GrainSense

User Manual

GrainSense®

SILO Analyzer

GrainSense

Imprint

Issue: 06/2025

Manufacturer
GrainSense Oy
Tutkijantie 9
90590 Oulu
Finland

Contact details can be found on the back page of this manual.

This manual is only intended for the GrainSense Silo analyzer.

Before using the GrainSense Silo analyzer, the operator mustead carefully the detailed instructions for safe and correct use of the GrainSense Silo analyzer.

GrainSense

Table of Contents

GrainSense

GrainSense

1. Introduction

Thank you for choosing GrainSense.

With GrainSense Silo analyzer, you analyse your grain. You can track your grain quality real-time from flowing grain. You receive reliable data, and you can store results in the cloud – so you can make the right decisions to control your outputs.

The GrainSense Silo analyzer is a revolutionary grain analyzer with advanced NIR (Near Infrared) technology. You get reliable protein, moisture, oil and carbohydrate contents instantly from flowing grain.

2. Safety and correct usage instructions

2.1 Safety

GS Silo analyzer is designed and manufactured in compliance with the latest applicable EU regulations, directives, and standards to ensure safety. It is essential to familiarize yourself with the information regarding product compliance and markings. GS Silo analyzer complies with all relevant EU regulations, directives, and standards applicable to its intended use. It has been designed and manufactured to meet the given requirements, ensuring its safe operation when used as directed.

Type Label: Please refer to the type label attached to the product for specific markings indicating compliance with relevant regulations, directives, and standards. The type label provides important information such as the CE marking and other possible and relevant certifications.

CE Marking: The CE marking on GS Silo analyzer indicates its compliance with the essential requirements of applicable EU directives and regulations. It demonstrates that the product has undergone assessment and meets the necessary safety, health, and environmental protection standards. Declaration of Conformity is available from request.

User Responsibilities: As a user of GS Silo analyzer, it is important to read and understand the user manual in its entirety. Follow all instructions, warnings, and precautions provided to ensure safe operation, prevent hazards, and maintain the product's performance.

If you have any questions regarding the safety, compliance, or operation of GS Silo analyzer, please contact our **customer support**: support@grainsense.com. Our team is available to provide guidance and address any concerns you may have.

Remember, it is crucial to adhere to safety guidelines, use the product as instructed, and exercise caution while operating GS Silo analyzer. Failure to follow these instructions may result in personal injury, property damage, or compromised product performance. By using GS Silo analyzer, you acknowledge that you have read and understood this safety chapter, and you agree to assume responsibility for using the product in a safe and responsible manner.

2.2 Correct use

The following points must be observed in order to use the GrainSense Silo analyzer in a correct manner:

Set up and operation

Adherence to the maintenance and servicing instructions

2.2 Exclusion of warranty

GrainSense is not liable for the following damages of the GrainSense Silo analyzer:

- All damage to the GS Silo analyzer misuse.
- Damage to the display resulting from applied pressure and scratches.
- Incorrect storage.
- Usage beyond the range of operational temperatures.

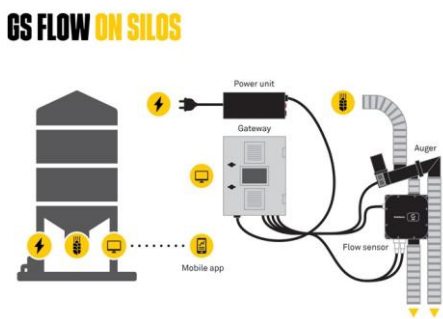
GrainSense

3. GrainSense Silo analyzer

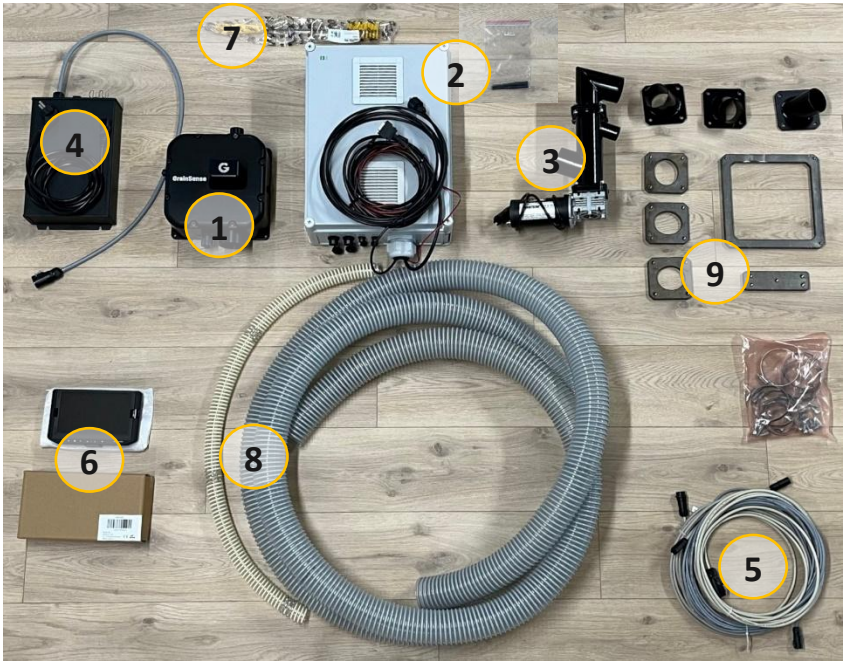
3.1 Product description

The GrainSense Silo analyzer has been developed for analyzing real-time grain quality in environments where grains are flowing. The GrainSense Silo analyzer measures protein, moisture, oil and carbohydrates online during processing or storing.

From a grain entry and exit system, the GrainSense Silo analyzer will continuously extract a sample of the grain from the connected system and perform a real-time quality analysis. The key values can be seen on the display of the device and the measurement data is sent to GrainSense Cloud, enabling the user to monitor the results in real time and to make quality-based decisions.



Schematic view of operation principle



1. GrainSense Silo analyzer Sensor unit
2. GrainSense Silo analyzer Gateway unit, Ethernet & Touchscreen cables and Wi-Fi antennas
3. GrainSense Silo analyzer Dosing Auger
4. GrainSense Silo analyzer Power unit
5. Cables (Auger Control, Sensor Power, Sensor Communication)
6. Touchscreen Display and mounting kit
7. Brush for cleaning the glass tube
8. Hoses (auger to sensor 32mm Ø, material for input/ouput and bypass 63mm Ø)
9. GrainSense Silo analyzer Installation parts:
    a Mounting plates for Dosing Auger for input and output hoses: tube flanges 3 pcs, flanges 3 pcs, housing adapter 1 pcs
    b Additional mounting plate for the sensor [not commonly used]
    c Hose clamps 8 pcs

GrainSense

3.2.1 Additional installation equipment and connectivity requirements

During installation and operation:

- Wi-Fi- connection

During installation:

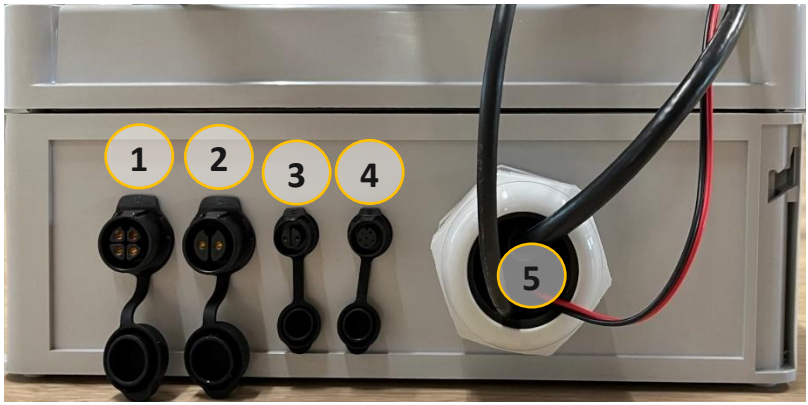
- A drill and a screwdriver
- Welding machine (if applicable)
- Alloy wrenches
- Drill bit hole saw 60 mm

- 3.2 Sensor connectors

Sensor power connector (2pin) and communication connector (multi-pin)

GrainSense

3.3 Gateway connectors



1. Power Inlet (4-pin)
2. Dosing Auger Outlet (2-pin)
3. Sensor Power Outlet (small 2-pin)
4. Sensor Communication Connector (small multi-pin)
5. Ready assembled Touchscreen display cables

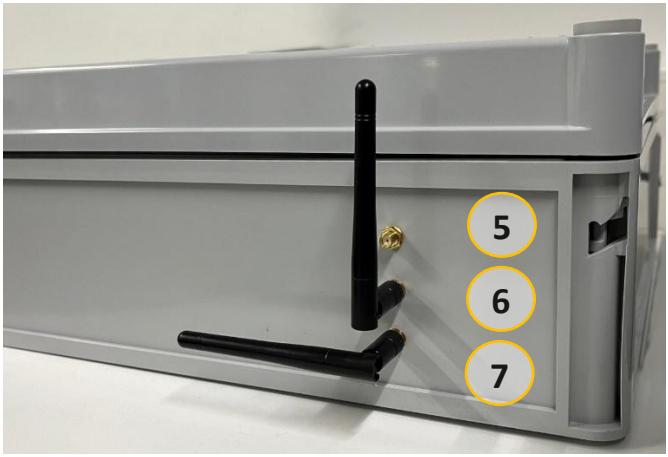
Cable Connectors Attachment to 1-4 :

Check that the orientation of the connector is correct.

Apply firm pressure while pushing the connector into place. One should feel or hear a distinct snap as the locking mechanism engages. This ensures a secure connection.

Cables Detachment:

Depress the connector's release button.



6. Not in use (sma)
7. Wi-Fi 1 (sma)
8. Wi-Fi 2 (sma)

Optimal Wi-Fi Antenna Positioning:

Aim for a 90-degree angle between antennas, if feasible.

GrainSense

4. GrainSense Silo Dashboard

The GrainSense Dashboard is a great web tool to analyze and manage the measurements on computer or tablet. Visit it at https://flowdashboard.grainsense.com/. The GrainSense Flow Dashboard also allows the user to export the data via an .xls or .csv file.

5. GrainSense Data collection

5.1 GDPR guidance

GrainSense is fully compliant with the General Data Protection Regulation (GDPR)

The GDPR has been in place since 25.5.2018. and involves all companies handling data from EU citizens. Data controllers (i.e. company) and data processors (company or subcontractor) are required to comply and give more power to a person regarding his data, that includes to:

Ask explicit consent for all different data types (GPS, email marketing, etc), describe how to data is used and for what purpose

Allow users to control the data (delete and export)

Companies must also have an internal guidance (this chapter of the User Manual) on GDPR.

5.2 Data infrastructure and protection

GrainSense acts as a data controller and processor, but for processing, it uses an outsourced infrastructure (Amazon AWS). GrainSense has taken measures to protect user data by:

Applying standard encrypted HTTPS (TLS) communication

Using proper authorization and authentication methods

Using enterprise level framework (Java Spring)

Taking nightly backups of the data (last 30 days)

Limiting admin rights to the databases (two key persons have access to user's personal data)

5.3 Data handling

GrainSense gathers data of all registered users to:

- Provide calibrations and other data to users and to their GrainSense Silo analyzers
- Provide statistical analyses of the user-specific data, and to showing it only to the user itself
- Verify account status and level
- Store all measured data to provide an access anytime anywhere to the user
- Provide high level customer support and guidance
- Provide higher level statistical data of a specific reason (anonymized) and providing it to all users

5.4 User data control

The user can stop their subscription at any time and ask for their data to be deleted by sending a request to support@grainsense.com from the account email address. Deletion is made completely anonymizing the user data: User details (email, address, etc) are anonymized and GPS locations changed. However, measured data itself is not deleted and will be used for statistical purposes.

Technical specifications

Size	225x225x110 mm
Weight of the sensor	5 kg
Power IP Class for sensor IP Class for gateway unit	230/110VAC IP69K IP54
Measurement principle	Near infrared transmittance spectroscopy
Sample size	100 grams per second flows through the sensor when measurement is ongoing
Species	Wheat, barley, soybean, maize, rapeseed, oats, rye
Storage temperature	-20 to +85 °C (-4 F to 185 F)
Operation temperature	+5 to +45 °C (32 F to 113 F)

GrainSense

6. Installation

Continuous grain flow is extracted from e.g., silo's elevator to dosing auger of the GrainSense Silo analyzer. Dosing Auger feeds a steady grain flow through the GrainSense Silo analyzer sensor unit.

6.1 Installation instructions

This document describes the installation procedure of the GrainSense Silo analyzer. The Silo Analyzer can be in a grain handling facility. **Every location is somewhat unique and planning before starting the installation is recommended.**

6.2 Package Contents (see 3.2)

Before starting the installation, check the installation location and carefully plan the exact place for the Sensor unit and the dosing auger. Same mounting plates can be used in grain handling facility.

7. Installation in Grain Handling Facility

7.1 Installing the sensor unit and dosing auger

GrainSense Silo analyzer can be installed in various locations in a grain handling facility. The sensor unit and the dosing auger must be installed in a vertically level surface, but the input hose, output hose and the bypass hose can also be installed in a round surface. The dosing auger and the input hose are installed above the sensor unit. Before starting the installation, make sure there is enough space for the dosing auger and for the input hose above the planned location of the sensor unit. Also, the input hose acts as a grain buffer for the GS Silo analyzer, so the longer the input hose is, the bigger the grain buffer is.

Example of Dosing Auger and Sensor installation

After the installation location is decided, mark the correct place for the sensor unit's mounting plate. The mounting plate is welded (if applicable) on to the elevator, so make sure that the location is correct and exactly horizontal. After the location has been marked, weld the mounting plate to the elevator. **NOTE! The installation is performed in a dusty environment. Make sure that all local regulations for welding are followed and take needed precautions to minimize the possibility of catching fire while welding.**

After the Sensor unit's mounting plate is welded, install the sensor unit. When the sensor unit is in place, define the installation location for the dosing auger. The dosing auger should be installed above the sensor unit and the output of the dosing auger, and the input of the sensor unit must be aligned. When the correct location is decided, mark the correct place for the dosing auger's mounting plate. The mounting plate is welded the same way as the sensor unit's mounting plate. After the mounting is welded, install the mounting bracket and the dosing auger.
Next, the mounting plate for the dosing auger's input hose and the bypass hose and the output hose for the sensor unit is installed. The mounting plate for the dosing auger's input hose will be installed above the dosing auger and it must be aligned with the input of the auger. The more vertical distance between the mounting plate and the dosing auger, the bigger the grain buffer will be. After the location is defined, mark the location. Then weld the mounting plate the same way as the other mounting plates.

Another example of installation

The mounting plate for the dosing auger's bypass will be installed below the bypass and must be aligned with the bypass. Installation will be done the same way as the other mounting plates. The mounting plate for the sensor unit's output will be installed below the sensor unit and must be aligned with the sensor unit's output.

Installation will be done the same way as the other mounting plates.
After all of the mounting plates have been welded, install the hose connections and the input hose, output hose and the bypass hose. Also, install the hose between the dosing auger and the sensor unit. Use the included hose clamps for securing the hoses.

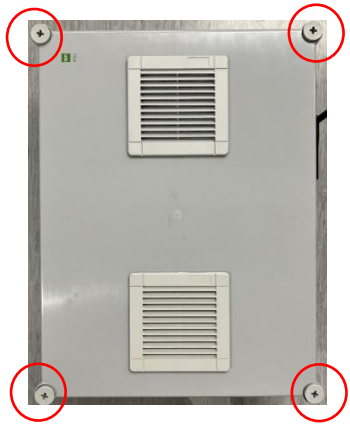
Note, recommended bending radius of the hoses is minimum 100mm.

7.2 Installing the gateway

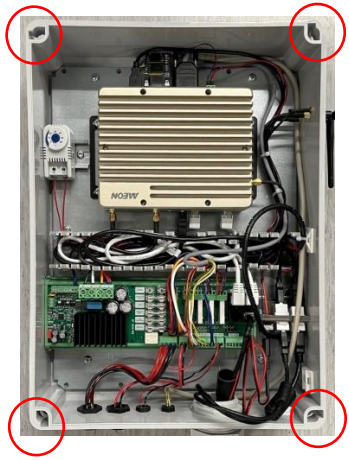
The gateway unit can be placed freely in the facility. It can be installed E.g., in a control room or close to the sensor unit. After the suitable location has been defined, the gateway unit is fixed securely. Connect the wiring between the gateway unit and the sensor unit so that the wiring is not subject to any damage.

Gateway Unit Enclosure Installation Guide

1. **Upright (Wall) Installation:** Begin by opening the cover of the Gateway unit. This can be done by loosening the locking screws located at the corners of the unit. Open cover carefully, there is wiring going to the fan attached to cover.



2. **Mounting the Gateway Unit:** Inside the Gateway unit enclosure, you will find 6mm holes in the corners. These are designed for mounting the unit to the wall. Ensure you use suitable screws for this purpose.



3. **Choosing the Right Material:** It's crucial to ensure that the wall material is suitable for the installation. The type of screws used will depend on this.
4. **Drywall Installation:** If you're installing the unit on drywall or a similar material, it's recommended to use screw anchors. This will provide additional support and stability to the unit.
5. **Attaching cover back on the enclosure:** Secure that the wiring to the fan is in order. Put cover back on and tighten locking screws in the corners.

Remember, safety should always be your first priority. Always use the appropriate tools and follow the manufacturer's instructions.

GrainSense

8. Operation Instructions

8.1. How does it work?

A dosing auger is installed close to a place where grain is flowing.

The GrainSense Silo Analyzer controls the auger and electronics to perform measurements in configured intervals. Measurements are being made until the user ends the measurement session. The measurements are collected by the gateway unit and sent via Wi-Fi network to the GrainSense Flow database. If a Wi-Fi network is not available during the measurement session, the data is saved in the device's memory and it is sent to the cloud, when Wi-Fi becomes available.

The user can access the GrainSense Silo Analyzer measurement sessions anytime from the GrainSense Flow - dashboard with the provided credentials.

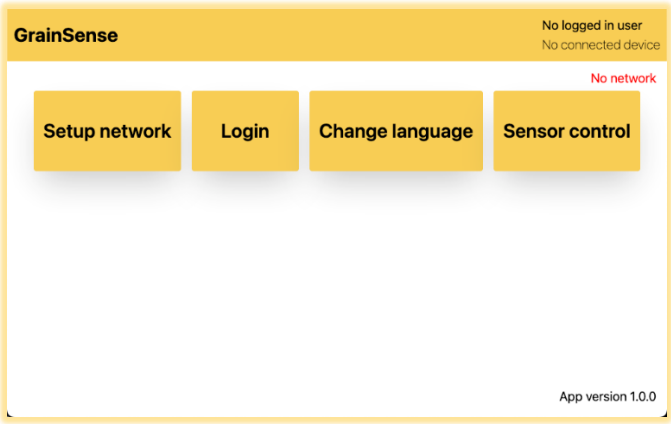
8.2. Powering up the GrainSense Silo Analyzer

1) Turn the main switch ON from the GrainSense Silo Gateway unit.

2) Change display mode to HDMI in Touchscreen if HDMI is not already on.

Display mode selector marked with orange circle.

3) Wait until you see the landing page on the screen.



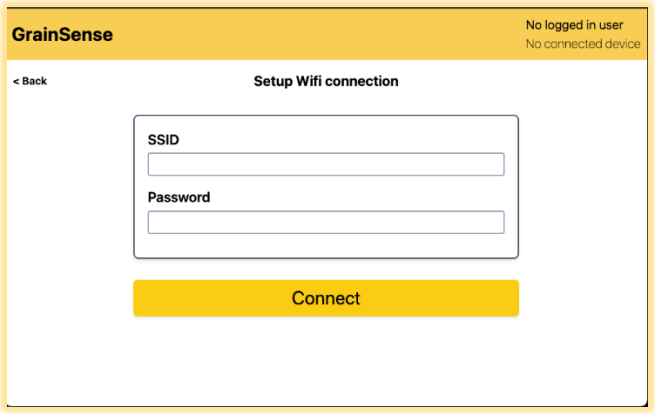
8.3. Network settings

GrainSense Silo Analyzer uses Wi-Fi network for Internet connection. To have the measurement results available real-time in the GrainSense cloud, Wi-Fi settings need to be configured.

4) Go to Setup Network.

5) Press connect **Connect** to Wi-Fi -button

6) Insert SSID (name of your Wi-Fi network) and password and select the security type of your network. Then tap **Connect**.

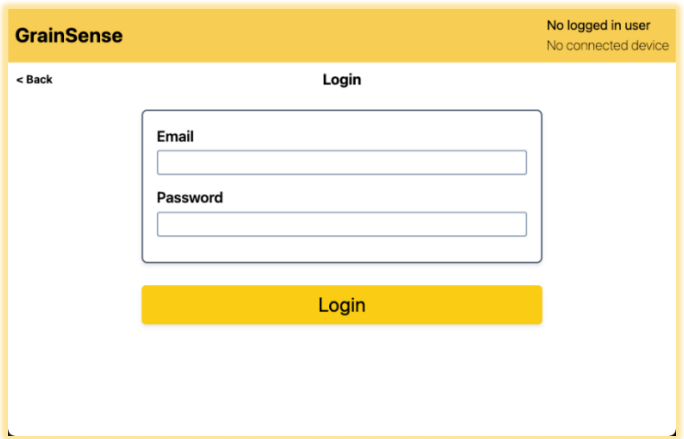


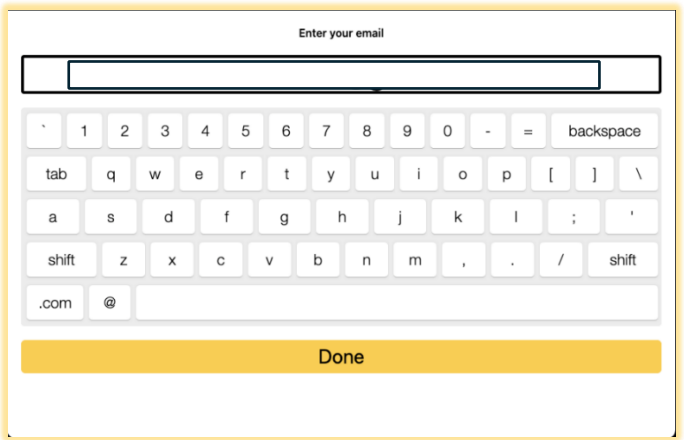
7) If screen shows established Wi-Fi network connection, press “Back” on upper left-hand corner.

8.4. Login

8) Press Login -button

9) Login with your registered user account and password

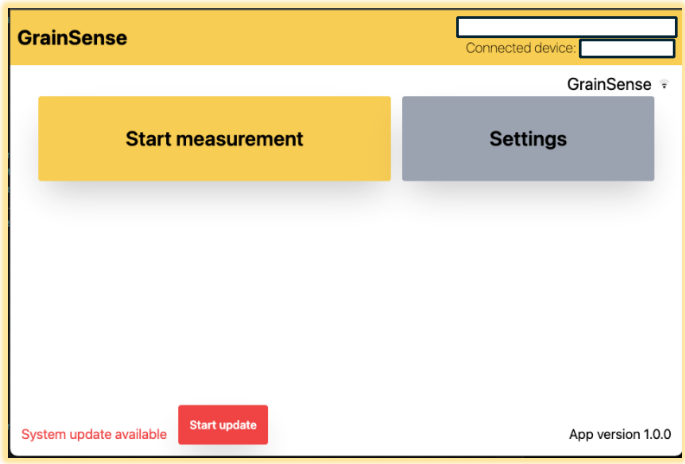




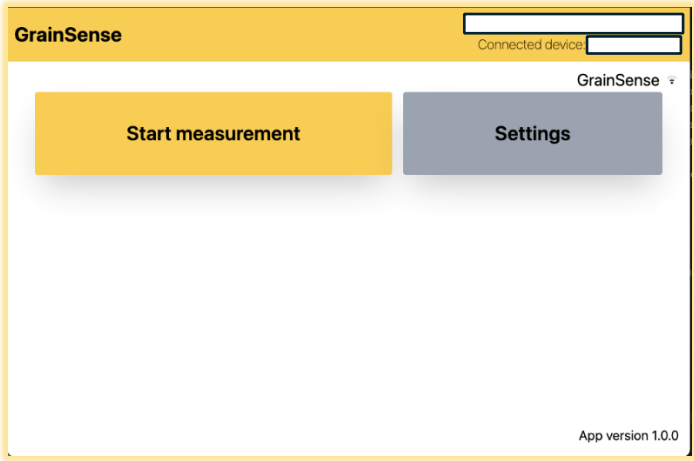
GrainSense

8.5. Check for updates

10) If there is on the bottom of the screen message on red that there is update available, download update by pressing Start update -button.



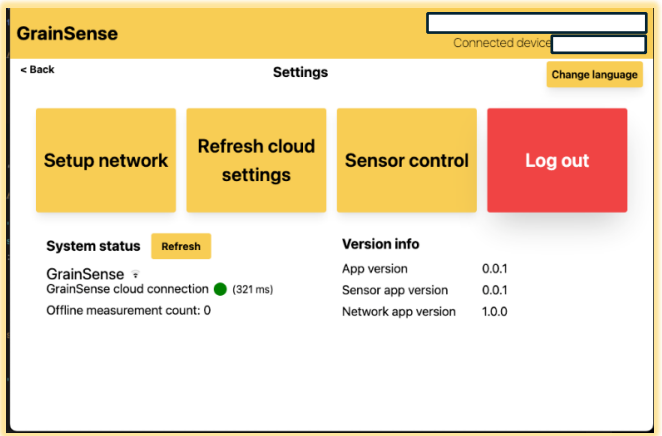
11) Confirm updating by pressing again Start update -button on following screen. “Update in progress” screen should appear. Wait for update and download completion and automatic restart of the GrainSense Flow Analyzer. During the update there are few different screens appearing and disappearing which are normal activity. After completion start-up screen should appear and GS Flow Analyzer is ready to use.



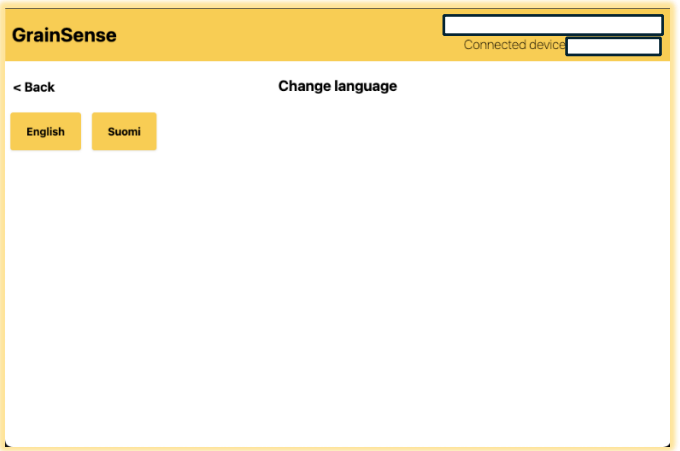
8.6. Language selection

12) Go to **Settings**-> **Language**

13) Select the language you want to use with GrainSense Silo Analyzer. Click **Change language** -button.

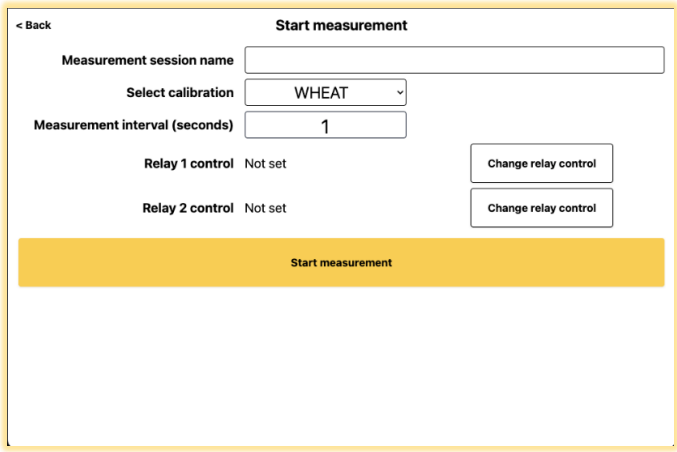


14) Change language -screen:



8.7. Measurement settings

From the Start measurement main view, you can define measurement interval (how often the measurements are taken during measurement session)



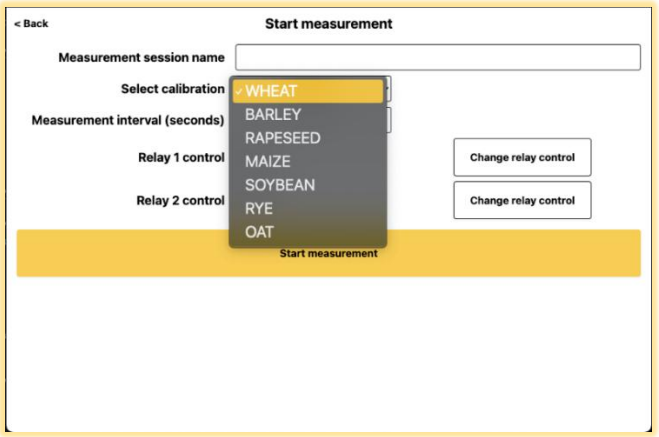
15) Tap on the Measurement interval value box to change the interval. Use the DEL -button to delete the old value and type in the new value with the keypad. Then tap “OK” to confirm the new value.

GrainSense

8.7.1. Calibration selection

16) Go to **Select Calibration**

17) Select the calibration that you want to use for the measurement session.

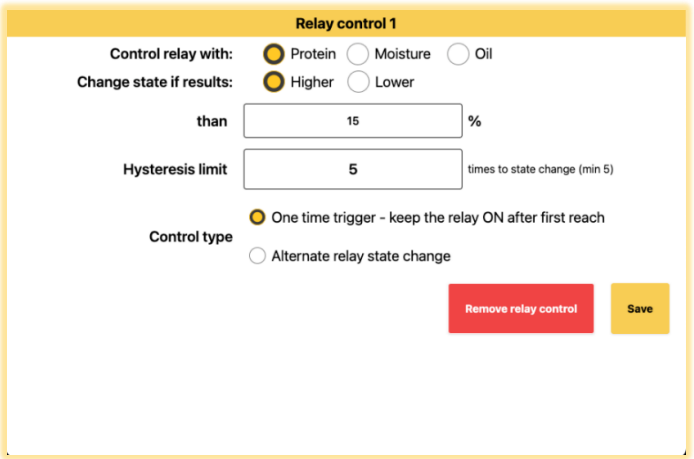


8.7.2. Setting alarms/relays

18) Go to **Change relay control**

19) Define the desired alarm parameters by using the radio -buttons and define the alarm threshold value in the field. Then tap **Save**.

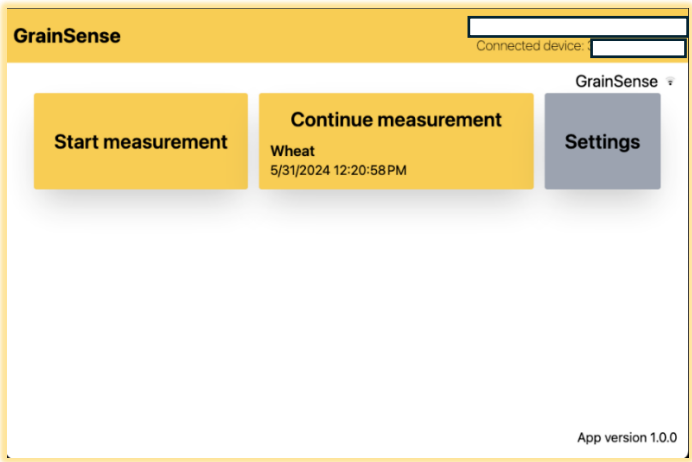
The alarm can be removed from the same dialog by using the **Remove relay control** button.



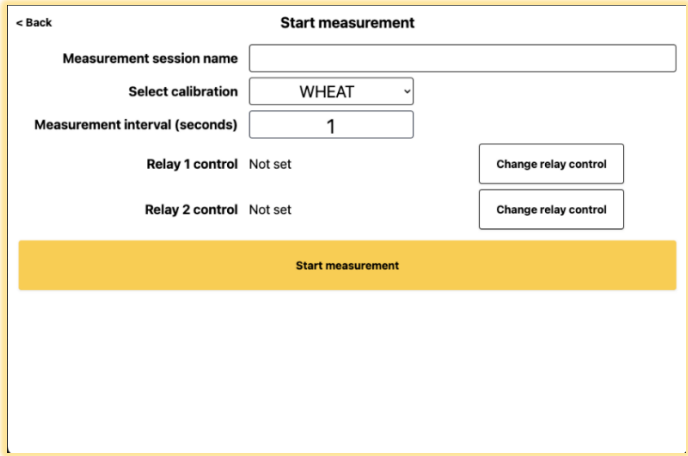
8.8. Starting measurement session

After all the settings have been defined, the measurement session can be started.

20) Tap **Start measurement** button (if you are in Main view) and then from Start measurement view **Start measurement**. One can also continue existing previous measurement session by tapping **Continue measurement** button.



Main view



Start measurement view

21) In the measurement session -view, the user will see the following information:

22) Selected calibration (e.g. wheat)

23) Latest protein and moisture percentage values

24) Average protein and moisture percentage values from the whole duration of the measurement session

25) If an alarm was defined in the settings, it will be displayed here

26) Duration of the measurement session


Wheat
Taking measurements
00:00:09
-
Protein average %
-
Protein latest %
Pause
Stop
-
Moisture average %
-
Moisture latest %
-
Oil average %
-
Oil latest %

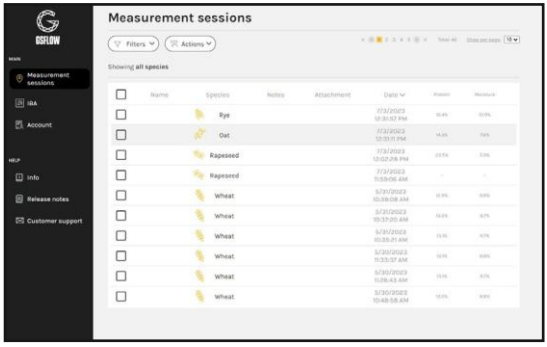
8.9. Stopping measurement session

When the batch of grain has been measured, the user can stop the measurement session by tapping the **Stop** button. After measurement has stopped user can exit from measurement by pressing **Exit** button

8.10. Viewing results

The results are automatically uploaded to the GrainSense cloud. The user can log in and view the results in **GrainSense Flow dashboard:** https://flowdashboard.grainsense.com/login .

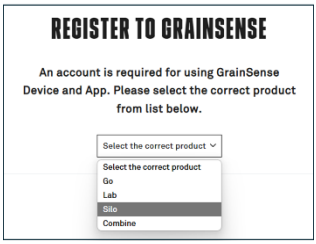
In GrainSense Silo dashboard, it is possible to add notes and attachments to measurement session export data and share the results via email.



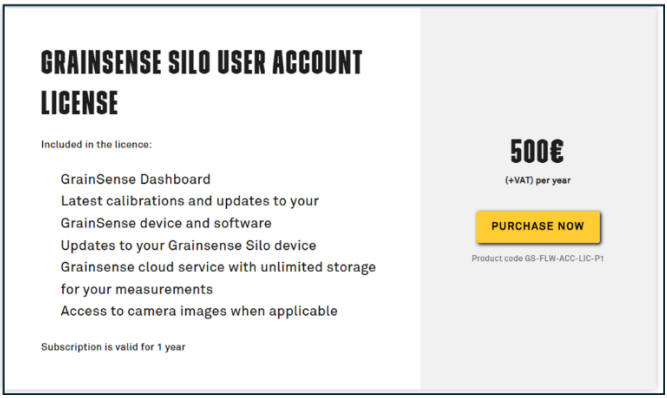
Please note that Individual Bias Adjustment (IBA) can be set from the Dashboard. For IBA update the touchscreen has to be connected to the internet next time starting the session.

9. Registering to GrainSense cloud

1. Go to www.grainsense.com/pages/account-registration
2. Select the current product from the list

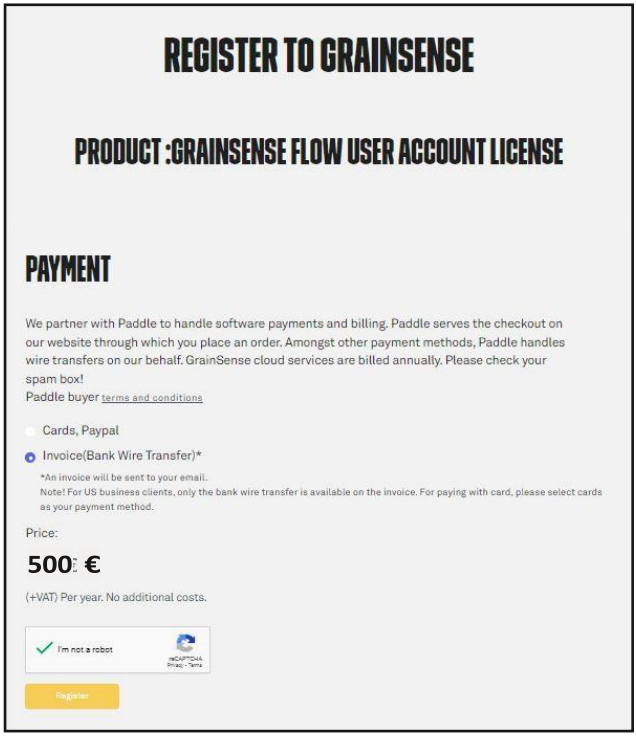


3. Select the “Silo”
4. Scroll down and click ‘Purchase now’ - button on the GrainSense Flow user account license

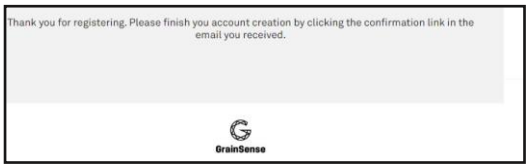


6. Click ‘Continue to payment’.

7. On the payment -page, select the payment method. Check the I'm not a robot -box (or alternatively, solve the reCAPTCHA challenge) and then click on the 'Register' - button.

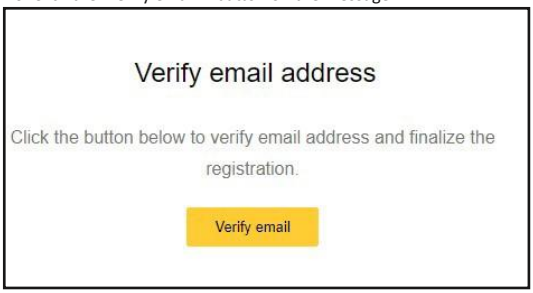


8. You should see the thank you for registering message.

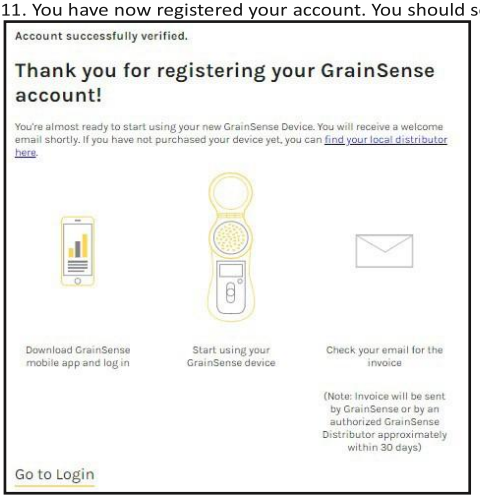


9. Go to your email inbox and open the "Confirm your email with GrainsenSense" - message.

10. Click the 'Verify email' - button on the message.



11. You have now registered your account. You should see the confirmation message on your browser.



10. Maintenance and servicing

10.1 Preventive maintenance

We recommend cleaning the glass tube after every 20 h of operations.
Check the cables, connections, glass tube and lamp bulb annually.
If the lamp bulb or glass tube is broken, please contact your local distributor.

10.2 Cleaning the glass tube

The glass tube inside the sensor unit should be kept clean. Depending on the measured species and operating environment, the need for cleaning varies. We recommend cleaning the glass tube at least every fortnight, but a shorter interval might be needed.
To clean the glass tube, release the hose clamp on the output of the sensor unit. Remove the output tube and use the supplied brush. After the glass tube is clean, connect the output tube and tighten the hose clamp.

10.3 Updating the calibrations on the GrainSense Silo analyzer

When the GrainSense Silo analyzer is connected to the internet, it automatically checks and downloads new calibrations.

CONTACT

For any support, please contact your local sales representative or support@grainsense.com

www.grainsense.com