

Seeding control system with operator panel *Helios*⁰⁴

User manual

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Version 6



Table of contents

| | |
|--|-----|
| 1. Legend | 5 |
| 2. List of terms..... | 6 |
| 3. General Information..... | 8 |
| 4. System components | 10 |
| 5. Operator panel..... | 12 |
| 6. Basics of the graphical interface..... | 14 |
| 7. Brief instructions for use | 18 |
| 8. Work screens | 27 |
| 8.1. Main screen | 27 |
| 8.1.1. General description of the main screen..... | 27 |
| 8.1.2. Clock | 30 |
| 8.1.3. Indicator of the installed memory card | 30 |
| 8.1.4. Speed sensor indicator..... | 31 |
| 8.1.5. The indicator of the manual blocking of control of products application | 31 |
| 8.1.6. Tramline rhythm indicator | 32 |
| 8.1.7. Fan sensor indicator | 32 |
| 8.1.8. Hopper sensor indicator | 32 |
| 8.1.9. Dispenser sensor indicator | 33 |
| 8.1.10. Indicator of product application control by mass | 33 |
| 8.1.11. Pressure sensor indicator..... | 34 |
| 8.1.12. Low oil pressure sensor indicator | 34 |
| 8.1.13. The indicator of the no battery charge sensor | 35 |
| 8.1.14. Ignition key position sensor indicator | 35 |
| 8.1.15. Remaining fuel sensor indicator..... | 35 |
| 8.1.16. Air filter sensor indicator | 36 |
| 8.1.17. Bout markers sensor indicator..... | 36 |
| 8.1.18. Implement position sensor indicator | 37 |
| 8.1.19. A general indicator of actuator failures..... | 37 |
| 8.1.20. Diagram of section control sensors in “precise” control mode..... | 38 |
| 8.1.21. Diagram of section control sensors in “hybrid” or “by area” control mode | 41 |
| 8.1.22. Diagram of section control sensors in the “flow” control mode..... | 42 |
| 8.2. The “Actuators” screen | 44 |
| 8.2.1. General description of the “Actuators” screen | 44 |
| 8.2.2. Tramline actuator indicator | 45 |
| 8.3. The “Table” screen..... | 46 |
| 8.4. The “Statistics” screen..... | 53 |
| 9. Setting up the tramline rhythm | 63 |
| 10. List of alarm messages and troubleshooting methods..... | 68 |
| 11. Configuring the operator panel..... | 76 |
| 11.1. Enabling the “Agronomist” access level | 76 |
| 11.2. Procedure for configuring the operator panel | 78 |
| 11.3. Checking basic settings and availability of connection to devices | 82 |
| 11.3.1. Checking operator panel profile settings | 82 |
| 11.3.2. Checking connection to sensors | 83 |
| 11.3.3. Checking of the sensor control | 84 |
| 11.4. Configuring the operator panel’s profile | 87 |
| 11.5. Saving and loading settings for the current profile | 92 |
| 11.6. Saving and loading profiles from a SD card | 94 |
| 11.7. General settings of the operator panel | 97 |
| 11.8. Configuring sensors | 105 |

| | |
|--|-----|
| 11.8.1. Switching to sensor setup mode..... | 105 |
| 11.8.2. The sensor status view screen..... | 105 |
| 11.8.3. Configuring the speed sensor..... | 107 |
| 11.8.4. Speed sensor calibration..... | 111 |
| 11.8.5. Configuring the hopper sensor..... | 113 |
| 11.8.6. Configuring the dispenser sensor..... | 114 |
| 11.8.7. Calibrating the dispenser for measuring the weight of the product..... | 118 |
| 11.8.8. Calibrating the dispensers to control the speed of its rotation..... | 120 |
| 11.8.9. Configuring the fan sensor..... | 122 |
| 11.8.10. Configuring the pressure sensor..... | 123 |
| 11.8.11. Configuring seed sensors..... | 125 |
| 11.8.12. Configuring the dry fertilizers sensors..... | 129 |
| 11.8.13. Configuring the liquid fertilizers sensors..... | 129 |
| 11.8.14. Configuring the implement position sensor..... | 132 |
| 11.8.15. Configuring the ignition key position sensor..... | 133 |
| 11.8.16. Configuring the low oil pressure sensor..... | 134 |
| 11.8.17. Configuring the battery charge sensor..... | 134 |
| 11.8.18. Configuring the remaining fuel sensor..... | 134 |
| 11.8.19. Configuring the air filter sensor..... | 134 |
| 11.8.20. Configuring the bout marker sensor..... | 135 |
| 11.8.21. Configuring the tramline actuator..... | 136 |
| 12. Configuring devices..... | 138 |
| 12.1. Procedure before configuring devices..... | 138 |
| 12.2. Seed sensors..... | 141 |
| 12.3. Pressure sensor..... | 143 |
| 12.4. Input device “Concentrator-8”..... | 145 |
| 12.5. Tramline actuator..... | 147 |

1. Legend



A note is used to highlight additional information, such as a description of additional features.



A warning is used to highlight important information that must be remembered.



Applies to menu items or options that are always available to user ("Operator" access level).



Applies to hidden menu items or options that require "Agronomist" access level.¹

PIN code: 88888



Used to describe the actions of function buttons.

Indicates that to activate the required function, you have to quickly press and release the button.



Used to describe the actions of function buttons.

Indicates that to activate the desired function, you have to press and hold the button until the function is performed.

¹ The access level is changed in the main screen's menu of the "Settings" in the item "User" (see subsection 11.1 on pg. 76). It is designed to prevent accidental changes of important parameters affecting the correct functioning of the system.

2. List of terms

- **Products application control** - before the system begins to control alarm deviations of data values from various sensors related to the product application process, certain criteria must be met, those are described on page 24. When these criteria are met, the system begins to monitor deviations of such data values outside the permissible limits. For example, the lack of seed flow through one of the seed sensors, or the fan's rotation speed is too low. If such alarm situations are detected, the system will display an alarm notification and sound an alarm.
- **Target rate** - a given target level of rate of application of the product relative to which the system controls the actual rate of application of the product. In case of detection of an excessive deviation from the target rate during the control of the application of products, the system displays an alarm message and emits a sound signal.
- **Minimum permissible level of actual rate** - the value of the minimum permissible level of the actual rate of the product's application. If, during the monitoring of the product's application, the actual rate of the product's application is found to be less than this value, the system displays an alarm message and emits a sound signal.
- **Product application path interval** - is a segment of the path during which information about skips, doubles and other data is accumulated for display in the table and diagrams. The length of the path segment is set by the operator before starting work with the "Recalculation, m" parameter in the settings of the section control sensor group (see subsection 11.8.11 on page 125 and subsection 11.8.13 on page 129).
- **Seed sensor** - a sensor designed to monitor the actual rate of seed application and its calculation according to the section of the seeding machine on which it is installed. It is also able to count the number of doubles and skips. High accuracy of seed counting is possible only for planters, where the rate of seeds application is relatively low, and the flow of seeds is rarefied. On seeding drills, accuracy decreases depending on the actual rate of the flow and usually the sensor readings are used only to determine the uneven distribution of seed flows between sections or its disappearance.
- **Dry fertilizer sensor** - a sensor designed to monitor the actual rate of application of dry granular fertilizers by section on a seeding machine, cultivator or any other implement. The dry fertilizer sensor is the same device as the seed sensor.
- **Liquid fertilizer sensor** - a sensor designed to monitor the actual rate of application of liquid fertilizers and calculate the volume of liquid fertilizers applied to the field by the section of the implement on which it is installed. The accuracy of the product count depends on the type of sensor and its settings.

- **Section control sensor** - common name for seed sensor, dry fertilizer sensor or liquid fertilizer sensor. Usually, these sensors are installed on each section of the implement.
- **Speed sensor** - a sensor designed to measure the speed of movement of the implement, calculate the distance traveled and other dependent values such as area, product application rates, etc.
- **Dispenser sensor** - a sensor designed to control the rotation of the shaft of the centralized seed metering device.
- **Fan sensor** - a sensor designed to control the speed of rotation of the fan.
- **Pressure sensor** - a sensor designed to control pressure, namely boost or vacuum, depending on the connection method.
- **Hopper sensor** - sensor designed to control the filling level of the hopper with seeds or dry fertilizers. In a case when the product level in the hopper decreases below the place where the sensor is installed, the system will display a message and emit a sound signal.
- **Implement position sensor** - a sensor designed to determine the current position of the implement - working or transporting.
- **Marker sensors** - sensors designed to determine the current position of mechanical bout markers. They are used to automatically switch the number of the run in the tramline rhythm.
- **Tramline** - a separate movement zone from plant processing zones. It is made by cutting off one or more sections of the seeding machine while moving on one of the runs of the tramline rhythm.
- **Tramline rhythm** - the sequence of seeding machine runs on the field, with the designation of those runs on which a certain section or several sections should not sow.
- **Tramline actuator** - the device, the full name of which is the actuator controller for tramline making. It controls the actuator stroke rod to cut off the flow of product application by the sections to which it is connected. Optionally, two sensors compatible with the input device can be connected to this controller. In most cases it's connected with sensors for monitoring the position of the left and right markers for making a guide line.
- **Input device** (also known as concentrator) - it is a device that monitors the status of several sensors (without its own controller) connected to it and provides access to this information in the RS-485 network.

3. General Information

Seeding control system with operator panel Helios⁰⁴ (hereafter the system) developed by the research and production company “Monada” taking into account the recommendations and wishes of manufacturers and distributors of agricultural machinery, using the latest achievements in the fields of agriculture and information technologies. The system is manufactured from imported components at its own production base. The system is designed to control the sowing process, application of dry and liquid fertilizers on mounted or trailed implements, such as a seeding machine, cultivator and others.

System features:

- accounting of the cultivated area with a division into the sown area and the unsown area due to skips;
- keeping detailed statistics on the sowing process;
- saving reports to a microSD card²;
- seed sowing control in accordance with the target rate set by the operator with a notification in case of deviation of the actual sowing rate from set target rate;
- notification in case of clogging or lack of seed flow into the seed tube with indication of its number;
- counting the number of seeds, doubles and skips on row drills;
- control and display of the passage of dry fertilizers through the tubes;
- notification when the actual rate of application of dry fertilizers is reduced;
- notification in case of clogging or lack of flow of dry fertilizers through the tube with indication of its number;
- control and display of the flow of liquid fertilizers through the tubes with a notification when the actual rate of the application of liquid fertilizers is reduced;
- notification in case of clogging or lack of flow of liquid fertilizers in the tube with indication of its number;
- notification in case of low seed or dry fertilizer level in hoppers;
- notification in case of no rotation of the central metering device shaft of seed or dry fertilizer;
- optionally, the system can control the speed of rotation of the central metering device shaft depending on the speed of movement with a notification in case of deviation from the target speed;

² The report contains only data from the statistics screen at the time the report was generated. Only FAT16 or FAT32 formatted memory cards are supported.

- optionally, the system can keep track of the mass of the product applied by the central metering devices with an alert when the actual rate of application of the product deviates from the specified target rate;
- display of air rarefaction and notification in case of deviations from the set limits;
- display of air pressure at the exit from the turbine and notification when it deviates from the specified limits;
- control of the fan rotation speed and notification in case of deviations from the set limits;
- movement speed control with notification in case of deviation from the set limits;
- control of the sensors of the autonomous fan drive engine³:
 - low oil level;
 - no battery charge;
 - ignition;
 - low fuel level;
 - clogging of the air filter;
- control of the working and transport positions of the implement by the sensor;
- making of a tramline by using actuators;
- it is also possible to perform only control of section sensors in the tramline control mode in case when the implement is equipped with a third-party system for tramline making;
- control over the position of mechanical markers that make a guide line on the ground for the next run to automatically switch the run number in the tramline rhythm;
- updating the software of devices installed in the system from a microSD card.

³ Optional sensors for the fan drive engine on seeding machines produced by ELVORTI.

4. System components

The minimum configuration of the system includes the following devices:

- operator panel Helios04 (see Figure 1, p.1);
- seed sensors⁴ (see Figure 1, p.2).



Figure 1 Operator panel and seed sensors



In addition to the specified devices, the delivery set includes communication cables, a power cable, accompanying documentation and other necessary components. The complete list is contained in the passport for the system being purchased.

The system may also include the following devices:

- dry fertilizers sensors⁵ (see Figure 1, p.2);
- air pressure or vacuum sensors (see Figure 2, p.1);
- input device (see Figure 2, p.2) - depending on the model, you can connect up to 8 different sensors, and if necessary, any number of input devices can be included in the system;
- tramline making actuators⁶ (see Figure 2, p.3) - it is possible to connect up to 2 additional sensors to the actuator controller.

⁴ The minimum number of seed sensors is 2 pcs. Installation is possible for each section or selectively at the discretion of the consumer. You can familiarize yourself with the types of sowing sensors on the website www.monada.ks.ua in the [catalog](#) or by contacting the manager using the contact information on the back of this manual.

⁵ From a technical point of view, the same sensors can be used to control the seeding sections and the dry fertilizer sections.

⁶ The maximum number of tramline creation actuators is 4 pcs.



Figure 2 Appearance of optionally available devices

The following sensors can be connected to the input device or the actuator controller for a tramline making:

- speed sensor⁷ (see Figure 3 p.1);
- hopper sensors (see Figure 3 p.2);
- dispenser sensors⁸(see Figure 3 p.1);
- fan sensors⁹ (see Figure 3 p.1);
- marker position sensors¹⁰ (see Figure 3 p.1);
- liquid fertilizer sensors¹¹ (see Figure 3 p.3).



*The latest models of the input device, allow to connect already existing seed sensors manufactured by **DICKEY-John, Kuhn, Gaspardo** and others to the system. You can find out about the possibility of connecting sensors from the manager, using the contact information on the back of this manual.*



Figure 3 Example of sensors that can be connected to the input device

⁷ The seeder speed sensor can also be connected directly to the operator panel, without the need to purchase additional devices. An inductive sensor, GPS or radar can be used to measure the speed of movement.

⁸ Dispenser sensors are used to control central metering device shaft rotation. The total number of the dispenser sensors, hoppers filling level sensors the and sensors of the fan drive engine is no more than 12 pcs.

⁹ The total number of fan rotation sensors cannot exceed 2 pcs.

¹⁰ To determine the position of markers, the system can use one or two sensors (using two sensors is recommended). The following sensors are optionally available: inductive, mechanical or hydraulic.

¹¹ If the number of sections of liquid fertilizers exceeds 8 pieces, then additional input devices are added to the system.

5. Operator panel

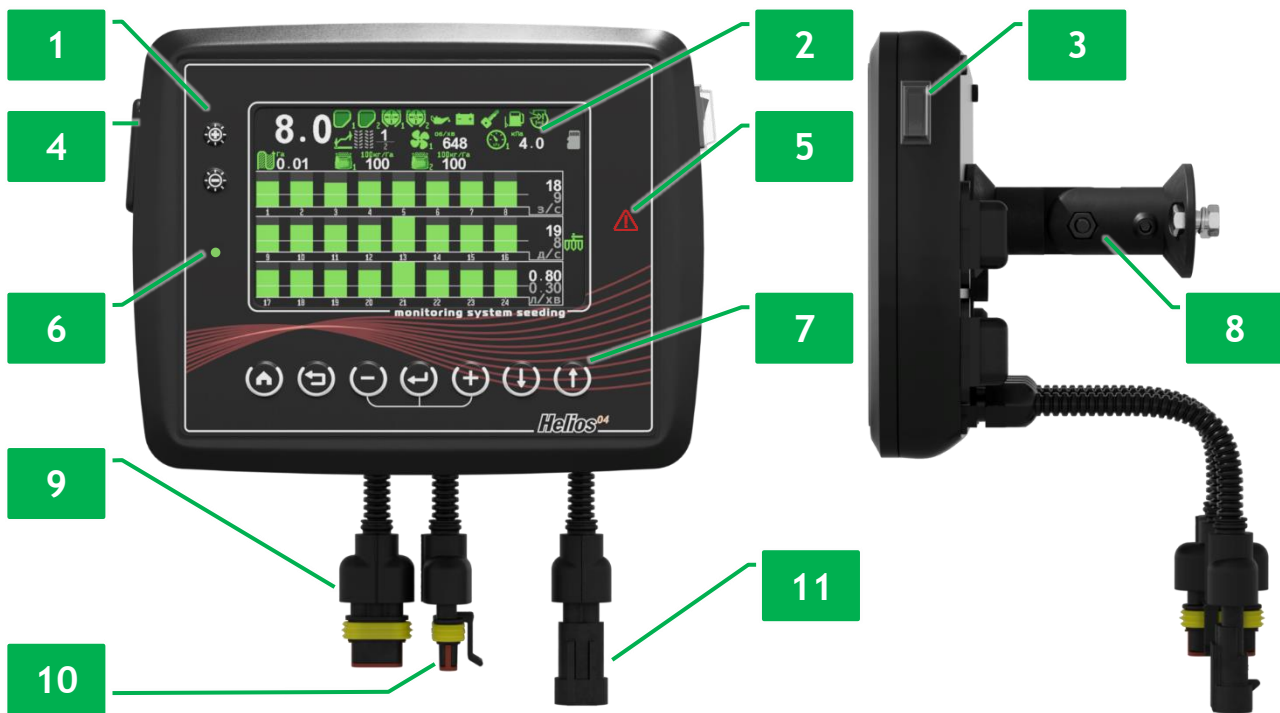


Figure 4 Operator panel

The appearance and controls of the operator panel are shown in the “Figure 4”. The operator panel consists of the following elements:

- power switch (see Figure 4 p.3);
- power indicator (see Figure 4 p.6);



If the polarity is mixed up when connecting to the tractor's on-board network, the power indicator glows red. If the polarity is correct, the indicator glows green.

- operator panel mounting bracket (see Figure 4 p.8);



The design of the bracket allows you to install the operator panel on a flat surface with any horizontal and vertical inclination. The system can be equipped with an additional bracket to attach the devices to the pipe.





























- operator panel control buttons (see Figure 4 p.1 and p.7). Their graphic icons, name and brief description are contained in “Table 1”;
- operator panel screen (see Figure 4 p.2);
- microSD memory card slot (see Figure 4 p.4);
- cable input of the speed sensor harness (see Figure 4 p.9);
- RS-485 communication harness cable input (see Figure 4 p.10);
- cable input of the power harness (see Figure 4 p.11);
- alarm indicator (see Figure 4 p.5).



If an alarm situation is detected by any monitored parameter, the alarm indicator flashes red at 2-second intervals.

Also, the alarm indicator will flash with a high frequency if the system is in the setup mode (access level “Agronomist” is selected). In this case, most alarm notifications are not displayed on the screen.

Table 1 Operator panel control buttons


| Button | Description |
|---|--|
|  Increase brightness |  Increase the brightness of the screen backlight.  Blocking control of the products application (works on any screen). |
|  Decrease brightness |  Decrease the brightness of the screen backlight. |
|  Home |  Cyclic switch of work screens.  Close alarm messages.  Quick move to the main screen.  Blocking control of the products application (only works on the main screen). |
|  Back |  Return to the previous menu or screen.  Return to the main screen from the work screens.  Exit sensor setup mode.  Activation of the feature of automatic calculation of the minimum permissible actual rate level for the section control diagrams. |
|  Minus |  Decrease the value of the selected parameter.  Disable control of the selected sensor. |
|  Menu |  Call a menu or activate an action.  Switch to sensor setup mode. |
|  Plus |  Increasing the value of the selected parameter.  Enable control of the selected sensor. |
|  Down |  Select the next window or menu item. |
|  Up |  Select the previous window or menu item. |

6. Basics of the graphical interface

Immediately after turning on the power, the loading screen with the logo appears on the operator panel screen¹² (see Figure 5). It is displayed until the operator panel establishes communication with all devices connected to it. This process takes a few seconds. After it the operator panel goes to the “Main screen” (see Figure 6 p.1).



Figure 5 Loading screen

Information about the work of the system, necessary for the operator, is placed on the work screens (see Figure 6). Cyclic switching of work screens is carried out using a  “Home” button.

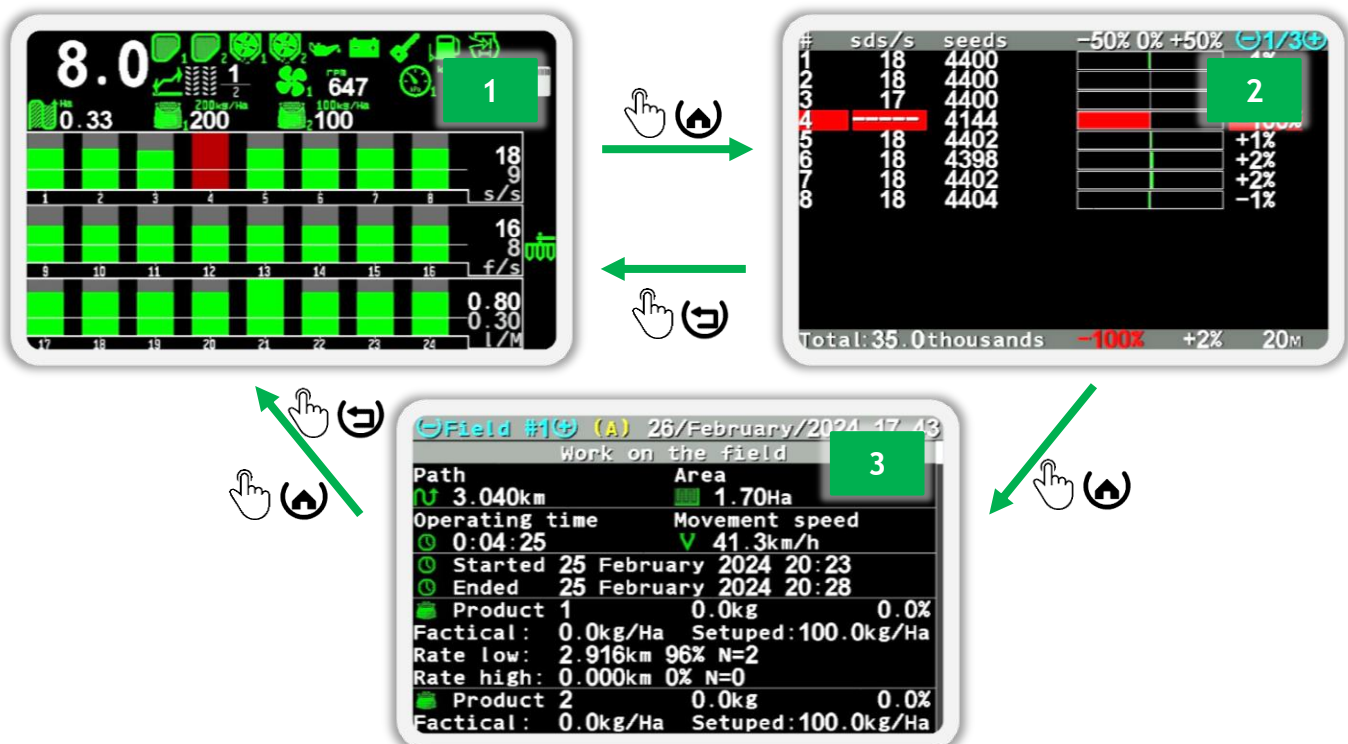


Figure 6 Scheme of switching between work screens


¹² The appearance of the logo on the boot screen depends on the system vendor and may differ from the image shown.

There are usually three work screens available:

- main screen (see Figure 6 p.1);
- “Table” screen (see Figure 6 p.2);
- “Statistics” screen (see Figure 6 p.3).

But in the case when the system is equipped with actuators for tramline making, a fourth screen is added on which the indicators of the actuators of the tramline are displayed.

Changing the system parameters is carried out using the menu and the context menu.

The context menu opens with a  “Menu” button in sensor setup mode. The selected element of the screen is highlighted by a white rectangle (see Figure 7).

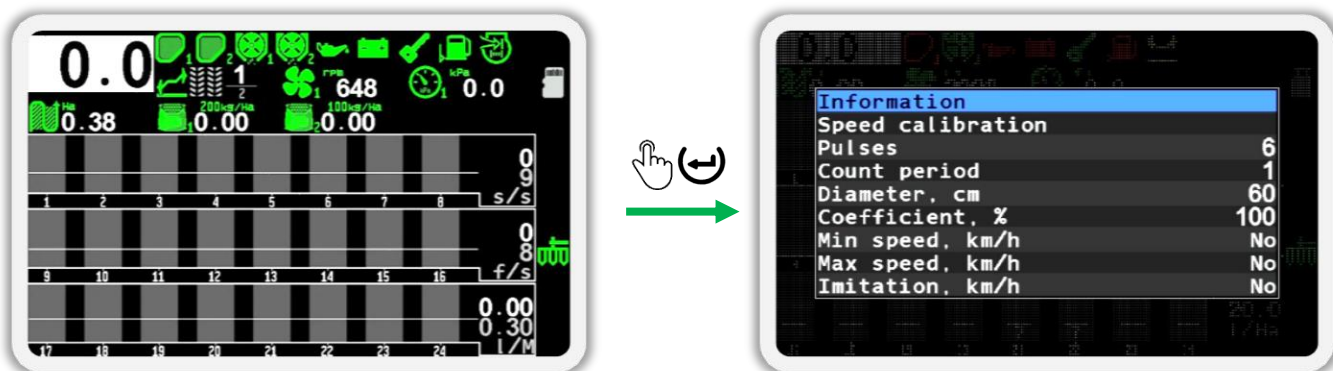




Figure 7 Opening the context menu of the speed sensor



To switch to sensor setup mode on the main screen you have to press the  “Menu” button for a few seconds.














The menu is opened by pressing the button  “Menu” from the screen in which it is provided. The selected menu item is displayed in black text on a blue background (see Figure 8). The transition from one menu item to another is performed with the buttons  “Up” or  “Down”.



Figure 8 Appearance of the menu

If a menu item allows you to perform any action, it will be described in the relevant sections and subsections of this manual. The action for the selected menu item is called by pressing the  “Menu” button. If a menu item is intended to jump to another menu, it contains an icon  on the right side (for example, item  “Change Date/Time” on Figure 8).

If the menu item is intended for changing a certain parameter, when such a menu item selected, this parameter will be surrounded by the symbols “-” and “+”. To change it, you have to use the buttons  “Plus” or  “Minus”. For example, items  “Brightness”,  “Language”,  “Buttons sound” and others are shown on Figure 8.

When selecting some numerical parameters, the numerical value is additionally surrounded by square brackets “-[” and “]” (see Figure 9 on the left). In this case, when the button  “Plus” or  “Minus” is pressed a window for entering numbers will be displayed (see Figure 9 on the right).

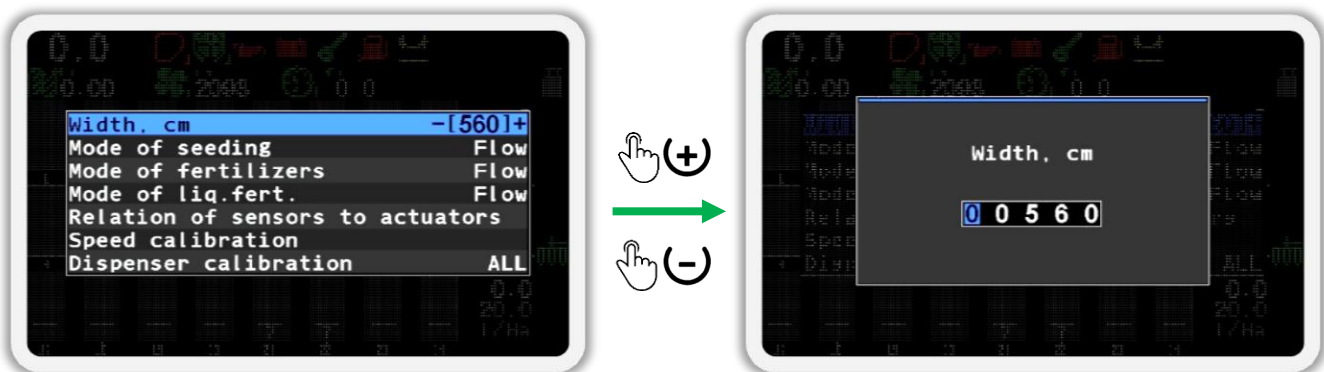






Figure 9 Window for entering numbers

The window for entering numbers usually contains the name of the parameter, as well as a field for entering a number. A digit that can be changed is displayed in black on a blue background. To change its value use buttons  “Plus” or  “Minus”, to move to another number use buttons  “Up” or  “Down”.

Some user actions require confirmation. For this, a message window is used, in which you have to press the button that corresponds to the confirmation of the selected action or the button that cancels the action if it was accidentally called. An example of such a window is shown on Figure 10.

Also, message boxes are often used to display the results of actions. Such windows may be closed automatically or after pressing any button.

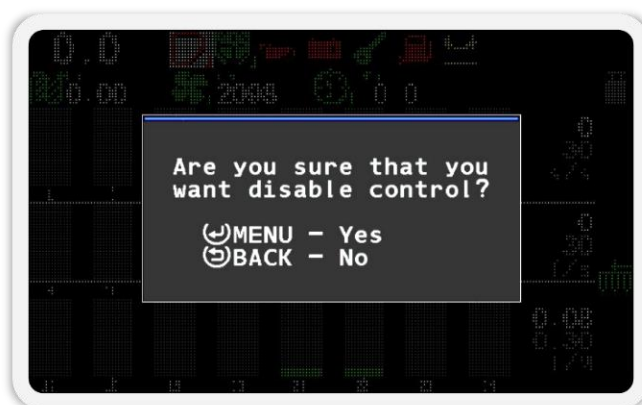


Figure 10 Message window

Alarm messages are used to notify about an accident. An example of an alarm message window is shown on Figure 11.

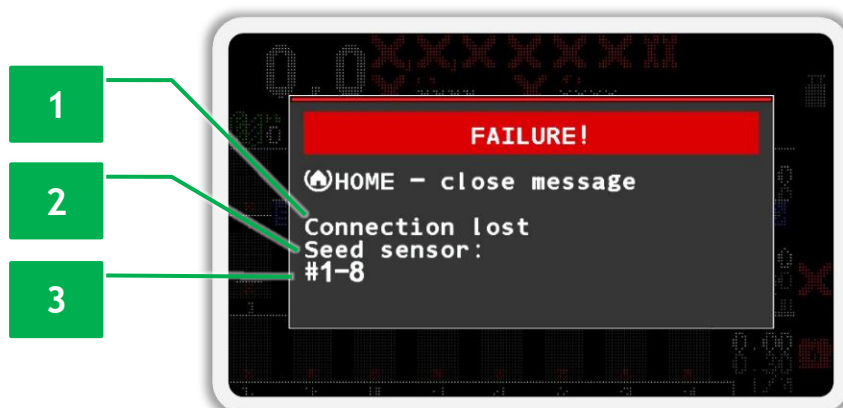



Figure 11 The window of an alarm message

The alarm message window contains the following information:

- [1] text describing the accident;
- [2] the type of sensor that recorded the accident;
- [3] a list of sensor addresses in case there are several identical sensors in the system and an accident of the same type is recorded for them.

To close the alarm message window, press the  "Home" button.



A list of all alarm messages and troubleshooting methods is described in section 10 "List of alarm messages and troubleshooting methods" (page 68).



If the alarm window is displayed, the operator's panel emits periodic sound and lights¹³ signals.

¹³ The alarm light indicator is shown on "Figure 4" p.5

7. Brief instructions for use







The instructions described in this section are universal, so take into account that the list of actions on your equipment may be much smaller, depending on the configuration of the system.





When setting up the sensors, you need to remember that for all types of sensors, you have to set the parameters separately for each of them. The exception to this rule is the seed sensors group, the dry fertilizer sensors group, and the liquid fertilizer sensors group. Almost all of their parameters are common to each group of sensors, except for two: sensor control and “Product application”.

Before starting work in the field, the following calibrations must be performed:

-  calibration of the speed sensor (Article 11.8.4 “Speed sensor calibration”);
-  calibration of dispenser sensors (see subsection 11.8.7 on page 118 and subsection 11.8.8 on page 120). It is carried out if there are appropriate sensors in the profile and only if it is necessary to control their speed of rotation depending on the speed of movement, or if they must be controlled by the weight of the application of the product on the area.

If the system is equipped with tramline actuators, check the tramline rhythm settings. Turning on, off and adjusting the tramline rhythms are located in the main menu “ Settings >  Tramline” (see subsection 9 on page 63).

After that, go back to the main screen. If the feature of tramline making is enabled, then check whether the mode of automatic switching of the run is enabled. Also, check the active run number on the tramline rhythm indicator  , that is displayed at the top. Number at the bottom of this indicator display total number of runs in tramline rhythm. The active run number control menu is opened by a short press of the  “Back” button on the main screen.


When automatic switching of the run number is possible the menu will look like shown in Figure 12.



| | |
|----------------|-----|
| Auto-switching | Yes |
| Active bout | -1+ |

Figure 12 Appearance of the run number management menu when automatic switching of the run number is available

Automatic switching of the active run number to the next one is possible only if three conditions are met:








- 1) the  "Auto-switching" parameter is set to "Yes";
- 2) the system was performing product application and stopped doing so after some time;
- 3) after stopping, one of the following conditions must be met:
 - or there are markers in the system profile and the position of the markers has changed;
 - or the implement position sensor has changed its state from working on the transport and the marker sensors are absent in the system profile.



When automatic switching of the active run number is not possible, the menu looks like shown in “Figure 13”. To switch the run number to the next one, select the  “Next bout” menu item and press the  “Menu” button.


| | |
|-------------|-----|
| Next bout | Yes |
| Active bout | -1+ |


Figure 13 Appearance of the run number management menu when automatic switching of the run number is not available

Next, it is necessary to check the sensor parameters that change depending on the operating mode. To do this, it is necessary to switch the main screen to the sensor setup mode by pressing the   “Menu” button for a couple of seconds (see subsection 11.8.1 on page 105). Switching from one sensor indicator to another is done by pressing the  “Up” or  “Down” buttons. The context menu is opened by pressing the  “Menu” button.



For **speed sensor** check the settings (see subsection 11.8.3 on page 107):


-  “Min speed, km/h”;
-  “Max speed, km/h”.



For each **dispenser sensor**  check the following settings (see subsection 11.8.6 on page 114):


-  “Period, s”.



If weight control of product application is enabled for the dispenser sensor and the calibration values for the selected seed-metering drum are known, then instead of performing the calibration procedure, these values can be entered manually in the following two parameters:

-  “Weight, g”;
-  “Weight, impulses”.




For each *fan sensor*  check the following settings (see subsection 11.8.9 on page 122):

-  “Minimum, rpm”;
-  “Maximum, rpm”.


For each *pressure sensor*  check the following settings (see subsection 11.8.10 on page 123):

-  “Minimum, Pa”;
-  “Maximum, Pa”.



For the groups of *seed sensors* and *dry fertilizer sensors* check the following settings (see subsection 11.8.11 on page 125):

-  “Faction”;
-  “Correction”;
-  “Recalculation, m”.




If the sensors of the seeding group or the dry fertilizer group are set to work in the “precise” control mode ¹⁴ or “hybrid”, then check the parameter:

-  “Rate error, %”.

For the group of *liquid fertilizer sensors* check the following settings:

-  “Recalculation, m”;
-  “Pulses per liter”.

Recommended values for “Wilger” flowmeters for the selected jet:



-  red - 8900 pulses per liter;
-  green - 15500 pulses per liter;
-  blue - 3400 pulses per liter.

If the sensors of the group of liquid fertilizers are configured to work in the “area” control mode, then also check the parameter:

-  “Rate error, %”.

¹⁴ The “precise” seed control mode allows you to monitor doubles and skips.

Now look carefully at the section sensor diagrams and check **individual sensor settings** such as:

-  Sensor control¹⁵;
-  “Product application”.

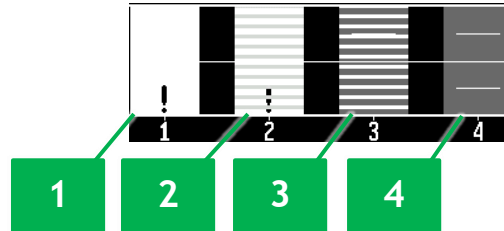





Figure 14 Display options for individual section control settings





- [1] -the control of the section sensor is disabled, but the product must be applied;
- [2] -section sensor control is disabled and product application is disabled;
- [3] -section sensor control is enabled, but product application is disabled (tramline control mode);
- [4] -the control of the section sensor is on and the product must be applied.

If the main screen is in sensor setup mode (the selected sensor is highlighted by a white rectangle), you should switch to system control mode. To do this, click on the  “Back” button.

Now, you have to go to the “Statistics” screen and make sure that the desired active field is selected. If work begins on a new field, after selecting an active field, the statistics for this field should be reset (see subsection 8.4 on page 53). After actions in the “Statistics” screen, return to the main screen.

Before starting work, make sure that the “Operator” access level is selected. **Otherwise, no alarm messages will be displayed.** This can be done in the  “Settings” menu or visually by flashing of the LED alarm indicator. If “Agronomist” or “Service” access level is selected, LED alarm indicator  will flash with a high frequency (see Figure 4, p.5).



For quick switching from access level  “Agronomist” to the access level  “Operator” you must quickly and simultaneously press and release the  “Up” and  “Down” buttons. After that, the main screen will be shown if any menus or screens have been opened.

¹⁵ Depending on whether the sensor is controlled or not, the sensor control parameter will be displayed in the menu with the text “Disable control” or “Enable control”.

For row drills operating in the “precise” seeding control mode, the value of the seeding target rate must be set. To do this, on the main screen, move the target rate change cursor to the seeding diagram using the \uparrow “Up” or \downarrow “Down” buttons (the main screen must be in control mode).

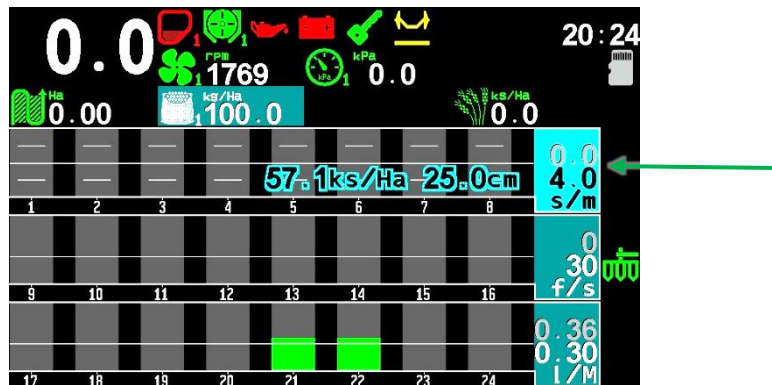


Figure 15 The selected target rate that can be changed is highlighted and flashes

Now using the \oplus “Plus” or \ominus “Minus” buttons change the seeding target rate (see Figure 16).

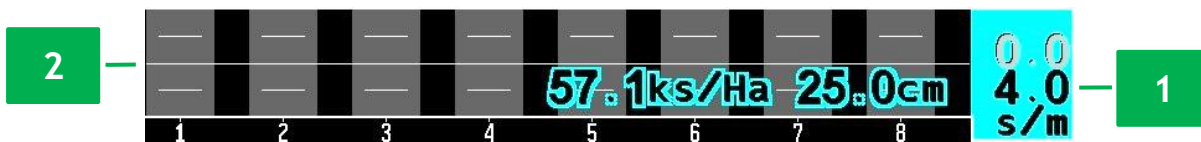


Figure 16 Diagram of seed sensors

- [1]** - the numerical value of the seeding target rate;
- [2]** - graphical representation of the seeding rate.

If the system is equipped with liquid fertilizer sensors and these sensors are configured to work in the “by area” control mode, then set the liquid fertilizer target rate in the same way.

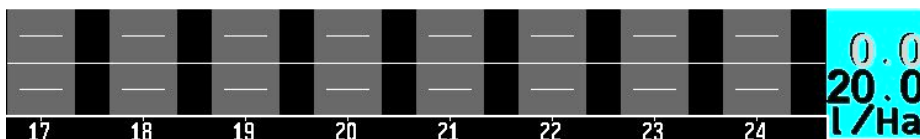



Figure 17 Diagram of liquid fertilizer sensors

If in the parameters of the dispenser sensor, control of the mass of the product application is enabled, then with the help of \uparrow “Up” or \downarrow “Down” buttons move the cursor to the indicator of the mass of product application by the central metering device. Changing the value of the target rate is performed using buttons \oplus “Plus” or \ominus “Minus”.



Figure 18 Indicator of the mass of product application by the central metering device

Automatic determination of the minimum permissible level of actual rate must be enabled for seed drills operating in the “flow” seeding control mode, as well as dry and liquid fertilizer sensors in the “flow” control mode. To do this, press the  “Back”¹⁶ button on the main screen for a few seconds.

After turning on the feature of automatic detection of the minimum permissible level of actual rate, its numerical display on the diagrams will be replaced by the label “AUTO” (see Figure 19) which will blink. The minimum permissible level of actual rate will be automatically determined after the start of movement.

Also, this feature can be used while driving to update the minimum permissible level of actual rate in case of a significant change in the actual rate of application of products.

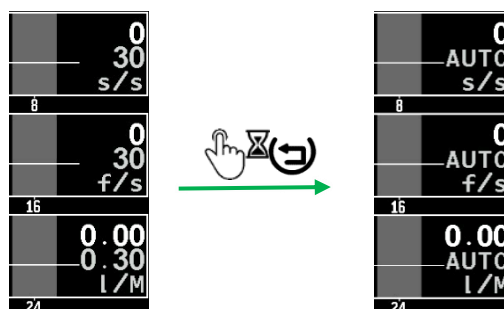


Figure 19

Move the implement from the transport position  to working .

Now the system is ready to work. A few seconds after the start of operation, the system should start to control the application of products. This is indicated by one long beep.



When control of the application of products is stopped, the system signals this with three short beeps.




If the system is moving with activated feature of the manual locking of product application control or in the transport position, the operator panel will signal this with three short beeps every 5 seconds. This is the same signal that is issued at the moment of stopping the control of the application of products.

¹⁶ Also, this feature will automatically set the value of the target rate (which is set in pieces per meter) when the seed sensors or dry fertilizer sensors are configured to work in the “hybrid” control mode.








It is very important to understand how the system makes a decision about the start of control of the application of products. Control criteria will differ depending on the configuration of the system. But in all variants, to start the control, the feature of manual blocking control of the products application must be deactivated.

Variant 1:




If your system is equipped with an implement position sensor and it is working properly, then product application control starts immediately after the movement starts with the implement in the working position .



Variant 2:






If the implement position sensor is absent in profile or faulty (the icon is red  or white ) then the system checks whether the movement has started and at least one of the two criteria is fulfilled:

- 1) *For one of the groups of section sensors of product application control (seed, dry or liquid fertilizers), application of the product is registered;*
- 2) *with an actual rate greater than the minimum permissible level;*
- 3) *and the percentage of such sections is greater than the value set in the parameter  “Those who distributing, %” of this group.*
- 4) *At least one of the dispenser sensors registers rotation of the shaft of central metering device, provided that in its individual settings in the parameter  “Alarms criteria” or  “Weight control” set to “Yes”.*

Variant 3:

If the implement position sensor is absent in profile or faulty (the icon is red  or white ) and in the settings of the speed sensor  “Alarms criteria” parameter is set to “Yes” then the product application control starts immediately after the start of movement.

For each of the options, the system will start checking the product application after a few seconds. This time interval is configured in the main menu item  Settings /  Alarm delay”.

If the speed sensor is faulty, then in the settings of the speed sensor, you can enable simulation of speed (see subsection 11.8.3 on page 107). When the speed simulation is on, it is possible to pause the movement simulation using the feature of manual lock of the product application control. When this feature is activated, an icon  is displayed on the right edge, and the simulation speed is equal to “0 km/h”. Activation and deactivation of the manual lock feature is performed by long pressing the   “Increase brightness” button or on the main screen by long pressing the   “Home” button.

After starting the movement, check the following indicators of the sensors:

- movement speed (see Figure 20 p.1) by the speedometer in the tractor or the GPS navigator, if this is possible;
- fan speed and pressure readings must be within the range specified in the settings (see Figure 20 p.8);
- actual rate of application of products by central seed metering devices by mass, if this feature is enabled (see Figure 20 p.4);
- the actual rate of application of seeds, dry and liquid fertilizers relative to target rate or the minimum permissible level of actual rate (see Figure 20 p.9, p.10, p.11);
- absence of alarm indication on other sensors (see Figure 20 p.2, p.3, p.7).

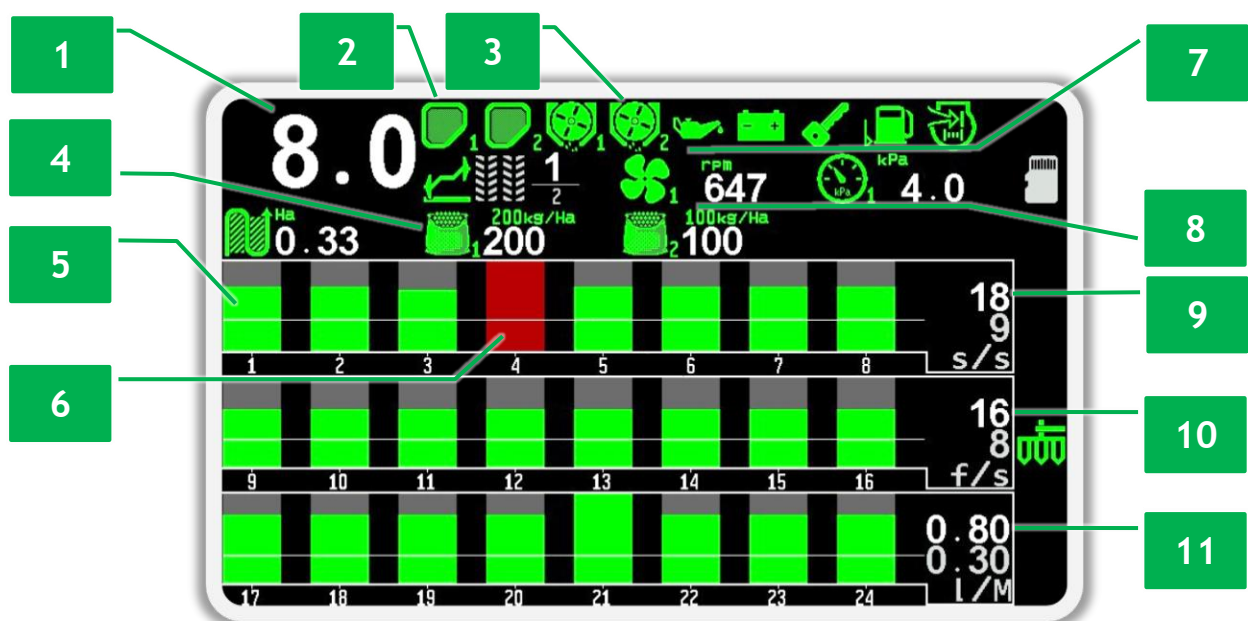


Figure 20 An example of the main screen indication

- [1] - speed indicator;
- [2] - hopper fullness indicators;
- [3] - dispenser sensors indicators;
- [4] - indicators of products application by mass by dispensers;
- [5] - display of the normal flow of seeds by seed sensor No. 1;
- [6] - display of lack of flow of seeds by sensor No. 4 (alarm state);
- [7] - indicators of the sensors of the autonomous fan drive engine;
- [8] - the fan indicator is on the left and the pressure indicator is on the right;
- [9] - average actual rate of application of seed;
- [10] - average actual rate of application of dry fertilizers;
- [11] - the average actual rate of application of liquid fertilizers.

If in the process of work alarm situations or deterioration of sowing quality occur, then stop and eliminate malfunctions. If an alarm situation is detected, the system will display an alarm message. The list of malfunctions and ways to eliminate them are described in section 10 (page 68).

You can view the results of sowing quality for the last passed interval of the sowing path in the “Table” screen (see subsection 8.3 on page 46).

You can view the sowing results for the entire field on the “Statistics” screen (see subsection 8.4 on page 53).

Statistics are saved automatically every 5 minutes, as well as after implement stopped moving. Therefore, it is recommended to turn off the operator panel only after stopping the movement.

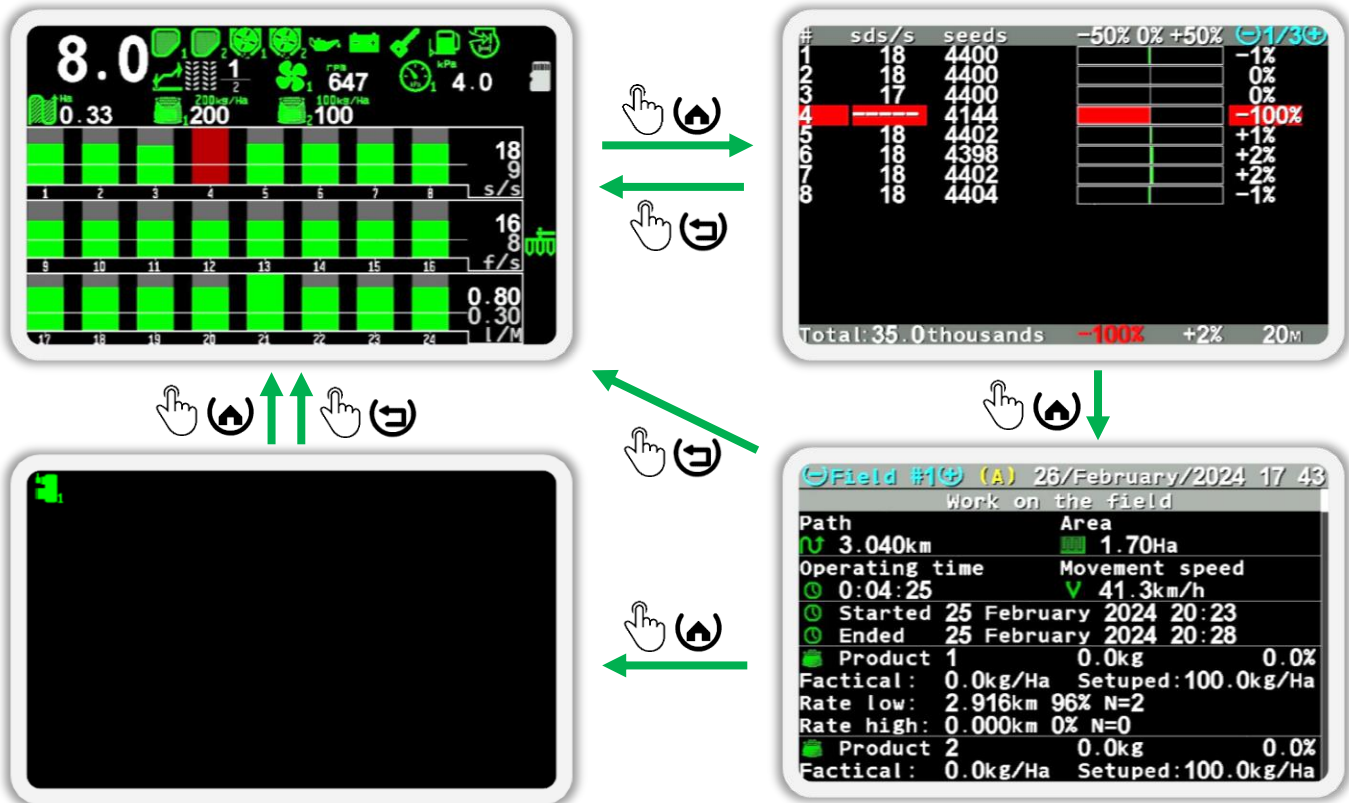


Figure 21 Scheme of switching between working screens

8. Work screens




















8.1. Main screen



8.1.1. General description of the main screen



















The main screen can work in two modes:

- system control mode;
- sensor setup mode.

In the system control mode, the main screen appears after turning on the operator panel. In this mode, the operator observes the progress of products application. The following functional buttons are used in system control mode:

| Button | Description |
|---|---|
|  Increase brightness |  Block control of products application (works on any screen). |
|  Home |  Cyclic switch of work screens.  Block control of products application. |
|  Back |  Open the menu for managing the number of the tramline run.  Enable the feature of automatic calculation of the minimum permissible level of actual rate for section control sensors. |
|  Minus |  Decrease the target rate for the selected element. |
|  Menu |  Open the main menu.  Switch to sensor setup mode. |
|  Plus |  Increase the target rate for the selected element. |
|  Down |  Move the cursor to the previous element of the target rate change. |
|  Up |  Move the cursor to the next element of the target rate change. |

To switch to sensor setup mode, you have to press the   “Menu” button on the main screen for a few seconds. The following function buttons are used in this mode:

| Button | Description |
|--|---|
|  Increase brightness |  Block control of products application (works on any screen). |
|  Home |  Cyclic switch of work screens.  Block control of products application and exit sensor setup mode. |
|  Back |  Exit sensor setup mode.  Enable the feature of automatic calculation of the minimum permissible level of actual rate for section control sensors. |
|  Minus |  Disable control of the selected sensor. |
|  Menu |  Open the context menu of the selected sensor. |
|  Plus |  Enable control of the selected sensor. |
|  Down |  Go to the next sensor. |
|  Up |  Go to the previous sensor. |

The following data is displayed on the main screen:

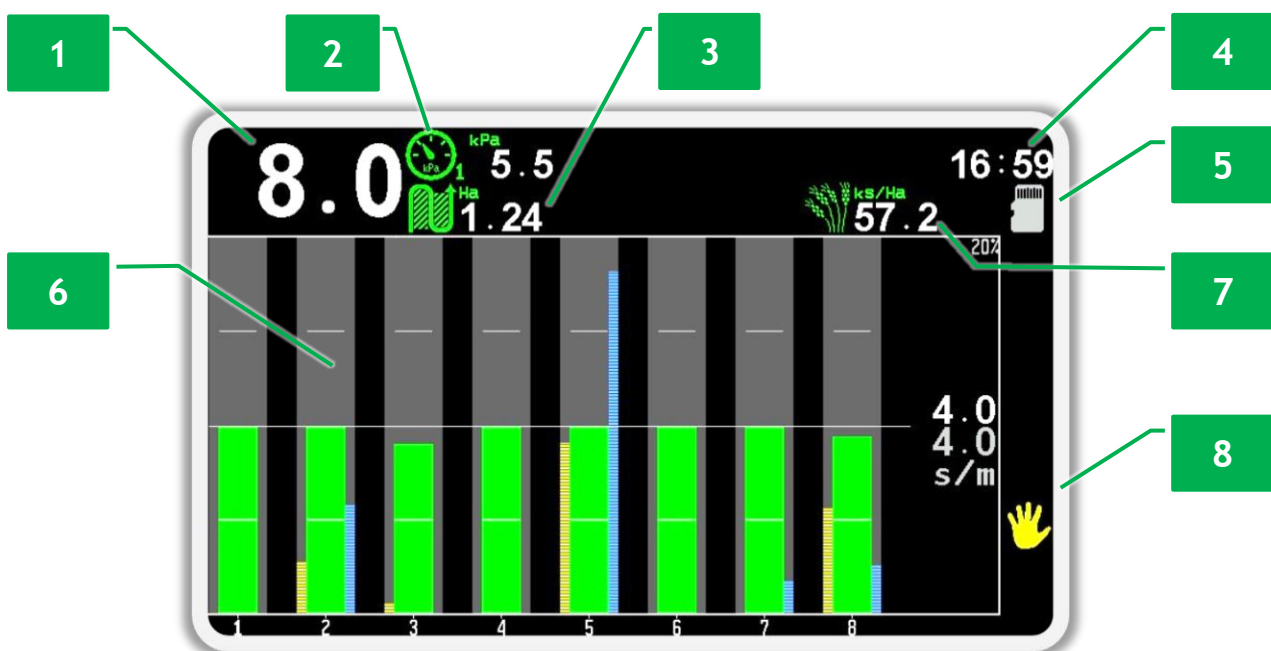


Figure 22 An example of the main screen of a planter

- [1] movement speed indicator;
- [2] pressure sensor indicator (vacuum);
- [3] indicator of cultivated area;
- [4] clock;
- [5] the icon of the presence of a micro-SD card in the device;
- [6] diagram of seed sensors (the figure shows it in the “precise” control mode);
- [7] alternative display of the average actual rate of application of seeds in thousands of seeds per hectare - seeds population;
- [8] the indicator of the activated feature of the manual blocking of control of the products application;

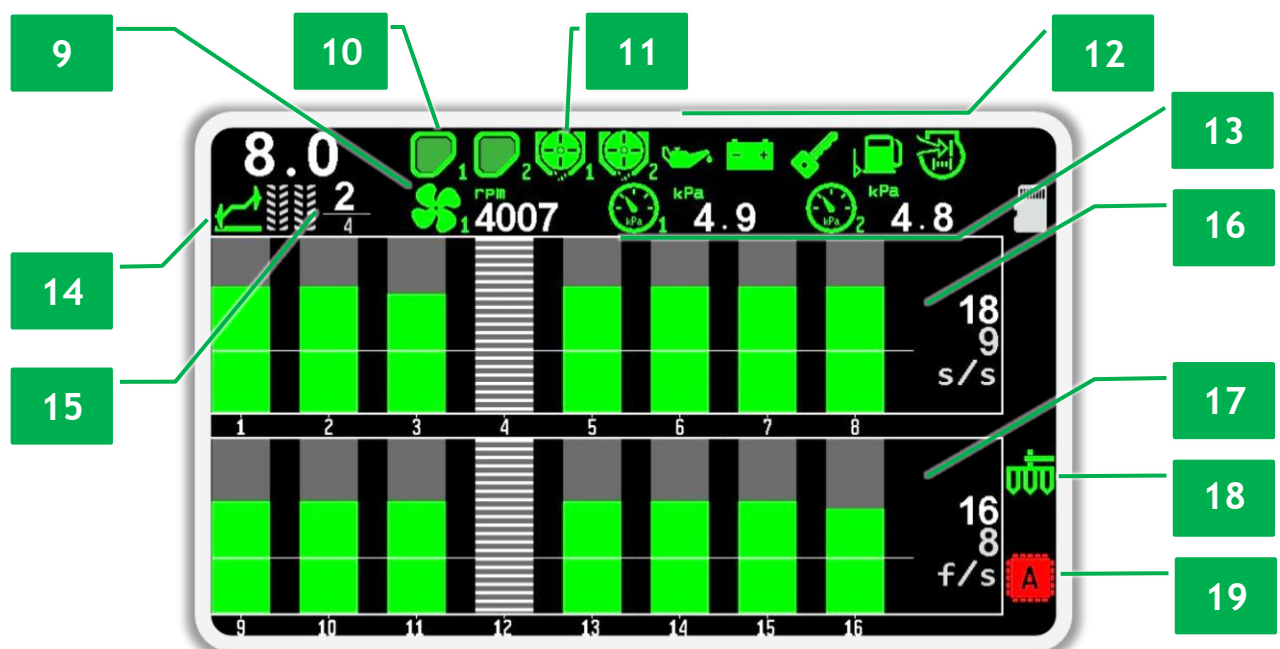


Figure 23 An example of the main screen of a seeding machine equipped with a tramline actuator

- [9] fan sensor indicator;
- [10] hopper sensor indicator;
- [11] dispenser sensor indicator;
- [12] indicators of the sensors of the autonomous fan drive engine¹⁷:
 - alarm oil pressure;
 - no battery charge;
 - ignition;
 - low fuel level;
 - air filter clogging sensor.
- [13] indicators of air pressure sensors in hoppers;
- [14] bout markers position sensor indicator;
- [15] indicator of runs of the tramline rhythm;

¹⁷ Optional sensors of the fan drive engine on seeding machines produced by ELVORTI.

- [16] diagram of seed sensors (in “flow” control mode);
- [17] diagram of dry fertilizer sensors (in “flow” control mode);
- [18] implement position sensor indicator;
- [19] a general indicator of the presence of failures in the operation of the actuators of the tramline, the individual indicators of which are located on the “Actuators” screen;

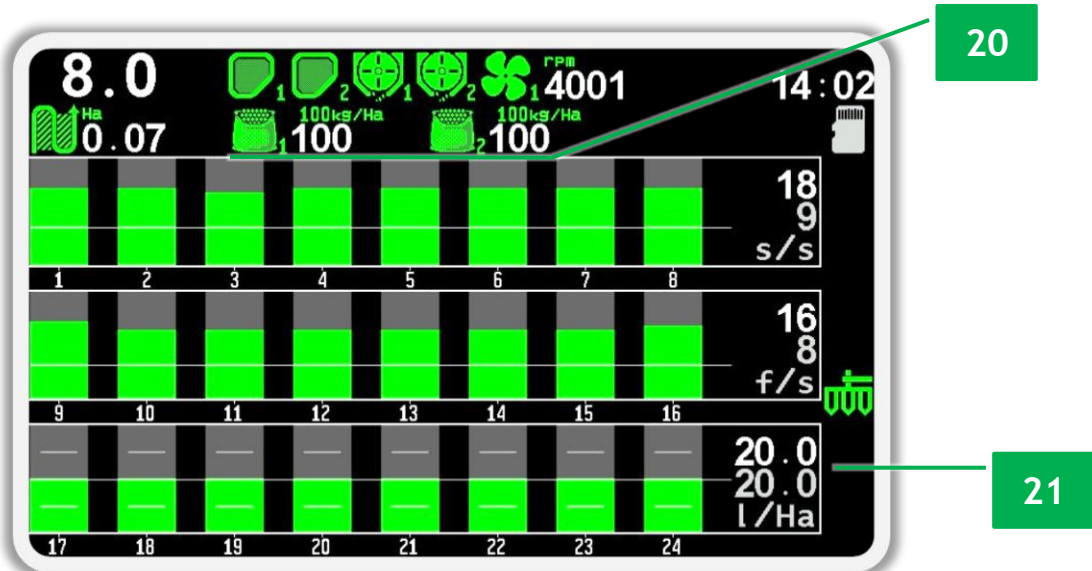


Figure 24 An example of the main screen of a seeding machine equipped with liquid fertilizer control sensors

- [20] control indicators of the application of the actual mass of the products by the dispensers;
- [21] diagram of liquid fertilizer sensors.

8.1.2. Clock


Clock (see Figure 22, p.4) is visible only if the number of indicators in the first line allows it to be placed there.

If displayed in white, it shows the current time of day. When you need to replace the battery, a red label “**BAT**” periodically appears. If the clock is faulty, the “**XX:XX**” label flashes.

If the time is displayed in blue, the indicator shows the trial period timer. It is displayed on the screen only if the system manufacturer has enabled the trial period mode. The format for displaying the remaining time until the end of the trial period - “**hours : minutes**”. Appears every 30 seconds, covering the indicators of the sensors located in the first line.

8.1.3. Indicator of the installed memory card





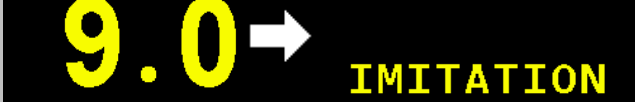
Intended to inform the user that there is a memory card inserted in the microSD card slot (see Figure 22, p.5).








There is a memory card inserted in the microSD card slot.





8.1.4. Speed sensor indicator

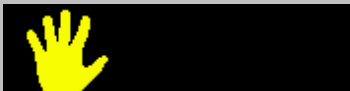
Displays the speed of movement in “km/h” (see Figure 22, p. 1). The indicator has the following display options:

| | |
|---|---|
|  | Normal state. Shows the movement speed. |
|  | Alarm state. The speed is greater than the permissible speed. ¹⁸ |
|  | Alarm state. The speed is lesser than the permissible speed. |
|  | Alarm state. No connection to the input device. ¹⁹ |
|  | Speed simulation is enabled. |

When speed simulation is enabled, it is possible to disable the speed using the product application control manual lock feature. When this feature is activated, the simulated speed is “0 km/h” and an icon  is displayed on the right edge (see Figure 22, p.8). Activation and deactivation of the feature of the manual blocking of control of products application is performed by long pressing the   “Increase brightness” button or on the main screen by long pressing the   “Home” button.

8.1.5. The indicator of the manual blocking of control of products application

It is intended to inform the user that the feature of manual blocking of control of products application is activated (see Figure 22, p.8). In a case when this feature is activated and the system registers movement, then every 5 seconds a sound signal of stopped control of the products application will be issued (three short sound signals) in order to attract the attention of the user. When the speed simulation is on, it is possible to disable the speed using this feature. When feature of the manual blocking of control of products application is activated, the simulated speed is “0 km/h”. Activation and deactivation of this feature is performed by long pressing the   “Increase brightness” button or on the main screen by long pressing the   “Home” button.



| | |
|---|--|
|  | The icon is displayed only when this feature is activated. |
|---|--|

¹⁸ Movement speed control is performed only if it is enabled in the move speed sensor settings.

¹⁹ Can only occur if a speed sensor is connected to the input device.


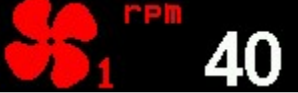
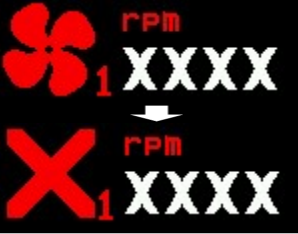

8.1.6. Tramline rhythm indicator

It is intended to display information about tramline making process (see Figure 23, p.15). The indicator has the following display options:

| | |
|--|---|
|  | <p>Normal state. The top number shows the number of the current run. The bottom number shows the total number of runs in the current tramline rhythm.</p> |
|  | <p>Automatic switching of the number of the current run is disabled or impossible due to a malfunction of the bout marker position sensors.</p> |



8.1.7. Fan sensor indicator



It is intended to display the speed of rotation of the fan and indicate the states of the sensor (see Figure 23, p.9). The indicator has the following display options:

| | |
|--|--|
|  | <p>Normal state.</p> |
|  | <p>Alarm state. The speed of rotation is greater or less than the permissible one.</p> |
|  | <p>Alarm state. No connection to the input device.</p> |
|  | <p>Sensor control is disabled.</p> |

8.1.8. Hopper sensor indicator





It is intended to display information about the level of filling of the hopper (see Figure 23, p.10). The indicator has the following display options:

| | |
|--|--------------------------------------|
|  | <p>Normal state. Hopper is full.</p> |
|  | <p>Alarm state. Hopper is empty.</p> |

| | |
|---|---|
|  | Alarm state. No connection to the input device. |
|  | Sensor control is disabled. |





8.1.9. Dispenser sensor indicator

It is intended for displaying the fact of the rotation of the central metering device shaft and indicating the sensor settings (see Figure 23, p. 11). The indicator has the following display options:

| | |
|--|---|
|  | Normal state. In case it's rotating, there is an animation of the rotation. |
|  | Alarm state. There is no rotation or the rotation speed does not meet the requirements. In case it's rotating, there is an animation of the rotation. |
|  | Alarm state. No connection to the input device. |
|  | Sensor control is disabled. |





8.1.10. Indicator of product application control by mass

Indicator is intended for displaying the actual value of the actual rate of application of products in kilograms per hectare, as well as for setting the target rate (see Figure 24, p. 20). The indicator is only displayed when the weight control feature is enabled in the dispenser sensor configuration. The indicator has the following display options:

| | |
|---|--|
|  | Normal state. The actual rate of application of the product is displayed on the bottom in a white color, and the target rate is displayed in green. |
|  | Alarm state. The actual rate of application to the product is greater or less than acceptable. The actual rate is shown on the bottom in a white color, and the target rate is displayed in red. |
|  | Target rate change mode. The value of the set target rate is displayed, the cursor blinks and the value can be changed by ⊕ "Plus" or ⊖ "Minus" buttons. |
|  | This is also the target rate change mode. In this mode, the indicator displays the set target rate value, but the cursor is transferred to another indicator. |






8.1.11. Pressure sensor indicator

It is intended for display of rarefaction (see Figure 22, p.2) or air pressure (see Figure 23, p.13) and indication of sensor states. The indicator has the following display options:

| | |
|---|---|
|  | Normal state. |
|  | Alarm state. The pressure is more or less than permissible. |
|  | Alarm state. No connection to the input device. |
|  | Sensor control is disabled. |






8.1.12. Low oil pressure sensor indicator

The low oil pressure indicator of the autonomous fan drive engine is intended to inform the operator about an alarm situation (see Figure 23, p.12). Alarm monitoring of this sensor is performed only when the ignition is on (see subsection 8.1.14 on page 35).

| | |
|--|--|
|  | Normal state. |
|  | Alarm state. Low oil pressure while the ignition is on  |
|  | Alarm state. No connection to the input device. |
|  | Sensor control is disabled. |





8.1.13. The indicator of the no battery charge sensor

The indicator of the no battery charge sensor is intended to inform the operator about the relevant alarm situation (see Figure 23, p.12). Alarm monitoring of this sensor is performed only when the ignition is on (see subsection 8.1.14 on page 35).

| | |
|---|--|
|  | Normal state. |
|  | Alarm state. There is no battery charge while the ignition is on  . |
|  | Alarm state. No connection to the input device. |
|  | Sensor control is disabled. |



8.1.14. Ignition key position sensor indicator



The ignition key position indicator is intended to indicate whether the ignition of the autonomous fan drive engine is on or off (see Figure 23, p.12). Control of the “low oil pressure” (see subsection 8.1.12 on page 35) and “no battery charge” (see subsection 8.1.13 on page 35) alarms is performed only when the ignition is on.

| | |
|---|---|
|  | The ignition is on. |
|  | The ignition is off. |
|  | Alarm state. No connection to the input device. |
|  | Sensor control is disabled. |

8.1.15. Remaining fuel sensor indicator





The fuel remaining indicator of the autonomous fan drive engine is intended to inform the operator about the low level of fuel in the tank (see Figure 23, p.12).

| | |
|---|--|
|  | Normal state. |
|  | Alarm state. There is low level of fuel in the tank. |

| | |
|--|---|
|  | Alarm state. No connection to the input device. |
|  | Sensor control is disabled. |







8.1.16. Air filter sensor indicator

The air filter indicator of the autonomous fan drive engine is intended to inform the operator about clogging of the air filter and the requirement to replace it (see Figure 23, p.12).

| | |
|---|---|
|  | Normal state. |
|  | Alarm state. The filter is clogged. |
|  | Alarm state. No connection to the input device. |
|  | Sensor control is disabled. |





8.1.17. Bout markers sensor indicator

It's intended to display information about the position of the bout markers (see Figure 23, p.14). The indicator has the following display options:

| | |
|--|---|
|  | Normal state. Both markers are lowered. |
|  | Normal state. The left marker is lowered. |
|  | Normal state. The right marker is lowered. |
|  | Normal state. Both markers are raised. |
|  | Alarm state. No connection to the input device. |
|  | Sensor control is disabled. |



8.1.18. Implement position sensor indicator

It's intended to inform the user that the implement is in the working (lowered) or transport (raised) position (see Figure 23, p.18).

| | |
|---|---|
|  | Implement is in the working position. |
|  | Implement is in the transport position. |
|  | Alarm state. No connection to the input device. |
|  | Sensor control is disabled. |

8.1.19. A general indicator of actuator failures

It's intended to inform the user about problems with actuators (see Figure 23, p.19). It does not appear on the screen if the actuators are working properly or not installed on the system. Detailed information about the status of the actuators can be seen on the "Actuators" screen. The indicator has the following display options:

| | |
|---|---|
|  | Alarm state. One or more actuators are in an alarm state. |
|  | Control of at least one of the actuators is disabled. No failures of the actuators were detected. |

8.1.20. Diagram of section control sensors in “precise” control mode

The section diagram in the “precise” seeding control mode is intended for visual display of the sowing process with the display of doubles and skips. In the “precise” control mode, the diagram consists of the following elements (see Figure 25):

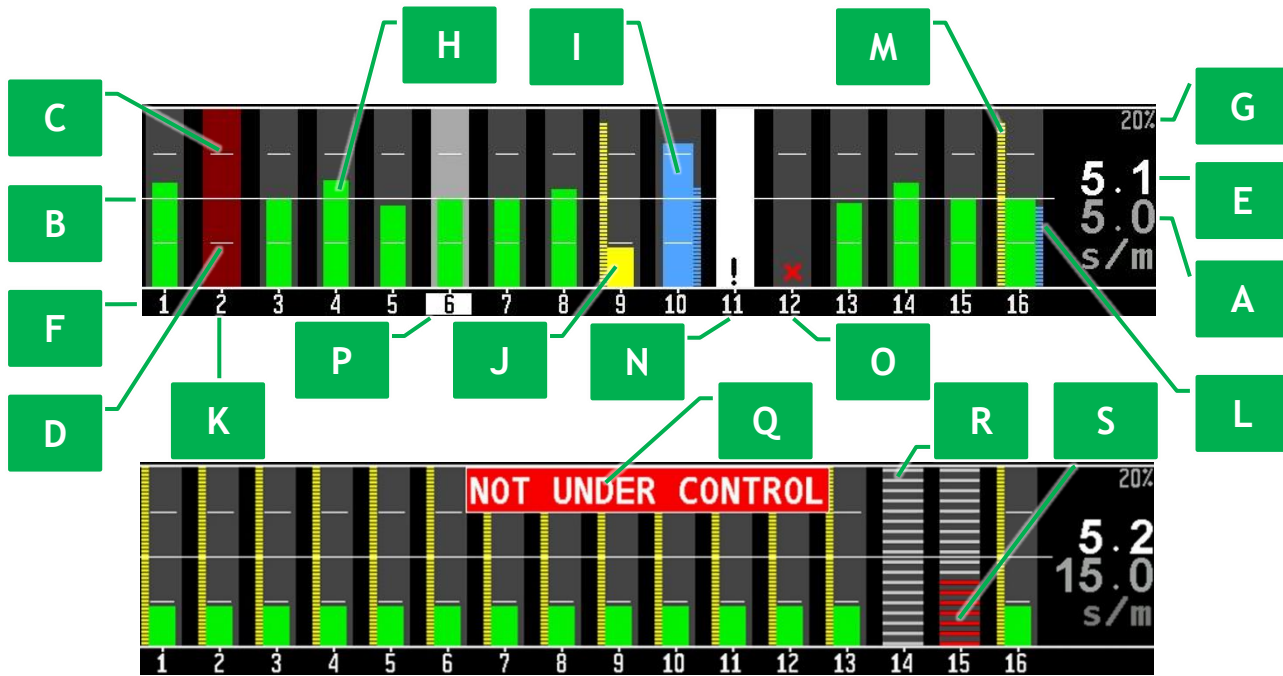



Figure 25 Diagram of seed sensors in the “Precise” control mode


[A] Target rate - a target rate of application of the product that is set by user. It is displayed in gray along with the unit of measurement “s/m” (seeds per meter). It has to be set by the operator with an accuracy of ± 0.1 s/m.

In order to change the target rate of application of the product, you have to move the cursor of target rate change to the diagram of section control sensors. To do this, on the main screen in system control mode, use the \uparrow “Up” or \downarrow “Down” buttons. Now using the \oplus “Plus” or \ominus “Minus” buttons change the target rate of seeding. When the cursor is on the diagram, the background flashes and target rate is displayed in black (see Figure 26). In addition to the value of the target rate in grains per meter, its values are also displayed in the format of seeds population in thousands of seeds per hectare and the calculated interval between two seeds (spacing) which is displayed in centimeters.



Figure 26 The selected rate that will change is highlighted and flashes

[B] The horizontal white line is a graphic representation of the target rate. It's displayed if the  "Grid" parameter has a value of "No" or "Full" (see item 11.7.6.2 on the page 102).

[C] The horizontal white line above the target rate line is a graphic representation of the maximum permissible level of actual rate²⁰ of application of the product compared to the target rate. It's displayed if the  "Grid" parameter has a value of "Partial" or "Full" (see item 11.7.6.2 on the page 102).



[D] The horizontal white line below the target rate line is a graphic display of the minimum permissible level of actual rate of application of the product compared to the target rate.

[E] The value of the average actual rate of application of the product. It is displayed in white above the target rate value.



The average actual rate of product application is calculated only for those sections whose sensors register the presence of seed flow.

[F] The numbers of the section control sensors correspond to the columns of the diagram.

[G] Shows the set value of the  "Scale S&D, %" parameter (the scale of a skips and doubles), to which the top border of the diagram corresponds. This value is set in the settings menu  "Diagram settings" (see item 11.7.6.3 on the page 103). The height of the column of skips and doubles is proportional to their current level at the given scale (see Figure 25, p.[M] p.[L]), but if the percentage of doubles or skips in a particular section is equal to or greater than the specified value, then this column of doubles or skips will be displayed for the entire height of the diagram.

[H][I][J] The columns of the actual rate of product application are a graphical display of the instantaneous actual rate of product application by the respective sections. For "Precise" or "Hybrid" control mode, the column can be displayed in one of three colors:

- in green color (see Figure 25, p.[H]) when the actual rate of application of the product is within the permissible deviation from the target rate (normal state);
- in blue color (see Figure 25, p.[I]) when the actual rate of application of the product is greater than the maximum permissible deviation from the target rate (alarm state);
- in yellow (see Figure 25, p.[J]) when the actual rate of application of the product is less than the minimum permissible deviation from the target rate (alarm state).

²⁰ The maximum and minimum allowed deviation of the actual rate of application of the product from the target rate is set in the settings of the section control sensor group in the "Rate error, %" parameter (see subsection 11.8.11 on page 125).

[K] If there is no column of the actual rate of product application, then product application does not happen for this section. If the system controls the application of products by that section, the background will flash dark red at full height (alarm state).


[L] The blue dashed column of the diagram shows the level of doubles by section (in the figure - by section number sixteen). The height of the column is proportional to the current level of the doubles at the given scale (see Figure 25, p.[G]).

[M] The yellow dashed column of the diagram shows the level of skips by section (in the figure - by section number sixteen). The height of the column is proportional to the current skips level in the given scale (see Figure 25, p.[G]).

[N] An exclamation mark in the middle of a white rectangle indicates a section control sensor whose control is disabled. For more information on control options, see Figure 14 on the page 21.

[O] A section control sensor with which connection is lost is indicated by a red cross.

[P] When main screen is in sensor setup mode, the currently selected section control sensor is highlighted in gray and its number background is highlighted in white.

[Q] If the system has detected the presence of a product application by the percentage of the number of sections specified by the  “Those who distributing, %” parameter (see subsection 11.8.11 on page 125) in the settings of these sensors group, but the instantaneous actual rate of application of the product by them is less than the minimum permissible level of actual rate, then the alarm message “NOT UNDER CONTROL” will be shown on the diagram. This can happen in one of two cases:

1. During the process of product application, the average instantaneous actual rate of product application became less than the minimum permissible level of actual rate, due to which the product application control criterion is not fulfilled. Thus, the operator will be notified of an alarm situation.
2. The operator has incorrectly set the value of the target rate, due to which the product application control criterion is not fulfilled. And in this case, the operator will be notified of an alarm situation.




The conditions for controlling the application of products are described in section 7 on the page 18.

[R] Indication that section control sensor is in the tramline control mode. See Figure 14 on the page 21 for more information on section control options.

[S] Alarm indication of product losses in the tramline.

8.1.21. Diagram of section control sensors in "hybrid" or "by area" control mode

The "hybrid" control mode is used for the seed sensors diagram and the dry fertilizer sensors diagram. The "by area" control mode is used for the liquid fertilizer sensors diagram. For these section control modes, the appearance of the diagram corresponds to the "Precise" control mode described in the previous subsection, except for the following features:

1. The target rate of sowing or dry fertilizers is specified with an accuracy of $\pm 1\text{pc/m}$. For liquid fertilizers target rate, the step varies from $\pm 0.1\text{l/ha}$ for a rate of less than 50l/ha , to $\pm 1\text{l/ha}$ for a higher rate.
2. There are no doubles and skips control for seed sensors or dry fertilizer sensors diagrams. There is also no  "Scale S&D, %" parameter display associated with them (see Figure 25, p.[G]).

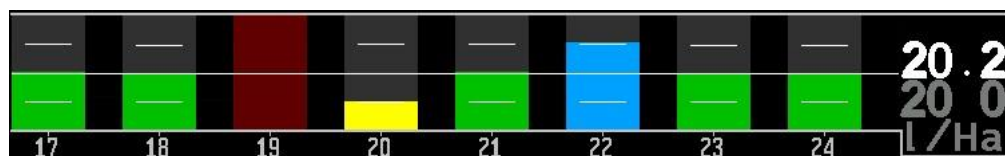





Figure 27 Diagram of sensors of liquid fertilizers in the control mode "by area"

Before starting work, for all diagrams set to the "hybrid" control mode, it is necessary to enable automatic determination of the target rate based on the actual rate of product application. To do this, press the    "Back" button on the main screen for a few seconds. If necessary, this feature can be used during work to adjust the target rate value.

8.1.22. Diagram of section control sensors in the “flow” control mode

The “flow” control mode can be used for any group of sectional sensors. For this control mode, the diagram consists of the following elements (see Figure 28):

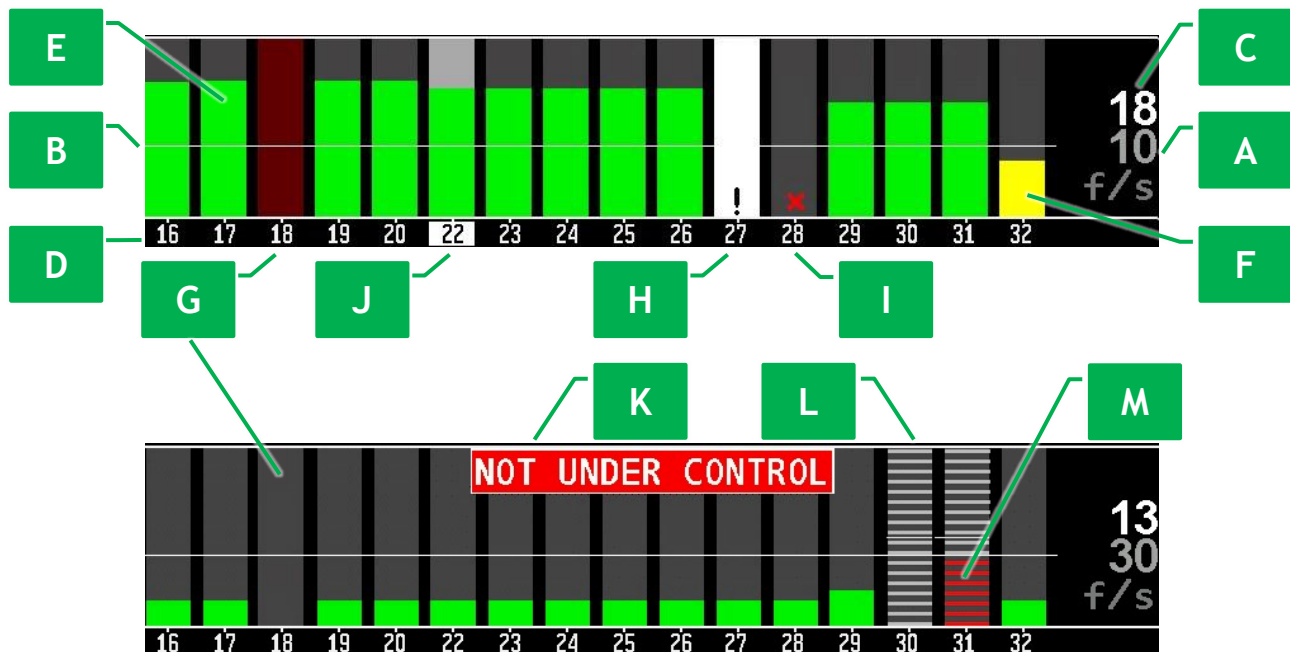



Figure 28 Diagram of seed sensors in the “Flow” control mode

[A] The value of minimum permissible level of actual rate of application of the product that is set by user. It is displayed in gray. Changes in steps of ± 1 . Displayed with the unit of measure:

- for seed sections “s/s” (seeds per second);
- for sections of dry fertilizers “f/s” (fertilizers per second);
- for sections of liquid fertilizers “l/M” (liters per minute).

Before starting work, for all diagrams set to the “flow” control mode, it is necessary to turn on the automatic determination of the minimum permissible level of actual rate based on the average value of the actual rate of product application of the sections. To do this, press the  “Back” button on the main screen for a few seconds. If necessary, this feature can be used during work to adjust the value of minimum permissible level of actual rate of product application.

[B] The horizontal white line is a graphic representation of the specified minimum permissible level of actual rate of product application.

[C] The numerical value of the actual rate of product application averaged over sections.

[D] The numbers of the section control sensors correspond to the columns of the diagram.

[E][F] Columns of actual rate of product application are a graphical representation of the instantaneous actual rate of product application by the

respective sections. For the "Flow" control mode, the column can be displayed in one of two colors:


- in green (normal state, see Figure 28, p.[E]), when the actual rate of application of the product is greater than the specified minimum permissible level of actual rate;
- in yellow (alarm state, see Figure 28, p.[F]), when the actual rate of application of the product is less than the specified minimum permissible level of actual rate.

[G] If there is no column of the actual rate of product application, then product application does not happen for this section. If the system controls the application of products, then background will flash dark red at full height (alarm state).

[H] An exclamation mark inside a white rectangle indicates a section control sensor whose control is disabled. See Figure 14 for more information on control options.

[I] A section control sensor with which connection is lost is indicated by a red cross.

[J] When main screen is in sensor setup mode, the currently selected section control sensor is highlighted in gray and its number background is highlighted in white.

[K] If the system has detected the presence of a product application by the percentage of the number of sections specified by the  "Those who distributing, %" parameter (see subsection 11.8.11 on page 125) in the settings of these sensors group, but the instantaneous actual rate of application of the product by them is less than the minimum permissible level of actual rate, then the alarm message "NOT UNDER CONTROL" will be shown on the diagram. This can happen in one of two cases:

1. During the process of product application, the average instantaneous actual rate of product application became less than the minimum permissible level of actual rate, due to which the product application control criterion is not fulfilled. Thus, the operator will be notified of an alarm situation.
2. The operator has incorrectly set the value of the target rate, due to which the product application control criterion is not fulfilled. And in this case, the operator will be notified of an alarm situation.



The conditions for controlling the application of products are described in section 7 on the page 18.

[L] Indication that section control sensor is in the tramline control mode. See Figure 14 on the page 21 for more information on section control options.

[M] Alarm indication of product losses in the tramline.

8.2. The “Actuators” screen


8.2.1. General description of the “Actuators” screen









The “Actuators” screen will be available only when tramline actuators are enabled in the system settings profile. This screen displays icons for these actuators. This screen can work in two modes (in the same way as the “Main Screen”):



- status monitoring mode of actuators;
- configuration mode of actuators.



















Figure 29 “Actuators” screen

You can go to this screen by switching between working screens using the  “Home” button (see Figure 21). After that, this screen will be displayed in the status monitoring mode of the actuators. The following function buttons are used in this mode:

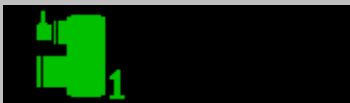
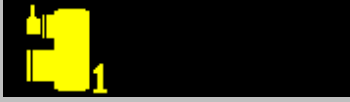

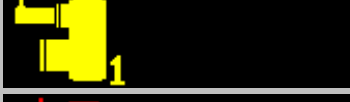



| Button | Description |
|--|--|
|  Increase brightness |  Block control of products application (works on any screen). |
|  Home |  Cyclic switch of work screens. |
|  Back |  Return to the main screen. |
|  Menu |  Switch to the configuration mode of actuators. |

To enter the actuators configuration mode, you have to press the   “Menu” button on this screen for a few seconds. The following function buttons are used in this mode:


| Button | Description |
|---|--|
|  Increase brightness |  Block control of products application (works on any screen). |
|  Home |  Cyclic switch of work screens. |
|  Back |  Exit the configuration mode of actuators. |
|  Minus |  Disable control of the selected actuator. |
|  Menu |  Open the context menu of the selected actuator. |
|  Plus |  Enable control of the selected actuator. |
|  Down |  Go to the next actuator. |
|  Up |  Go to the previous actuator. |

8.2.2. Tramline actuator indicator


The indicator is intended to display information about position of the actuator rod. The indicator has the following display options:

| | |
|---|---|
|  | Normal state. The rod is retracted. |
|  | Normal state. At this moment, the rod is moving to the retracted position. |
|  | Normal state. The rod is extended. |
|  | Normal state. At this moment, the latch is moving to the extended position. |
|  | Alarm state. A malfunction in the work of the tramline actuator was detected. |
|  | Alarm state. No connection to the tramline actuator. |
|  | Tramline actuator control is disabled. |

8.3. The “Table” screen

The “Table” screen (see Figure 30) allows you to get more detailed information about the work of the implement in real time, as well as to analyze the quality of work on the last completed path interval of the product application after stopping the system. You can go to this screen by switching between working screens using the  “Home” button (see Figure 18).



Product application path interval is a segment of the path during which information about skips, doubles and other data is accumulated for display in the table and diagrams. The length of the path segment is set by the operator before starting work with the  “Recalculation, m” parameter in the settings of the section control sensor group (see subsection 11.8.11 on page 125 and subsection 11.8.13 on page 129).



















The information in this table is valid for the current power-on session and is reset at power-off.

This screen has three modes of displaying information:


- Displaying values of quality and actual rate of seeding in seeds per meter (only for seed control mode “precise”, see Figure 30).
- Displaying values of quality and seeds population in thousands of seeds per hectare (only for seed control mode “precise”, see Figure 31).
- Displaying the number of sown seeds, applied dry fertilizers or the volume of liquid fertilizers (see Figure 32). This display mode is always available to the user.

The following buttons are active on this screen:

| Button | Description |
|--|--|
|  Increase brightness |  Block control of products application (works on any screen). |
|  Home |  Cyclic switch of work screens. |
|  Back |  Return to the main screen. |
|  Minus |  Previous data page. |
|  Menu |  Reset the current accumulated data. |

| Button | | Description | |
|---|------|---|--------------------------------|
|  | Plus |  | Next data page. |
|  | Down |  | Scroll the table down one row. |
|  | Up |  | Scroll the table up one row. |

In the figures “Figure 30” and “Figure 31”, the data in columns 7, 8, 9, 10, 11, 15, 16 are calculated for each passed path interval of the product application. The data in these columns correspond to the last completely completed path interval of the product application. This data is reset in one of the following cases:

- automatically at the moment of start of application of the products;
- resetting the accumulated data by a  “Menu” button on the “Table” screen;
- changing the number of the active field in the “Statistics” screen²¹;
- resetting statistics of the active field;
- turning off the operator panel.

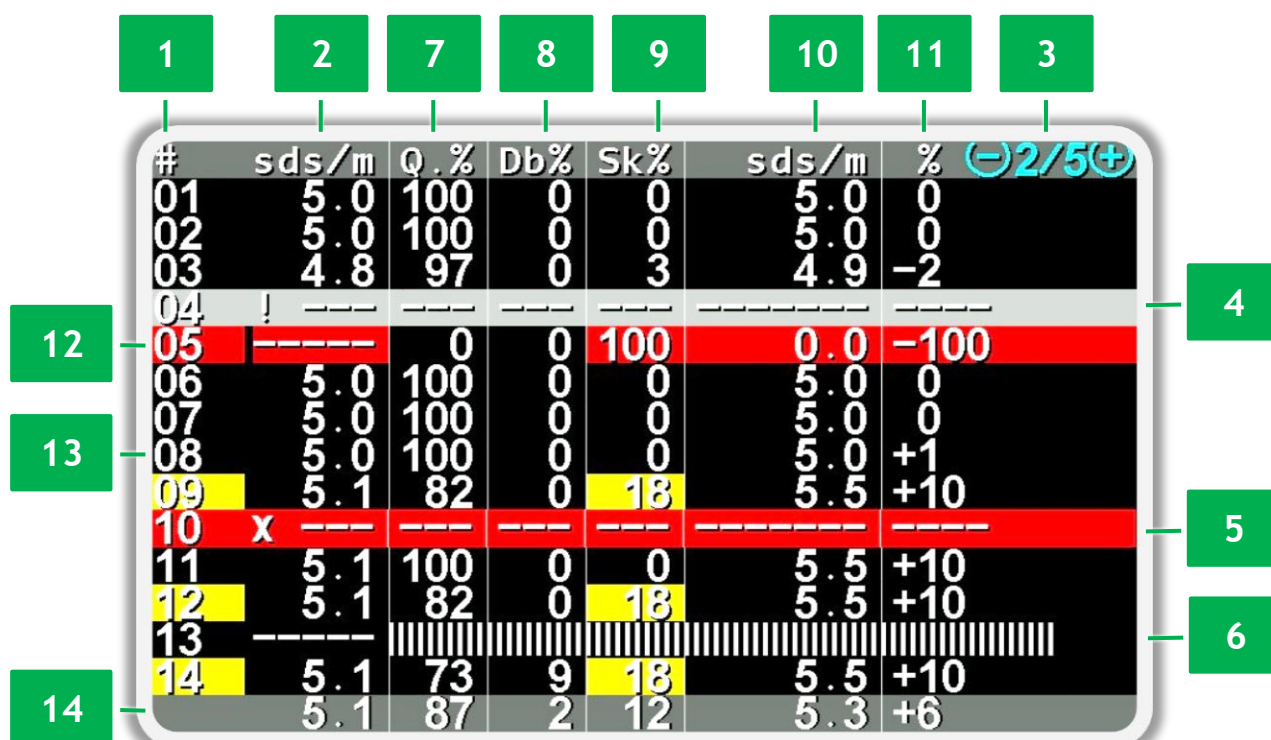


Figure 30 Display of actual rate of seeding in seeds per meter

²¹ The active field is the field selected in the statistics screen, in which statistics about the process of applying products are stored.

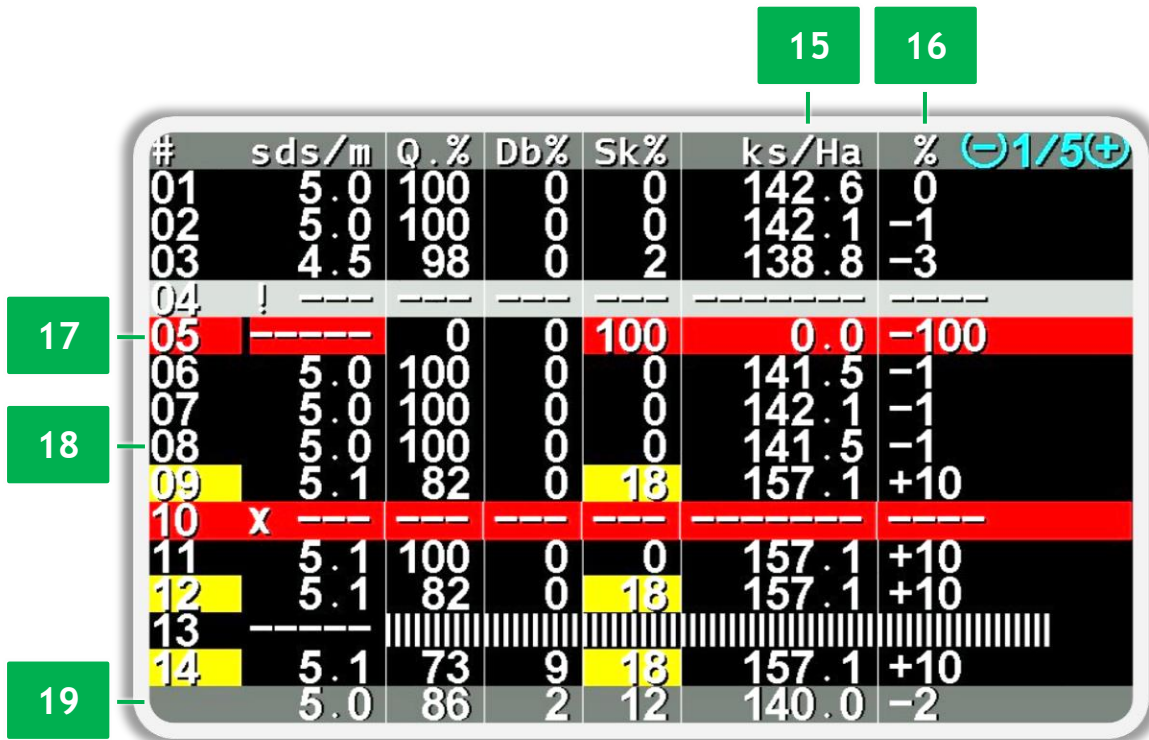


Figure 31 Display of population rate of seeding in thousands of seeds per hectare

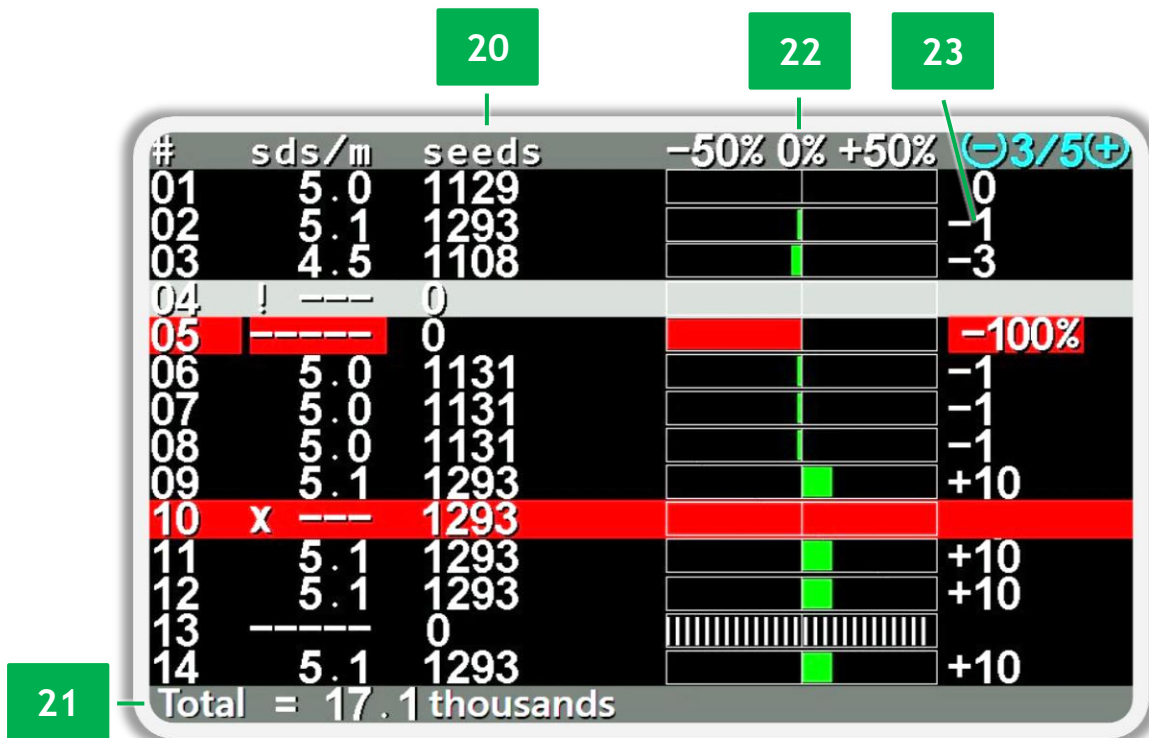


Figure 32 Displaying the number of sown seeds


The contents of the “Table” screen, common to all display modes

[1] Section control sensors numbers. The background is colored yellow if at least one of the cells in the row is colored yellow (warning condition) and there are no alarm ones. The background is colored red if at least one of the displayed parameters in the row is in an alarm state.

[2] The current actual rate of application of the product.


For section control modes “precise”, “hybrid” and “by area”, the background is colored yellow if the deviation of the actual rate of application of the product from the target rate is more than half of the alarm deviation set in the settings of the sensors of the section group²². The background is colored red (alarm state) when detected deviation of the actual rate of product application from the target rate is more than set in the settings.

For any section control mode, the background is colored red (alarm state) when the actual rate of application of the product becomes less than the minimum permissible level of actual rate.


[3]  Numbers of data pages indication. The number on the left is the page number that is currently displayed on the screen. The number on the right is the total number of pages.


[4]  Indication of the sensor which control is disabled.


[5]  Indication of the sensor with which there is no connection.

[6]  Indication of the sensor which is in the tramline control mode.

Content of the “Table” screen, specific to both modes of displaying seeding data for sections in the “precise” control mode

[7]  Quality of sowing.²³ Shows the ratio of seeds sown according to the target rate to the sum of all seeds and skips registered by the seed sensor during the last passed path interval of the product application, in percentage.

[8]  Doubles. Shows the ratio of doubles to the sum of all seeds and skips registered by the seed sensor during the last passed path interval of the product application, in percentage. The background is colored yellow if the percentage of doubles is more than half of the alarm deviation set in the settings²⁴. The background is colored red if the percentage of duplicates is greater than the alarm deviation set in the settings (alarm state).

[9]  Skips. Shows the ratio of skips to the sum of all seeds and skips registered by the seed sensor during the last passed path interval of the product

²² The alarm deviation of the actual rate of sowing from the target rate is set in the settings of the seed sensors group in the parameter “Error rate, %” (see subsection 11.8.11 on page 125).

²³ The quality of sowing has the same meaning as the term singulation.

²⁴ The alarm deviation of the percentage of doubles is set in the settings of the seed sensors group in the “Doubles error, %” parameter. If this parameter is set to the value “No”, then the value of the “Scale S&D, %” parameter in the “Diagram parameters” settings will be used as the alarm indication threshold (see item 11.7.6.3 on page 103).

application, in percentage. The background is colored yellow if the percentage of skips is more than half of the alarm deviation set in the settings²⁵. The background is colored red if the percentage of skips is greater than the alarm deviation set in the settings (alarm state).

The content of the “Table” screen, specific to mode displaying the actual rate of sowing for sections in the “precise” control mode.

[10] Average actual rate of sowing²⁶ during the last passed path interval of the product application. Displayed in seeds per meter. Background color changes accordingly to the description in point [2].

[11] The percentage deviation of the actual sowing rate from the target rate during the last passed path interval of the product application. Background color changes accordingly to the description in point [2].

[12] Seed sensor No. 5, by which the sowing process is not taking place at the moment. During the last passed path interval of the product application, the sowing quality was 0%, there were no doubles, and the percentage of skips was 100%. The average actual sowing rate was 0 seeds per meter, and the deviation from the target rate was -100% (no sowing).

[13] Seed sensor No. 8, which is currently sowing with an actual rate of 5.0 seeds per meter (19.8 - 20.2 cm). During the last passed path interval of the product application, the quality of sowing was 100%. There were no doubles or skips. The average sowing rate during the last passed path interval of the product application was 5.0 seeds per meter (19.8 - 20.2 cm), and the deviation of the sowing rate from the set target rate was +1%, which means that the average actual rate was slightly overestimated in relation to the set target rate and, accordingly, the interval between seeds (spacing) was less than required by only 1%.

[14] A row of average sowing results for seed sensors group. It shows that the instantaneous average actual rate of sowing is 5.1 seeds per meter. The current actual sowing rate is calculated only by those sensors that currently register the flow of seeds (numbers 1-3, 6-9, 11-12, 14-16). During the last passed path interval of the product application, the averaged values were: quality 86%, doubles 2%, skips 12%. During the last passed path interval of the product application the averaged actual sowing rate was 5.3 seeds per meter (18.7 - 19.0 cm) and the deviation of the actual sowing rate from the target rate was +6% by sensors that registering flow of seeds.

²⁵ The alarm deviation of the percentage of skips is set in the settings of the seed sensors group in the “Skips error, %” parameter. If this parameter is set to the value “No”, then the value of the “Scale S&D, %” parameter in the “Diagram parameter” setting will be used as the alarm indication threshold.

²⁶ This value by means is similar to term of spacing.

The content of the “Table” screen, specific to mode displaying the seeds population for sections in the “precise” control mode.

[15] Average actual population of seeds during the last passed path interval of the product application. Shown in thousands of seeds per hectare. Background color changes accordingly to the description in point [2].

[16] The percentage deviation of the average actual population of seeds from the target rate during the last passed path interval of the product application. Background color changes accordingly to the description in point [2].

[17] Seed sensor No. 5, by which the sowing process is not taking place at the moment. During the last passed path interval of the product application, the sowing quality was 0%, there were no doubles, and the percentage of skips was 100%. The average actual population of seeds was 0 thousand seeds per hectare, and its deviation from the target rate was -100% (no sowing).

[18] Seed sensor No. 8, which is currently sowing with an actual rate of 5.0 seeds per meter (19.8 - 20.2 cm). During the last passed path interval of the product application the quality of sowing was 100%. There were no doubles or skips. The average actual population of seeds during the last passed path interval of the product application was 141.5 thousand seeds per hectare, and the deviation of actual population of seeds from the target rate was -1%. This means that the average actual population was slightly lower than required.

[19] A row of average sowing results for seed sensors group. Shows that the current average actual rate of sowing is 5.0 seeds per meter. The current actual sowing rate is calculated only by those sensors that currently register the flow of seeds (numbers 1-3, 6-9, 11-12, 14-16). During the last passed path interval of the product application, the averaged values were: quality 86%, doubles 2%, skips 12%. During the last passed path interval of the product application the averaged actual population of seeds for all sensors was 140.0 thousand seeds per hectare, and its deviation from the target rate was -2%. This means that the actual averaged actual population of seeds was lower than required by all sensors.

The content of the “Table” screen, specific to mode displaying the number of sown seeds, applied dry fertilizers or the volume of applied liquid fertilizers.


[20] A column with the amount of product applied by sections. Depending on the type of section and its control mode, it displays the following data:



- the number of seeds - for seed sensors in the “precise” control mode.
- not exact, but only a relative number of pieces - for seed sensors or dry fertilizer sensors in the “hybrid” or “flow” control mode.
- volume in liters - for sensors of liquid fertilizers, regardless of the control mode.

[21] The total amount of applied product by all sections.


[22] A graphical representation of the deviation of the average actual rate of product application by the section, calculated during the last passed path interval of the product application. Displayed as a percentage.

For the “flow” and “hybrid” control modes, the zero mark is determined according to the average actual rate value of all sections applying the product. The left and right borders are always equal to 50%.

For “precise” and “by area” control modes, the zero mark corresponds to the target rate. The left and right borders are set by the  “Error rate, %” parameter in the settings of the corresponding group of section control sensors.

The indicator of the deviation of the actual rate of product application is a colored horizontal bar that is displayed according to the deviation value. When a deviation of actual rate of the product application is less than actual rate of product application averaged by all sections, then this indicator displayed on the left . When more - it is displayed on the right .


The deviation indicator is displayed in green while the deviation value is less than half of range of the left or right bounds.

If this value is more than half of the left or right bounds but still within these bounds, then it’s displayed  as yellow color.

If the deviation value has exceeded the left or right bounds, then the deviation indicator is displayed  as red color.

[23] The percentage deviation of the average actual rate of the product application by the section, calculated during the last passed path interval of the product application, which is displayed on the graphical indicator (see point 22).



















8.4. The “Statistics” screen

The “Statistics” screen (see Figure 35) is intended for displaying general information about the traveled distance, cultivated area, working speed, etc. You can go to this screen by switching between working screens using the  “Home” button (see Figure 6).








Statistics are saved automatically every 5 minutes, as well as after implement stopped moving. Therefore, it is recommended to turn off the operator panel only after stopping the movement.

The following buttons are active on this screen:

| Button | Description |
|---|--|
|  Increase brightness |  Block control of products application (works on any screen). |
|  Home |  Cyclic switch of work screens. |
|  Back |  Return to the main screen. |
|  Minus |  Go to the statistics from the previous field. |
|  Menu |  Open the menu of the “Statistics” screen. |
|  Plus |  Go to the statistics from the next field. |
|  Down |  Scroll down 1 line.  Scroll down 1 page. |
|  Up |  Scroll up 1 line.  Scroll up 1 page. |

In the “Statistics” screen, you can open a menu with the following menu items (see Figure 33):

-  Select a field
-  Statistics (switch display mode)
-  Run
-  Save to SD card
-  Reset statistics

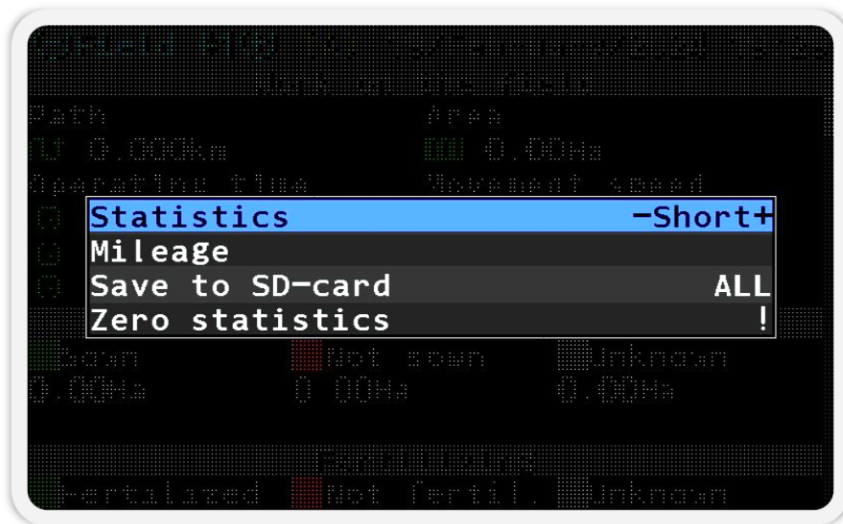




Figure 33 “Statistics” screen menu

 “Select a field” menu item is intended for selecting the active field in which new statistical data will be stored. This menu item is not displayed for a field that is already active.

 “Statistics” menu item is intended for switching the display mode of statistical data. Only two modes are available: “Short” and “Full”. In the short data display mode, some details of the product application process and most of the alarm information are hidden. Full mode displays all data.










By selecting a  “Run” menu item and pressing the  “Menu” button a message will be displayed with the values of the traveled path and the processed area (see Figure 34), which were accumulated during the entire work of the system. This data cannot be reset.



Figure 34 System mileage

 “Save to SD-card” menu item is only displayed if an SD card is inserted into the memory card slot. This menu item is intended to save statistics to the SD card for all fields or the selected field by number.²⁷ The field number is selected using the  “Plus” and  “Minus” buttons.


 “Zero statistics” menu item is intended to reset the accumulated statistics of the currently viewed field. To do this, you have to select this item and press the  “Menu” button. In the window, enter the PIN code “88888” for the  “Agronomist” access level. If the current access level in the system is  “Agronomist” then a question will be asked with the requirement to confirm the execution of the selected action.

Detailed description of the contents of the “Statistics” screen

The description of this screen (see Figure 35 and Figure 36) is made on the example of the work of a seeding machine that applied the following products:

- sowing in the “precise” control mode;
- dry fertilizers application in the “flow” control mode with weight calculation based on the rotations of the metering drum;
- liquid fertilizers application in the control mode “by area”.

“Statistics” screen title

[1] “active field” indicator . Displayed if the field, for which statistics are shown, is active. Statistics that accumulating during the work²⁸ of implement is stored in the active field.

[2] Field number, for which statistics are shown **Field #1**.


[3] Current date and time. When you need to replace the battery, the red label “BAT” appears periodically. If the clock is faulty, the “XX:XX” label flashes.

Block “Work on the field”

[4] Path , that the implement traveled during operation.

[5] Area , processed by the implement during the work.

[6] Work time , during which the work was performed.

[7] Average movement speed  during the work.

[8] Date and time of start and end of work on the field.

²⁷ The report contains same data as were in the statistics screen at the time the report was generated. Only FAT16 or FAT32 formatted memory cards are supported.

²⁸ By working on the field, we mean the process of products application on the field.

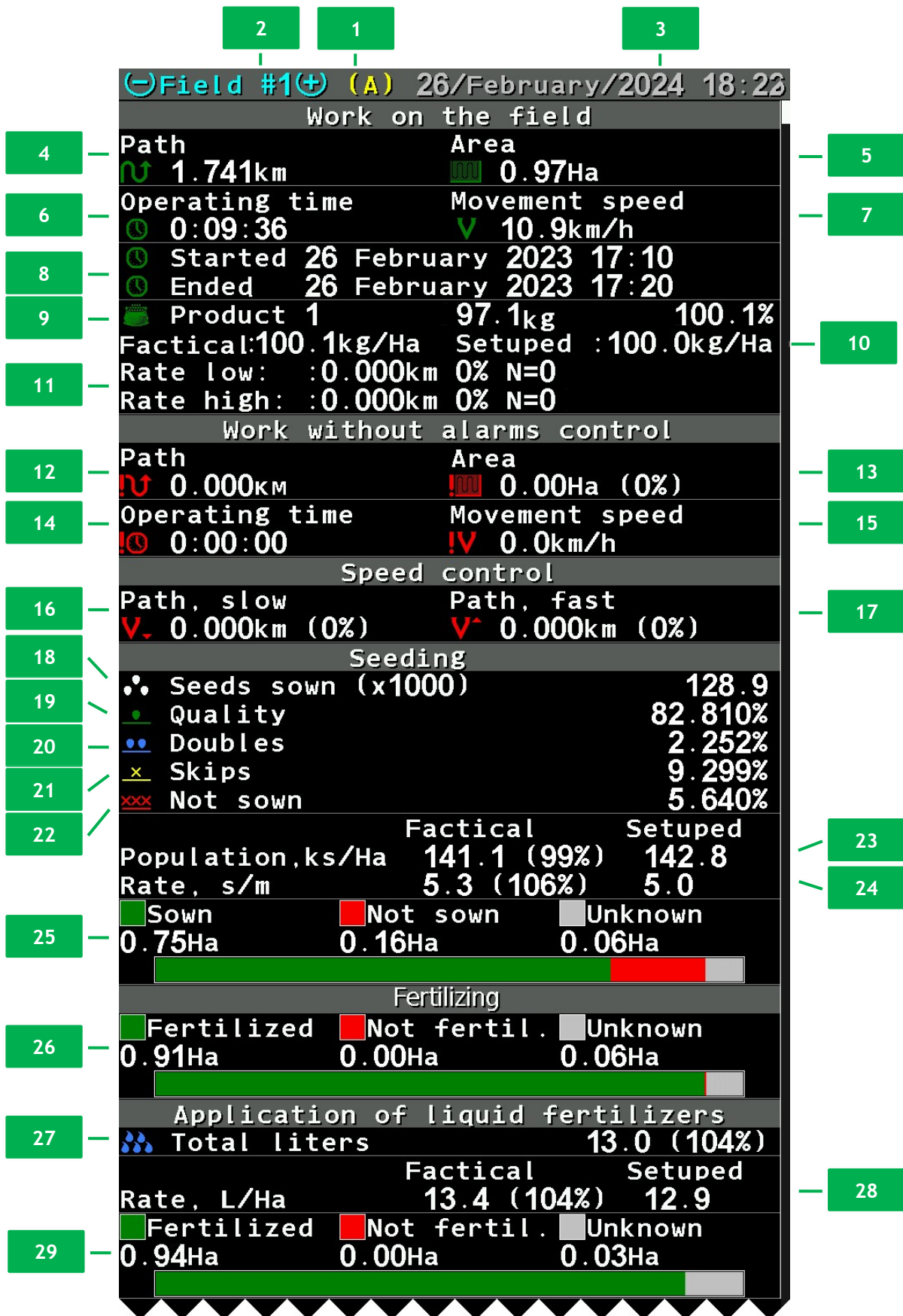


Figure 35 Example of the view of the general part of the “Statistics” screen

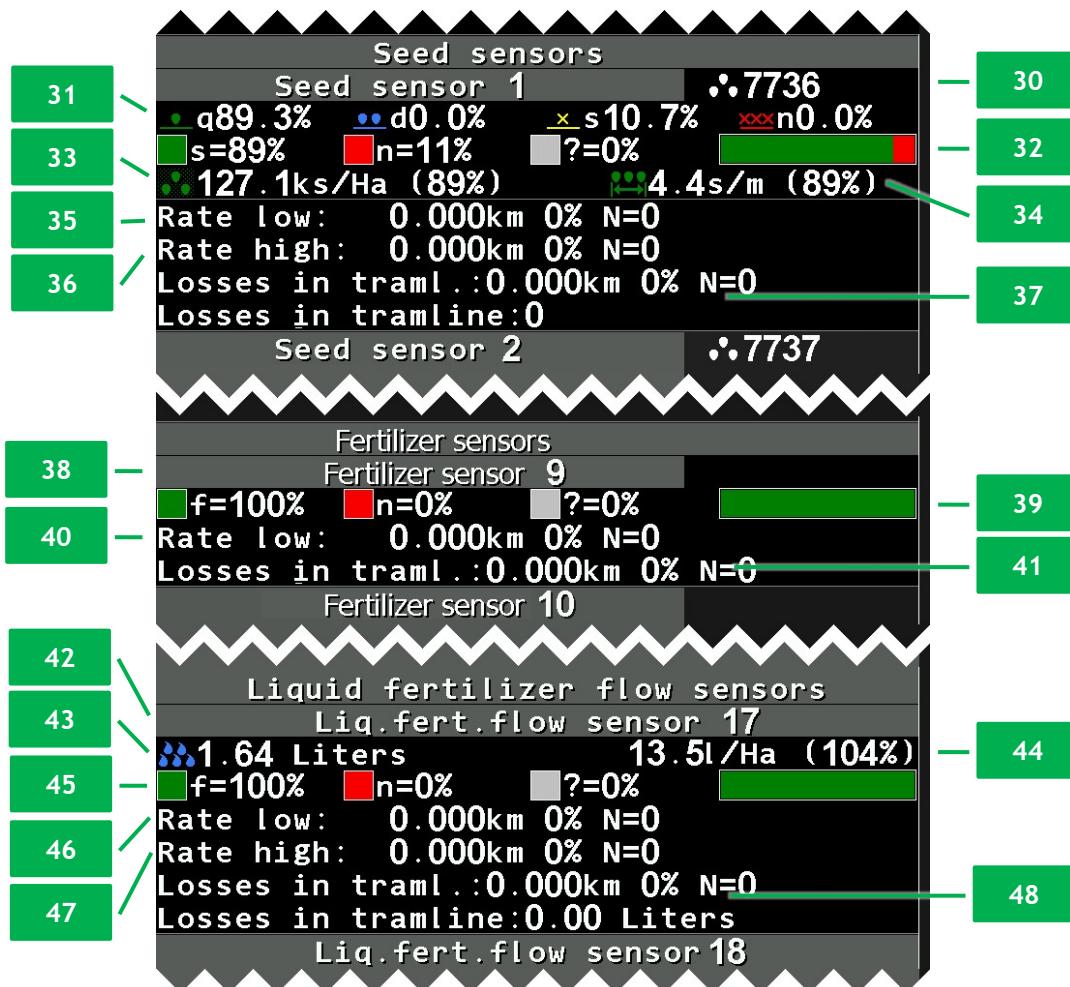




Figure 36 Example of the view of the “Statistics” screen with data for each section


- [9] In this row, from left to right, the following information is displayed:
- Product number  according to which the accounting of the application of the product by weight is performed. In this case, “Product 1” corresponds to dry fertilizers.
 - The weight of the applied product, calculated according to the number of measured rotations of the metering drum and its characteristics.
 - The ratio of the actually calculated weight to the target weight. Displayed as a percentage.
- [10] In this row, from left to right, are displayed:
- The average actual rate of application of the product by weight. Displayed in kilograms per hectare.
 - The average target rate of the application of the product that was controlled. Displayed in kilograms per hectare.
- [11] These two lines display the alarm statistics regarding to the application of the product by weight. The upper line displays statistics about too low actual


rate of application of the product, and the lower line displays statistics about too high actual rate. Each line contains the following information:

- The length of path, during which the actual rate of application of the product deviated from the target rate is more than acceptable²⁹.
- The ratio of this path with active alarm to the entire path traveled during work, in percent.
- The number of such alarms that occurred during work.

Block “Work without alarms control”


[12] Path  the implement traveled during operation without alarm control. Recorded if the target rate or minimum permissible level of actual rate of product application is set incorrectly or is deliberately overestimated by the operator so that the system does not signal alarms (see Figure 25, p.[Q]).


[13] Area  processed by the implement during work without alarm control, as well as the ratio of this area to the entire processed area.

[14] Work time  when work was performed without alarm control.

[15] Average move speed  during work without alarm control.


Block “Speed control”


[16] Path  that implement traveled during work at a speed less than the specified one³⁰, as well as the ratio of this path to the entire path during which the work was performed (displayed as a percentage).


[17] Path  that implement traveled during work at a speed more than the specified one, as well as the ratio of this path to the entire path during which the work was performed (displayed as a percentage).


Block “Seeding”

[18] The total number of sown seeds . Displayed in thousands of pieces.

[19] Quality of sowing³¹  across the entire field. Shows the ratio of seeds sown according to the target rate to the sum of all seeds and skips (in percent).

[20] Ratio of doubles  across the entire field to the sum of all seeds and skips. Displayed as a percentage.

[21] Ratio of skips  detected in the process of sowing (micro gaps) across the entire field to the sum of all seeds and skips. Displayed as a percentage.

[22] Ratio of skips  registered during continuous gaps to the sum of all seeds and skips. Displayed as a percentage.



The minimum continuous gap registered by the system corresponds to the path traveled by the seeding machine in 1 second, during which the sensor did not register any seed.

²⁹ The value of the maximum permissible deviation of the actual rate of application of the product by weight from the target rate is set in the parameter “Product rate error, %” in the “Settings” menu (see item 11.7.9 on page 103).

³⁰ Move speed monitoring is only available if it is enabled in the speed sensor settings.

³¹ This value by means is similar to term of singulation.

[23] This line contains the following information:

- Actual population of seeds across the entire field. Shown in thousands of seeds per hectare.
- Ratio of the actual population of seeds to the average target population³². Displayed as a percentage.
- The average value of the target population of seeds.

[24] This line contains the following information:

- Average actual rate of sowing³³ across the entire field. Shown in seeds per meter.
- Ratio of the average actual rate of sowing to the average target rate. Displayed as a percentage.
- The value of average target rate.



It is important to remember that the average actual target is calculated only in relation to the path during which the seed sensors registered the presence of seeds flow (without taking into account continuous gaps). Therefore, the percentage deviation of the actual rate of sowing may differ from the percentage deviation of the actual population.




[25] Information about sown , not sown  and not controlled  areas during the work. The graph shows the percentage ratio between sown, not sown and not controlled areas.

Not controlled area is an area on which the seeding machine was supposed to sow, but there was no connection to the seed sensor or control of that sensor was disabled.

In the “Precise” control mode of sowing, the not sown area is calculated as the area corresponding to one skip multiplied by the total number of detected skips.

In the “Flow” and “Hybrid” control mode of sowing, the not sown area is the area where the seed sensor did not register the application of seeds.

“Fertilizing” block

[26] Information on the application of dry fertilizers is divided into fertilized , not fertilized  and not controlled  areas during the work. The graph shows the percentage ratio between fertilized, not fertilized and not controlled areas.

Not controlled area is an area where the implement was supposed to apply dry fertilizers, but there was no connection to the dry fertilizer sensor or control of that sensor was disabled.

Not fertilized area is an area on which the sensor did not register the application of dry fertilizers.

³² In fact, the operator sets the target rate of sowing (in seeds per meter) at the beginning of work and should not change it during work on the entire field. It is from the target rate of sowing the value of population of seeds is calculated.




³³ This value by means is similar to term of spacing.

Block “Application of liquid fertilizers”


[27] The total amount of applied liquid fertilizers . Displayed in liters.




[28] This line contains the following information:




- The average value of the actual rate of application of liquid fertilizers throughout the field. Displayed in liters per hectare.
- The ratio of the average actual rate of application of liquid fertilizers to the average target rate. Displayed as a percentage.
- The average value of the target rate of application of liquid fertilizers. Displayed in liters per hectare.

[29] Information on the application of liquid fertilizers is divided into fertilized , not fertilized  and not controlled  areas during the work. The graph shows the percentage ratio between fertilized, not fertilized and not controlled areas. Not controlled area is an area where the implement was supposed to apply liquid fertilizer, but there was no connection to the liquid fertilizer sensor or control of that sensor was disabled. Not fertilized area is an area on which the sensor did not register the application of liquid fertilizers.


Block “Seed sensors”

[30] The number of the seed sensor for which the data is displayed, as well as the number of seeds  which were sown by the respective section.


[31] Percentage of quality of sowing³⁴ , doubles  and skips /xxx registered by the seed sensor. These items have the same meaning as items 19, 20, 21 and 22.

[32] Percentage and chart of sown , not sown  and not controlled  areas on which the sowing for this section was performed.





[33] The left half of this line contains the following information:

- Average value of actual population of seeds  for whole area covered by this section. Shown in thousands of seeds per hectare.
- Ratio of the actual population to the target population. Displayed as a percentage.

[34] The right half of this line contains the following information:

- Actual rate of sowing  for this section³⁵. Displayed in seeds per meter. Ratio of the actual rate of sowing to the target rate. Displayed as a percentage.



It is important to remember that actual rate of sowing  is calculated only in relation to the path during which the seed sensor registered the presence of sowing (without taking into account ). Therefore, the percentage of deviation of the actual rate  may differ from the deviation percentage of the actual population of seeds .

³⁴ This value by means is similar to term of singulation.

³⁵ This value by means is similar to term of spacing.

[35] This line contains the following information:

- The alarm path, during which the actual rate according to the given seed sensor was less than the permissible deviation from the target rate set by the operator.
- The ratio of this alarm path to the entire path traveled during the work. Displayed as a percentage.
- The number of such alarms that occurred during work.

[36] This line contains the following information:

- The alarm path, during which the actual rate according to the given seed sensor was more than the permissible deviation from the target rate set by the operator.
- The ratio of this alarm path to the entire path traveled during the work. Displayed as a percentage.
- The number of such alarms that occurred during work.




[37] Losses of seeds into the tramline are displayed in two lines. The first line contains the following information:

- The alarm path during which losses of seeds into the tramline were registered.
- The ratio of this alarm path to the entire path traveled during the work. Displayed as a percentage.
- The number of such alarms that occurred during work.

The second line shows the number of seeds lost into the tramline.

Block “Fertilizer sensors”

[38] The number of the dry fertilizer sensor for which statistical data is displayed.

[39] Information of the application of dry fertilizers is divided into fertilized , not fertilized  and not controlled  area during the work.

[40] This line contains the following information:


- The alarm path, during which the actual rate of application of dry fertilizers by this sensor was less than the permissible deviation from the target rate set by the operator.
- The ratio of this alarm path to the entire path traveled during the work. Displayed as a percentage.
- The number of such alarms that occurred during work.

[41] This line contains the following information:

- The alarm path, during which losses of dry fertilizers into the tramline were registered.
- The ratio of this alarm path to the entire path traveled during the work. Displayed as a percentage.
- The number of such alarms that occurred during work.




Block “Liquid fertilizer sensors”

[42] The liquid fertilizer sensor number for which statistics are displayed.

[43] The volume of applied liquid fertilizers is displayed in the left half of this line . Displayed in liters.

[44] The right half of this line contains the following information:

- The average actual rate of application of liquid fertilizers for this section. Shown in liters per hectare.
- The ratio of the average actual rate of application of liquid fertilizers to the average target rate of application of liquid fertilizers. Displayed as a percentage.

[45] Information on the application of liquid fertilizers is divided into fertilized , not fertilized  and not controlled  area during the work.

[46] This line contains the following information:

- The alarm path, during which the actual rate of application of liquid fertilizers by this section was less than the permissible deviation from the target rate set by the operator.
- The ratio of this alarm path to the entire path traveled during the work. Displayed as a percentage.
- The number of such alarms that occurred during work.

[47] This line contains the following information:

- The alarm path, during which the actual rate of application of liquid fertilizers by this section was more than the permissible deviation from the target rate set by the operator.
- The ratio of this alarm path to the entire path traveled during the work. Displayed as a percentage.
- The number of such alarms that occurred during work.







[48] Losses of liquid fertilizers into the tramline are displayed in two lines. The first line contains the following information:

- The alarm path, during which losses of liquid fertilizers into the tramline were registered.
- The ratio of this alarm path to the entire path traveled during the work. Displayed as a percentage.
- The number of such alarms that occurred during work.

The second line shows the volume of liquid fertilizers lost into the tramline. Displayed in liters.

9. Setting up the tramline rhythm

In order to turn on and setup the tramline rhythm, you have to perform the following actions:

1. On the main screen, press the  “Menu” button. The screen will show the main screen menu with an  “Settings” item. Press the  “Menu” button again. Select an  “Tramline” item (see Figure 37). To do this, use the  “Up” or  “Down” buttons (further, in the text, use these buttons to move from one menu item to another).

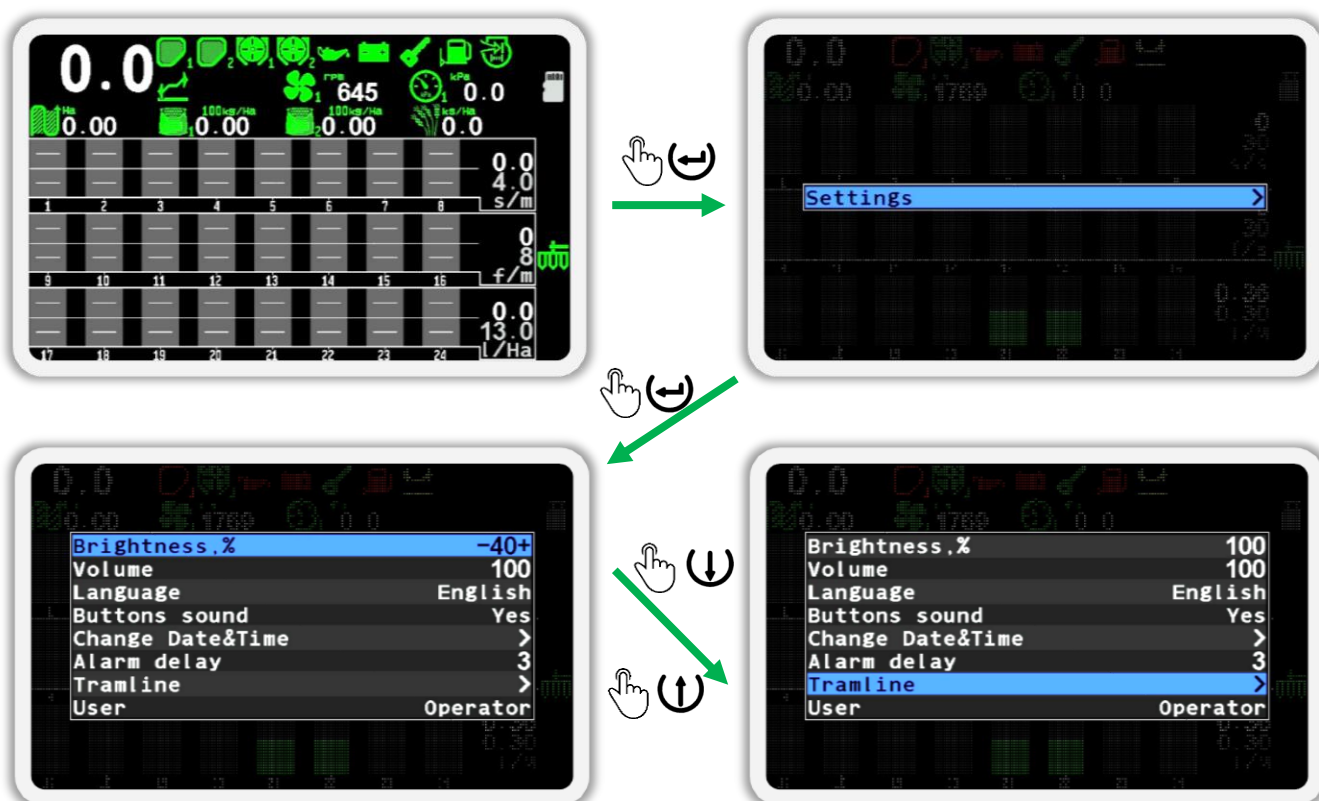








Figure 37

2. Press the  “Menu” button. As a result, the menu of tramline rhythm settings will be displayed on the screen. In the  “Tramline” item set the value to “Yes” (use the  “Plus” or  “Minus” buttons). Next, go to the  “Tramline rhythm settings” menu item and press the  “Menu” button. As a result, the screen for setting up the tramline rhythm will appear (see Figure 38).

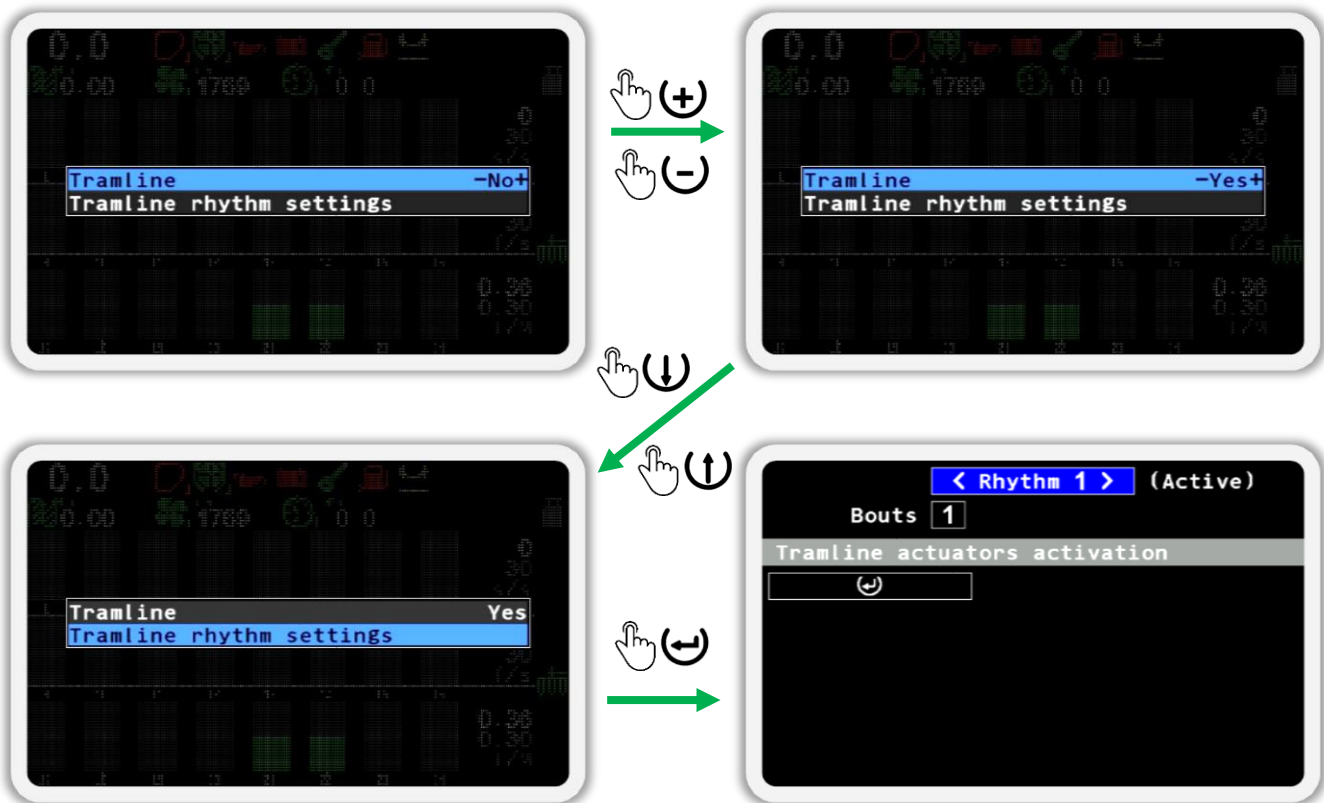


Figure 38

3. To switch between items on screen (↑) “Up” and (↓) “Down” buttons are used. Use these buttons to select item **< Rhythm 1 >** of the rhythm number setup. Use the (+) “Plus” and (-) “Minus” buttons to change the rhythm number. Press the (☰) “Menu” button and in the menu that appears select the 👤 “Select” item (see Figure 39). Press the (☰) “Menu” button again so that the selected rhythm becomes active and is used during the work on the field. When a rhythm is active, the message “Active” is displayed to the right of the rhythm number.

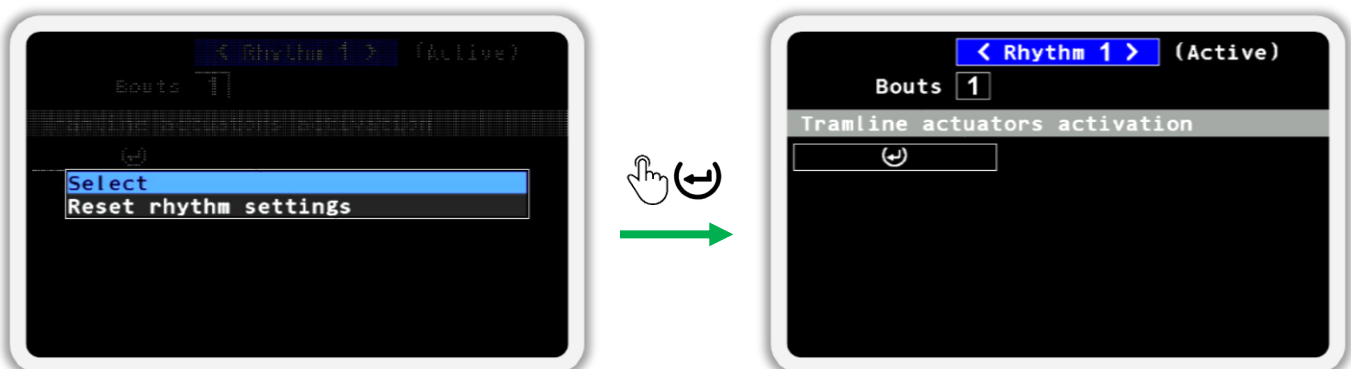







Figure 39

- Next, go to the item **Bouts 1** of setup of the number of runs in this rhythm. To do this, press the  “Down” button. After that press the  “Menu” button. In the menu that appears (see Figure 40), change the number of runs to the desired number using the  “Plus” or  “Minus” buttons and press the  “Menu” button again.

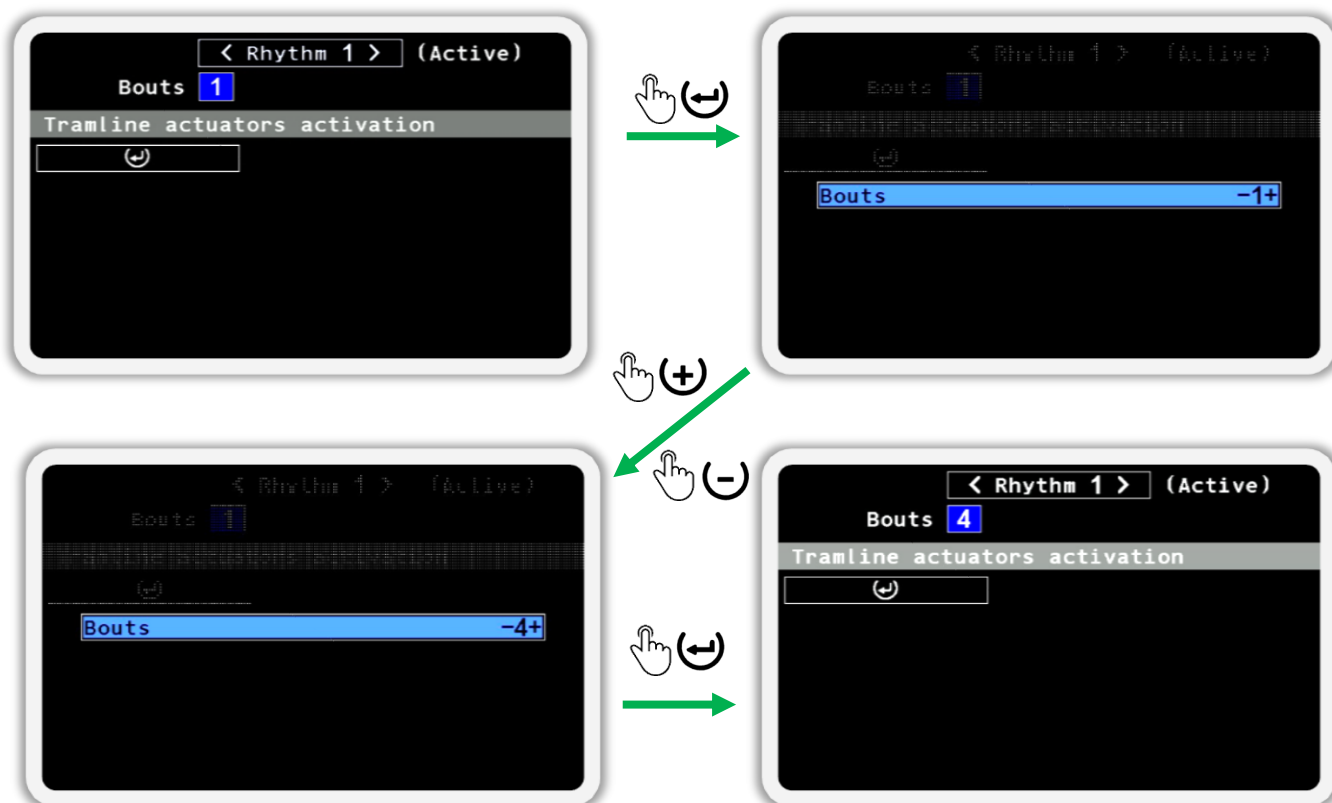


Figure 40






- Add actuators that will be used for tramline making. First, select the item of adding an actuator to the rhythm by pressing the  “Down” button (see Figure 41). Now press the  “Menu” button. In the menu that appears on the screen, change the actuator number to the desired one in the  “Actuator” item. Then select an  “Bout” item and change the run number to the one on which the actuator should cut off the product application flow. To complete the procedure of adding an actuator to the tramline rhythm, press the  “Menu” button.



Figure 41

- To move through the items of setting the runs numbers, on which the actuator will cut off the flow of products, use the \oplus “Plus” and \ominus “Minus” buttons. If you need the actuator to cut off the product application flow on additional runs, then go to the item of adding a new run. Press the ☺ “Menu” button (see Figure 42) and then in the menu that appears on the screen, select the desired run number. To complete the procedure of adding a new run number on which the actuator will cut off the flow of products, press the ☺ “Menu” button. A total of up to four runs can be added for each actuator.

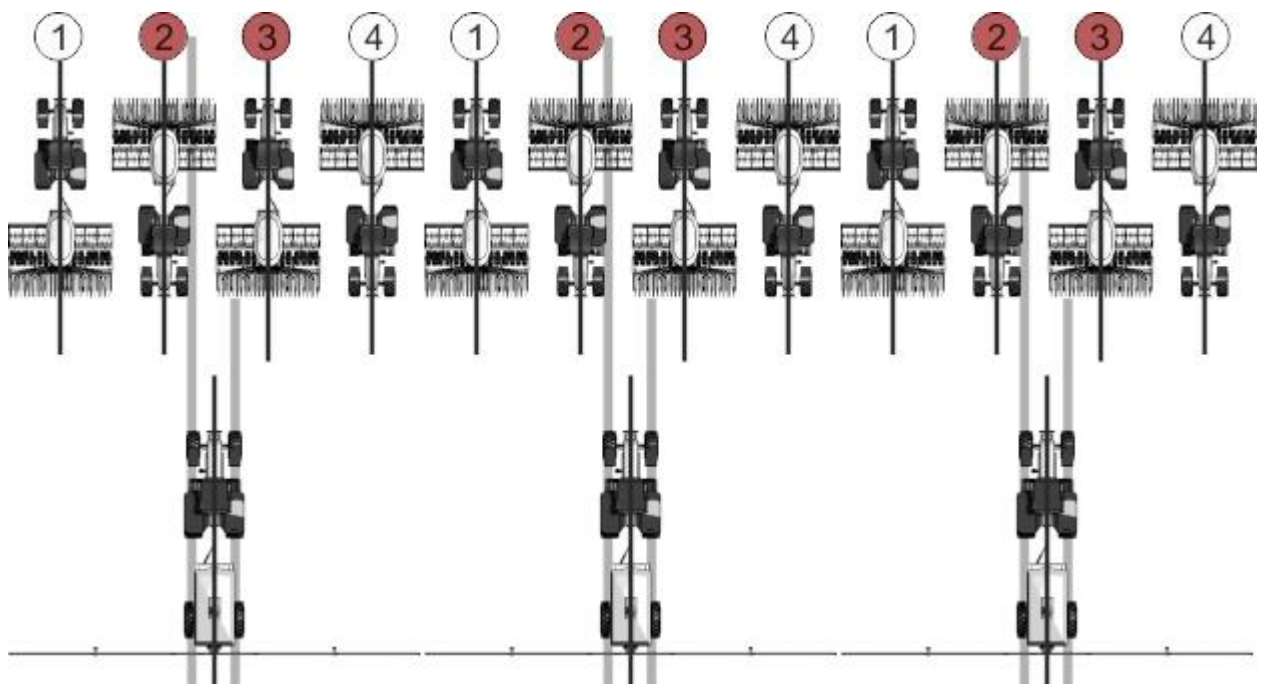
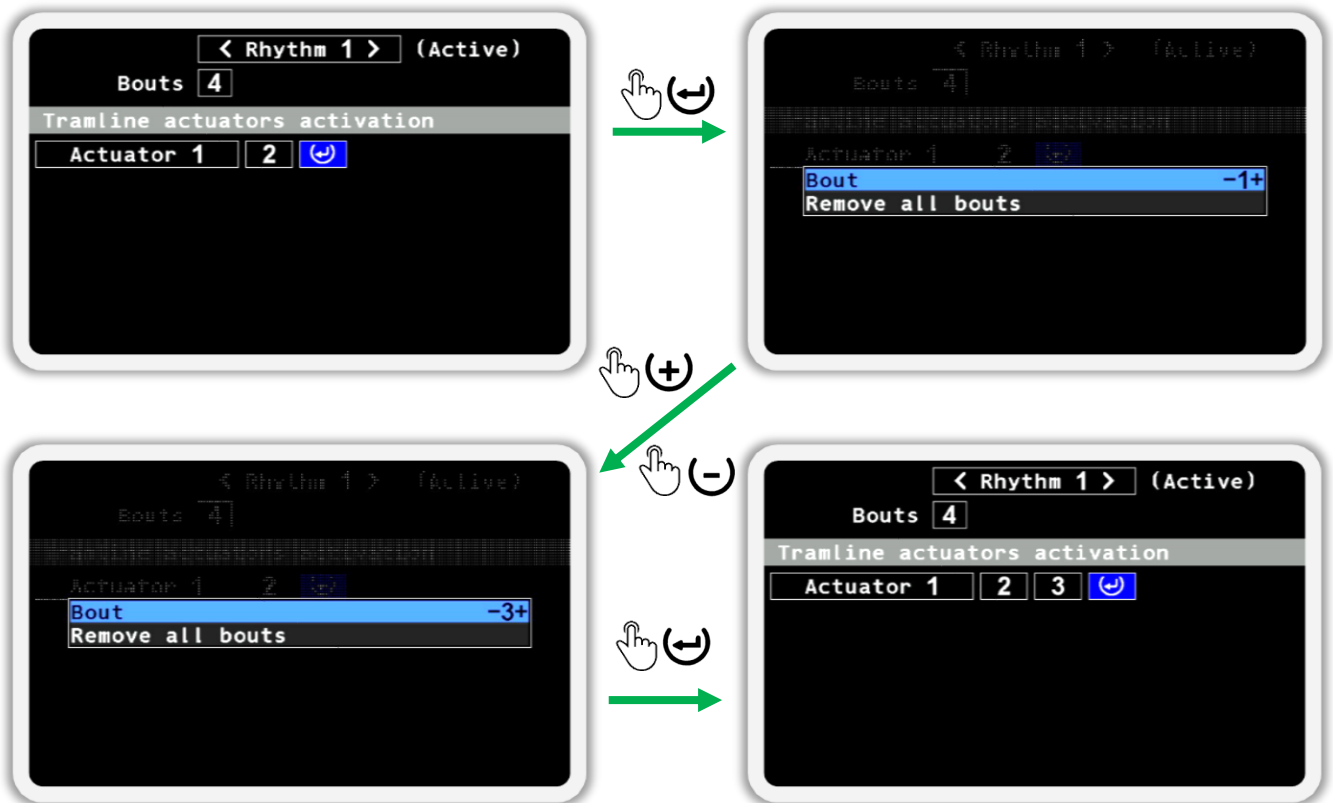










Figure 42




- Once you've set up the tramline rhythm, return to the main screen. To do this, use the  "Back" button. When the tramline making, feature is enabled, the tramline rhythm indicator is displayed on the main screen  (see subsection 8.1.6 on page 32). The process of changing the number of the current run and the mode of switching runs is described in section 7 "Brief instructions for use" on page 18.




10. List of alarm messages and troubleshooting methods

| Alarm text | Description and troubleshooting |
|---|--|
| No connection | <p>No connection to sensors, actuators, input device or other devices.</p> <ul style="list-style-type: none"> • Check that devices connected to the network. • Check the power supply. It must meet the parameters specified in the passport. |
| Wrong device type! | <p>A device of a different type was detected at the address of a device of one type. The reason may be an incorrect setting of the system profile or the configuration of the device itself.</p> <ul style="list-style-type: none"> • To resolve this issue, contact service support. Contacts of the service support are on the back of this manual. |
| Low speed of rotation or High speed of rotation | <p>The speed of rotation of the fan or the central metering device shaft is lower or higher than the permissible one.</p> <ul style="list-style-type: none"> • Check the controlled device. • Check the sensor settings. • Make sure the sensor is working properly. • For the dispenser sensor, make sure the movement speed displayed on the monitor matches your actual speed. • Calibrate the dispenser sensor. |
| No rotation | <p>There is no rotation of the central metering device shaft.</p> <ul style="list-style-type: none"> • Check the controlled device. • Check the sensor settings. • Make sure the dispenser sensor is working properly. |
| Hopper empty | <p>The product level in the hopper is very low. Filling is required.</p> <ul style="list-style-type: none"> • Check the level of filling of the hopper. • If the level of the product is higher than the level of the sensor installation, make sure the sensor is working properly. |

| Alarm text | Description and troubleshooting |
|-------------------|--|
| High pressure | <p>The absolute value of the measured pressure (boost or vacuum) is greater than the permissible value.</p> <ul style="list-style-type: none"> • Decrease fan or turbine speed. • Check the position of the air intake control valve (if present). • Check the correctness of the connection to the pressure sensor (tube) and the absence of clogging in the pressure measurement line. |
| Low pressure | <p>The absolute value of the measured pressure (boost or vacuum) is lower than the permissible value.</p> <ul style="list-style-type: none"> • Increase fan or turbine speed. • Check the air duct for tightness. • Check the position of the air intake control valve (if present). • Check the correctness of the connection to the pressure sensor (tube) and the absence of clogging in the pressure measurement line. |
| Not under control | <p>The actual rate of the product application according to the given number of section control sensors is below the minimum required to start product application control.</p> <ul style="list-style-type: none"> • Make sure the movement speed displayed on the monitor matches your actual speed. • Check the set target rate or the minimum permissible level of actual rate of product application depending on the control mode of the group of sections. • Check the  “Fraction” parameter value in the seed or dry fertilizer sensor settings. Maybe the value should be decreased. • Check the  “Pulses per liter” parameter value in the liquid fertilizer sensor settings. Maybe the value should be decreased. • Check that there is enough product in the hoppers or in the tank. • Make sure the metering device is working properly and device adjustments are correct. |



| Alarm text | Description and troubleshooting |
|----------------------|---|
| Under allowable rate | <p>The section sensor of seeds, dry fertilizers or liquid fertilizers detected too low actual rate of application of the product during work.</p> <ul style="list-style-type: none"> • Check that there is enough product in the hoppers or in the tank. • Make sure the movement speed displayed on the monitor matches your actual speed. • Check the  “Fraction” parameter value in the seed or dry fertilizer sensor settings. Maybe the value should be decreased. • Make sure the seed sensor is working properly by reading the seed sensor status value in the “Information” screen. • Check the  “Pulses per liter” parameter value in the liquid fertilizer sensor settings. Maybe the value should be decreased. • Make sure the metering device is working properly and device adjustments are correct. |
| Over allowable rate | <p>The sectional sensor of seeds, dry fertilizers or liquid fertilizers detected too high actual rate of application of the product during work.</p> <ul style="list-style-type: none"> • Make sure the movement speed displayed on the monitor matches your actual speed. • Check the  “Fraction” parameter value in the seed or dry fertilizer sensor settings. Maybe the value should be increased. • Make sure the seed sensor is working properly by reading status value in the “Information” screen. • Check the  “Pulses per liter” parameter value in the liquid fertilizer sensor settings. Maybe the value should be increased. • Make sure the metering device is working properly and device adjustments are correct. |

| Alarm text | Description and troubleshooting |
|------------------------------------|---|
| High % of doubles | <p>The detected percentage of doubles is higher than the specified one.</p> <ul style="list-style-type: none"> • Make sure the movement speed displayed on the monitor matches your actual speed. • Check the  “Doubles error, %” parameter value in the seed sensor settings. • Check the  “Fraction” parameter value in the seed sensor settings. Maybe the value should be increased. • Make the seed sensor is working properly by reading status value in the “Information” screen. • Check that the metering device is working properly and device adjustments are correct. |
| High % of skips | <p>The detected percentage of skips is higher than the specified one.</p> <ul style="list-style-type: none"> • Make sure the movement speed displayed on the monitor matches your actual speed. • Check the  “Skips error, %” parameter value in the seed sensor settings. • Check that there are enough seeds in the hoppers. • Check the  “Fraction” parameter value in the seed sensor settings. Maybe the value should be decreased. • Make sure the seed sensor is working properly by reading status value in the “Information” screen. • Make sure the metering device is working properly and device adjustments are correct. |
| Tramline actuator Stall | <p>The actuator of the tramline is jammed.</p> <ul style="list-style-type: none"> • Make sure the actuator rod position sensors are working properly. • Make sure the tramline actuator mechanism is working properly. |
| Tramline actuator Illegal state | <p>Both rod position sensors were triggered.</p> <ul style="list-style-type: none"> • Make sure the rod position sensors are working properly. |

| Alarm text | Description and troubleshooting |
|--|---|
| <p>Seeding to tramline or Distributing to tramline</p> | <p>The seed, dry fertilizers or liquid fertilizers sensor has detected an unacceptably high rate of the product losses being in the tramline control mode.</p> <p>For the seed or dry fertilizers sensor:</p> <ul style="list-style-type: none"> • Check the  “Toler. sowing to tramline, %” parameter in the settings of the sections control sensors group. Maybe the value should be increased. • Make sure the metering device and flow cut-off mechanism are working properly. • Check the  “Fraction” parameter in the settings of the sections control sensors group. Maybe the value should be increased. • Make sure the sensor working properly by reading status value in the “Information” screen. <p>For the liquid fertilizer sensor:</p> <ul style="list-style-type: none"> • Check the  “Tolerable leak to tramline, %” parameter in the settings of the sectional sensors group. Maybe the value should be increased. • Make sure the metering device and flow cut-off mechanism are working properly and device adjustments are correct. |
| <p>Clogged</p> | <p>The seed or dry fertilizer sensor has detected a clogging of the optical channel.</p> <ul style="list-style-type: none"> • Eliminate clogging. • Check for absence of dust in the optical channel. • Check the power supply. It must meet the parameters specified in the passport. |


| Alarm text | Description and troubleshooting |
|---------------------------------|--|
| Light struck | <p>The seed or fertilizer sensor has detected an extremely high light level in the optical channel.</p> <ul style="list-style-type: none"> • Avoid direct sunlight entering the optical channel of the sensor. |
| Broken | <p>The seed or dry fertilizer sensor has detected a malfunction. Maybe it must be replaced.</p> <ul style="list-style-type: none"> • Check the power supply. It must meet the parameters specified in the passport. |
| Old firmware! Wrong S&D calc! | <p>The seed sensor with outdated software is detected.</p> <ul style="list-style-type: none"> • Contact support to update the software in your device. Contacts of the service support are on the back of this manual. |
| Emergency oil pressure Failure! | <p>The low oil pressure sensor was alarmed.</p> <ul style="list-style-type: none"> • Make sure the low oil pressure sensor is working properly. • Check the activation signal in the low oil pressure sensor settings. • Check that ignition key position sensor control is enabled, if it is present in the profile. • Make sure the ignition key position sensor is working properly, if it is present in the profile. |
| No battery charge Failure! | <p>A lack of battery charge was detected.</p> <ul style="list-style-type: none"> • Make sure the battery charge sensor is working properly. • Check the activation signal in the battery charge sensor settings. • Check that control of ignition key position sensor is enabled, if it is present in the profile. • Make sure the ignition key position sensor is working properly, if it is present in the profile. |



| Alarm text | Description and troubleshooting |
|--|---|
| <p>Low fuel Failure!</p> | <p>Low level of fuel is left in the tank.</p> <ul style="list-style-type: none"> • Make sure the fuel level sensor is working properly. • Check the activation signal in the fuel level sensor settings. • Check the delay of the activation signal in the fuel level sensor settings. By default, it's 15 seconds. |
| <p>Air filter Failure!</p> | <p>The air filter is clogged.</p> <ul style="list-style-type: none"> • Make sure the air filter sensor is working properly. • Check the activation signal in the air filter sensor settings. • Check the delay of the activation signal in the air filter sensor settings. By default, it's 5 seconds. |
| <p>Rate of product is to low! or Rate of product is to high!</p> | <p>The system registers the incorrect speed of rotation of the drive shaft of the central metering device, which distributes the product with the feature of control of the weight of the product turned on.</p> <ul style="list-style-type: none"> • Check the target rate of the product application. • Check the metering device. • Check the settings of the dispenser sensor. • Make sure the dispenser sensor is working properly. • Run calibration of the dispenser sensor weight control feature. |
| <p>User is Agronomist! Alarms will not be shown!</p> | <p>The system detected the fulfillment of the condition of product application control while the access level is set to the "Agronomist". This message is displayed only once during the entire time of work with this access level.</p> <ul style="list-style-type: none"> • For normal system operation, set the access level to "Operator" in the settings. |

| Alarm text | Description and troubleshooting |
|--|---|
| Speed to low! | <p>The movement speed of the seeding machine is greater than the set one.</p> <ul style="list-style-type: none"> • Decrease movement speed. • Make sure the movement speed displayed on the monitor matches your actual speed. • Check the current speed limits in the “Information” screen for the speed sensor. • Check all speed sensor settings. Pay attention to the value of the  “Max speed, km/h” parameter. • Calibrate the speed sensor. • Make sure the speed sensor is working properly. |
| Speed to high! | <p>The movement speed of the seeding machine is lower than the set one.</p> <ul style="list-style-type: none"> • Increase movement speed. • Make sure the movement speed displayed on the monitor matches your actual speed. • Check the current speed limits in the “Information” screen for the speed sensor. • Check all speed sensor settings. Pay attention to the value of the  “Min speed, km/h” parameter. • Calibrate the speed sensor. • Make sure the speed sensor is working properly. |
| Speed sensor #1 failed or Speed sensor #2 failed | <p>The alarm is raised only when the usage of two movement speed sensors is selected in the system profile settings, but the system registers movement by only one of them.</p> <ul style="list-style-type: none"> • Make sure the speed sensors working properly and eliminate the detected malfunctions. • Change the system profile to use only one speed sensor. |

11. Configuring the operator panel

11.1. Enabling the “Agronomist” access level

To configure all parameters of the operator panel, the  “Agronomist” access level must be enabled. To do this, follow these steps:

1. On the main screen, press the  “Menu” button. As a result, the main screen menu with an  “Settings” item will be displayed (see Figure 43).

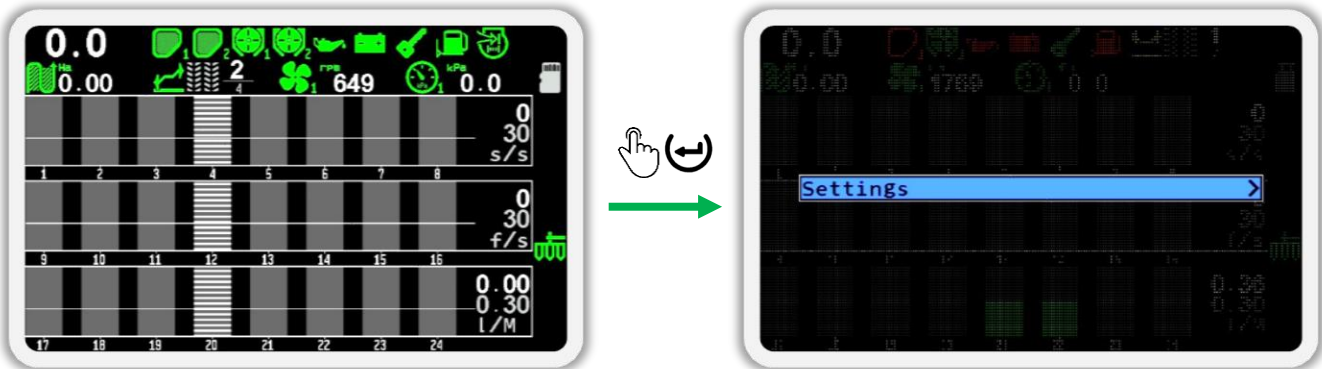






Figure 43

2. Press the  “Menu” button again. As a result, the “Settings” menu will be displayed (see Figure 44). In this menu, select an  “User” item. To do this, use the  “Up” or  “Down” buttons (hereafter use these buttons to move from one menu item to another).

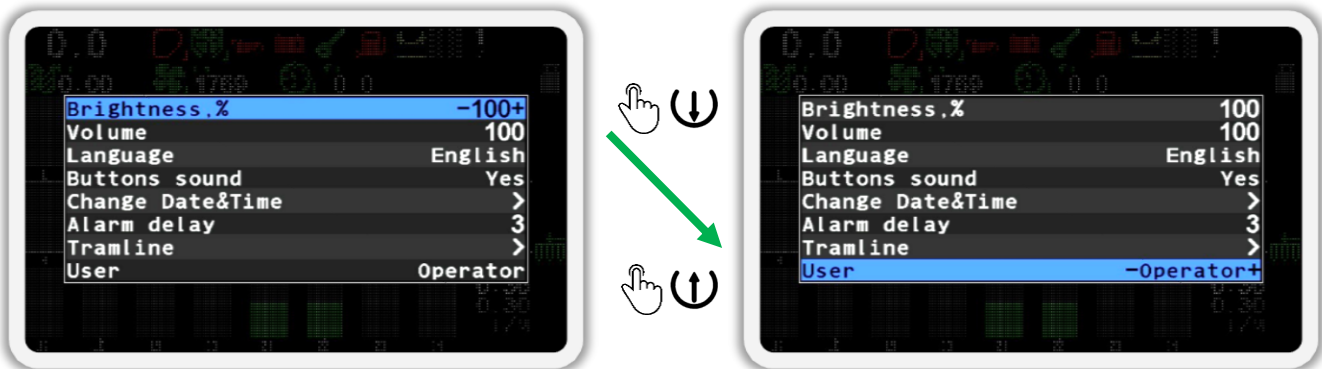










Figure 44

3. Now select the  “Agronomist” user (see Figure 45 on the left). To do this, use the  “Plus” or  “Minus” buttons.
4. Press the  “Menu” button.
5. In the window that appeared (see Figure 45 on the right) enter PIN code “88888”. A number whose value can be changed is displayed in black on a blue background. To change its value, use the  “Plus” or  “Minus”

buttons, and to move to the next number, use the  “Up” or  “Down” buttons.

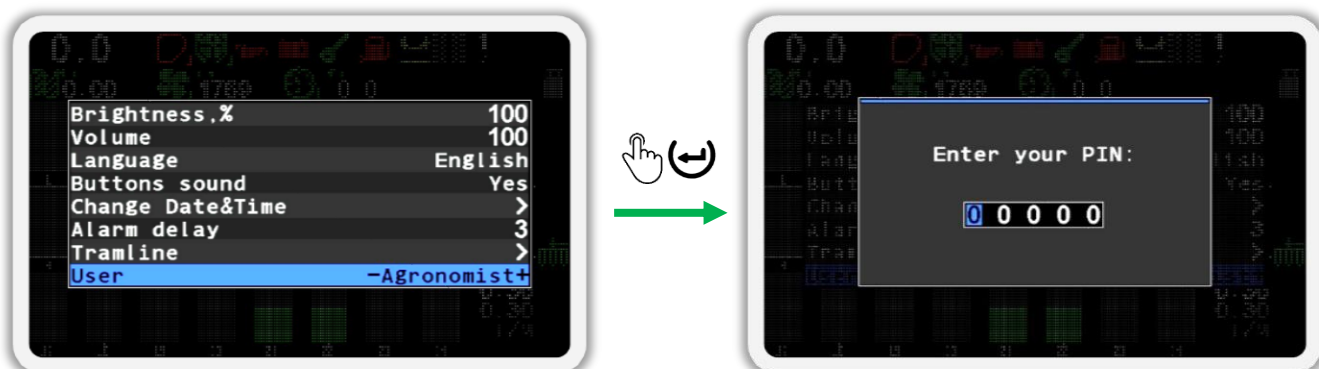



Figure 45

- After entering the PIN code, press the  “Menu” button. If the code is entered correctly, you will see a message with the label “Agronomist” (see Figure 46). After this panel will automatically return to the “Settings” menu.

All operator panel menus will now show all parameters available for configuration.

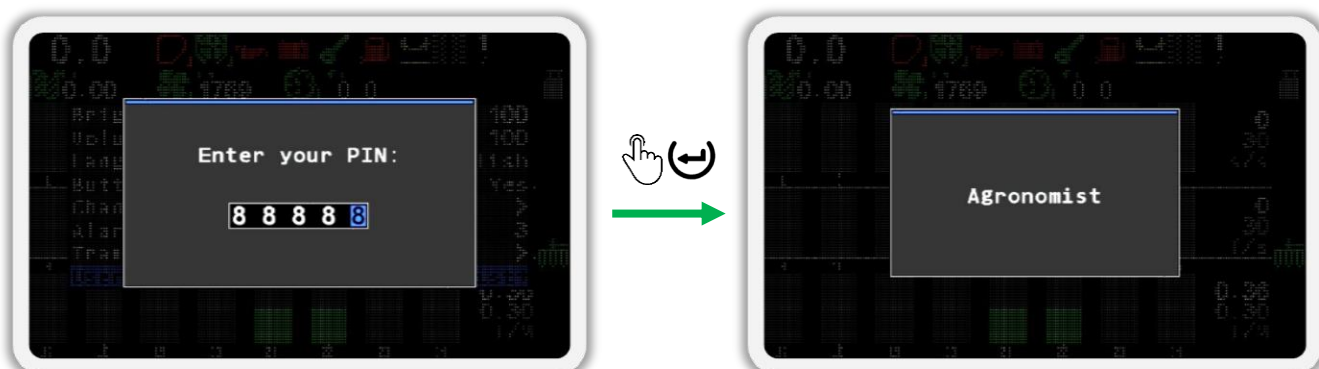




Figure 46



To quickly switch to the “Agronomist” access level you have to quickly and simultaneously press and release the  “Up” and “Down” buttons. After that, the screen for entering the PIN code will be displayed. Enter the PIN code “88888” and press the  “Menu” button. After that, any windows or menus that were displayed on the screen will be closed. As a result, the main screen will be displayed.



If “Agronomist” or “Service” access level is selected, the alarm indicator will flash with a high frequency (see Figure 4, p.5). Additionally, no alarm notifications will be displayed until the access level is changed to “Operator”.

11.2. Procedure for configuring the operator panel

This subsection specifies the sequence of actions performed during the commissioning works necessary to configure the operator panel.



The instructions described in this section are universal, so take into account that the list of actions on your equipment may be much smaller, depending on the configuration of the system.

















When setting up the sensors, you need to remember that for all types of sensors, you have to set the parameters separately for each of them. The exception to this rule is the seed sensors group, the dry fertilizer sensors group, and the liquid fertilizer sensors group. Almost all of their parameters are common to each group of sensors, except for two: sensor control and “Product application”.

1. Connect all devices to the operator panel and provide them with electrical power according to the scheme in the system passport.
2. Check the initial settings of the operator panel and check the connections to the devices in the system. This procedure consists of the following steps:
 - a) Check your profile settings (see subsection 11.3.1 on page 82). If the profile settings do not match the system equipment, configure the system profile. (see subsection 11.4 on page 87).
 - b) Make sure the operator panel has successfully established connection with the sensors (see subsection 11.3.2 on page 83 and subsection 11.3.3 on page 84).



Setting the following parameters requires the “Agronomist” access level. The procedure for changing the current access level is described in subsection 11.1 “Enabling the “Agronomist” access level” on page 76.




3. Configure general system settings (see subsection 11.7 on page 97):
 - a)  Specify the implement width (see subsection 11.7.1.1 on page 97).
 - b)  Check the sowing sensors control mode (see item 11.7.1.2 on page 98). For planters, the control mode should be set to “Precise”. For seeding drills, the control mode should be set to “Hybrid” (recommended) or “Flow”.

- c)  Check the dry fertilizer sensors control mode. Control mode “Hybrid” (recommended) or “Flow” must be set (see item 11.7.1.3 on page 98).
- d)  Check the liquid fertilizer sensors control mode. Control mode “Flow” or “By area” must be set (see item 11.7.1.4 on page 98).
- e)  If there is a tramline actuator, then setup relation between the seed and dry fertilizer sensors and the tramline actuators (see item 11.7.1.6 on page 101).
4. Perform the initial setup of the specified below parameters for the sensors used in the system (see subsection 11.8 on page 105):
- a) Speed sensor (see subsection 11.8.3 on page 107):
-  “Alarms criteria”;
 -  “Pulses”;
 -  “Diameter, cm”;
 -  “Imitation” - set “No”;
 -  perform speed sensor calibration.
- b) Dispenser sensors (see subsection 11.8.6 on page 114):
-  “Period, s”;
 -  “Alarms criteria”;
 -  “Weight control” - if necessary, enable this feature and perform calibration (see subsection 11.8.7 on page 118);
 -  “Rotation speed control” - if necessary, enable this feature and perform calibration (see subsection 11.8.8 on page 120).



Instead of the outdated mode of controlling the speed of rotation of the metering device shaft, it is better to use the new feature of controlling it by the weight of the applied product.

c) Fan sensors (see subsection 11.8.9 on page 122):

-  “Impulses”;
-  “Minimum, rpm”;
-  “Maximum, rpm”.



d) Pressure sensors (see subsection 11.8.10 on page 123):

-  “Filter”;
-  “Minimum, Pa”;
-  “Maximum, Pa”.

e) Sensors of the diesel generator of the fan drive:

- “Emergency oil pressure”;
- “No battery charge”;
- “Ignition”;
- “Low fuel”;
- “Air filter”.

For the listed sensors, check the parameters (see subsection 11.8.15 on page 133):

-  “Activation signal”;
-  “Signal delay, sec”.




f) Implement position sensor (see subsection 11.8.14 on page 132):



-  “Transporting position signal”.

g) Sensors of run markers (see subsection 11.8.20 on page 135):





-  “Signal ‘down’”.

h) Seed sensors (see subsection 11.8.11 on page 125):






-  “Rate error, %”;
-  “Doubles error, %”;
-  “Skips error, %”;

-  “Those who distributing, %”;
-  “Toler.sowing to tramline, %”.



i) Dry fertilizers sensors (see subsection 11.8.12 on page 129):

-  “Rate error, %”;
-  “Those who distributing, %”;
-  “Toler.sowing to tramline, %”;
-  “Group start address”.

j) Liquid fertilizers sensors (see subsection 11.8.13 on page 129):

-  “Pulses per liter”;
-  “Rate error, %”;
-  “Those who distributing, %”;
-  “Toler.sowing to tramline, %”;
-  “Group start address”.

k) Tramline actuator (see subsection 11.8.21 on page 136):

-  “Cutoff position”;
-  “Switch”.




Settings are saved automatically three seconds after the last key pressed. Therefore, wait a few seconds before turning off the operator panel.

11.3. Checking basic settings and availability of connection to devices

11.3.1. Checking operator panel profile settings

The operator panel profile settings are designed to let the operator panel know what types of sensors and how many are in use in the system. Usually, the system comes to the consumer with an operator panel in which profile settings have already been set properly.

But before you start configuring the parameters of the operator panel, you have to make sure that the profile settings of the operator panel correspond to your system configuration. For this, it is necessary to perform the following actions:

1. Connect all devices to the operator panel and provide them with electrical power according to the scheme in the system passport.
2. Press and hold the  “Up” button and turn on the operator panel. Make sure the power indicator is green (see Figure 4 p.6) and the operator panel display shows the loading screen with the logo³⁶ (see Figure 47 on the left). After a few seconds, the profile info screen will appear on the display³⁷ (see Figure 47 on the right).



If the polarity was mixed up when connecting to the tractor's on-board network, the power indicator will light up in red.

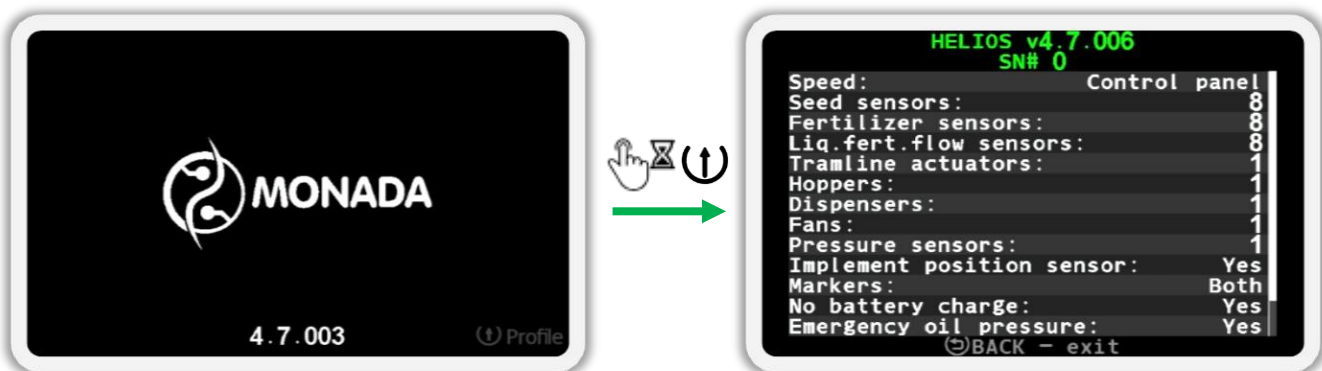



Figure 47 Load screen on the left and profile info screen on the right

³⁶ The appearance of the logo on the boot screen depends on the system vendor and may differ from the figure shown.

³⁷ The contents of the profile info screen may differ from the one shown in the figure depending on the profile settings of the system.

- Now release the pressed button and read the profile settings. If the profile settings match the configuration and connection scheme of your system, go to the “Main screen”. To do this, you have to press the  “Back” button.



If the operator panel profile is not configured correctly, then you have to configure the profile. The profile configuring procedure is described in subsection 11.4 “Configuring the operator panel’s profile” (page 87).

11.3.2. Checking connection to sensors

After the main screen appears, make sure that the operator panel has established connection to all sensors. Just wait a few seconds. If the alarm message with the text “Connection lost” does not appear on the screen (see Figure 48), then the operator panel has successfully detected all devices according to the profile settings.



Figure 48 “Connection lost” alarm message window



If the operator panel could not connect to one or more devices, you have to check the correctness of the device connection according to the connection diagram in the system passport, and also check the profile settings again. If it is impossible to restore connection to the devices, contact the specialists of the technical support service. Contact details are listed on the back of this manual.

11.3.3. Checking of the sensor control

Next, you have to make sure that there are no sensors whose control is disabled. Such sensors are called “removed from control”. Indicators of sensors removed from control are painted white and marked with an exclamation mark (see Figure 49).

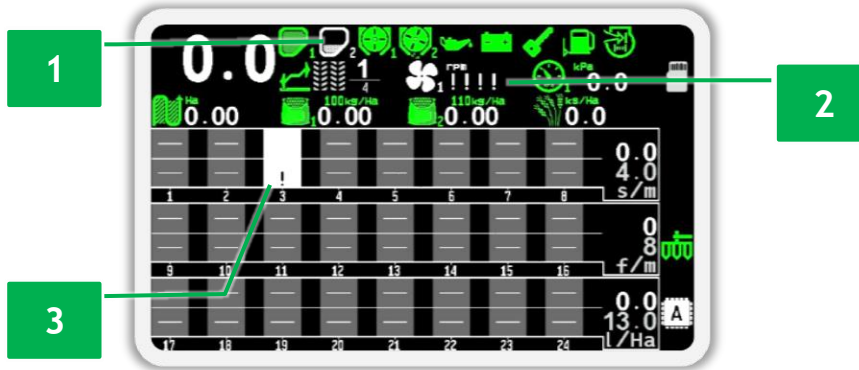



Figure 49 Example of sensors removed from control: 1 - bunker sensor; 2 - fan sensor; 3 - seed sensor #3

If neither of the sensors are removed from control on the main screen, go to subsection 11.7 on page 97.



In some cases, the customer can get the system configured so that the profile will include such sensors that are not included in the delivery set. Sensors absent in the delivery set will be removed from control. Do not enable control of such sensors. This can be done for systems whose capabilities on your equipment can be expanded by purchasing optional sensors and enabling control of these sensors after they are connected.

If the sensors are physically present in the system but removed from control, then their control must be turned on. To do this, follow these steps:

1. When on the main screen, press the  “Menu” button and hold for a few seconds. As a result, the main screen will go into sensor setup mode, and the background of the speed sensor will be colored white. Release the pressed button.

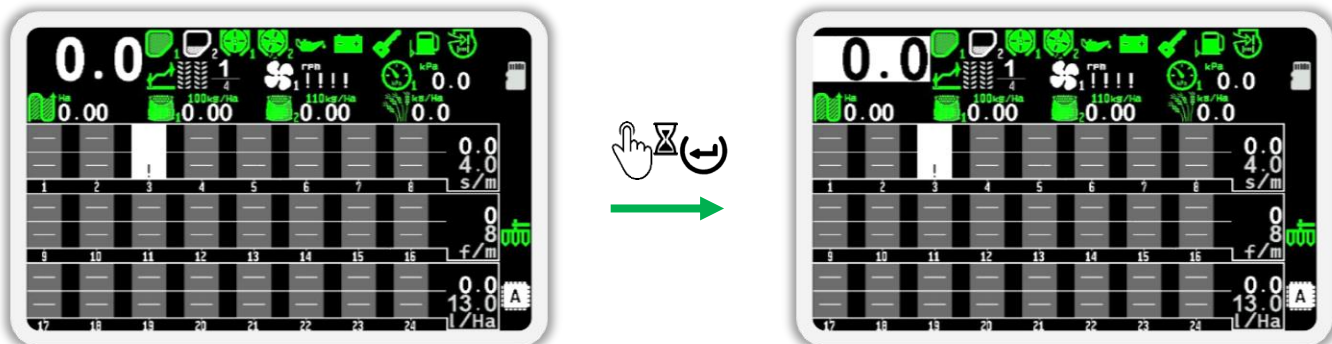




Figure 50 Switching to sensor setup mode. The picture on the right shows the selected speed sensor (its background is colored white)

- Press the  “Down” or  “Up” button until the sensor removed from control is selected. Examples of selected sensors are shown in Figure 51.

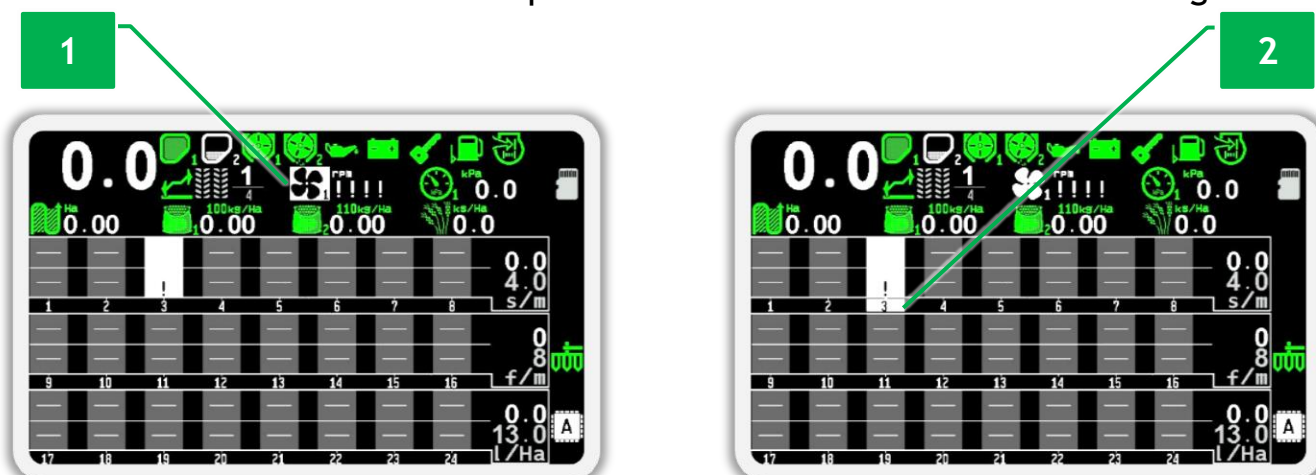




Figure 51 Example of selected sensors: 1 - selected fan sensor; 2 - selected seed sensor #3 (the sensor number is displayed on a white background)

- Enable sensor control. To do this, press the  “Plus” button. In the message window, press the  “Menu” button to confirm your actions (see Figure 52).

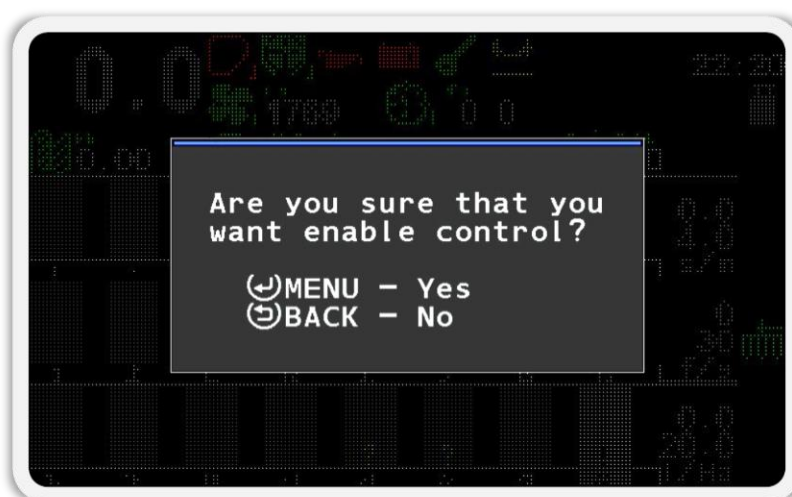



Figure 52



A confirmation window appears only at the first attempt to enable or disable sensor control. Once confirmed, this prompt will no longer occur for as long as you are in sensor setup mode.



The procedure of turning on the sensor control is called setting the sensor under control.

4. Follow steps 2 and 3 until control is enabled for all available sensors.
5. After you have verified that all available sensors are under control, exit the sensor setup mode. To do this, press the  “Back” button.
6. If there are tramline actuators in the system profile, then perform similar actions on the “Actuators” screen.

Make sure there are no sensors removed from control. Indicators of such sensors are displayed in white and marked with an exclamation mark. Make sure there are no sensors without established connection. Indicators of such sensors are displayed in red and marked with a red cross in the form of the letter “X” (see Figure 53).

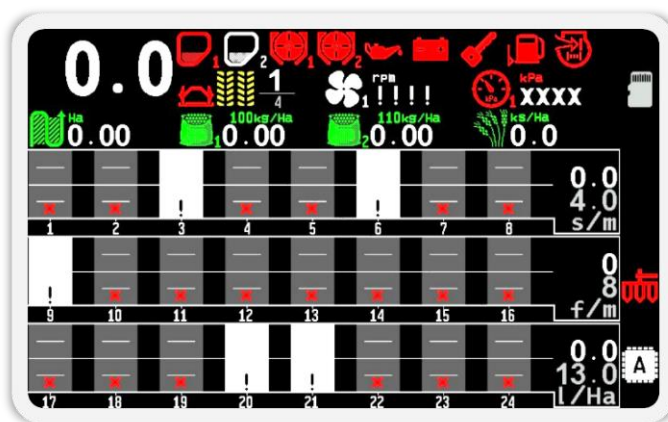


Figure 53 An example of displaying the “Main screen” when there is no connection to some sensors, and some sensors are removed from control

As a result, control of all sensors should be enabled. Also, the operator panel must establish connection to all sensors. In this case, the “Main screen” will look like Figure 54.

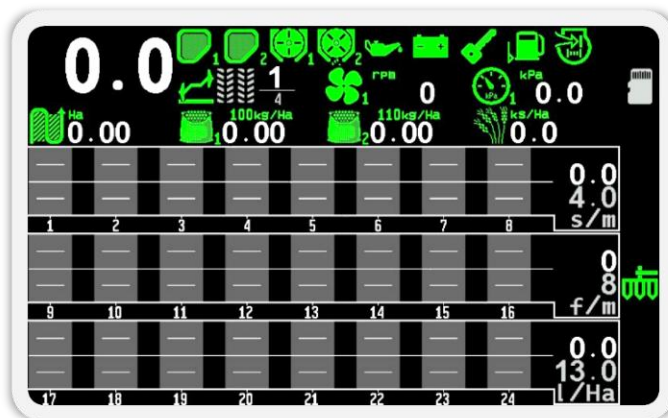


Figure 54 An example of the display of the “Main screen” when connection to all sensors is established and all sensors are set under control

11.4. Configuring the operator panel's profile

In order for the operator panel to know what types of sensors or actuators and how many of them are used in the system, it is necessary to configure the profile of the operator panel according to the system configuration. For this, it is necessary to perform the following actions:

1. Connect all devices to the operator panel and provide them with electrical power according to the scheme in the passport of the system.
2. Turn on the operator panel. Make sure the power indicator is green (see Figure 4, p.6) and the operator panel display shows the loading screen with the logo ³⁸ (see Figure 55 on the left). After a while “Main screen” will appear on the display³⁹ (see Figure 55 on the right).



If the polarity is mixed up when connecting to the tractor's on-board network, the power indicator lights up red.

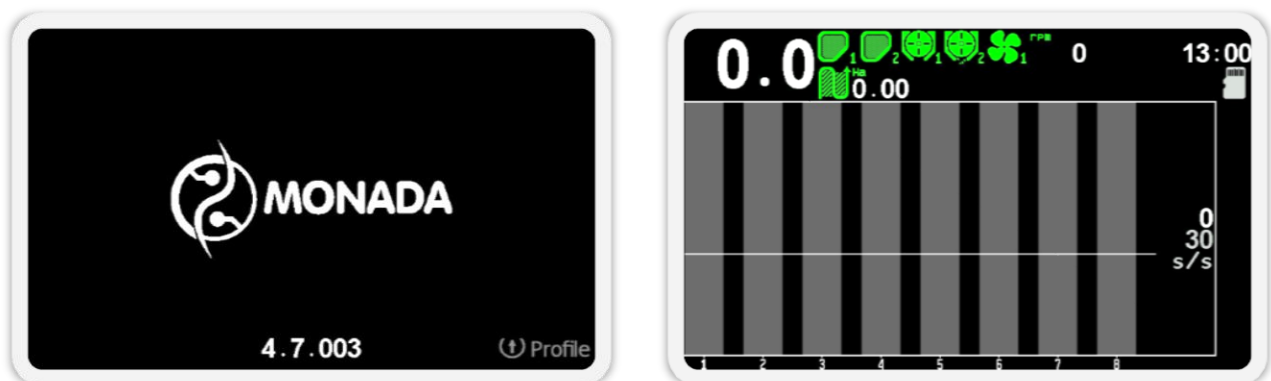








Figure 55 The loading screen is on the left and the main screen is on the right

3. After the “Main screen” appears on the operator panel display, you have to enter the system profile settings menu. To do this, you have to perform the following actions:
 - a) Enable the “Agronomist” access level. The procedure of changing the access level is described in subsection 11.1 on page 76.
 - b) Exit from the  “Settings” menu (see Figure 56 p.1) and return to the main screen menu (see Figure 56 p.2). To do this, press the  “Back” button.
 - c) Select the  “Service” menu item (see Figure 56 p.3) and press the  “Menu” button. As a result, the  “Service” menu will be

³⁸ The appearance of the logo on the boot screen depends on the system vendor and may differ from the figure shown.

³⁹ The appearance of the main screen may differ from the one shown on the figure depending on the system profile settings.

displayed on the screen (see Figure 56 p.4), in which the  “Profile” menu item will be selected.






- d) Press the  “Menu” button again. As a result, the profile settings menu will be displayed on the screen (see Figure 56 p.5).



Figure 56

4. In the profile settings menu (see Figure 57) there is a corresponding menu item for each type of sensor or actuator. The parameter located in the menu on the right sets the number of sensors or the way they are connected. To move from one menu item to another, use the  “Up” or  “Down” buttons and to change the parameter use the  “Plus” or  “Minus” buttons.

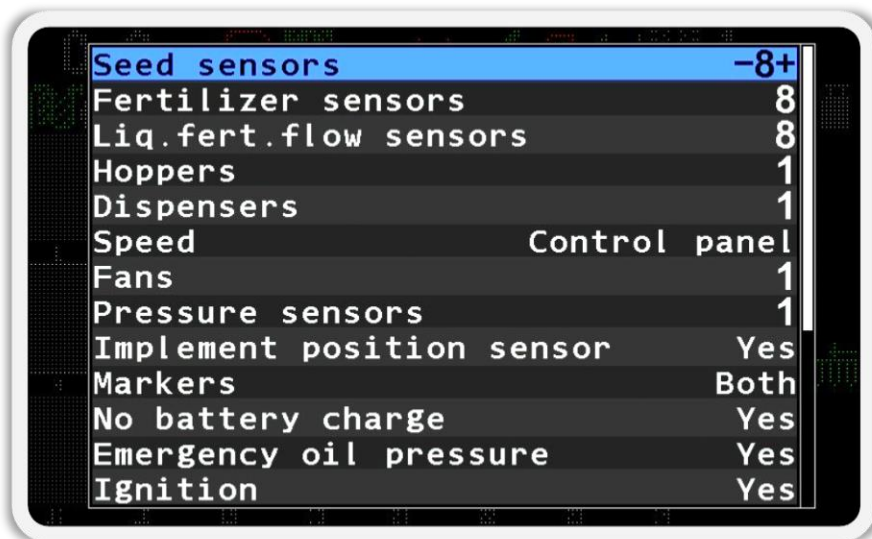




Figure 57 Profile settings menu

- After you configured the operator panel profile settings according to your system configuration, go to the  “Save profile” menu item (see Figure 58 p.1) and press the  “Menu” button. If everything is configured correctly, as a result you will see the message “Saved” (see Figure 58 p.2), and after a few seconds the next message “Restart system” (see Figure 58 p.3).
- Turn off the system (see Figure 4, p.3). This completes the operator panel profile setup process.

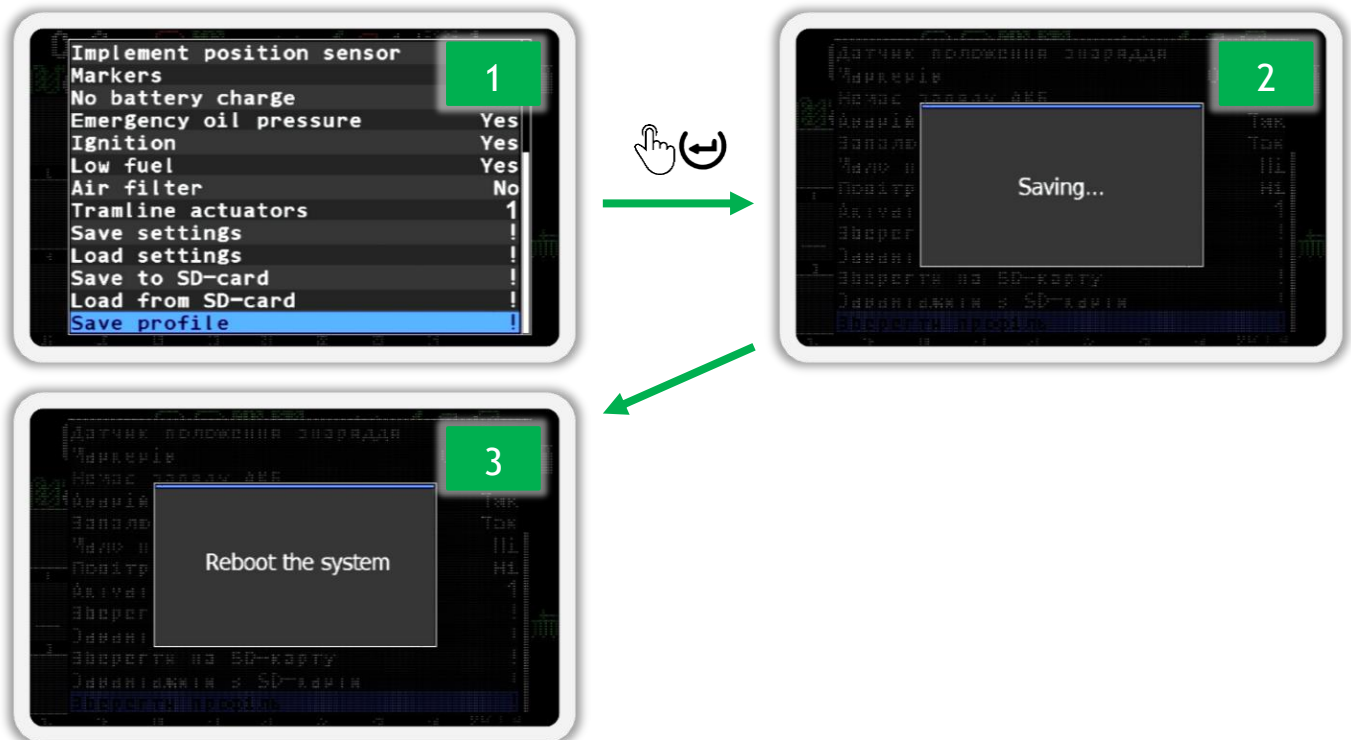


















Figure 58



The system profile is configured with respect to sensors as observable objects and actuators as actuating objects. Several sensors of different types can be connected to one device. For example, a single ID-4 input device (also known as a concentrator) can have fan sensors, dispenser sensors, and hopper sensors connected to it. One actuator device and two bout marker sensors are connected to one tramline actuator controller. You can read more about the system configuration options in section 4 “System components” on page 10.

List of system profile parameters:

-  **Seed sensors** - the parameter is intended for entering the number of seed sensors. Valid range of values is 2...144.
-  **Fertilizer sensors** - the parameter is intended for entering the number of dry fertilizers sensors. Valid range of values is 0...72.
-  **Liq.fert.flow sensor** - the parameter is intended for entering the number of liquid fertilizer sensors. Valid range of values is 0...72.
-  **Hoppers** - the parameter is intended for entering the number of bunker filling level sensors in the system. Valid range of values is 0...9.
-  **Dispensers** - the parameter is intended for entering the number of central metering device shaft rotation control sensors. Valid range of values is 0...9.
-  **Speed** - the parameter is intended for inclusion or exclusion in the profile of the speed sensor. Available values:
 - *No* - there is no speed sensor in the system.
 - *Control panel* - the movement speed sensor is connected to the operator panel.
 - *Input device* - the movement speed sensor is connected to the input device.
 - *Input device(2)* - two movement speed sensors (on the left and right wheel) are connected to the input device.
-  **Fans** - the parameter is intended for entering the number of fan rotation speed sensors. The valid range of values is 0...2.
-  **Pressure sensors** - the parameter is intended for entering the number of pressure sensors in the system. The valid range is 0...3.

-  **Implement position sensor** - the parameter is intended for inclusion or exclusion in the profile of the sensor of the same name. Available values: No or Yes.
-  **Markers** - the parameter is intended for entering the number of sensors that determine the position of the bout markers. Available values:
 - *No* - there are no marker position sensors in the system;
 - *One* - the position of the markers is determined by one sensor;
 - *Both* - the position of the markers is determined by two sensors.
-  **No battery charge** - the parameter is intended for enabling or disabling the sensor of the same name from the group of sensors of the fan drive diesel generator in the profile. Available values: No or Yes.
-  **Emergency oil pressure** - the parameter is intended for enabling or disabling the sensor of the same name from the group of sensors of the fan drive diesel generator in the profile. Available values: No or Yes.
-  **Ignition** - the parameter is intended for enabling or disabling the sensor of the same name from the group of sensors of the fan drive diesel generator in the profile. Available values: No or Yes.
-  **Low fuel** - the parameter is intended for enabling or disabling the sensor of the same name from the group of sensors of the fan drive diesel generator in the profile. Available values: No or Yes.
-  **Air filter** - the parameter is intended for enabling or disabling the sensor of the same name from the group of sensors of the fan drive diesel generator in the profile. Available values: No or Yes.
-  **Tramline actuators** - the parameter is intended for entering the number of tramline actuators in the system. The valid range is 0...4.



The total number of sensors in a profile has the following limitations:

- 1) *No more than 12 sensors of hoppers, dispensers and fan drive diesel generator in total.*
- 2) *No more than 144 seed and dry fertilizer sensors in total.*
- 3) *No more than 199 section control sensors of any type.*






11.5. Saving and loading settings for the current profile

It is possible to save all system settings (general and sensors) for the current profile. This may be necessary if you want to make changes to the settings for temporary needs and then restore the saved settings.



These system features are useful if there is no SD card in the operator panel. If there is an SD card in the operator panel, it is more convenient to use the feature of saving and loading profiles with all settings from the SD card (see subsection 11.6 on page 94).

Follow these steps to save your settings:

1. Open the  “Profile” menu which is in the main screen menu  “Service”. This procedure is described in detail in the subsection 11.4 point 3 on page 87.
2. Select the  “Save settings” menu item (see Figure 59 p.1) and press the  “Menu” button. As a result, a message will appear on the screen asking you to confirm the action (see Figure 59 p.2).
3. Press the  “Plus” button to confirm. As a result, the message “Saved” will appear on the screen (see Figure 59 p.3). After that, you can freely experiment with the settings.

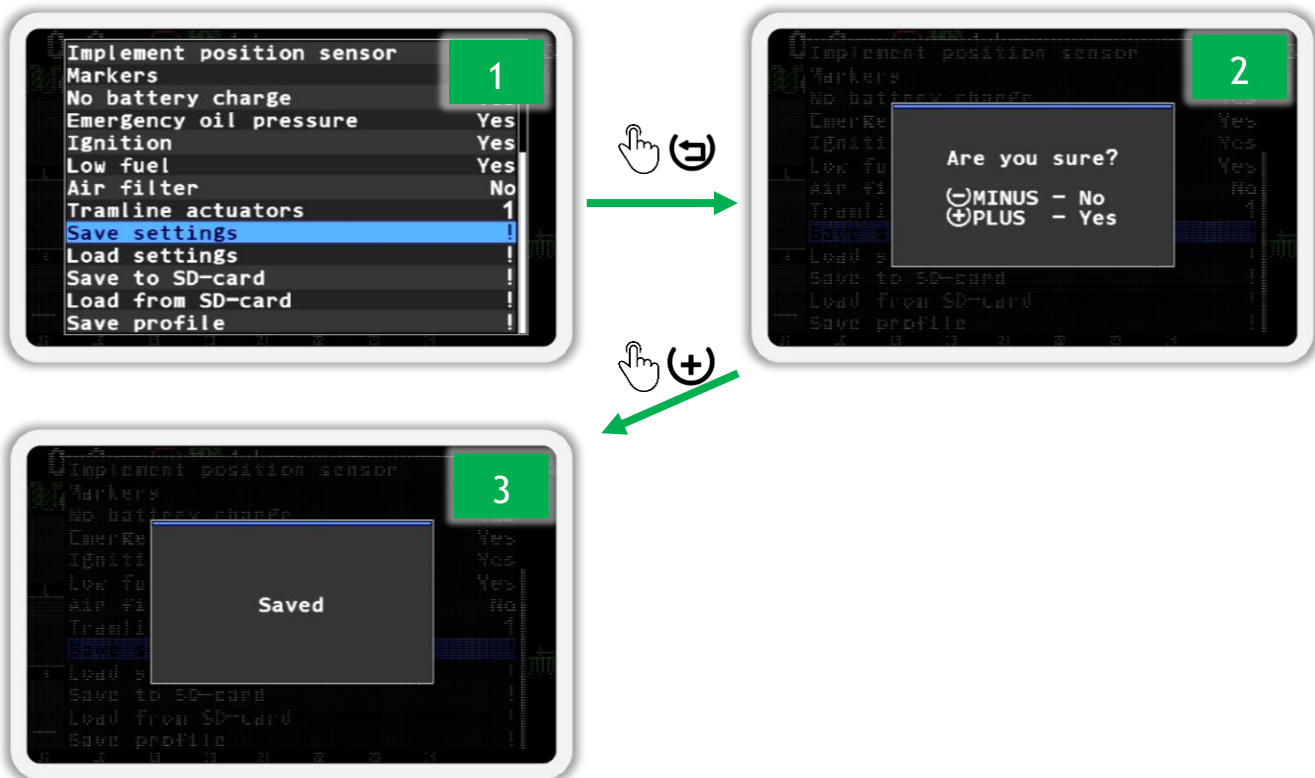







Figure 59 Saving settings

To load previously saved settings, follow these steps:

1. Open the  “Profile” menu which is in the main screen menu  “Service”. This procedure is described in detail in the subsection 11.4 point 3 on page 87.
2. Select the  “Load settings” menu item (see Figure 60 p.1) and press the  “Menu” button. As a result, a message will appear on the screen asking you to confirm the selected action (see Figure 60 p.2).
3. Press the  “Plus” button to confirm. As a result, the message “Loaded” will appear on the screen (see Figure 60 p.3).

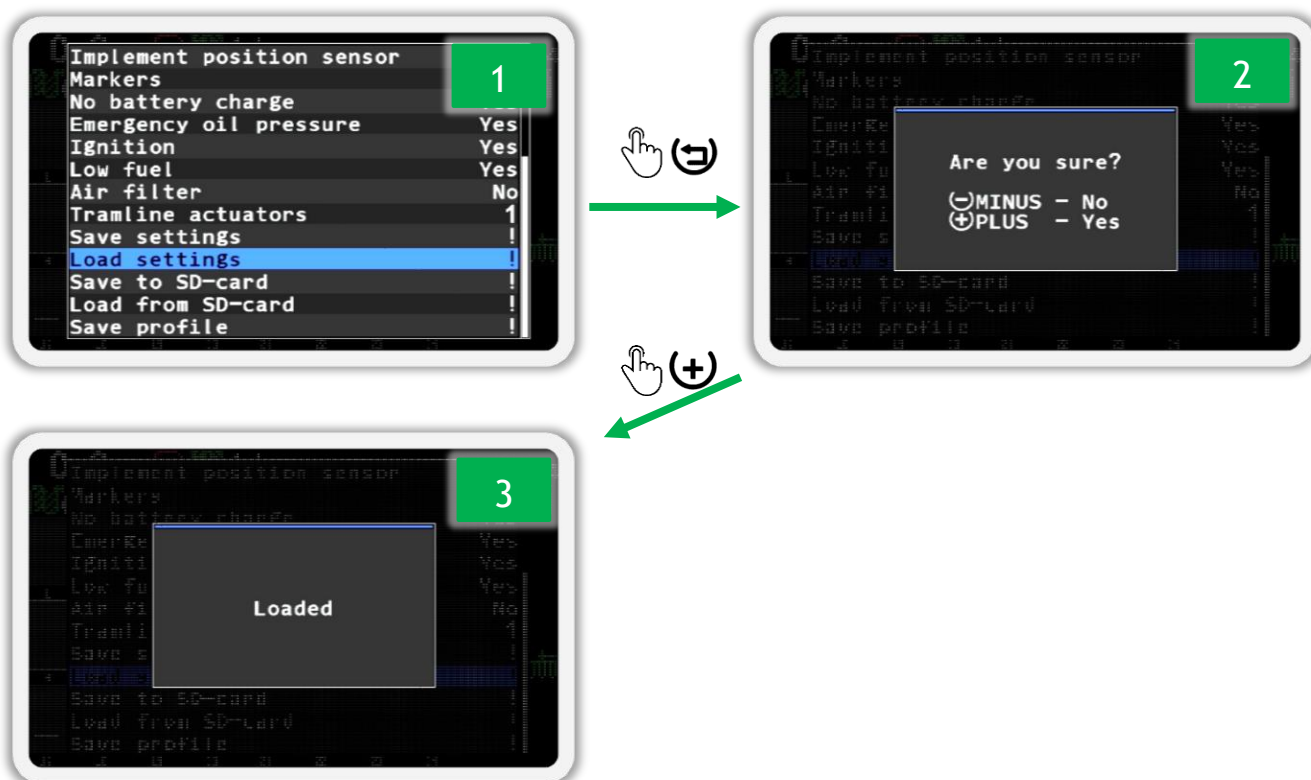






Figure 60 Loading settings

11.6. Saving and loading profiles from a SD card

The system allows you to save the current profile with all settings to a file on the SD card. And then load such a profile with settings from a file on the SD card. Such a need may be when using one operator panel with several different implements. For example, you can save profiles for planter and seed drill and load them when working with one or another implement.

To save the profile and all settings to a file on the SD card, perform the following actions:

1. Open the  “Profile” menu which is in the main screen menu  “Service”. This procedure is described in detail in the subsection 11.4 point 3 on page 87.
2. Select the  “Save to SD-card” menu item (see Figure 61 p.1) and press the  “Menu” button. As a result, the message “Saved” will appear on the screen (see Figure 61 p.2). You can then create a new profile or load one from a file on your SD card.

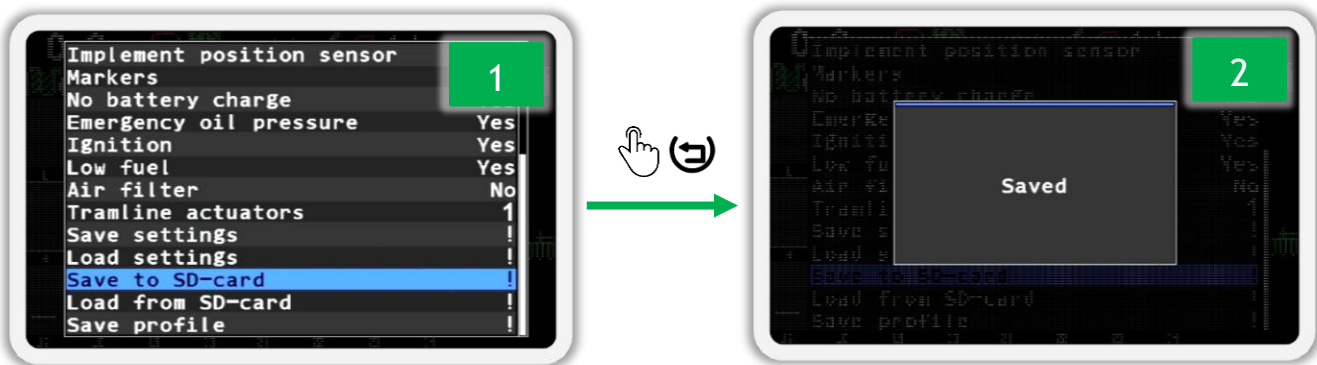


Figure 61 Saving a profile to a file on an SD card



When saving the current profile with all settings to a file on the SD card, the system assigns a name to the file automatically. The file name looks like this: “P0001.pfl”. Where “0001” is a number that is automatically increased by “1” each time the save function is called.

The user can remove the SD card from the operator panel and insert it into a smartphone or personal computer. All profiles are stored in the “PROFILES” folder. The name of the profile can be changed, but it is desirable that its length does not exceed eight letters and only the English alphabet and numbers are used.







Profile files created by one version of the operator panel firmware are likely to be incompatible with other versions of the operator panel firmware.

In order to load the profile and all settings from a file on the SD card, perform the following actions:






Figure 62 Loading profile with settings from SD card

1. Open the  “Profile” menu which is in the main screen menu  “Service”. This procedure is described in detail in the subsection 11.4 point 3 on page 87.
2. Select the  “Load from SD-card” menu item (see Figure 62 p.1) and press the  “Menu” button. As a result, the profile file selection screen with settings will appear on the screen (see Figure 62 p.2 and p.3).

In this screen, the header displays prompts with actions that can be performed by clicking on the button whose image is near the action label. In this line, two numbers are displayed in the middle. The number on the left corresponds to the sequence number of the file which profile is currently displayed on the screen, and on the right is the total number of profile files.

The profile name is displayed in the second line. If it is displayed in red (see Figure 62 p.2), it means that this profile file is not compatible with the current version of the operator panel firmware. The third line will display the firmware version by which this profile was created.

If the profile file is compatible with the current version, then the lines below will display the width of the implement and the configuration of the profile.

3. To go to the next file, press the  “Plus” button.
4. After selecting the profile file, press the  “Menu” button. As a result, a message will appear on the screen asking you to confirm the selected action (see Figure 62 p.4).
5. Press the  “Plus” button to confirm action. As a result, the message “Loaded... Reboot system” will appear on the screen (see Figure 62 p.5). Wait a few seconds until the system reboots automatically. Alternatively, turn off the operator panel and after a short pause, turn on the operator panel.







11.7. General settings of the operator panel




Settings are saved automatically three seconds after the last key pressed. Therefore, wait a few seconds before turning off the operator panel.



Figure 63 “Settings” menu

The  “Settings” menu (see Figure 63) is intended for setting the general parameters of the operator panel. First of all, consider the  “The implement settings” menu item. This item allows you to open a menu with the most important parameters that need to be configured first, namely the following:  “Width, cm”,  “Mode of seeding”,  “Mode of fertilizers” and  “Mode of liq.fert.” (see Figure 64). Let’s take a closer look at the following menu items.

- 11.7.1.  **The implement settings** - calls up a menu that allows you to adjust the parameters of the implement (seeding machine, cultivator, etc.). This menu contains the following items:

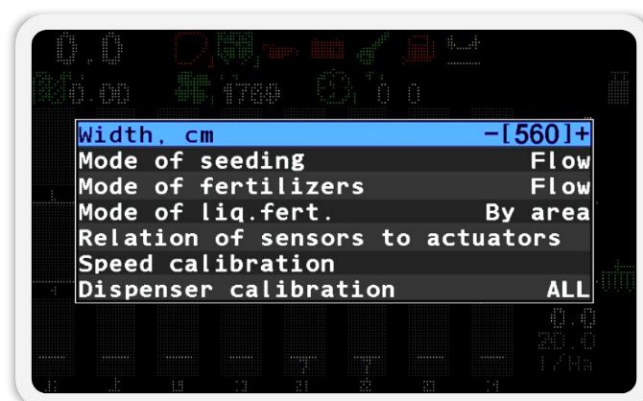




Figure 64 “Implement settings” menu



- 11.7.1.1.  **Width, cm** - this parameter determines the working width of the implement. It is set in centimeters. It is used to calculate the cultivated area. Make sure to enter the correct width of your implement.


11.7.1.2.  **Mode of seeding** - allows you to switch between three seeding control modes and display seeding data:

- *Flow* - information is displayed in seeds per second, the maximum value for the controlled minimum permissible level of actual rate is 400 s/s. This mode can be used on seeding drills.
- *Hybrid* - information is displayed in seeds per meter, the maximum rate is 200 s/m. This mode is recommended for use on seeding drills.
- *Precise* - the information is displayed in seeds per meter, additionally the system records skips and doubles, the maximum rate is 50.0 s/m. This mode is used on planters.



If there is some data in the statistics for at least one of the fields, when you try to change the mode from “Precise” to “Flow” or “Hybrid” (and vice versa), a message will be displayed with the requirement to reset the statistics to select a new mode.

11.7.1.3.  **Mode of fertilizers** - allows you to switch between three modes of control of dry fertilizers and displaying data of dry fertilizer application. The modes are the same as in the  “Mode of seeding” parameter.


11.7.1.4.  **Mode of liq. fert.** - allows switching between two modes of control of liquid fertilizers and display of liquid fertilizer application data:

- *Flow* - the information is displayed in liters per minute, the minimum and maximum values for the controlled minimum permissible level of actual rate of product application are 0.01 l/M and 99 l/M, respectively. This mode is recommended for use in the case when the capabilities of sectional flow meters do not allow accurate calculation of the actual rate of application of liquid fertilizers.
- *By area* - the information is displayed in liters per hectare. The minimum rate is 0.1 L/Ha, and the maximum rate is 999 L/Ha.



WARNING! Make sure to do the following:

- 1) enter the width of your implement in the menu item “Width, cm”;
- 2) set the seeding control mode “Precise” or “Hybrid”.
- 3) set the dry fertilizer control mode “Hybrid”.
- 4) set the liquid fertilizer control mode “Flow” or “By area”.

11.7.1.5.  **Relation of sensors to actuators** - brings up a screen intended for matching seed sensors or dry fertilizer sensors with actuators (see Figure 65). This relation determines which section control sensors should be switched to the tramline control mode at the time when the actuator rod is moved to the tramline making position (this is the state when the actuator stops application of a product by cutting off certain sections).

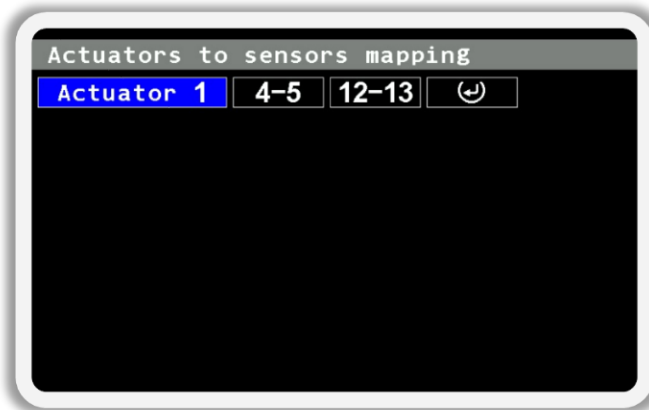




Figure 65 The screen for setting the relation of section sensors to actuators

For a newly created profile, this screen does not have any configured relations of actuators and section control sensors. The only available element is the button to add a new actuator relation with section control sensors . Press the  “Menu” button to create a new relation. As a result, a menu with the following items will appear on the screen (see Figure 66).

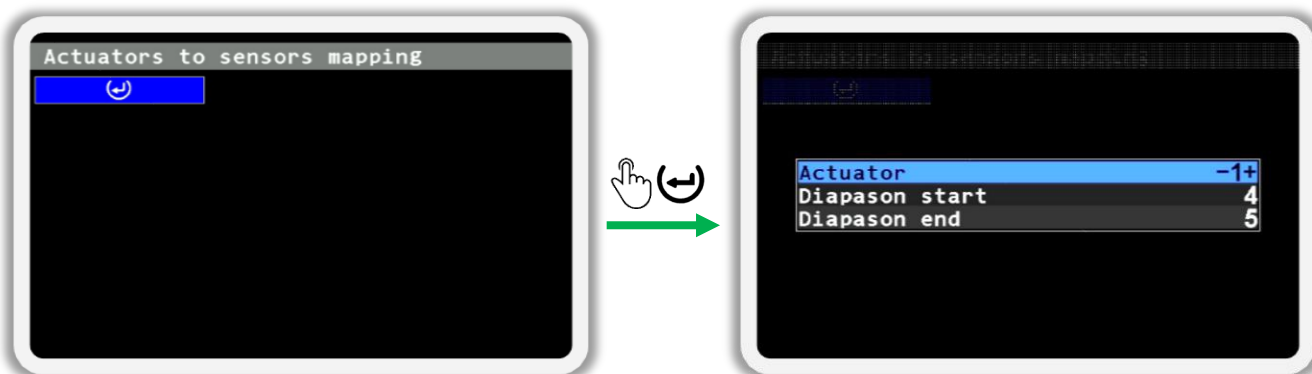













Figure 66 The menu for creating a new relation between the actuator and section control sensors


In this menu,  “Actuator” item determines the sequence number of the tramline actuator for which the sectional sensors will be assigned. In menu items  “Diapason start” and  “Diapason end” set the range of numbers of section control sensors that should be switched to the tramline control mode at the time when the actuator is switched to the state of tramline making. If the actuator is connected to only one section, set the same section sensor number in both parameters. For example, if the parameter  “Diapason start” set to “3”, and the parameter  “Diapason end” set to “6”, then the section control sensors





with numbers “3”, “4”, “5” and “6” will be assigned to the actuator. After you have set the desired values, press the  “Menu” button to confirm relation settings. To cancel creating a relation, press the  “Back” button.

Now that the tramline actuator to section control sensors relation has been created, the following buttons are used to navigate through the elements in this screen.

 “Plus” and  “Minus” are used to navigate through elements to the left and right.

 “Up” and  “Down” are used to navigate through elements vertically. Available only if there are more than one actuator is configured in the system profile.

The selected element is highlighted in blue. To open the menu of actions for the selected element, press the  “Menu” button.

In the case when the actuator controls the cutting off of the flow of several sections whose addresses are in different ranges, it is possible to add three additional ranges. That is, in general, up to four ranges of section control sensors can be assigned to one actuator. For this, by using the  “Plus” or  “Minus” buttons, select the  button, that is on the right side in the row of relation setup, and press the  “Menu” button (see Figure 67).

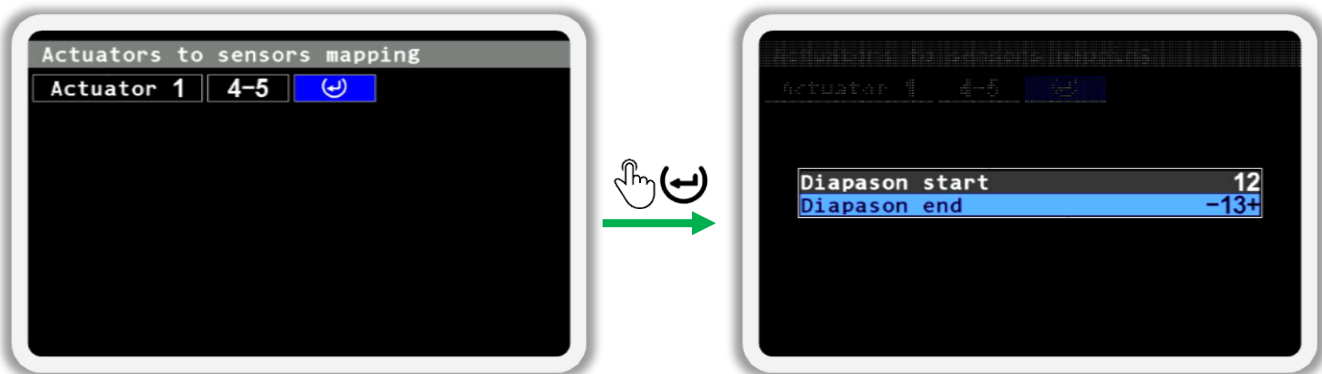








Figure 67 *The menu for creating an additional range of section sensors connected to the tramline creation actuator*

In the menu that appears, in  “Diapason start” and  “Diapason end” set an additional range of numbers of sectional sensors that should be switched to the tramline control mode. After that press the  “Menu” button to confirm addition of a new range. To cancel addition of a new range of section control sensors, press the  “Back” button.

To delete the added range, select the button with the address range of the section control sensors to be deleted and press the  “Menu” button. In the menu that appears, select the  “Remove diapason” menu item and press the

☰ “Menu” button. To remove all the settings of the relation of the actuator with section control sensors, in this menu select the 👤 “Remove all diapasons” item.

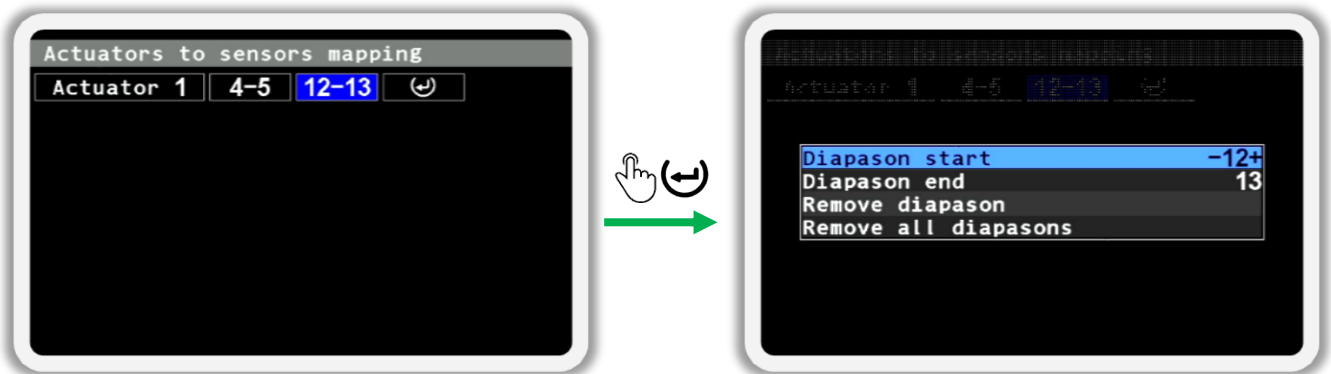


Figure 68 Menu of editing the existing range of section control sensors assigned to the tramline making actuator

11.7.1.6. 👤 **Speed calibration** - allows you to calibrate the speed sensor. The speed sensor calibration procedure is described in paragraph 11.8.4 “Speed sensor calibration” on page 111.

11.7.1.7. 👤 **Dispenser calibration** - allows you to calibrate the 👤 “Wheel, pulses” and 👤 “Dispenser pulses” parameters for the selected dispenser sensor (only one or all at once). The procedure for dispenser sensors calibration is described in subsection 11.8.8 “Calibrating the dispensers to control the speed of its rotation” on page 120.



Instead of this outdated mode of controlling the rotation of the central metering device in relation to the movement speed, it is better to use the new feature of controlling the central metering device by the rate of product application in kilograms per hectare (see subsection 11.8.6 below on page 114 and subsection 11.8.7 below on page 118).


Now let's take a closer look at the 👷 “Settings” menu items:





- 11.7.2. 👷 **Brightness, %** - allows you to adjust the brightness of the display backlight that is most comfortable for work. The brightness can also be changed by the ☀️ and 🌑 buttons.
- 11.7.3. 👷 **Volume** - allows you to change the volume of audio signals.
- 11.7.4. 👷 **Language** - allows you to select the language in which the text information will be displayed.
- 11.7.5. 👷 **Buttons sound** - allows you to turn on or off the sounds of button presses.
- 11.7.6. 👷 **Diagram settings** - calls up a menu that allows you to configure a convenient option for displaying information about products application done by sections. The menu is available in the “Precise” or “Hybrid” modes of control of sections of seed or dry fertilizers, as well as in the “By area” mode of control of sections of liquid fertilizers.



Figure 69 “Diagram settings” menu

- 11.7.6.1. 👷 **Skips & Doubles** - enables or disables the display of bars of skips and doubles for the last passed seeding path interval on the diagram. The display of skips and doubles is possible only in the “Precise” seeding control mode, and for other modes this option is not displayed in the menu.
- 11.7.6.2. 👷 **Grid** - allows you to choose the type of grid demarcation on the diagram. Possible values for the parameter:
- *No* - only the line of the target rate of the product application.
 - *Partial* - only the limits of the permissible range of deviation of the actual rate of the product application from the target rate.
 - *Full* - the line of the target rate and the limits of the permissible range of deviation of the actual rate from the target rate.

11.7.6.3.  **Scale S&D, %** - allows you to change the scale of the display of skips and doubles bars on the seeding diagram (in the range from 5% to 50% of the entire scale height). The height of the bars of skips and doubles is proportional to their current level in the scale specified by the parameter. The display of skips and doubles is possible only in the “Precise” seeding control mode, and for other modes this option is not displayed in the menu.

11.7.7.  **Change Date & Time** - is used to go to the menu where you can set the current date and time (see Figure 70). To set the date and time values displayed in the menu items, select the  “Set” menu item and press the  “Menu” button. To cancel changes, you have to press the  “Back” button.

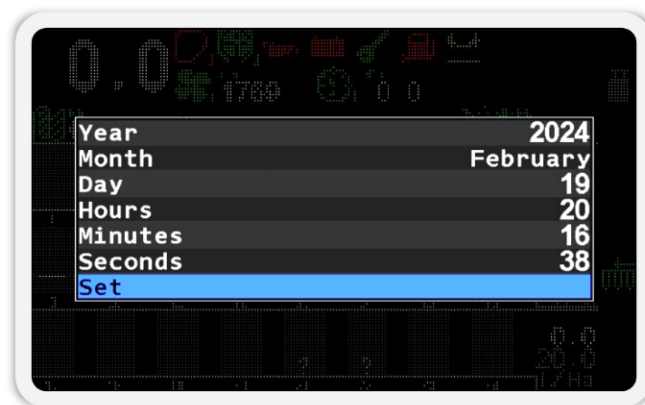




Figure 70 “Change Date & Time” menu

11.7.8.  **Alarm delay** - allows you to set the time in seconds that the system will wait from the beginning of the accident to the moment when the alarm message will be displayed.

11.7.9.  **Product rate error, %** - allows you to set the permissible range of deviation of the actual rate of the product from the target rate, which is controlled by the dispenser sensors in kilograms per hectare. If the actual rate deviates more than specified in this parameter, a corresponding alarm notification will be displayed. This menu item is displayed only if in the settings of at least one of the dispenser sensors, product application control by weight feature is enabled (see subsection 11.8.6 below on page 114 and subsection 11.8.7 below on page 118).




- 11.7.10.  **Tramline** - is used to navigate to a sub-menu that is designed to control the tramline rhythms. The principles of setting the tramline rhythms were described in chapter 9 “Setting up the tramline rhythm” on page 63.






Figure 71 Tramline rhythm setup menu

- 11.7.11.  **User** - the system has three levels of access to settings parameters (in order of increasing access level):

- *Operator* - does not allow you to change some system parameters and reset statistics without entering a PIN code.
- *Agronomist* - allows you to reset statistics, change parameters that are not available for the “Operator” access level, etc.
- *Service* - can be used only by the service department during commissioning.

After turning on the power, the lowest access level is set - “Operator”. The process of enabling the “Agronomist” access level is described in detail in subsection 11.1 above “Enabling the “Agronomist” access level” on page 76. To switch to a lower level of access, you do not need to enter a PIN code - just press the  “Menu” button after selecting a lower access level.



Also, to switch to the access level  “Operator”, you can press the  “Up” and  “Down” buttons at the same time. After that, any windows or menus will be closed and the main screen will be shown.




If the access level “Agronomist” or “Service” is selected, the alarm indicator will flash with a high frequency (see Figure 4, p.5). Additionally, no alarm messages will be displayed until the access level is changed to “Operator”.

11.8. Configuring sensors

11.8.1. Switching to sensor setup mode

The sensors are configured via the context menu of the sensor indicator on the main screen. To open the context menu, you must perform the following actions:

1. Press the  “Menu” button for a few seconds on the main screen to enter the sensor setup mode (see Figure 72). The picture on the right shows the selected speed sensor. The selected sensor will be displayed inside a white rectangle.

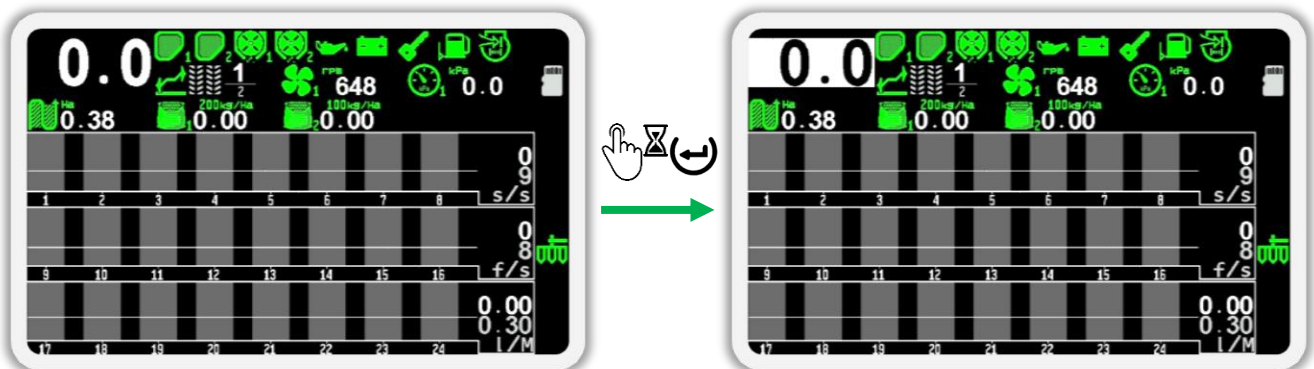







Figure 72 Switching main screen to sensor setup mode





2. To switch from one sensor to another sensor, use the  “Up” or  “Down” buttons.
3. After selecting the sensor, press the  “Menu” button. As a result, the context menu of this sensor's settings will appear.









The appearance of the context menu depends on the type of selected sensor and the access level of the current user. All sensors in their context menu have a common menu item  “Information” that allows to open the sensor status view screen.

11.8.2. The sensor status view screen


The sensor status view screen (see Figure 73) allows you to get more information about the current status of any sensor. You can go to this screen using the  “Information” menu item in the context menu of a sensor's indicator.

The following buttons are active on this screen:

| Button | | Description | |
|---|-------|---|--|
|  | Back |  | Return to the screen with the selected sensor. |
|  | Minus |  | Go to the previous sensor. |

| Button | Description |
|---|---|
|  Menu |  Open the context menu of the selected sensor. |
|  Plus |  Go to the next sensor. |
|  Down |  View the previous active alarm. |
|  Up |  View the next active alarm. |



In the “Information” screen when you open the context menu of a sensor the  “Information” item won’t be displayed.

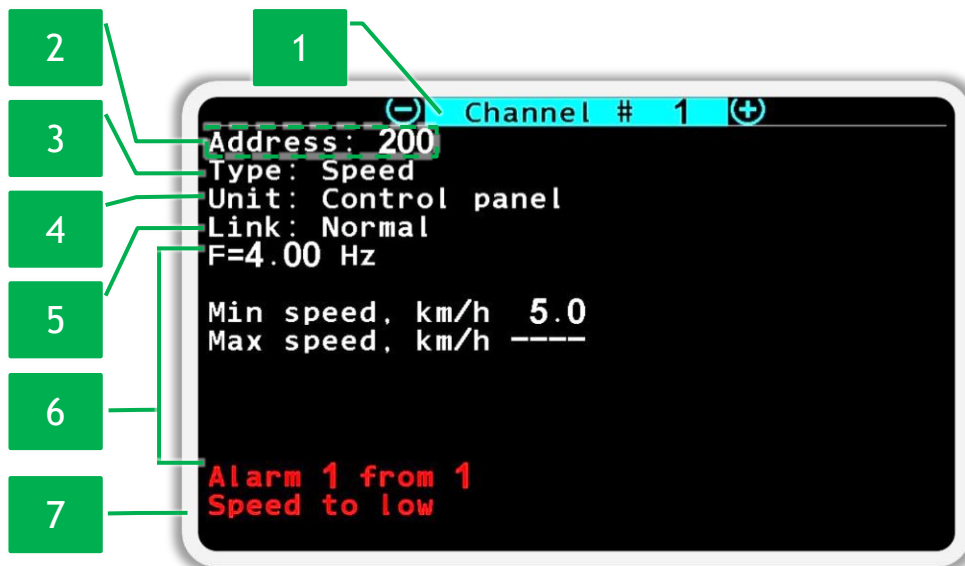




Figure 73 Example of the speed sensor status view screen

The “Information” screen contains the following items:

[1] Channel - index number of the selected sensor. To switch from one sensor to another sensor, use the  “Plus” and  “Minus” buttons.

[2] Address - each sensor has its own network address. The addresses of the control sensors of the seed, dry fertilizer and liquid fertilizer sections are in the range from 1 to 199, and the addresses of other sensors connected to the RS-485 network communication harness (see Figure 4 p.10) starts from 200. The only sensor without address is a speed sensor connected directly to the operator's panel (the "Address" field in the figure is added only for clarity).

[3] Type - indicates the sensor type and its own number in the group.



[4] Unit - indicates the connection of the speed sensor to the operator panel.

[5] Link - defines the current state of connection to the selected sensor.

Possible communication states for sensors of any type are as follows:

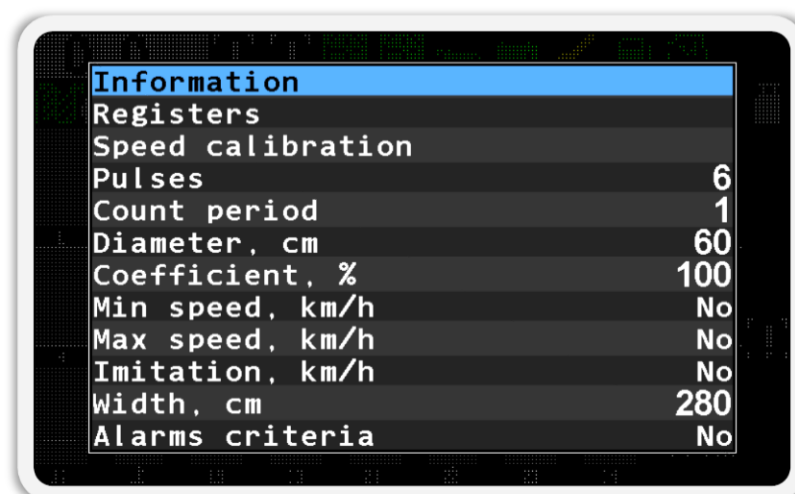
- *Normal* - normal state. Connection to the sensor is established.
- *Not controlled* - the presence of connection or other failures is not controlled.
- *No connection* - no connection to the sensor.

[6] This area of the screen contains additional information specific to the various sensor types. Information in this area is displayed only when control of this sensor is enabled.

[7] **Alarm** - if a connection to the sensor is established and there are active alarms, this field displays information about the number of active alarms and its name. The first number shows the number of the current alarm, and the second number shows the count of active alarms. To switch the number and description of the alarm, use the  “Up” and  “Down” buttons.


11.8.3. Configuring the speed sensor

The speed sensor has the following context menu items (see Figure 74):



| Information | |
|-------------------|-----|
| Registers | |
| Speed calibration | |
| Pulses | 6 |
| Count period | 1 |
| Diameter, cm | 60 |
| Coefficient, % | 100 |
| Min speed, km/h | No |
| Max speed, km/h | No |
| Imitation, km/h | No |
| Width, cm | 280 |
| Alarms criteria | No |

Figure 74 Parameters of the movement speed sensor

-  **Information** - selecting this menu item will open a screen displaying the status of the selected sensor (see subsection 11.8.2 above on page 105). The speed sensor has additional items with the following values:
 - value of the current frequency of pulses from the movement speed sensor (see Figure 75 p.1);
 - the value of the minimum permissible speed of movement (see Figure 75 p.2);
 - the value of the maximum permissible speed of movement (see Figure 75 p.3);

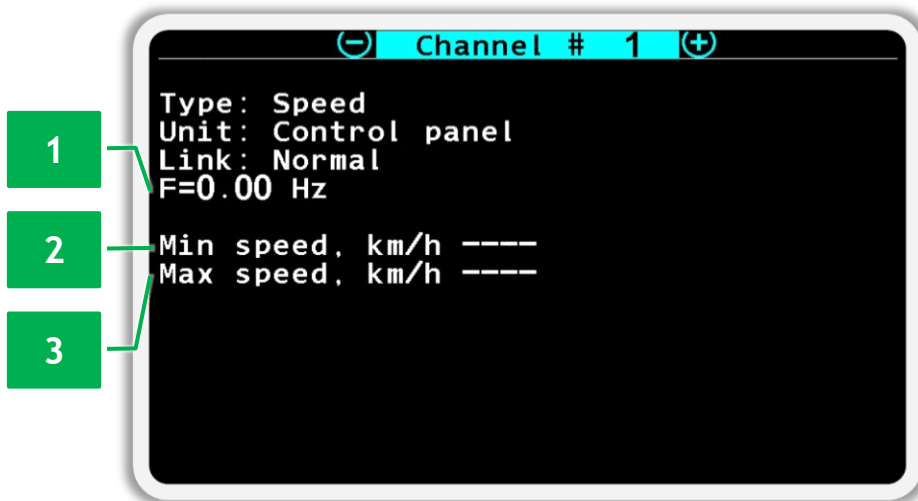









Figure 75 Speed sensor status view screen

- 
Registers - for a speed sensor, this menu item is only displayed when the sensor is connected to an input device. This item is intended to open the “Registers” screen. This screen is used by authorized service engineers to diagnose the selected sensor.
- 
Speed calibration - this menu item is intended to start the speed sensor calibration procedure⁴⁰. Before starting the calibration, the following parameters of this sensor must already be set:  “Pulses” and  “Diameter, cm”. The procedure for calibrating the speed sensor is described in subsection 11.8.4 below “Speed sensor calibration” on page 111.





Calibration of the speed sensor must be performed before starting work on the products' application.

- 
Pulses - sets the number of pulses from the movement speed sensor per rotation of the shaft on which it is installed.
- 
Count period - the pulse counting period during which the speed of movement is calculated. This option is only used when a speed sensor is connected to the operator panel.


For the “Precise” sowing control mode, a value of up to 25% of the  ”Pulses” parameter value is recommended. When using the “Flow” or “Hybrid” control modes, it is recommended to set it to half of the number of pulses per wheel rotation.

⁴⁰ This item duplicates the item “Speed Calibration” in the menu of the main screen “Settings / The implement settings”.

-  **Diameter, cm** - determines the diameter of the drive wheel.
-  **Coefficient, %** - the gear ratio value for cases when there is some indirect transmission between the speed sensor and the drive wheel. For example, when the sensor is installed on the intermediate shaft or the metering shaft, and the transmission to the shaft is carried out through gears or chain transmission. The value of the coefficient is displayed as a percentage. For direct transmission, the transmission ratio is 1:1, i.e. 100%. Valid range of values - from 10% (1:10) to 1000% (10:1).



It is recommended to perform the speed sensor calibration procedure to automatically calculate the “Coefficient” parameter. The calibration procedure is described in subsection 11.8.4 below “Speed sensor calibration” on page 111.



In case it is not possible to perform automatic calibration of parameter  “Factor”, then you can calculate its value using the formula:

$$K = N_e / N_o * 100\%$$

Where N_e - the multiplication of the number of teeth of all driven gears (all even gears), and N_o - the multiplication of the number of teeth of all driving gears (all odd gears), starting from the one on the same shaft as the drive wheel.

In cases where a speedometer (or GPS navigator) is installed in the tractor and the displayed speed in the operator panel is different, then the coefficient can be calculated using the following formula:


$$K_{new} = \frac{K_{current} * V_{tractor}}{V_{operator\ panel}}$$




-  **Min speed, km/h** - The parameter is intended for setting the minimum permissible speed of movement. If you set the value to “No”, the control of the minimum speed of movement will not be carried out. When the value of the minimum speed is set and the system has started control of the products application, when moving at a speed less than the one specified in this parameter, the operator will be notified via alarm indication on the main screen⁴¹ as well as alarm sound and light⁴² signals.
-  **Max speed, km/h** - The parameter is intended for setting the minimum permissible speed of movement. If you set the value to “No”, the

⁴¹ See the description of the speed sensor indicator in the subsection 8.1.4

⁴² The alarm light indicator is shown in “Figure 4”, p.5

control of the maximum speed of movement will not be carried out. When the value of the maximum speed is set and the system has started control of the products application, when moving at a speed greater than the one specified in this parameter, the operator will be notified via an alarm indication on the main screen as well as alarm sound and light signals.

- 
Imitation, km/h - the parameter is intended to specify the speed of the simulated movement. Allows an implement to work with a faulty speed sensor.

When the speed imitation is on, it is possible to pause the movement imitation using the feature of manual blocking of the product application control. When this feature is activated, an icon  is displayed on the right edge, and the imitation speed is equal to “0 km/h”. Activation and deactivation of the manual blocking feature is performed by long pressing the button  “Increase brightness” or on the main screen by long pressing the button  “Home”.



- 
Width, cm - this parameter is displayed only when the system profile specifies that the speed will be measured by two speed sensors. They will be connected to the input device. This parameter specifies the distance between the centers of two wheels on which speed sensors are installed (see Figure 76).



Figure 76 Measuring the distance between two wheels for the “Width, cm” parameter

- 
Alarms criteria - if this parameter is set to “Yes”, the system will start controlling the application of products immediately after the start of movement. Displayed only in the case when the implement position sensor is absent in profile or faulty.

11.8.4. Speed sensor calibration

Before starting the speed sensor calibration procedure, you have to find a place on the field where you can drive 100m and place the tractor at the beginning of calibration path. There are two ways to start speed sensor calibration.

The first way to start the calibration procedure



Open the context menu of the speed sensor and start calibration from the menu item  “Speed calibration”. If the current access level is “Operator”, then you have to enter the PIN code for the “Agronomist” access level. If the current access level is “Agronomist”, then you just have to confirm your actions by pressing on the  “Plus” button. As a result, the speed sensor calibration window will appear (see Figure 77 p.6).



Figure 77 Starting calibration from the context menu of the sensor

The second way to start the calibration procedure

Enable the “Agronomist” access level. After that, in the main screen menu “Settings” select “The implement settings” menu item (see Figure 78 p.3) and open its submenu. Next, select the “Speed calibration” menu item (see Figure 78 p.5) and run the calibration. As a result, the speed sensor calibration window will appear (see Figure 78 p.6).

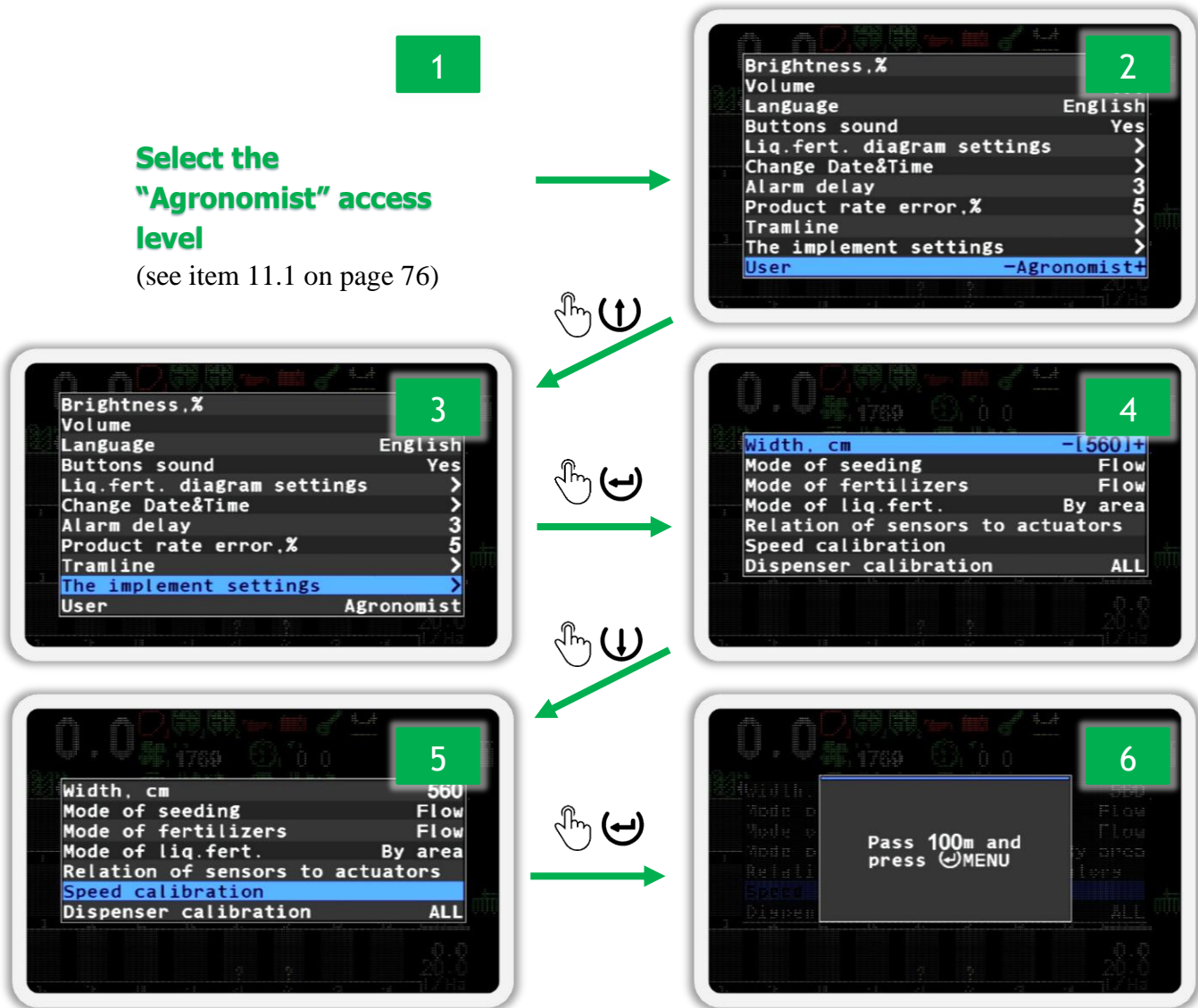


Figure 78 Starting calibration from the main screen menu

Calibrating the speed sensor


After the speed sensor calibration window appears, drive a hundred meters and stop. After stopping, press the “Menu” button. As a result, you will see the message “Completed” - this means that the calibration procedure has been successfully completed. You can cancel the speed sensor calibration procedure by pressing the “Back” button.

11.8.5. Configuring the hopper sensor

The hopper sensor has no settings. Its context menu has only standard items for most sensors (see Figure 79):



Figure 79 Parameters of the hopper's level of filling sensor

-  **Information** - selecting this menu item will open a screen displaying the status of the selected sensor (see subsection 11.8.2 above on page 105). The hopper level sensor has only one additional item:
 - *Pin* - displays the current value of the logic level of the signal (“0” or “1”) at the input of the input device to which this sensor is connected (see Figure 80).

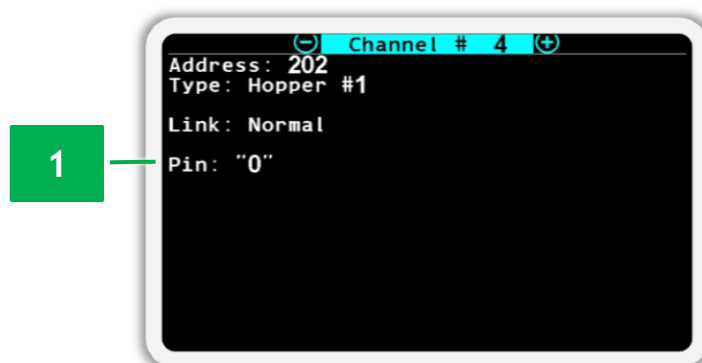





Figure 80 Status view screen for the hopper full level sensor

-  **Disable control / Enable control** - this parameter is individual for the selected sensor. By selecting this item and pressing the  “Menu” button, the control state of the selected sensor will either be disabled or enabled. The text in this menu item depends on the current control state of the selected sensor.
-  **Registers** - this menu item is intended to open the “Registers” screen. This screen is used by authorized service engineers to diagnose the selected sensor.

11.8.6. Configuring the dispenser sensor


The dispenser sensor, depending on the settings, has the following context menu items (see Figure 81):



Figure 81 Parameters of the dispenser sensor



The parameter values for each dispenser sensor are individual!

- 
Information - selecting this menu item will open a screen displaying the status of the selected sensor (see subsection 11.8.2 above on page 105). The dispenser sensor has an additional item with the value of the current sensor frequency (see Figure 82 p.1). The frequency value is displayed in Hertz.

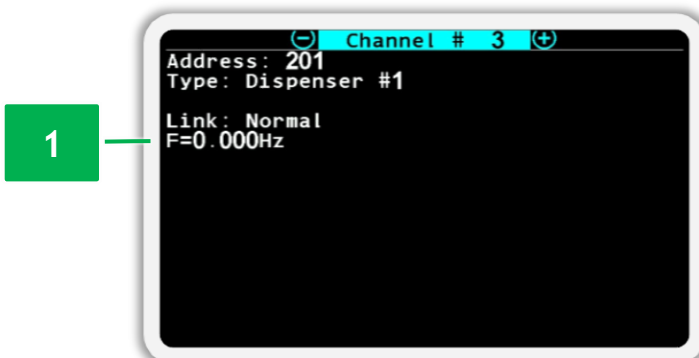










Figure 82 Screen of viewing the status of the dispenser sensor

- 
Disable control / Enable control - this parameter is individual for the selected sensor. By selecting this item and pressing the  “Menu” button, the control state of the selected sensor will either be disabled or enabled. The text in this menu item depends on the current control state of the selected sensor.
- 
Registers - this menu item is intended to open the “Registers” screen. This screen is used by authorized service engineers to diagnose the selected sensor.
- 
Dispenser calibration (weight) - the menu item is intended to start the procedure for determining the mass of the product, that distributed by the metering drum, in relation to number of impulses from dispenser sensor. The procedure of calibration of the dispenser for mass calculation is described in the subsection 11.8.7 below on page 118. This menu item will be shown if the  “Weight control” parameter is set to “Yes”.
- 
Period, s - allows you to set the maximum time interval between pulses from dispenser sensor. If this interval is exceeded, the system will display the “No rotation” alarm. The value is set in seconds.



If this sensor's “Alarms criteria” parameter is set to “Yes”, then this menu item will not be displayed, and the parameter value will be equal to 1 second.








- 
Rotation speed control - this menu item is intended to enable control of the rotation speed of the central metering device shaft in relation to the movement speed. If the value “Yes” is set, then the rotation speed of the shaft is controlled within the permissible deviation specified in  “Maximum error, %” item. If it is enough just to control the presence of rotation of the central metering device shaft, then you must set the value “No”.



To control the rotation speed of the central metering device shaft, calibration is required! The process of calibrating dispensers is described in the subsection 11.8.8 below on page 120.





Instead of this outdated mode of controlling the rotation of the central metering device shaft in relation to the speed sensor, it is better to use the new feature of control of the metering device according to the target rate of the product application in kilograms per hectare (see below the item “Weight control”).

-  **Wheel, pulses** - this parameter is used in conjunction with the  “Dispenser pulses” parameter to control the rotation speed of the central metering device shaft. It determines the number of pulses from the movement speed sensor, which corresponds to the number of pulses from the dispenser sensor, specified in  “Dispenser pulses” parameter. These two parameters are automatically calculated during the calibration process (see subsection 11.8.8 below on page 120).
-  **Dispenser pulses** - the number of pulses from the dispenser sensor, which corresponds to the number of pulses from the movement speed sensor, specified in the  “Wheel, pulses” parameter.
-  **Maximum error, %** - in this menu item, the maximum permissible deviation of the rotation speed of the central metering device is determined. If the rotation speed deviates more than the specified limits, the system will display one of the alarms: “High speed of rotation” or “Low speed of rotation”.
-  **Weight control** - this menu item is intended to enable control of product application by the central metering device according to the target rate set in kilograms per hectare. Set to “Yes” to enable this feature. When enabled, this sensor automatically becomes part of the condition for starting the control of alarms of product application (see page 24).



To correctly calculate the weight of the product distributed by the dispenser, calibration is required! The calibration process is described in the subsection 11.8.7 below on page 118.










-  **Type of product** - this menu item defines the product number that is distributed by this dispenser. This menu item is only displayed if the  “Weight control” parameter is set to “Yes”.
 If there are several central metering devices in the system and they distribute the same product (seed), then the same product number must be set for each of them.
 If there are several central metering devices in the system, but they distribute different products (seed and dry fertilizers), then each of them must be assigned an individual product number. The system allows you to control up to four different products.
 The most common settings schemes for product types:
 - There is 1 dispenser sensor in the system. Set the value to “Product 1”.
 - There are 2 sensors in the system and both central metering devices distribute one product. Set both sensors to “Product 1”.

- There are 2 sensors in the system, but the central metering devices distribute different products (seed and dry fertilizers). Set the value “Product 1” for the first dispenser sensor and set the value “Product 2” for the second dispenser sensor.
- The system has 3 sensors, of which two central metering devices distribute seed, and the third distributes dry fertilizers. Set the value “Product 1” to those sensors whose central metering devices distribute the seed. Set the third dispenser sensor to “Product 2”.







When trying to change the value of the “Type of product” parameter, or to enable (or disable) the control of the dispenser sensor with the weight control enabled, the system will ask to reset the statistics for the current field if there is any data in this field.

Before performing the changes described above, it is recommended to change the number of the statistics active field to the field with reset data or reset the data for the current field.

-  **Weight, gr** - this menu item determines the weight of product corresponding to the number of pulses from the dispenser sensor specified in the  “Weight, pulses” parameter. Both of these parameters determine the characteristics of the central metering device drum.  “Weight, gr” and  “Weight, pulses” parameters are calculated by the system during calibration. The procedure for calibrating the dispenser sensor for weight measurement is described in the subsection 11.8.7 below on page 118. This menu item will be shown if the  “Weight control” parameter is set to “Yes”.
-  **Weight, pulses** - this parameter contains the number of pulses from the dispenser sensor corresponding to the weight of product specified in the  “Weight, gr” parameter. This menu item will be shown if the  “Weight control” parameter is set to “Yes”.
-  **Alarms criteria** - this item is displayed only if there is no implement position sensor in the system profile or it is removed from control. In this case, by setting the value to “Yes”, you will connect this sensor to the logic of making a decision to start control of alarms of product application. And if the value is set to “No”, then the sensor will not be used when making a decision on the start of control of product application.




11.8.7. Calibrating the dispenser for measuring the weight of the product

To perform this type of calibration of an individual dispenser sensor, the following actions must be performed:

1. On the main screen, go to sensor setup mode (see subsection 11.8.1 above on page 105).
2. Select the dispenser sensor you want to calibrate and open its context menu.
3. In the context menu of the sensor, select the  “Dispenser calibration (weight)” item and press the  “Menu” button to open the calibration screen (see Figure 83 p.1).
4. In the screen that appears, press the  “Plus” button to prepare for the calibration procedure (see Figure 83 p.2). As a result, the screen will show a list of actions that must be performed before starting the calibration itself (see Figure 83 p.3). Do everything necessary and press the  “Up” button.
5. The screen will show a new list of actions that must be performed for calibration (see Figure 83 p.4). This screen also displays the counter of pulses received from the dispenser sensor. Rotate the metering shaft to fill the container with seeds until “Complete calibration” text appears at the bottom of the screen (see Figure 83 p.5).



It is recommended to continue filling the container with seeds if the number of pulses from dispenser sensor is less than 100 or the weight of seeds in the container is less than 2 kg.

6. Press the  “Minus” button to end calibration.
7. In the window for entering numerical values, enter the weight of product in the container (calculated by the difference between the weight of the container with product and the weight of the empty container).
8. After entering the weight press the  “Menu” button. Exit the calibration screen. To do this, press the  “Back” button.








Fill the container with seeds until the "Finish Calibration" text appears at the bottom of the screen.

Figure 83 Calibrating the dispenser sensor for measuring the weight of product

11.8.8. Calibrating the dispensers to control the speed of its rotation

To perform this type of dispenser sensor calibration, the following steps must be performed:

1. Enable access level “Agronomist” (see subsection 11.1 above on page 76).
2. In the menu of the main screen in the  “Settings” menu select the  “The implement settings” item (see Figure 84 p.1) and press the  “Menu” button (see Figure 84 p.2).
3. Select the  “Dispenser calibration” item (see Figure 84 p.3).
4. Select which dispenser sensor you will calibrate. You can select “ALL” or only one of the available dispenser sensors.
5. Start the dispenser sensor calibration process. To do this, press the  “Menu” button (see Figure 84 p.4).
6. Start rotating the drive wheel. As pulses are received from the dispenser sensors and the speed sensor, the percentage of the progress of the calibration will increase (see Figure 84 p.5).
7. Rotate the drive wheel until the message “Stop rotation!” appears (see Figure 84 p.6).
8. After stopping, the message “Done” will appear, after which the menu “The implement settings” will be displayed automatically.

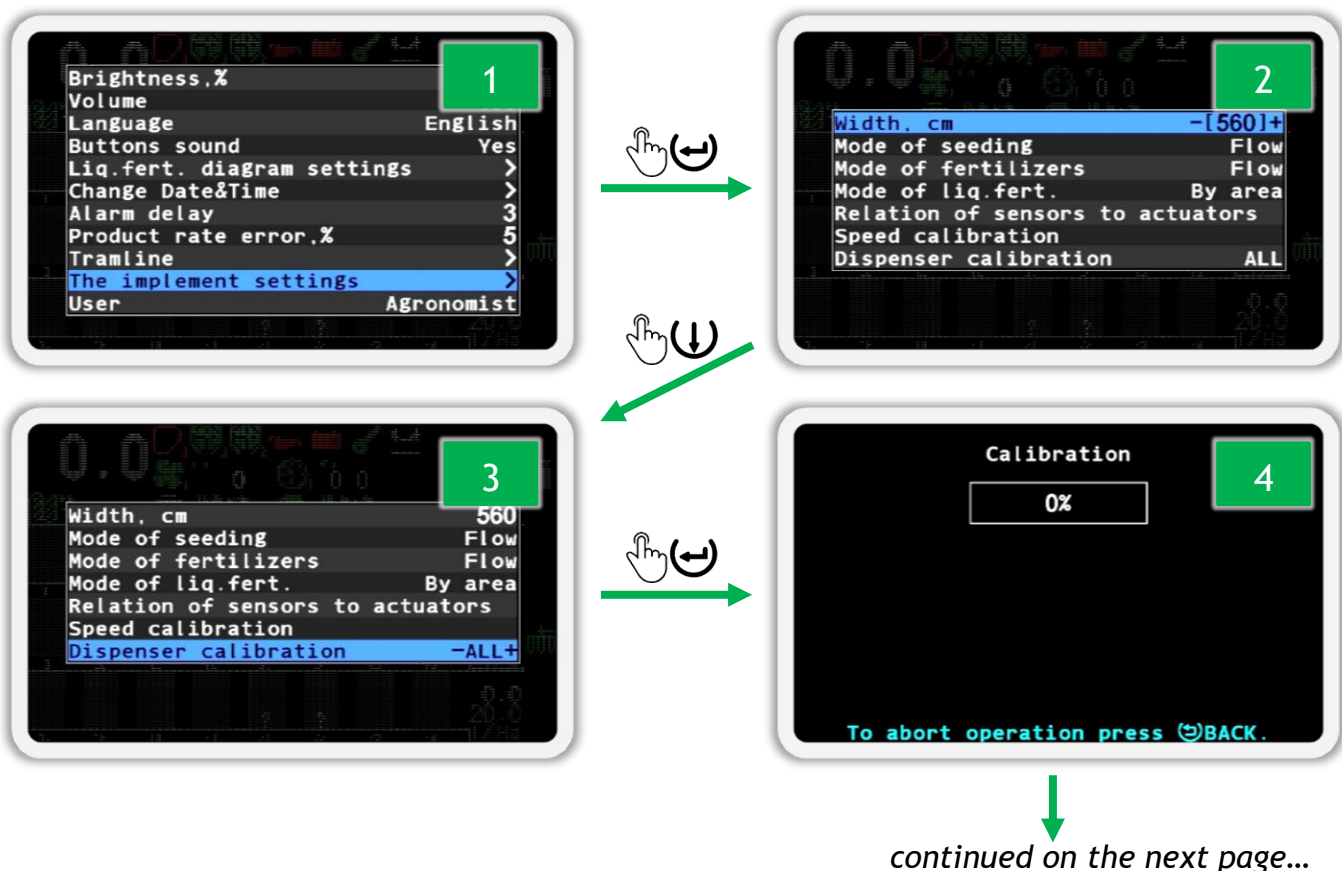


Figure 84

...start on the previous page

Rotate the drive wheel until the message "Stop rotation" appears.

After stopping, the message "Done" will appear, after which the "The implement settings" menu will be displayed.

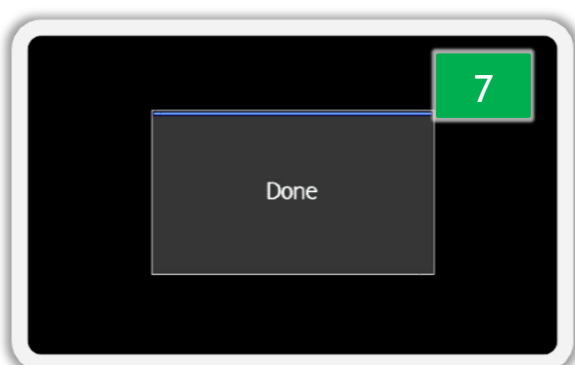
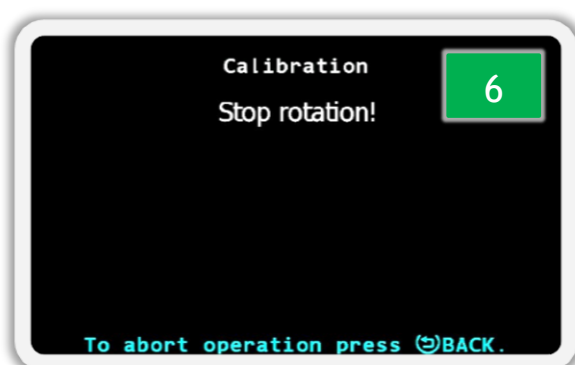
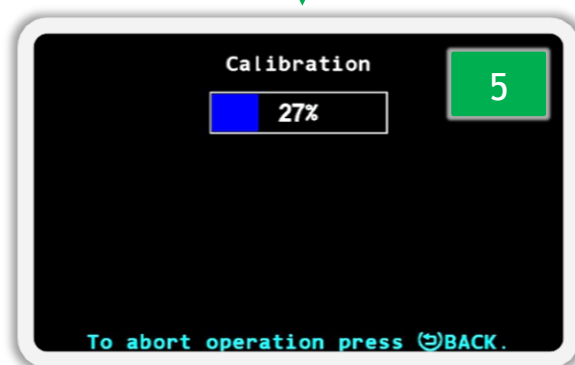


Figure 85



If you want to cancel the calibration, press the ⏪ "Back" button. As a result, you will see the message "Calibration canceled".

11.8.9. Configuring the fan sensor

The fan sensor has the following context menu items (see Figure 86):

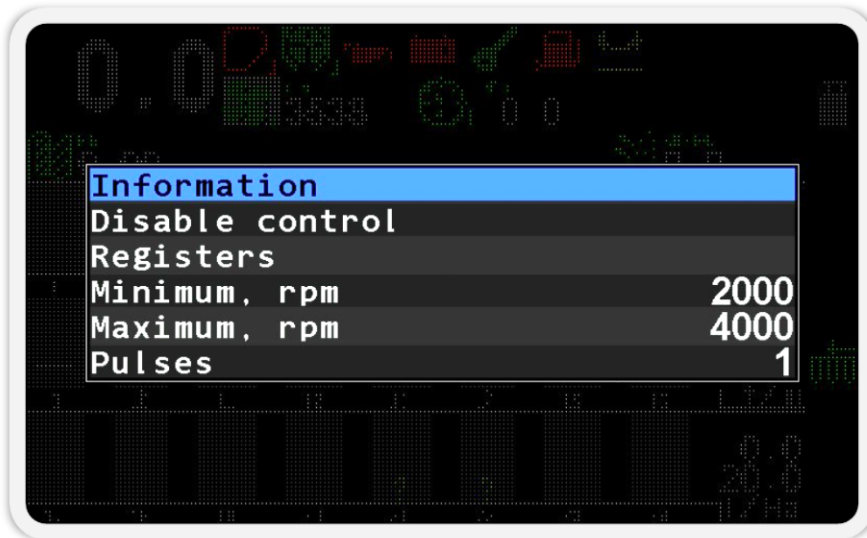




Figure 86 Fan sensor parameters



The parameter values for each fan sensor are individual!

- 
Information - selecting this menu item will open a screen displaying the status of the selected sensor (see subsection 11.8.2 above on page 105). The fan sensor has an additional item with the value of the current frequency of the sensor being viewed (see Figure 87 p.1). The frequency value is displayed in hertz.

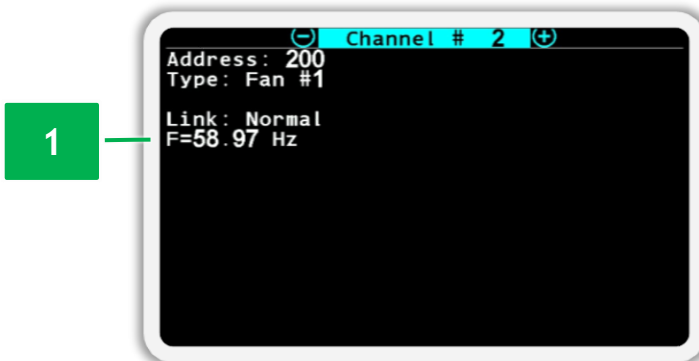








Figure 87 Fan sensor status view screen

- 
Disable control / Enable control - this parameter is individual for the selected sensor. By selecting this item and pressing the  “Menu” button, the control state of the selected sensor will either be disabled or enabled.

The text in this menu item depends on the current control state of the selected sensor.

- 
Registers - this menu item is intended to open the “Registers” screen. This screen is used by authorized service engineers to diagnose the selected sensor.
- 
Minimum, rpm - sets the minimum value of the fan rotation speed. During movement (or fulfillment of the products application control condition in case of the absence of a movement speed sensor) and the speed of rotation of the fan decreases below this value, the system will display the alarm message “Low speed of rotation”.
- 
Maximum, rpm - sets the maximum value of the fan rotation speed. When the fan rotation speed is increased above this value, the system will display the alarm message “High speed of rotation”.
- 
Pulses - sets the number of pulses from the fan rotation sensor for one rotation.

11.8.10. Configuring the pressure sensor

The pressure sensor has the following context menu items (see Figure 88):

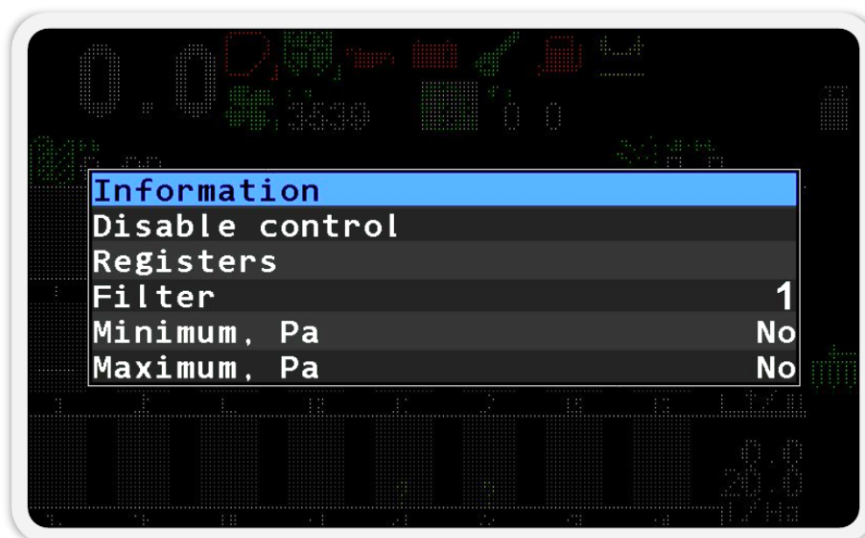



Figure 88 Pressure sensor parameters



The parameter values for each pressure sensor are individual!

- 
Information - selecting this menu item will open a screen displaying the status of the selected sensor (see subsection 11.8.2 above on page 105). The pressure sensor has an additional item with the value of the current measured pressure (boost or vacuum) (see Figure 89 p.1). The pressure value is displayed in kilopascals.

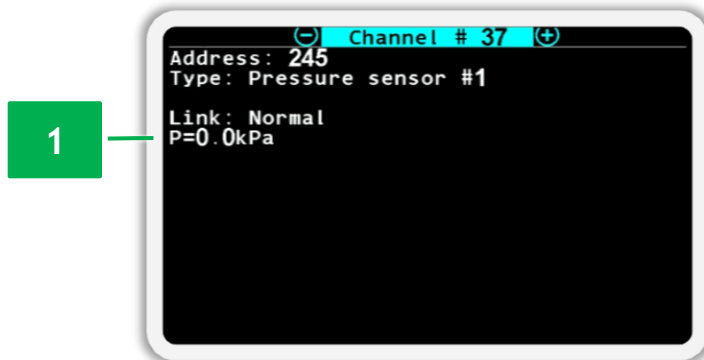








Figure 89 Screen of viewing the status of the pressure sensor

- 
Disable control / Enable control - this parameter is individual for the selected sensor. By selecting this item and pressing the  “Menu” button, the control state of the selected sensor will either be disabled or enabled. The text in this menu item depends on the current control state of the selected sensor.
- 
Registers - this menu item is intended to open the “Registers” screen. This screen is used by authorized service engineers to diagnose the selected sensor.
- 
Filter - sets the measurement duration and averaging of the measured pressure. Increase this parameter value if the measured pressure value fluctuates greatly.
- 
Minimum, Pa - when moving (or fulfilling the products application condition in case of the absence of a movement speed sensor) and the value of the measured pressure exceeds the minimum value, the system will display the alarm message “Low pressure”. Control of the minimum value of the measured pressure can be disabled by selecting the “No” option.
- 
Maximum, Pa - if the value of the measured pressure exceeds the maximum value, the system will display the alarm message “High pressure”. Control of the maximum value of the measured pressure can be disabled by selecting the “No” option.

11.8.11. Configuring seed sensors

The seed sensor has the following context menu items (see Figure 90):

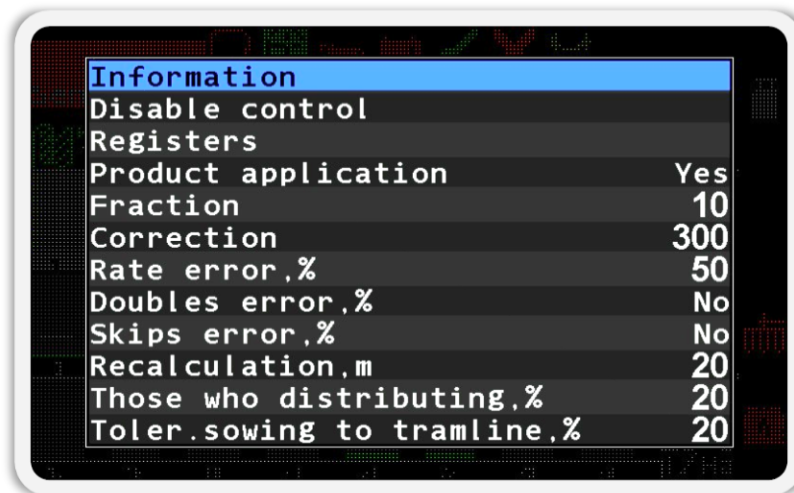



Figure 90 Seed sensor settings



The parameter values for the seed sensors are common to the whole group.

- 
Information - selecting this menu item will open a screen displaying the status of the selected sensor (see subsection 11.8.2 above on page 105). Seed sensor have an additional status (see Figure 91 p.1), the possible states of which are as follows:
 - *Working* - normal state.
 - *Working : Tramline* - normal state. The sensor is switched to the mode of the tramline control.
 - *Configuring* - the sensor has received new settings from the operator panel and is applying them.
 - *Calibration in progress* - the sensor performs an initial calibration. This process takes a few seconds.
 - *Clogged* - blocking of the infrared light emitter was detected in the optical channel of the sensor. Most likely due to blockage of the seeding tube.
 - *Light struck* - the sensor may not work properly because it is exposed to too much sunlight.
 - *Faulty* - the sensor became faulty and must be replaced.
 - *Unknown* - other malfunctions that cannot be identified.

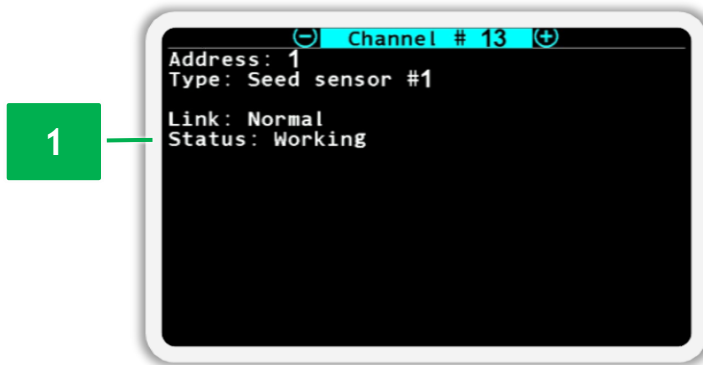








Figure 91 Screen of viewing the status of the seed sensor

- 
Disable control / Enable control - this parameter is individual for the selected sensor. By selecting this item and pressing the  “Menu” button, the control state of the selected sensor will either be disabled or enabled. The text in this menu item depends on the current control state of the selected sensor.
- 
Registers - this menu item is intended to open the “Registers” screen. This screen is used by authorized service engineers to diagnose the selected sensor.
- 
Product application - this parameter is individual for the selected sensor. It is used to indicate whether the section on which the seed sensor is installed should apply seed. If the value “Yes” is set, then the actual rate of seed application in this section is controlled according to the target rate or the minimum permissible level of actual rate. If the value “No” is set, then such a section is switched to the tramline control mode and the sensor start to control the presence of product losses.
- 
Fraction - defines the threshold for filtering input signals from dust and other small rubbish fractions. With the help of this parameter, the minimum flight time of the grain through the optical channel of the sensor is determined (value in hundreds of microseconds). The optimal value depends on the size of the seed and the speed of its flight.





To avoid calculation errors after changing the crop, it is necessary to change the value of the fraction. Recommended values of the fraction depending on the size of the grain (look at the size of the following crops):

- rapeseed / canola - 1-5;
- wheat - 5-10;
- corn - 10-30;
- sunflower - 10-30;
- for pneumatic seed drills, the recommended value of the fraction is 1 (regardless of the crop being sown).



- 
Correction - this parameter is used to increase or decrease the sensitivity of the seed sensor depending on the features of the mounting bracket of the seed sensor. **The default value is 300.** Increasing this parameter decreases the sensitivity of the sensor, which can allow dust and small rubbish fractions to be excluded from the seed count.



Changing this parameter is required in some cases and therefore it is not recommended to change it yourself without first consulting with technical support specialists. Technical support contacts are listed on the back of this manual.

- 
Rate error, % - determines the maximum permissible deviation of the actual rate of sowing to the value of the target rate, before displaying an alarm message. It is specified as a percentage. Displayed only for “Precise” and “Hybrid” control modes.
- 
Doubles error, % - this option can be used to enable alarm messages when a specified percentage of doubles is exceeded. If set to “No”, alarm notifications will be disabled. If a numerical value is set, the alarm message “High % of doubles” will be displayed when the specified percentage of doubles is exceeded. Displayed only for “Precise” control mode.
- 
Skips error, % - this option can be used to enable alarm messages when a specified percentage of skips is exceeded. If set to “No”, alarm notifications will be disabled. If a numerical value is set, the alarm message “High % of skips” will be displayed when the specified percentage of skips is exceeded. Displayed only for “Precise” control mode.
- 
Recalculation, m - the parameter sets the length of the path (in meters) during which information about skips, doubles and other data is accumulated for display in the “Table” screen and the sowing diagram. The range of permissible values is from 10m to 50m.

When sowing control mode is set to “Precise”, this value can be calculated by the system according to the set target rate and the number of holes in metering disc. To do this, do the following:

- 1) Set the target rate.
- 2) Select this parameter in the sensor’s context menu and press the  “Menu” button.
- 3) A warning will appear that a target rate of sowing must be set. Press the  “Menu” button.




- 4) Next, a window will appear in which you have to enter the number of holes in the metering disc and press the  “Menu” button (see Figure 92) and then the system will calculate the optimal value of the parameter.



Figure 92




It is recommended to calculate the values of the “Recalculation, m” parameter of the seed sensor once when the target rate value changed or the metering disk is changed.

- 
Those who distributing, % - indicates the minimum ratio of sowing sections as one of the criteria for start of the control of the products application⁴³. The default value is 20%, the permissible range is from 5% to 80%. The value of this parameter is used for notification of an alarm situation “NOT UNDER CONTROL” (see subsection 8.1.20 above on page 38).
- 
Toler. sowing to tramline, % - the parameter sets the permissible actual rate of product losses into tramline. It is set as a percentage of the target rate, or the minimum permissible level of actual rate of the “flow” control mode. When the actual rate of product loss exceeds the set value, the system will display the alarm message “Seeding to tramline”. Default value is 20%, valid range is from 0 to 50%.

⁴³ Criteria for start of the control of the products application are described on page 24.

11.8.12. Configuring the dry fertilizers sensors

The dry fertilizer sensor contains the same menu items and parameters as the seed sensor. See subsection 11.8.11 above “Configuring seed sensors” on page 125. But there is one special parameter:

- 
Group start address - the parameter specifies the address of the sensor, starting from which the sensors of dry fertilizers are connected in series. The default value is “AUTO”. In this case, the addresses of the dry fertilizer sensors will start counting immediately after the seeding sensors.

However, there are seeding machines that can change their configuration from seeding drill to planter with fewer sowing sections, but use the same dry fertilizer sensors. In order not to change the addresses of already installed sensors of dry fertilizers, you can simply set the initial address of the group.

11.8.13. Configuring the liquid fertilizers sensors

Liquid fertilizer sensors have the following context menu items (see Figure 93):

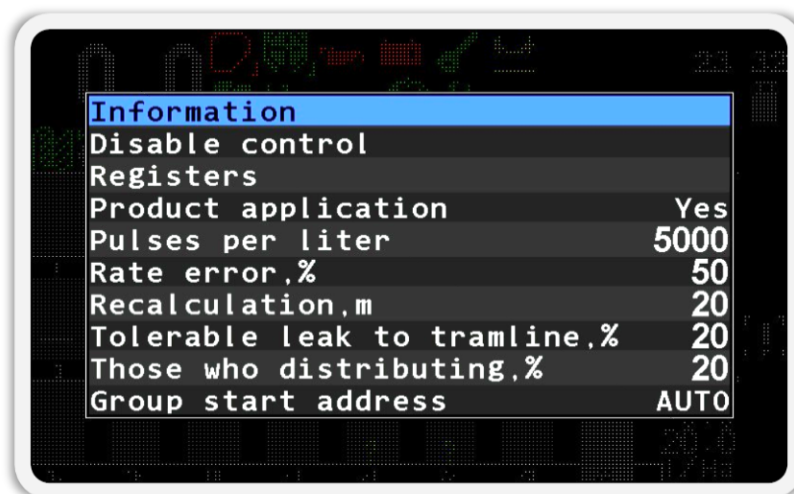



Figure 93 Liquid fertilizers sensors settings



Parameter values for liquid fertilizer sensors are common to the whole group.

- 
Information - selecting this menu item will open a screen displaying the status of the selected sensor (see subsection 11.8.2 above on page 105).

Liquid fertilizer sensor has two additional fields “Status” and “Flow” (see Figure 94 p.1 and p.2):

- *Status* - has the following status options:
 - *Working* - normal state.
 - *Working : Tramline* - normal state. The sensor is switched to the mode of the tramline control.
- *Flow* - this field displays the value of the actual rate of liquid fertilizers application, which is displayed in liters per minute.

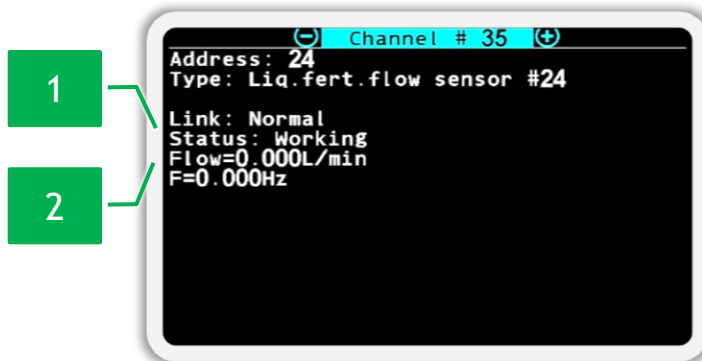















Figure 94 Screen of viewing the status of the liquid fertilizer sensor

-  **Disable control / Enable control** - this parameter is individual for the selected sensor. By selecting this item and pressing the  “Menu” button, the control state of the selected sensor will either be disabled or enabled. The text in this menu item depends on the current control state of the selected sensor.
-  **Registers** - this menu item is intended to open the “Registers” screen. This screen is used by authorized service engineers to diagnose the selected sensor.
-  **Product application** - this parameter is individual for the selected sensor. It is used to indicate whether the section on which the sensor is installed should apply liquid fertilizer. If the value “Yes” is set, then the actual rate of liquid fertilizers application in this section is controlled according to the target rate or the minimum permissible level of actual rate of the product application. If the value “No” is set, then this section is switched to the mode of the tramline control and the sensor controls the presence of product losses into tramline.
-  **Pulses per liter** - determines the number of pulses from the sensor per liter of product. Recommended values for Wilger flowmeters for the selected jet:

-  red - 8900 pls./L;
 -  green - 15500 pls./L;
 -  blue - 3400 pls./L.
-  **Rate error, %** - determines the maximum permissible deviation of the actual rate of liquid fertilizers application to the value of the target rate, before displaying an alarm message. It is specified as a percentage. Displayed only for “By area” control mode.
 -  **Recalculation, m** - the parameter sets the length of the path (in meters), during which information is accumulated for display in the “Table” screen. The range of permissible values is from 10m to 50m.
 -  **Tolerable leak to tramline, %** - the parameter sets the permissible actual rate of product losses into tramline. It is set as a percentage of the target rate, or the minimum permissible level of actual rate of the “flow” control mode. When the actual rate of product loss exceeds the set value, the system will display the alarm message “Distributing to tramline!”. Default value is 20%, valid range is from 0 to 50%.
 -  **Those who distributing, %** - indicates the minimum ratio of these sections as one of the criteria for start of the control of the products application⁴⁴. The default value is 20%, the permissible range is from 5% to 80%. The value of this parameter is used for notification of an alarm situation “NOT UNDER CONTROL” (see subsection 8.1.20 above on page 38).
 -  **Group start address** - the parameter specifies the address of the sensor, starting from which the sensors of liquid fertilizers are connected in series. The default value is “AUTO”. In this case, the addresses of the liquid fertilizer sensors will start counting immediately after the seed and dry fertilizer sensors.
 However, there are seeding machines that can change their configuration from seeding drill to planter with fewer sections, but use the same liquid fertilizer sensors. In order not to change the addresses of already installed sensors of liquid fertilizers, you can simply set the initial address of the group.

⁴⁴ Criteria for start of the control of the products application are described on page 24.

11.8.14. Configuring the implement position sensor

The implement position sensor has the following context menu items (see Figure 95):

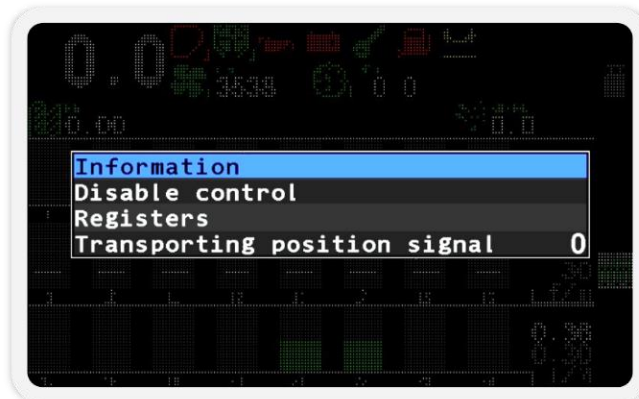



Figure 95 Settings of the implement position sensor

-  **Information** - selecting this menu item will open a screen displaying the status of the selected sensor (see subsection 11.8.2 above on page 105). The implement position sensor has additional items with the following values:
 - *Position* - displays the current position (see Figure 96 p.1). It has two possible values:
 - Working;
 - Transporting.
 - *Pin* - displays the current value of the logic level of the signal (“0” or “1”) at the input of the input device to which this sensor is connected (see Figure 96 p.2).

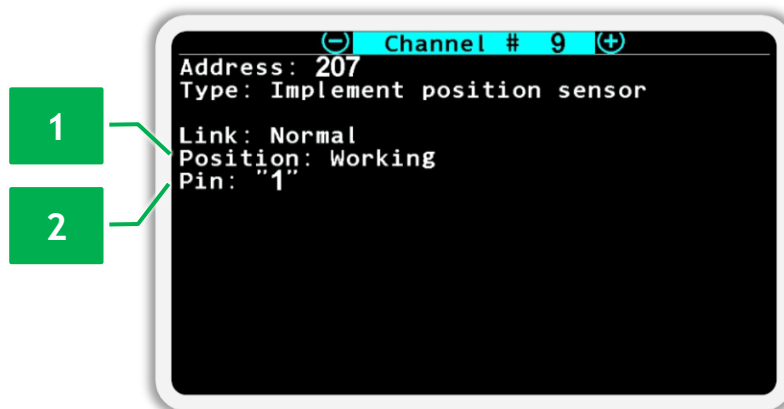






Figure 96 Screen of implement position sensor's status view

-  **Disable control / Enable control** - this parameter is individual for the selected sensor. By selecting this item and pressing the  “Menu” button, the control state of the selected sensor will either be disabled or enabled. The text in this menu item depends on the current control state of the selected sensor.

- 
Registers - this menu item is intended to open the “Registers” screen. This screen is used by authorized service engineers to diagnose the selected sensor.
- 
Transporting position signal - sets the value of the logic level at the input to the input device, which corresponds to the transport position of the implement.

11.8.15. Configuring the ignition key position sensor

The ignition key position sensor has the following context menu items (see Figure 97):

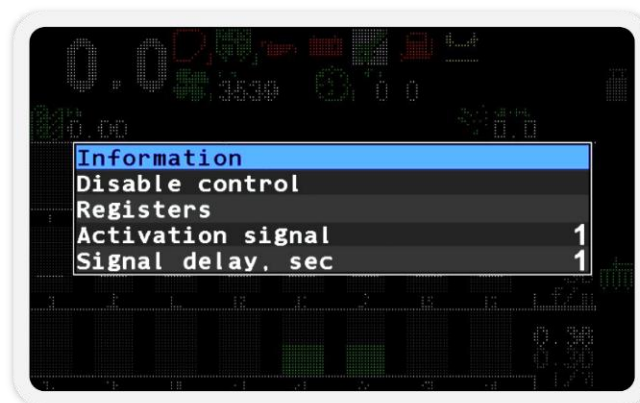



Figure 97 The ignition key position sensor settings

- 
Information - selecting this menu item will open a screen displaying the status of the selected sensor (see subsection 11.8.2 above on page 105). The ignition key sensor has additional item with the following values:
 - o displays the current value of the logic level of the signal at the input of the input device (see Figure 98 p.1).

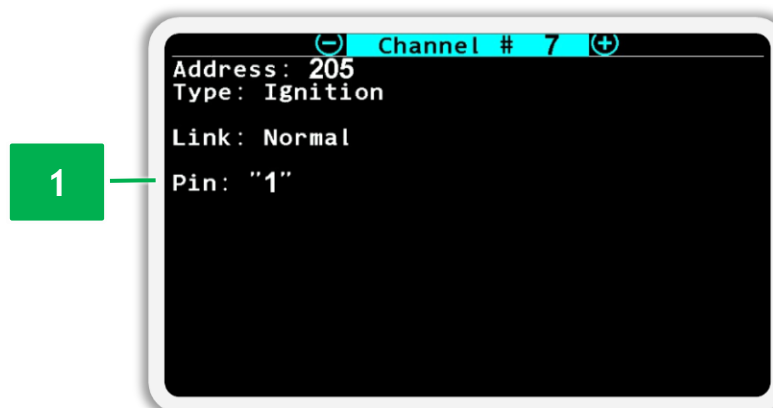








Figure 98 Screen of the ignition key position sensor’s status view

- 
Disable control / Enable control - this parameter is individual for the selected sensor. By selecting this item and pressing the  “Menu” button,


the control state of the selected sensor will either be disabled or enabled. The text in this menu item depends on the current control state of the selected sensor.

-  **Registers** - this menu item is intended to open the “Registers” screen. This screen is used by authorized service engineers to diagnose the selected sensor.
-  **Activation signal** - sets the value of the logic level at the input of the input device, which corresponds to the position of the key when the ignition is on in the autonomous engine of the fan drive.
-  **Signal delay, sec** - sets the value of the delay before changing the value of the signal to the opposite. This is necessary to eliminate false positives. The value is set in seconds.


11.8.16. Configuring the low oil pressure sensor

The sensor has the same settings options and status screen as the ignition key position sensor (see subsection 11.8.15 above on page 133). The only difference is that the parameter  “Activation signal” sets the value of the logic level at the input of the input device, which corresponds to low oil pressure in the autonomous fan drive motor.


11.8.17. Configuring the battery charge sensor

The sensor has the same settings options and status screen as the ignition key position sensor (see subsection 11.8.15 above on page 133). The only difference is that the parameter  “Activation signal” sets the value of the logic level at the input of the input device, which corresponds to the absence of battery charge from the autonomous motor of the fan drive.

11.8.18. Configuring the remaining fuel sensor

The sensor has the same settings options and status screen as the ignition key position sensor (see subsection 11.8.15 above on page 133). The only difference is that the parameter  “Activation signal” sets the value of the logic level at the input of the input device, which corresponds to the minimum fuel level in the tank of the autonomous engine of the fan drive. And the value of the signal delay parameter is set to 15 seconds by default.

11.8.19. Configuring the air filter sensor


The sensor has the same settings options and status screen as the ignition key position sensor (see subsection 11.8.15 above on page 133). The only difference is that the parameter  “Activation signal” sets the value of the logic level at the input of the input device, which corresponds to the clogging of the air filter of the autonomous motor of the fan drive. And the value of the signal delay parameter is set to 5 seconds by default.

11.8.20. Configuring the bout marker sensor

Bout marker position sensor has the following context menu items (see Figure 99):



Figure 99 Settings of the run marker sensor

- 
 - Information** - selecting this menu item will open a screen displaying the status of the selected sensor (see subsection 11.8.2 above on page 105). The bout marker sensor has additional items with the following values:
 - *Status* - displays the current position (see Figure 100 p.1). It has two possible values:
 - “Raised”;
 - “Lowered”.
 - *Pin* - displays the current value of the logic level of the signal (“0” or “1”) at the input of the actuator controller or the input device to which this sensor is connected (see Figure 100 p.2).

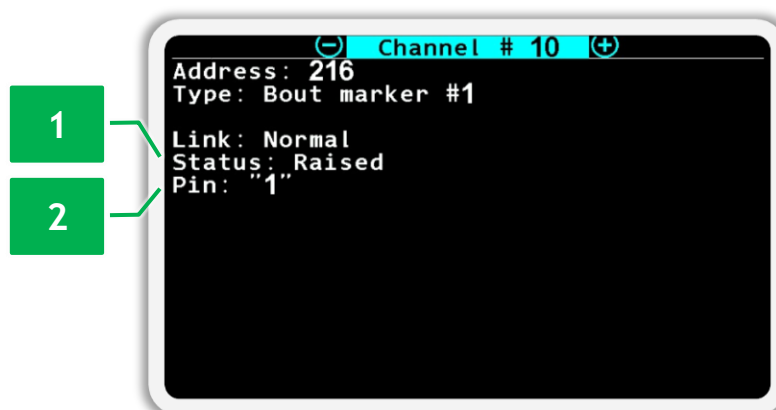






Figure 100 Bout marker sensor status view screen

- 
 - Disable control / Enable control** - this parameter is individual for the selected sensor. By selecting this item and pressing the  “Menu” button, the control state of the selected sensor will either be disabled or enabled.

The text in this menu item depends on the current control state of the selected sensor.

-  **Registers** - this menu item is intended to open the “Registers” screen. This screen is used by authorized service engineers to diagnose the selected sensor.
-  **Signal “down”** - gives the value of the logic level at the input of the input device, which corresponds to the position of the lowered bout marker to make the line of the next run.

11.8.21. Configuring the tramline actuator

The tramline actuator indicator has the following context menu items:

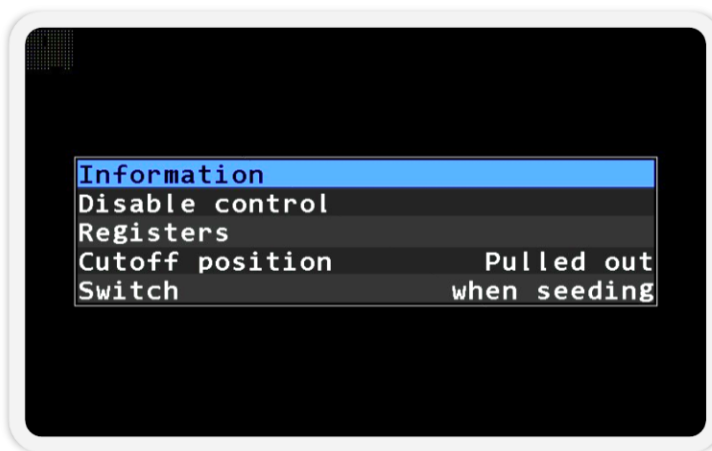



Figure 101 Settings of the tramline actuator

-  **Information** - selecting this menu item will open a screen displaying the status of the selected sensor (see subsection 11.8.2 above on page 105). The actuator for tramline making has an additional item:
 - *Status* - this item displays the current position of the actuator rod “Pulled in” or “Pulled out” (see Figure 102 p.1).

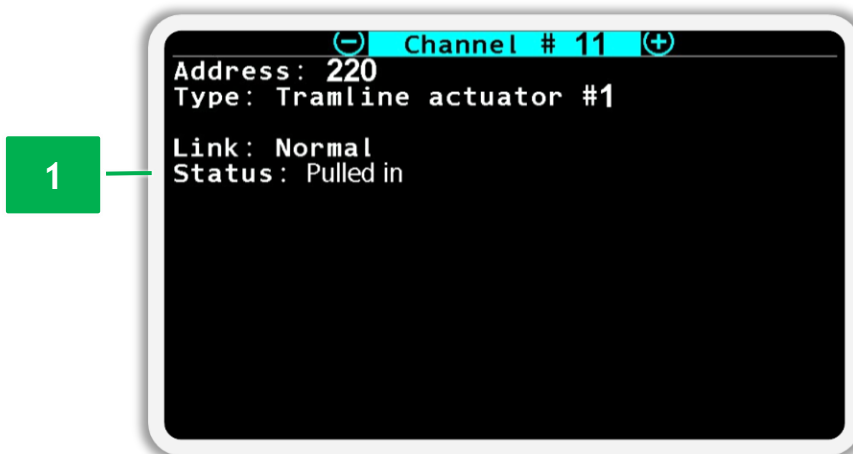







Figure 102 Screen of viewing the state of the tramline actuator

-  **Disable control / Enable control** - this parameter is individual for the selected sensor. By selecting this item and pressing the  “Menu” button, the control state of the selected sensor will either be disabled or enabled. The text in this menu item depends on the current control state of the selected sensor.
-  **Registers** - this menu item is intended to open the “Registers” screen. This screen is used by authorized service engineers to diagnose the selected sensor.
-  **Cutoff position** - this item specifies in which position the actuator rod cuts off the product flow: “Pulled out” or “Pulled in”.
-  **Switch** - this item specifies when it is allowed to change the position of the actuator latch. Two options are available: “always” and “when seeding”.

12. Configuring devices

12.1. Procedure before configuring devices





These operations are mostly carried out at the stage of setting up the system in production by authorized service engineers, as well as in the case of replacing the seed sensor or the dry fertilizer sensor in the system. Unqualified intervention can lead to system failure. In the service menu, we recommend not performing unknown operations by trial and error method. During the changing of addresses, you must be guided only by this manual or the recommendations of an authorized service engineer of “Monada” LLC. See the telephone numbers at the end of the instructions.

1. Disconnect all sensors from the RS-485 communication harness connector on the operator panel (four-pin connector, see Figure 103).
2. Connect the sensor or other device that needs a new address to the communication harness connector on the operator panel (see Figure 103).
3. Turn on the operator panel. When the loading is complete, alarm messages about disconnection from devices will be shown. Close all alarm messages.



Figure 103 RS-485 communication harness connector

- On the main screen, press the  “Menu” button. As a result, a menu with one item  “Settings” will be displayed on the screen (see Figure 104).

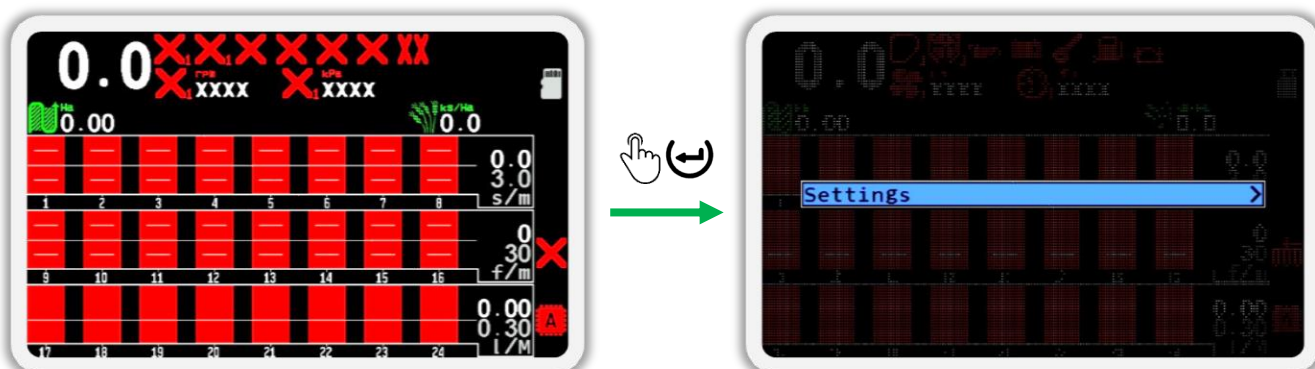






Figure 104

- Press the  “Menu” button again. As a result, a menu will appear on the screen, in which you have to select the  “User” item (see Figure 105). To do this, use the  “Up” or  “Down” buttons (further in the text, to move from one menu item to another, use these buttons).

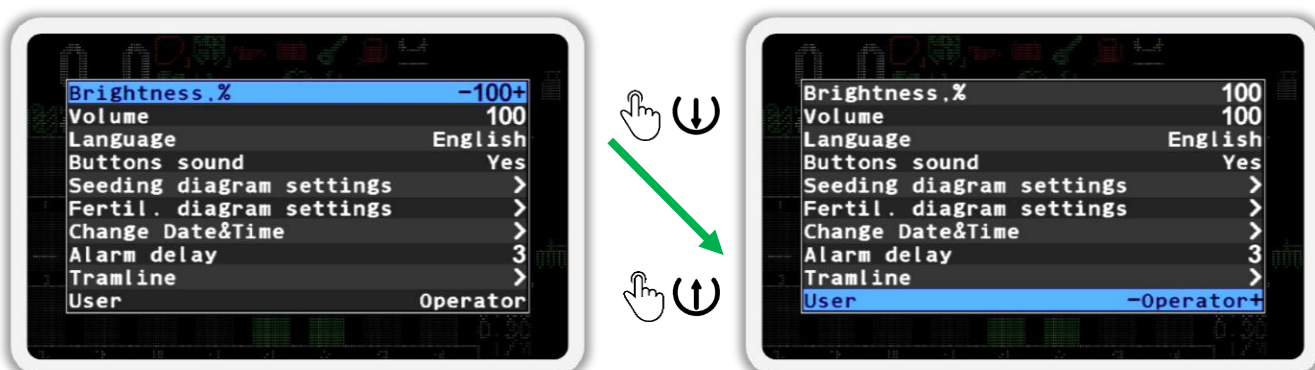









Figure 105

- Select the user “Agronomist” (see Figure 106 on the left). To do this, use the  “Plus” or  “Minus” buttons.
- Press the  “Menu” button.
- In the window that appeared (see Figure 106 on the right), enter the PIN code “88888”. A number whose value can be changed is displayed in black on a blue background. To change its value, use the  “Plus” and  “Minus” buttons and to move to another number, use the  “Up” and  “Down” buttons.

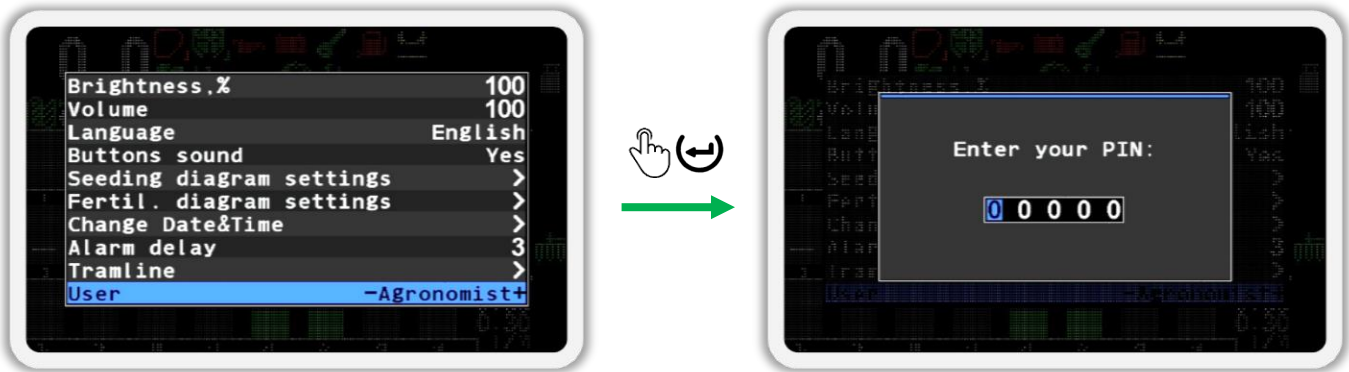



Figure 106

9. After entering the PIN code, press the  “Menu” button. If the code is entered correctly, you will see a message with the label “Agronomist” (see Figure 107). After that, the panel will automatically return to the “Settings” menu.

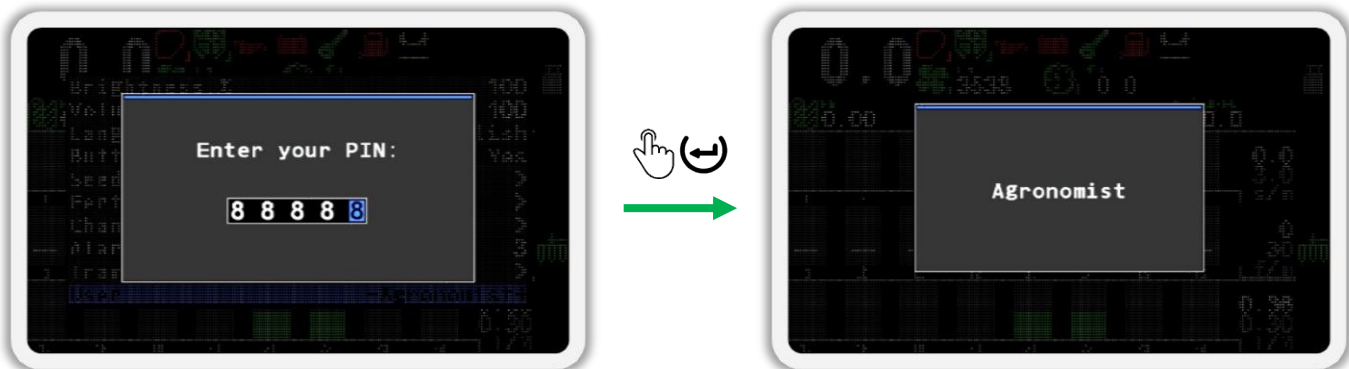




Figure 107



If you made a mistake in the PIN code or selected the “Service” user, then an error message will be displayed after pressing the  “Menu” button. Close the error message by pressing any button and enter the PIN again or close the PIN entry window by pressing the  “Back” button.






10. Exit from the “Settings” menu (see Figure 108 p.1) and return to the main screen menu. To do this, press the  “Back” button.
11. Select the  “Service” menu item (see Figure 108 p.2) and press the  “Menu” button. As a result, the “Service” menu will be displayed on the screen (see Figure 108 p.3).
12. Select the  “Sensor configuration” menu item and press the  “Menu” button. As a result, the “Sensor configuration” menu will be displayed on the screen (see Figure 108 p.4).



Figure 108

12.2. Seed sensors

1. Changing the address of the sensor is possible only when it is working in normal mode. The program address of the sensors on the tube changes immediately after connection. The open sensor is renumbered on the standard bracket or by placing it in a certain way (see Figure 109) with the condition that direct light rays will not enter the optical channel of the sensor (the space between the glass).

Seed sensor on reflection



A mirror or other reflective surface

Seed sensor on illumination

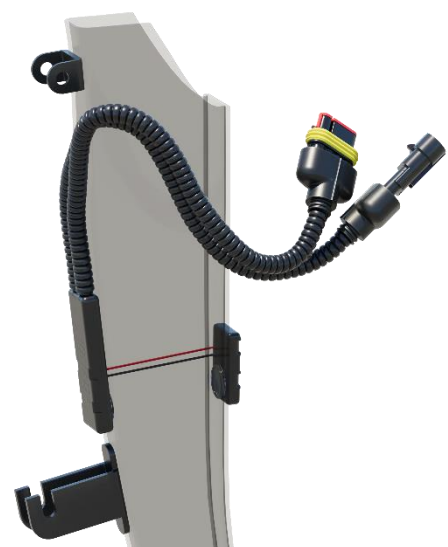













Figure 109










2. In the “Sensors Configuration” menu (see Figure 108 p.4), by using the  “Up” and  “Down” buttons, select the  “Seed sensor” item and press

the  “Menu” button. As a result, the “Seed sensor” menu will open (see Figure 110 on the left).

- Using the  “Up” or  “Down” buttons select the  “Sensor address” item and make sure the “AUTO” value is selected (see Figure 110 on the left). Use the  “Plus” and  “Minus” buttons to change this parameter.



When the “Sensor address” item is selected, you can search for sensors. To do this, you have to press the  “Menu” button. If the sensor is found, then the address of the found sensor will be shown in the value of the “Sensor address” item. When you press the  “Menu” button again, the next sensor will be searched.

- Using the  “Up” or  “Down” buttons to select the  “New address” item and using the  “Plus” or  “Minus” buttons enter a new program address (see Figure 110 on the left).
- Using the  “Up” or  “Down” buttons select the  “Set” item and press the  “Menu” button. As a result of successful sensor readdressing, the message “Done” will be displayed on the screen (see Figure 110 on the right).

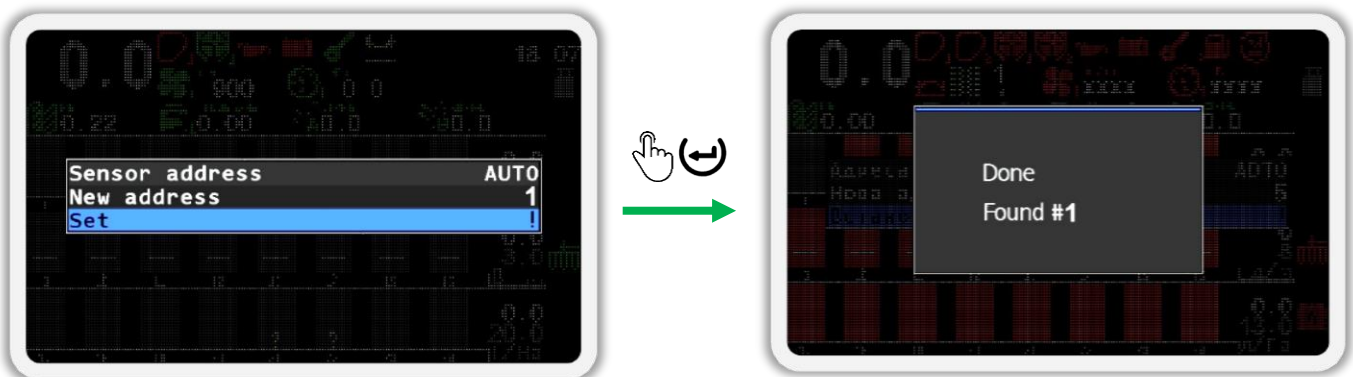



Figure 110

- Make sure that the address of the sensor has changed to the correct one. To do this, physically disconnect and connect the sensor to the connector of the communication harness. After that, return to the main screen (see Figure 111). To do this, first exit the Service menu, and then close the main screen menu (use the  “Back” button).

Connected sensor with new address "5"












Figure 111














After performing the actions for readdressing the sensors, you have to change the user from "Agronomist" to "Operator" in the "Settings" menu. Another way to switch to the "Operator" access level is to simply turn off the operator panel and then turn it back on.

12.3. Pressure sensor

1. In the "Sensors Configuration" menu (see Figure 108 p.4), by using the  "Up" or  "Down" buttons, select the  "Pressure sensor" item and press the  "Menu" button. As a result, the "Pressure sensor" menu will open (see Figure 112 on the left).
2. Using the  "Up" or  "Down" buttons select the  "Sensor address" item and make sure the "AUTO" value is selected (see Figure 112 on the left). Use the  "Plus" and  "Minus" buttons to change this parameter.



When the "Sensor address" is selected, you can search for sensors. To do this, you have to press the  "Menu" button. If the sensor is found, then the address of the found sensor will be shown in the value of the "Sensor address" item. When you press the  "Menu" button again, the next sensor will be searched.

3. Using the  "Up" or  "Down" buttons select the  "New address" item and using  "Plus" or  "Minus" buttons enter a new address (see Figure 112 on the left). **The system looks for the first pressure sensor at address 245, the second at address 246, and so on.**
4. Using the  "Up" or  "Down" buttons select the  "Set" item and press the  "Menu" button. As a result of successful readdressing, the message "Done" will be displayed on the screen (see Figure 112 on the right).

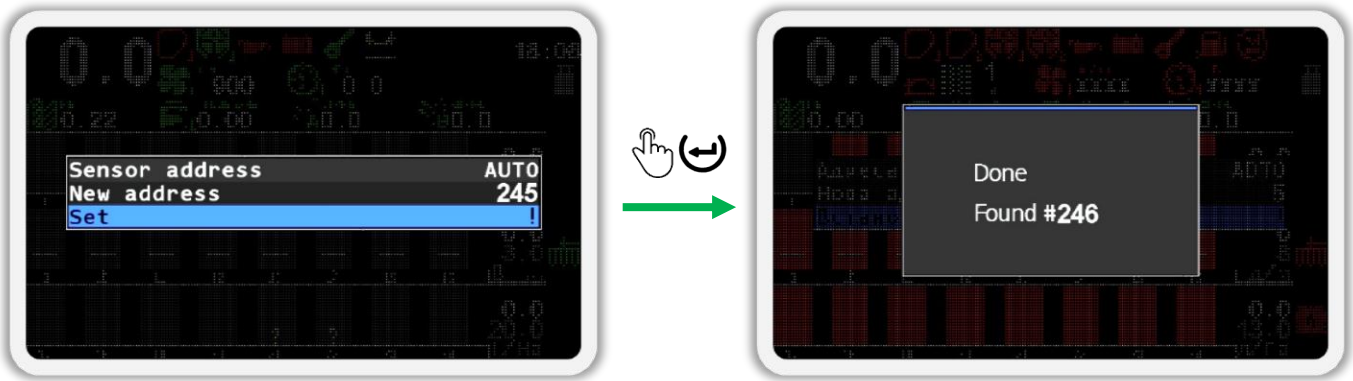



Figure 112

5. Make sure that the address of the sensor has changed to the correct one. To do this, physically disconnect and connect the sensor to the connector of the communication harness. After that, return to the main screen (see Figure 113). To do this, first exit the Service menu, and then close the main screen menu (use the  “Back” button).

Connected sensor with new program address "245"

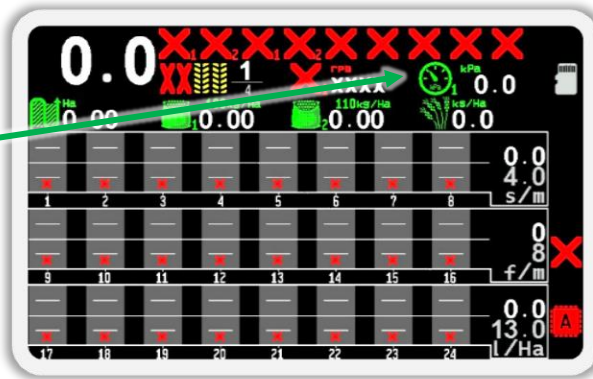






Figure 113



After performing the actions for readdressing the sensors, you have to change the user from “Agronomist” to “Operator” in the “Settings” menu. Another way to switch to the “Operator” access level is to simply turn off the operator panel and then turn it back on.

12.4. Input device “Concentrator-8”

1. In the “Sensor Configuration” menu (see Figure 108 p.4), by using the  “Up” or  “Down” buttons, select the  “Concentrator-8” item and press the  “Menu” button. As a result, a menu with device settings will open (see Figure 114).

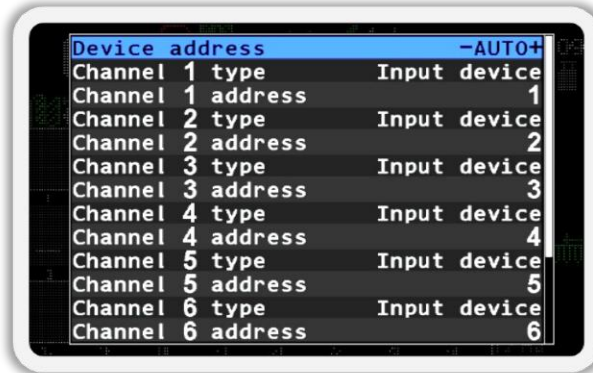









Figure 114

2. Select the  “Device address” item and make sure the “AUTO” value is selected (see Figure 114). Use the  “Plus” or  “Minus” buttons to change the parameters.





When the “Sensor address” is selected, you can search for sensors. To do this, you have to press the  “Menu” button. If the sensor is found, then the address of the found sensor will be shown in the value of the “Sensor address” item. When you press the  “Menu” button again, the next sensor will be searched.



3. Select the  “Channel 1 type” item and set the emulated sensor type to “Input device” or “Seed sensor” (see Figure 115 on the left).
4. Select the  “Channel 1 address” item and enter the emulated sensor address (see Figure 115 on the left). **Addresses for sensors that usually connected to the input device start from 200. Exceptions to this rule are seed sensors, dry fertilizer sensors and liquid fertilizer sensors whose addresses start from 1. Marker sensors have the following addresses: 216 - left and 217 - right.**
5. Follow steps 3, 4 for channels 2-8.



Features are available for handy editing:

When the  “Menu” button is pressed on an item “Channel # type” the value of the current type will be set in all items following the selected one, and will also set the channel addresses sequentially.

When the  “Menu” button is pressed on an item “Channel # address” the addresses of channels following the selected one will be set sequentially

- Select the  “Set” item and press the  “Menu” button. As a result of a successful process of sending the settings to the device, the message “Done” will be displayed on the screen (see Figure 115).

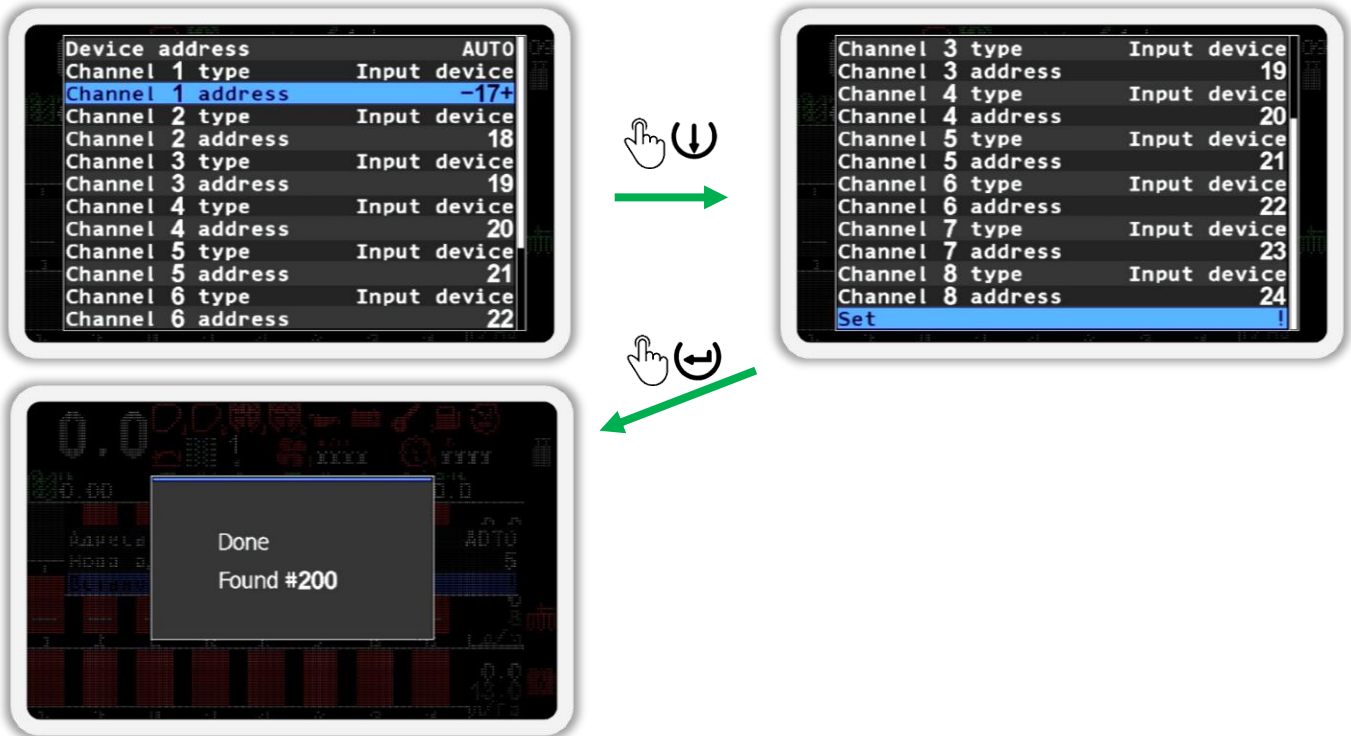



Figure 115

- Make sure the concentrator settings have changed to the correct settings. To do this, physically disconnect and connect the concentrator to the communication harness. After that, return to the main screen (see Figure 116). To do this, first exit the “Service” menu, and then close the main screen menu (use the  “Back” button).

An input device connected with addresses from 17 to 24 for connecting liquid fertilizer sensors to its inputs

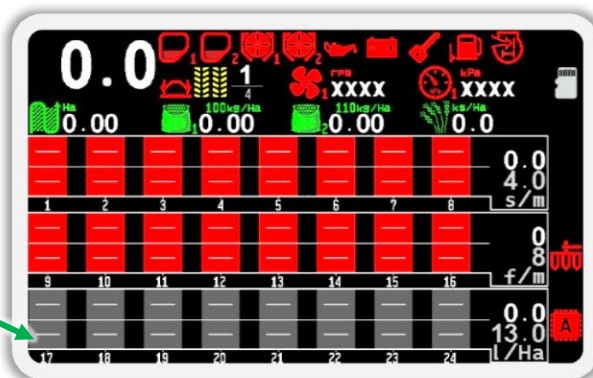




Figure 116



After performing the actions for readdressing the sensors, you have to change the user from “Agronomist” to “Operator” in the “Settings” menu. Another way to switch to the “Operator” access level is to simply turn off the operator panel and then turn it back on.

12.5. Tramline actuator

1. In the “Sensors Configuration” menu (see Figure 108 p.4), select the  “Tramline actuator” item and press the  “Menu” button. As a result, the configuration menu of the device of the same name will be opened (see Figure 117).

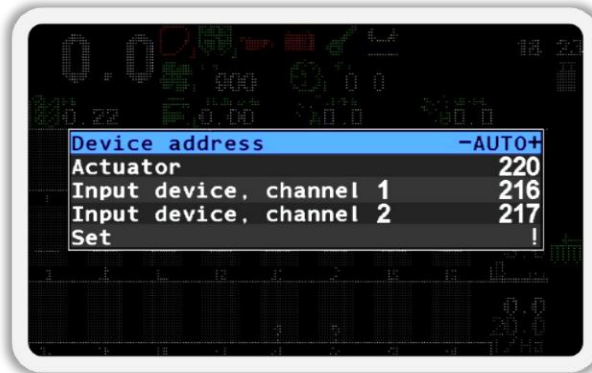







Figure 117

2. Select the  “Device address” item and make sure the “AUTO” value is selected (see Figure 117). Use the  “Plus” and  “Minus” buttons to change this parameter.



When the “Sensor address” is selected, you can search for sensors. To do this, you have to press the  “Menu” button. If the sensor is found, then the address of the found sensor will be shown in the value of the “Sensor address” item. When you press the  “Menu” button again, the next sensor will be searched.














3. Select the  “Actuator” item and, by using the  “Plus” or  “Minus” buttons, enter the address (see Figure 118 on the left). **In the system, actuator addresses start from 220 and increase sequentially for each additional controller.**
4. Select the  “Input device, channel 1” item and, by using the  “Plus” or  “Minus” buttons, enter the address or turn off this channel by selecting the “No” option. **Marker sensors have the following addresses: 216 - left and 217 - right. Sensors of other types compatible with the input device start from address 200.**
5. Follow the steps described in p.4 for the  “Input device, channel 2” menu item.
6. Using the  “Up” or  “Down” buttons select the  “Set” item and press the  “Menu” button. As a result of a successful process of sending the settings to the device, the message “Done” will be displayed on the screen (see Figure 118).



Figure 118

7. Make sure that the tramline actuator parameters have changed to the correct ones. To do this, physically disconnect and connect the device to the communication harness. After that, go to the actuators screen (Figure 119). To do this, first exit the “Service” menu, and then close the main screen menu (use the  “Back” button). Then switch work screens until you get to the actuators screen (use the  “Home” button).

Tramline actuator #1 has the address “220”, #2 - “221” and so on.



Figure 119



After performing the actions for readdressing the sensors, you have to change the user from “Agronomist” to “Operator” in the “Settings” menu. Another way to switch to the “Operator” access level is to simply turn off the operator panel and then turn it back on.



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