

1. INTRODUCTION

The LAE **WFM-1** WiFi module allows an LAE controller fitted with TTL (version WFM-1) or RS485 serial port (version WFM-1B) to be connected to a cloud.

Connectivity is bidirectional: the WiFi module send data to the cloud for storage or monitoring; from the cloud, commands or configurations may be sent to the connected controller.

2. CONNECTIONS

- Connect the WFM-1 to the TTL or RS485 port of the controller via the FC04-10DP01 cable that LAE supplies with the module.

IMPORTANT: the controller must provide a 5V voltage to the serial connector for the WFM-1 to be powered.

- Power the controller.
- To publish data on the cloud, the WFM-1 must connect to a router with 2.4GHz WiFi.

3. SETUP

It's possible to configure the WFM-1 parameters via a PC, smartphone or tablet.

Every time that the WFM-1 is powered, this creates a WiFi Access Point (AP) with SSID=LAE_XXXXXX and password=12345678.

The WFM-1 remains in this mode for approximately 2 minutes, when they elapse, if no connection has taken place, it will turn off and turn on again in the previously set operating mode.

If it connects within 2 minutes to the WFM-1, this remains in the Access Point mode till the configuration has been completed.

- To connect to the WFM-1 using a PC:
 - Click on the  icon, low right close to the clock.
 - After connecting, it's possible to get access to the internal web server typing in the address 192.168.4.1.

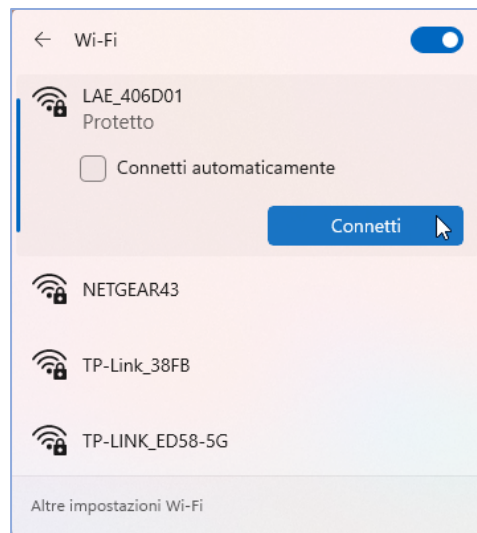


FIG. 1 CONNECTION TO THE ACCESS POINT (PC)

- To connect to the WFM-1 using a smartphone or tablet:
 - Using a camera of the device, scan the QR Code identified with “1” present on the WiFi module

Note: it's also possible to connect to the WFM-1 by searching the network through the WiFi settings of your own device.

- After connecting, it will be possible to get access to the internal web server by typing in address 192.168.4.1 or scanning the QF identified with “2” present on the WiFi module.



FIG. 2 WFM-1

Note: at the end of the configuration of WFM-1 (see following paragraphs), if the “machine serial number” parameter has been set only with alphanumeric characters (for ex.: sn0001), it's possible to get access to the web server by typing the value of the “machine serial number” parameter in the address bar, followed by local/(for ex. Sn0001.local/).

During the first access to the web server, it's necessary to set a new access password:

The screenshot shows a web browser window with the title 'WFM-1 - Set Password'. The address bar shows 'Non sicuro 192.168.4.1/login'. The main content area features a 'Set New Password' form with two input fields: 'Enter password' and 'Confirm password', followed by a blue 'Set Password' button.

FIG. 3 SETTING A NEW PASSWORD

This password is necessary for the following access to the web server.

In case of password loss, read chapter 6 “Forgotten access password”.

After getting into the web server, the first page displayed is the Home Page:

The screenshot shows the 'WFM-01, Home page' of a web interface. It includes a navigation bar with links: Home, Advanced, Status, About, Reserved Area, and Logout. The main content area is titled 'WiFi Scan result' and contains a 'Refresh' button. Below this is a table of scan results:

SSID #	SSID	Signal
SSID #1	NETGEAR43	4/4
SSID #2	TP-Link_38FB	4/4
SSID #3	TP-LINK_ED58-5G_2E	4/4
SSID #4	LAE_2.4GHz	4/4
SSID #5	LAE_2.4GHz	1/4

Below the table is the 'WiFi Configuration' section, which includes a dropdown menu for 'Station, SSID', input fields for 'Station, password' (with 'Enter password' and 'Confirm password' labels), and 'Save' and 'Reset' buttons at the bottom.

FIG. 4 HOME PAGE

In the web server it's possible to check the operation state of the WiFi module or configure its parameters.

Parameter configuration is divided into two levels: in the "base" level, accessible to all users, simple operations are possible such as connecting WFM-1 to a local AP and set the WiFi module communication to the cloud.

To get access to the "advanced" configuration, it's necessary to get access to the reserved area by typing in username and password.

The username is always "user"; the password is "P4sswOrd" at the first power-up; later it's possible to modify it inside the "Advanced" tab into the "System" section.

In case of password loss, read chapter 6 "Forgotten access password".

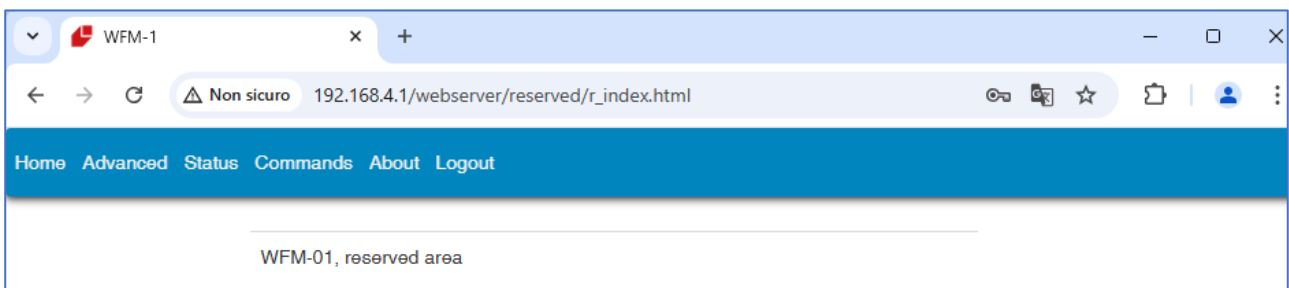


FIG. 5 HOME PAGE, RESERVED AREA

Get access to the "Advanced" tab to configure the WFM-1.

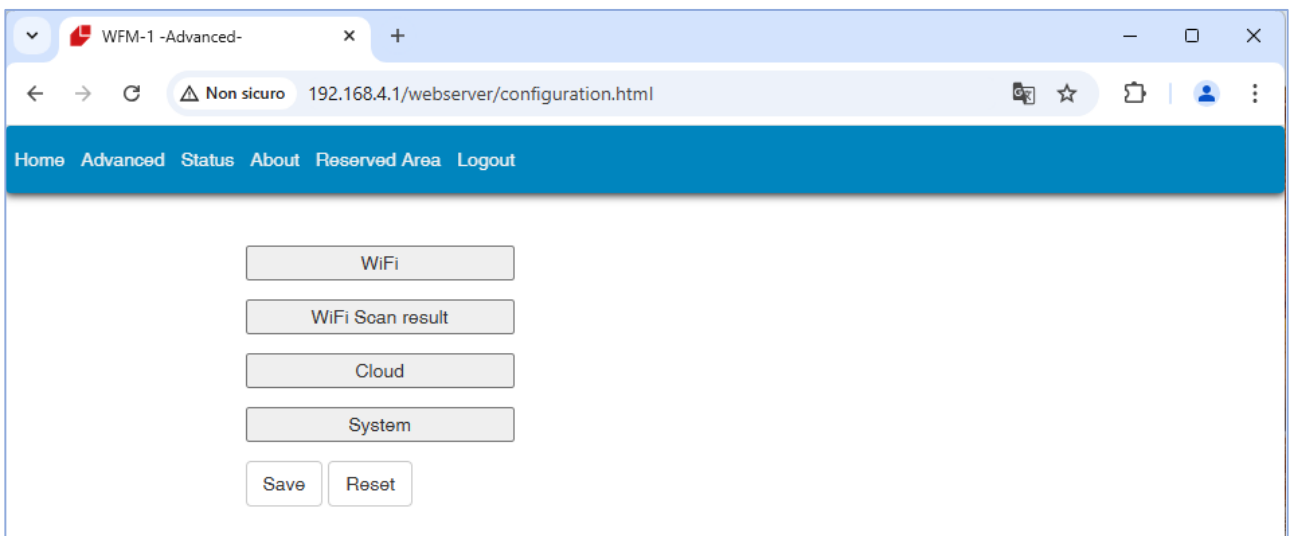


FIG. 6 ADVANCED

To connect the WFM-1 to the cloud service, just configure the parameters of the “WiFi”, “Cloud” and “Modbus” submenus (the latter is described at paragraph 5).

1. WiFi

Use this submenu to configure WiFi connectivity.

WFM-1 -Advanced-

192.168.4.1/webserver/configuration.html

Non sicuro

Home Advanced Status About Reserved Area Logout

WiFi

WiFi Configuration

WiFi mode

Access Point

Station, SSID

Station, password

Enter password

Confirm password

Station, DHCP: IP address

0000

Station, DHCP: Net Mask

0000

Station, DHCP: Gateway address

0000

Station, DHCP: DNS address

0000

MAC address

F0:F5:BD:25:F7:24

WiFi Scan result

Cloud

System

Save

Reset

FIG. 7 WiFi CONFIGURATION

To be able to send data to the cloud, the WFM-1 must have access to Internet. So it's necessary to connect the WFM-1 to a local WiFi router fitted with Internet connectivity. Here below are the parameters to be configured:

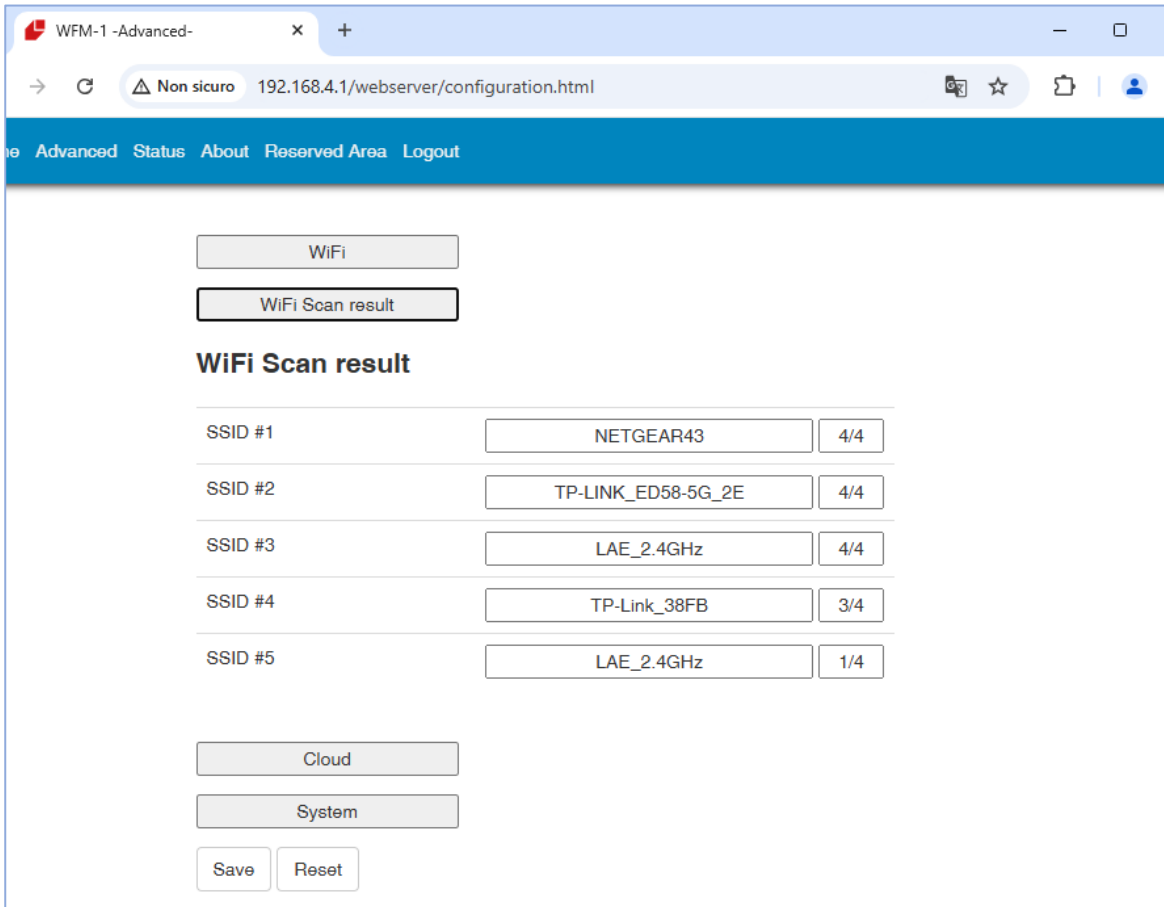
- "WiFi mode": select option "station".
- "Station, SSID": select the SSID in the list of the WiFi network to connect to.
- "Station, password": type in the password of the WiFi newtwork to connect to and confirm it.

Parameters configurable by expert users (reserved area):

- The network addresses of WFM-1 may be set manually by setting "Station, DHCP" on "Disabled". Then, parameters "Station, IP address", "Station, IP subnet mask", "Station, IP Gateway address", "Station, IP DNS address" need to be set, too.

2. WiFi Scan result

In this submenu, the list of the SSID detected by the WiFi module appears.



The screenshot shows a web browser window with the title "WFM-1 -Advanced-". The address bar shows "192.168.4.1/webserver/configuration.html". The page has a blue header with navigation links: "Advanced", "Status", "About", "Reserved Area", and "Logout". The main content area has a sidebar with buttons for "WiFi", "WiFi Scan result", "Cloud", "System", "Save", and "Reset". The "WiFi Scan result" section is active and displays a table of detected SSIDs.

SSID #	SSID	Signal
SSID #1	NETGEAR43	4/4
SSID #2	TP-LINK_ED58-5G_2E	4/4
SSID #3	LAE_2.4GHz	4/4
SSID #4	TP-Link_38FB	3/4
SSID #5	LAE_2.4GHz	1/4

FIG. 8 WiFi SCAN RESULT

3. Cloud

In this submenu, the parameters to get access to the cloud services are configured.

The screenshot shows a web browser window with the title 'WFM-1 -Advanced-'. The address bar shows the URL '192.168.4.1/webserver/configuration.html' with a 'Non sicuro' (Not secure) warning. The navigation bar includes links: Home, Advanced, Status, About, Reserved Area, and Logout. The main content area features three buttons: 'WiFi', 'WiFi Scan result', and 'Cloud'. Below these is the 'Cloud configuration' section. It contains a 'Send data to cloud' dropdown menu set to 'Enabled'. There are three text input fields for 'Machine serial number', 'Machine model', and 'Machine description'. The 'MQTT asset id' field is a text input with the value 'F0F5BD25F724_001'. At the bottom of the configuration section are 'Save' and 'Reset' buttons. A 'System' button is located below the configuration fields.

FIG. 9 CLOUD CONFIGURATION

Basic parameters:

- “Send data to cloud”: set on “enabled” it enables sending data to the cloud.
- “Machine Serial Number”, “Machine model”, “Machine description”: type in data allowing the machine to be identified within the cloud services.
- “MQTT asset id”: the necessary identification code to be able to send data to the cloud.

Parameters that may be configured by expert users (reserved area):

- “MQTT hostname”: URL where the MQTT metrics are to be sent.
- “MQTT port”: port used by the WiFi module to send the MQTT metrics; the default value is 8883. Make sure that this port is not blocked by its own firewall.
- “MQTT username”, “MQTT password”: type in the data received at the subscription of the service.
- “MQTT certificate URL”: URL used by the WiFi module to download the certificate to validate the data to be sent to the cloud.

Note: the WFM-1 is pre-programmed in our factory with values for the connection to the Servitly services.

4. Saving settings

When configuration is over, click on Save to save the newly programmed parameters. The WFM-1 turns off and then on again automatically to be able to use the new configurations.

4. Status

To monitor the status of WFM-1, get access to the “Status” tab. In this page, in case of a malfunction, the possible causes are displayed to ease troubleshooting.

Note: when the WFM-1 is connected to Internet, the blue LED is lit.

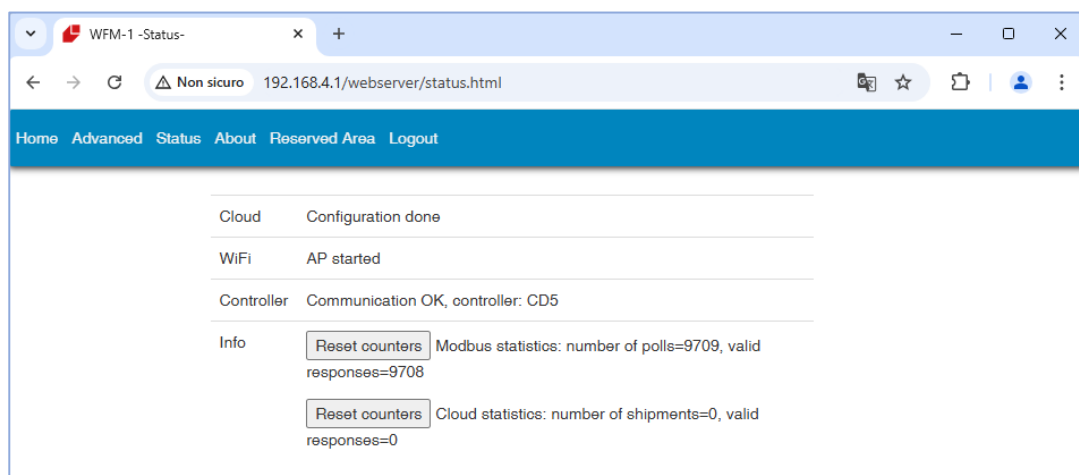


FIG. 10 STATUS

The details displayed are:

- “Cloud”: the cloud configuration status.
- “WiFi”: the communication status between the WFM-1 and the router.

- “Controller”: the communication status with the device connected to the WFM-1.
- “Info”: the communication statistics between the WFM-1 and the device to be monitored and between the WFM-1 and the cloud.

5. SETUP FOR EXPERT USERS

Here below is the description of of the “NTP”, “Modbus” and “System” submenus present in the “Advanced” page (reserved area).

1. NTP

In this submenu, it’s possible to configure the addresses of the NTP (Network Time Protocol) servers.

The screenshot shows a web browser window with the title 'WFM-1 - Advanced-'. The address bar shows the URL '192.168.4.1/webserver/reserved/r_configuration.html' with a 'Non sicuro' (Not secure) warning. The page has a blue navigation bar with links: Home, Advanced, Status, Commands, About, and Logout. The main content area has a sidebar with buttons for 'WiFi', 'WiFi Scan result', 'NTP', 'Cloud', 'Modbus', and 'System'. The 'NTP' button is selected. The 'NTP configuration' section contains four rows, each with a label and a text input field:

Label	Value
NTP address #1	0.pool.ntp.org
NTP address #2	1.pool.ntp.org
NTP address #3	2.pool.ntp.org
NTP address #4	3.pool.ntp.org

At the bottom of the configuration section are 'Save' and 'Reset' buttons.

FIG. 11 NTP CONFIGURATION

2. Modbus

Use this submenu to configure the serial communication with the controller to be monitored.

The screenshot shows a web browser window with the address bar displaying "192.168.4.1/webserver/reserved/r_configuration.html". The page has a blue navigation bar with links: Home, Advanced, Status, Commands, About, and Logout. Below the navigation bar, there are two NTP address fields: "NTP address #3" with the value "2.pool.ntp.org" and "NTP address #4" with the value "3.pool.ntp.org". There are two buttons labeled "Cloud" and "Modbus". The "Modbus configuration" section contains several dropdown menus and a text field: "Controller model" (Autodetect -LAE oor), "Protocol" (ASCII), "Baudrate" (9600), "Word length" (7 bit), "Parity" (EVEN), "Stop bit" (1 stop bit), and "Slave address" (1). At the bottom of the configuration section is a button labeled "System".

FIG. 12 MODBUS CONFIGURATION

The configurations to communicate with the LAE controllers are two:

- Controllers with MODBUS ASCII protocol. Set the following values
 - "Protocol": ASCII
 - "Baudrate": 9600
 - "Word length": 7 bit
 - "Parity": EVEN
 - "Stop bit": 1 stop bit
 - "Slave address": 1
- Controllers with MODBUS RTU protocol. Set the following values
 - "Protocol": RTU
 - "Baudrate": 9600
 - "Word length": 8 bit
 - "Parity": NONE
 - "Stop bit": 1 stop bit
 - "Slave address": 1

3. System

In this submenu, it's possible to modify the password to get access to the reserved area of the webserver; moreover, it's possible to change the prefix of the SSID with which the WFM-1 shows itself as Access Point (as a default it's LAE).

The screenshot shows a web browser window titled "WFM-1 -Advanced-". The address bar shows the URL "192.168.4.1/webserver/reserved/r_configuration.html" with a "Non sicuro" (Not secure) warning. The browser interface includes navigation buttons (back, forward, refresh) and icons for security, extensions, and user profile. A blue navigation bar at the top contains links: Home, Advanced, Status, Commands, About, and Logout. The main content area features a vertical stack of buttons: WiFi, WiFi Scan result, NTP, Cloud, Modbus, and System. Below these is the "System configuration" section, which contains two rows of configuration fields. The first row is for "Webserver, reserved area password" with "Enter password" and "Confirm password" input fields. The second row is for "AP wifi, prefix" with a text input field containing "LAE". At the bottom of the configuration section are "Save" and "Reset" buttons.

System configuration	
Webserver, reserved area password	Enter password
	Confirm password
AP wifi, prefix	LAE
Save Reset	

FIG. 13 SYSTEM CONFIGURATION

6. Forgotten Password

If the password is lost/forgotten, it's necessary to reset the WFM-1 to the factory by settings following the procedure hereinafter:

- From the login page, type in password 12345678

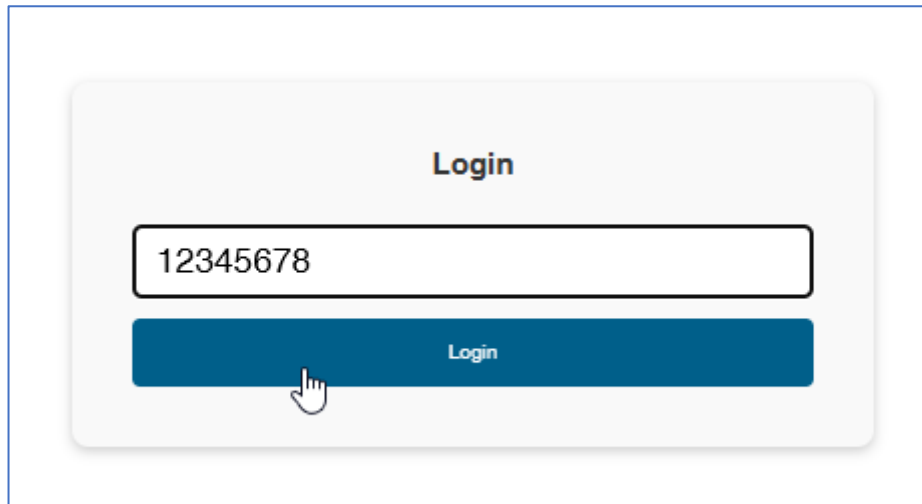


FIG. 14 SYSTEM CONFIGURATION

- In the Reset to Factory Settings page, click on Yes

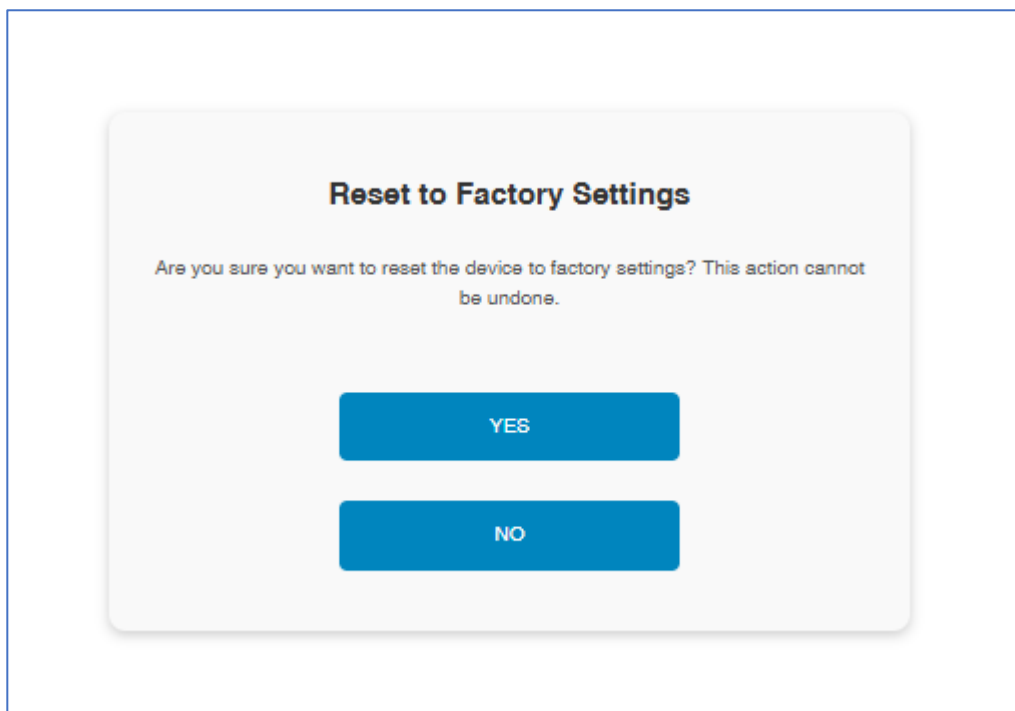


FIG. 15 SYSTEM CONFIGURATION

7. Commands

From this page it's possible to send template files to the WFM-1, to be able to run communication between the controller and the cloud.

The WFM-1 is supplied with the necessary files to be used with almost every LAE device: check with your seller if your controller is already in.

In this page, it's also possible to restore factory configuration to the WFM-1 by clicking on the "Reset to factory default" key, or restart the WFM-1 with key "Reboot".

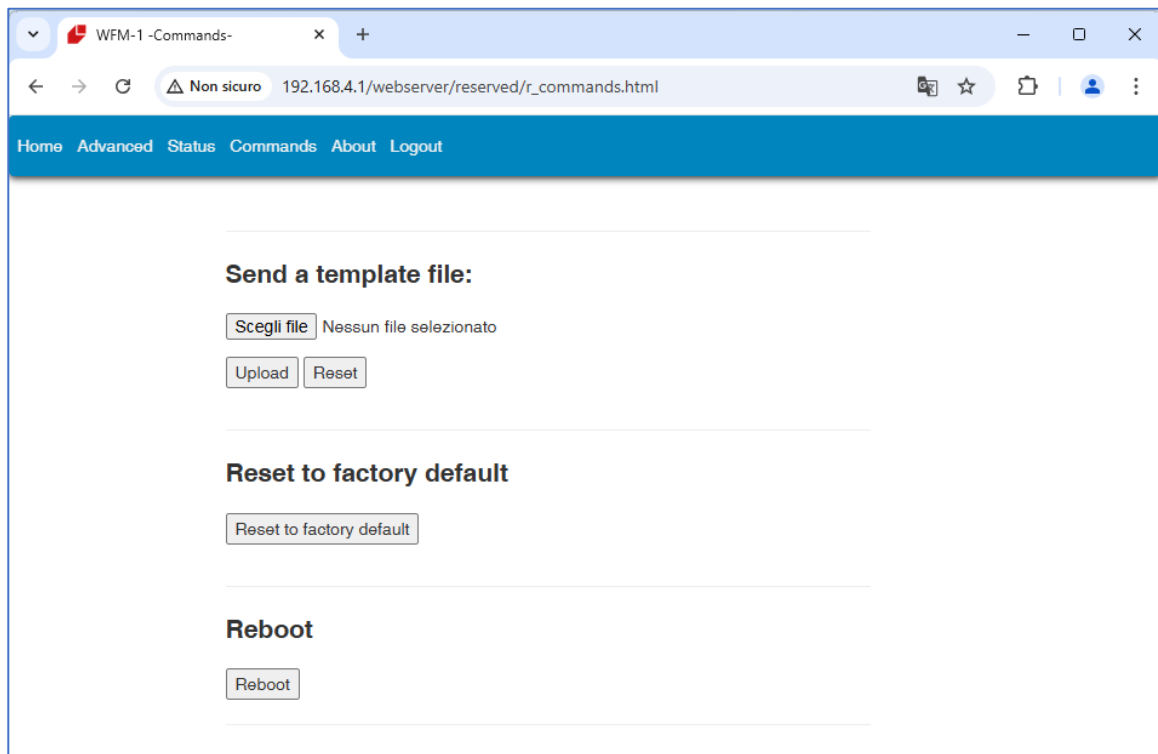
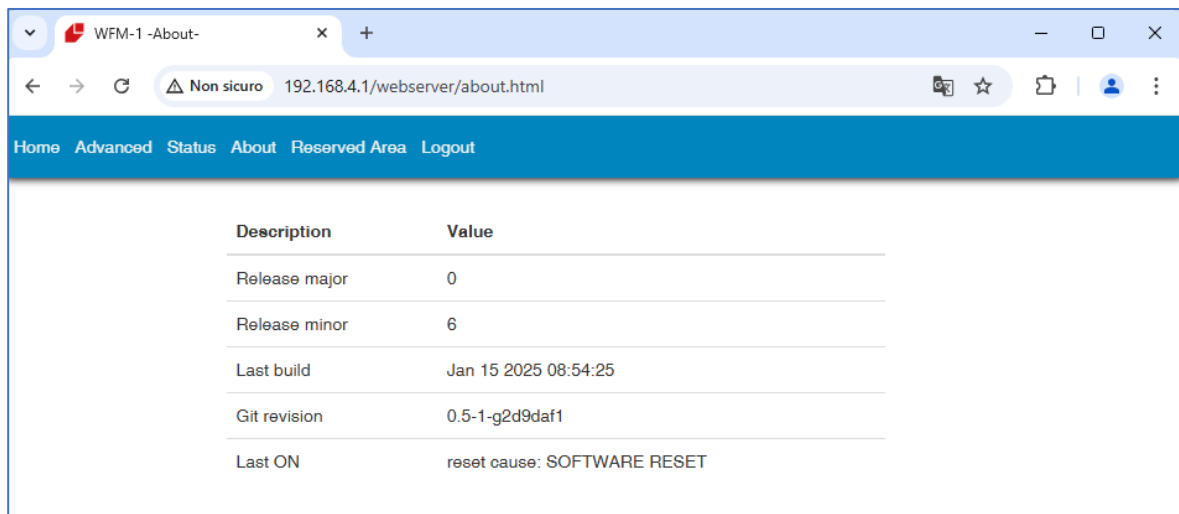


FIG. 16 COMMANDS

8. About

In this page, the details relevant to the firmware release are provided.



Description	Value
Release major	0
Release minor	6
Last build	Jan 15 2025 08:54:25
Git revision	0.5-1-g2d9daf1
Last ON	reset cause: SOFTWARE RESET

FIG. 17 ABOUT

9. Technical Data

- CPU: ESP32-C6
- Core: 32-bit RISC-V single-core microprocessor 160Mhz
- Memory: 8MB FLASH
- OS: Free RTOS
- WiFi: IEEE 8802.11ax 2.4 GHz Wi-Fi 6 (Fully compatible with IEEE 802.11b/g/n protocol)
- TTL/RS485
- Power supply: 5 Vdc from an LAE controller
- Size: 67.5 x 35 x 15 mm

10. Approvals

FCC	2AC7Z-ESPC6WROOM1
IC	21098-ESPC6WROOM1
KR	R-C-es5-ESP32C6WROOM1

CN	24J31H8DC601
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11. How to order

Model	Version	Customisations	Description
WFM-1			External Wi-Fi module with connectivity for LAE controllers to the Cloud
	A		TTL version
	B		RS485 version
		-...N	Customisation pro Customer, with a progressive N number

12. SUBSCRIBING TO SERVITLY SERVICE

To subscribe to the Servitly service and display the published data on the cloud, please provide LAE with a valid email address, necessary to do the login to the site <https://lae.servitly.com/> and receive the notifications relating to the alarms of the devices connected to the WFM-1.

Within 48 hours, you will receive an email by Servitly with the indications on how to set your own password.

After setting it, it will be possible to connect to the site and do the login.

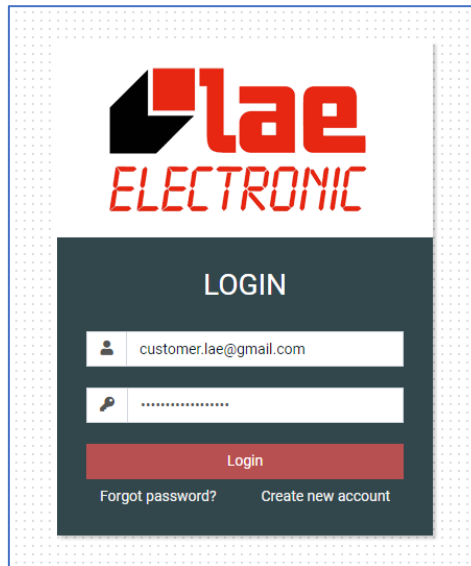


FIG. 18 SERVITLY - LOGIN

13.OVERVIEW

After login in, the page with the localisation of the WFM-1s connected to the account opens.

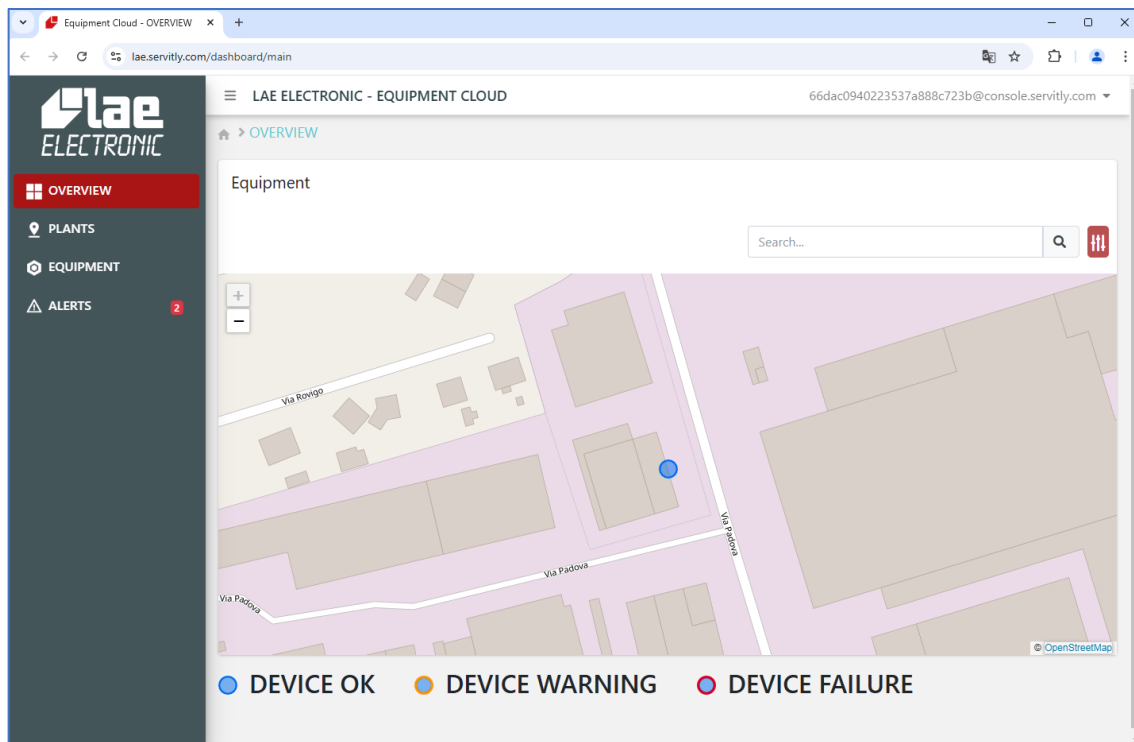


FIG. 19 OVERVIEW

14.PLANTS

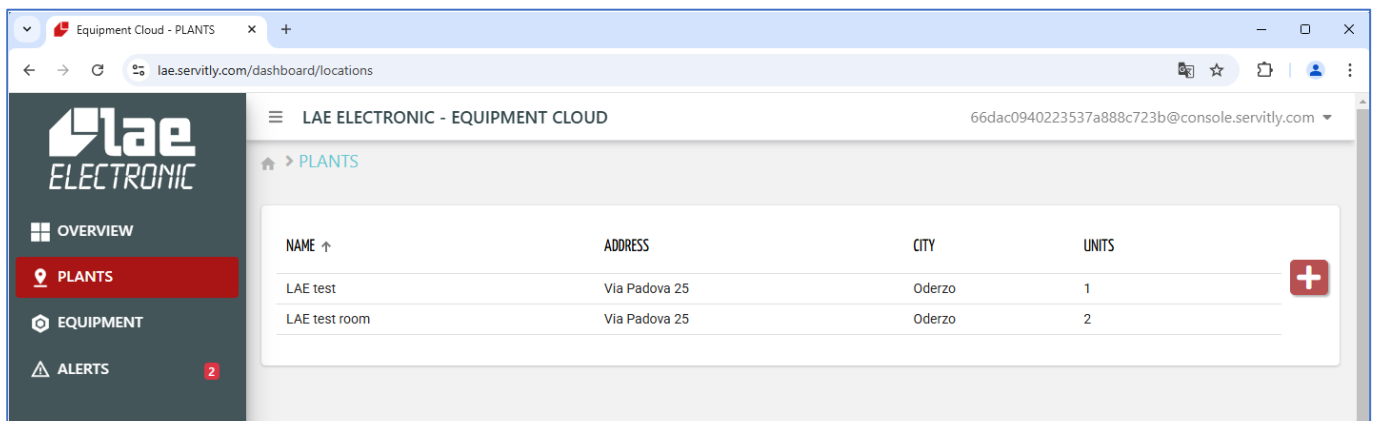


FIG. 20 PLANTS

Page “PLANTS” includes the list of Locations (that is the physical place where the WFM-1s are installed).

- Location: the location name
- Address: the location address
- City: the location city/town
- Equipment: the number of refrigerators (or machines) installed in the location

Click on the location line to display the equipment.

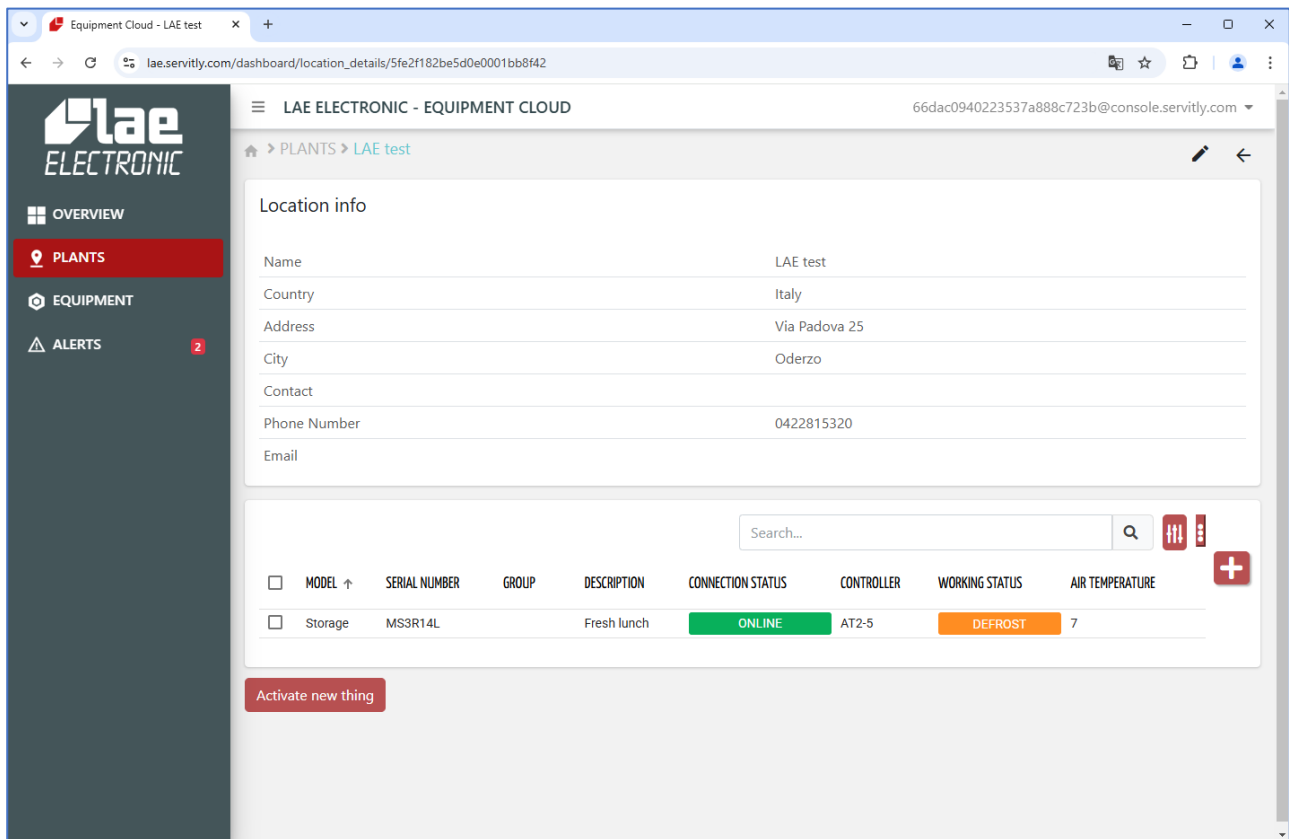


FIG. 21 PLANTS – LOCATION INFO + EQUIPMENT

15.EQUIPMENT

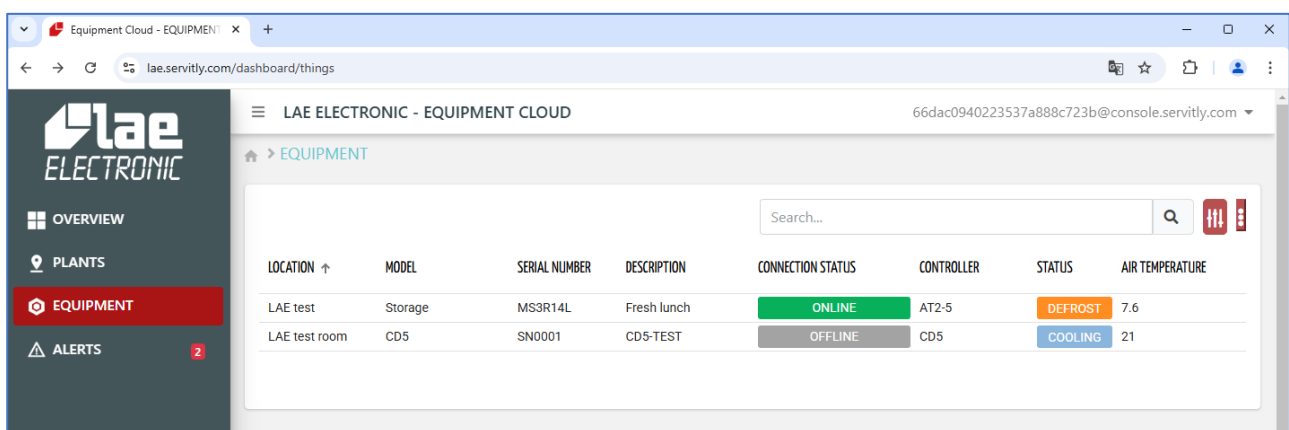


FIG. 22 EQUIPMENT

Page “EQUIPMENT” includes the list of refrigerators (or machines) installed.

- Location: the installation place
- Model: the refrigerator (or machine) model

- Serial Number: the serial number of the refrigerator (or machine)
- Description: a short description of the function
- Connection Status: the status of the connection to the Cloud
- Status: the machine status (Cooling, Defrost...)
- Air Temperature: the air temperature detected by the machine

Model, Serial Number and Description match the values set locally in the WFM-1s.

Click on the controller row to get access to the dedicated page.

15.1 Equipment Cloud

In the Equipment page you may display all details relevant to a refrigerator (or machine) registered in the Cloud.

In the “OVERVIEW” section, the machine details, the current status and the trend of the measured temperatures are displayed.

In this section, it's possible to send some commands to the device:

- Standby / Start
- Lights ON/OFF (if an output is configured as LIGHTS)
- Setpoint setting of the controller
- Setting the defrost interval of the controller
- Manual defrost start (“MANUAL DEFROST”)

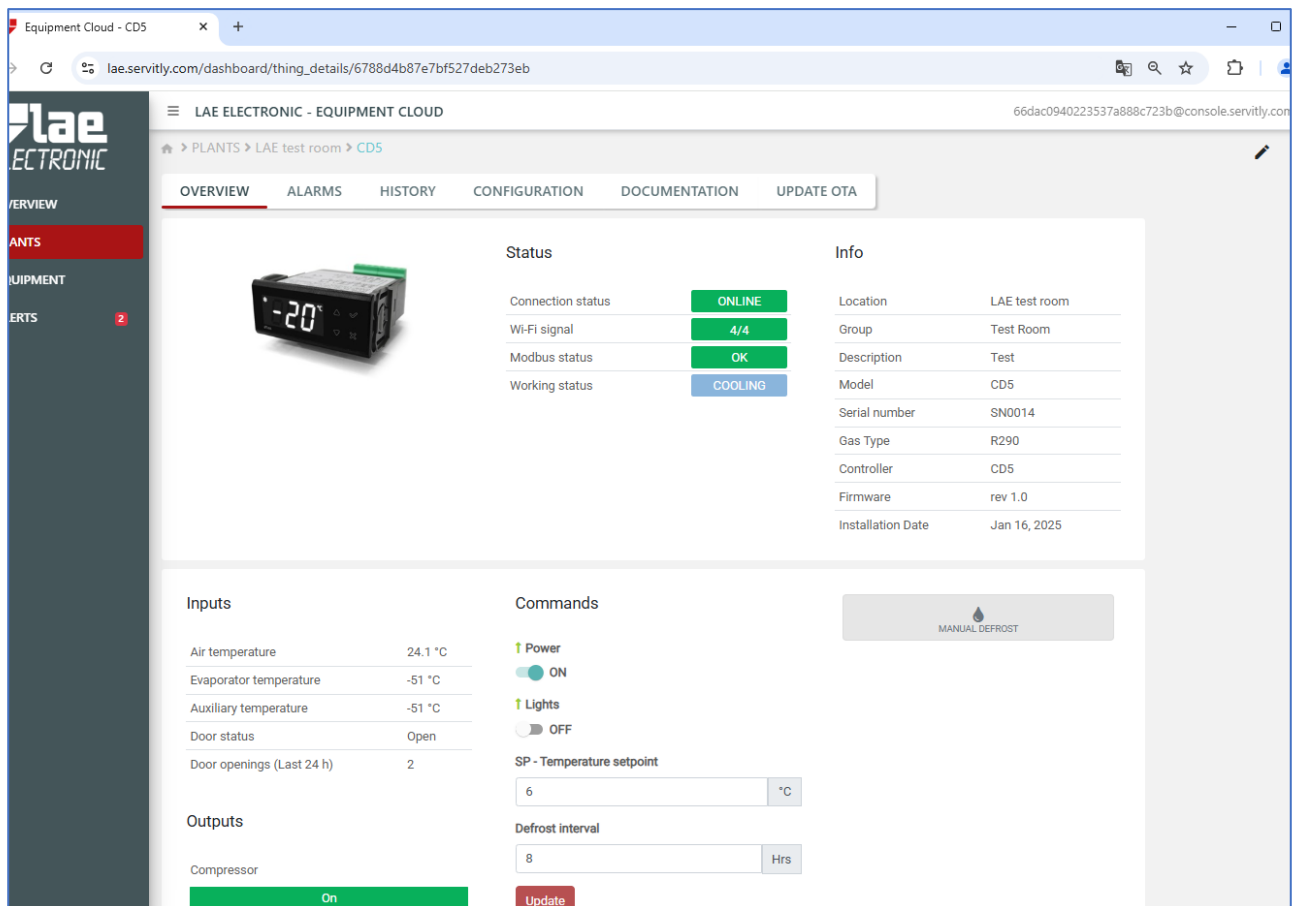


FIG. 23 CONTROLLER OVERVIEW

In the "ALARMS" section, the active alarms and the recordings of the past alarms are shown.

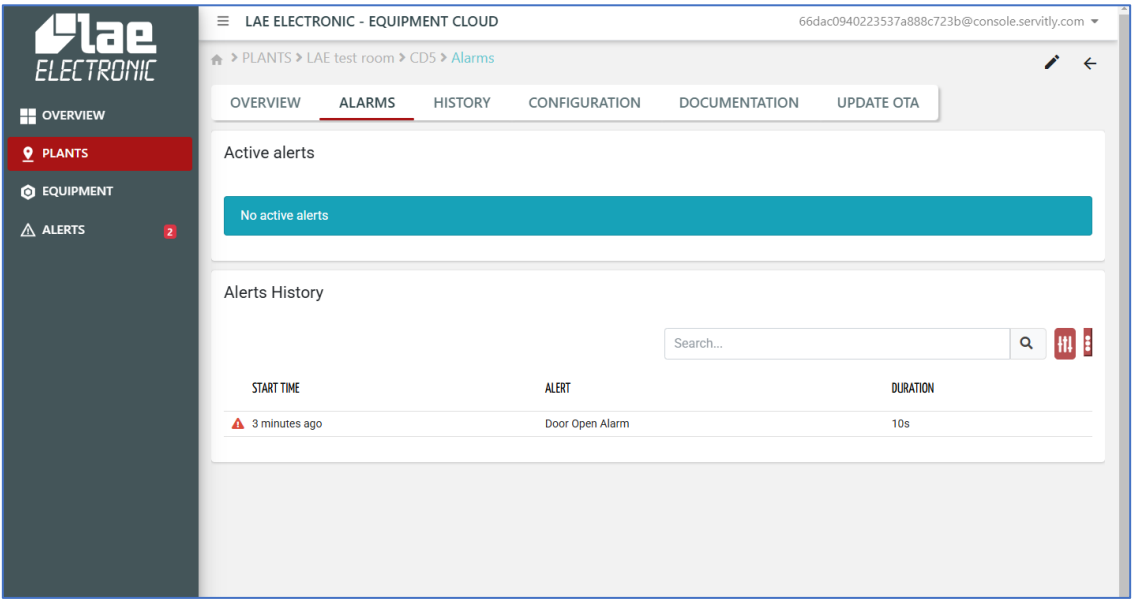


FIG. 24 CONTROLLER ALARMS

In the "HISTORY" section, temperature recordings are shown.
Click on Export to save the temperatures recorded in the selected period on an excel sheet.

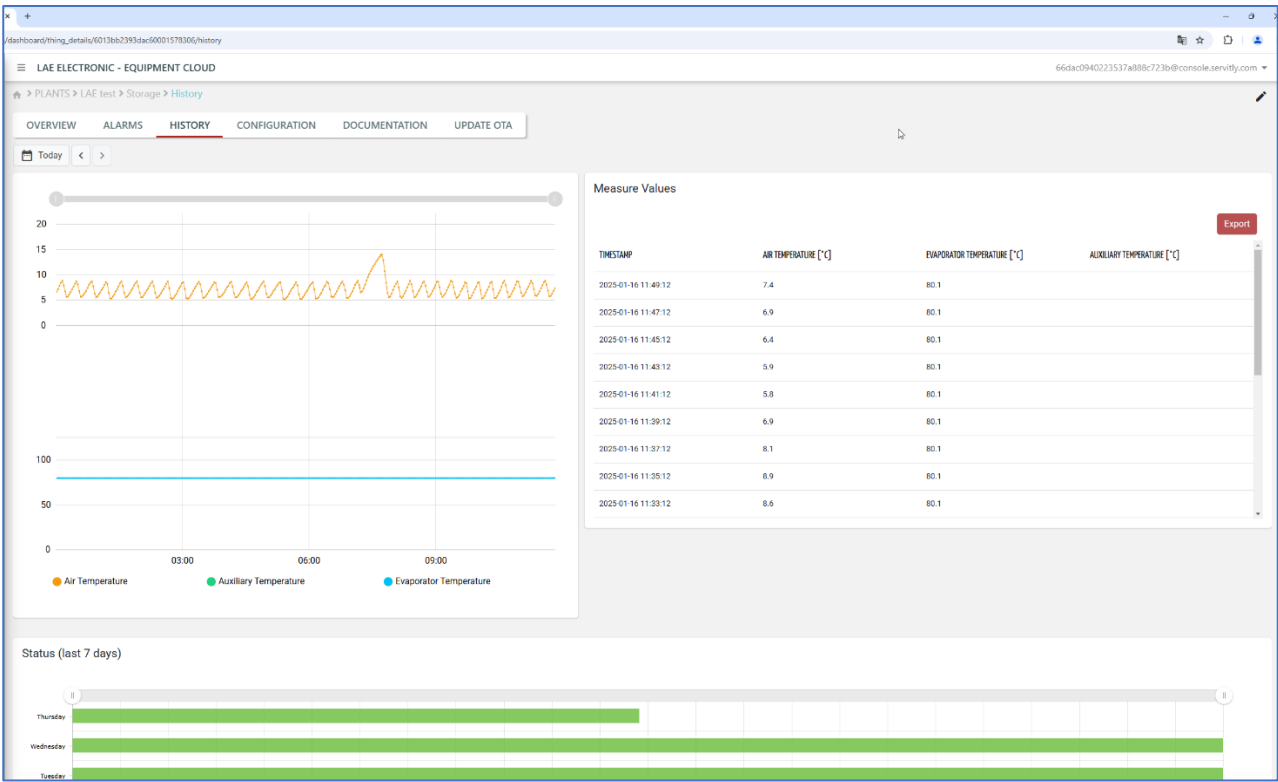


FIG. 25 CONTROLLER HISTORY

The machine status of the last 7 days are also displayed.

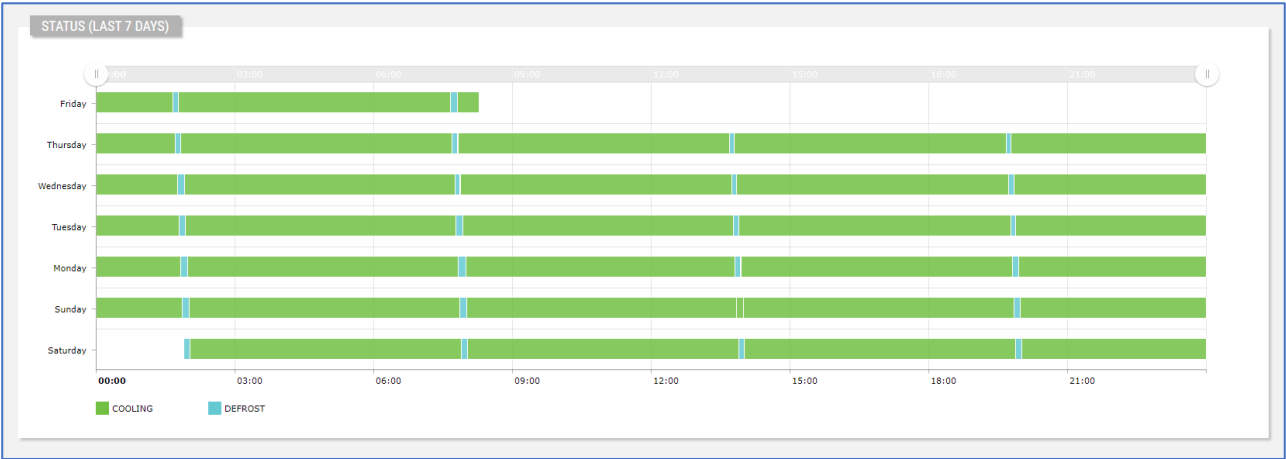


FIG. 26 STATUS (LAST 7 DAYS)

In the “CONFIGURATION” section, it’s possible to reprogram the control parameters of the machine by sending URS type files to the controller (or *.uts type files for less recent controllers, please contact LAE for more details), generated via the external URS 2.1 tool.

In the “DOCUMENTATION” section, the machine manuals and if need be also the one of the controller are present.

Through the “Update OTA” section, reserved to expert users, it’s possible to update the WFM-1 firmware or the controller firmware Over The Air (OTA).

16.ALERTS

In the Alerts page you find information on the active and the past alarms.

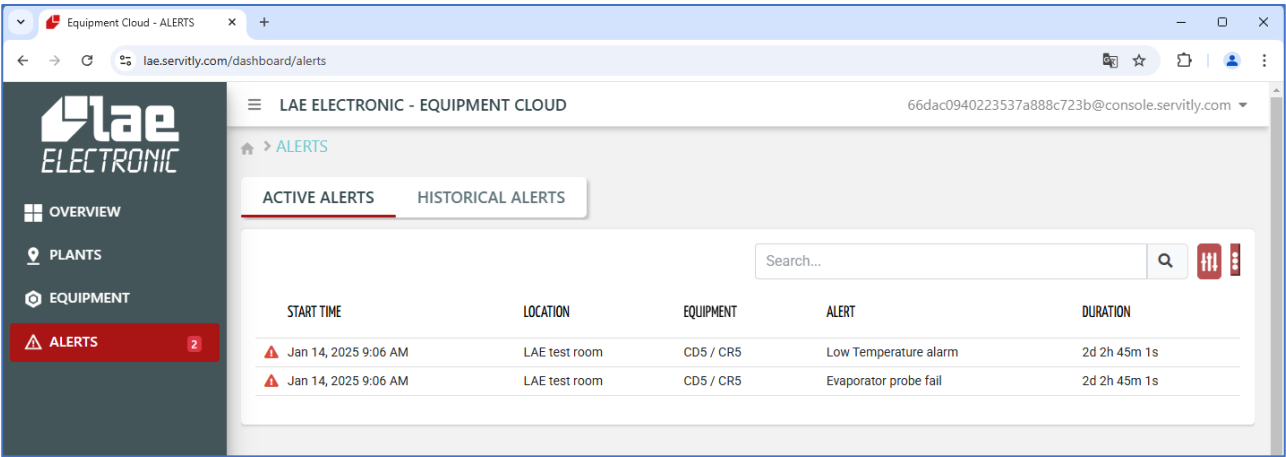


FIG. 27 ACTIVE ALERTS

In the “HISTORICAL ALERTS” tab, it’s possible to download the alarm history on an Excel file.

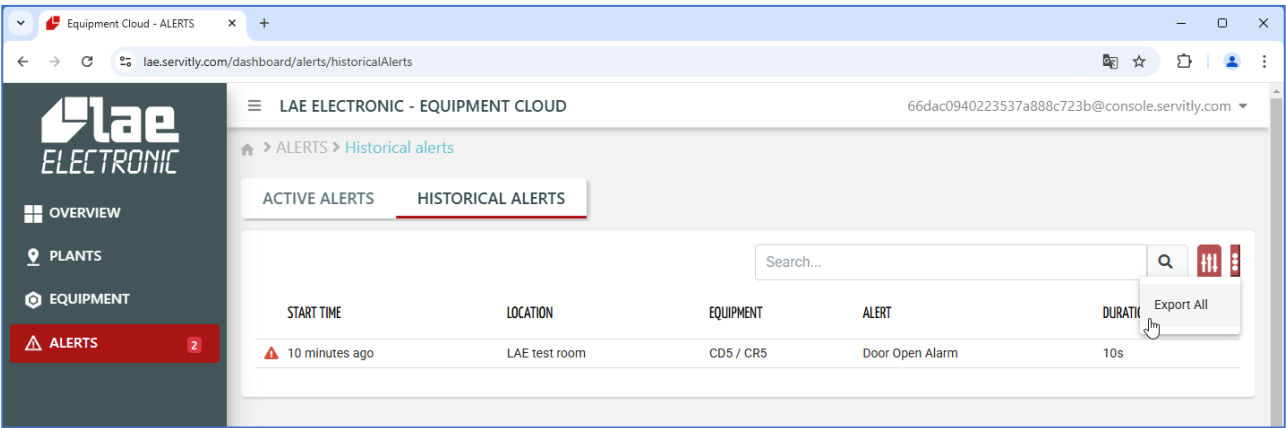


FIG. 28 HISTORICAL ALERTS

1. HOW TO (for expert users only)

17.1 Add a Location

Click on the “PLANTS” tab to open the location list.

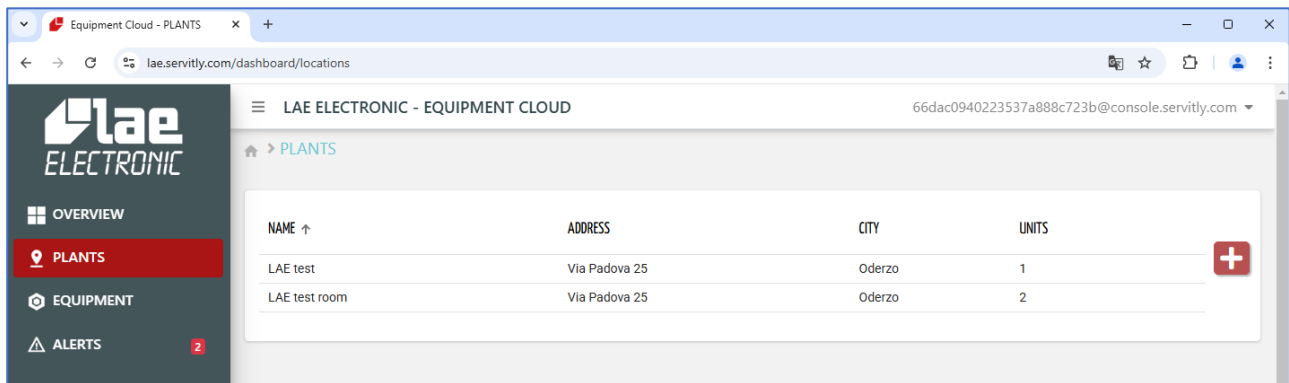


FIG. 29 PLANTS

Click on the  key to add a new location and complete the form proposed.

Add location

Name

Country

Timezone

GPS Position
The GPS coordinates in the format <latitude>,<longitude>

Address
The location address

City
The location city

Contact
The reference person for this location

FIG. 30 ADD NEW LOCATION

- Name: location name
- Country: location Country
- Timezone: the time zone
- GPS Position: the geographical coordinates of the location.

Note: this information is necessary to be able to display the location on the Overview page map. The GPS coordinates may be obtained with Google Maps.

- Address: location address.
- City: location city/town.
- Contact: the location contact person.
- Phone Number: the location contact person's phone number.
- Email: the location contact person's email address.

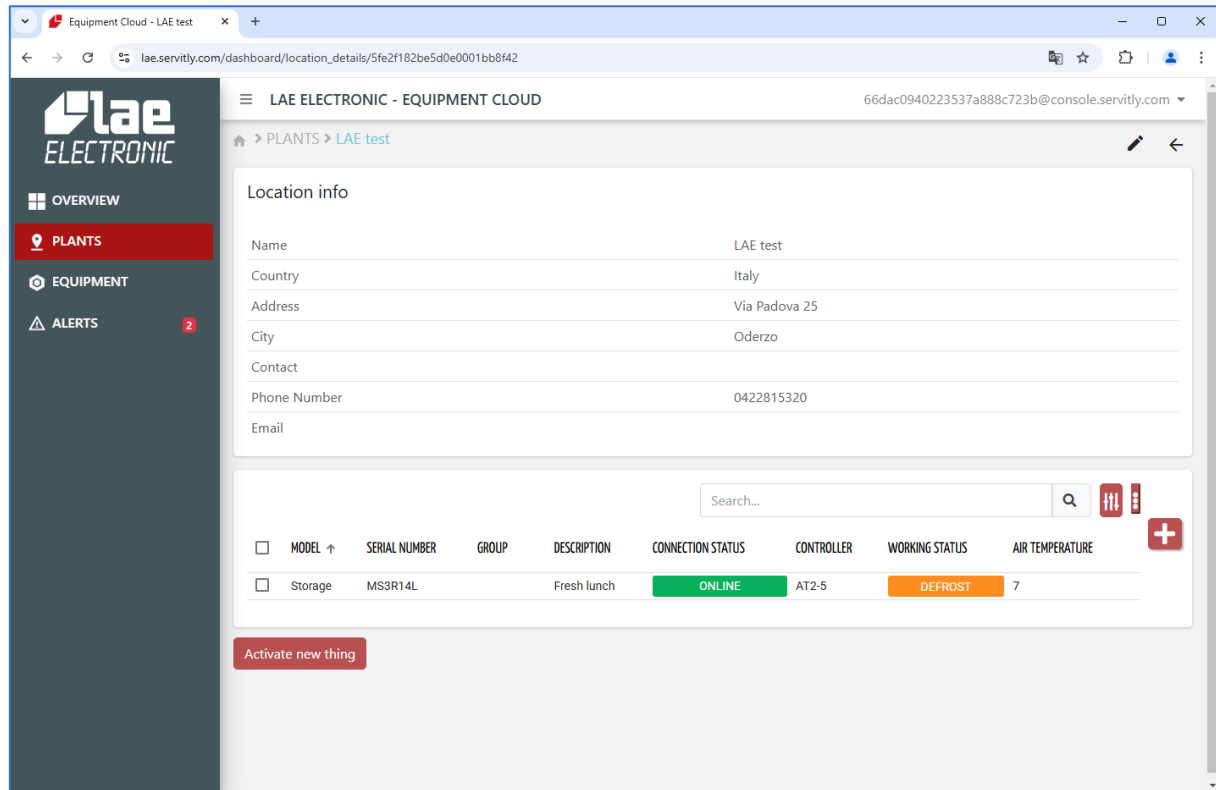
Click on "Save" to complete the creation of a new location.

To make the location visible on the map it's necessary that this includes at least one equipment.

17.2 Add equipment

CAUTION: the creation of new equipment implies a fixed annual activation cost. To know how much that it, please contact your local seller.

From the “PLANTS” page, click on the location row where you want to add a new equipment: the following page will be displayed:



The screenshot shows the 'LAE ELECTRONIC - EQUIPMENT CLOUD' dashboard. The left sidebar contains navigation links: OVERVIEW, PLANTS (active), EQUIPMENT, and ALERTS (with a red badge '2'). The main content area is titled 'PLANTS > LAE test'. It features a 'Location info' section with fields for Name, Country, Address, City, Contact, Phone Number, and Email. Below this is a table of equipment with columns: MODEL, SERIAL NUMBER, GROUP, DESCRIPTION, CONNECTION STATUS, CONTROLLER, WORKING STATUS, and AIR TEMPERATURE. A red '+' button is located at the bottom right of the equipment table.

MODEL	SERIAL NUMBER	GROUP	DESCRIPTION	CONNECTION STATUS	CONTROLLER	WORKING STATUS	AIR TEMPERATURE
Storage	MS3R14L		Fresh lunch	ONLINE	AT2-5	DEFROST	7

FIG. 31 PLANTS – LOCATION INFO + EQUIPMENT

Clik on the  key near the Equipment table and fill in just the “Name” and “Thing Definition” fields, selecting the LAE controller you wish to monitor via the cloud.

The screenshot displays a web browser window with the URL `lae.servitly.com/dashboard/location_details/61de8e87d6e704000196f614/thing_details/add`. The page title is "LAE ELECTRONIC - EQUIPMENT CLOUD". The left sidebar contains navigation links: "OVERVIEW", "PLANTS" (highlighted in red), "EQUIPMENT", and "ALERTS" (with a red badge showing "2"). The main content area is titled "Add thing" and contains the following fields:

- Name**: A text input field.
- Serial Number**: A text input field.
- Thing Definition**: A dropdown menu.
- GPS Position**: A text input field with a placeholder "The GPS coordinates in the format <latitude>,<longitude>".
- Group**: A text input field with a placeholder "The group to which the unit belongs within the system".
- Installation Date**: A date picker field.
- Activation Date**: A date picker field.
- Gas Type**: A dropdown menu (partially visible at the bottom).

FIG. 32 ADD EQUIPMENT

Click on “Save” to create a new equipment.

The other details of this form may be filled in later on.

Click on the “CONNECTION” tab and fill in the “Asset Id” field with the code found in the webserver, see chapter 3.3 (Cloud).

The screenshot displays the 'LAE ELECTRONIC - EQUIPMENT CLOUD' interface. The left sidebar contains navigation links: OVERVIEW, PLANTS (highlighted), EQUIPMENT, and ALERTS (with a red notification badge). The main content area has three tabs: GENERAL, CONNECTION (selected), and RULES. Under the CONNECTION tab, there are three sections: Configuration, Connector, and Mapping. The Configuration section has radio buttons for 'Token' and 'Manual' (selected). The Connector section includes fields for 'Type' (Servitly Thing Connector), 'Mqtt Broker URL' (mqtt.servitly.com:8883), 'Username' (lae_test), 'Password' (masked with dots), and 'Payload Format' (JSON). A note specifies the password must be 8 characters or longer and include at least 1 lowercase letter, 1 uppercase letter, and 1 number. The Mapping section has fields for 'Asset Id', 'Path', and 'Full Path'.

FIG. 33 ADD EQUIPMENT - CONNECTION

Click on “Save” to complete the creation of a new equipment.

Check the location equipment list to verify if the operation has ended successfully.

17.3 Modifying your personal information and the access password

Click on your e-mail top right to select Profile.

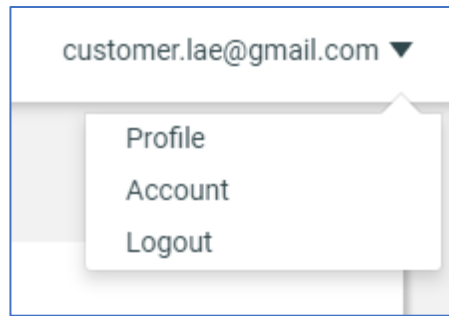


FIG. 34 PROFILE

A page opens up including personal information and the access credentials.

Modify the desired fields and confirm by clicking on “Save”.

17.4 Receiving notification e-mail and push notifications

The system may send notification emails and push notifications when alarm occurs and ends.

To configure this option, please proceed as described below:

Click on your own e-mail top right and select Profile.

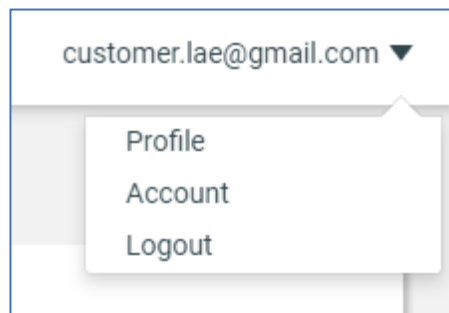


FIG. 35 PROFILE

Click on the “NOTIFICATIONS” tab.

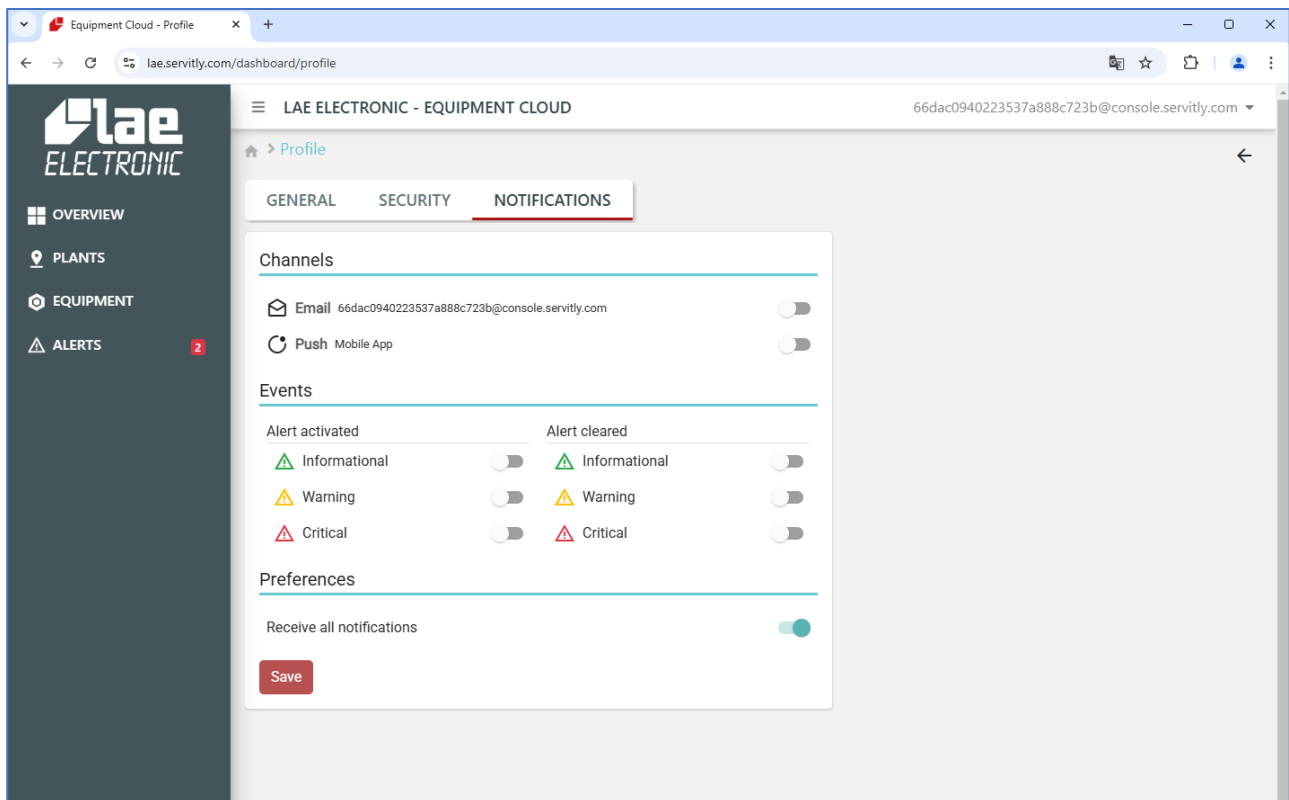


FIG. 36 PROFILE - NOTIFICATIONS

Select the notifications that you wish to receive.

Click on “Save” to confirm.