TRIEPIC

USER MANUAL

DOMINIQUE DUTSCHER SAS

REVISION HISTORY				
VER.	**REFERENCE**	**MODIFICATION PERFORMED**	**PERFORMED BY**	**REVIEWED BY**
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1. Prologue

Thank you for your reliance in COOLVACUUM for the purchase of your new freeze dryer. COOLVACUUM applies the most advanced technology for the design and manufacture of its equipment, using the best quality materials. Likewise, our machinery incorporates the best finished materials to comply with the demanding requirements of the industry.

The **documentation provided** with the freeze dryer includes the description, installation, operation and other technical instructions necessary for a good knowledge of the equipment, for a correct operation and to achieve the best performance of the equipment, always taking into account the user's safety.

It is therefore **mandatory to read carefully and understand the instructions before installing, starting up or using this machine**. Once you have finished reading, keep the manual in a safe place.

The **COOLVACUUM** Quality Department is at your disposal to clarify any doubts that may arise from reading the manual, thanking you in advance for any suggestions to improve it.

COOLVACUUM reserves the right to modify the characteristics of its machines without prior notice, provided that this is done to improve their performance, reliability or operation.

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2. Safety

The **COOLVACUUM** freeze dryers of the **TRIEPIC** series have been designed and built in accordance with European laws, complying with all required safety standards, and including the following safety devices, among others.

- **Safe start and stop devices**, which allow any service during the automatic cycle, when performed after a cycle stop during a recognized stable stop state.

- **Emergency stop pushbuttons** with mechanical locking, located in the areas with the highest number of operators.

- **Power disconnection devices**, which allow cleaning, maintenance and repair work to be carried out safely.

All these safety devices are integrated into the machine, forming part of it. The modification, cancellation or lack of maintenance of any of them increases the risk of accidents and implies a violation of the Directive of Use **2009/104/CE**.

The manufacturer assumes no responsibility for any damage resulting from modifications to the machine, removal or lack of maintenance on its components that has been carried out without the prior approval of the manufacturer.

Any repairs must be carried out by specialized technicians. Otherwise, repairs may involve dangerous risks for the user.

IN ANY CASE OF EMERGENCY, ACCIDENT OR INCIDENT ON THE MACHINE, PRESS THE EMERGENCY BUTTON WITH A SINGLE BLOW. THE MACHINE WILL STOP SUDDENLY, AT ANY STEP OF THE CYCLE.

THIS WAY OF SHUTTING DOWN THE MACHINE SHOULD ONLY BE USED FOR EMERGENCY CASES, BUT NEVER AS A REGULAR PROCEDURE TO STOP THE MACHINE.

WHEN THE EMERGENCY CASE IS SOLVED AND THE MACHINE IS READY TO OPERATE NORMALLY, UNLOCK THE PUSH BUTTON BY TURNING THE RED KNOB CLOCKWISE.



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3. General description

The freeze dryer model **Triepic** is designed to provide a complete freeze drying service of the highest quality and in the safest and most reliable way.

A series of protections and automatisms guarantee the total reliability and reproducibility of the process.

The equipment consists of a compact unit housing all the components and motors of the system, including the 2 condensers, the cooling components and the vacuum pump. The 3 accessories or chambers where the product to be lyophilized is introduced are located in the upper part of the bench.

The 3 accessories of the freeze dryer can be the same or different from each other, depending on the characteristics or format of the product to be freeze dried.

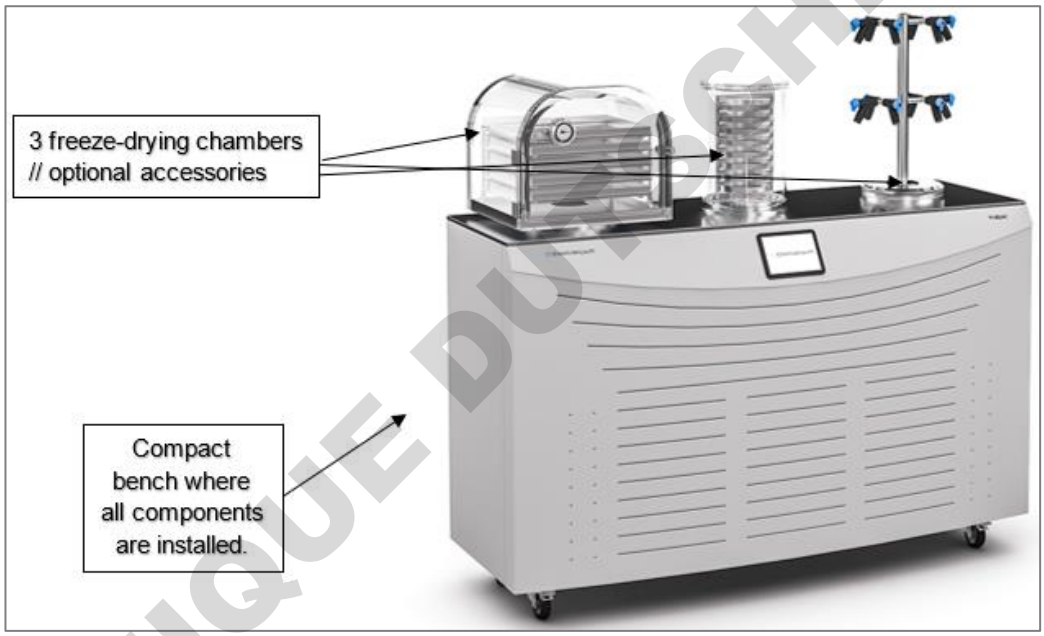
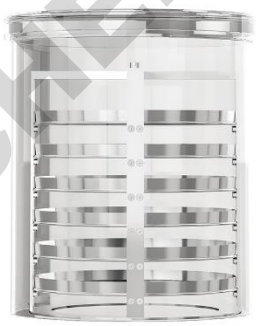


Figure 1. General description.

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These are the 4 options available:

Table 1. Optional chambers.

Specifications	Chambers
LE-CAMPC-565 Methacrylate cubic chamber with 5 rectangular plates Number of shelves: 5 Interdistance between shelves (mm): 43 Size (mm): 420 X 390 Shelves area (m^2): 0.82 Height increase (mm): 475	
LE-CAMP-6370 Methacrylate circular chamber with 6 shelves Number of shelves: 6 Interdistance between shelves (mm): 80 Size (mm): ø 370 Shelves area (m^2): 0,65 Height increase (mm): 550	
LE-CAMP-6370-8M Methacrylate circular chamber with 6 plates and manifold cover Cover with manifold: 8 valves with CN 29/32 connection for flasks Number of shelves: 6 Interdistance between shelves (mm): 80 Size (mm): ø 370 Shelves area (m^2): 0,56 Height increase (mm): 550	
LE-COLM-12M Stainless steel manifold for 12 valves for flasks Valves: 12 Valve connection: CN 29/32 Increased height (mm): 570	

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4. Installation and commissioning.

The equipment must be located in a room with controlled temperature and humidity, not exceeding 25ºC for proper performance.

4.1. Connection

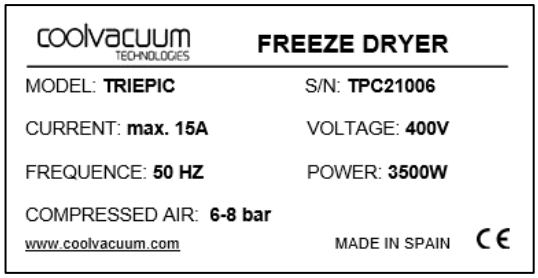


Figure 2. CE Nameplate.

Current
The equipment must be connected to the power supply, according to the specifications.

Table 2. Electrical power Specifications.

Specifications	
Maximum Current	15A
Voltage and Frequency	400V III; 50 Hz
Power	3500W

Compressed air
The equipment must be connected to a compressed air supply, according to specifications. The air connection is at the rear of the unit.

Table 3. Compressed air Specifications.

Specifications	
Compressed air	From 6 to 8 bar

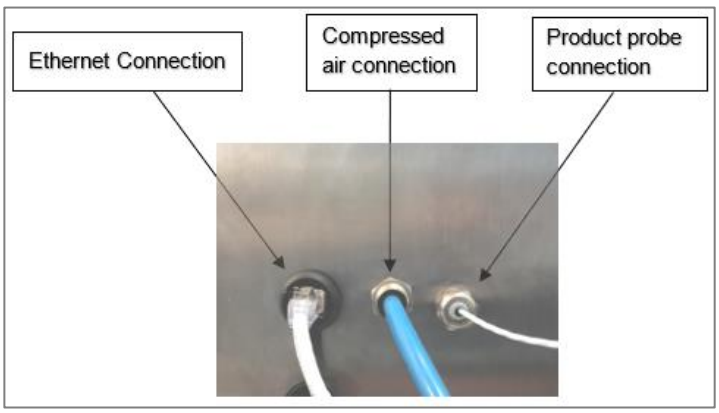


Figure 3. Connections.

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Drainage

The drain of the freeze dryer should be connected to a piped water outlet. After the defrosting cycle, the water will be discharged through this pipe.

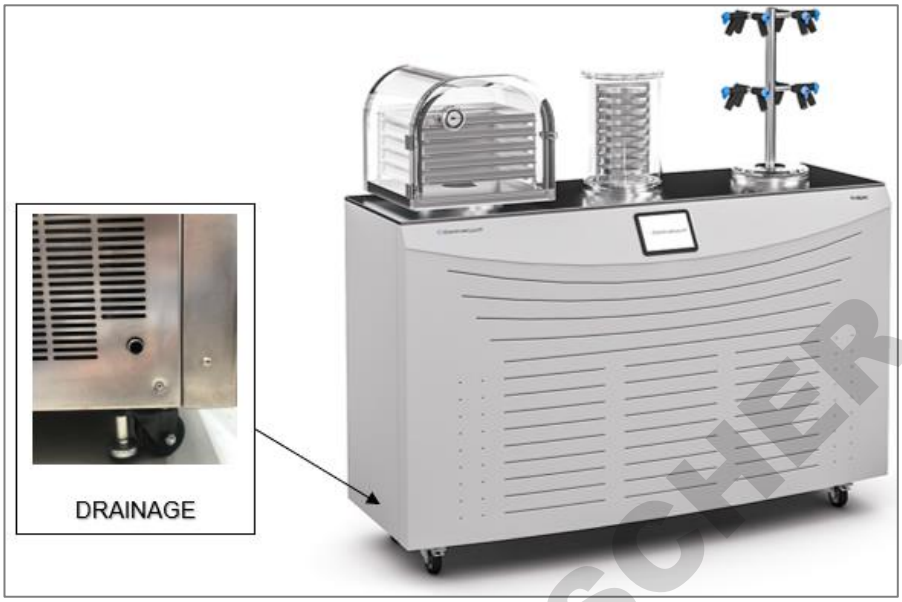


Figure 4. Drainage - Connection.

Smoke outlet

The vacuum pump is located inside the bench, and is equipped with a filter in the gas outlet to avoid the initial smoke coming out of the pump in the first minutes of operation.
Optionally, the smoke can be redirected to the outside, making the necessary connections.

Ethernet

There is also the possibility to connect the freeze dryer to ethernet through an input located on the back of the equipment. In this way, it is possible to control the freeze dryer remotely via Tablet or smartphone.
For remote control it will be necessary to assign the freeze dryer a local IP and download the *Vijeo Desingn App.*

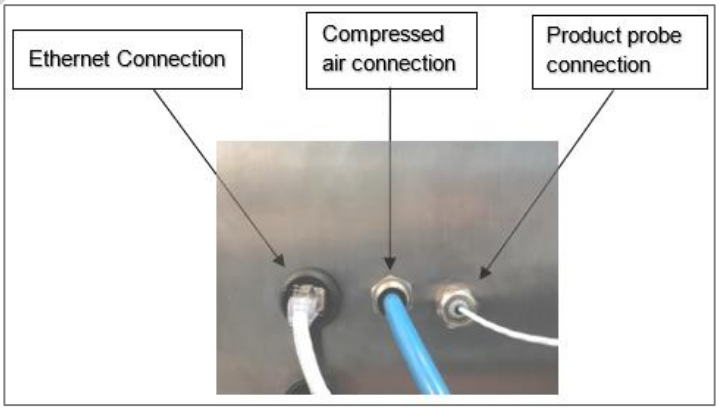


Figure 5. Ethernet - Connection.

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4.2. Filling the vacuum pump with oil

Before starting up the unit, check whether the vacuum pump is filled with oil.

1. If you have received the freeze dryer together with its corresponding vacuum pump and it already contains oil inside, you can skip this step. This oil is clean and is valid for the operation of the equipment.

2. If your pump does not contain oil, you must fill it.

   You can use one of Coolvacuum's video tutorials as a guide:

   Search on YouTube:
   Cambio del aceite de una bomba de vacío – COOLVACUUM

   https://www.youtube.com/watch?v=fVVXOnRNJA8&t=6s

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4.3. Switch-on

Once the freeze dryer has been connected to all the required services, start it up.

The on/off switch of the equipment is located on the right side.

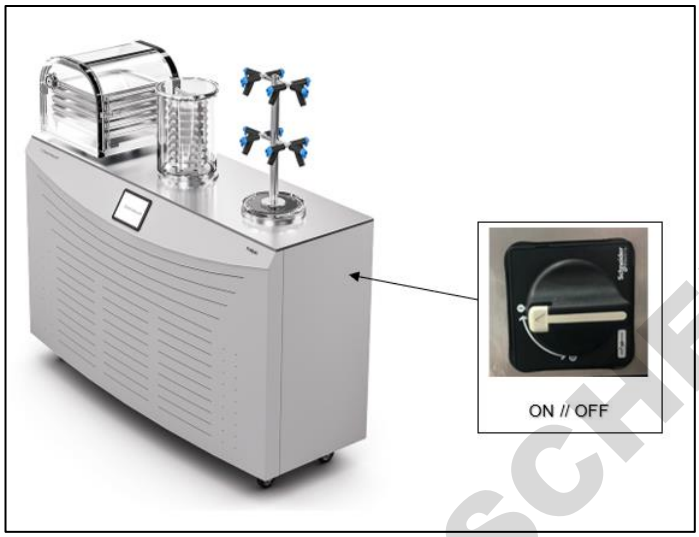


Figure 6. ON/OFF Switch.

Once the freeze dryer has been switched on, the equipment is controlled by means of the touch screen on the front of the unit.

In the following figure the user can see that next to the display there is also the USB connection and the emergency stop button.

- In the **USB port** there must always be a USB memory stick connected, for the correct functioning of the graphs. Otherwise, the graphs will not appear on the display. The USB must be empty and formatted.

- All functions of the freeze dryer are controlled and monitored from the **touch screen**. For more information on the control system, please refer to section *6. Screens Navigation*.

- The **stop button or emergency button** should be used, as the name suggests, in case of emergency. Once pressed, the unit stops operation.
  When the stop button is reset, the freeze dryer returns to its previous operating status.

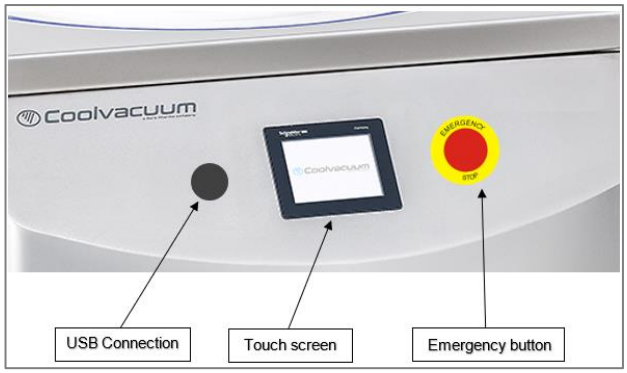


Figure 7. Touch screen - Switch-on.

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4.4. Data collection

During the freeze-drying and/or defrosting cycles the freeze-dryer monitors the data from the vacuum and temperature probes and stores them in the SD card located in the PLC or in the USB located in the front of the freeze-dryer.

In both options, a .csv document will be obtained, to be able to correctly interpret the data it is recommended to convert to an .xlsx document.

The following is a detailed description of how to obtain the cycle data with the two options.

4.4.1. SD card

During freeze-drying and/or defrosting cycles, the freeze-dryer monitors the data from the vacuum and temperature probes and stores them in an SD memory.
To consult the cycle data, the SD card must be removed and the data read and interpreted on a computer.

The data is automatically downloaded in text document with the following order:

Day/Month/Year → Hour: Minute → Temp. Condenser → Product temperature 1 → Product temperature 2 → Product temperature 3 → Chamber temperature probe 1 → Chamber temperature 2 → Chamber temperature 3 → Chamber vacuum → Number of step → Name of recipe → Recipe reference → Batch

IMPORTANT: cycle data is only saved while the SD card is inserted in the PLC.



Figure 8. Data collection - SD card.

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To register all the data you will need to download the FileZilla program and introduce the following data:

- **Server (PLC IP):** 192.22.73.2
- **User name:** USER
- **Password:** user
- **Port**: 21

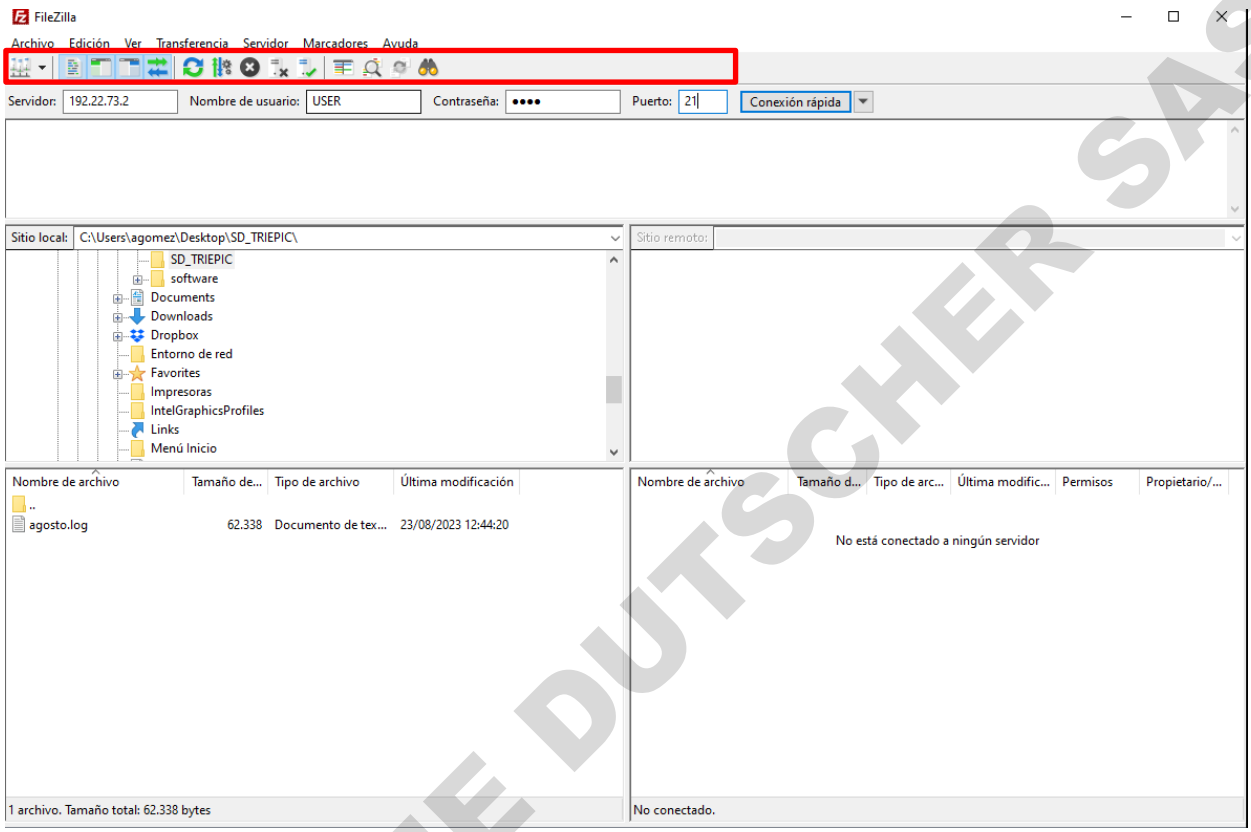


Figure 9. FileZilla data.

You will find the text documents in the “/sd0” folder and every text document will be created monthly.

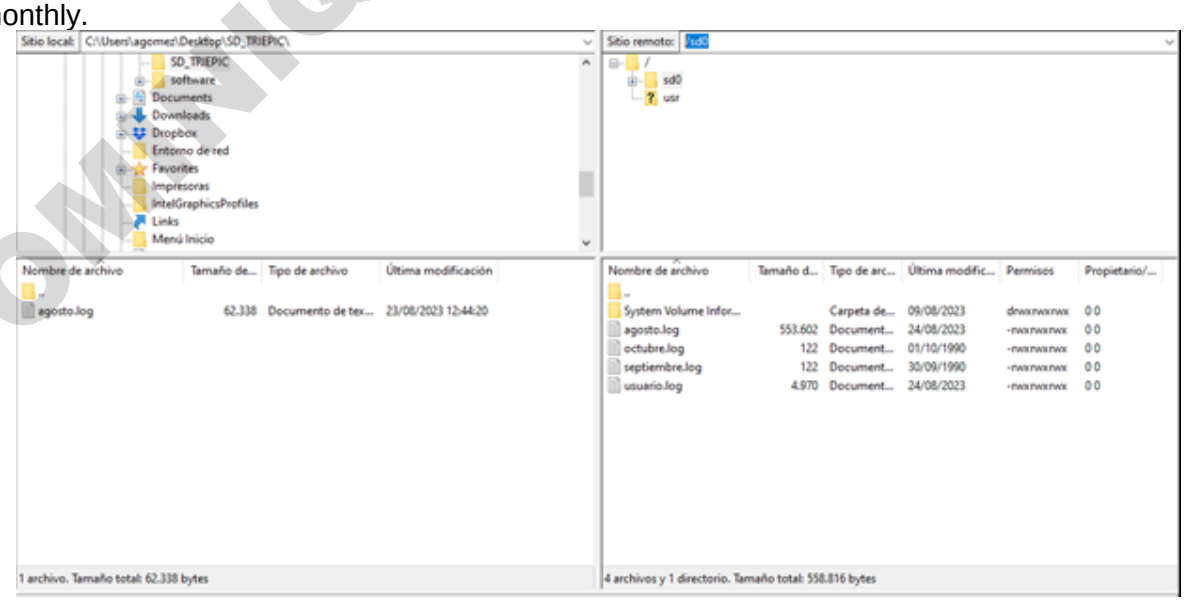


Figure 10. FileZilla directory.

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4.5. Chamber aeration

Once the freeze-drying cycle is finished, the chambers with the freeze-dried product are under vacuum, with negative pressure.

In order to open the door and unload the product, the chamber must be aerated.

The aeration works manually, each of the different accessories has an independent aeration system.

Cubic chamber

It has a manual ball valve.

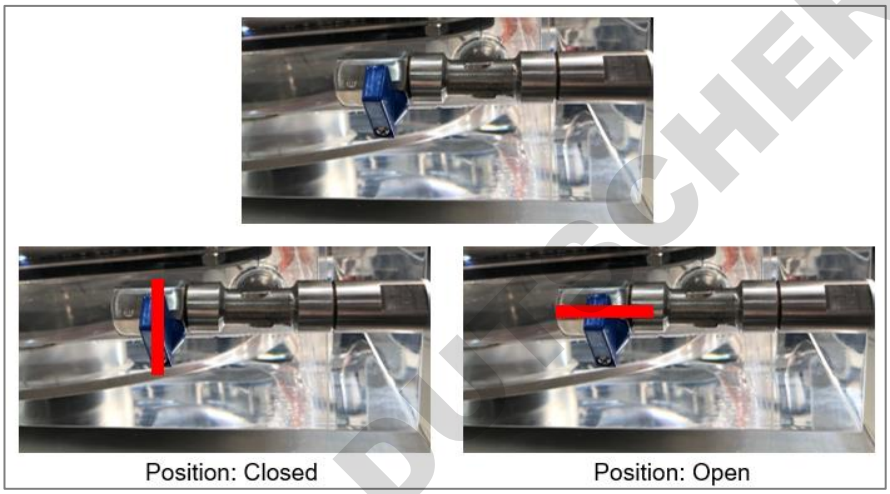


Figure 11. Aeration - Cubic chamber.

Manifold adapter

In the case of the manifold adapter with rubber valves, each of the valves can act as a manual aeration valve. Opening one of the valves is sufficient to aerate the entire contents.

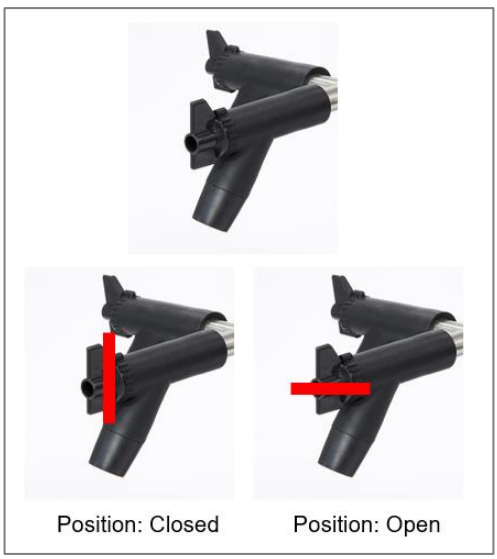


Figure 12. Aeration - Manifold adaper.

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5. Freeze-drying: steps to follow

1. Preparation: Before starting a freeze-drying cycle, check that the freeze-dryer is ready and in optimal conditions.
   - Verify that the condenser(s) should be clean and dry, with no water remaining from the last lyophilization cycle.
   - Make sure that there is no water left inside by opening the drain from the control screen and verifying that no water comes out of the drain pipe.
   - Check the correct condition of the oil in the vacuum pump.

2. Freezing the product. The freezing of the product should be done in a separate freezer and preferably in the same trays / containers that will be introduced in the freeze dryer. The product introduced into the freeze dryer should always be previously frozen.
   In case the chamber is equipped with a specific temperature probe for the product, it is possible to disconnect the probe from the freeze dryer to introduce it in the tray during the freezing phase.

3. Drying: Start the freeze dryer and run the drying cycle.

4. Aeration: Once the drying cycle is finished, the chamber must be aerated to unload the product.

5. Defrosting: Once the freeze-dried product has been removed, the ice accumulated in the condenser should be melted by means of a defrosting cycle.

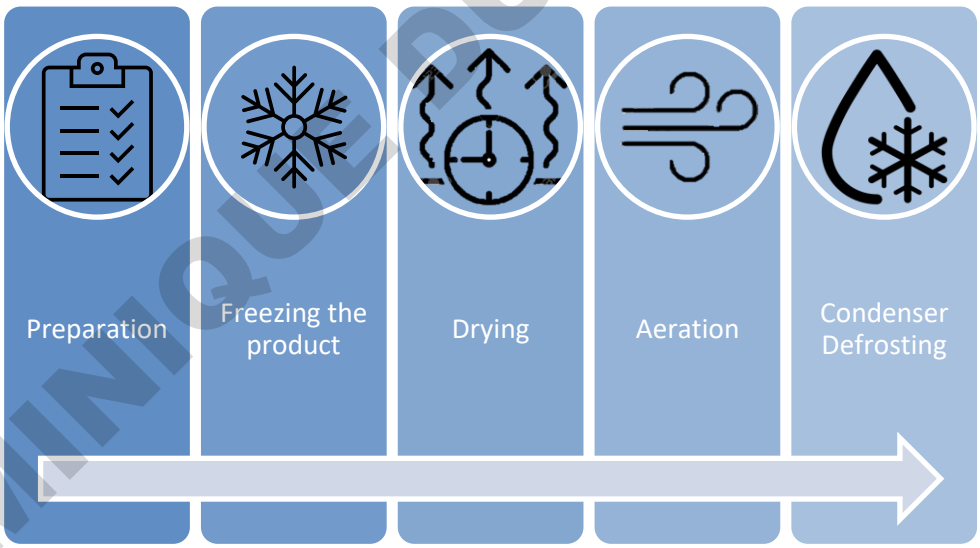


Figure 13. Freezer-drying: Steps to follow.

5.1. Infinity (optional)

In the case of the Triepic Infinity freeze dryer, it is prepared to perform endless freeze dryer cycles, so that the 2 condensers alternate so that when one is cooling, the other is defrosting and vice versa.
The freeze dryer is already factory programmed to perform automatic defrosting of the condensers every 48 hours, to prevent them from filling with ice to the maximum and collapsing.

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6. Screens Navigation

This manual contains the most relevant information about the control system that monitors the freeze dryer. This application is operated from a touch screen located on the front of the unit.

When the main switch is activated, the system starts with the initial screen.

In this main screen the contact details of the manufacturer are displayed.



Figure 14. Initial screen.

The top panel of the screen is the Navigation Panel which indicates at all times which screen we are on by colouring the icons green.



Figure 15. Navigation panel.

To start the system, click in the center of the screen to go to the Log-In screen.

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6.1. Log In & User Management

The system is user and password protected to restrict user access.

To log in you must enter your credentials and then press the "Confirm user" button.

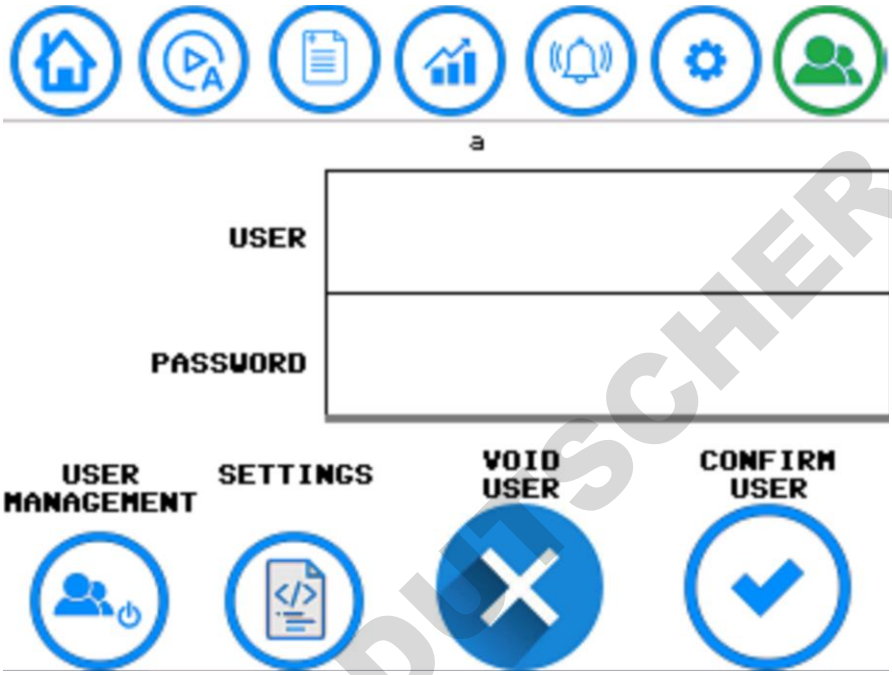


Figure 16. Log in - Without a registered user.

The following table describes the users and passwords that are defined as standard:

Table 4. Predefined access data.

Access data	User	Password
Security Group 04 ADMIN	admin	5555
Security Group 02 MAN	man	4321
Security Group 03 USER	user	1234

Once the user has been Confirmed and the session has started, the user with which we have registered appears at the top of the screen. At this point the freeze dryer functions can be performed.

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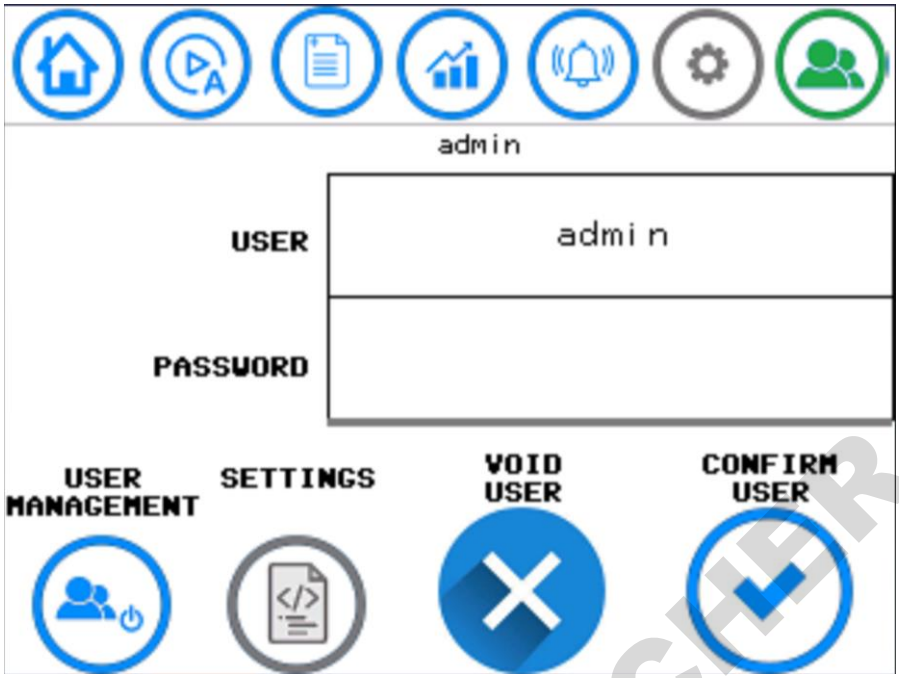


Figure 17. Log In - Registered user.

In the Log In screen you will find the User Management and settings button.

By clicking on the user management button, the following screen appears from where you can create / edit / or delete users, as long as you are registered with the appropriate level.

<u>To create a new user:</u>

1. Choose the group you belong to
2. Type a new user
3. Type a new password
4. Press **+**

<u>To delete a user:</u>

1. Select user
2. Press **-**

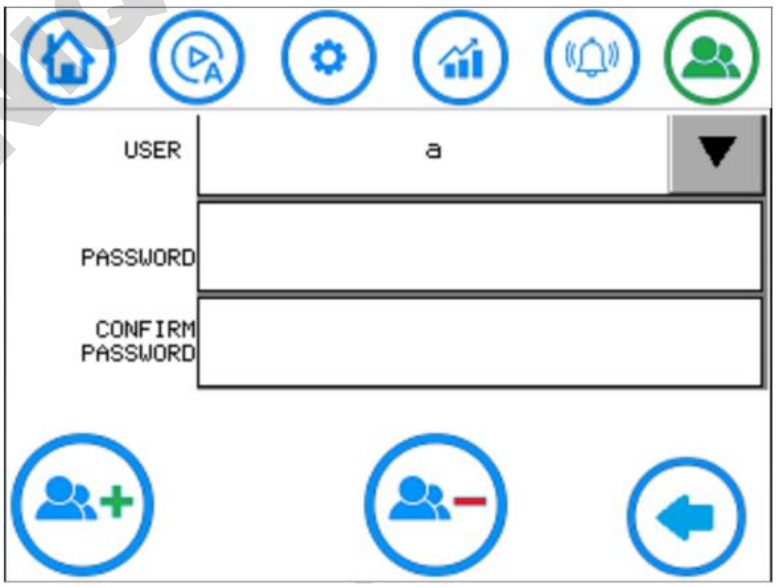


Figure 18. User management.

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In this drop-down menu you can see the different groups that may be available.

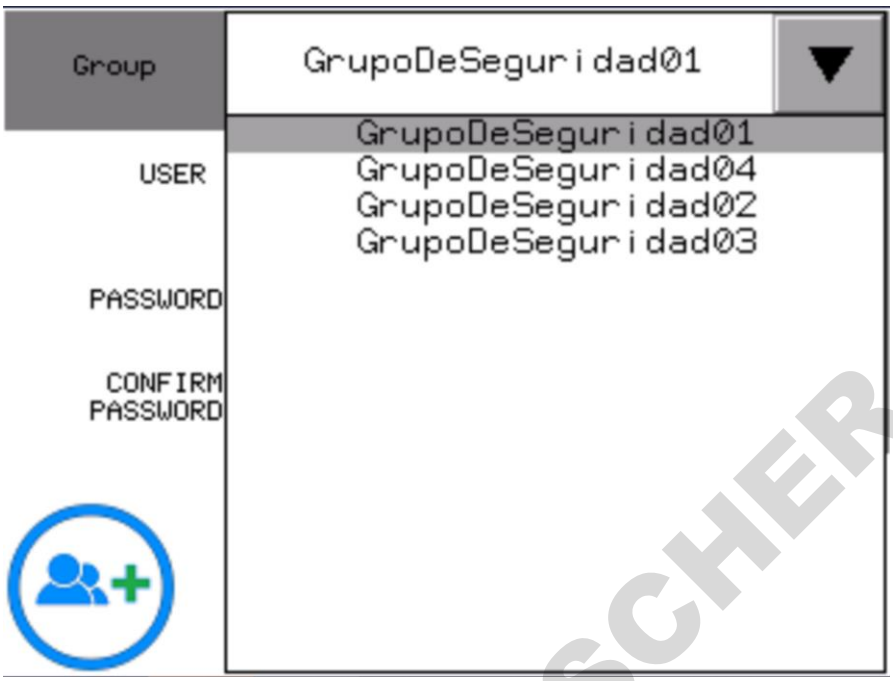


Figure 19. User management - Security group.

The following table describes the access differences for each User Group:

Table 5. User Group.

Description of the action	Grup 04 (ADMIN)	Grup 02 (MAN)	Grup 03 (USER)
User management	x		
Automatic cycle start (Start)	x	x	x
Automatic cycle stop (Pause)	x	x	x
End of automatic cycle (Stop)	x	x	x
Editing freeze-drying cycle parameters (cycle hours)	x	x	x
Defrost start	x	x	x
Edit defrost parameters	x	x	
Manual mode	x	x	

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6.2. Home

Home is the main monitoring screen of the freeze dryer. From this screen you can see immediately the operation of the cycle.

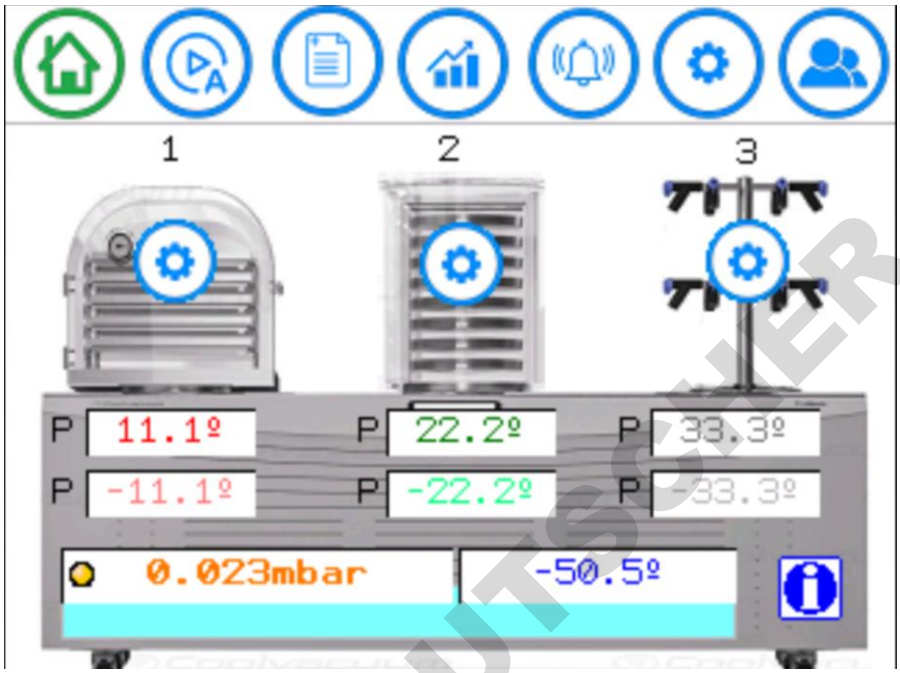


Figure 20. Home.

- The first of the data indicates in (ºC) the temperature set by the product probe. This probe can be switched on and off, which can be useful when freezing the product in a separate freezer. It is recommended to freeze the product with the product temperature probe already inside the tray. In this way the temperature that it will mark during the whole cycle will be more accurate since it will be inside the product and there will be no false contact of any kind.
- The second data indicates the vacuum level (mbar).
- The last two temperatures indicate the temperatures in (ºC) of condenser 1 and condenser 2. The box is red if the temperature is positive and therefore a defrost is being carried out, or if on the contrary it is negative and what we are doing is cooling the condenser.

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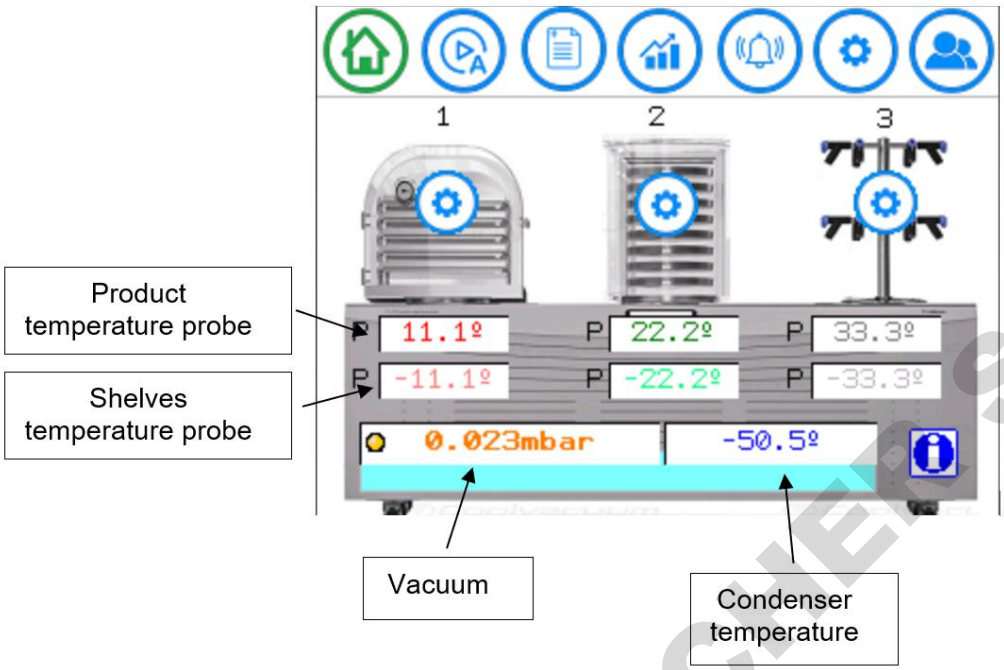


Figure 21. Home - Supervision data.

By pressing the "Information" button, a table form the top is displayed to show information of temperature, time and vacuum of the process running.

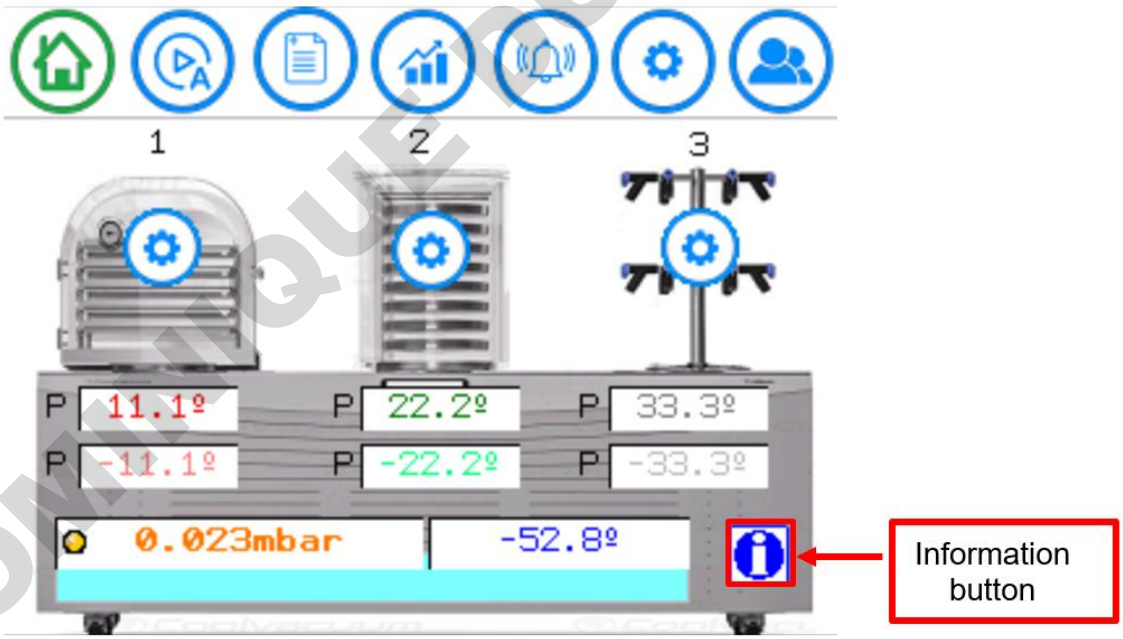


Figure 22. Home - "View more" button.

An orange/blue bulb is marked for motors that are on or valves that are open. And a black bulb (off) for motors that are off or valves that are closed.

In the information table that is displayed we can see the set-points and current value of the temperature, vacuum and time. We can also see the steep that the process is currently in.

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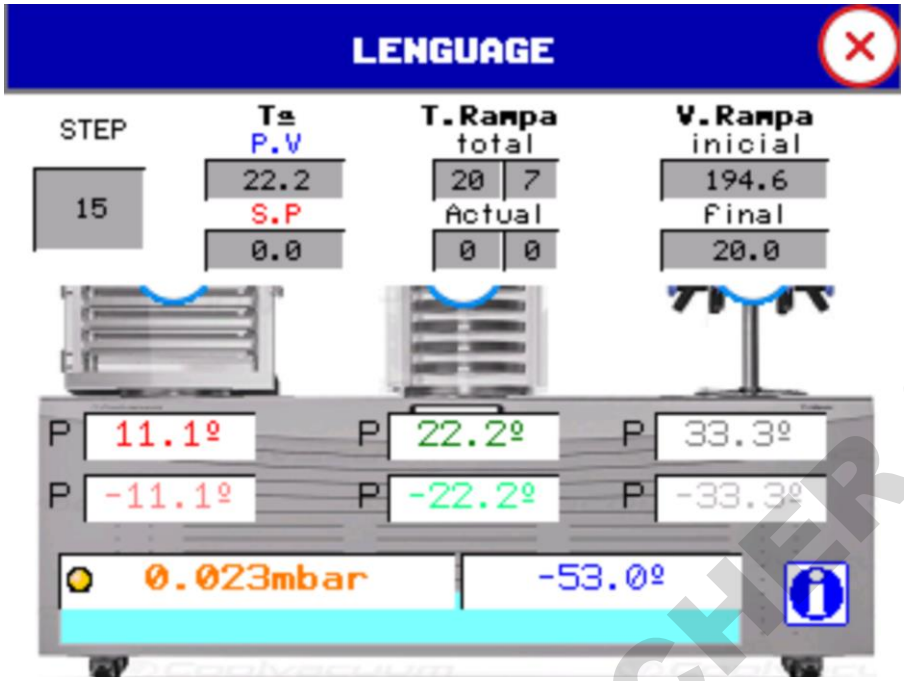


Figure 23. Home - More supervision information.

In the Home screen there are information bars under each chamber. These are information bars showing the status of each cycle. They represent a percentage of the elapsed cycle.

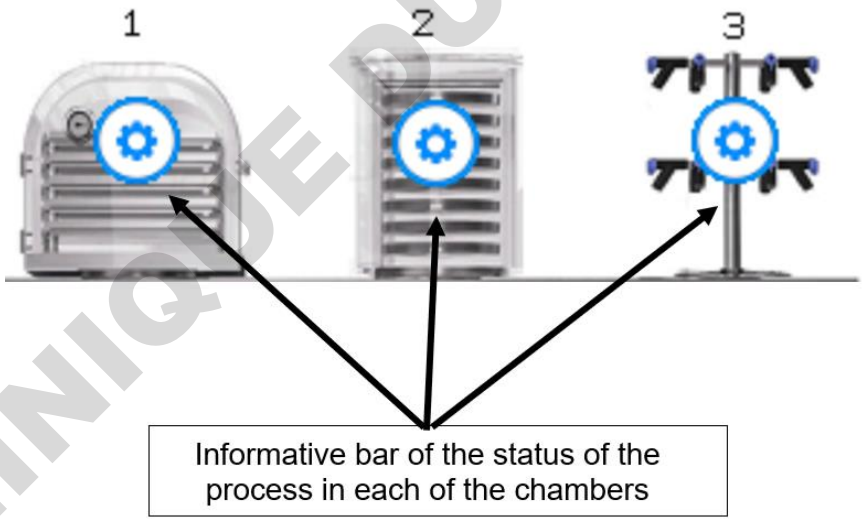


Figure 24. Home - Informative bar.

Each chamber can be programmed separately to perform cycles of different durations, so each accessory has its own settings button.

By clicking on the accessory or chamber settings button 1, the following tab opens:

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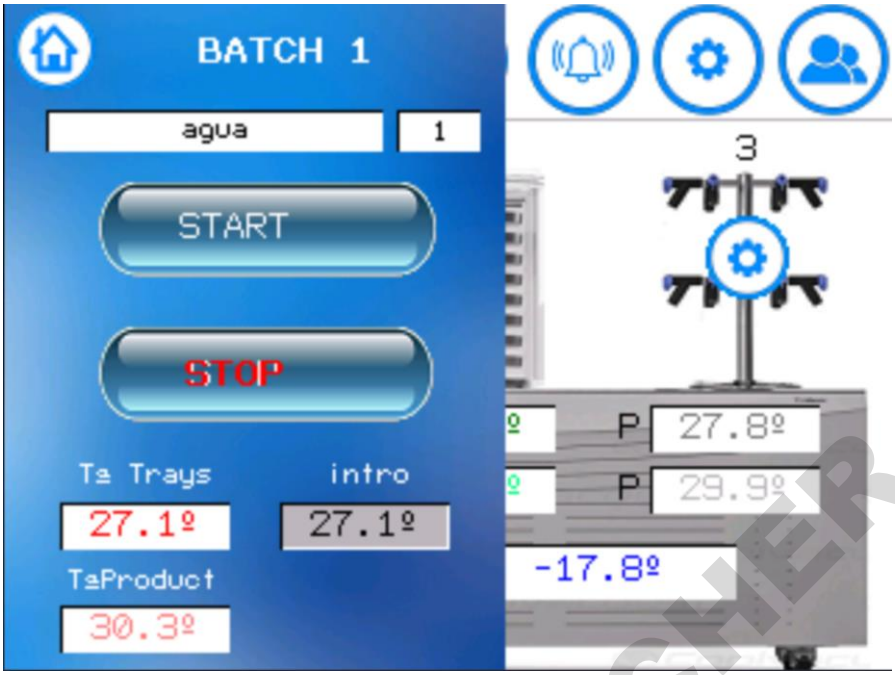


Figure 25. Home - Product 1 settings.

In the upper part it is possible to write a specific Batch or Reference for each cycle or each product. This reference will be reflected in the data table extracted from the freeze dryer, which will be stored in the SD memory.

In the central part of the settings panel, the cycle status bar is displayed again, showing a percentage of the elapsed time.

In addition to the following buttons, from which the freeze-drying cycles are controlled:

START: Start of the programmed automatic freeze-drying cycle.

STOP: End of the programmed freeze-drying cycle. With this action the "Product 1" accessory is isolated from the rest by closing the butterfly valve and it is possible to perform the individual aeration of this single batch.

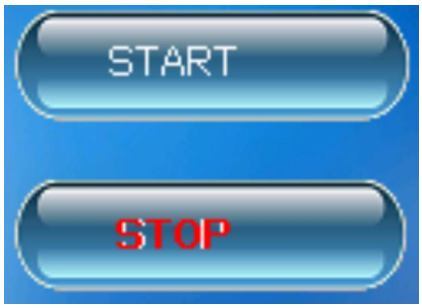


Figure 26. Home - Product settings 1 - Actions.

The actual phase of the accessory will light in red if it is the “STOP” and green if it is the “START”.

The settings tabs for chambers 2 and 3, which work exactly the same as chamber 1.

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6.3. Operation Mode



Figure 27. Operation Mode.



AUTOMATIC MODE: The green bulb lights up if any of the chambers is in operation. That is, if any freeze-drying is in progress.



MANUAL MODE: With the appropriate user level, motors can be turned on or off, or valves can be closed and opened independently.



DEFROST: The left green bulb lights up when defrosting compressor. For more information about the defrost cycle, see section *6.3.2. Defrost*.

6.3.1. Manual Mode

Pressing the Manual Mode settings button opens the Manual Mode synoptic screen.

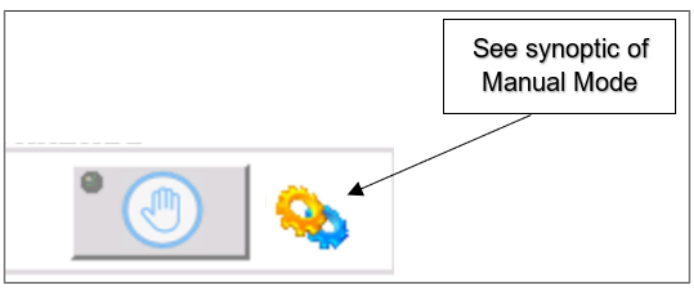


Figure 28. Operation mode - Manual.

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In the manual mode synoptic, all components of the freeze dryer are represented by symbols.

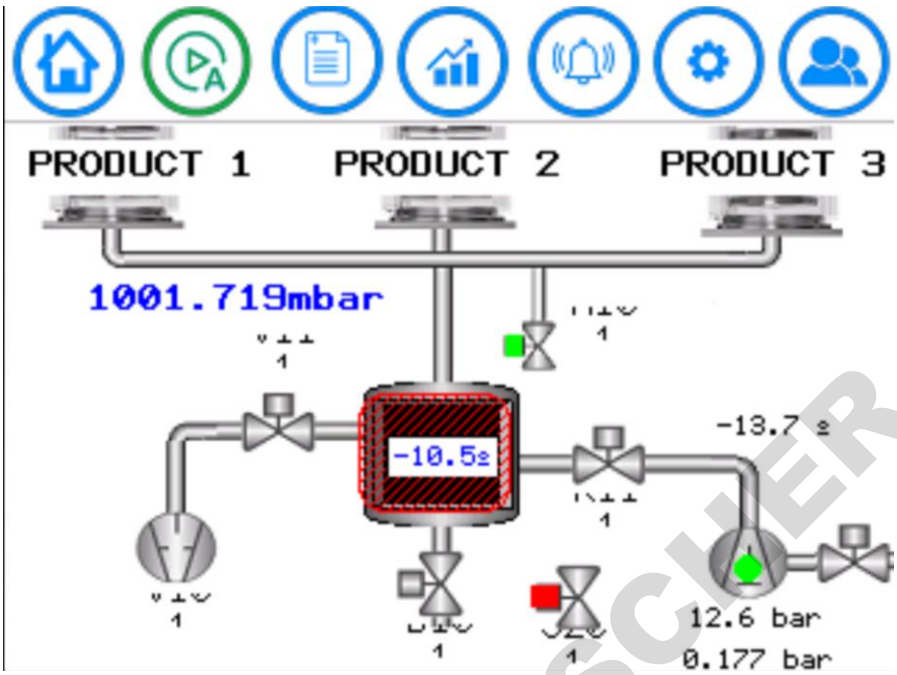


Figure 29. Operation mode - Manual - Synoptic.

6.3.2. Defrost

Pressing the ON/OFF button start or stop the defrost.

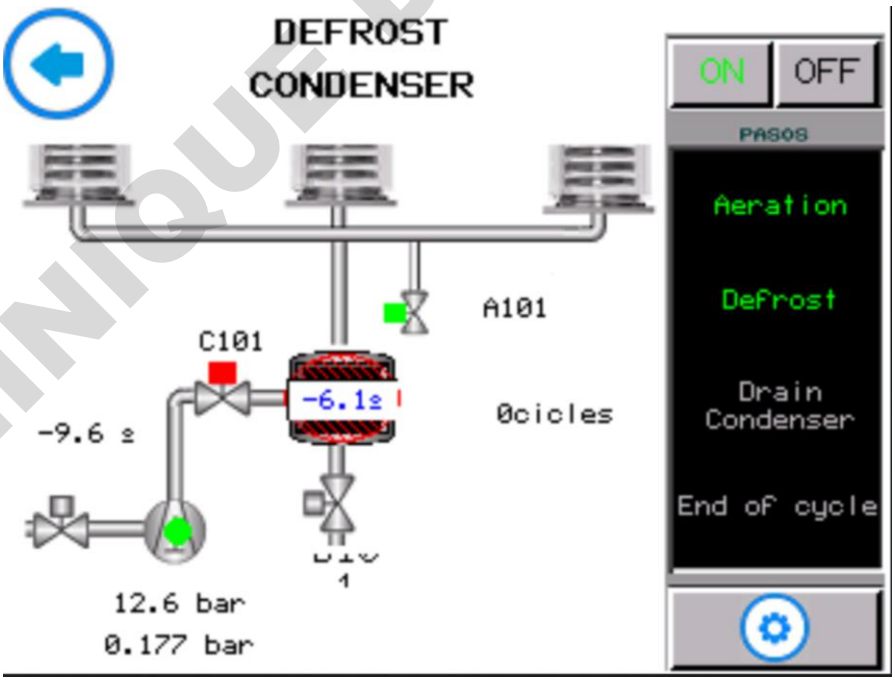


Figure 30. Operation Mode - Defrost.

The cycle sequence is as follows:

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1. **Aeration:** This cycle preforms an aeration to eliminate the vacuum in the condenser, the aeration will not end until reaches atmospheric pressure.
2. **Defrost:** By means of the refrigeration system connected in reverse, hot steam is injected into the condenser to melt the accumulated ice.
3. **Drain condenser:** Once the ice has melted, the water is drained.
4. **End of cycle:** This sequence marks the end of the defrost preformed.



Figure 31. Operation Mode - Defrost



In the defrost cycle settings button, the user can program the times in each of the stages of the cycle. And repeat the cycles as many times as necessary.

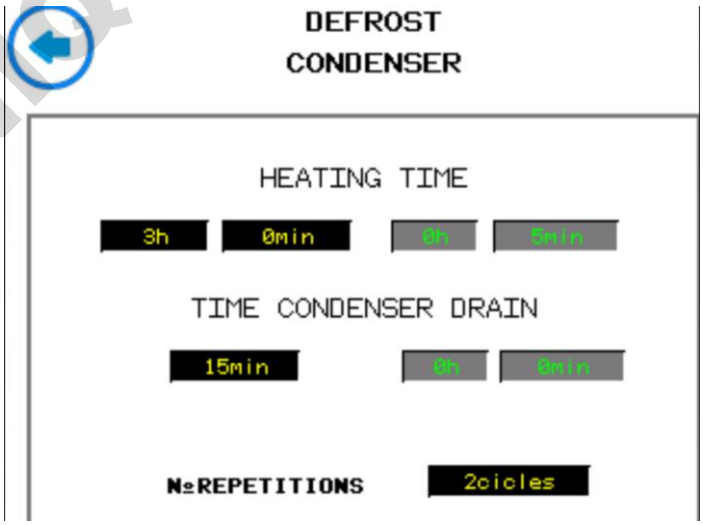


Figure 32. Defrost setpoints.

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6.4. Settings

In the settings screen, there are all the programmed parameters related to: freeze-drying set-points, probe calibrations, motor counters, compressors, programmer settings.

The main screen of settings will display the lyophilization sett-points.

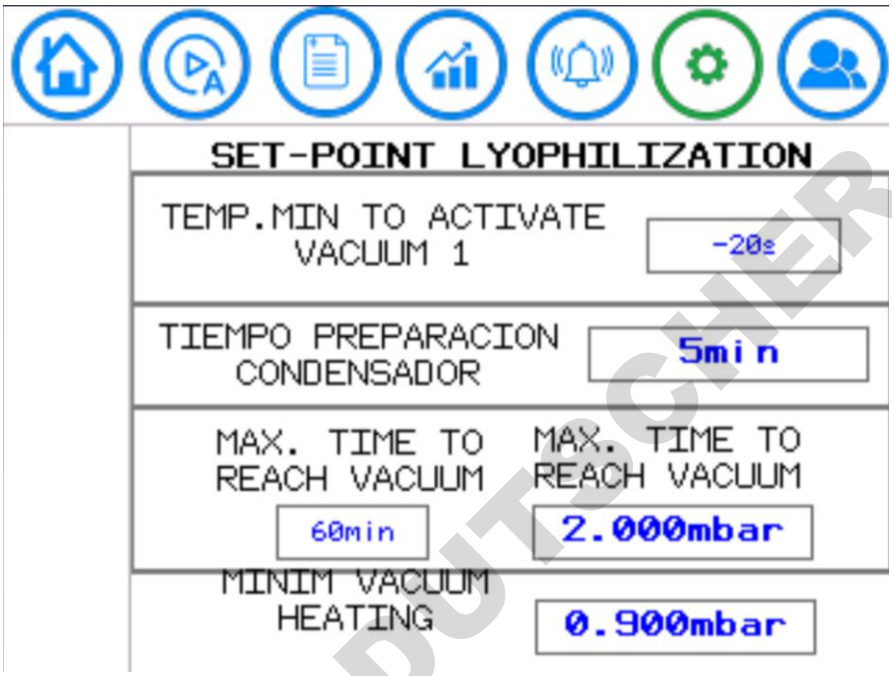


Figure 33. Lyophilisation settings.

To access the general settings screen, you need to access from the users log in screen.

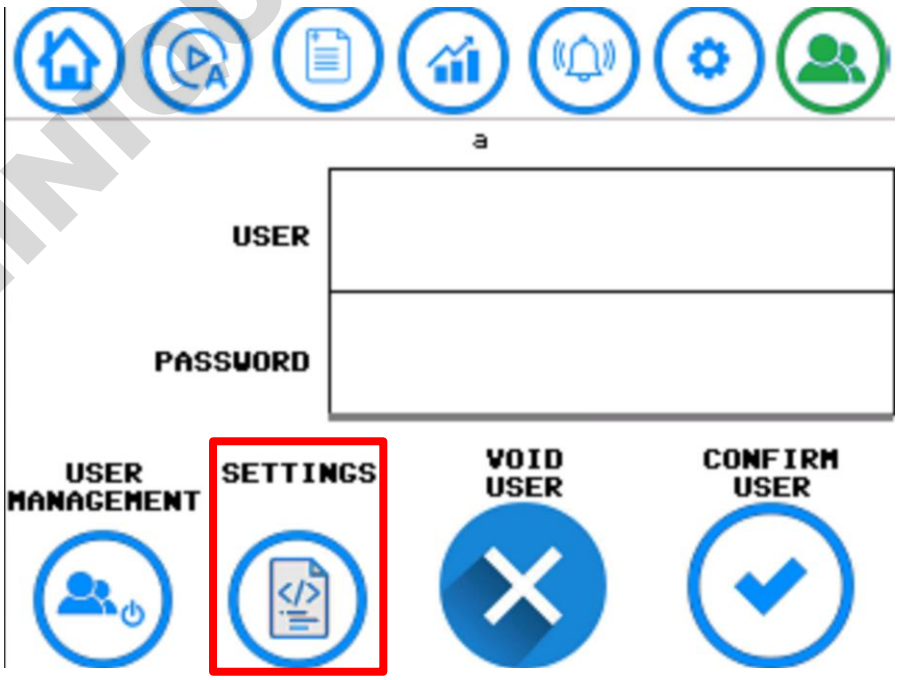


Figure 34. Settings.

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From this screen you can access to all the settings of the machine.



Figure 35. Settings main screen.

6.4.1. Set-points

In the set-points screen you can modify all the parameters from the lyophilization:

- Temperature minimum to activate vacuum (ºC)
- Time of condenser preparing (min)
- Maximum time to reach vacuum (min)
- Minimum vacuum to reach (mbar)
- Minimum vacuum heating (mbar)

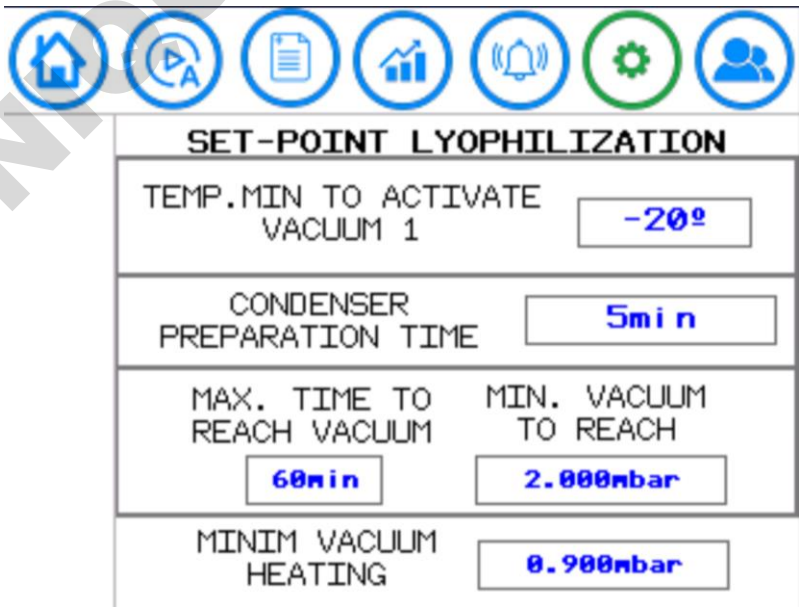


Figure 36. Lyophilization settings.

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6.4.2. Calibrations

In this screen you can calibrate the vacuum sensor and the condenser temperature sensor.

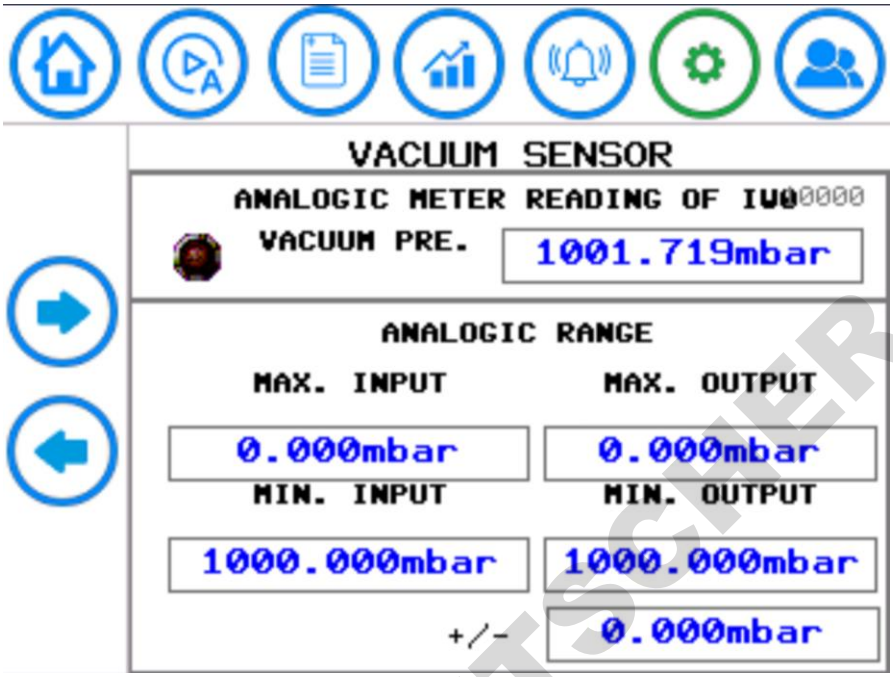


Figure 37. Vacuum sensor calibration.

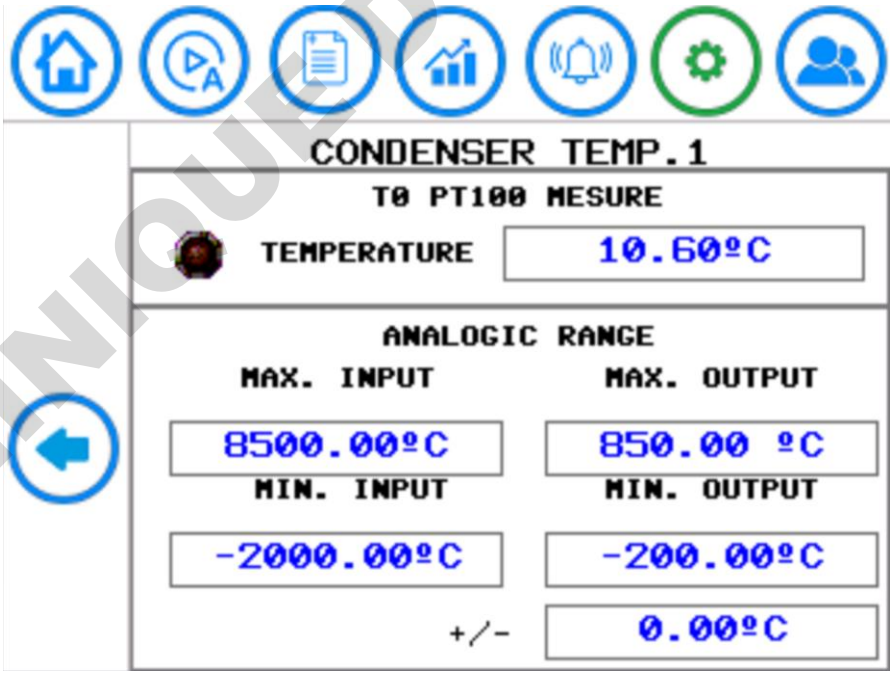


Figure 38. Condenser calibration.

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6.4.3. Accountants

In this screen you can supervise and reset the timers for the compressor and vacuum system.

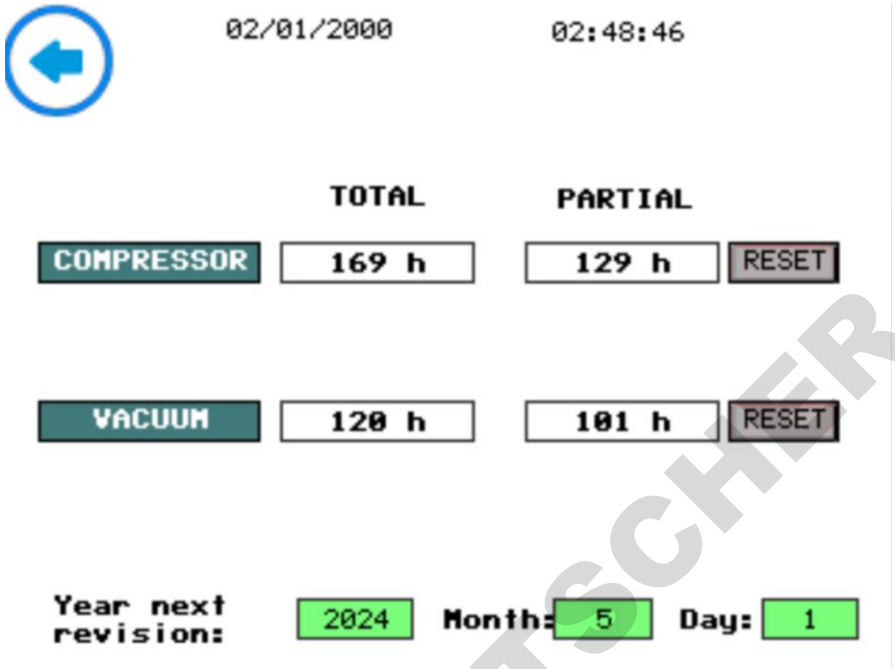


Figure 39. Settings: Accountants.

6.4.4. Compressor

From this section we can supervise the compressor, cold control and pressure switches set-points and settings.



Figure 40. Compressor main screen.

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Figure 41. Compressor settings.



Figure 42. Cold control.

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Figure 43. Pressure switches.

6.4.5. Programmer settings

From the programmer settings you can program the data recompiled and the HMI.

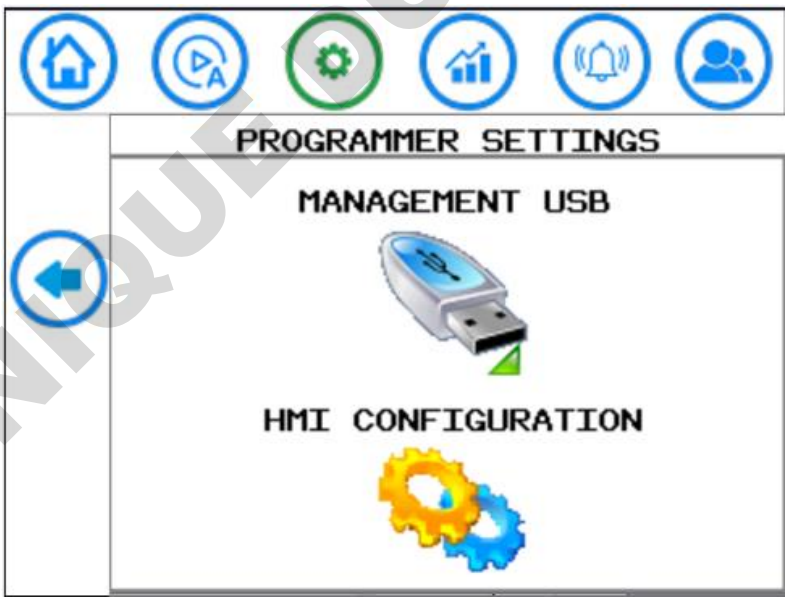


Figure 44. Settings - Programmer settings.

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6.4.6. USB Management



Figure 45. Settings - Programmer settings - USB management.

6.4.7. Configuration HMI

From the HMI configuration you can modify:

- The version and date the PLC have received a change or actualization.
- Upgrade the time in PLC
- Configuration of the system (It is highly recommended to not change the configuration system that is programmed from default)
- Errors registry
- Load setting factory
- Counters
- Language
- Compressor

It is highly recommended to not change the configuration system that is programmed from default.

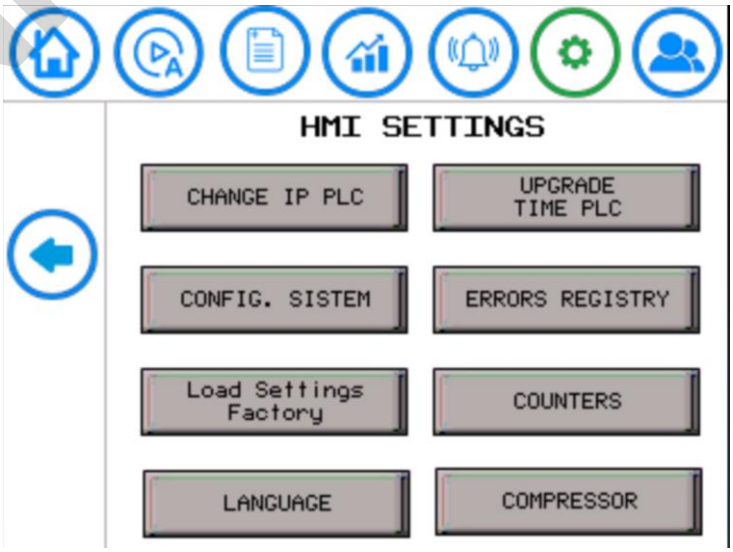


Figure 46. Settings - Programmer settings - HMI Configuration.

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6.5. Trends

The graphical display shows the evolution of the cycles.

IMPORTANT: For this screen to work, it is necessary to connect an external USB memory stick to the USB input on the front of the freeze dryer.

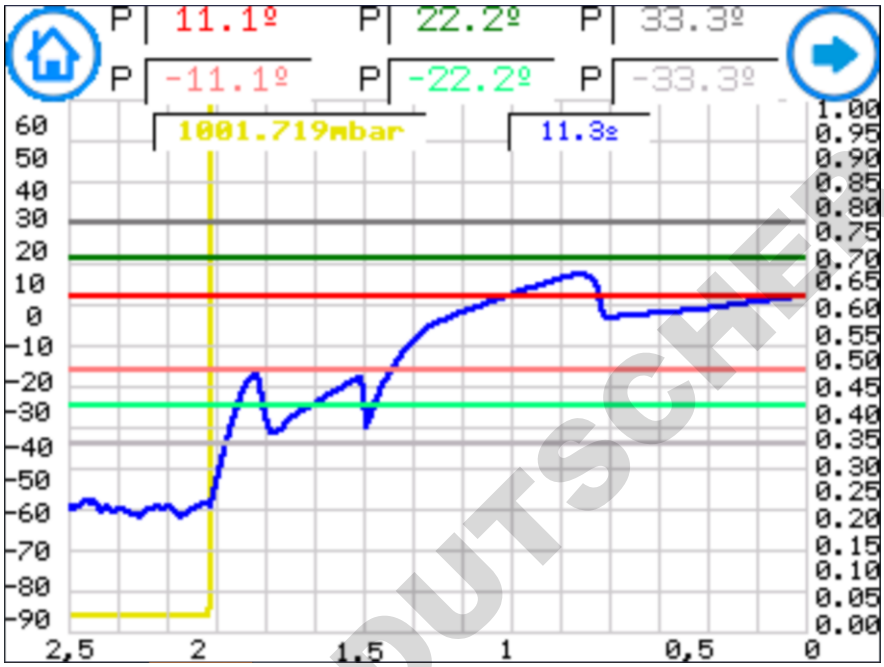


Figure 47. Trends.

In this second graph screen it is possible to select a specific date and time period to display the data.

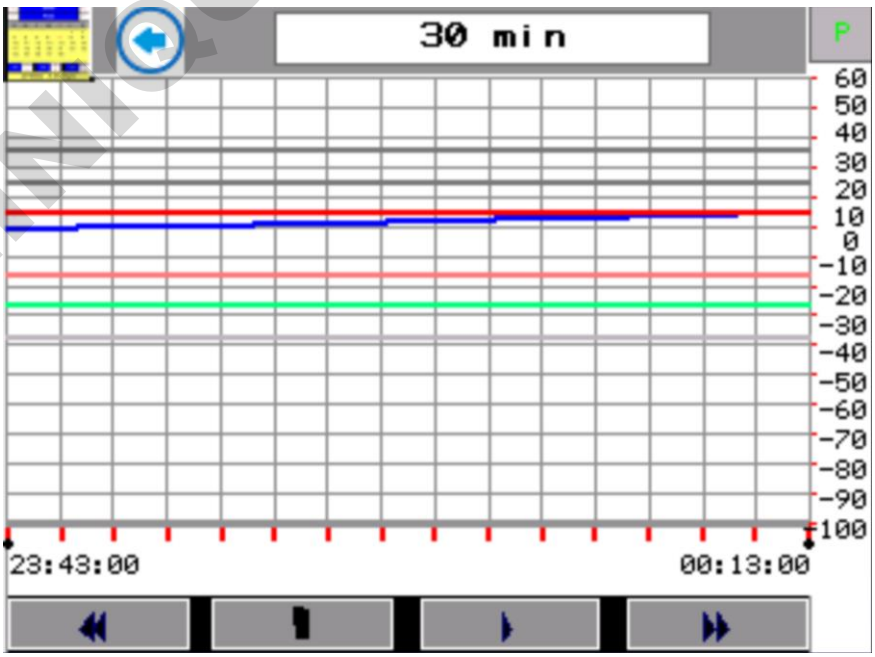


Figure 48. Selection of time.

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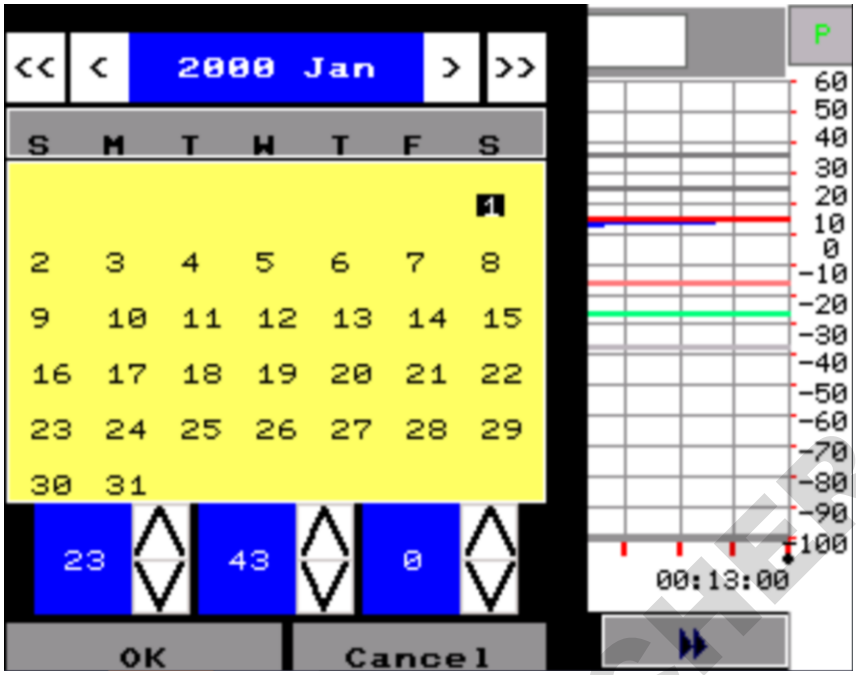


Figure 49. Selection of date.

6.6. Alarms

In the alarms screen you can view the Alarms user logs history.

Although when an alarm appears in the system, a red line flashes on the main screen until it is reset.

To reset the alarms, the problem must be solved and then press the "Reset" button.



Figure 50. Active alarms.

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Figure 51. Alarms register.

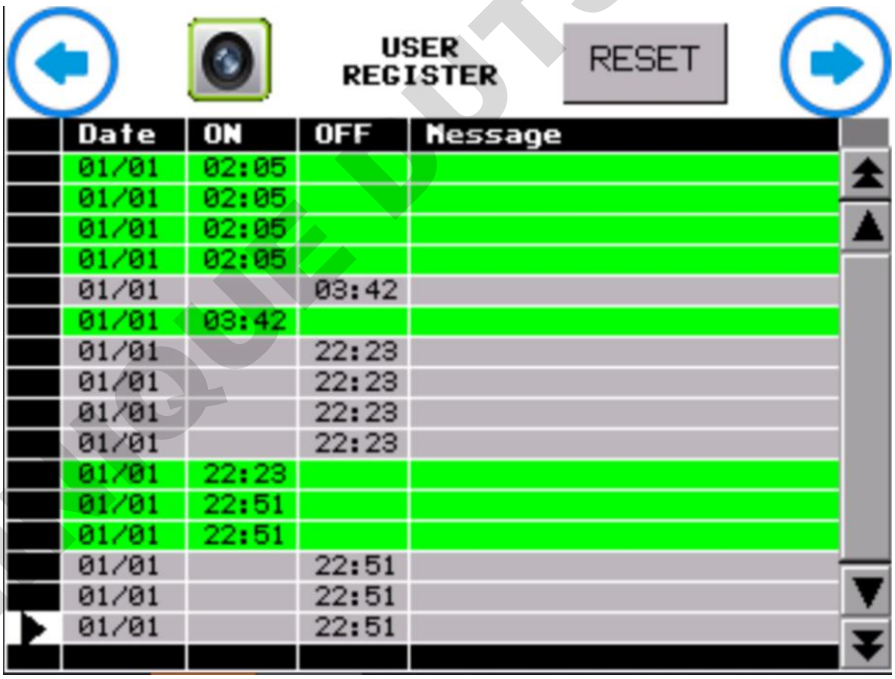


Figure 52. User register.

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