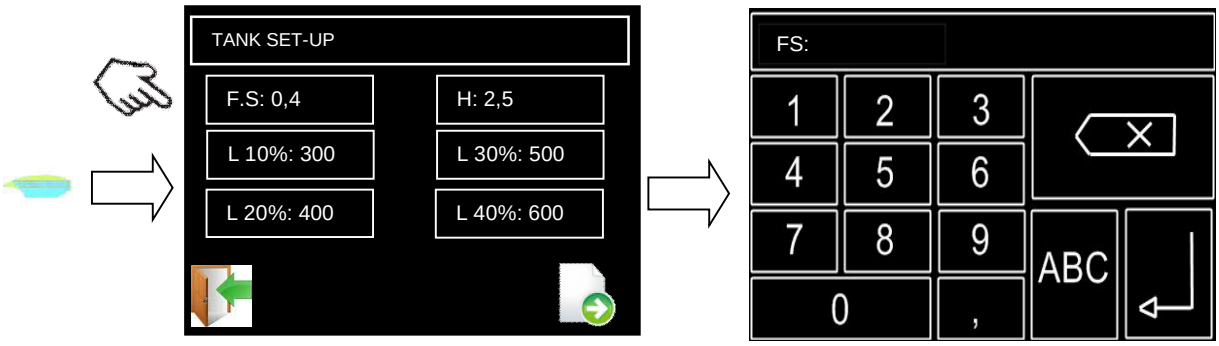


Fig. 51

In this field it is possible to set the full-scale value of the pressure transducer which has the function of detecting the water column present in the tank. Press on the parameter to enable the modification; a window is displayed for entering data in which the new parameter value can be entered. By pressing Enter to confirm the modification is enabled.

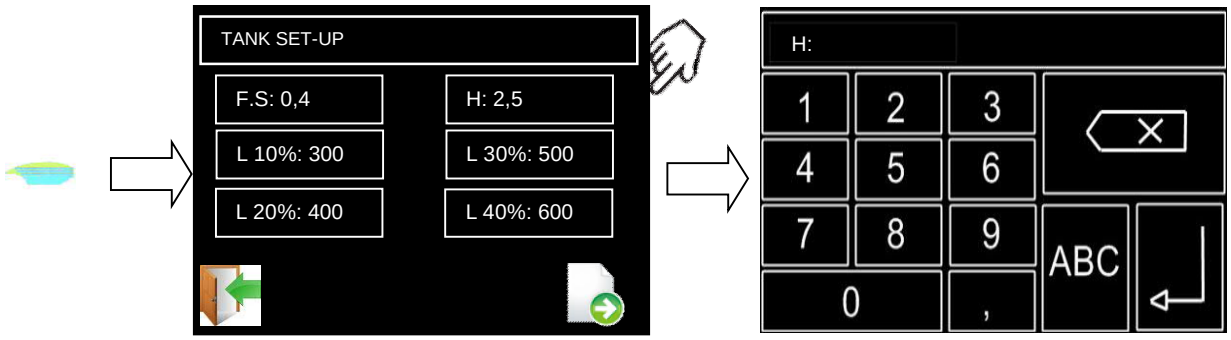


Fig. 52

In this field it is possible to set the value of the tank height (expressed in metres). Press on the parameter to enable the modification; a window is displayed for entering data in which the new parameter value can be entered. By pressing Enter to confirm the modification is enabled.

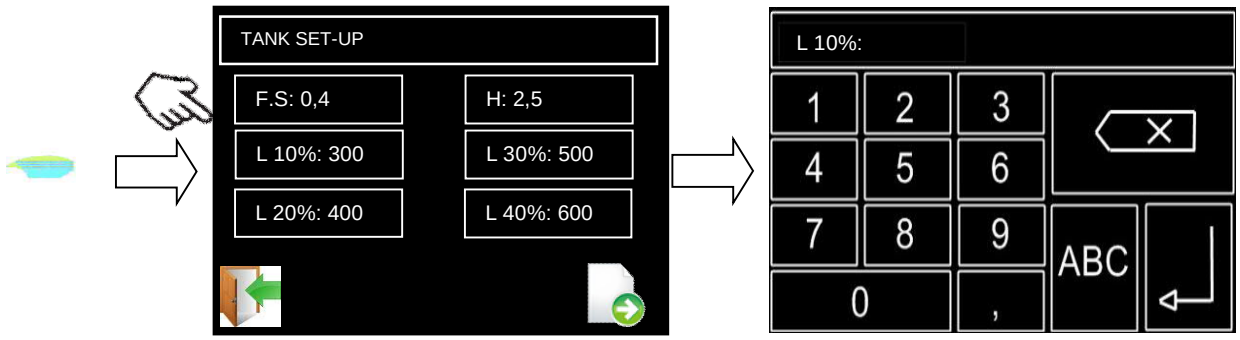


Fig. 53

In the field it is possible to set the quantity of liquid (litres) present in the tank 10% filled. Press on the parameter to enable the modification; a window is displayed for entering data in which the new parameter value can be entered. By pressing Enter to confirm the modification is enabled.

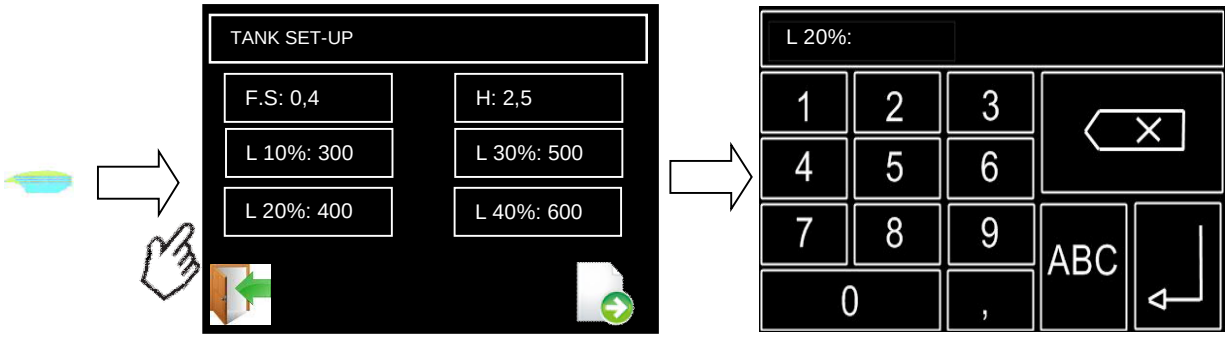


Fig. 54

In this field it is possible to set the quantity of liquid (litres) present in the tank 20% filled. Press on the parameter to enable the modification; a window is displayed for entering data in which the new parameter value can be entered. By pressing Enter to confirm the modification is enabled.
Proceed as described earlier for all the points present in the loading curve.

All the 10 points are not necessary; it is sufficient to enter only the 10% and 100% value, the number of points to be entered in the loading curve depends on the shape of the tank and the accuracy to be provided to the operator.

6.3.7 RPM sensor configuration

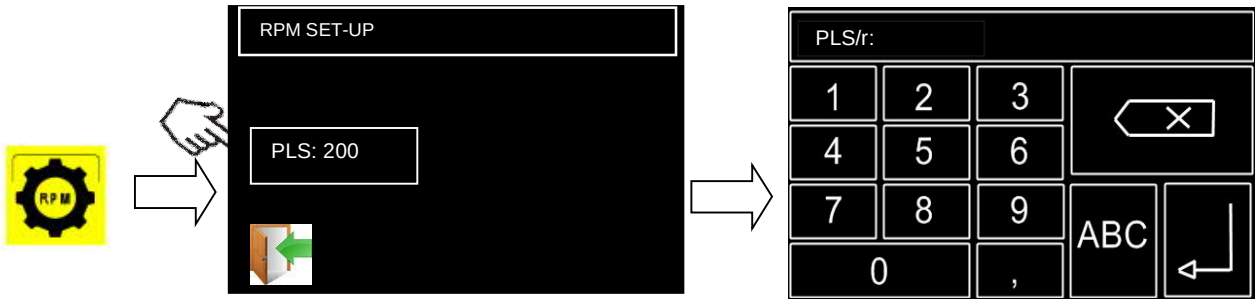


Fig. 55

In this menu it is possible to set the value of the pulses per turn of the PTO (or other rotating components, depending on the position of the sensor) in such a way as to be able to obtain the pump rpm. Press on the parameter to enable the modification; a window is displayed for entering data in which the new parameter value can be entered. By pressing Enter to confirm the modification is enabled.

6.3.8 Bar configuration

To calculate the correct distribution of the dosage it is necessary to know how the sprayer bar is structured: number of sections, dimensions of the sections, distance between the nozzles.

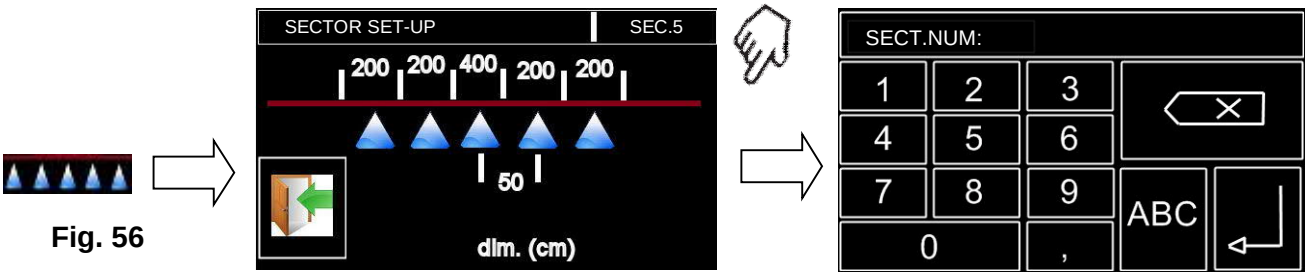


Fig. 56

In this field it is possible to set the value of the number of sections of the bar (MAX 7). Press on the parameter to enable the modification; a window is displayed for entering data in which the new parameter value can be entered. By pressing Enter to confirm the modification is enabled. The modification of this parameter involves enabling/disabling fields concerning the dimensions of the sections.

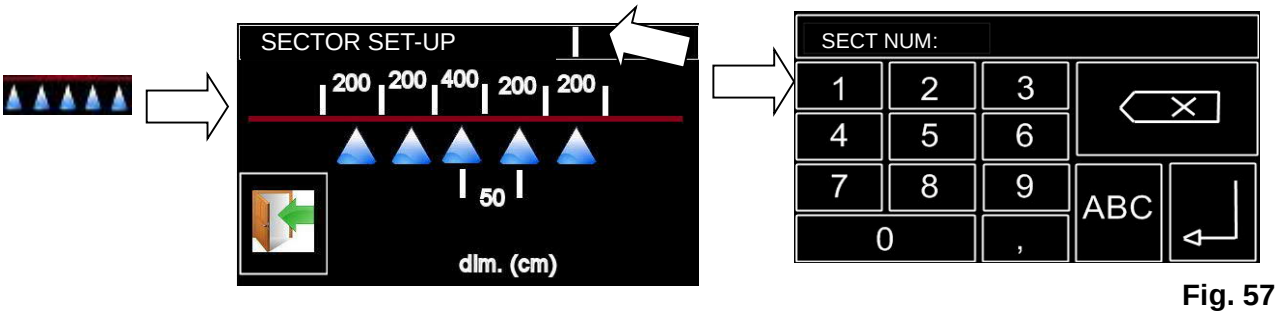


Fig. 57

In this field it is possible to set the value of the distance between the nozzles (expressed in cm). Press on the parameter to enable the modification; a window is displayed for entering data in which the new parameter value can be entered. By pressing Enter to confirm the modification is enabled.

The dimension of each section must be entered from the outermost on one side to the outermost on the other.

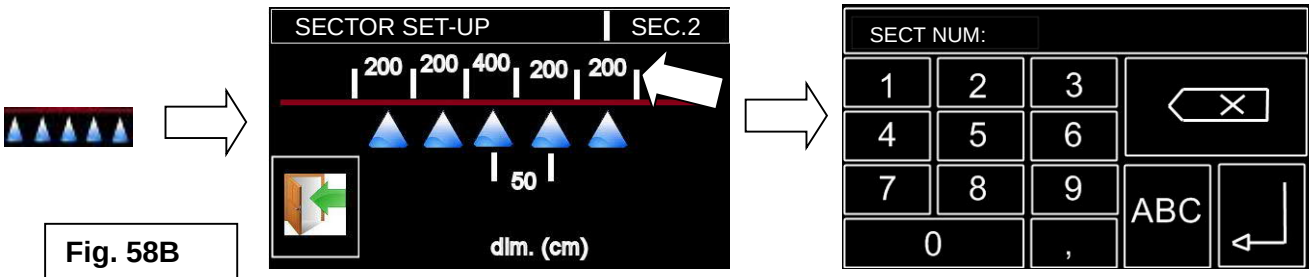


Fig. 58B

Fig. 58

The sizing of the Bar is done simply by quoting the drawing displayed. The dimensions of each section are entered expressed in cm. On pressing the display on the quota to be set a window is displayed for entering the data in which the new parameter value can be entered. By pressing Enter to confirm the modification is enabled.
Proceed as described earlier for all the sections enabled.

6.3.8.a Sprayer configuration

To calculate the correct distribution of the dosage it is necessary to know how the sprayer bar is structured: number of sections, dimensions of the sections, distance between the nozzles.

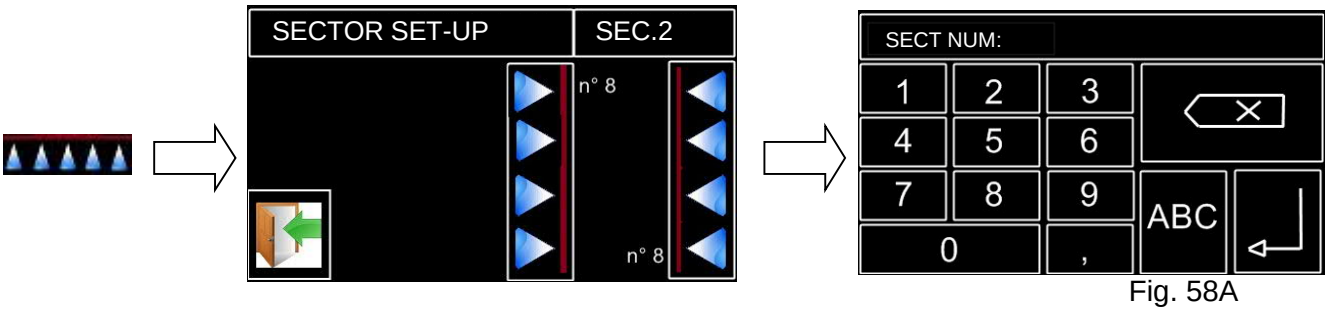
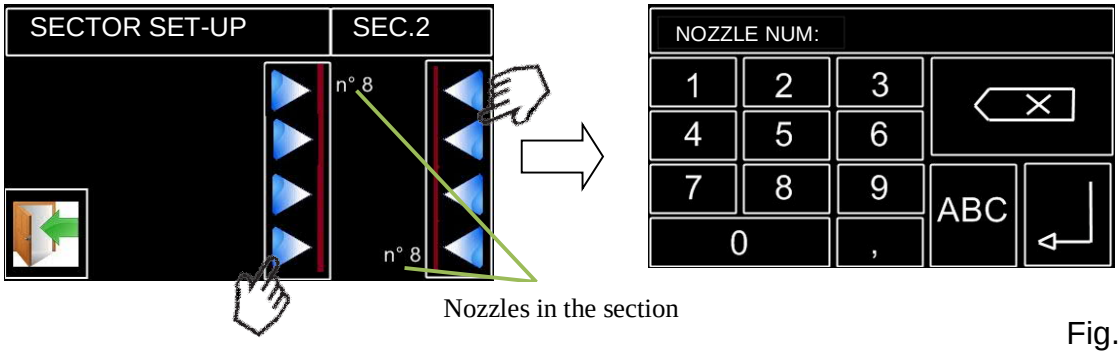


Fig. 58A

In this field it is possible to set the value of the number of sections of the sprayer (2, 3 or 4). Press

on the parameter to enable the modification; a window is displayed for entering data in which the new parameter value can be entered. By pressing Enter to confirm the modification is enabled. The modification of this parameter involves enabling/disabling fields concerning the dimensions of the sections.



Nozzles in the section

Fig. 58B

By pressing the display in correspondence of each section it is possible to set-up the number of corresponding nozzles. By pressing in correspondence of the parameter a screen will appear that will allow to enter the new value. By pressing Enter to confirm the modification is enabled. After having entered the number of nozzles for each section, press the Exit button 

6.3.9 Buono Simply parameters configuration Import/Export

<u>To carry out this procedure use an SD CARD which should be inserted in the housing provided on the LH side of the Buono Simply (SEE DIAGRAM PAGE 9).</u>

In this section of the menu it is possible to export or import the entire configuration of the Buono Simply computer.

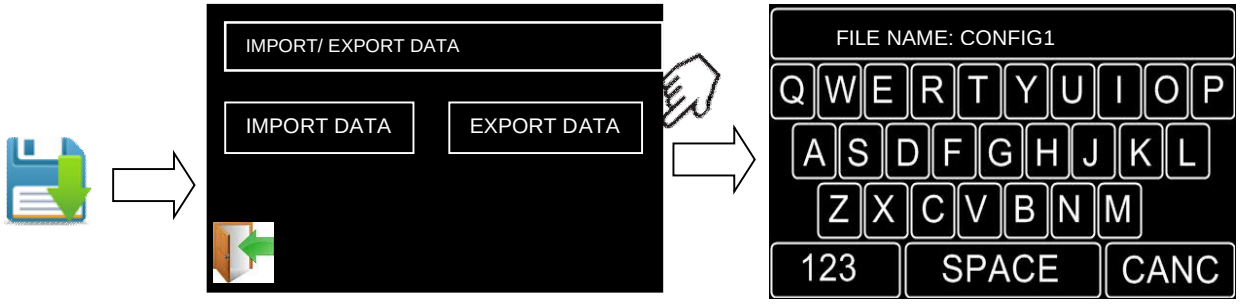


Fig. 59

This proceed may be particularly convenient in case a number of machines have to be prepared simultaneously since, after having configured the first computer it is possible to export the data from the computer just configured and import these to the successive ones thereby avoiding having to enter all the configuration parameters manually.

6.3.9.1 Buono Simply parameters configuration Export

The export procedure starts with pressing the touch screen on the data export field; a screen page is displayed in which to enter the name to be given to the export file. Press Enter, confirming the name entered; the data will be exported on the SD card of the file named after the parameter entered.



At the end of the export phase a report will appear on the display indicating whether or not the parameters have been exported.



Fig. 61

To end the procedure, just press any point on the screen. The file created has the extension .cfg. Do not modify it using the pc.

Considerations on the name to be given to the file:

- the name of the file must have a maximum length of 8 characters
- the name must not have the space character
- It must not contain the extention or type (.cfg) (it will be added automatically)

By following the example shown earlier, enter only the text preceding the.(point) CONFIG1

6.3.9.2 Buono Simply parameters configuration Import

The import procedure starts with pressing the touch screen on the data import field; a screen page is displayed in which the list of configuration files present on the SD card is displayed.

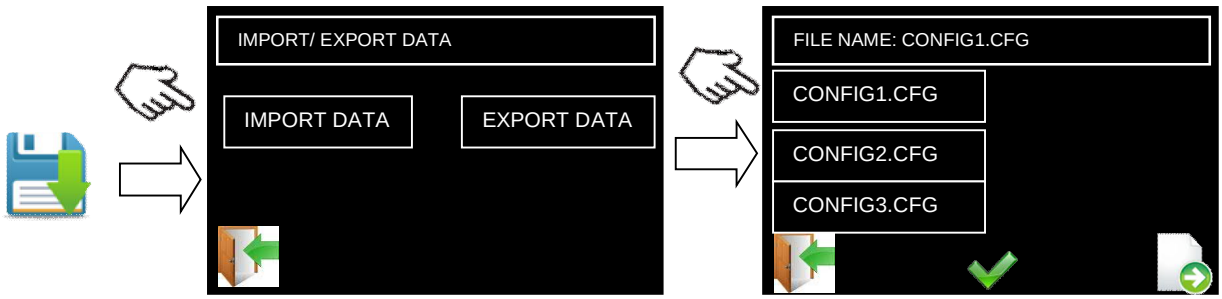


Fig. 62

Press on the name indicating the file to be uploaded; the name to be uploaded will be displayed at the top of the screen.

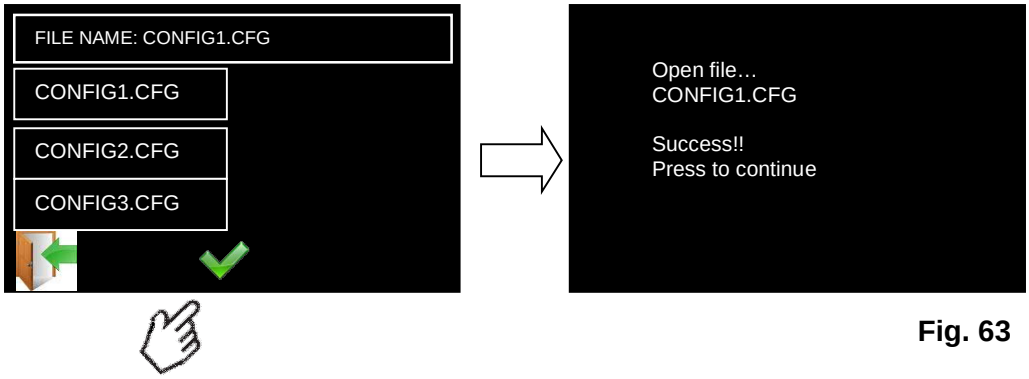


Fig. 63

Press ✔; the data contained in the selected file will be uploaded.
In this case too a summary screen page of the success or failure of the operation will be proposed.

6.3.10 Nozzles Presetting

In this menu it is necessary to preload the nozzles fitted onboard the machine in such a way that the user, during the creation of their dosing programs, only has the nozzles actually present and not a list of items which could disorient the user. It is possible to preload a maximum number of 4 (four) nozzles.

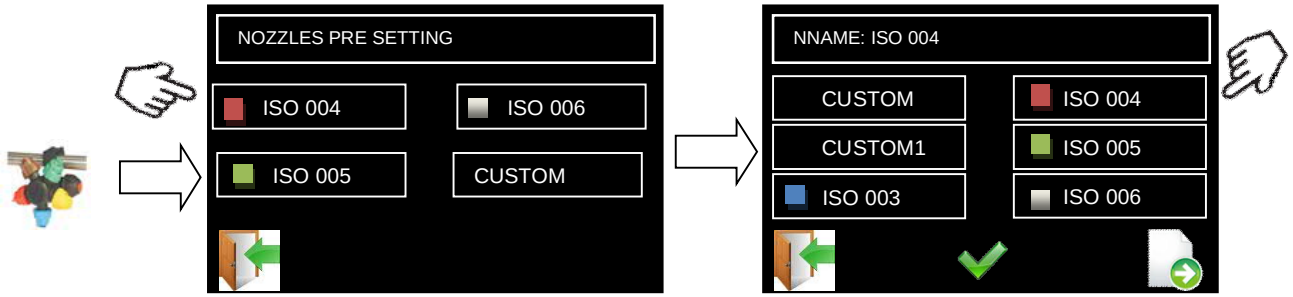


Fig. 64

The assignment of the nozzle to be pre-loaded is done by filling in the 4 areas present in the menu entry screen page. Pressing on each of these areas will display a list of nozzles among which it is possible to select, by pressing on the nozzle selected, then press on ✔ to confirm the selection. Press to exit, return to the previous screen page. At this point it is possible to fill in the remaining three preselection fields.
The “database” from which it is possible to preload the nozze consists of:

- ISO nozzles
- customised nozzles (if entered)

The ISO nozzles present are:
ISO 01, ISO 015, ISO 02, ISO 025, ISO 03, ISO 04, ISO 05, ISO 06, ISO 07, ISO 08, ISO 10, ISO 15

6.3.11 Nozzles setting

In this menu the nozzles database is created; the data entry structure is the same as that given in the technical specifications of the nozzles issued by the manufacturers. It is possible to enter a maximum number of 7 nozzles to which a name with a maximum of 11 characters can be associated. For each nozzle it is possible to enter 6 operating ranges plus any drop type in each range.

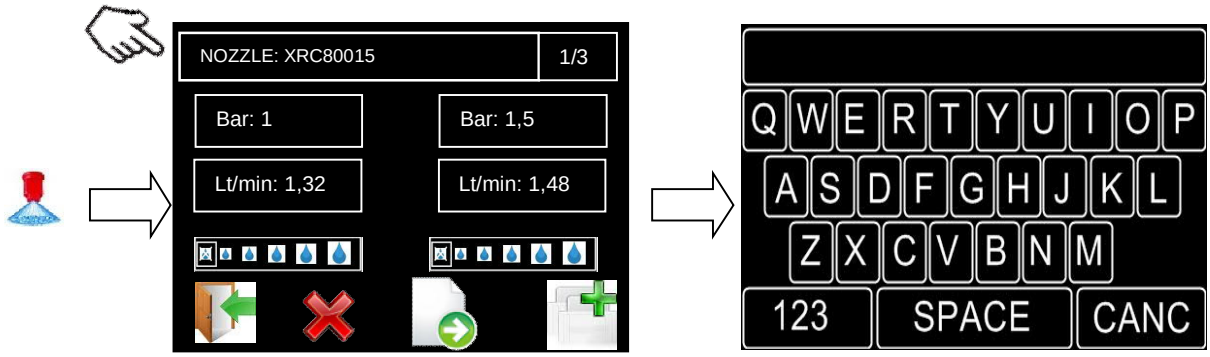


Fig. 65

Press “NOZZLE” on the display: it is possible to assign the name to the nozzle which is being entered (max. 11 characters). Numbers and letters can be entered by means of the data entry keypad. For reasons of space the keypad is divided into two parts, press the ABC and 123 keys to enable the part of letters that are not displayed or the numeric keypad.

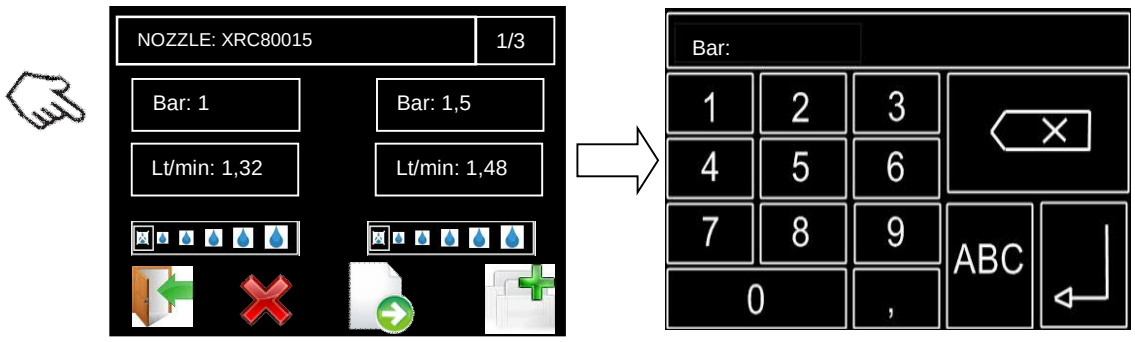


Fig. 66

Press on the Bars parameter on the display and enter the first operating pressure indicated by the manufacturer.

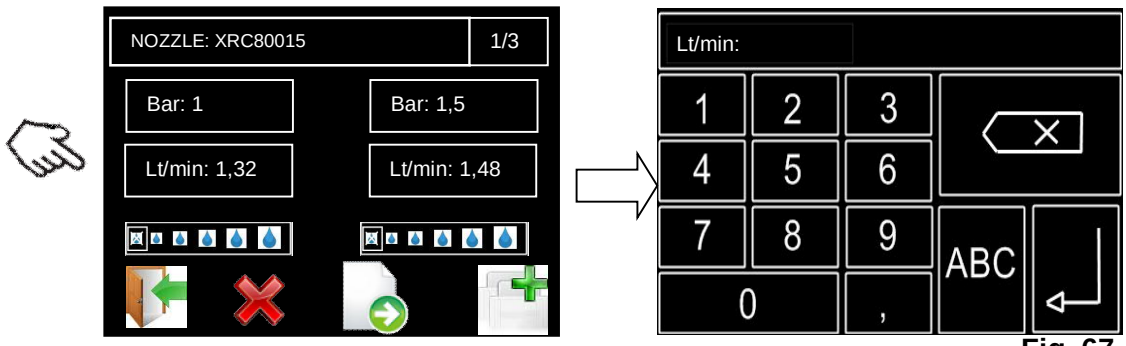


Fig. 67

Press on the BarL/min parameter on the display and enter the flow rate on the first operating pressure indicated by the manufacturer.

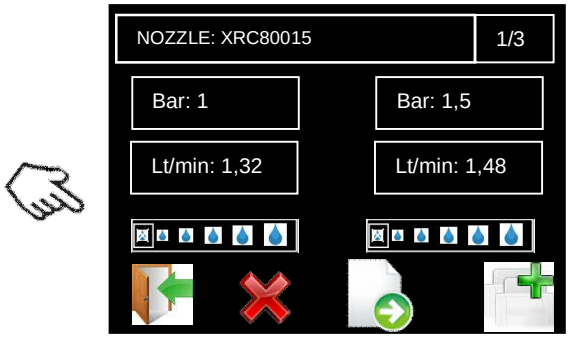


Fig. 68

Press the drop type parameter on the display and enter the dimension of the drop indicated by the manufacturer in the fields entered earlier. The operations described above can successively be repeated for the remaining fields of the screen page. Since it is possible to enter 6 operating ranges and only two are displayed for each screen page, press to enable entry of the successive fields. **It is not obligatory to enter all the 6 operating ranges of the nozzle, just 2 are sufficient.**

If the type of drop is not present or the drop alarm is not to be enabled for this nozzle, just set in all the fields the drop with the symbol. After filling in the fields, to make the parameters effective, press .

It is possible to scroll through and display all the nozzles loaded by means of the key.

6.4 SETTING THE LANGUAGE

In this menu it is possible to set the required language. Just press on the flag indicating the nation for which the language is to be selected.
Then press Exit to return to the higher level of the menu.

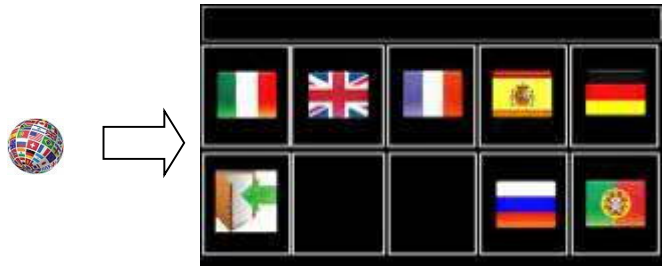


Fig. 69

6.5 USER SETTINGS

In this menu it is possible to select the colours of the display background and texts.
Select the TEXT CL parameter to modify the colour of the texts.

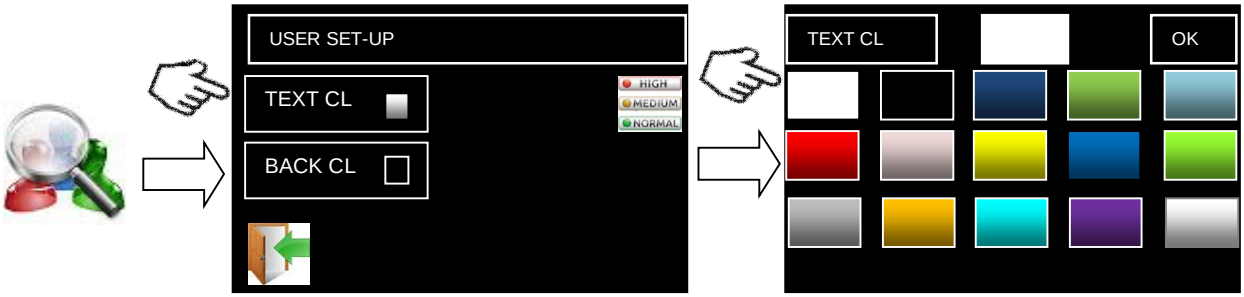


Fig. 70

After selecting the required colour, which appears in the central box on the side of the text in the field to be modified; press OK to enable the selection.
Select the BACK CL parameter to modify the colour of the background.

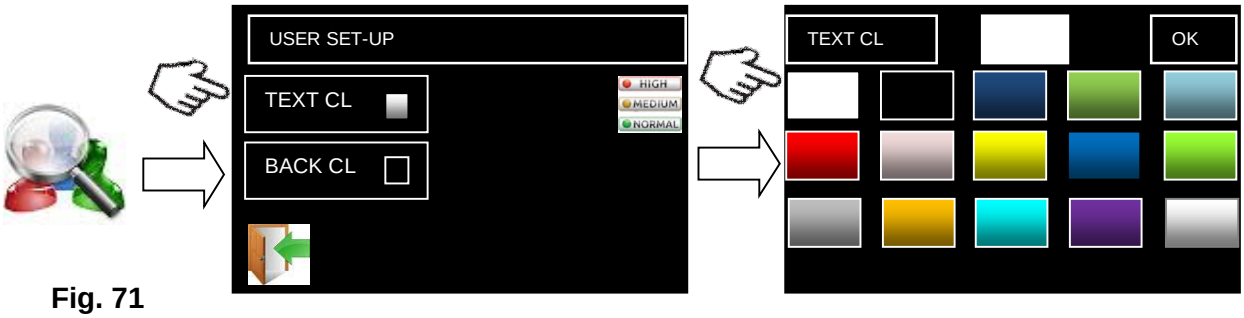


Fig. 71

After selecting the required colour, which appears in the central box on the side of the text in the field to be modified; press OK to enable the selection.

In this section it is possible to also change the user level, pressing the key and positioning the red cursor on the selected level the type of user is changed, making the modifications active on exiting the active menu.

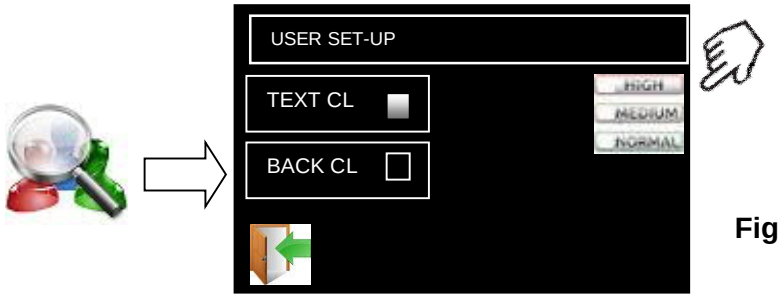
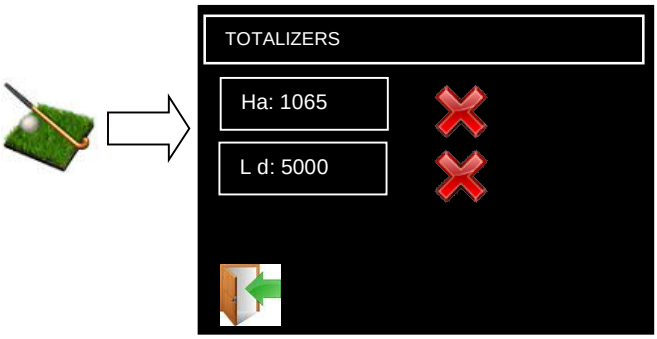


Fig. 72

6.6 TOTALIZERS RESET

This menu displays the liters distributed and hectares treated.



You can clear the values displayed by pressing with the corresponding red **X.**

6.7 PROGRAMS MENU

In this section the dosing program to be used for distributing the product will be configured. It is possible to create up to 5 programs; each program is identified by a number. (e.g. 1/5 , 2/5, etc…)

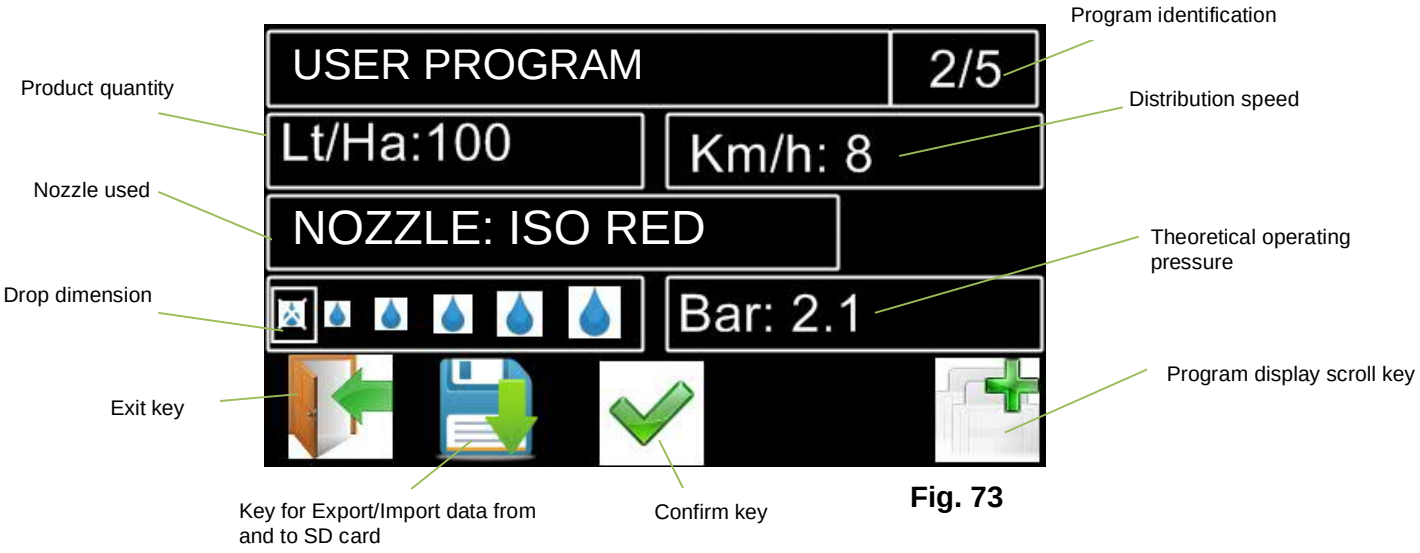
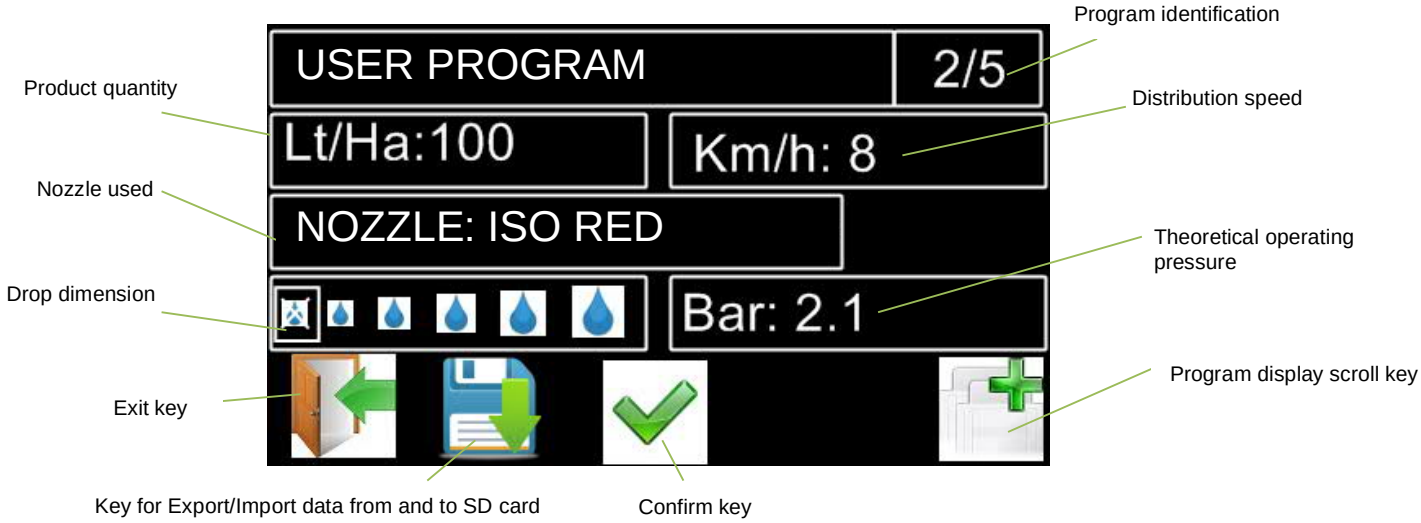


Fig. 73



To load and carry out the treatment program just scroll through the programs using the ✔ key, after having identified the program required press  to exit. The main screen page will display the treatment data regarding the program loaded.

6.7.1 Creation of a new program

Press the display on the key indicated by the  symbol.

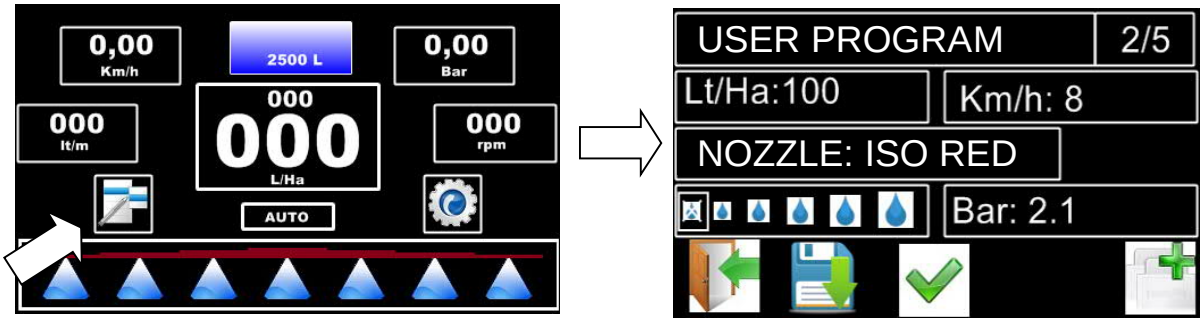


Fig. 74

Scroll through the programs already present up to the last program available, if 5 programs have already been created, an existing one must be modified.

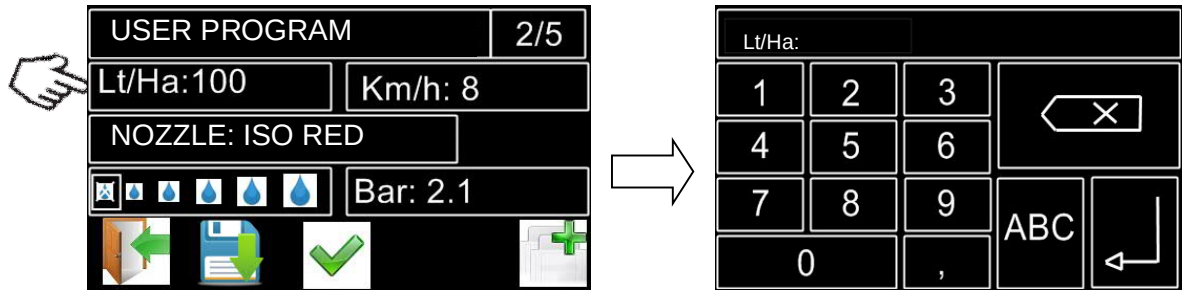


Fig. 75

In this field it is possible to set the value of the litres per hectare to be delivered. Press on the parameter to enable the modification; a window is displayed for entering data in which the new parameter value can be entered. By pressing Enter to confirm the modification is enabled.

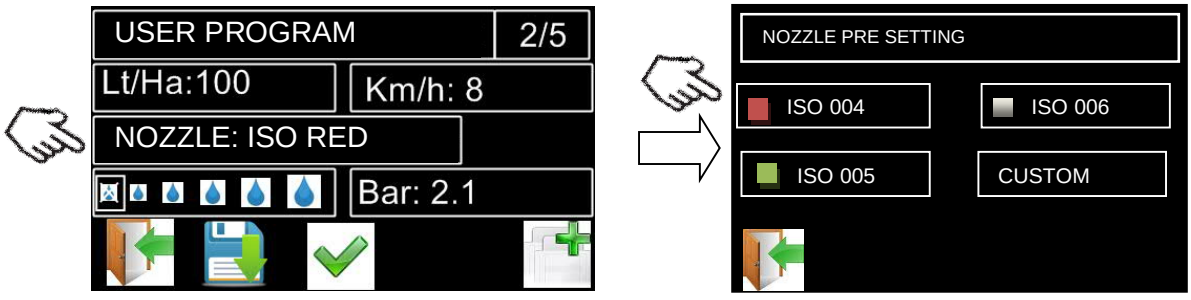


Fig. 76

In this field it is possible to set the nozzle that is to be used in the treatment. The nozzle to be loaded is selected from among those pre-programmed. Press on the parameter to enable the modification; a window is displayed for entering data in which the new nozzle to be used can be selected. By pressing Exit to confirm the modification is enabled.



Fig. 77

In this field the drop alarm signalling can be enabled or disable depending on the required dimension. By pressing on the parameter the modification is enabled.
If the nozzle selected does not have the drop dimension in the database, the sign ? appears on the nozzle loaded. During data entry, the working of the program is simulated, started from l/ha, km/h and type of nozzle, the theoretical operating pressure and the relative drop dimension is calculated.
If the drop dimension set is not identical to that calculated in simulation, in place of symbol ?, a > or < symbol is displayed so that the operator can increase or decrease the drop dimension.
In this field it is possible to set the value of the simulation speed or the speed that is expected to be maintained during the treatment. The default value proposed is that saved as simulation speed in the user menu. **The variarions of this parameter automatically modify the simulation speed if the program created is confirmed.**

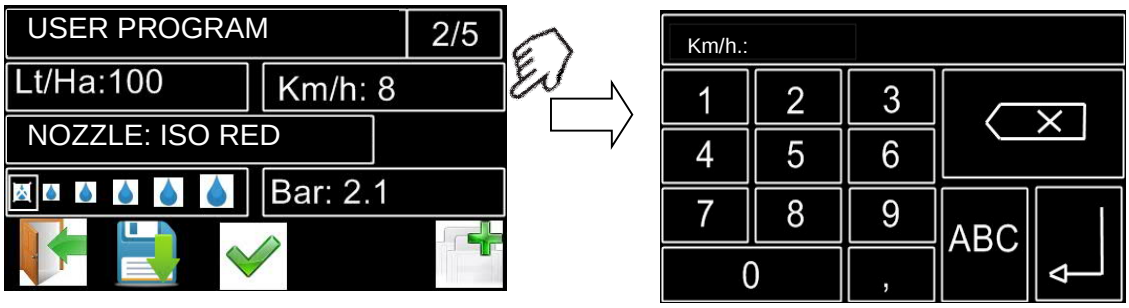
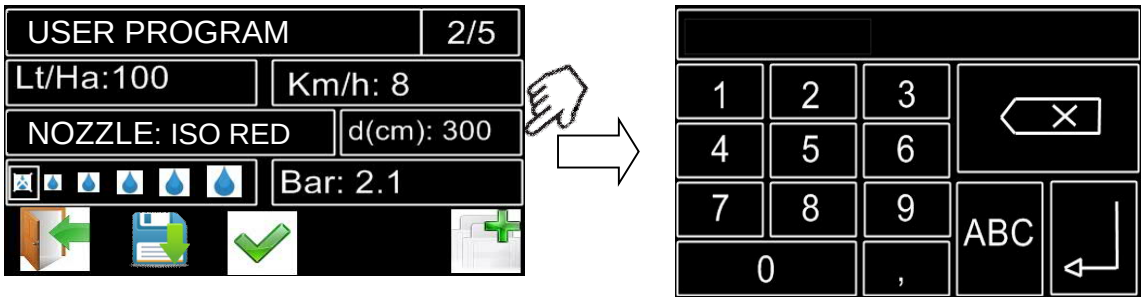


Fig. 78

Press on the parameter to enable the modification; a window is displayed for entering data in which the new parameter value can be entered. By pressing Enter to confirm the modification is enabled.
On the basis of the data entered so far, the simulation is done in automatic mode, indicating the theoretical operating pressure.
(Valid for sprayer only)
Besides the data previously entered, in the sprayer dosing program a further field has to be added: the distance between a row and another to be treated.



After entering all the data to make the program effective, press ✔. If the confirm button is not pressed, the program is not saved and will be lost. A program entry confirmation key has been inserted so that the operator is free to carry out all the necessary simulations.

6.7.2 Buono Simply treatment programs Import/Export

To carry out this procedure use an SD CARD which should be inserted in the housing provided on the LH side of the Buono Simply (SEE DIAGRAM PAGE 9).

In this section of the menu it is possible to export or import the dosing programs of the Buono Simply computer.



Fig. 79

This information may be useful for creating an archive of products distributed.
The information extrapolated is as follows:

- Chemical product distributed
- Name of the field treated
- Work start date and time
- Work end date and time
- Dosage
- Theoretical operating pressure
- Nozzle name
- Treatment speed set
- Treated Ha
- Distributed l/ha

Selection of the program to be exported or replaced if necessary in case of import from the SD card is done in the dosing programs entry page (Fig. 71), by pressing to select the program on which to act.

6.7.2.1 Buono Simply parameters Configuration Export

The export start procedure starts with pressing the touch screen in the data export field; a page is displayed for entering the name of the chemical product distributed, the name of the field treated, the work start date and time, the work end date and time and the name of the file with which the information is to be saved. Press , confirming the parameters entered; the data will be exported on the SD card of the file named after the parameter entered.

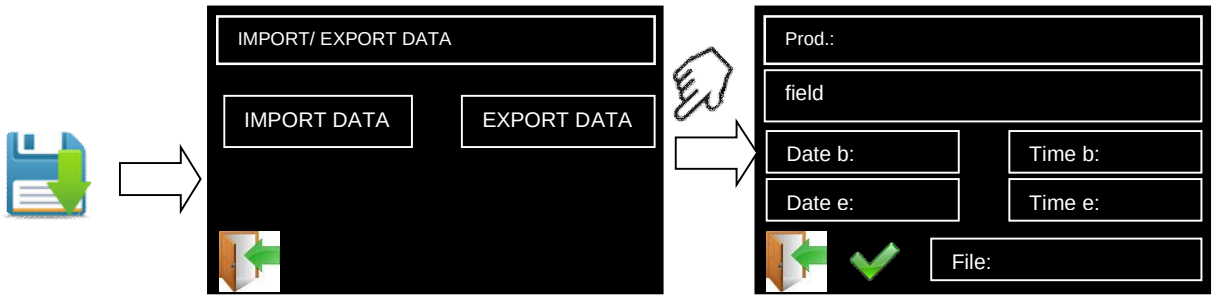


Fig. 80

At the end of the export phase a report will be displayed indicating whether or not the parameters have been exported.



Fig. 81

To end the procedure, just press any point on the screen.
The file created is a text file which can be displayed on the computer with any editor.
Considerations on the name to be given to the file:

- the name of the file must have a maximum length of 8 characters
- the name must not have the space character
- it must not contain the extension or type (.txt) (it will be added automatically)

Follow the example shown earlier and enter only the text preceding the.(point) CLIENTE1
Date time format (dd/mm/yy oo:mm)

6.7.2.2 Buono Simply parameters Configuration Import

The import procedure starts by pressing the touch screen on the data import field; a screen page is displayed in which the list of configuration files present on the SD card is displayed.

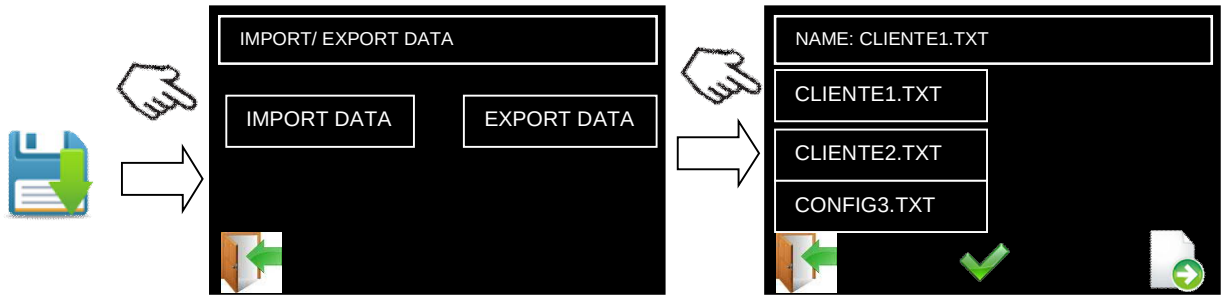


Fig. 82

Press on the name indicating the file to be uploaded; the name to be uploaded will be displayed at the top of the screen.

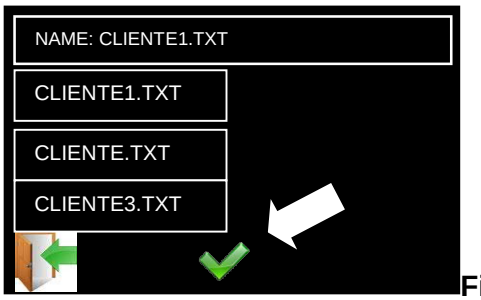


Fig. 83

Press ✔; the data contained in the file selected will be uploaded and a summary page will be displayed showing all the data of the program uploaded.



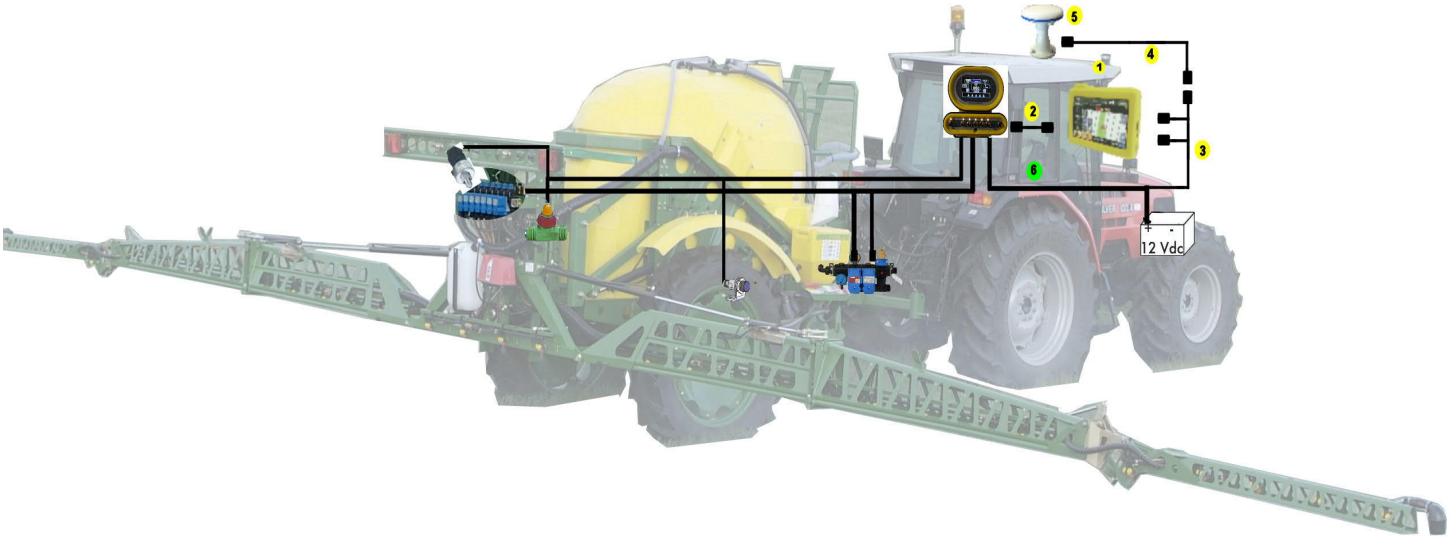
Fig. 84

<u>Press ✔; the data will be saved and the program opened earlier will be replaced.</u>

If ✖ is pressed there will be no replacement of pre-existing programs.

7 AUTOPLUS GPS CONNECTION

7.1. Wiring diagram



POS.	DESCRIPTION
1	Autoplus Control Panel
2	Serial communication cable
3	Autoplus power cable
4	Antenna cable
5	GPS Antenna
6	Buono Computer power cable

7.2. Electrical connection

To connect your computer to Autoplus, just plug on the Autoplus side the cable on the usb port of the GPS (Fig.85) and on the computer side the communication cable into the RS-232 port on the back of the display case (fig.86).
The Autoplus must be powered using the provided cable.

Fig. 85



Fig. 86



The recognition of the connection and the subsequent activation is automatic. **No programming is required**. After the two devices will be synchronized, on the Buono display will show "GPS".



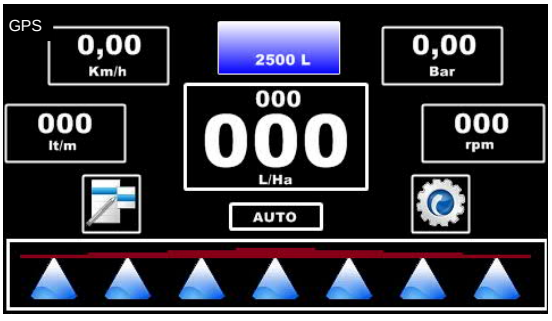


Fig. 87

The setups to be executed on Autoplus must be consistent with those made on Buono Simply computer. both devices have to be programmed (for programming the Autoplus refer to the relevant manual).

7.3. Operation description

The Autoplus, via RS232 communication, sends to the computer the information relating to the speed of treatment, and it controls, automatically, the opening and closing of the various sections in the event of overlap.
The Autoplus works if the switches of Buono (on / off sections switches) are in the ON position.

NOTE:
The use of the Autoplus, or of a GPS, ensures that the Buono does not require installation of the speed sensor.
The eventual installation of the speed sensor does not create any interference with the signal received from the GPS, because, until there will be communication between GPS and computer, the speed indication will be detected by GPS.
If there were no communication between computer and GPS, Buono would use, as source of the speed signal, the sensor installed on the wheel.

8. TROUBLESHOOTING

1) **All the checks on the operating unit board must be done by specialist personnel!**

POSSIBLE PROBLEM	CHECK
Wheel sensor, and the flow rate sensor not working	- Does the computer receive a 12V power supply? 1) - The sensor LED is ON? (not available for flow rate sensors) - Does the sensor work during the test? - Are all the wires connected correctly?
The pressure sensor is not working	- Does the computer receive a 12V power supply? 1) - Is the pressure sensor supplied with ≥ 12V? - Are all the wires connected correctly?
Driving speed display incorrect	- Does the sensor work? Has it been set up correctly? - Have the wheel and radar been set up correctly? - Has the calibration been done correctly? - Does the simulated speed system work?
Flow rate display incorrect	- Does the sensor work? - Has the calibration been done correctly?
Pressure display incorrect	- Does the sensor work? - Has the calibration been done correctly?
The sections do not open	- Are all the cables connected correctly? - Is the operating unit switch set at “ON”? - Is the main valve switch set at “ON”? - Is the section LED ON? - Is the power supply of the system ≥ 12V?
Malfunctioning of the flow rate regulation	- Does the speed sensor work correctly? - Do the flow rate and pressure sensors work correctly?? - Have the Flow rate and Pressures been programmed correctly? - Does the simulated speed system work? - Does the pressure regulator work correctly? - Are all the set-ups correct? - Have all the calibration processes been carried out correctly? - Are the connections correct?
Difference between nominal datum and effective flow rate datum	- Does the pressure regulator work without problems? - Does the flow rate sensor work without problems?

1) **All checks on the device board must be carried out by specialised staff**

9. USEFUL INFORMATION

9.1 TECHNICAL SPECIFICATIONS

Supply voltage	10 ÷ 16 Vdc
Maximum power absorbed	max 200 mA at 12 Vdc (outputs excluded)
Working Temperature	- 10 °C /+70 °C
Weather conditions	Relative humidity 80%
Transport and stock	
Temperature	-25 °C /+75 °C
Weight	1300 g.
Dimensions (WxHxD)	160 x 220 x 80 mm
Standards	
Protection class	IP 54
EMC	In accordance with Directive 2004/108/EC and ISO 14982
Display	TFT 4,3” Colorsi; Resolution 480x272 pixels
Procesor	32 bit STM32F103 64MHz
Boot	via SD card
Inlets	2 inlets 4-20mA 4 digital inlets
Outlets	1 RS-232 1 Can bus 9 outlets via Relè
Memories	Slot SD Card

9.1.1 Speed sensor

Supply voltage	5 to 13 VDC
Output signal	NAMUR
Max. operating frequency	1000 Hz
Operating temperature	- 25 °C/+70 °C
Max. activation distance	5 mm
Protection degree	IP 67

9.1.2 Flow meter sensor

Supply voltage	9 to 24 VDC
Output signal	Open collector (square wave)
STANDARD operating field	10 - 100 l/min
TURBO operating field	10 - 100 l/min
“STANDARD” number of pulses/litre	68
“TURBO” number of pulses/litre	647
Operating temperature	0 °C /+60 °C
Maximum operating pressure	40 bar
Protection degree	IP 67

9.1.3 Pressure sensor

Supply voltage	8 to 28 VDC
Output signal	4-20 mA
Operating temperature	-15 °C /+80 °C
Maximum operating pressure	15 bar
Protection degree	IP 65

9.2 WARNINGS

- The section of the power cable to the computer should not be less than 2.5 mm^2 and must be connected directly to the battery or to a socket that can withstand a minimum power input of 10 A.
- **Connection to normal cigarette lighter sockets should be strictly avoided.**
- Pay special attention to the status of the battery charge and to the correct working of the alternator; flat battery or worn alternator accentuate the positive or negative voltage peaks, which can damage the internal electronic circuits.
- During the assembly and every subsequent check, it is advisable to apply a moderate amount of dielectric silicone grease on the wire terminals to prevent rusting or false contacts.

All Bertolini valves are designed for operating with a rated voltage of 12 V in continuous current (12VDC), i.e. with the normal battery present on the most common agricultural machinery. Their regular operating field ranges from 10 V to 14.5 V; outside this range there may be operating problems or damage to the internal electronic circuit.

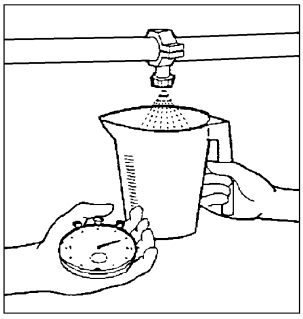
- Always disconnect the battery cables while the battery is being charged.
- Do not carry out electric welding with the power supply wires connected; make sure these (+ and –) are disconnected so as not to favour uncontrollable voltage peaks.
- For correct delivery during treatment and for better reliability of the data provided by the computer, check the nozzles for wear during each treatment. If two or more nozzles are worn, replace all the nozzles.

Frequencies higher than: carrier 80 MHz – amplitude 30 V/m – modulation AM – 80% - 1 kHz, may cause malfunctions and/or distribution errors of the computer and/or of the equipment connected to it)

9.3 CALCULATING THE FLOW RATE OF THE NOZZLES

Following normal wear of the nozzles, it is necessary to check the flow rates and therefore the performance of the nozzles periodically, as follows:

Bring the system to operating conditions.
Measure the flow rate (Q – litres delivered per minute) of a nozzle using a graduated container. Compare the values measured with the corresponding values shown in the Tables provided by the manufacturer of the nozzles used.



To check the litres delivered per hectare (l/ha) enter the data in the following formula:

$$\mathbf{LHa} = \frac{600 \times Q}{I \times V}$$

Where:

Lh = applied volume (l/ha)
I = Interspace between the nozzles (m)
Q = flow rate of nozzle (l/min)
V = advancement speed (km/h)

9.4 CALCULATING THE FLOW RATE OF THE PUMP CORRECTLY

1. Flow rate of the bar:



$$D = \frac{\text{LHa x V (km/h) x L (m)}}{600}$$

Where:
D = Flow rate of the bar (l/min)
LHa = Applied volume (l/ha)
V = Treatment speed
L = Operating width (bar)

Q = Litres per hectare

Example: $D = \frac{200 \text{ x } 7 \text{ x } 12}{600} = 28 \text{ l/min}$

2. Flow rate of pump:

Dp = D + Dr+ Da

Dr=Flow rate regulation = 10% min
Da=Agitation flow rate = 5% vol. tanks

Example: Dp = 28 + (28 x 10%) + (600 x 5%)
= 28 + 2,8 + 30
Dp = 60.8 l/min

Note: An excessively high return flow rate in the tanks can lead to foam formation.

9.5 PRACTICAL METHOD FOR CALCULATING THE NUMBER OF PULSES OF THE SPEED SENSOR

If there is no 100 m long rectilinear tract, to calculate parameter “C”, proceed as follows:
Suppose the mechanical means is started upon such a way as to complete a certain number of rotations (in this example, 10 rotations are considered; in any case, the greater the number of rotations considered, the greater the measuring accuracy).
Then measure on the ground the distance travelled from the starting point to the destination point as shown in Fig. 18 (in this case a distance of 40m is supposed to be measured).

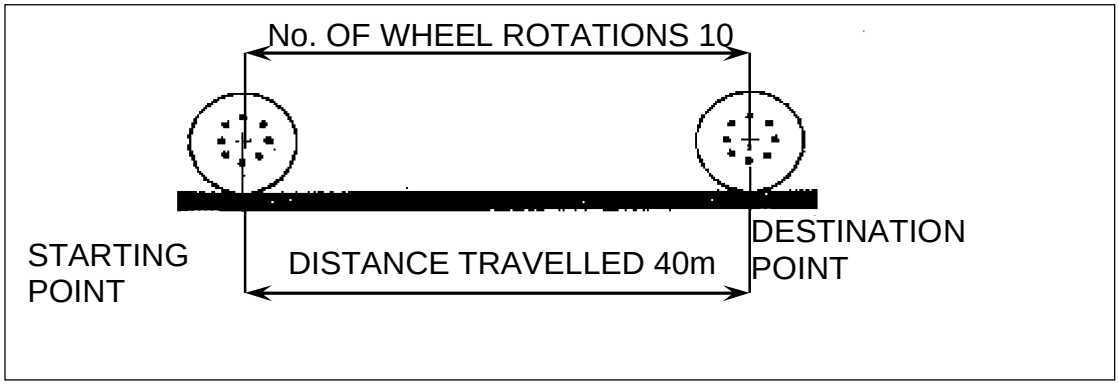


Fig. 18

The wheel circumference is obtained by dividing the distance travelled by the number of rotations of the wheel.
Therefore:

$$C = \frac{40 \text{ metres}}{10 \text{ rotations}} = 4 \text{ metres } (400 \text{ Cm})$$

The number to be programmed in the “wheel circumference” constant will be equal to the wheel circumference expressed in cm divided by the number of references (bolts), in this example, 8.

$$Cost. = \frac{400 \text{ Cm}}{8 \text{ ref.}} = 50\text{Cm (number to be programmed in the "wheel circumference" constant)}$$

9.6 MEMORANDUM OF LOTS PROGRAMMED

Lot No.	Lot name	Date saved in memory	Notes
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			

Manufacturer: IDROMECCANICA BERTOLINI S.p.A.
Address: Via Cafiero 20
42124 REGGIO EMILIA – ITALY
Tel. +39 0522 306641 Fax +39 0522 306648
E-mail: email@bertolinipumps.com
Internet: www.bertolinipumps.com