ESD ISOBUS system
Electronic Seed Driver

MONITORING SYSTEM
FOR PRECISION SEED DRILLS

CE

NO. 1811-ESD
OEM-EN
REV. 2

INSTRUCTIONS FOR USE

O.E.M. VERSION (MANUFACTURERS)

EN

CE

This product meets the EMC standards as determined in the 2004/108/EC directive and subsequent amendments and reference to the applied EN ISO 14982 standard

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MC Elettronica S.r.l. *is not obliged to give notice of any further modifications of the product.*

The information given in this manual does not allow unauthorised personnel to tamper with the product in any way.
The warranty on the equipment will no longer be valid if tampering should be detected.

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1. Rules and general warnings

1.1 Introduction

This instruction manual provides all specific information needed to know and correctly use the equipment.
After buying the product, read the manual carefully and refer to it any time you have doubts on how to use the equipment or when you have to carry out maintenance operations.
Keep the manual on the machine. If this is not possible, keep it ready at hand.

ALL RIGHTS RESERVED. THIS MANUAL IS INTENDED FOR CUSTOMERS ONLY. ANY OTHER USE IS FORBIDDEN.

1.2 Terms of the warranty

- SUBJECT OF THE WARRANTY: the warranty is applied to the product and to those parts which are marked with the serial number or any other identification number used by *MC Elettronica*;
- DURATION OF THE WARRANTY: *MC Elettronica* guarantees the *ESD ISOBUS SYSTEM* and its accessories for a period of **1 year** from the date of manufacture (printed on the identification label on the back of the product).

  The warranty covers the product and any repairs carried out within the agreed terms.

  This warranty does not apply in the event of:
  - accidental damage;
  - improper use;
  - changes which have not been agreed upon, improper installation (or set-up);
  - damage caused when an equipment not manufactured by *MC Elettronica*, which is mechanically or electrically connected to our instruments, breaks or does not function properly;
  - force majeure events (lightning, floods, fire or other causes which do not depend on *MC Elettronica*).

  Repairs under warranty, which must be carried out in the laboratories of our authorised centres, are entirely free of charge provided the equipment is directly transported to said laboratories or sent carriage free. Transport costs and ensuing risks are entirely borne by the Customer.

  The above-mentioned warranty is valid unless otherwise agreed between *MC Elettronica* and the Customer.

> ***Warning***
> *MC Elettronica* declines any liability for damages or direct or indirect costs caused by improper use or inability of the Customer to use the equipment separately and/or together with other equipment.

1.3 Service

Service is available in all countries where the equipment is officially supplied by *MC Elettronica* (during and after the warranty period).

Any kind of operation to be performed on the *ESD ISOBUS SYSTEM* must be carried out in accordance with the instructions provided in this manual or as agreed with *MC Elettronica*.

If not, the relative terms of the warranty might become null and void.

2. General description

The ESD ISOBUS SYSTEM is a system designed for application on pneumatic precision seed drills, the main functions of which are:

- Check of the sowing distance and population for each row (max 48 rows); the data for sowing distance and population is represented in numeric format (value) and in analogue format (histograms)
- Check of the presence of granular fertiliser (check ON/OFF) for each row (max 48 rows)
- Audible and visual alarms in the event of sowing that does not comply or the absence of fertiliser
- Calculation of the processed area; a total counter and up to 9 partial counters are available.
- Linear distance travelled.
- Yield (ha/h)
- ESD module control for automated seeding disc control.

There are also other functions available such as:

- Display of RPM fan and visual and audible alarms (RPM_{max} and RPM_{min} programmable)
- Display of the quantity of localised herbicide and audible and visual alarms (Δl/ha programmable)
- Display for displaying analogue video signal (PAL) of 1 camera (not supplied);

Furthermore, the ESD ISOBUS SYSTEM is equipped with other inlets that can be used for other applications and another analogue video input (PAL) that can be configured on request: contact MC Elettronica's Technical Department for further details.
The connection architecture of the ESD ISOBUS SYSTEM is of modular and self-configuring type; up to a maximum of 48 seed sensors + 48 fertiliser seed sensors (a total of 96 inputs), to which 16 additional inputs for other sensors are added (feed-rate, area counter override, localised herbicide flowmeter, etc.).
Each seeding ECU can handle 24 seed sensor inputs (24 seed or 24 fertiliser or 12 seed + 12 fertiliser); a connector configuration has been provided for to connect its relative accessory. Each seeding ECU can be connected indifferently to each wiring harness and the SYSTEM will automatically recognise the configuration. The diagram on the next page shows the main configurations (for different configurations, contact Elettronica's Technical Department)

3. System installation

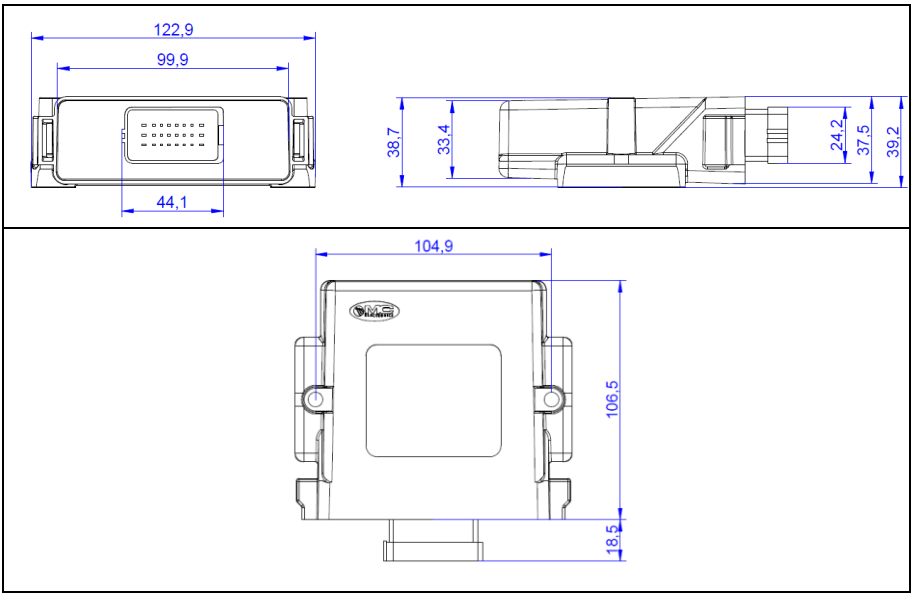


Figure 1 - ECU Isobus dimensions 00CEN-0005

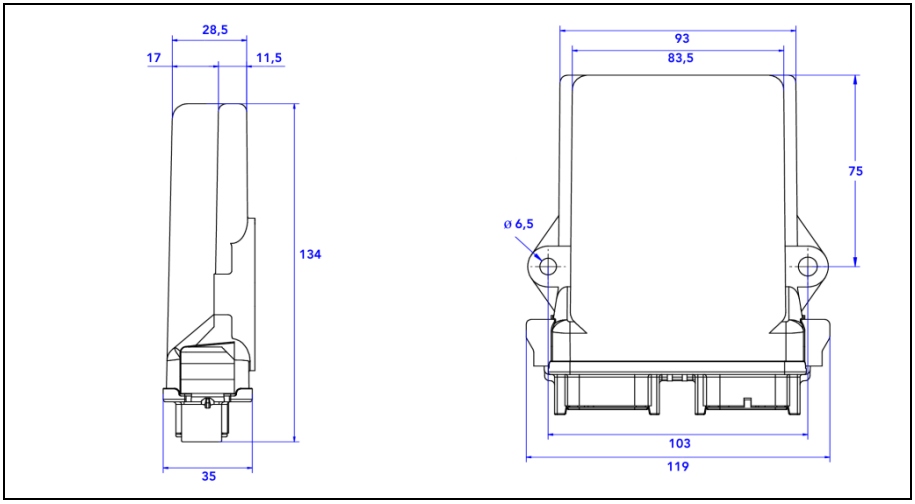


Figure 2 - ECU Gateway dimensions code 10CEN-004

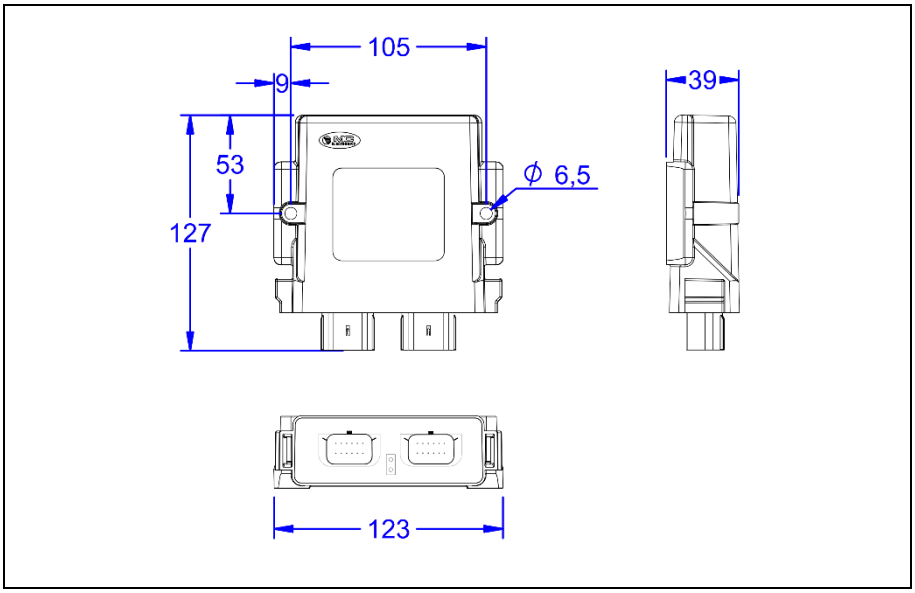


Figure 3 - Seeding ECU dimensions code 10CEN-0019

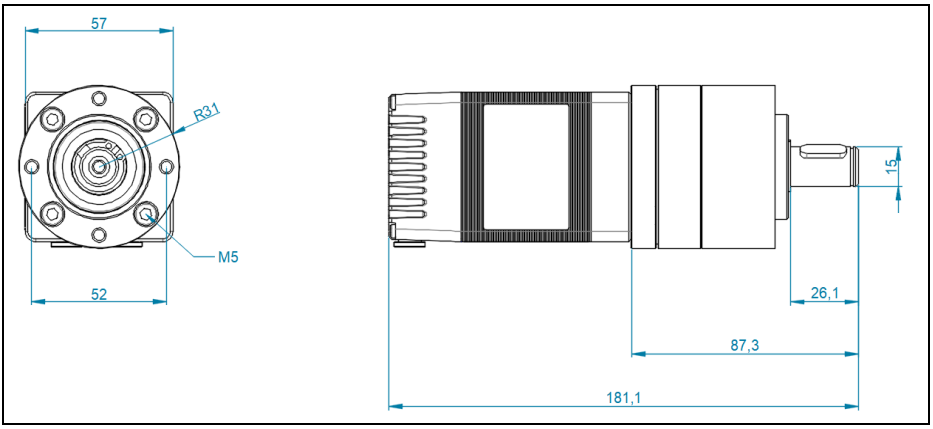


Figure 4 - ESD module code 10MTR-0001

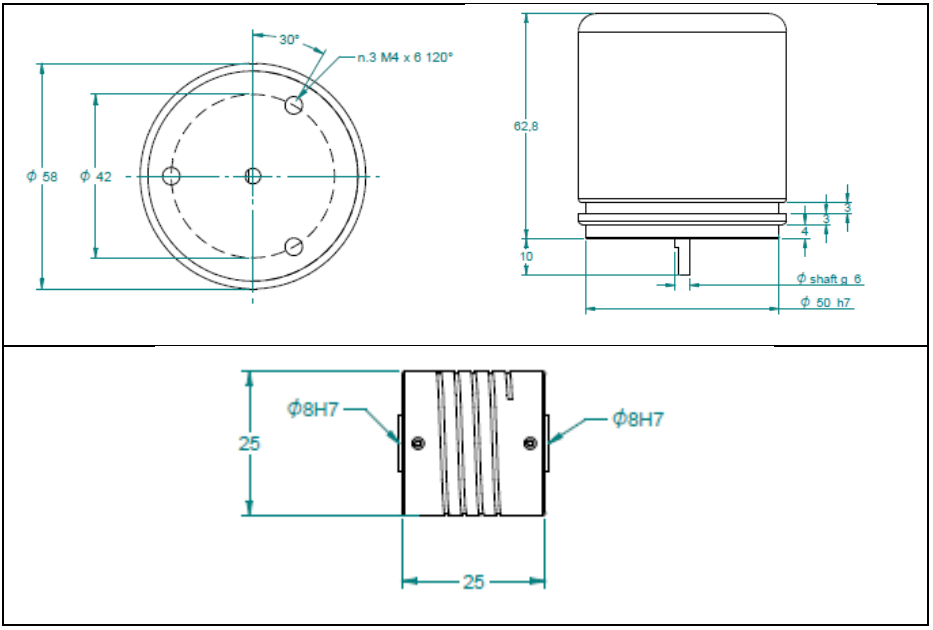


Figure 5 -Encoder sensor code 00SEN-0023

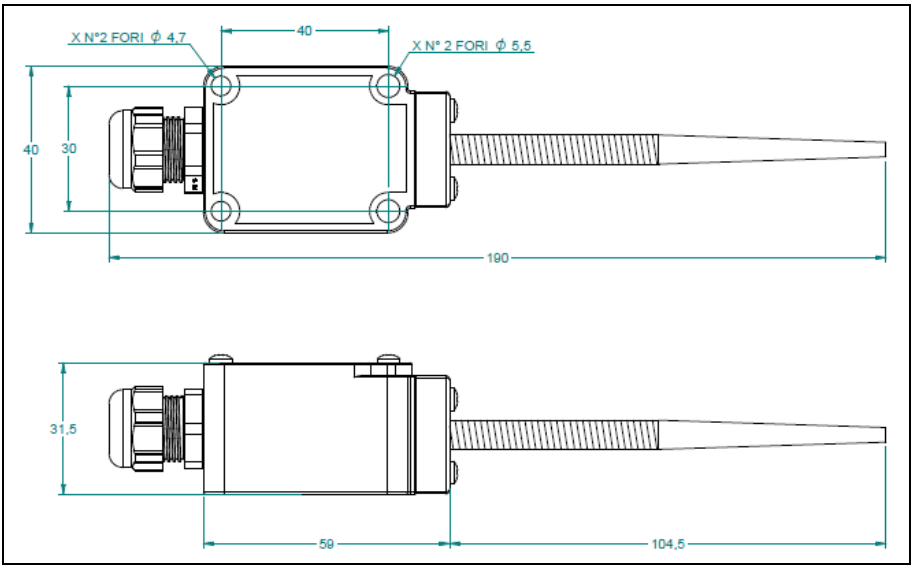


Figure 6 - Work sensor code 1414

Note:
THE MECHANICAL DIMENSIONS OF THE ESD MODULE ARE PROVIDED PURELY AS A GUIDELINE; FOR MORE INFORMATION ON CHARACTERISTICS AND AVAILABLE TYPES, CONTACT THE MC ELETTRONICA TECHNICAL OFFICE.

3.1 Sensor installation

The ESD ISOBUS SYSTEM can be equipped with the following sensors:

- Proximity inductive sensor, NPN, 12V, N.O.
- Normally open limit switch contact

3.1.1 Incremental speed encoder sensor installation

You can install the speed encoder sensor directly or indirectly (through chain and gears) on the wheel of the seed drill (Figure 7).
In the case of a chain with gears, the pulses / 100 metres must be calculated accordingly with the transmission ratio.
Be sure to check that the elements near the encoder sensor do not damage it during transport operations.

The sensor must be installed so as to ensure speed reading with a speed of at least 100 pulses / metre (10000 pulses / 100 metres) in order for the system to work properly. Change the speed parameter or perform the calibration procedure from the dedicated VT menu.

Warning
The sensor cable should be covered with a rubber sheath.

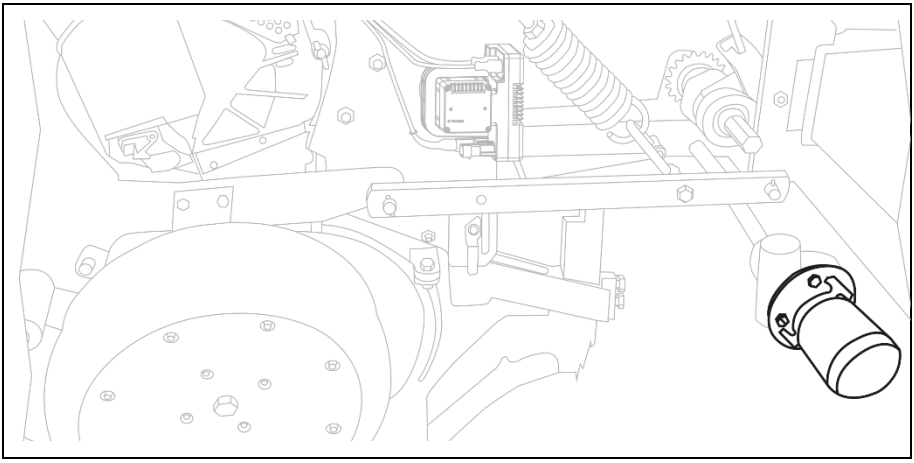


Figure 7 - Encoder sensor installation

3.1.2 Work sensor installation

The work sensor is used to detect when the seed drill is lowered to the ground. It works like a simple switch (closed when turned).
The following figures show an installation example.

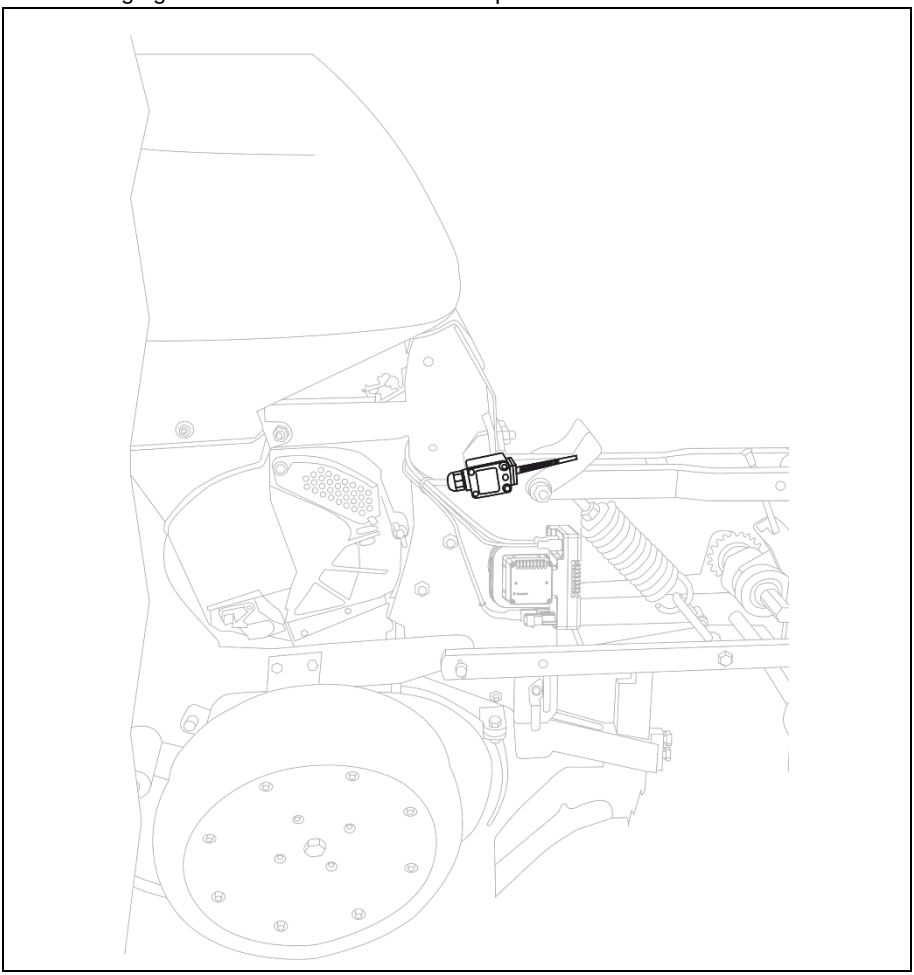


Figure 8 - Work sensor installation

⚠	**Warning** The sensor cable should be covered with a rubber sheath.

3.1.3 Seed sensor and the wiring harness installation

The seed sensors must be positioned on every single row of the seed drill so that when the seed falls, it passes through the two seed sensor elements.

To install the wiring harness, proceed as follows:

- distribute the wiring harness cables fastening them to the seed drill's air pipes with clamps, paying attention to the numbers on the cables near the connectors: cable no. 1 corresponds to row no. 1 of the Monitor, cable no. 2 corresponds to row no. 2 of the Monitor, etc... It is important to consider the seed drill's first row (starting from either right or left) as "no. 1 row" and that the other be connected in sequence: Figure 9 shows an example of a six-row wiring harness application taking the first row on the left of the seed drill, as reference;
- position the junction box **(A)** at the centre of the seed drill, fastening it with clamps;

To install the seed sensors, proceed as follows:

- If the sowing elements of the seed drill are “high” with the dropping tubes that bring the seeds to the ground, the seed sensors to be installed are TES typology (with external electronics) or TIN typology (with internal electronics) and must be placed at about half the length of the pipe itself.
- If the seed drill has "low" sowing elements and the seed falls directly from the disc to the ground, the seed sensors to be installed depend on the type of seed drill and must be directly fitted on the sowing element Figure 11, following the indications on the datasheet attached to this manual (**N.B.** the datasheet is specific to the brand and model of the seed drill used).

Warning
make sure that seed sensors do not obstacle the seed-drop or the mechanical functioning of the sowing element.

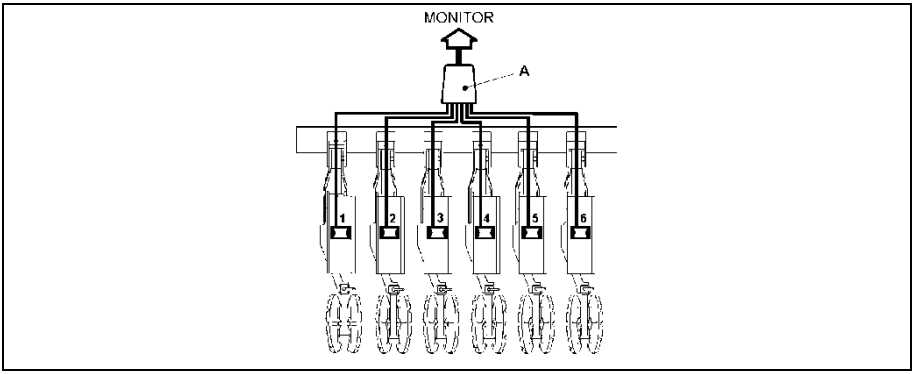


Figure 9 - Wiring harness installation.

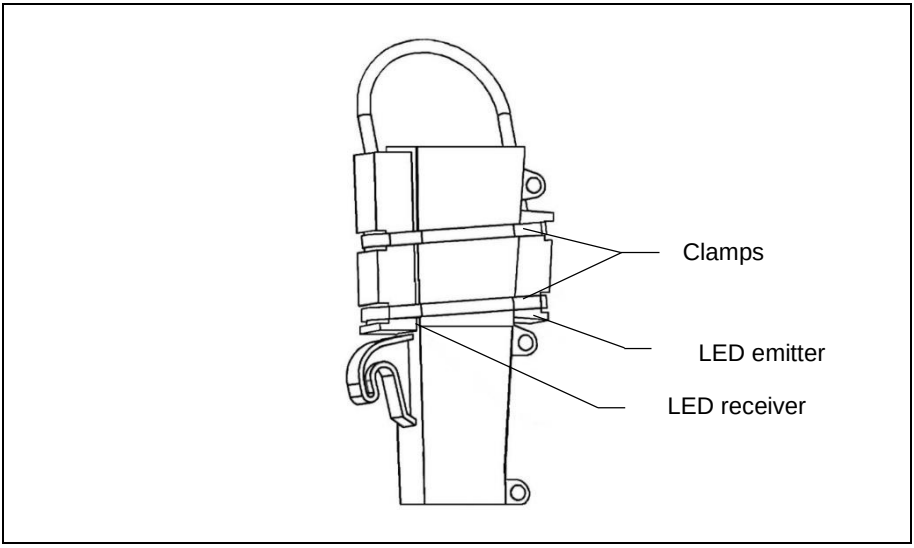


Figure 10 Example of seed sensor installation, TES typology (with external electronics) or TIN typology (with internal electronics) on the dropping tube.

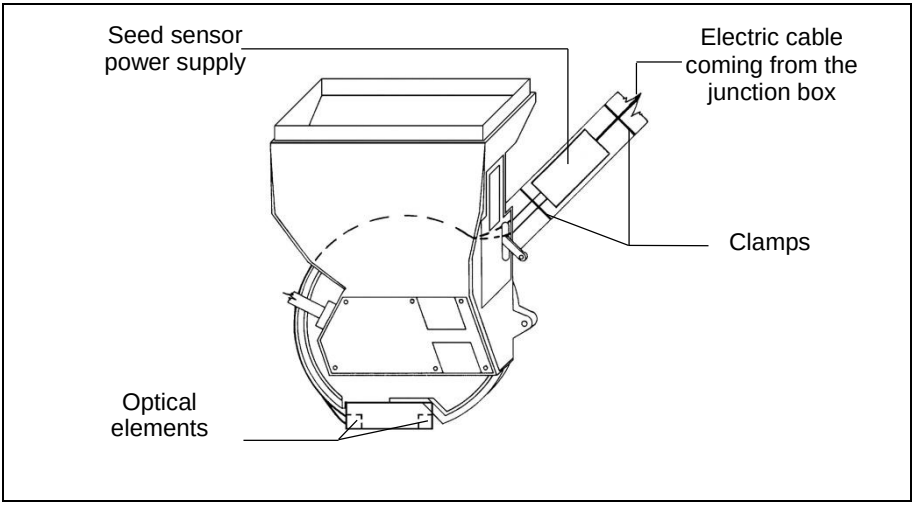


Figure 11 Example of seed sensor installation

3.1.4 **Flowmeter sensor installation**

Install the spraying unit with the flowmeter sensor so that only the flow of the sections passes through the sensor.
If installation has been carried out correctly, the computer indicates the flow only when the section valves are open.

Attention!
The flowmeter sensor must be installed as far as possible from the pressure regulation valve. Therefore we recommend using a 60-70 cm pipe to make the flow more homogeneous.

NOTE: should it be necessary to adjust the system to a desired pressure, put in a ¾" TE with a manually adjustable maximum pressure valve between the pump and the adjustment unit. In the event of pressure exceeding the established value, the valve will by-pass the system, discharging the flow into the tank. The installation can be different depending on the flowmeter sensor capacity and can be assembled, on request, with the following capacities: 2/20, 10/100 litres per minute (for different capacity values, contact the supplier).

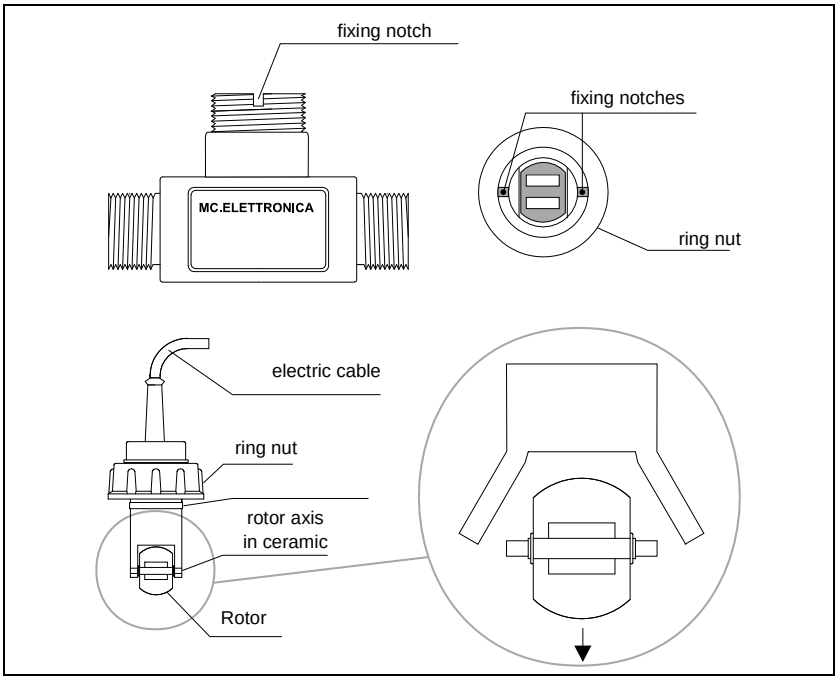


Figure 12 - Flowmeter sensor

3.1.5 Radar sensor and GPS installation

As an alternative to the speed sensor seen in sub-paragraph 3.1.1, it is possible to connect non-MC Elettronica radar or GPS sensors to the 24-row Seeding ECU, which allow the system to reach the vehicle feed-rate.

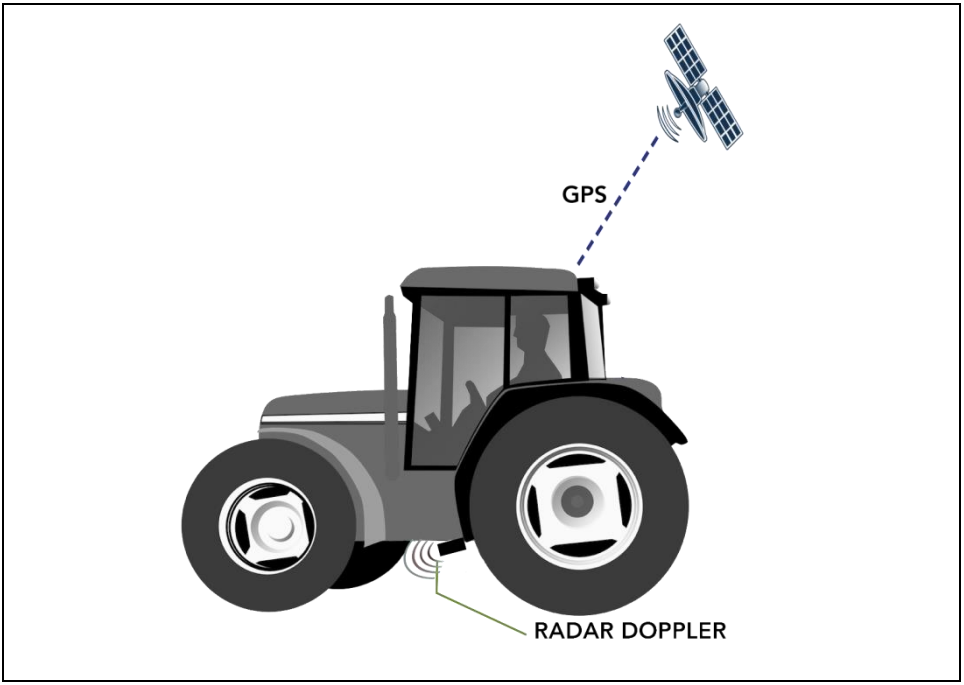


Figure 13 - Installation point

Said sensors can be connected to the 7” VT via adaptive wiring. For more details on how to implement these sensors, contact the MC elettronica technical assistance service.

3.2 Operation

3.2.1 **Seed sensor recognition**

The ESD ISOBUS SYSTEM immediately recognises the number of ECUs and the type of seed sensors connected to them: standard MC Elettronica seed sensors are equipped with initial pulse for recognition;
The ESD ISOBUS SYSTEM distinguishes the type of seed sensor, for seeds or fertiliser, and for this reason wiring is available in 3 groups: "only seed" wiring, "only fertiliser" wiring and seed + fertiliser wiring (see diagrams on the previous pages) when started during the initial test the following screen is displayed, where "HW V-x.xx" and "SW V-x.xx" respectively indicate the hardware and software version.

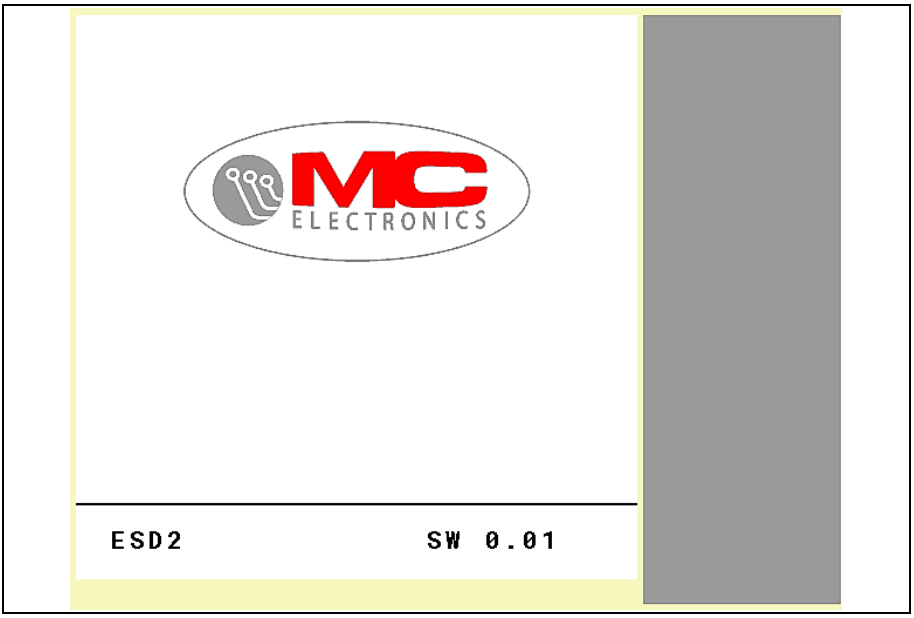


Figure 14 - Start-up screen with reference to the hw and sw version

Subsequently on the display the following work screen appears that can be different depending on the number of ECU and seed sensors recognised; there are 2 basic configurations:

- Up to 12 rows
- Up to 24 rows

The following shows a few examples of recognised configurations.

IT IS IMPORTANT THAT THE OPERATOR CHECKS THE CORRECT ACQUISITION OF THE SEED SENSORS EVERY TIME THEY ARE SWITCHED ON: AFTER INITIAL RECOGNITION THE SEED SENSORS THAT HAVE NOT BEEN DETECTED ARE NO LONGER MONITORED UNTIL IT IS NEXT SWITCHED ON

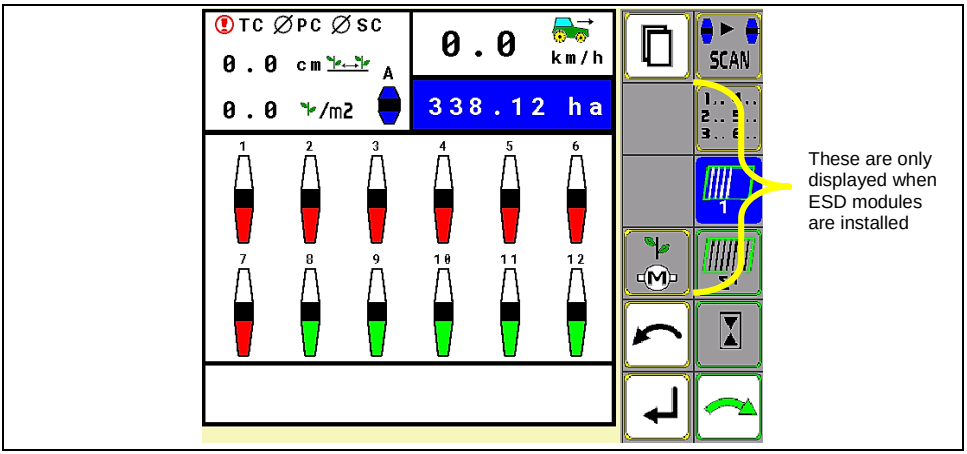


Figure 15 - Example of 12 rows

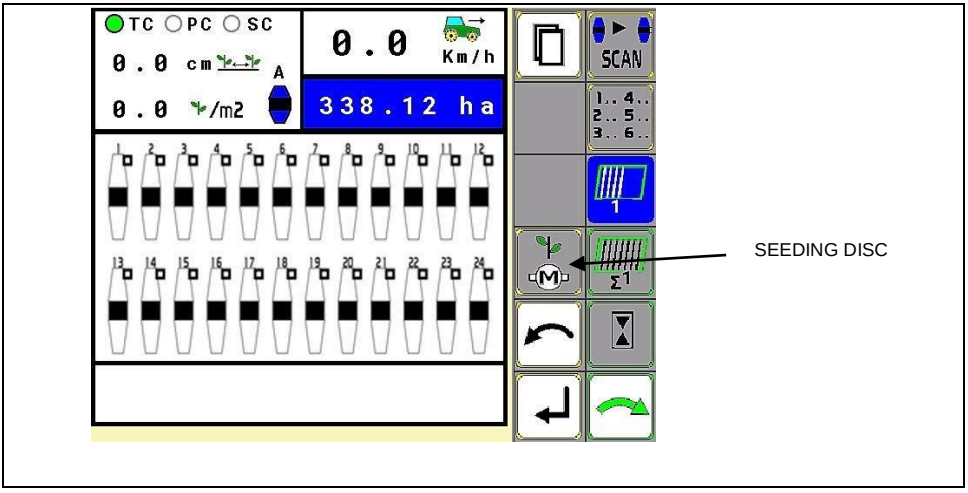


Figure 16 - Example of 24 rows

3.2.2 Keyboard operation

3.2.2.1 Main screen

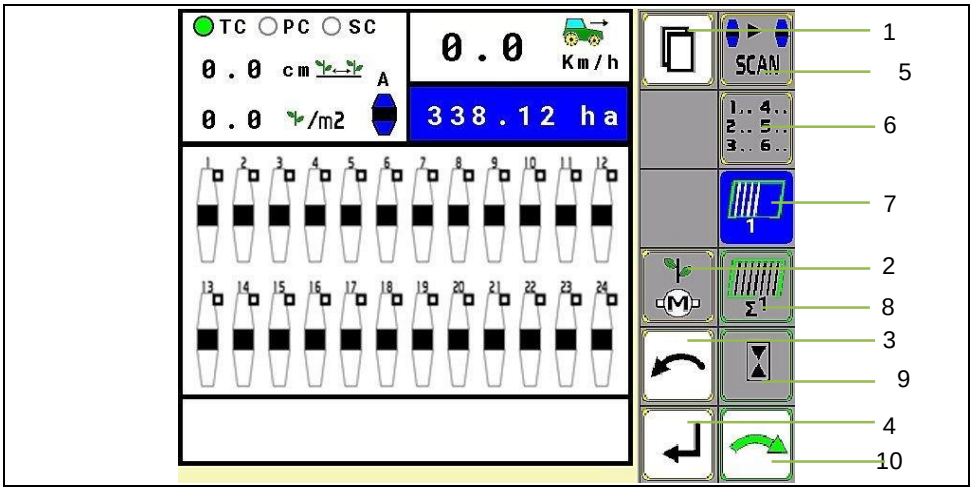


Figure 17 - Main screen example

The front panel allows the user to view all the data relating to the working cycle. The following elements can be seen on the panel:

1. **MENU**: displays the “Main parameters” screen, which allows the operator to quickly change the system operating parameters.
2. **ESD disc:** this displays the diagnostic screen of the ESD seeding disc module.

These three icons are only displayed when the number programmed in the reserved menu of the relative modules is >0;
the icons are only displayed on the left side and come in three different colours:

- *Grey background*: the relative ESD function is enabled and active in the background without alarms
- *Yellow background*: the relative ESD function is enabled if the operator has pressed the physical key next to the icon (or has touched the icon on the touch screen) opening a pop-up window in the foreground, with the diagnostic information and relative alarms.
- *Red background*: the relative ESD function is enabled and there are alarms; the icon maintains its red background even if the operator touches it or presses the physical key to open the diagnostic pop-up window in the foreground.

Description	Enabled Function	Active Function	Alarm status
❶ ESD Disc			

Table 1: Colours of the icons related to the ESD disc module

❶ Press the “ESD disc” icon key to view the following diagnostic screen:

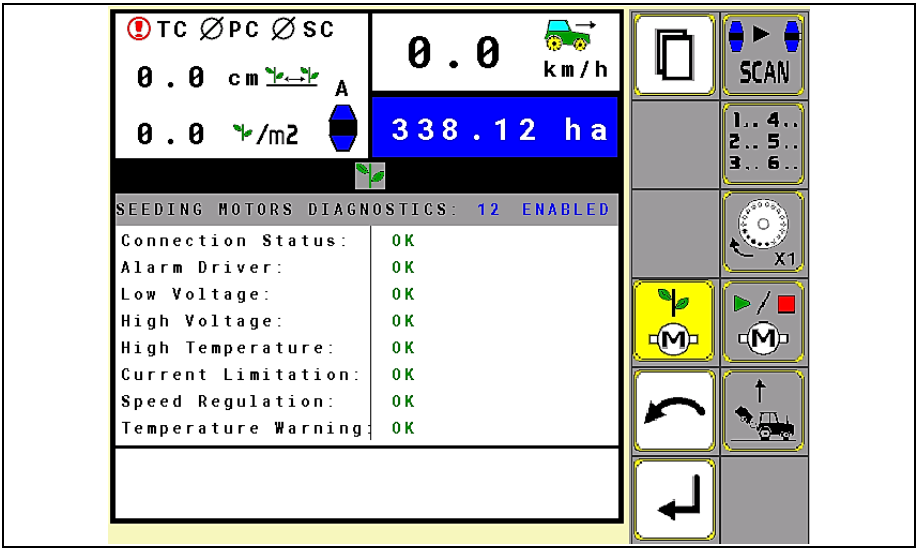
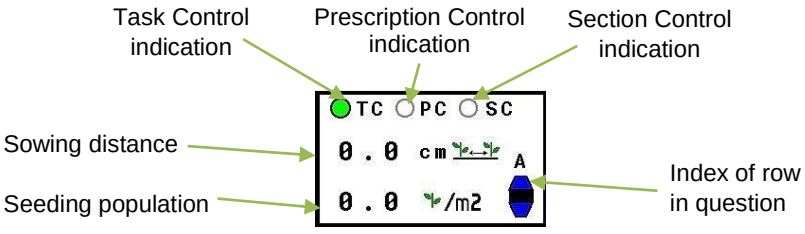


Figure 18 - Example of diagnostic screen of the ESD disc function

3. **RETURN:** closes and silences the alarm.
4. **ENTER:** confirms parameter selection.
5. **SCAN:** activates/disables scrolling of the fields for the distance and population per row.



SCAN →	Activates the sowing distance and seeding population per row parameters
II SCAN →	Deactivates the sowing distance and seeding population per row parameters

∅	Function disabled from the TC menu
!	System restart required
○	Function enabled from the TC menu but not in currently working
●	Function enabled from the TC menu and currently working

If the letter “A” appears instead of the index of the file in question, it gives us the result of the average value of the sowing distance and population among the rows in the system.

6. **DATA:** Pressing this key once displays the sowing distance summary table of all the seed sensors; pressing the same key again displays a second table with the seeding population values of every seed sensor.

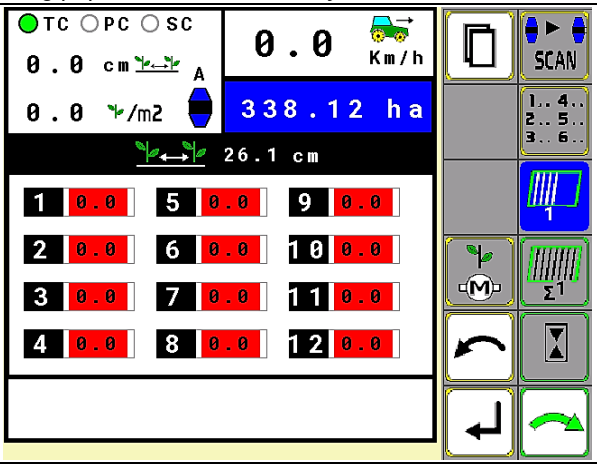


Figure 19 - Example screen of the sowing distance per seed sensor

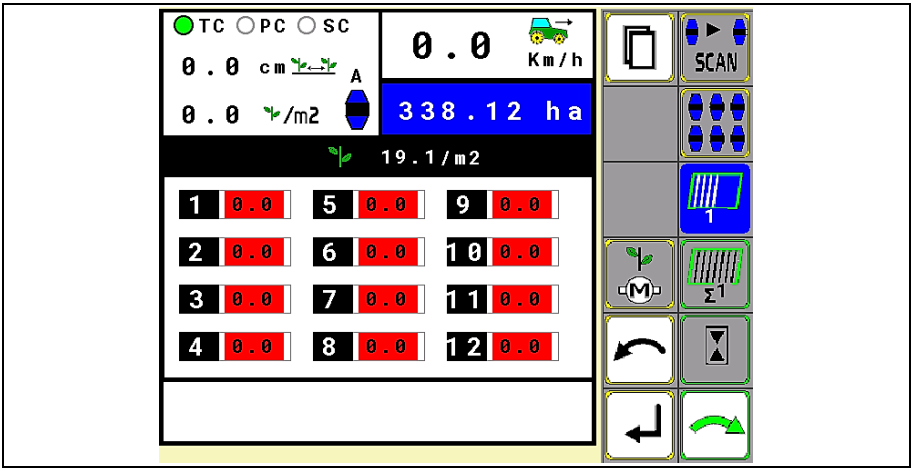


Figure 20 - Seeding population example screen

7. Parameter can be displayed on the variable range
8. Parameter can be displayed on the variable range
9. Parameter can be displayed on the variable range
10. Parameter scrolling key present on keys 9 - 10 - 11.

Icon	Description
	Partial processed area (hectares or acres)
	Total processed area (hectares or acres)
	Total hours worked
	Linear distance travelled (metres or feet)
	Instantaneous yield (hectares/hours or acres/hours)

Icon	Description
	Total hours worked
	Instantaneous herbicide rate (litres/hectare or gallons/acre)
	Total herbicide distributed (litres or gallons)
	Subsequent Target Rate
	Previous Target Rate
	Reload button active
	Reload button disabled
	Start enabled motors (test)
	Stop enabled motors (test)
	Work sensor simulation
	No Work sensor simulation

Table 2: Summary table of the icons of keys 9 - 10 – 11.

3.2.3 **Main Parameters Screen**

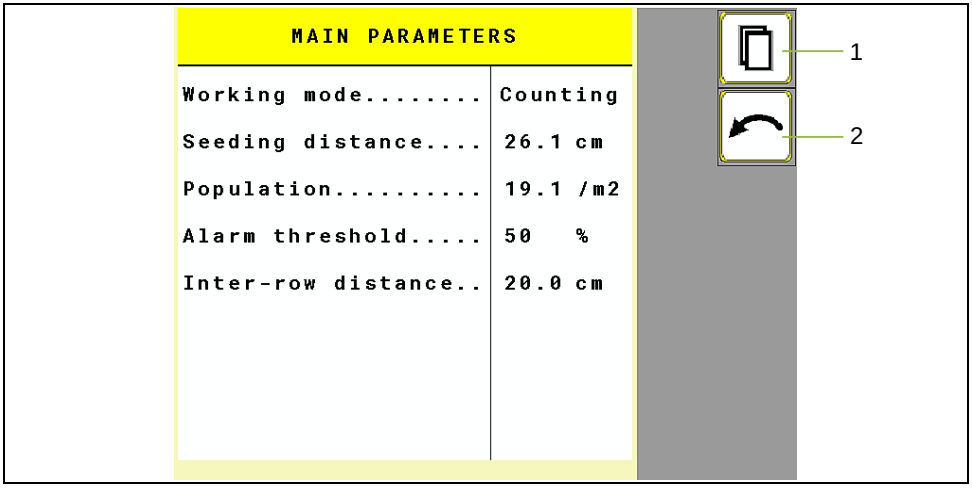


Figure 21 - 'Main parameters' example screen

Using the following panel, it is possible to display the parameters corresponding to actual machine operation:

1. **MENU**: displays the system programming screens.
2. **RETURN:** return to the initial work screen.

3.2.4 **Programming screens**

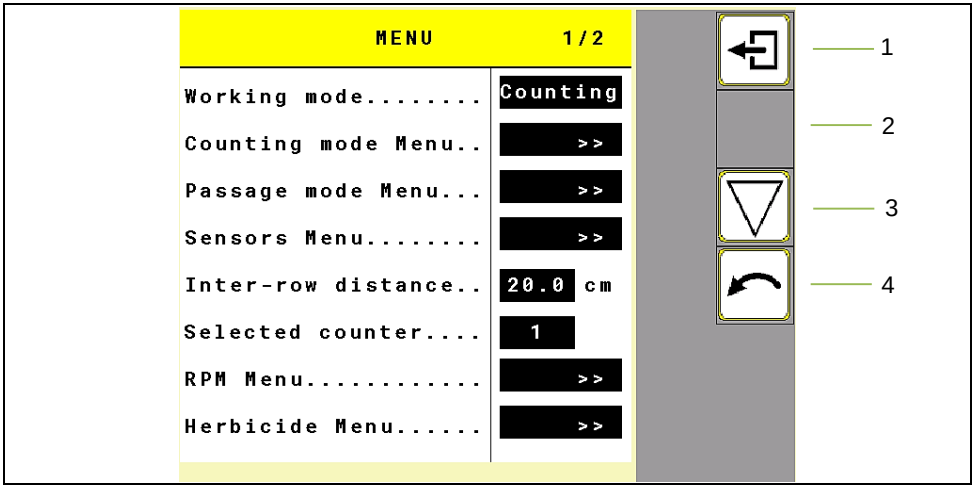


Figure 22 - Example screen

This last window that completes the initial scrolling cycle displays the seed drill use counters:

1. **MAIN**: goes back to the initial screen
2. **UP:** increases the selected value.
3. **DOWN**: decreases the selected value.
4. **RETURN**: goes back to the previous screen.

3.3 Graphic interface description

3.3.1 Seed drill work screen

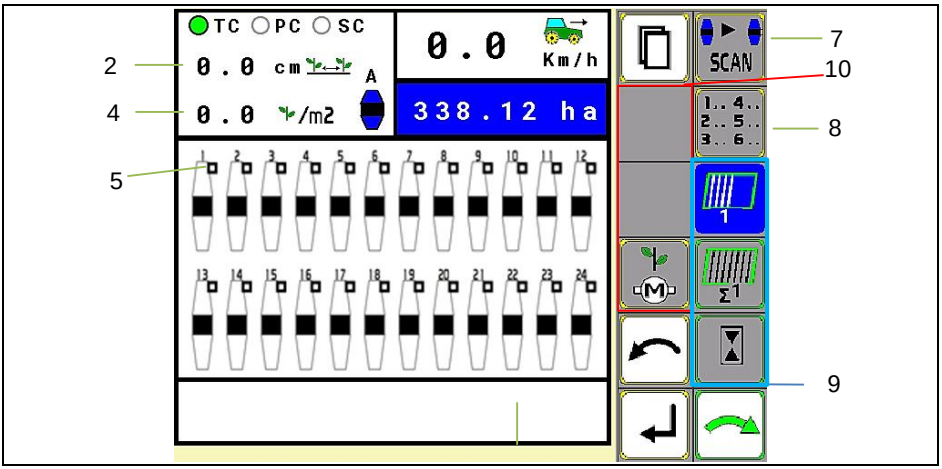


Figure 23 - Seed drill work example screen

1. **SPEED**: Work speed indicator.
2. **SOWING DISTANCE**: Sowing distance indicator in reference to the row indicated by the indicator (see point 3).
3. **ROW INDEX**: Displays the index of the row on which the sowing distance and population per square metre is being displayed. This number automatically increases to continuously analyse the situation. Scrolling on a row can be locked using the “SCAN” key shown in point 7. The letter “A” appearing above the blue histogram displays the average between the sowing distance and seeding population rows.
4. **SEEDING POPULATION**: Indicator of the number of plants per square metre based on the indicator (see point 3).
5. **ROW HISTOGRAM:** Displays the seeding status of the individual row. For more details, see the following “Analogue display” sub-paragraph.

6. **VARIABLE RANGE:** Variable indicators, based on the parameter selected by the keys inside block 9. The list of possible displays includes:
   - Partial processed area
   - Total processed area
   - Total hours worked
   - Linear distance travelled
   - Instantaneous yield
   - Total hours worked
   - Instantaneous herbicide rate
   - Total herbicide distributed
   - Activation of camera 1
7. **SCAN:** activates/disables scrolling of the fields for the distance and population per row. Display touch screen key.
   (For more details, see sub-paragraph 3.2.2.1)
8. **DATA:** Pressing this key once displays the sowing distance summary table of all the seed sensors; pressing the same key again displays a second table with the seeding population values of every seed sensor. Display touch screen key.
   (For more details, see sub-paragraph 3.2.2.1)
9. **VARIABLE PARAMETERS:** The displayable parameter icons are displays on the “VARIABLE RANGE” (in blue) described in point 6. Display touch screen key.
   (For more details, see sub-paragraph 3.2.2.1)
10. **SYSTEM TIME**
11. **ESD FUNCTIONS**: the icons are only visible when they are enabled from the reserved menu

3.3.1.1 Analogue display

The analogue display in histograms is based on the programmed sowing distance or population value (target) (see Programming chapter); the programmed value is assigned the reference of 100% and the histograms provide information concerning the quality of sowing detected, in the range of 100+/-50% according to the following screen :

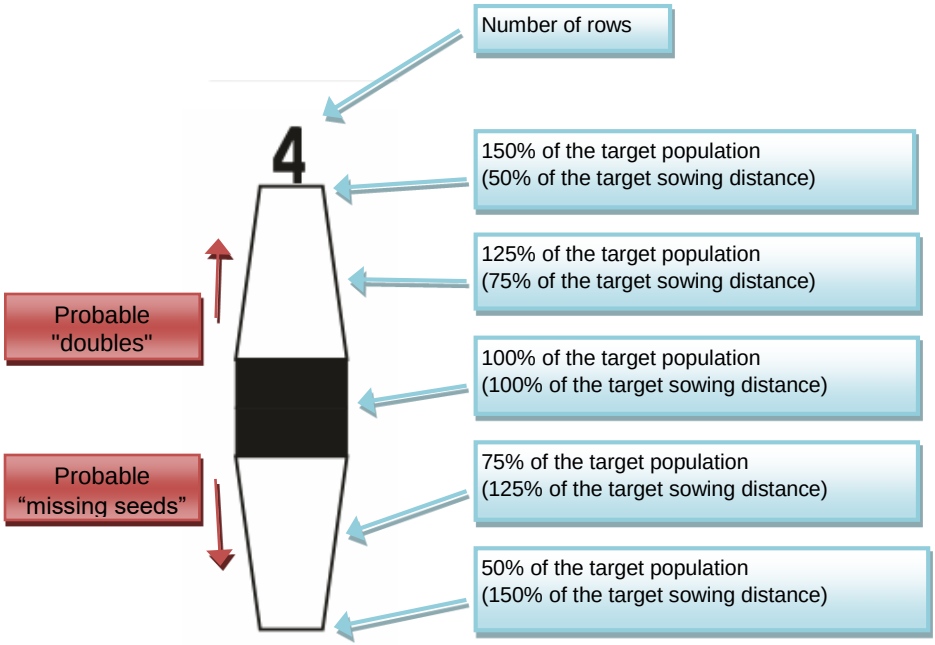


Figure 24- Detail of a seeding histogram

The colour of the histograms varies in relation to the alarm threshold set (see Programming chapter): the histogram remains green (or "neutral" until the sowing distance and population value detected remain within the programmed threshold, while it turns red (with an alarm message) when the values detected exceed the threshold; in the following example the alarm threshold is set at 10%:

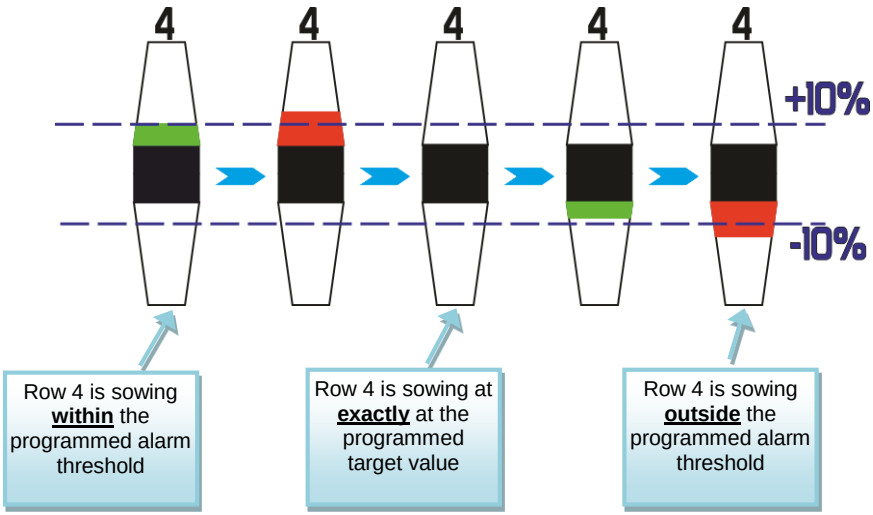


Figure 25 - Example of colours of the sowing histograms

3.3.1.2 Tabular display

In the table display the instant numerical values of sowing distance (or population) calculated on every row are indicated; the colour of the table's cells varies in relation to the alarm threshold set (see Programming chapter): the cell becomes red (with an alarm message) when the value detected exceeds the threshold; in the following example with target sowing distance programmed at 25.0 cm, the alarm threshold is set at 10%:

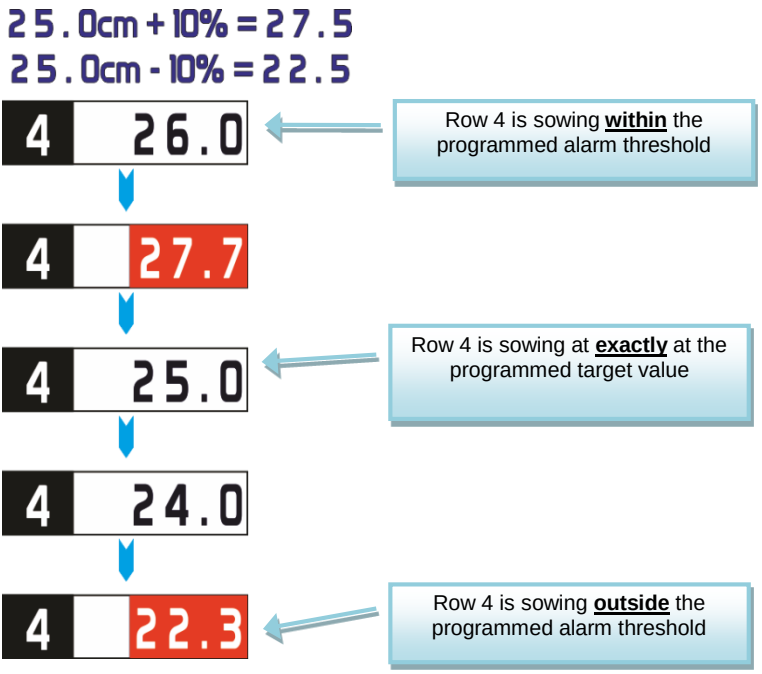


Figure 26 - Cases of tabular views in relation to sowing

3.3.1.3 Display in PASSAGE mode

The ESD ISOBUS SYSTEM can work in *COUNTER* mode, as referred to by the information provided in the previous paragraphs, and in *PASSAGE* mode;
in the latter mode, the sowing distance or population are not calculated but are only checked by the presence or absence of pulses (for further details see the Programming chapter).

In passage mode, the numerical indications of the sowing distance and population values are replaced by horizontal dashes; the conditions of normal work and alarms are shown in the following images.

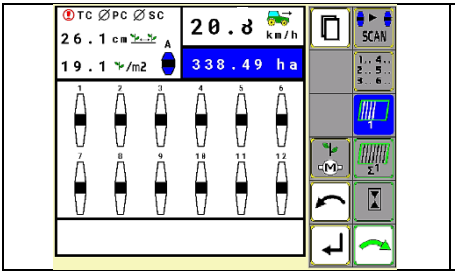


Figure 27

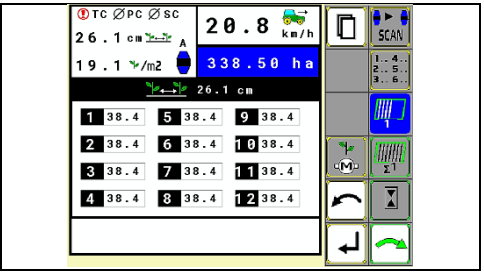


Figure 28

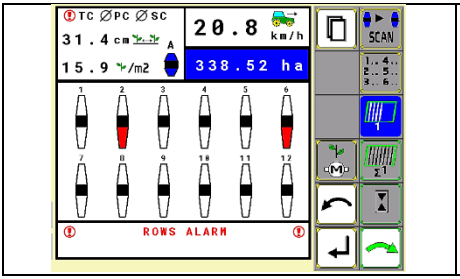


Figure 29

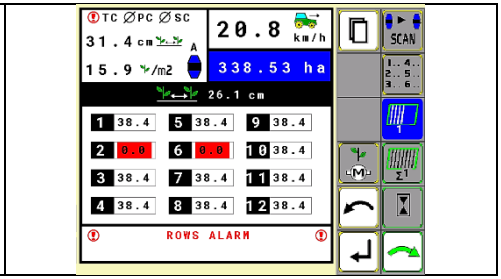


Figure 30

3.3.1.4 Fertiliser seed sensor display

Seed sensor signals for granular fertiliser are managed in ON/OFF mode, that is, the presence or absence of pulses is checked; the fertilising seed sensors are however recognised when switched on and the alarm sounds when no pulse is detected for a period of time that can be programmed by the operator (see Programming chapter). Both in the histogram display as well as in the tabular display the fertiliser seed sensors are identified with ▫ during normal operation and with ● in the event of an alarm, as indicated in the following diagram:

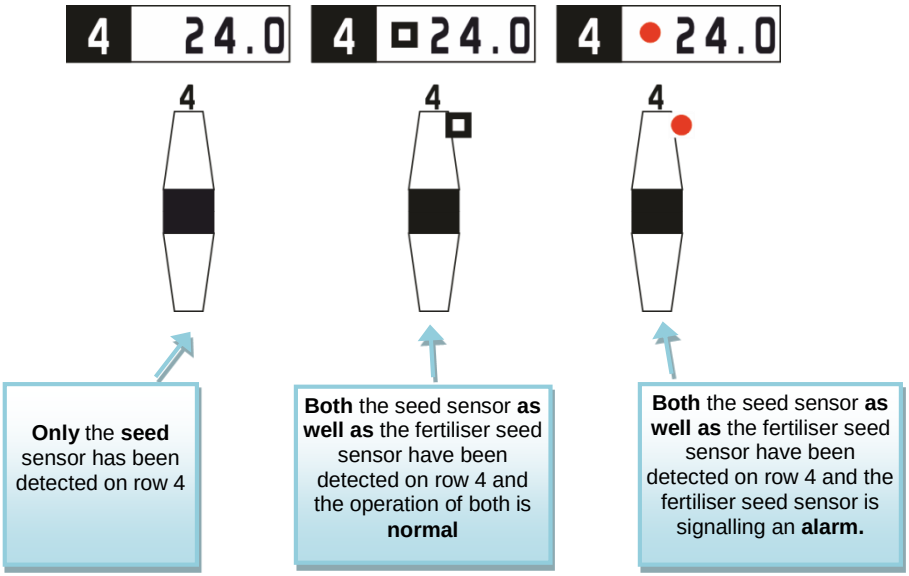


Figure 31 - Relation between histogram and tabular display

3.3.1.5 Viewing the excluded rows from inspection

As described in paragraph “3.5 Automatic exclusion of inspection on the rows”, sowing and fertiliser control can be suspended on one or more rows, such as in the finishing manoeuvres on the edges of the field; the ESD ISOBUS SYSTEM with ESD module will verify, in any case, the consistency of the signals from the seed sensors, emitting an alarm if one or more of the seed sensors on the excluded rows from the inspection should continue to send pulses (e.g. mechanical exclusion of the mechanism from the faulty row);
note: this inspection is only active on the seed sensors and not on the fertiliser seed sensors;
Below are some examples:

	Row no. 12 was excluded from the seed/fertiliser inspection and the seed sensor is not detecting a pulse. **CORRECT**
	Row no. 12 was excluded from the seed/fertiliser inspection but the exclusion device was not activated or it did not work and the seed sensor of row 12 is still detecting the seeds; **ALARM**
	Row no. 12 was excluded from the seed/fertiliser inspection but the exclusion device was not activated or it did not work and the seed sensor of row 12 is still detecting the seeds and the sowing of row 12 is over the set target **ALARM**
	Row no. 12 was excluded from the seed/fertiliser inspection but the exclusion device was not activated or it did not work and the seed sensor of row 12 is still detecting the seeds and the sowing of row 12 is lower than the set target. **ALARM**

Table 3:

3.4 Automatic exclusion of inspection on the rows

The automatic exclusion of file control can only be used in the ESD ISOBUS SYSTEM when there are no ESD modules.
You can set the ESD ISOBUS SYSTEM to automatically consider one or more rows as excluded without acting as described in the previous paragraph; this feature is active by default, however, this can be enabled or disabled in future software releases.
The automatic exclusion is only active when the machine is moving and the automation only works on the rows in alarm status and is activated by pressing the ENTER key : below is a practical example.

- A finishing is required due to the irregular shape of the field

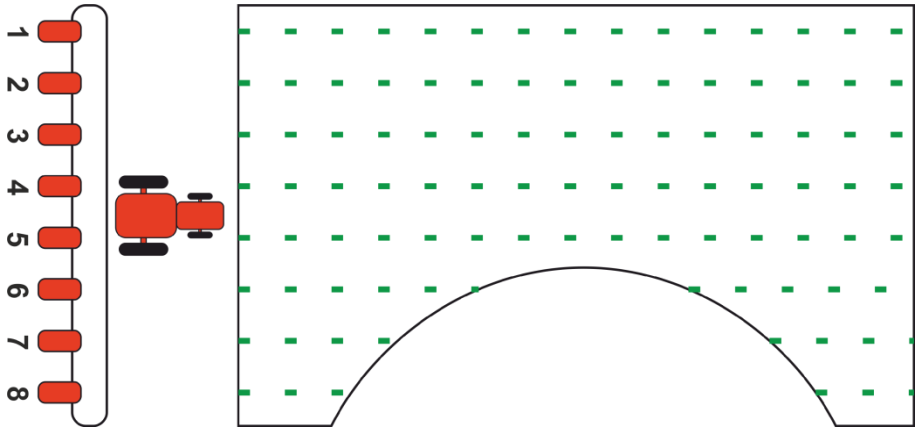


Figure 32 - Example of an irregular field shape and rows

- Therefore, the sowing inspection must be excluded first on row 8, then on row 7, then on row 6; after a few metres the sowing inspection must be reactivated first on row 6, then on row 7 and lastly on row 8;
  Note: all the mechanical (or electronic) closing and reopening operations of the rows are assigned to the operator;
- While the machine is moving, the operator mechanically or electrically excludes row 8, and since the ESD ISOBUS SYSTEM will no longer detect pulses, an alarm will be emitted. Press the ENTER key and the buzzer stops ringing and after about 1 second, row 8 is considered to be excluded; the same sequence can be subsequently repeated for rows 7 and 6;

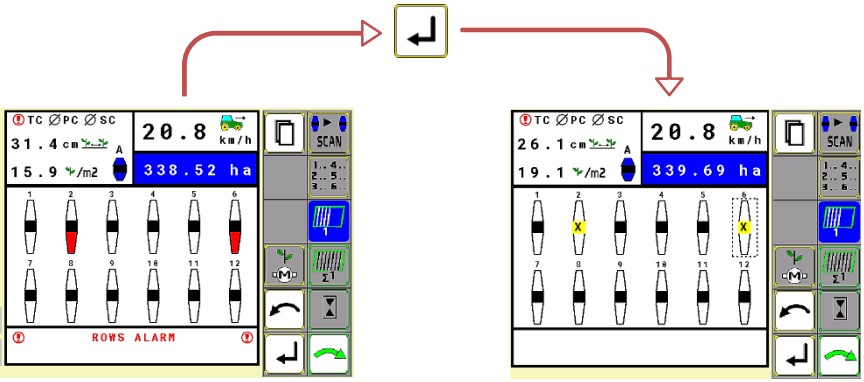


Figure 33 - Row exclusion example

- While the machine is moving, the operator mechanically or electrically reactivates row 6, which was previously excluded, the ESD ISOBUS SYSTEM will detect pulses and emit an alarm. Press the ENTER key and the buzzer stops ringing and after about 1 second, row 6 is considered active again; the same sequence can be subsequently repeated for rows 7 and 8.

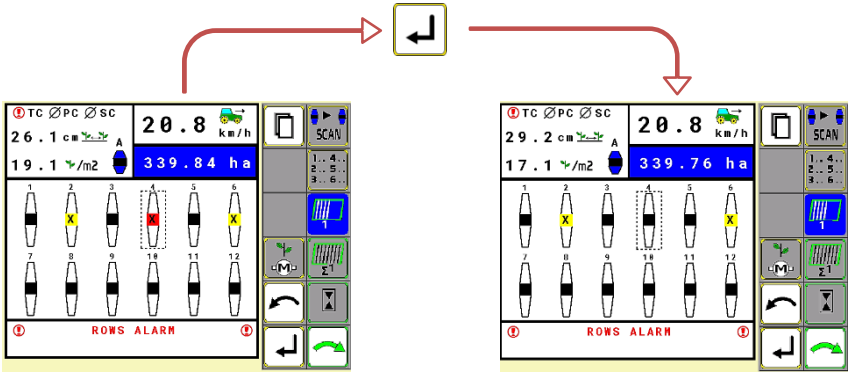


Figure 34 - Row reopening example

Note:
ALL CHANGES MADE AS DESCRIBED IN THIS PARAGRAPH ARE TEMPORARY AND ARE AUTOMATICALLY CANCELLED WHEN THE MACHINE STOPS (SPEED = 0.0Km/h

4. Programming

In the ESD ISOBUS SYSTEM with ESD module there are 2 different type of programming available:

- Specific programming for the Virtual Terminal
- Specific programming for seeding ECU

THE 7" VIRTUAL TERMINAL MAY BE MATCHED TO DIFFERENT TYPES OF MC ELETTRONICA ECUs (SOWING, SPRAYING, HAY-MAKING, ETC.) THEREFORE THE GRAPHIC INTERFACE DEPENDS ON THE ECU CONNECTED AND IS DIFFERENT IN DIFFERENT CASES, HOWEVER THERE ARE SOME GENERIC PARAMETERS THAT APPLY TO ALL THE APPLICATIONS (E.G. METRIC OR IMPERIAL UNIT OF MEASUREMENT) AND THAT ARE THUS PROGRAMMABLE IN THE VIRTUAL TERMINAL WHILE THE SPECIFIC PARAMETERS FOR EACH APPLICATION (E.G. SOWING DISTANCE) ARE PROGRAMMABLE IN THEIR RESPECTIVE ECUs THROUGH THE VT.

4.1 ECU Gateway programming

4.1.1 Main parameters

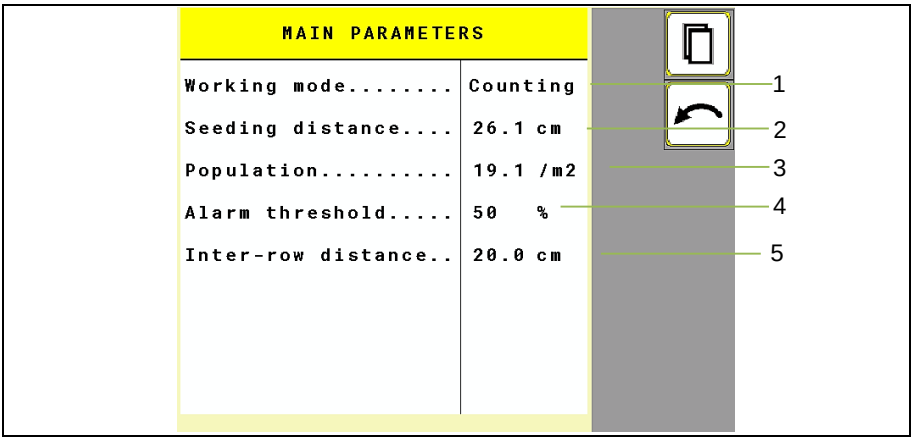


Figure 35 - Main Parameters example screen

At any time during work it is possible to check the main programmed parameters; this information is shown on the menu page which is accessible by pressing the MENU key once. Below is a definition of the parameters summarising system setting:

1. **WORKING MODE MODE:** Indicates whether the operating mode has been defined as “Counter” or “Passage”.
2. **SEEDING DISTANCE:** indicates the distance programmed between one seed and the next.
3. **POPULATION:** indicates the number of seeds programmed per square metre.
4. **ALARM THRESHOLD:** indicates the percentage value of the alarm threshold, compared to the sowing distance value.
5. **INTER-ROW DISTANCE:** Indicates the set distance to keep between one seeding row and the next.

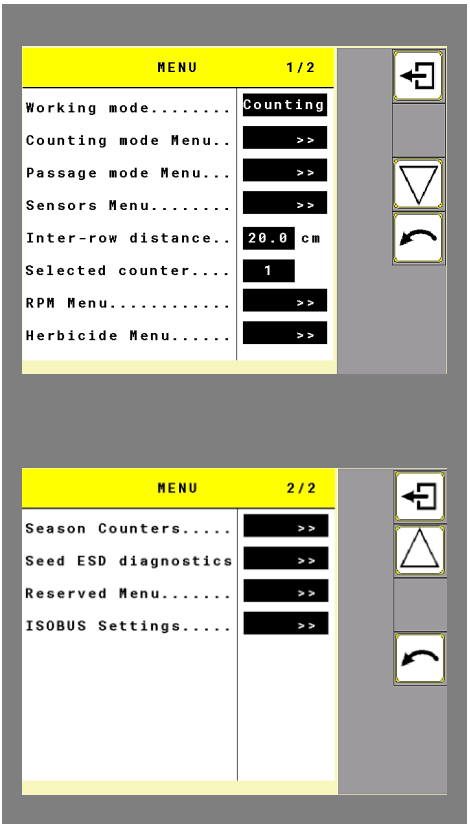
4.1.2 **Menu**

This programming phase is available at all times during work by pressing the menu button twice: the first press will display the main parameters currently scheduled (non-changeable) and with the second press of the menu button you will enter the programming menu.
Defining the parameters that make up this menu, we will have:

WORKING MODE: The operating mode defines how the sowing distance and population are calculated and checked. The ESD ISOBUS SYSTEM with ESD module allows the operator to choose between COUNTER and PASSAGE mode.

COUNTING mode: the SYSTEM calculates and checks the sowing distance and seeding population for every row, counting the pulses coming from the seed sensors; this operating mode is recommended for work with medium/large sized seeds (e.g. corn, beetroot, soybean)

PASSAGE mode: the SYSTEM limits itself to checking the presence of pulses coming from the seed sensors, calculation of the sowing distance or seeding population is NOT calculated. This operating mode is recommended for work with small seeds (e.g. rapeseed, vegetables);

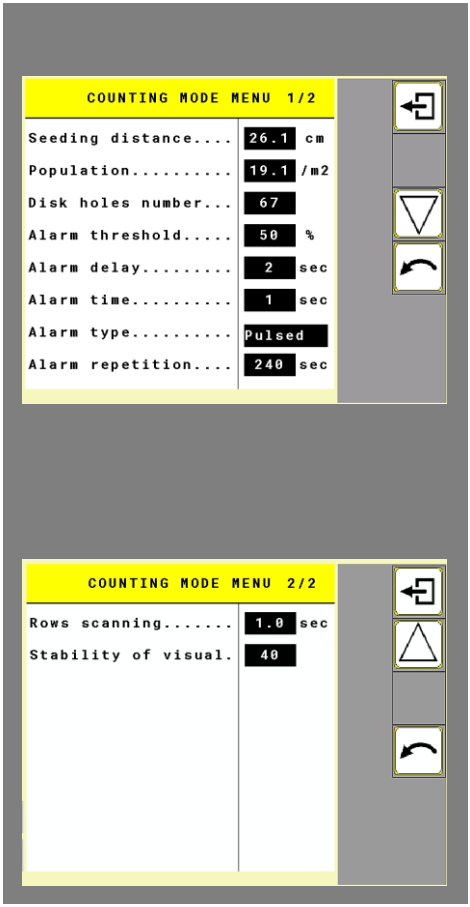


COUNTING operating mode is never active for the <u>fertiliser</u> seed sensor signals, which are always managed with PASSAGE operating mode

COUNTING MODE MENU: defines the seeding population and density calculation parameters according to counter mode.
PASSAGE MODE MENU: sets the seeding population and density parameters according to passage mode.
SENSORS MENU: manages the operating and management parameters of the various system operation sensors.
INTER-ROW DISTANCE: Program the width between the rows in cm (or inches); this data is important both to calculate the area being worked on and to calculate the sowing distance and population; to calculate the processed area, the ESD ISOBUS SYSTEM with ESD module automatically calculates the operating width, multiplying the interrows width data by the number of seed sensors acquired at start-up;
SELECTED COUNTER: The ESD ISOBUS SYSTEM with ESD module can manage up to 9 different sets of totalisers independently, for total or partial processed area and for total litres of weed killer distributed. Each set of totalisers can be managed and reset separately from the others.
RPM MENU: enables and disables RPM sensor minimum and maximum threshold monitoring and the respective alarms.
HERBICIDE MENU: sets the herbicide system operating parameters on the ESD ISOBUS SYSTEM with ESD module.
SEASON COUNTERS: two more overall counters are available, processed area and hours worked; these counters are increased independently from the set of work counters selected; these counters indicate the total machine work.
SEED ESD DIAGNOSTIC: this screen contains all the information of each individual ESD module useful for diagnostic functions.
RESERVED MENU: the screens contained in this sub-menu are protected by a password that must be entered on a screen that appears when said screens open, as illustrated in - Reserved Menu screenFigure 45
Once the password has been entered correctly, the settings we will edit are necessary to adapt the system to the machine on which it is installed.
ISOBUS SETTINGS: this screen contains the ISOBUS parameters

4.1.2.1 Counter mode menu

The following parameters can be set in this menu:



- **SEEDING DISTANCE**: program the reference sowing distance (*valid only for COUNTING operating mode*): the SYSTEM will associate this with the 100% reference value as a reference for the signalling of alarms on seed sensor inputs;
- **POPULATION**: program the reference seeding population (*only valid for COUNTER operating mode*): the SYSTEM will associate this to the 100% reference value as reference for alarm signals on seed sensor inputs;
- **DISC HOLES NUMBER:** the number of holes on the seeding disc
- **ALARM THRESHOLD**: program the alarm threshold in percentage (*valid only for COUNTER operating mode*): this percentage is referred to the sowing distance and population values programmed;
  for example: if you program a population of 10.0 seeds/m^2 and an alarm threshold of 25%, this means that alarms on the VT for the rows in which the seeding population detected is less than 7.5 seeds/m^2 (10.0-25%) or greater than 12.5 seeds/m^2 (10.0+25%) will be signalled;
- **ALARM DELAY**: program the time delay between the visual signalling of the alarm (histogram in red or cell in red) and the audible one (buzzer).
- **ALARM TIME**: program the duration of the audible alarm.
- **ALARM TYPE**: select the type of audible alarm for counter mode.
- **ALARM REPETITION**: once the first audible alarm cycle has been completed, the VT will repeat the audible signal cycle at intervals that are established by the parameter (if the alarm condition continues)
- **ROWS SCANNING**: in counter operating mode, the two main fields at the top in the VT screen indicate sowing distance and population values, scanning the various rows for the time programmed in this parameter.

- **STABILITY OF VISUALIZATION**: In the counting work mode, the display stability can be increased or decreased; the higher the set value, the more stable the display will be, that is, only the more serious errors will be indicated. If the set number is low, the display will be less stable and minor errors will also be indicated

4.1.2.2 Passage mode menu

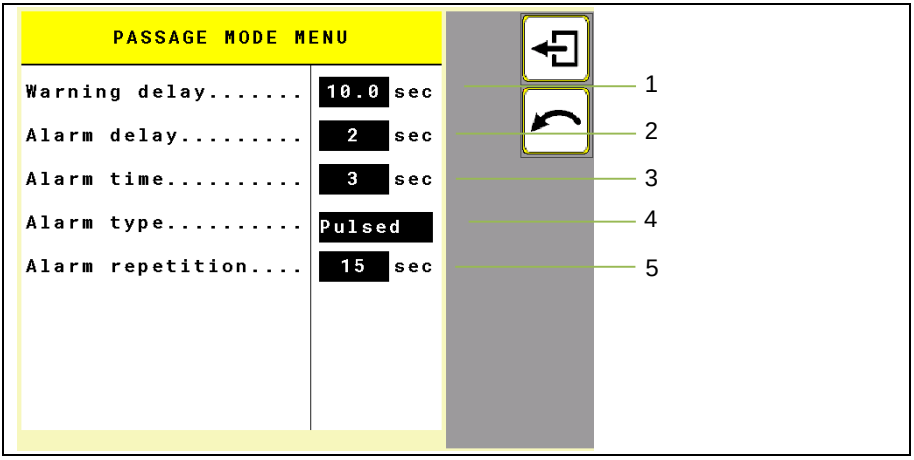


Figure 36 - Passage mode menu example screen

The following parameters can be programmed in this menu:

1. **WARNING DELAY:** In passage mode, the sowing alarm sounds when a pulse is no longer detected for the time programmed in this parameter; for example: programming this parameter at 3.0 seconds, the sowing alarm sounds if one or more seed sensors do not send pulses for at least 3.0 seconds.
2. **ALARM DELAY:** Program the time delay between the visual signalling of the alarm (histogram in red or cell in red) and the audible one (buzzer)
3. **ALARM TIME:** Program the duration of the audible alarm
4. **ALARM TYPE:** Select the Passage mode audible alarm type
5. **ALARM REPETITION:** Once the first audible alarm cycle has been completed, the VT will repeat the audible signal cycle at intervals that are established by this parameter (if the alarm condition continues).

4.1.2.3 Sensors Menu

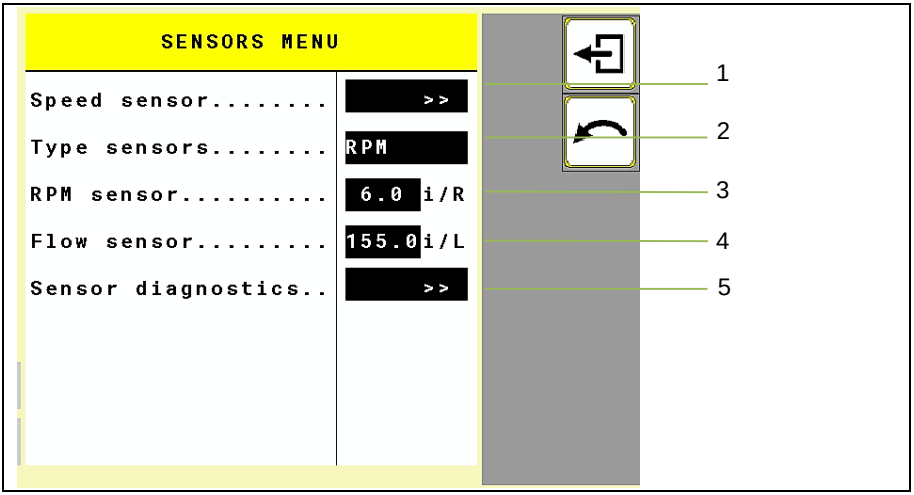
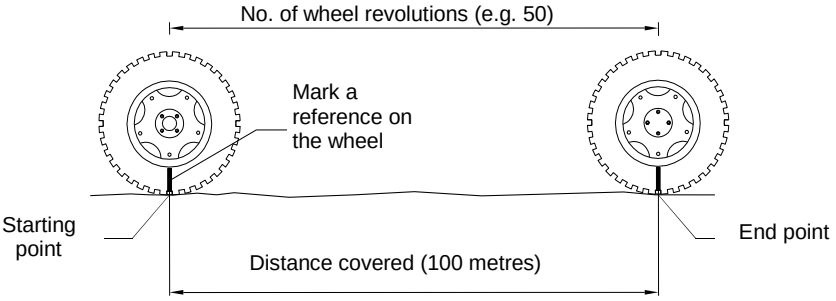


Figure 37 - Sensors menu example screen

1. **SPEED SENSOR**: It is possible to program the number of pulses coming from the speed sensor every linear 100 metres (or 330ft) covered by the machine; you can enter the parameter manually via manual Calibration;
   In the example below, assuming that the speed sensor is located so as to detect 4 pulses for every revolution of the seed drill wheel.



$$Parameter = \frac{100\ meter}{Wheel\ circumference\ in\ meters}\ X\ N°\ of\ references\ on\ the\ wheel$$

Figure 1 - Explanatory diagram for speed sensor calibration

In this example, the parameter to be programmed is 100/2*4 = 200 pulses/100 metres When using ESD modules it is necessary to select a high frequency speed input (minimum 100 pul/m) selected in the “Speed source” parameter, defined in paragraph 4.2.2.4.1.

2. **TYPE SENSOR:** Normally the speed sensor is mounted on the seed drill and during manoeuvres on the field, lifting the seed drill automatically stops the work area counter. Instead, if the sensor is mounted so as to continue to detect pulses during the manoeuvres on the field, it is possible to install a supporting sensor (typically a spring switch) that closes a contact to lock the counting of the area; in this menu it is possible to enable or disable this sensor.

3. **RPM SENSOR:** Program the number of pulses per revolution coming from the RPM fan sensor (if installed)

4. **FLOW SENSOR:** Program the number of pulses per litre coming from the flowmeter sensor (if installed) to detect the quantity of localised herbicide, ; we recommend running the practical test described below. Pour a pre-established (and as accurate as possible) amount of water into the tank, (e.g. 50 litres); make a note of the currently programmed value, e.g. 172.0

   Reset the "total litres" totaliser by pressing and holding the button Bring the localised herbicide system to normal working pressure and drain all the water from the tank. Check the litres displayed by the totaliser, for example 51 litres.
   Apply the following formula:

$$Nuovo\ parametro = \frac{Litri\ totalizzati * \ attuale\ parametro}{Litri\ realmente\ introdotti}$$

   In the example:

$$\frac{51 * 172.0}{50} = 175.4$$

   Program the new value obtained; 175.4 in the example;
   Repeat the test following the same steps, making sure that the quantity displayed corresponds to what was actually introduced.

5. **SENSOR DIAGNOSTICS:** In this menu you can check the electrical wiring of various sensors, even when the machine is stopped. The screen shows all the available sensor types and the information displayed corresponds to the status of the sensors themselves, for example: by placing a metal reference in front of the speed sensor, it will go from "OFF" to "ON" and vice versa when the metal reference is removed. For the seed and fertiliser sensors, moving an obstacle (a finger or a screwdriver) in front of the sensor's optical parts, one at a time, you will see the numbers on the display corresponding to the sensor tested; furthermore, moving the black selection bar with the and keys, the VT will emit an audible signal when its sensor moves from "OFF" to "ON".

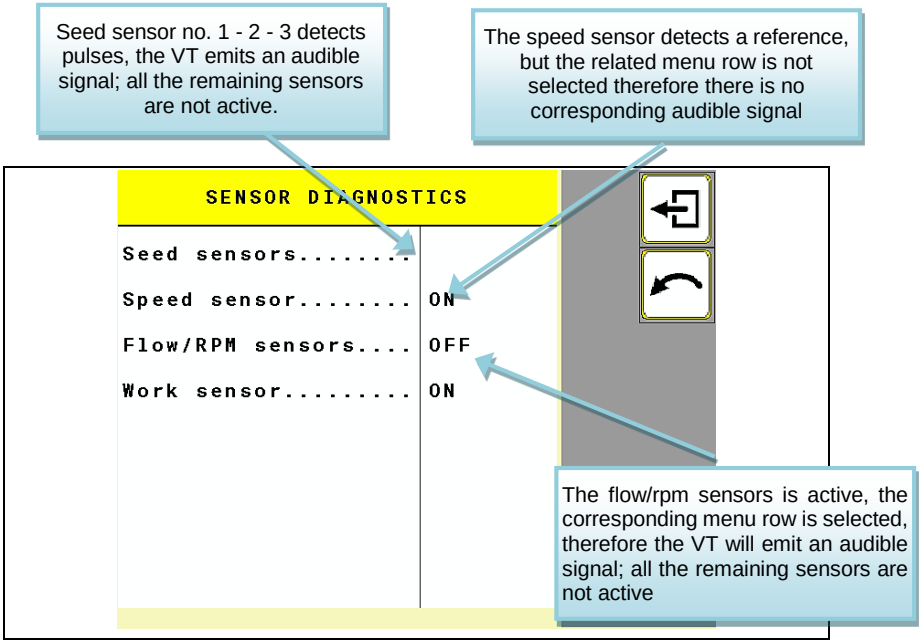


Figure 38 - Sensor diagnostics menu example screen.

Speed sensor

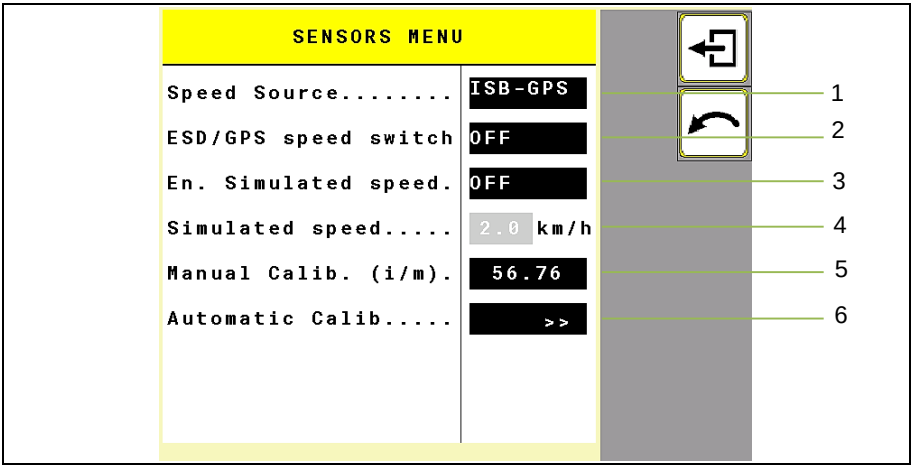


Figure 39 - Main screen of the Speed Source menu

You can set and calibrate the speed sensor from this menu:

1. **SPEED SOURCE**: selects the speed source.
   You can set the following configurations:
   - ***ECU ESD***: sensor connected to ESD Gateway ECU, the calibration will be measured in “number of pulses/m”
   - ***ISB - GND***: is the speed signal coming from the isobus network referred to the ground
   - ***ISB - WH***: is the speed signal coming from the isobus network referred to the ground
   - ***ISB - GPS***: is the speed signal coming from the isobus network referred to the gps antenna
2. **ESD/GPS SPEED SWITCH:** if the encoder sensor is installed on the machine, enable the function to switch automatically the speed source to the encoder if there isn’t GPS signal
3. **EN. SIMULATED SPEED**: enable the function to simulated a speed source directly by the terminal
4. **SIMULATED SPEED**: is the value of the simulated speed you want to set
5. **MANUAL CALIBRATION (i/m)**: you can manually indicate the speed sensor calibration value;
6. **AUTOMATIC CALIBRATION**: run the automatic calibration procedure

Speed sensor calibration

To run the speed sensor automatic calibration procedure, follow the path: User Settings > Speed Source, then press the AUTO key. N.B. This key can only be used when the "Calibration Ratio" field is selected.

The screen that is displayed is like the one shown in Figure 40.

The steps to take for proper calibration are as follows:

1. Position 2 indicators on the ground at a distance of 100 metres from each other.
2. Proceed as follows:

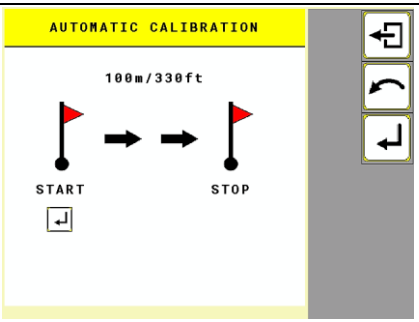
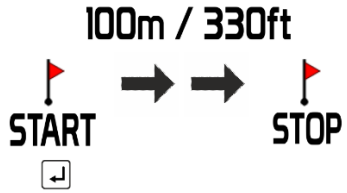
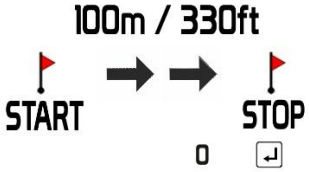
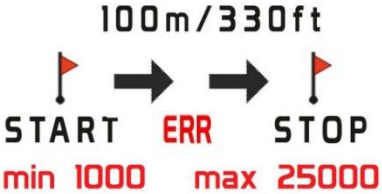
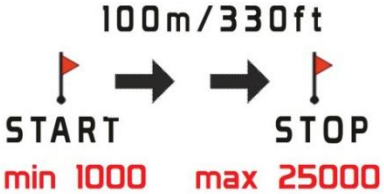


Figure 40- Speed source manual calibration screen

	
1)Take the tractor to the first reference point and press the ENTER key to start measuring	2)Move forwards with the tractor to the second point marked and press ENTER again to stop measuring, as in point 1;
	
3)if the pulses are not in the permitted range, an error message will be displayed as shown in the figure	4)If the calibration procedure continues with no errors, the pulses will be displayed automatically under the menu item Automatic Calibration, in the row under the words START – STOP.

4.1.2.4 RPM menu

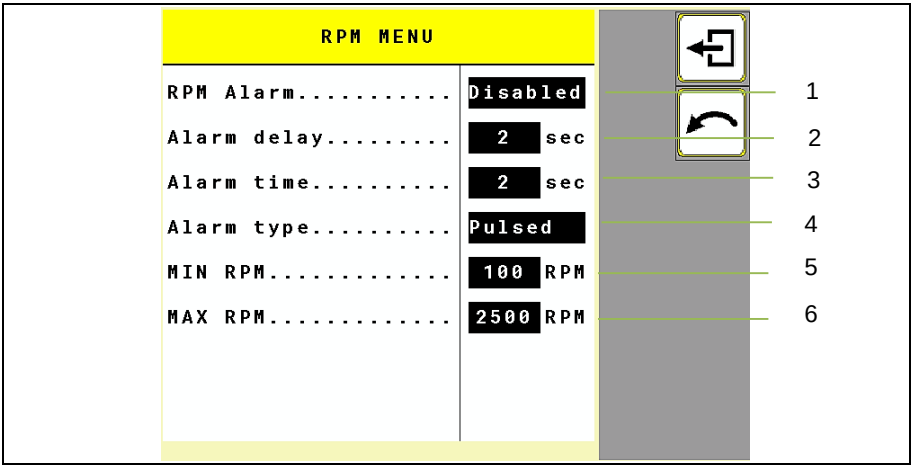


Figure 41 - RPM Menu example screen

The following parameters can be programmed in this menu:

1. **RPM ALARM**: RPM monitoring can be enabled/disabled (for example, the fan if the corresponding sensor is present), so that the ESD ISOBUS SYSTEM with ESD module signals the alarm.
2. **ALARM DELAY:** programs the minimum time for which the RPMs detected must be less than the minimum threshold (RPM MIN) or higher than the maximum threshold (RPM MAX) to trigger the alarm signal.
3. **ALARM TIME:** sets the duration of the RPM audible alarm signal.
4. **ALARM TYPE:** sets the type of RPM audible alarm.
5. **MIN RPM:** programs the minimum threshold under which the RPM alarm trips (if enabled).
6. **MAX RPM**: programs the maximum threshold over which the RPM alarm trips (if enabled).

4.1.2.5 Herbicide menu

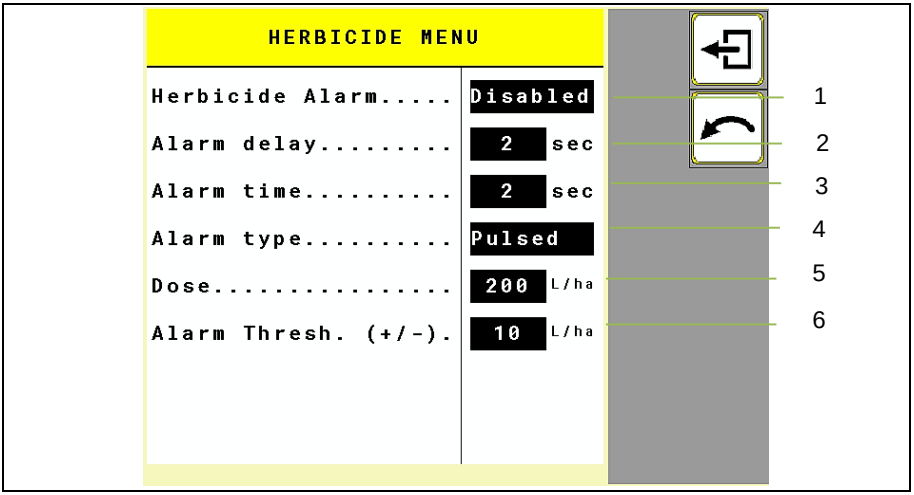


Figure 42 - Herbicide menu example screen

The following parameters can be programmed in this menu:

1. **HERBICIDE ALARM**: the quantity monitoring of litres/hectare l/ha (or gallons/acre GPA) of localised weed killer can be enabled/disabled (if the corresponding sensor is present), so that the ESD ISOBUS SYSTEM signals the alarm if the dose being distributed is lower or greater than the set tolerance.
2. **ALARM DELAY**: programs the minimum time for which the instantaneous dose is over the set tolerance, so as to trip the alarm.
3. **ALARM TYME**: sets the duration of the herbicide audible alarm signal.
4. **ALARM TYPE**: selects the type of herbicide alarm
5. **DOSE**: programs the reference dose for localised herbicide in litres/hectares or gallons/acres
6. **ALARM THRESHOLD [+/-]**: sets the maximum difference (in l/ha or GPA), beyond which the herbicide alarm trips (if enabled). For example, if the does is programmed at 100 l/ha and an alarm threshold of +/- 20 l/ha is programmed, the herbicide alarm will trip when the detected dose is lower than 80 l/ha (100-20l/ha) or greater than 120 l/ha (100+20l/ha).

4.1.2.6 Season counters

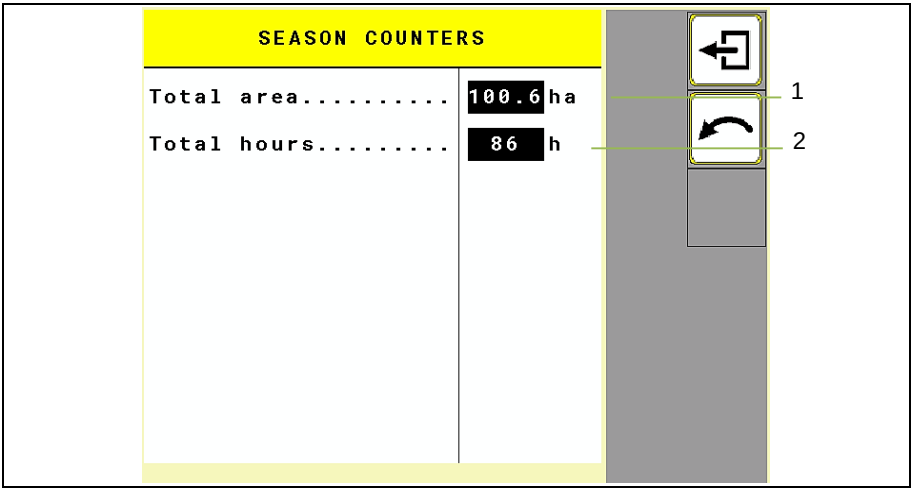


Figure 43 - Season counters menu example screen

Two additional overall counters are available, processed area and hours worked; these counters are increased independently from the set of selected work counters. These counters indicate the total machine work.

1. **TOTAL AREA**: indicates the total processed area in hectares (ha) or acres (A). The value can be reset by pressing the ENTER key.
2. **TOTAL HOURS**: indicates the total hours worked. The value can be reset by pressing the ENTER key; a message will appear requesting confirmation. Press ENTER again to reset.

4.1.2.7 Seed ESD Diagnostic

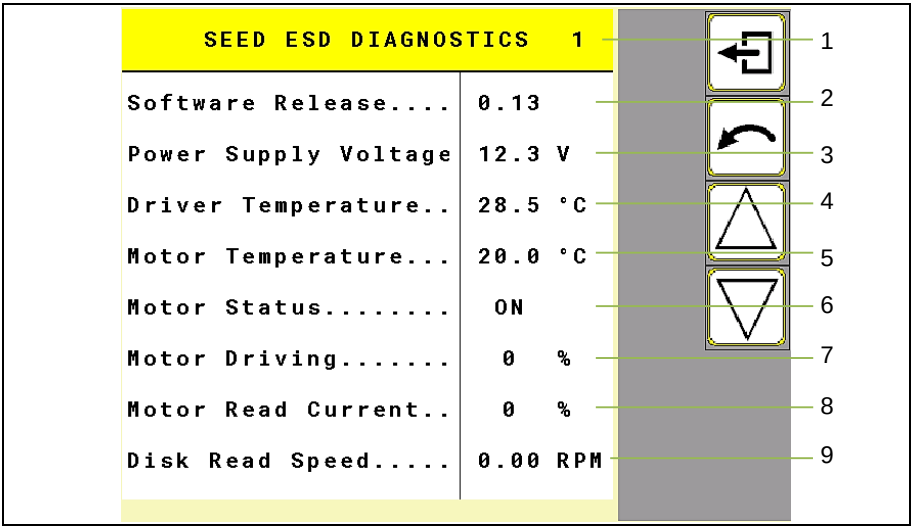


Figure 44- Seed ESD diagnostic screen

1. **ESD MODULE SELECTED:** number of module selected, to change the number of the motor selected press ▼▲ button
2. **SOFTWARE RELEASE:** version of software of the module selected
3. **POWER SUPPLY VOLTAGE:** voltage of the module selected
4. **DRIVER TEMPERATURE:** temperature of the ECU 10CEN-0019 of the module selected
5. **MOTOR TEMPERATURE:** temperature of the motor 10MTR-0001 of the module selected
6. **MOTOR STATUS:** operating reference of the module selected
7. **MOTOR DRIVING:** load percentage of the module selected
8. **MOTOR READ CURRENT:** current percentage of the module selected
9. **DISK READ SPEED:** angular speed of the disk

4.1.2.8 Reserved menu

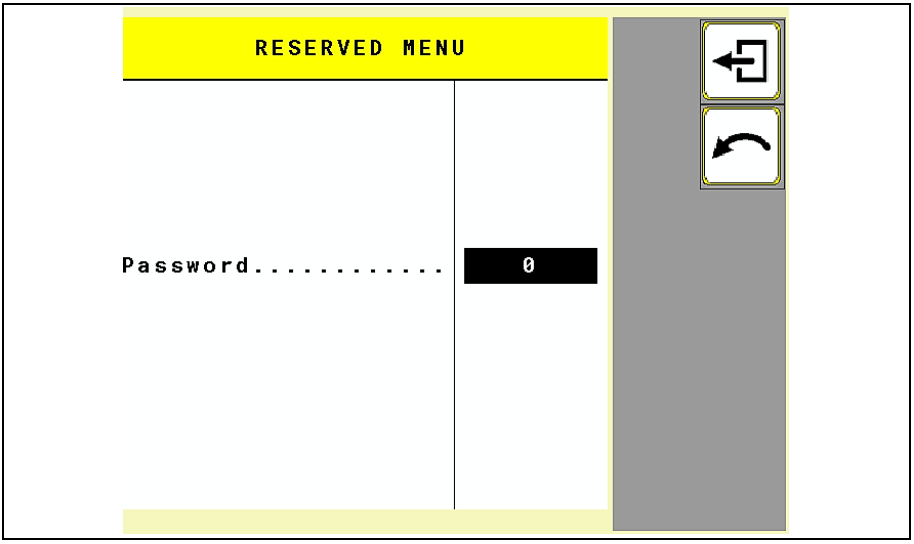


Figure 45 - Reserved Menu screen

To enter the password, you must use the ▼▲ keys to select the number, starting from the most significant digit, and confirming the desired value with the ENTER key. The procedure must be repeated for the 4 digits that make up the password. Pressing the ENTER key on the last digit verifies the entered credentials. If the password is not correct, the system automatically goes back to the “Menu” screen.

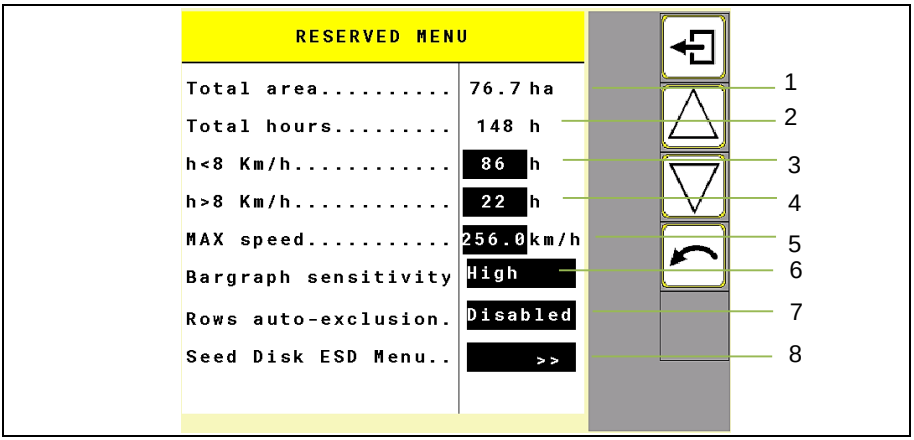


Figure 46 - Reserved menu page 1 example screen

1. **TOTAL AREA**: Total processed area
2. **TOTAL HOURS**: Total hours worked
3. **h<8 Km/h:** Indicates the number of hours worked at speeds greater than 8 Km/h
4. **h>8 Km/h**: Indicates the number of hours worked at speeds lower than 8 Km/h
5. **MAX SPEED**: Maximum allowed speed
6. **BARGRAPH SENSITIVITY**: Main screen graphic sensitivity
7. **ROWS AUTO-EXCLUSION**: File exclusion enabling / disabling
8. **SEED DISK ESD MENU:** Settings for ESD modules on seeding disc

4.1.2.9 Seed disk ESD menu

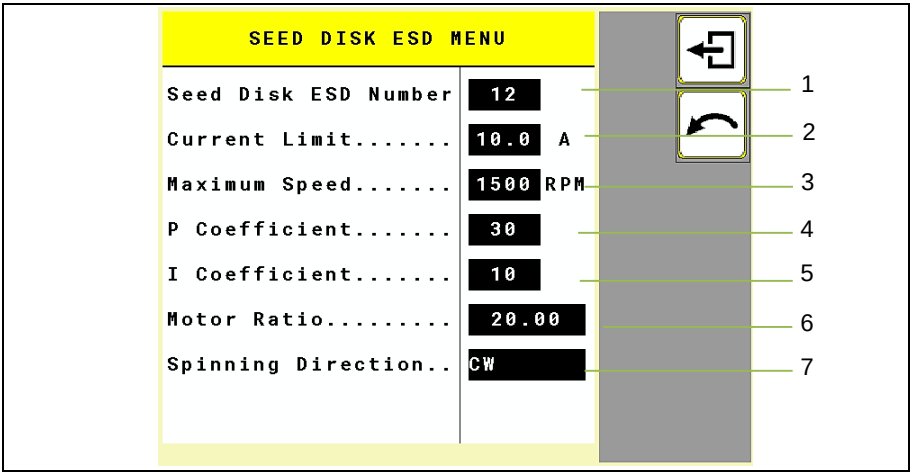


Figure 47 - Seed disc ESD menu example screen

1. **SEED DISK ESD NUMBER**: to enter the number of ESD modules that need to be controlled.
2. **CURRENT LIMIT**: maximum possible absorption per motor
3. **MAXIMUM SPEED**: maximum possible rpm per motor
4. **P COEFFICIENT**: system adjustment parameters
5. **I COEFFICIENT**: system adjustment parameters
6. **MOTOR RATIO** to enter the reduction ratio between motor and disc (if there is a chain).
7. **SPINNING DIRECTION**: to tell the system in what direction the gearmotor turns. [(CW = clockwise)(CCW = anticlockwise)]

4.1.2.10 Isobus Settings

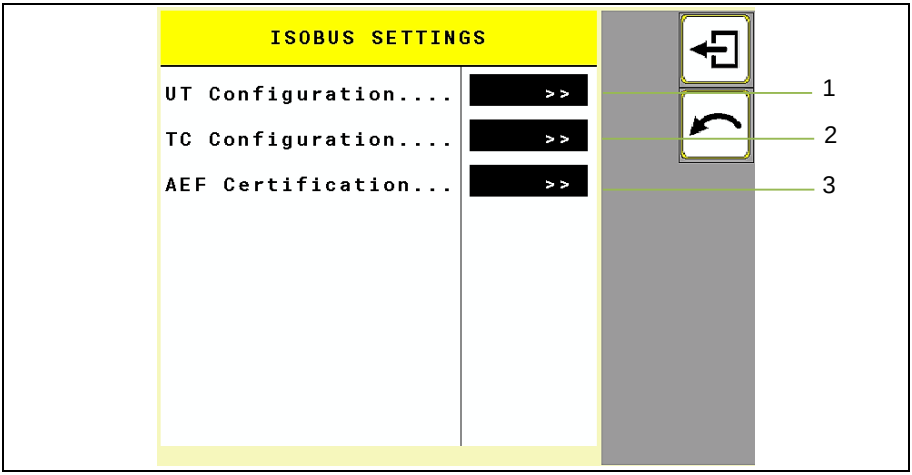


Figure 48 - Isobus settings screen

1. **UT CONFIGURATION:** access to the settings of the Isobus Universal Terminal
2. **TC CONFIGURATION:** access to the settings of the Isobus Task Control
3. **AEF CERTIFICATION:** access to the certification of the AEF

UT Configuration

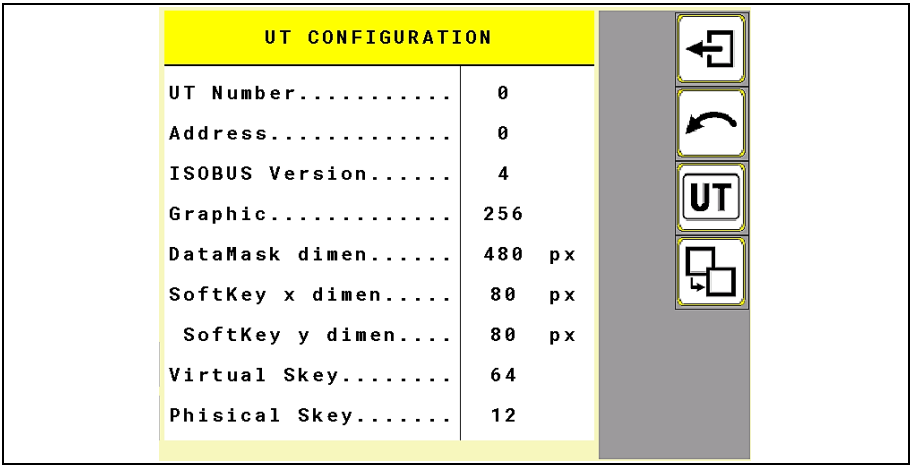


Figure 49 - UT configuration screen

Shows all the information related to the Isobus Universal Terminal.

TC configuration

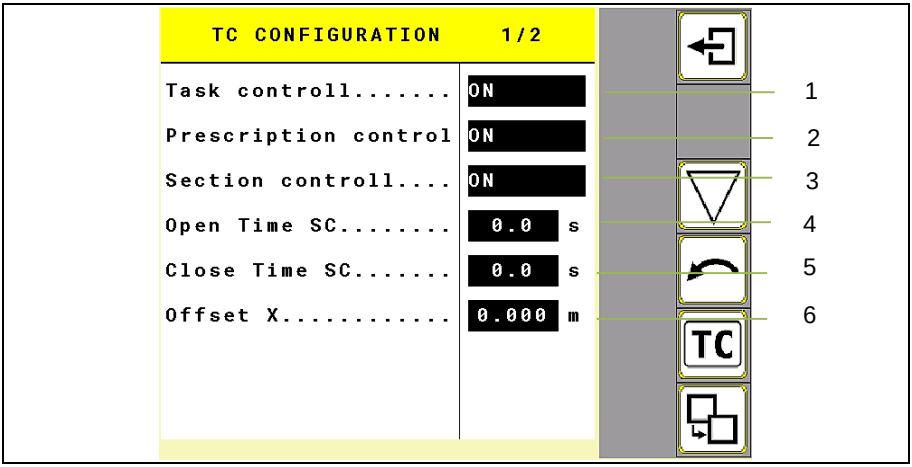


Figure 50 - TC configuration page 1

1- **TASK CONTROLL:** enable the task control function
2- **PRESCRIPTION CONTROL:** enable the prescription control function
3- **SECTION CONTROLL:** enable the section control function
4- **OPEN TIME SC:** set the advance time to the opening of the sections
5- **CLOSE TIME SC:** set the delay time to the closing of the sections
6- **OFFSET X:** set the distance between the GPS antenna and the position of the sections

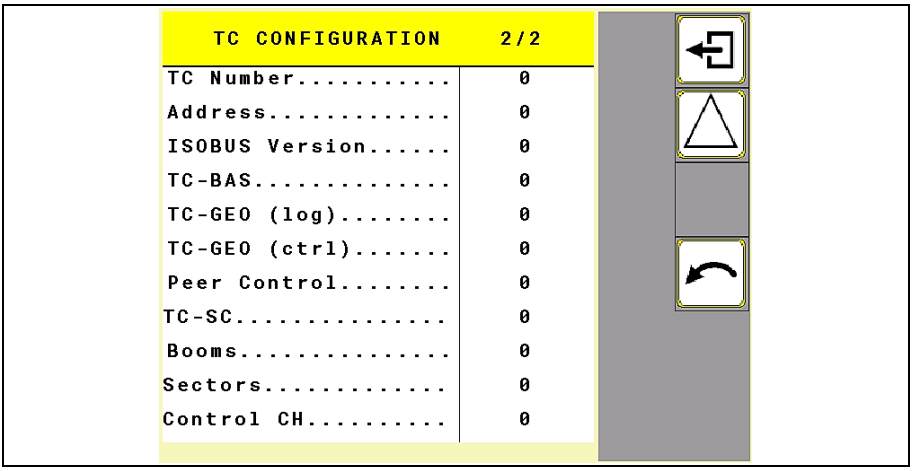


Figure 51 - TC configuration page 2

Shows all the information related to the Isobus Task Control.

AEF Certification

Figure 52 - AEF Certification Screen

Show all the information related to the Isobus AEF certification.

5. Programmable parameters

Field	Unit	Minimum	Maximum	Resolution	Default
Backlight	%	20	100	1	100
Buzzer volume	%	20	100	1	100
Language	-	0	6	1	0
Unit of measurement	-	0	1	1	0
Operating mode	-	0	1	1	0
Sowing distance (Counter)	cm	0.1	99.9	0.1	10.0
Seeding population (Counter)	seeds/m^2	0.1	99.9	0.1	13.3
Total hours	h	0	65535	1	0
Speed calibration coefficient	Pulses/m	0.1	999	0.01	100
Total area	ha	0.0	9999.9	0.1	0
Alarm threshold (Counter)	%	10	50	1	25
Alarm delay (Counter)	s	0	12	1	4
Alarm duration (counter)	s	1	10	1	2
Alarm type (Counter)	-	1	2	1	1
Alarm repetition (Counter)	s	10	240	1	15
Row scan (Counter)	s	0.2	12.0	0.1	2.0
Display stability (Counter)	-	0	50	1	0
Hours	h	0	23	1	0
Minutes	min	0	59	1	0
Day/night dimmer	h min	0 0	23 50	1 10	5 0

Field	Unit	Minimum	Maximum	Resolution	Default
Signal delay (Passage)	s	1.0	10.0	0.1	4.0
Alarm delay (Passage)	s	0	12	1	4
Alarm duration (Passage)	s	1	10	1	2
Alarm type (Passage)	-	1	2	1	1
Alarm repetition (Passage)	s	10	240	1	15
Fertiliser control (Fertiliser)	-	1	2	1	2
Signalling delay (Fertiliser)	s	1.0	10.0	0.1	4.0
Alarm delay (Fertiliser)	s	0	12	1	2
Alarm duration (Fertiliser)	s	1	10	1	4
Alarm type (Fertiliser)	-	1	2	1	1
Alarm repetition (Fertiliser)	s	10	240	1	15
Area locked sensor	-	1	2	1	2
RPM sensor	Pul/rev	1.0	20.0	0.1	2.0
Flowmeter sensor	Pul/litre	10.0	999.9	0.1	172.0
Counter selected	-	1	9	1	1
RPM alarm	-	1	2	1	2
RPM alarm delay	s	0	12	1	2
RPM alarm duration	s	1	12	1	2
RPM alarm type	-	1	2	1	1
RPM minimum threshold	RPM	0	9999	1	200
RPM maximum threshold	RPM	0	9999	1	2000
Herbicide alarm	-	1	2	1	2
Alarm delay (Herbicide)	s	0	12	1	2
Alarm duration (Herbicide)	s	1	12	1	2

Field	Unit	Minimum	Maximum	Resolution	Default
Alarm type (Herbicide)	-	1	2	1	1
Reference value (Herbicide)	l/ha	0	9999	1	200
Alarm threshold (Herbicide)	l/ha	1	999	1	10
ESD Function	-	1	2	1	1
Speed source	-	1	4	1	1
Nr. ESD Seeding disc (ESD seeding)	-	0	24	1	0
Proportional parameter (ESD seeding)	-	1	99	1	40
Integrative parameter (ESD seeding)	-	1	99	1	30
Motor reduction (ESD seeding)	-	1.00	655.35	1.0	66.67
Direction of motor rotation (ESD seeding)	-	1	2	1	1
Nr. ESD pesticide (ESD pesticide)	-	0	24	1	0
Proportional parameter (ESD pesticide)	-	1	99	1	40
Integrative parameter (ESD pesticide)	-	1	99	1	30
Motor reduction (ESD pesticide)	-	1.00	655.35	1.0	66.67
Direction of motor rotation (ESD pesticide)	-	1	2	1	1
Nr. ESD fertiliser (ESD fertiliser)	-	0	24	1	0

Field	Unit	Minimum	Maximum	Resolution	Default
Proportional parameter (ESD fertiliser)	-	1	99	1	40
Integrative parameter (ESD pesticide)	-	1	99	1	30
Motor reduction (ESD fertiliser)	-	1.00	655.35	1.0	66.67
Direction of motor rotation (ESD fertiliser)	-	1	2	1	1
Alarm Driver (ESD seeding)	-	1	48	1	OK
Low Voltage (ESD seeding)	-	1	48	1	OK
High Voltage (ESD seeding)	-	1	48	1	OK
High Temperature (ESD seeding)	-	1	48	1	OK
Current Limitation (ESD seeding)	-	1	48	1	OK
Speed Regulation (ESD seeding)	-	1	48	1	OK
Temperature Warning (ESD seeding)	-	1	48	1	OK
Alarm Driver (ESD pesticide)	-	1	48	1	OK
Low Voltage (ESD pesticide)	-	1	48	1	OK
High Voltage (ESD pesticide)	-	1	48	1	OK
High Temperature (ESD pesticide)	-	1	48	1	OK
Current Limitation (ESD pesticide)	-	1	48	1	OK
Speed Regulation (ESD pesticide)	-	1	48	1	OK

Field	Unit	Minimum	Maximum	Resolution	Default
Temperature Warning (ESD pesticide)	-	1	48	1	OK
Alarm Driver (ESD fertiliser)	-	1	48	1	OK
Low Voltage (ESD fertiliser)	-	1	48	1	OK
High Voltage (ESD fertiliser)	-	1	48	1	OK
High Temperature (ESD fertiliser)	-	1	48	1	OK
Current Limitation (ESD fertiliser)	-	1	48	1	OK
Speed Regulation (ESD fertiliser)	-	1	48	1	OK
Temperature Warning (ESD fertiliser)	-	1	48	1	OK

6. Alarms

The alarms are always displayed based on the priority of the message. They are following by a modulated audible signal to get the operator's attention regarding the problem that is then displayed on the screen.

When an alarm is generated in the ESD ISOBUS SYSTEM with ESD module, it can be due to various parameters that the system monitors during machine operation. The sensitivity, duration and tolerance threshold are defined in the specific programming menus described in paragraph 4.
The events that generate an alarm are listed below:

- The **operating mode** set to "Counter" allows us to make sure that the sowing distance and the seeding population correspond to the values the operator wants. Instead, if set to "Passage", the system verifies whether the seed passes within a certain interval.
- The ESD ISOBUS SYSTEM can be equipped with seed sensors for **fertiliser passage**; if it does not pass within a set time, it generates an alarm signal; the same goes for herbicide distribution monitoring.

7. Maintenance

This chapter gives instructions on how to carry out routine and special maintenance.
Routine maintenance refers to those operations which must be carried out periodically. As they do not require specific skills, they can be carried out by the users (operators, etc.).
Special maintenance refers to unforeseeable operations due to mechanic or electric failures. They require specific technical skills, so they should be exclusively carried out by qualified personnel (maintenance personnel etc.).

7.1 Routine maintenance

Routine maintenance consists in cleaning the instrument.
Clean the instrument with a wet cloth and mild detergent to avoid erasing the serigraphs on the panel.

Warning

- *Do not use pressurised water jets.*
- *Do not use abrasive products, solvents or alcohol.*
- *Do not use hard pointed objects to press on the keyboard.*

7.1.1 How to protect the main connector

If the monitor is not used for a long time, disconnect the main signal connector from the wiring. We recommend isolating both connectors (of the monitor and of the wiring harness) with Nylon. If they are not disconnected, no protection is needed.

8. Troubleshooting

In case of appliance malfunctioning, perform the simple checks below to find out what you need to do.
If the problem still remains after carrying out the suggested checks, contact your local dealer or *MC elettronica* Technical Service.

PROBLEM	CAUSE	SOLUTION
The Monitor does not turn on	a. The power cable is disconnected	a. Check the power cable
Sowing distance is not correct/constant	a. Incorrect positioning of seed sensors. b. Speed is not constant c. Incorrect calibration of ESD module parameters (see programming chapter)	a. Check seed sensor positioning: they must not obstruct seed dropping or the mechanical operation of the sowing element. b. See below
The Monitor does not recognised one or several seed sensors	a. Relative seed sensor cable interrupted b. One or several seed sensors have a different code compared to others	a. Restore connection b. Contact MC Elettronica Customer Services

9. Technical data

9.1 ECU Isobus

Power supply voltage	: 10 – 32 Vdc
Maximum power consumption (ECU only)	: 40 mA
Room temperature	: -20°C ÷ +70°C
Protection rating	: IP67
Communication line	: 2 x CAN BUS 2.0B
Dimensions	: 125 x 123 x 39

9.2 ECU gateway

Power supply voltage	: 10 – 16 Vdc
Maximum power consumption (ECU only)	: 400 mA
Room temperature	: -20°C ÷ +70°C
Protection rating	: IP67
Communication line	: 2 x CAN BUS 2.0B
Dimensions	: 119 x 134 x 35

9.3 Accessories

9.3.1 **Pipe seed sensors**

Power supply voltage	: 8 - 10 Vdc
Output signal	: 70 mA
Working temperature	: - 20°C / +70°C
Protection rating	: IP 67

9.3.2 **Bracket seed sensors**

Power supply voltage	: 8 - 10 Vdc
Rated current	: 70 mA
Working temperature	: - 20°C / +70°C
Protection rating	: IP 67

9.3.3 **Proximity sensor**

Power supply voltage	: 12 Vdc
Output signal	:Closed when turned (configurable)
Working temperature	: - 25°C / +75°C
Protection rating	: IP 67

9.3.4 **Speed encoder sensor**

Power supply voltage	:12Vdc
Output signal	:NPN 200 pulses/rev
Working temperature	: - 25°C / +70°
Protection rating	: IP 66

9.3.5 **Valve LB100**

Power supply voltage	: 10 - 16 Vdc
Rated current	: 600 mA
Working temperature	: - 20°C / +70°C
Protection rating	: IP 65

9.3.6 **ESD Module**

Power supply voltage	: 12 Vdc
Rated current	: 10.5 A
Peak current	: 15 A
Rated power	: 76 W
Rated output torque to shaft	: 5 Nm
Peak output torque to shaft without load (<500ms)	: 7.3 Nm
Rated output speed to shaft without load	: 173 RPM@12
Rated output speed to shaft	: 130 RPM@12V
Minimum output speed to shaft	: 13 RPM
Working temperature	: - 20°C / +70°C
Protection rating	: IP 65

CAUTION!!

DO NOT WASH USING A POWER WASHER WITH PRESSURE JET

Electronic equipment for agriculture

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