

Seeding monitoring system
АНД11.05.00.00.000
With control panel
АНД15.12.01.00.000-01

Operating Manual
АНД15.12.01.00.000-01РО

Version 1



Kherson
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1. General information

- 1.1. Seeding monitoring system has been developed and produced by LLC “Scientific and Production Company Monada”.
- 1.2. Seeding monitoring system is used for automatic control over the seeding complex parameters and notification about extraordinary situations.
- 1.3. Seeding monitoring system consists of the following elements:
 - Control panel.
 - Seeding sensors used for control over the seeding flow through the seed ducts. They shall be installed either on each seed duct or optionally at the consumer’s discretion.
 - Cable network.
 - Speed sensor.
 - Input device – ID-03 or ID-04. Used for connection of additional sensors: up to 13 for ID-03 and up to 6 for ID-4 (optionally).
 - Level sensors used for detecting the seeding material inside the hoppers. Up to 10 level sensors may be connected to the system (optionally).
 - Rotation control sensors used for control over the drive shaft rotation. Up to 10 rotational control sensors may be connected to the system (optionally).
 - Fan rotation sensor used for measuring and displaying the fan rotation as well as for rotation control in the prescribed range (optionally).
- 1.4. It is a universal seeding monitoring system which may be used both for precise seeding machines (infertile crop) and for mechanical/pneumatic flow seeding machines (grain crop).

2. Operating procedure

2.1. Appearance and controls of control panel are shown in Figure 1.

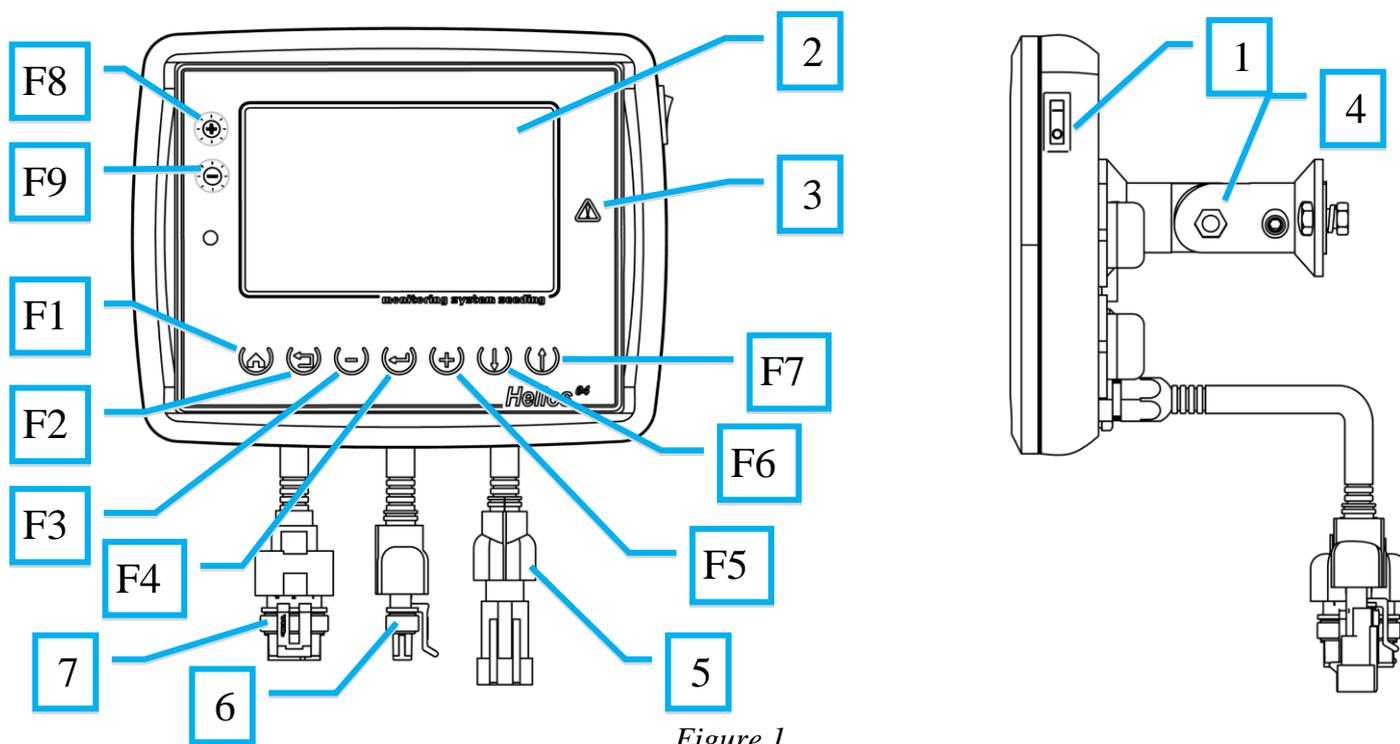


Figure 1

[1] Power switch

[2] Control panel screen

[3] Alarm indicator. In case of detecting any failure upon any controlled parameter it blinks red once per 2 seconds. The indicator stops flashing when alarmed parameter control disabled, or when a normal state restored.

[4] Control panel mounting bracket. Its construction provides installation on flat surface with any horizontal or vertical slope. Additional mounting bracket is provided for installation on the tube.

[5] Power cable connector

[6] Network cable connector

[7] Speed sensor cable connector.

Table 1 describes the control panel buttons, their graphical symbols, functions and short description. Button location is shown in Figure 1.

Table 1 Control panel buttons designation

Button	Function	Description
F1 	Home	Return to the main screen. Deselect sensor.
F2 	Back	Move to the previous screen. Deselect sensor.

Button	Function	Description
F3 	Minus	Decrease of the selected parameter. Disable control of selected sensor.
F4 	Menu	Menu call or activation of the selected menu item.
F5 	Plus	Increase of the selected parameter. Enable control of selected sensor.
F6 	Down	Select the next element of window/menu
F7 	Up	Select the previous element of window/menu
F8 	Increase brightness	Increase the brightness of backlight.
F9 	Decrease brightness	Decrease the brightness of backlight.

2.2. General principles of operations with control panel.

Operation of the seeding monitoring system parameters and movement between the screens shall be performed by means of menu and context menu. Open the menu by pressing the button “**Menu**” on the main screen. Open the context menu by pressing the button “**Menu**” on the supplementary screens. The structure of menu is the following:

- **Sensors**
- **Settings**
 - **Contrast**
 - **Diagram settings**
 - **Skips and Doubles**
 - **Precise mode grid**
 - **Skips and Doubles scale, %**
 - **Buttons sound**
 - **Alarm delay**
 - **Field number**
 - **Seeding machine parameters**
 - **Width**
 - **Mode of seeding**
 - **Mode of fertilizers**
 - **Speed calibration**
 - **Dispenser calibration**

- **Language**
- **User**
- **Statistics**
- **Service**
 - **Profile**
 - **Seed sensors**
 - **Hoppers**
 - **Dispensers**
 - **Speed**
 - **Fans**
 - **Fertilizer sensors**
 - **Save settings**
 - **Load settings**
 - **Save profile**
 - **Sensor address**
 - **New address**
 - **Registers**
 - **Enter key**
- **View sensors status**
- **Seeding table**

See section 9 for detailed description of the control panel menu.

Control panel information is distributed between several screens:

- Configuration screen, see Figure 2.
- Main screen, see Figure 3.
- Cumulative statistics screen, see Figure 4.
- Sensors status screen, see Figure 5.
- Seeding table screen, see Figure 6.
- Alarm message windows, see Figure 7.
- Service settings screen, see Figure 16.

After turning on the seeding monitoring system, the configuration screen is shown on the control panel for a few seconds (see Figure 2). It shows the amount and type of sensors included into the system.

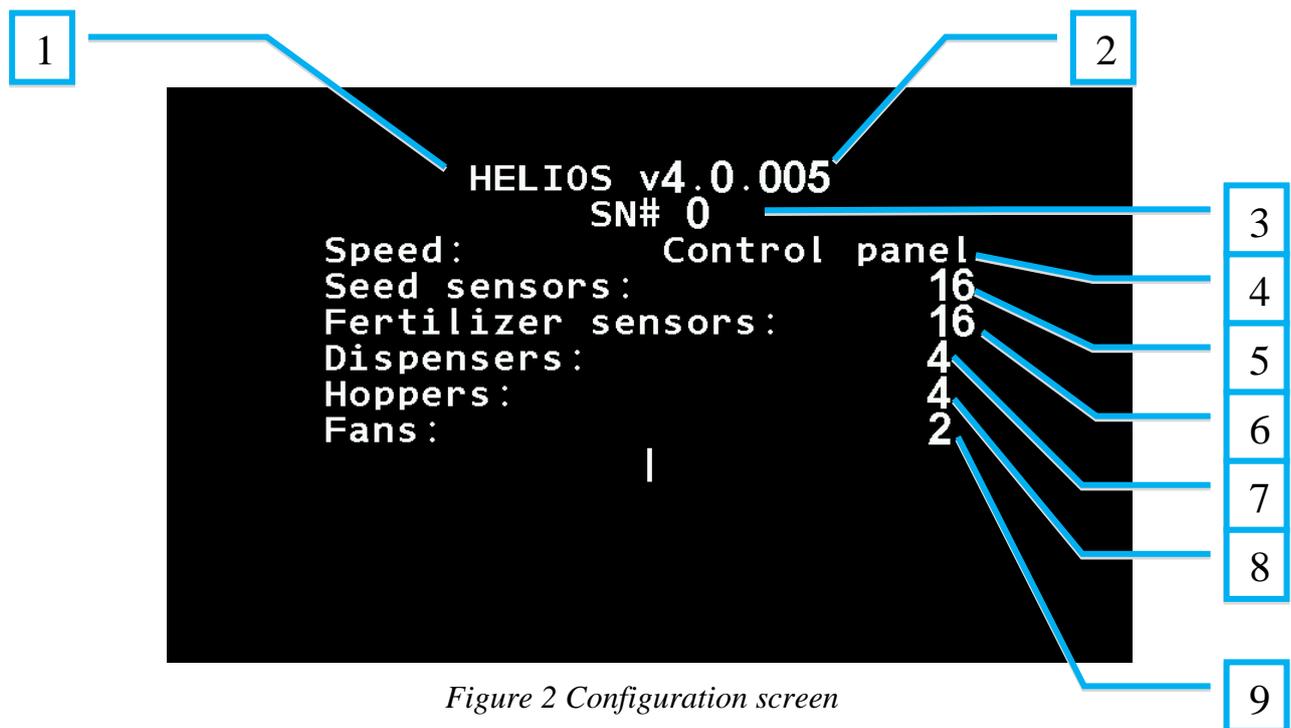


Figure 2 Configuration screen

- [1] Control panel name
- [2] Software version
- [3] Seeding monitoring system serial No.
- [4] Presence of the speed sensor, and connection type
- [5] Number of seeding sensors
- [6] Number of fertilizer sensors
- [7] Number of dispensers rotation sensors
- [8] Number of level sensors
- [9] Number of fan rotation sensors

Then the main screen appears (see Figure 3) and the system is ready to work.

3. Main screen

Main screen of the control panel is shown in Figure 3.

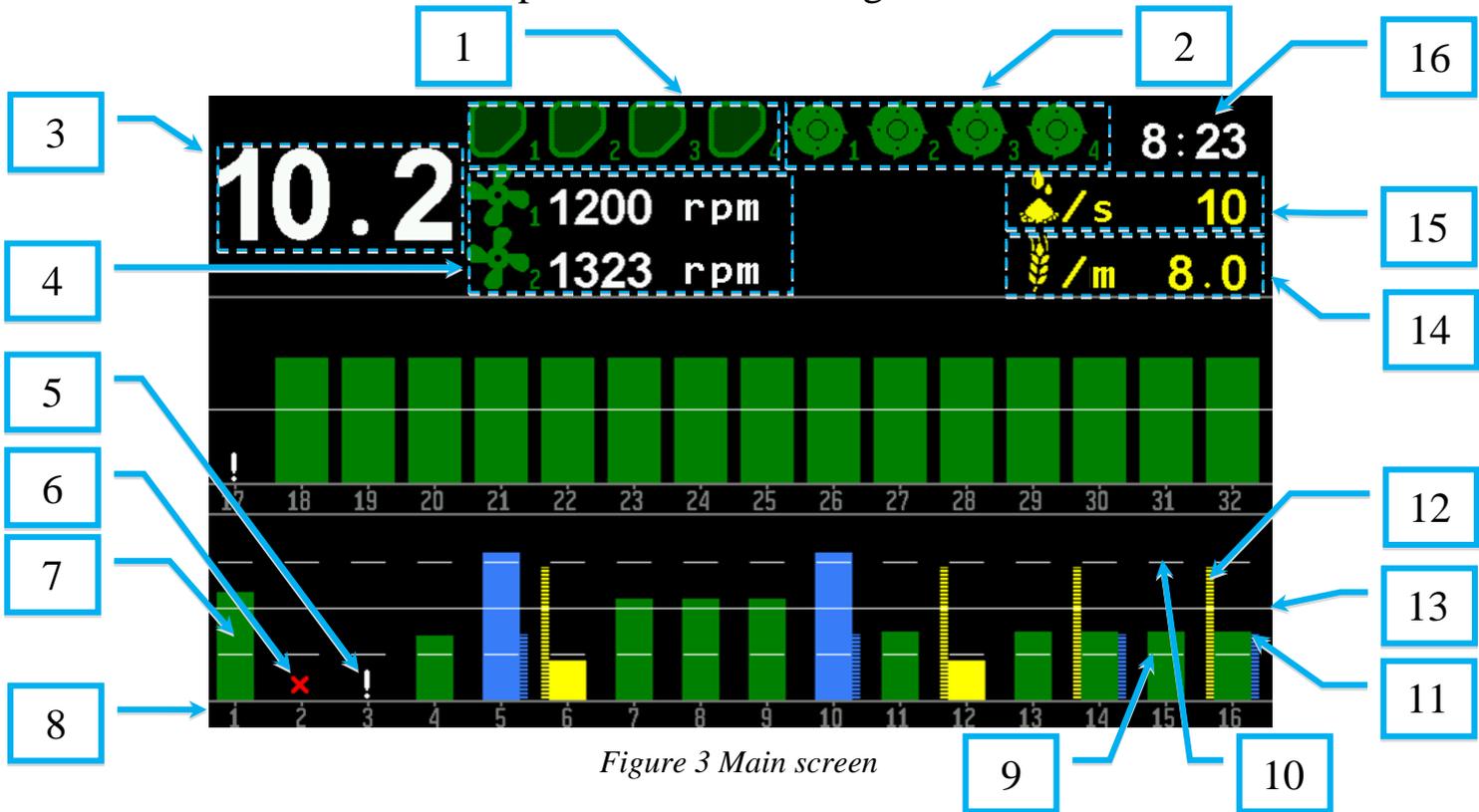


Figure 3 Main screen

The following data are shown in the main screen:

- [1] Hopper symbols (in the normal condition*).
- [2] Dispensers symbols (in the normal condition *).
- [3] Speed indicator (km/h).
- [4] Fan rotation speed indicators.
- [5] Seeding sensor that is not controlled is marked with exclamation mark.
- [6] Seeding sensor with which is there is no connection is marked with cross.
- [7] The bar on the diagram showing the seeding level upon the present seed tube (in the figure – upon the seed tube No.1). The bar height is proportional to the seeding rate. The bar can be colored in three colors: green if the seed flow is in the acceptable range; blue if the seed flow is above the allowed rate; yellow if the seed flow is below the minimum rate. The background flashes red if there is no seeding.
- [8] Seed tubes numbers according to diagram bars.
- [9] The lower limit of deviation of the prescribed rate for precise seeding [14]. It is displayed for diagram in precise or hybrid mode if parameter "**Precise mode grid**" is set to "**Partial**" or "**Full**".

- [10] The upper limit of deviation of the prescribed rate for precise seeding [14]. It is displayed for diagram in precise or hybrid mode if parameter "**Precise mode grid**" is set to "**Partial**" or "**Full**".
- [11] The blue bar on the diagram that shows the amount of doubles for the present seed tube (No. 16 on the figure). The height of the bar is proportional to the level of doubles, for systems with less than 50 seeding sensors. For systems with a number of more than 50 sensors the height of the bar is fixed, and the bar appears when exceeding a specified percentage of the parameter "**Skips and doubles, %**" in the menu "**Diagram settings**".
- [12] The yellow bar on the diagram that shows the amount of skips for the present seed tube (No. 16 on the figure). The height of the bar is proportional to the level of skips, for systems with less than 50 seeding sensors. For systems with a number of more than 50 sensors the height of the bar is fixed, and the bar appears when exceeding a specified percentage of the parameter "**Skips and doubles, %**" in the menu "**Diagram settings**".
- [13] Graphical representation of the prescribed seeding rate [14] which provides visual estimation of seeding density upon seed tubes in respect of prescribed rate. It is always displayed for diagram in flow mode, and in precise or hybrid mode if parameter "**Precise mode grid**" is set to "**No**" or "**Full**".
- [14] Prescribed seeding rate. In this case the "**precise**" control mode is selected parameter is shown in seeds per meter. If you select the "**flow**" mode (used for grain seeding machines) parameter will be shown in seeds per second. Use the "**Plus**" button for increasing and the "**Minus**" button for decreasing the seeding rate.
- [15] Prescribed fertilizing rate. Use the "**Up**" button for increasing and the "**Down**" button for decreasing the fertilizing rate.
- [16] Clock (shows the current time). It is visible only when the total number of hopper sensors and dispensers does not exceed 8.
- * *Possible sensor conditions is listed and described in Section 10 "Symbols on the main screen".*

4. Cumulative statistics

Cumulative statistics is used for the view of general data about the passed path, treated area, amount of sown seeds etc. In order to view the statistics select the item "**Statistics**" in the main menu (open the main menu by pressing the "**Menu**" button on the main screen).

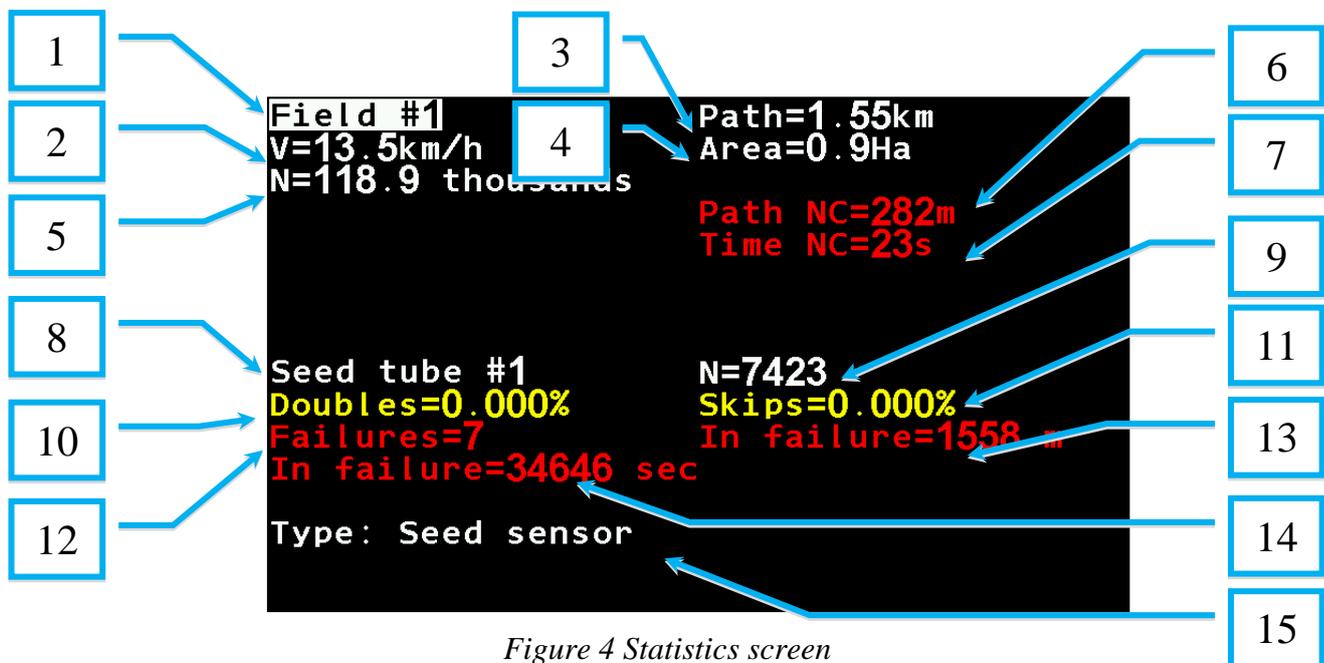


Figure 4 Statistics screen

- [1] Selection of the field upon which the statistics is shown. Use "**Plus/Minus**" buttons for selecting other field.
- [2] Average speed of the seeding machine movement.*
- [3] Seeding machine path.*
- [4] Treated area.*
- [5] Total amount of sown seeds (for the whole field).**
- [6] Passed way in which the system does not perform control of failures due to insufficient seeding rate.*
- [7] Time during which the system does not perform control of failures due to insufficient seeding rate.
- [8] Seed tube number for additional statistics (additional statistics [9], [10], [11], [12], [13], [14]). In order to select other seed tube, please select the appropriate operating element by "**Up/Down**" buttons (the selected window element is highlighted with white) and then select the required seed tube by "**Plus/Minus**" buttons.
- [9] Amount of seeds sown by the selected seed tube (in pcs).**
- [10] Average relative amount of doubles (in percent from the total amount of seeds sown by this seed tube).**
- [11] Average relative amount of skips (in percent from the total amount of seeds sown by this seed tube).**
- [12] Number of failures regarding the selected seed tube.
- [13] Path during which the selected seed tube was in failure.*
- [14] Time during which the selected seed tube was in failure.
- [15] Sensor type for the selected seed tube: seeding sensor and fertilizer sensor.

- * - hidden when speed sensor is absent in system.
- ** - hidden in “Flow” and “Hybrid” control modes of the seeding and fertilizer sensors. It is also hidden if no doubles and skips were registered for seed tube.

Cumulative statistics screen has a context menu opened by pressing the **Menu** button. The following functions are available from the context menu:

- **Summary**
- **Reset**

In order to reset the cumulative statistics for the selected field, use "Up/Down" buttons to select the item "**Reset**" and press the "Menu" button. The item "**Reset**" is available in the user access modes “**Agronomist**” and “**Service**”. Access mode operation is described in Section **Ошибка!** **Источник ссылки не найден.** “Settings”.

 **Warning!** *The statistics is automatically saved every 5 minutes and immediately after stopping the system. Therefore, the operator panel is recommended to be switched off only after the motion stops.*

5. Sensor status screen

Sensor status screen provides the detailed description of the data about any sensor status at any time. You may open this window in two ways:

- Choose the item "**View sensors status**" in the main menu.
- Choose the item "**Information**" in the sensor main menu on the main screen (see Section 8 **Sensors settings**).

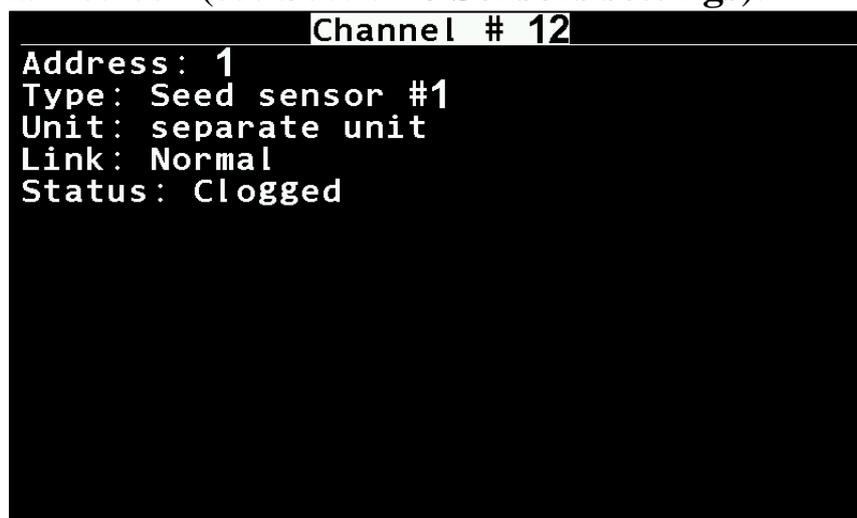


Figure 5 Sensor status

Figure 5 shows the sensor status screen consisting of five parameter rows:

- **Channel** – number of the control channel used for processing the selected sensor. Use "**Plus/Minus**" buttons to select the required sensor channel.
- **Address** – each sensor in the system (except the speed sensor) has its own network address. Seeding sensor addresses start from number 1 while hoppers and shaft control sensors addresses start from number 200.
- **Type** – shows the type and the number for a certain sensor connected to the selected control channel. There are five types of sensors in the system:
 - Speed sensor.
 - Seeding sensor.
 - Hopper sensor.
 - Dispenser rotation sensor.
 - Fan rotation sensor.
- **Unit** – shows belonging of the selected sensor to the input device or shows that it is a separate unit in the seeding monitoring system cable network.
- **Link** – shows the current connection status of the selected sensor. There are the following possible states for any sensor types:
 - **Normal** – normal condition;
 - **Not controlled** – control of sensor is disabled;
 - **No connection** – break of the communication line with the sensor.
- **Status** – Seeding sensors (in the "**Normal**" condition) have additional status, as follows:
 - **Working** – standard condition;
 - **Configuring** – the sensor obtain new settings from the control panel, and applies them;
 - **Calibration in progress** – the sensor performs initial calibration (it may take a few seconds);
 - **Clogged** – a foreign element is stuck in the sensor optical hole. It may be caused by the seed tube clogging;
 - **Light struck** – the sensor cannot operate due to exposure to intensive sunlight;
 - **Faulty** – sensor is broken and shall be replaced;
 - **Unknown** – other unidentified failures.

6. Seeding table screen

Seeding table screen allows to obtain the detailed data in real time about the actual seeding rate and amount of sown seeds through seed tubes as well as to view the aggregate amount of sown seeds upon the whole seeding complex.

#	sds/m	thousands seeds
01	---	0.000
02	---	0.000
03	---	0.000
04	7.5	22.213
05	7.5	22.213
06	7.5	22.213
07	7.5	22.213
08	11.1	22.221
09	6.6	22.211
10	6.6	22.221
11	6.6	22.221
12	6.6	22.221
13	7.5	22.213
14	7.5	22.213
Total =		288.8 thousands

Figure 6 Seeding table

The current seeding density is shown in seeds per meter (with decimals) in the mode of the diagram set to "**Precise**" and "**Hybrid**", or in seeds per second in the mode of the diagram set to "**Flow**". The amount of sown seeds through seed tubes is shown in thousands and ones of seeds (with dot), while the aggregate amount of sown seeds upon the seeding complex is shown in thousands and hundreds of seeds (with dot).

For example, data shown in Figure 6 shall be read as follows: Seed tubes 1-3 are not seeding. Seed tubes 4-14 are seeding. The fourth seed tube makes up 7.5 seeds per meter. At the moment it has sown 22213 seeds. In general, the system has sown nearly 288800 seeds.

If the system contains more seed tubes than on the screen table, you may scroll it by "**Down/Up**" buttons (increasing or decreasing the seed tube numbers).

 **Warning!** *The data shown in this table are valid for the current work and will be reset in case of switching off the power.*

7. Alarm messages

They are used for notification of any events in the system, see Figure 7.

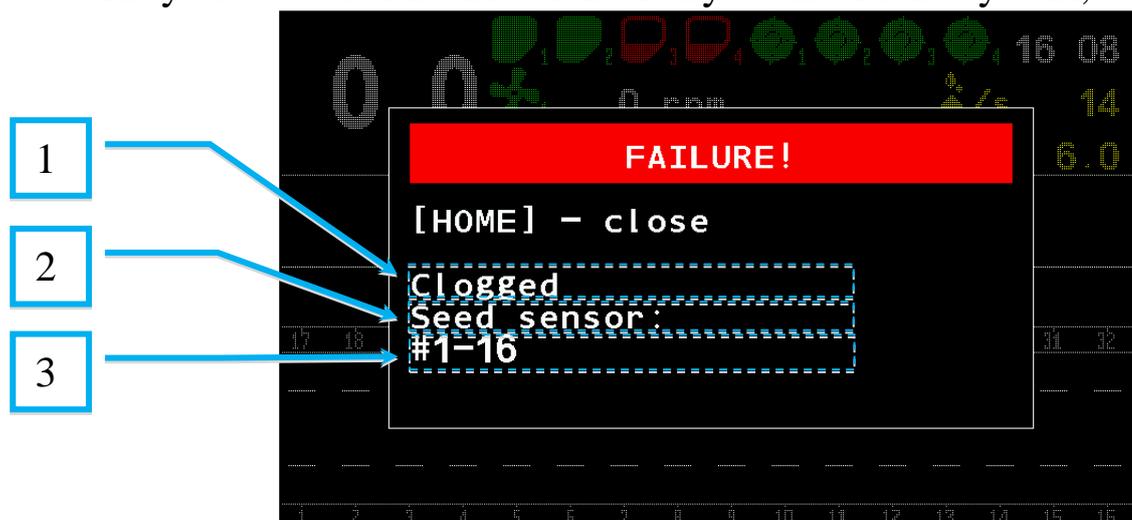


Figure 7 Alarm message

Alarm message shows the following:

- [1] Type of failure.
- [2] Type of the sensor.
- [3] List of sensors addresses if the system has several similar sensors with the similar failure.

Press the "**Home**" button to close the alarm message window. When the alarm message appears the device produces audible and light signals periodically (see [3] Figure 1).

8. Sensors settings

8.1. Entering the setting mode

You can adjust sensors in the appropriate sensor context menu. Enter the sensor context menu in the following way:

- On the main screen (see Figure 3), press the "**Menu**" button to enter the main menu.
- Use the buttons "**Up/Down**" to select the item "**Sensors**".
- Press the "**Menu**" button.
- On the main screen the selected sensor will be displayed inside the white rectangle (for the selected seeding or fertilizing sensor, its number will be displayed inside the white rectangle).
- Use the buttons "**Up/Down**" to select another sensor.
- Use the buttons "**Plus/Minus**" to disable control of the defective sensor or to enable control.

- When required sensor is selected, press the "**Menu**" button to enter the context menu.

Type of context menu depends on the selected sensor type and the current user's access level. All the sensor context menus have the common item "**Information**" showing the data about the sensor status (see Section 5 Sensor status screen).

 **Warning!** *The settings are saved automatically in about three seconds after the last press on the keyboard.*

8.2. *Hopper sensor settings*

Hopper sensor has no settings; its context menu contains only one item:

- **Information** – shows the sensor status screen.

8.3. *Dispenser rotation sensor settings*

Shaft rotation control sensors have five parameters and the context menu consists of six items, see Figure 8:

- **Information** – shows the sensor status screen.
- **Rotation speed control** – this menu item is used to enable the control of rotation speed of dispenser. If "**Yes**" is selected, the deviation of dispenser speed outside the tolerance is controlled. The tolerance is set in the menu item "**Max error, %**". If there is enough control of presence of rotation speed, select item "**No**".

 **Warning!** *Calibration is required for control of dispenser rotation speed!*

- **Period, s** – in dispenser settings it provides the maximal interval (in seconds) between impulses from the rotation control sensor. In case of exceeding this interval the seeding monitoring system detects failure "**No rotation**" upon this dispenser shaft. The value is set in seconds.
- **Wheel, pulses** – this parameter is used together with parameter "**Dispenser, pulses**" to control the rotational speed. It sets the number of pulses from the speed sensor, which corresponds to the number of pulses from dispenser sensor, set in menu item "**Dispenser, pulses**". These two parameters are automatically calculated during the calibration using the menu "**Settings > Seeding machine parameters > Dispenser calibration**" (*the*

menu is available at the "Agronomist" access level). The calibration process is described in Section 9.2.6.5 "Settings".

- **Dispenser, pulses** – the number of pulses from dispenser sensor, which corresponds to the number of pulses from the speed sensor set in menu item "**Wheel, pulses**".
- **Max error, %** – in this menu item the maximum permissible deviation of rotation speed of dispenser is set. In case the speed of rotation of dispenser deviates outside the specified limit the seeding control system will register one of the failures "**High speed of rotation**" or "**Low speed of rotation**".

! Warning! The setting parameters for each dispenser speed sensor are individual!

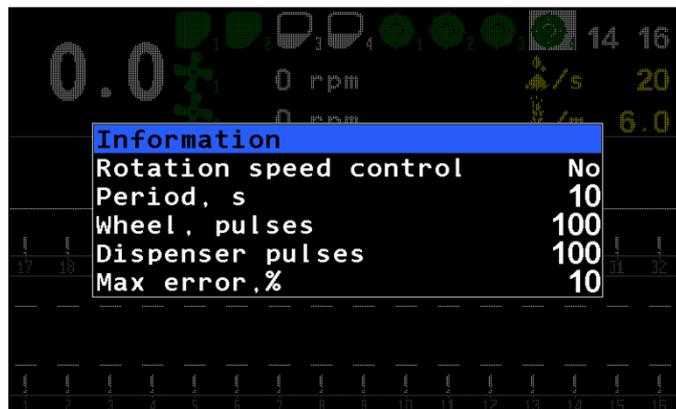


Figure 8 Dispenser parameters

8.4. Speed sensor settings

Speed sensor has five parameters and the context menu consists of six items, see Figure 9:

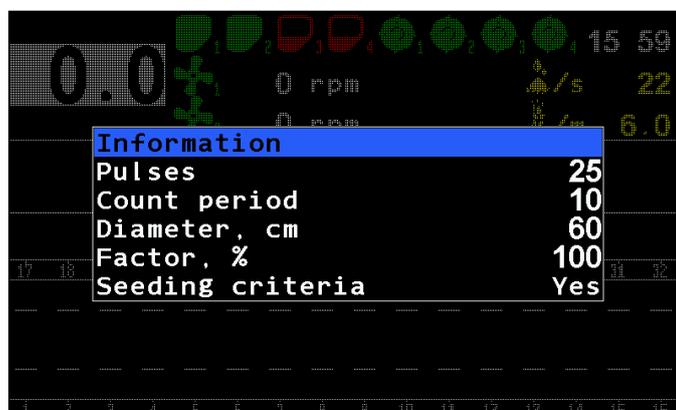


Figure 9 Speed sensor parameters

- **Information** – shows the sensor status screen;

- **Pulses** – number of impulses transferred from the sensor per rotation of the shaft where the sensor is installed;
- **Count period** – counting period (in impulses) used for speed calculation (half-rotation is recommended, i.e. half of the pulses amount per rotation);
- **Diameter, cm** – drive wheel diameter;
- **Factor, %** – transmission factor in cases of any indirect transmission between speed sensor and drive wheel (in percent; in case of direct transmission factor makes up 1:1, i.e. 100%). Available range: from 10% (1:10) to 1000% (10:1).

If the sensor is mounted on the intermediate shaft or the shaft of dispenser, while the transmission to shaft is carried out through the gear or chain transmission, it is possible to calculate the value of the coefficient using the formula:

$$k = N_d / N_w \cdot 100\%$$

Where N_d – is the product of the multiplication of the number of teeth of the driven gears (all even-numbered gears), and N_w is the product of the number of teeth of all drive gears (all odd-numbered gears starting from the one on the same shaft with the drive wheel).

Also, the coefficient can be obtained automatically using the calibration menu "**Settings > Seeding machine parameters > Speed calibration**" (paragraph 9.2.6.4).

In those cases, when the speedometer (or GPS-navigator) is installed on the tractor and the displayed speed in operator panel is different, the correction factor can be calculated using the following formula:

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

- **Seeding criteria** – eliminates the presence/absence of seeding machine moving speed according to the seeding sensor alarm logics. Value “**Yes**” - the speed is used in the seeding sensor alarm logics (standard value), value “**No**” - the speed is not used (recommended for seeding machines with speed sensor installed before the coupling clutch).

8.5. Seeding sensors settings

Seeding sensor has four parameters and the context menu consists of five items, see Figure 10:

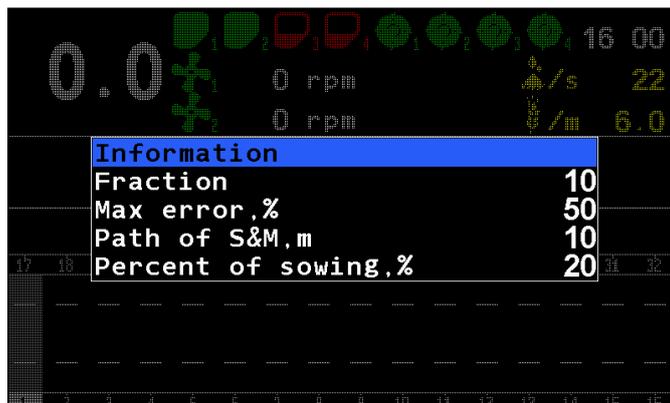


Figure 10 Seeding sensor parameters

- **Information** – shows the sensor status screen.
- **Fraction** – determines the input signal filtration threshold regarding the accidental waste. This parameter is used for setting the minimal seed flow time through the sensor hole (in hundred microseconds). The optimal selection depends on the seed size and its flow speed.

In order to avoid calculation errors, after change of the culture you shall change the fraction.

Recommended fractions, depending on the seed size (according to the sizes of the following cultures):

- Rape – 1-5
- Wheat – 5-10
- Corn – 10-30
- Sunflower – 10-30

Recommended fraction for pneumatic seeding machines shall be 1, irrespective of the sown culture).

This parameter is available at the “Agronomist” access level.

- **Max error, %** – determines the maximal deviation of seeding density, in percent from the nominal seeding density in seeds per meter. This parameter is used for "Precise" and "Hybrid" control modes. *This parameter is available at the “Agronomist” access level.*
- **Path of S&M, m** – determines the interval (in meters) of calculating and renewing the data about skips and doubles. This parameter is used for **precise** control mode.

- **Percent of sowing, %** - determines the minimal proportion of seed tubes under which the seeding complex controller (under the seeding conditions) enters control state and display alarm messages when seeding rate abnormal. Default value: 20%, available range: from 5% to 80%. Also, this value is used for notification of a failure, when there is sowing on the specified percent of seed tubes, but the system does not go to control because of the insufficient level of seeding rate (for example, due to excessive seeding rate, set by the operator).

Warning! Also for seeding and fertilizer sensors item "Sensitivity" can be shown. It is possible in case your system has the outdated seeding sensor. This setting adjusts the sensitivity of the optical sensor (as a percentage of the maximum), and the best choice depends on the size of the grains that are sown and their colors.

8.6. Fan rotation sensor settings

Fan rotation sensor has three parameters and the context menu consists of four items, see Figure 11:

- **Information** – shows the sensor status screen;
- **Minimal, rpm** – if the seeding complex is moving (or perform seeding conditions in the absence of speed sensor) and fan rpm is beyond the minimal parameter, the alarm message appears.
- **Maximal, rpm** – if the seeding complex is moving (or perform seeding conditions in the absence of speed sensor) and fan rpm is beyond the maximal parameter, the alarm message appears.
- **Pulses** – number of impulses per one rotation.



Figure 11 Fan parameters

9. Control panel menu

System settings menu allows changing the main system parameters, the diagram display parameters and additional seeding parameters. The amount of changeable parameters depends on the current access level. The control panel main menu is shown as follows:



Figure 12 Main menu

Use the buttons "**Up**" and "**Down**" for navigation in menu. Select the menu item by pressing the "**Menu**" button. If the item includes the inserted sub-items (e.g. "**Settings**" etc.), submenu will be shown, and otherwise additional screen will be shown. If the menu item is a changeable parameter (e.g. "**Brightness**", "**Button sound**" etc.) you may edit it by means of buttons "**Plus**" and "**Minus**".

9.1. Sensors

If you select the main menu item "**Sensors**" you will enter the sensor setting mode (see the details in Section 8 "Sensors settings").

9.2. Settings

If you select the main menu item "**Settings**" you will enter the submenu as shown in "Figure 13".

⚠ Warning! The settings are saved automatically in about three seconds after the last press on the keyboard.



Figure 13 Settings menu

9.2.1. Brightness – selects the most comfortable brightness of display image.

9.2.2. Diagram parameters – opens the submenu used for setting the more convenient seeding data view mode. This menu is available only in control mode “**precise**”.

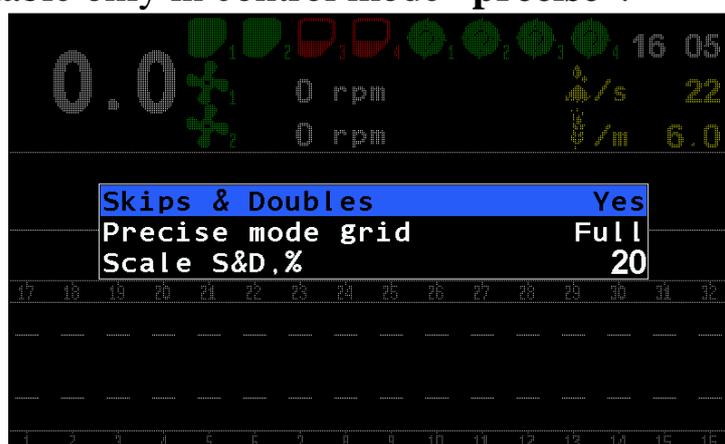


Figure 14 Diagram parameters

9.2.2.1. Skips and Doubles – turns on/off on the diagram the number of skips and doubles for the latest measuring period (adjustable according to the **Seeding sensor settings**). Skips and doubles appear only in the precise seeding mode, if amount of seed sensors in system is less than 60.

9.2.2.2. Precise mode grid – allows selecting type of grid view on the diagram in modes “**Hybrid**” or “**Precise**”. Possible grid parameters:

- **No** – displays only the line of seeding rate;
- **Partial** – displays only available range borders;

- **Full** – displays the line of seeding rate and available range borders.

9.2.2.3. Scale S&D, % – setting the skips and doubles bar scale (in the range from 5% to 50% for the whole scale). The height of the bar is proportional to the level of skips and doubles, for systems with less than 40 seeding sensors. For systems with a number of 40 sensors and more the height of the bar is fixed, and bar appears when exceeding a specified percentage in the parameter "**Scale S&D**" in the menu **Diagram settings** (in the range of from 1% to 45%).

9.2.3. Buttons sound – allows turning on/off audible signal when user presses the buttons.

9.2.4. Alarm delay – sets the waiting period (in seconds) from the beginning of failure occurrence at any sensor till the display of the alarm message.

9.2.5. Field number – allows selecting the field, which is currently processed. Cumulative statistics will be shown in respect of this field.

This parameter is available for the “Agronomist” user access level.

9.2.6. Seeding machine parameters – opens the submenu used for setting the seeding machine parameters.

This parameter is available for the “Agronomist” user access level.

9.2.6.1. Width – sets the seeding machine width.

9.2.6.2. Mode of seeding – switching between the seeding control modes and display modes of seeding data: **flow** mode (data shown in seeds per second; maximum rate 400 seeds/second), **hybrid** mode (data shown in seeds per meter; maximum rate 200 seeds/meter) and **precise** mode (data shown in seeds per meters, with information about skips and doubles; maximum rate 50 seeds/meter). When you try to change the mode from "**Precise**" to "**Flow**" or "**Hybrid**" (and vice versa) will be shown a message with the request to reset the statistics for the selection a new mode.

9.2.6.3. Fertilizers mode – switching between the display modes of fertilizing data: **flow** mode (data shown in

fertilizers per second), **hybrid** mode (data shown in fertilizers per meter without information about skips and doubles).

9.2.6.4. Speed calibration – provides the speed sensor calibration. In order to activate the calibrating procedure, please select this item by pressing the "**Menu**" button. The list of operations will appear. After 100 meters press "**Menu**" button. Press any other button (differing from "**Menu**" button) to cancel the calibrating procedure.

9.2.6.5. Dispenser calibration - allows calibrating the parameters "**Wheel, pulses**" and "**Dispenser, pulses**" of the selected dispenser (one or all at once). In order to perform the calibration procedure, select the menu item "**Dispenser calibration**". Use the "**Plus**" and "**Minus**" buttons to set the number of dispenser you want to calibrate (or set it to "**ALL**" to calibrate all dispensers at once). Press the "**Menu**" button. You will see the dispenser calibration screen (see Figure 15). It is necessary to perform the rotation of the wheel that drives the dispenser until the calibration process reaches 100%. In this case the message "**Stop rotation!**" will appear. Now you can stop the rotation and wait for the message "**Done**". Now the calibration process is complete. If you want to cancel the calibration process press the "**Cancel**" button.

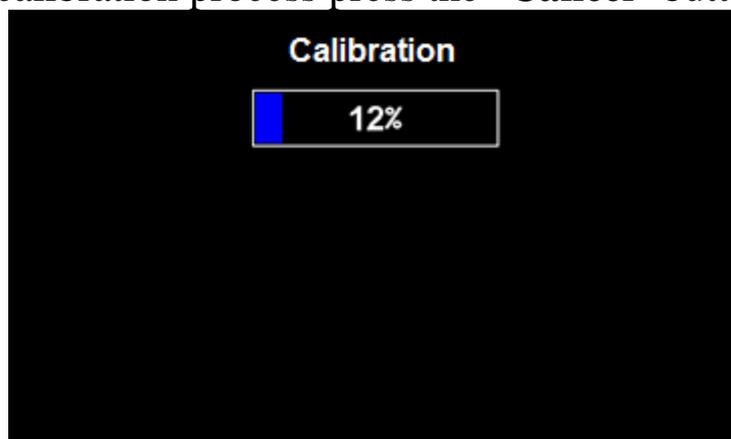


Figure 15 Dispenser calibration

9.2.7. Language – allows changing user interface language.

9.2.8. Change Date&Time - this menu item is only displayed if the total number of dispenser and hopper sensors is not more than 8. When you press the "**Menu**" button a dialog box for entering the time and date appears. In this window you can navigate the menu using the buttons "**Up**" and "**Down**". You

can change the parameters using the buttons "**Plus**" and "**Minus**". Specific date and time can be set by selecting the menu item "**Set**" and pressing the "**Menu**" button. Click the "**Back**" or "**Home**" buttons to cancel the changes.

9.2.9. User – the system provides three access modes (by increasing the access level):

- **Driver** – at this access level it is forbidden to change some parameters. It is also forbidden to reset the statistics;
- **Agronomist** – allows resetting the statistics, adjusting the seeding machine width, the speed sensor parameters, the shaft control and the seeding parameters (PIN-code: 88888).
- **Service** – may be used by the service engineers only.

In order to switch to the higher access level, please select the desired access level ("**User**" menu item: see the current access level to the right) and press the "**Menu**" button. Enter the PIN-code. If you enter the correct code, the access level will be changed as shown by the message on the screen. PIN-code is not required for switching to the lower access level. At power up the lowest access level "**Driver**" is selected by default.

9.3. *Statistics*

Opens the statistics window (see Chapter 4 “Cumulative statistics”).

9.4. *Service*

This menu is available for the “Agronomist” user access level.

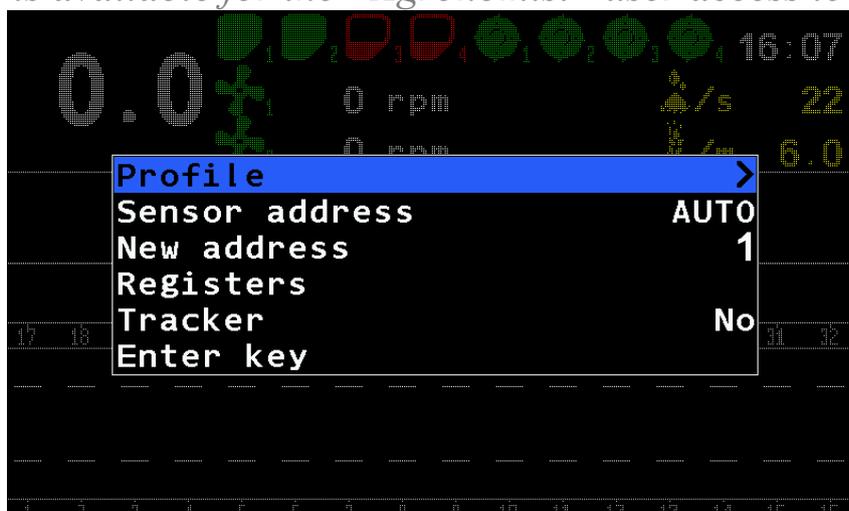


Figure 16 Sub-menu Service

9.4.1.Profile – opens the submenu used for adjustment of the seeding monitoring system sensors compound and amount. Submenu consists of nine parameters, see Figure 17:

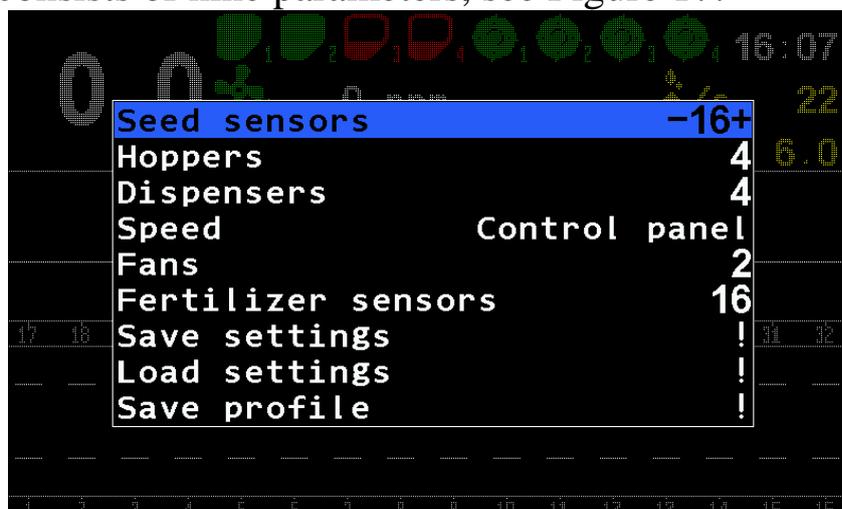


Figure 17 Profile

9.4.1.1. Seed sensors – the parameter is used for entering the number of seed sensors in the system. Available range of values 1...100 for the flow and hybrid control modes in case there are no fertilizer sensors. If there are fertilizer sensors the range is 1...80. For the precise control mode, it is 1...24.

9.4.1.2. Hoppers – used for entering the number of hopper sensors in the system. Available range of values: 0...10*.

9.4.1.3. Dispensers – used for entering the number of shaft rotation sensors in the system. Available range of values: 0...10*.

*** The total amount of Hoppers and Dispensers sensors should not exceed 10.**

9.4.1.4. Speed – used for selecting presence of speed sensor:

- **No** - speed sensor in the system is absent.
- **Control panel** - speed sensor included in the system and connected to the control panel.
- **Input device** - speed sensor included in the system and is connected to an input device.

9.4.1.5. Fans – used for entering the number of fan rotation sensors in the system. Available range of values: 0...2.

9.4.1.6. Fertilizer sensors – used for entering the number of fertilizer sensors in the system. Available range of values: 1...60.

9.4.1.7. Save settings – used for saving all the sensors settings in a separate buffer of non-volatile memory; performed by pressing the "**Menu**" button. Further you may restore all saved settings for current profile.

 **Warning! If you change the profile all saved settings will be lost.**

9.4.1.8. Load settings – used for restoring sensors settings in the system from the storage buffer created by the previous menu item; performed by pressing the "**Menu**" button.

9.4.1.9. Save profile – used for saving the edited profile of the seeding monitoring system in the non-volatile memory; performed by pressing the "**Menu**" button.

9.4.2. Sensor address – this and the following item provides changing the seeding sensor network address. This function is required, for example, in case of replacing the defective sensor. Sensor address selected in this menu item shall be changed to the address selected in the "**New Address**" menu item. Also in this menu item, mode "**AUTO**" can be selected. In this case new address will be set to the sensor, which will be found automatically. If select menu item "**Sensor address**" and press "**Menu**" button, then will be selected address of the sensor, which was found automatically.

 **Warning! "AUTO" mode can only be used when only one sensor is connected, the address of which you want to change.**

9.4.3. New address – new address for the sensor selected in the "**Sensor Address**" parameter. Press the "**Menu**" button to rename the sensor. After successful renaming the message "**Done**" will appear on the screen (in case when address is selected manually) or "**Done. Found #1**" (in case when is selected mode "**AUTO**", founded sensors address will be displayed).

9.4.4. Registers – if you select this item, the screen will show the detailed data of the seeding sensor registers (see Figure 18). Register data shall be used by service engineers and manufacturer of the seeding monitoring system.

Address #1		
Time	4067	MaxErr 50
CNT	2	Quant 500
Stat	0	Densit 0
HI_al	0	AdcRng 2300
LO_al	0	Filter 10
Avg	0	Window 1411
CurDAC	118	Mode 2
CurADC	2391	
CurrFb	820	
FstOut	1715	
RI FtOut	1711	
dOvLin	299	
		HwVer 6.000
		0x0600
		FwVer 0.015
		0x000F
		Serial 0
		ST.PV 1.004
MB_SZ	0	
MB_CRC	0	

Figure 18 Seeding sensor registers

9.4.5. Enter key – this menu item is used for entering the key to switch off the trial period. Selecting this item and pressing the **Menu** will show the message "**Trial period switched off**", if the trial period already is switched off.

If the trial period is switched on the window for entering the key will be shown. At the top of the window that appears will be specified your ID number (see Figure 19). This number must be reported to the service-engineer LLC “Scientific and Production Company Monada” (by phone at the end of the instruction), in order to get the key.

Also, this window will block the operation of the system after the trial period expires.

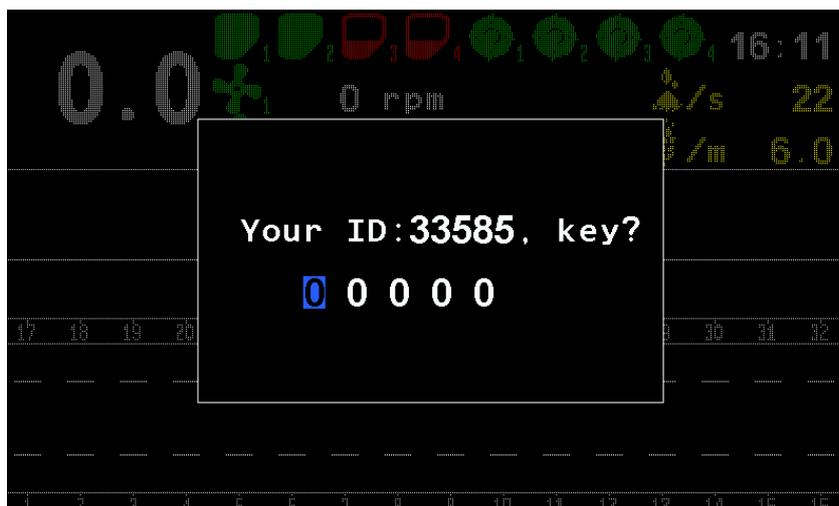


Figure 19 Trial deactivation window

9.5. Viewing sensors status

If you select the main menu item "**Status view**" you will see the detailed data of the seeding monitoring system sensors status. See the details in Section 5 "Sensor status screen".

9.6. Seeding table

If you select the main menu item "**Seeding table**" you will see the detailed data of actual seeding rate and amount of sown seeds upon each seed tube. See the details of the table screen in Section 6 "Seeding table screen".

10. Symbols on the main screen

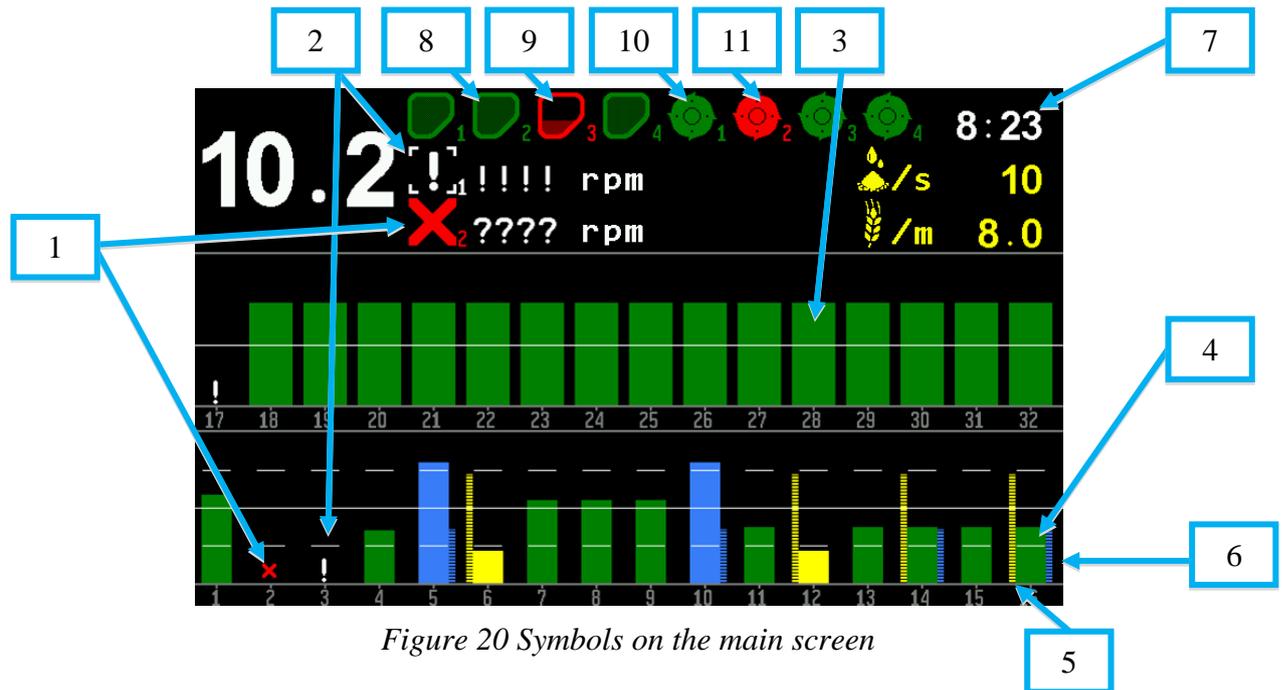


Figure 20 Symbols on the main screen

- [1] Sensors with which there is no connection are marked with red crosses.
- [2] Sensors, which control is disabled, are shown with white exclamation mark.
- [3] Standard sensor condition in the seeding process (for flow or hybrid display mode).
- [4] Standard sensor condition in the seeding process (for precise display mode) in the form of three vertical bars; the central one shows the seeding level.
- [5] Left bar shows the skips level (in the selected scale).
- [6] Right bar shows the doubles level (in the selected scale).
- [7] If displayed in white, it shows the current time. Current time is displayed only in case the total amount of hoppers and dispensers sensors does not exceed 8.

When the batteries need to be replaced the red sign "BAT" periodically appears.

If the clock is faulty the sign "XX:XX" will flash.

If displayed in blue, it shows the countdown timer of the trial period. It is displayed on the screen, only when trial mode is switched on by the manufacturer. The display format of the time remaining until the end of the trial period is - "hours:minutes". It appears every 30 seconds, overlapping icons of hoppers and dispensers sensors.

- [8] Indicator of hopper sensor in the "Full" state. It is displayed in green.

[9] Indicator of hopper sensor in the "Empty" state. It is displayed in flashing red.

[10] Indicator of dispenser sensor in the "Normal" state. It is displayed in green.

[11] Indicator of dispenser sensor in the "Faulty" state. It is displayed in flashing red.

11. Changing the sensor software address

Warning!

These operations shall be performed mainly at the adjustment stage by authorized service engineers, as well as in case of sensor replacement. Unauthorized interference may cause the system failure. In the service (technological) menu we strongly recommend not to perform the unknown operations by means of taking samples. During the readdressing process you shall follow only this Operating Manual or recommendations of the authorized service engineer of LLC "Scientific and Production Company Monada" (see contact phone numbers in the end).

1. Disconnect all the seeding sensors from the network cable on the control panel (4-pin connector, see Figure 21).
2. Connector of sensor, which address should be changed, plug into connector of the network cable of the control panel (see Figure 21).

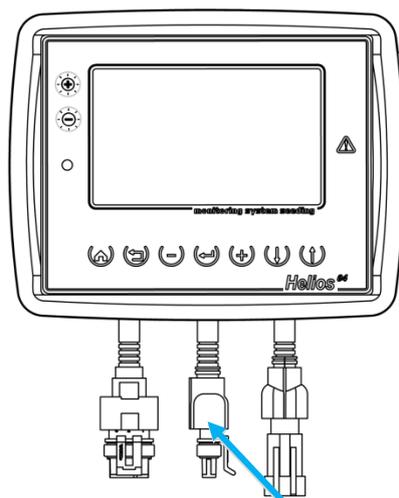


Figure 21 Network cable

3. On the main screen (see Figure 22) press the **Menu** button to open the main menu.

Connected sensor



Figure 22

4. Use the buttons "Up/Down" to select the item "Settings" (see Figure 23) and press the "Menu" button.

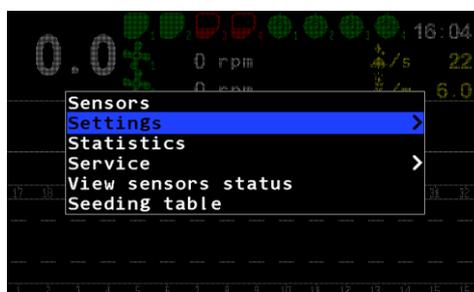


Figure 23

5. Use the buttons "Up/Down" to select the item "User" (see Figure 24). Use the buttons "Left/Right" to select the access level "Agronomist" and press the "Menu" button. Enter the PIN-code: 88888. If you enter the correct code, the access level will be changed as shown by the message on the screen. After that the main screen will appear.



Figure 24

6. On the main screen press the "Menu" button to open the main menu again. Use the buttons "Up/Down" to select the item "Service" (see Figure 25) and press the "Menu" button.



Figure 25

7. You may change the sensor address only in case of operating in standard mode. Software address of sensor connected to the tube shall be changed after connection, while open sensor shall be renumbered at the standard seed tube or under a certain location (see Figure 26) upon condition that direct sunlight does not penetrate into the sensor optic channel (space between glasses).

Reflection sensor



Transmission sensor



Mirror or other light-reflecting surface Figure 26

8. Ensure normal operation of the sensor: select the "**Registers**" item and press the "**Menu**" button. In the appeared window use the buttons "**Plus/Minus**" to select the current sensor address (see Figure 27) and check that the field "**Stat**" has the value only "**0**" or "**1**" (see Figure 27).
9. Press the "**Back**" button to return to the "**Service**" menu.

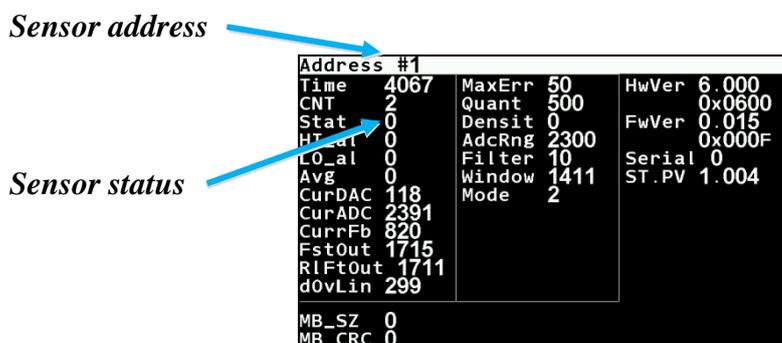


Figure 27

10. Use the buttons "**Up/Down**" to select the item "**Sensor Address**" and with the buttons "**Plus/Minus**" set **the current software address** of the connected sensor (see Figure 28) or select "**AUTO**" if address unknown.
11. Use the buttons "**Up/Down**" to select the item "**New Address**" and with the buttons "**Plus/Minus**" set **the new address** (see Figure 28). Then press the "**Menu**" button. After successful change of address, the message "**Done**" will appear on the screen.



Figure 28

12. Make sure that the sensor address has changed to the required one: unplug and then plug the sensor connector into connector of the network cable of the control panel (see Figure 29).

*Connected sensor with
new software address "5"*



Figure 29

Warning!

After performing steps to change addresses of the sensors, you shall change in the menu "Settings" the access level from "Agronomist" to "Driver" or turn off the system and then turn it back on.

MANUFACTURER'S CONTACT DETAILS

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