alpais
battery monitoring system

ALPAIS

BATTERY MONITORING SYSTEM

USER MANUAL

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Cus. Rev. 6.5

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1.INTRODUCTION

ALPAIS Battery Monitoring System (BMS) measures the voltage, temperature, internal resistance etc. of the battery. These are systems that enable the characteristics to be measured in real-time, to check whether the measured values are within the expected range, to detect faulty/defective batteries before they damage the system, and to send the necessary warnings to the connected systems via dry contact or communication interfaces in case of errors. The Control Module in the center of the BMS system provides a complete solution for monitoring the desired number of batteries with its hardware and software.

1.1. ALPAIS System Structure

Alpais BMS consists of the web server software, a Battery(cell) Module, a String Module, a Control Module, and accessories of modules, each module functions as follows;

Table 1. Modules and Definition Table

Module Name	**Remark**
Battery Module (BATMOD-XXX)	Determination of the single cell voltage, temperature, resistance, state of health, and alarm indication Balancing feature for series connected batteries Extreme battery voltage and current control
String Module (STRMOD-XXX)	Determination of the string voltage and current parameters
Control Module (CONMOD-XXX)	Realization of the battery data acquisition, control, alarm, and event logging upload
Accessories	Power Supply, Measuring Cable, Data Cable, Current Sensor, and Current Measuring Cable

1.2. Operating Conditions

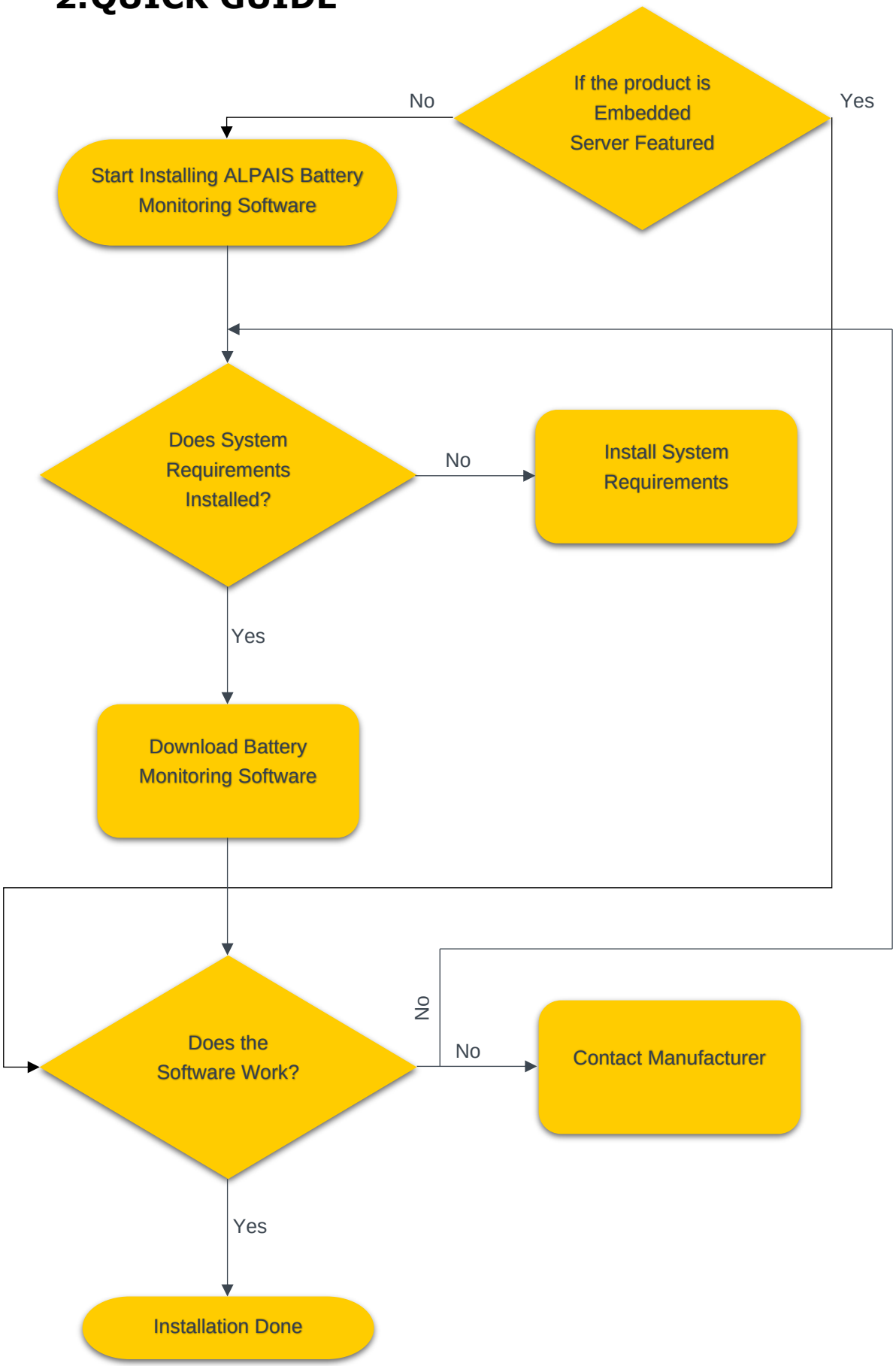
- Operating Temperature: 0°C ~ +50°C
- Storage Temperature: -10°C ~ +70°C
- Working Humidity:5 % ~ 90 % RH, non-condensing
- Atmosphere Pressure: 80 – 110 kPa

1.3. Measurements

Table 2. Measurement Parameter Table

Measuring Place	**Parameter**
Battery	Voltage Internal Resistance Temperature
String	Voltage Current Charge/Discharge Cycle Ambient Temperature
Other (Optionally)	Humidity Voltage Balancing State of Health

2.QUICK GUIDE



2.1. System Requirements

- 1 Server (If installation is desired on the local network and there is no embedded server)

Recommended server features are as follows

- Core speed of 1.3 GHz or faster
- Min 2-core CPU
- Min 4 GB RAM
- Min 25 GB of free hard disk space

2.2. Communication

In case of any problems please contact us at the following contact information.

Address: Atakent Mahallesi Vatan Caddesi No:40/1, Postal Code: 41275 Basiskele, Kocaeli, Turkiye

Phone: +90 (216) 561 90 73

Fax: +90 (216) 561 90 74(pbx)

info@alpais.com.tr | www.alpais.com.tr

3.ALPAIS SOFTWARE

Installation, configuration, adjustment, alarm notification, and monitoring related to the system are performed via web-based ALPAIS Software. ALPAIS Software is run on a Linux-based operating system to maintain system stability. The system supports Modbus RTU, TCP/IP, and SNMP protocols.

The Analyzer (Analyzer) and the server communicate with Ethernet protocol. A server can provide battery data for multiple clients. The analyzer and server are located in the same package.

- Features

1. Local Area Network or Cloud Monitoring
2. Multiple Location Control from Single Control Center
3. Supports SNMP, Modbus-RTU and MODBUS TCP/IP*
4. HDMI Display Compatibility*
5. Real-Time Battery Status and Color Notification
6. Detailed Charge / Discharge Record
7. Alarm and Event Activities
8. E-mail Notifications
9. Embedded Web Server
10. PDF or CSV Reporting
11. Graphics and Analysis Tools
12. Alarm History and Service Logs
13. Management and Service Based Reporting
14. Battery Based Voltage-Current Notifications

*Only the Control Module with an Embedded Server supports MODBUS-TCP and HDMI display screens.

Modbus Register Map will be shared with the relevant user on request.

4.CONFIGURATION OF SOFTWARE

4.1. Login

It is possible to access with IP by the manufacturer via any tablet, phone, or computer. Simply enter the e-mail and password to log into the interface.

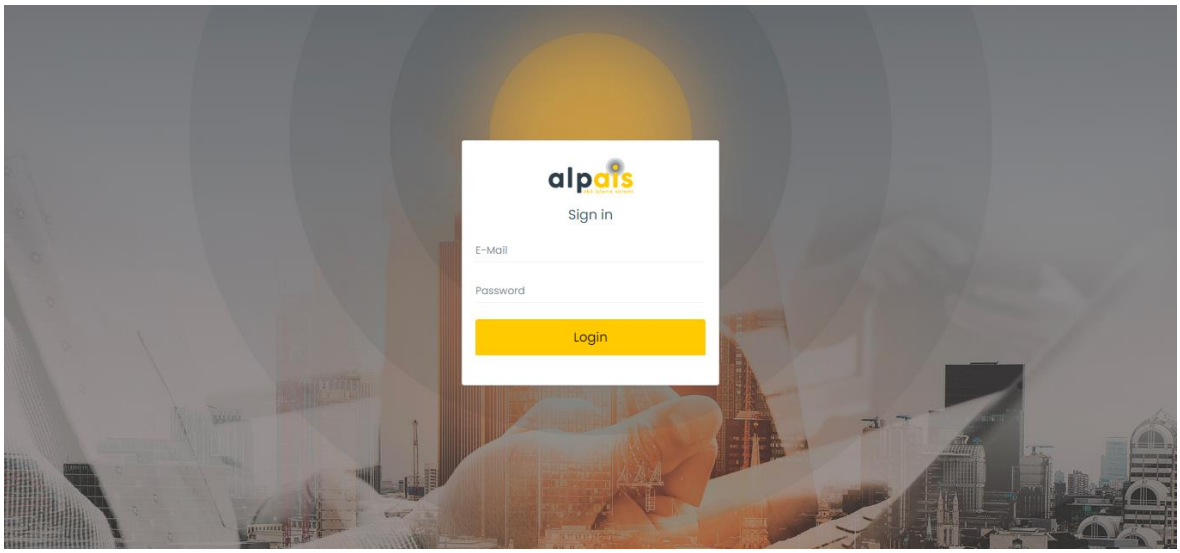


Figure 1. Login Screen

4.2. Roaming

After logging in to the site, all transactions in the left column are shown.

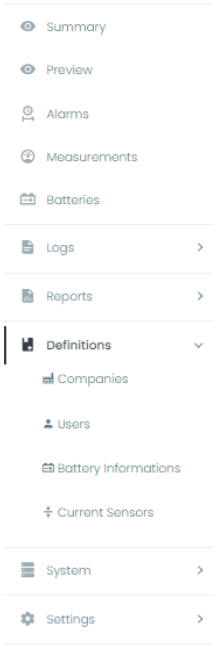


Figure 2. Roaming

4.3. Summary

In the summary section, all devices under the company appear with their string statuses and general statuses. Clicking on the device accesses the preview screen of the specified device. Thus, more detailed information can be accessed.

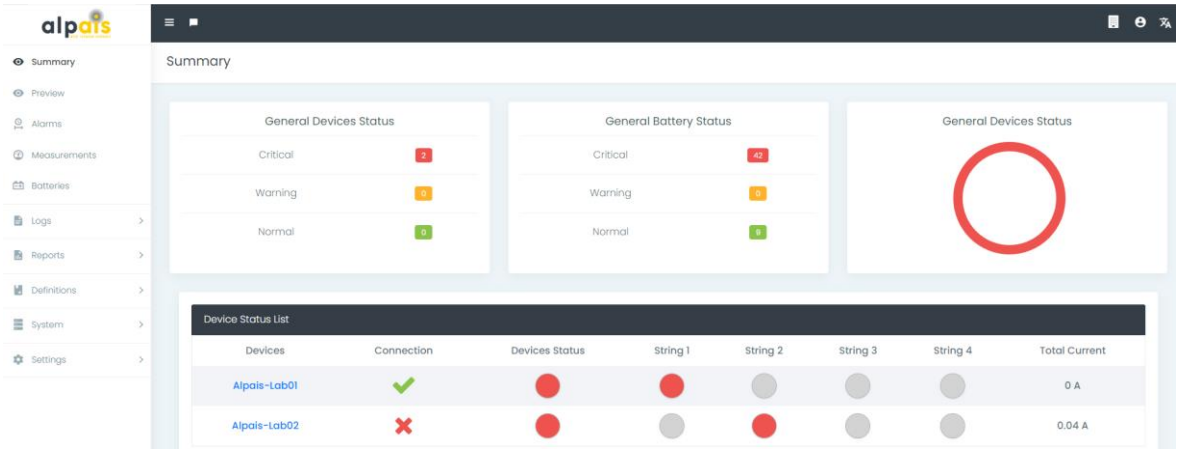


Figure 3. Summary Screen

4.4. Preview

This section includes a system overview. The system is showed the Battery Status Information, General Alarm Status and General Status from see in Figure 4. It also controls the number of batteries, current, voltage, and temperature in each string. Roaming is also available from the 'Device List'.

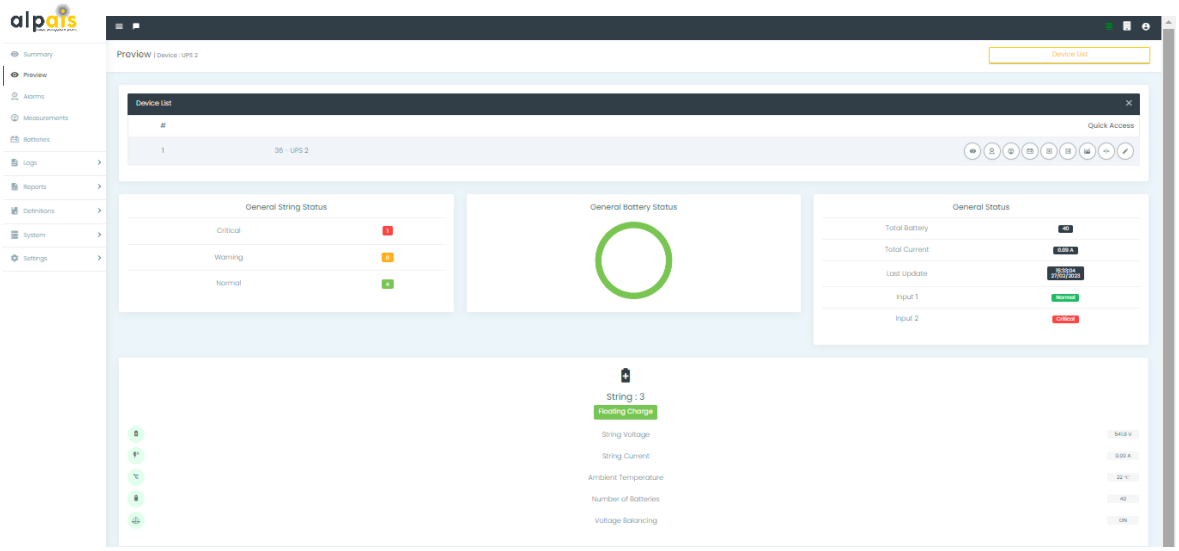


Figure 4. Preview Screen

4.5. Alarms

Battery and String Alarm Status are given in this part. The alarm details are given as shown in Figure 5 with their string, batteries, and explanations. These are real-time data.

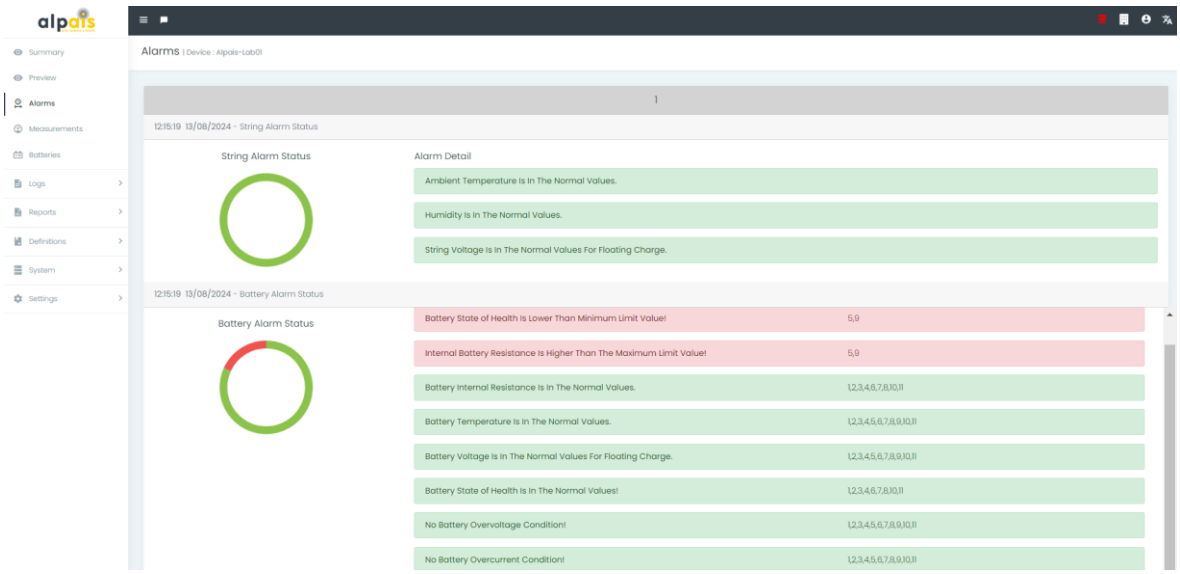


Figure 5. General Alarm Screen

4.6. Measurements

This section shows the measurement values of all parameters (voltage, current, temperature, etc.) in each battery and string. Measured values are given in column graphs. Figure 6 shows the selection of the string and others. These are real-time data. Also, if the voltage balancing feature is turned on, it shows the target voltage value and balancing (%) on each string.

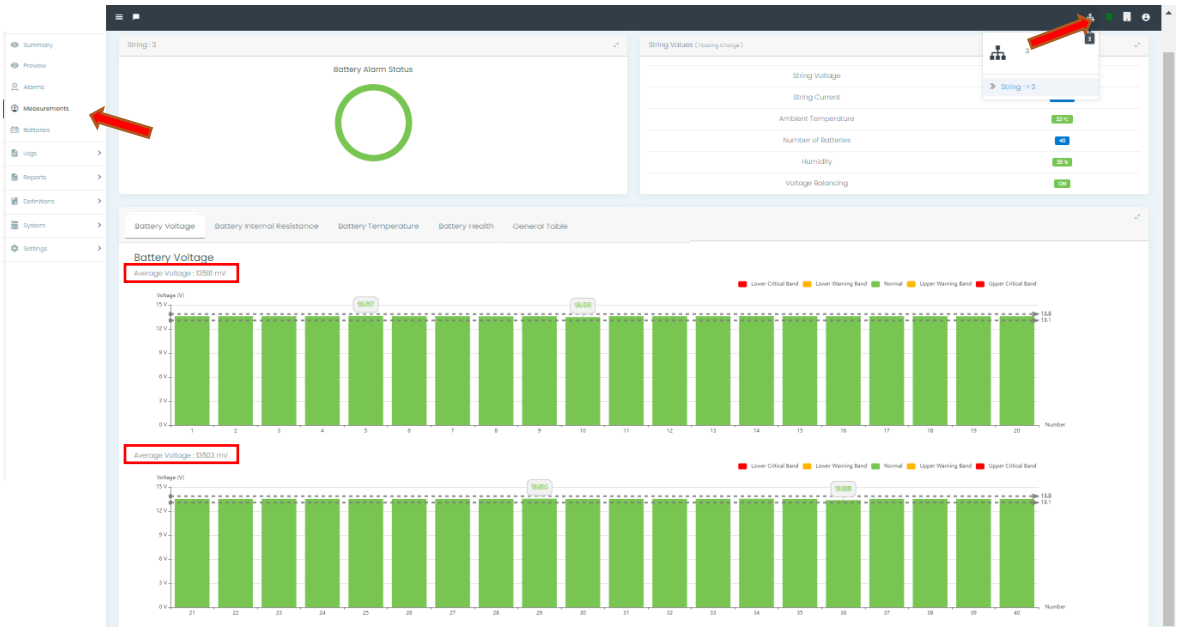


Figure 6. Measurement Screen

4.7. Batteries

It's shown the condition of the battery in each string (see Figure 7). Alarm notification is available in case of alert or critical condition. It also shows the number of batteries, voltage, current, and temperature in each string.

Table 3. Battery Measurement Color Definitions

Color	Definitions
Green	The battery does not exceed the upper and lower limit values of the relevant parameters and is normal state.
Yellow	The battery is in the warning band of the upper and lower limit values of the relevant parameters and is warning state.
Red	The battery has exceeded the upper and lower limit values of the relevant parameters and is alarm state.

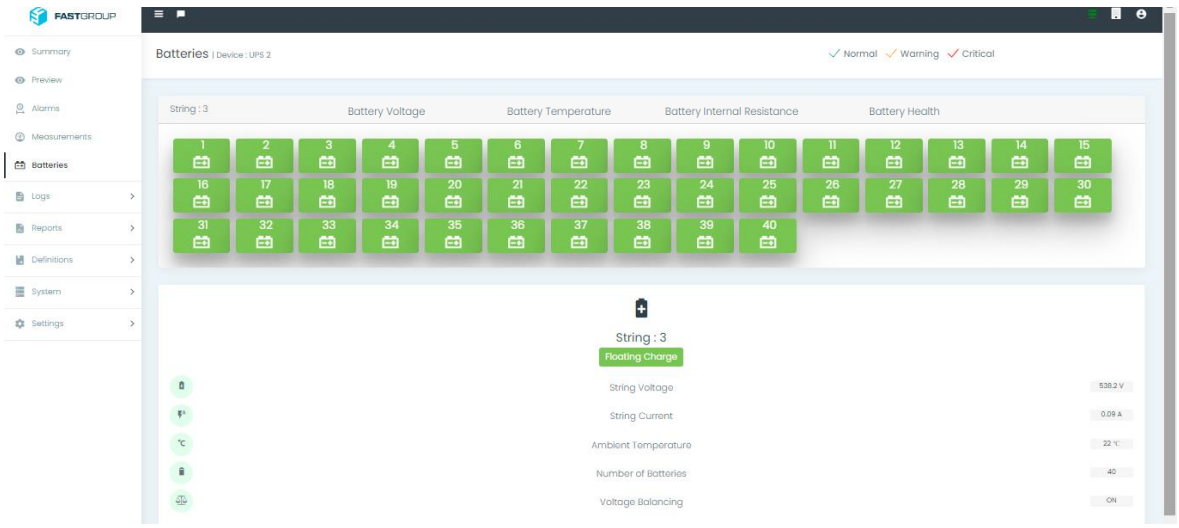


Figure 7. Battery Screen

4.8. Logs

4.8.1. Battery Alarms

In this part, you can select the critical or warning battery status of the limit values according to the specified status (idle, floating, etc.) and battery alarm parameters between the desired dates. The log table can be downloaded in CSV or PDF format.

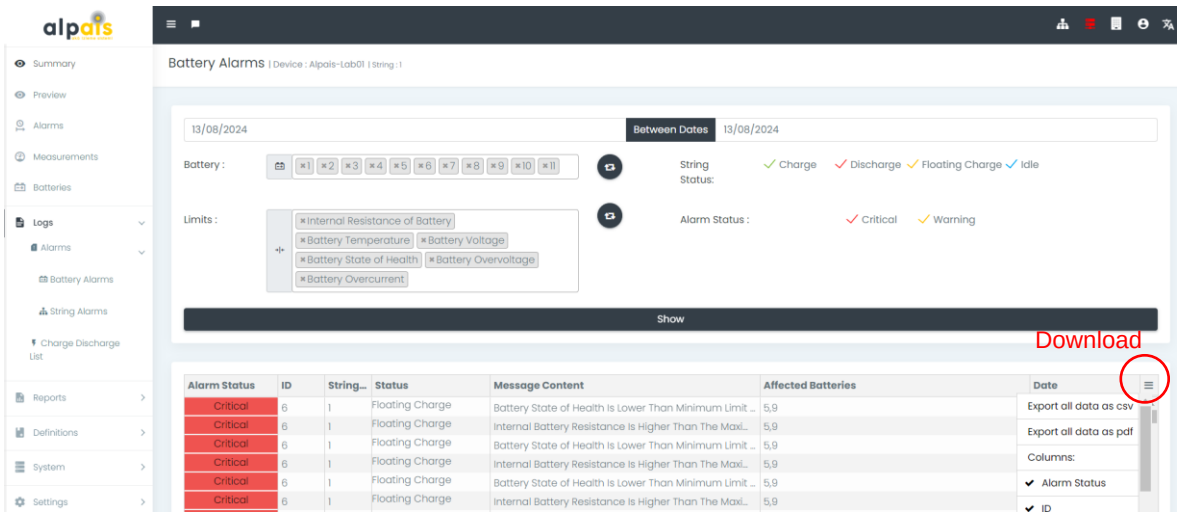


Figure 8. Battery Alarm Screen

4.8.2. String Alarms

In this part, you can select the critical or warning string status of the limit values according to the specified status (idle, floating, etc.) and string alarm parameters between the desired dates. The log table can be downloaded in CSV or PDF format.

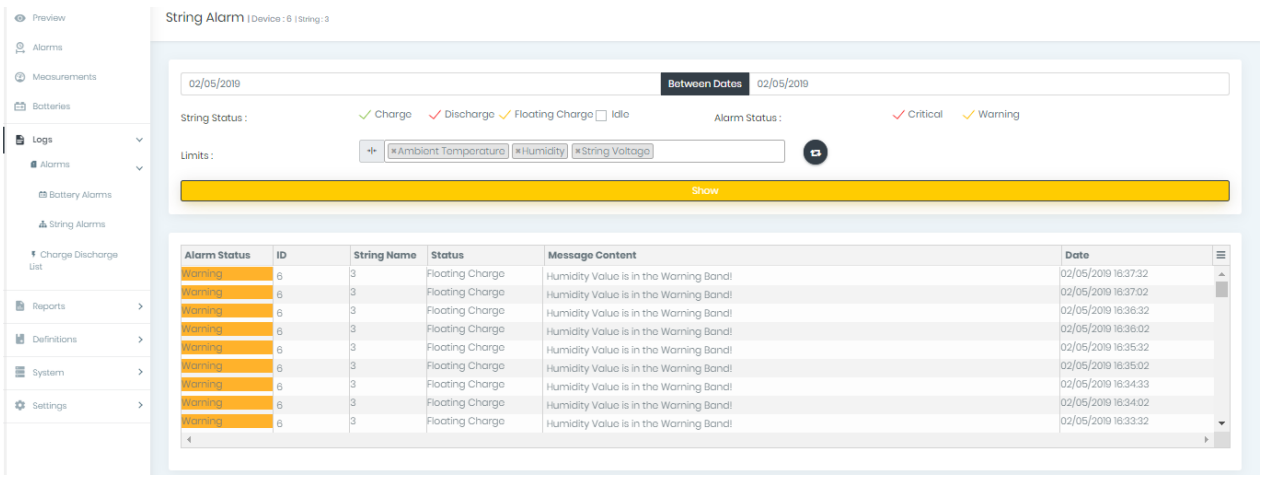


Figure 9. String Alarms Screen

4.8.3. Charge/Discharge List

In this part, the voltage, internal resistance, and temperature of each battery are shown graphically according to charge or discharge conditions. When clicking the 'Show Batteries' button, the page in Figure 11 is opened as a report. Likewise, String presents its own parameters graphically.

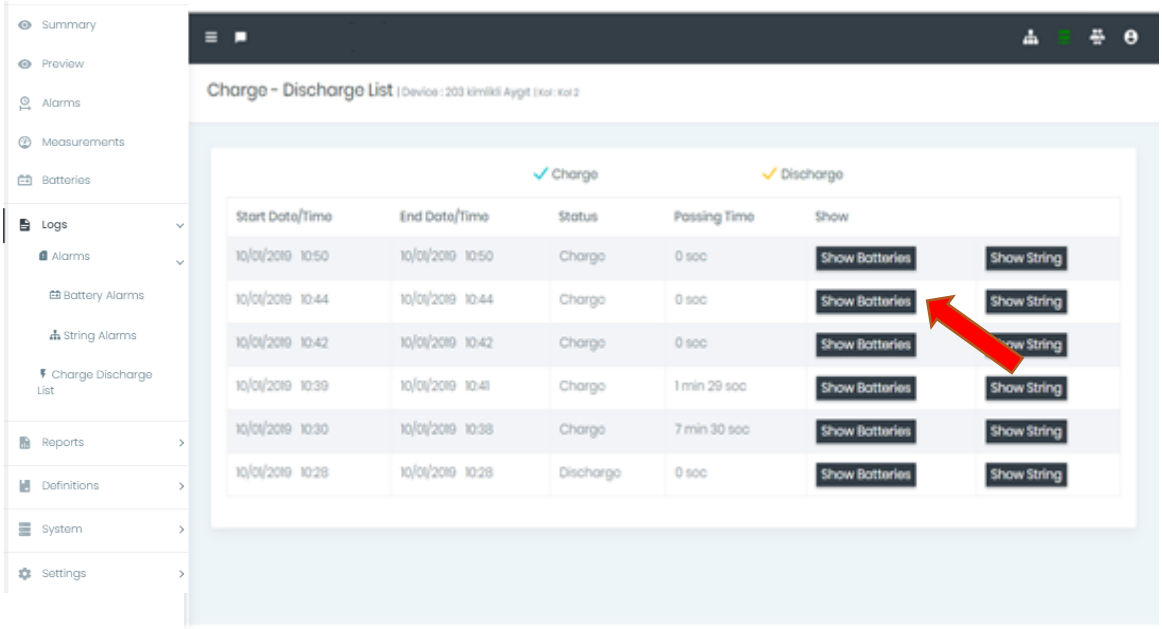


Figure 10. Charge/Discharge List Screen

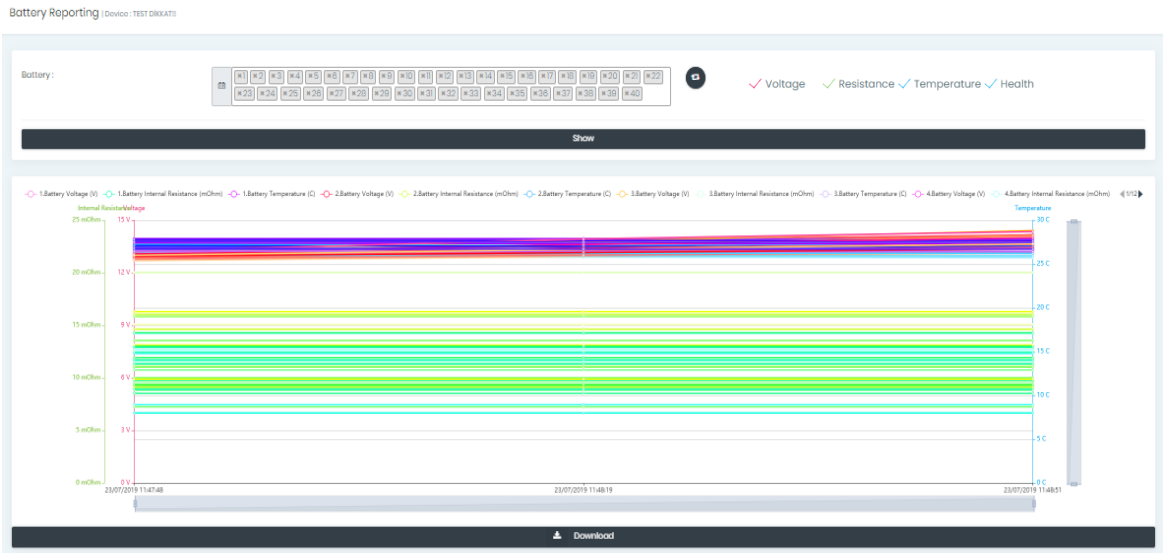


Figure 11. Charge/Discharge Graph Screen

4.9. Report

4.9.1. Report of Batteries

Each battery is displayed optionally the voltage, temperature and internal resistance values as graphical representation in order to at the specified date and at specified time intervals (see Figure 12). In addition, data of selected batteries are downloaded as CSV or PDF files. String selection is made from the right corner.

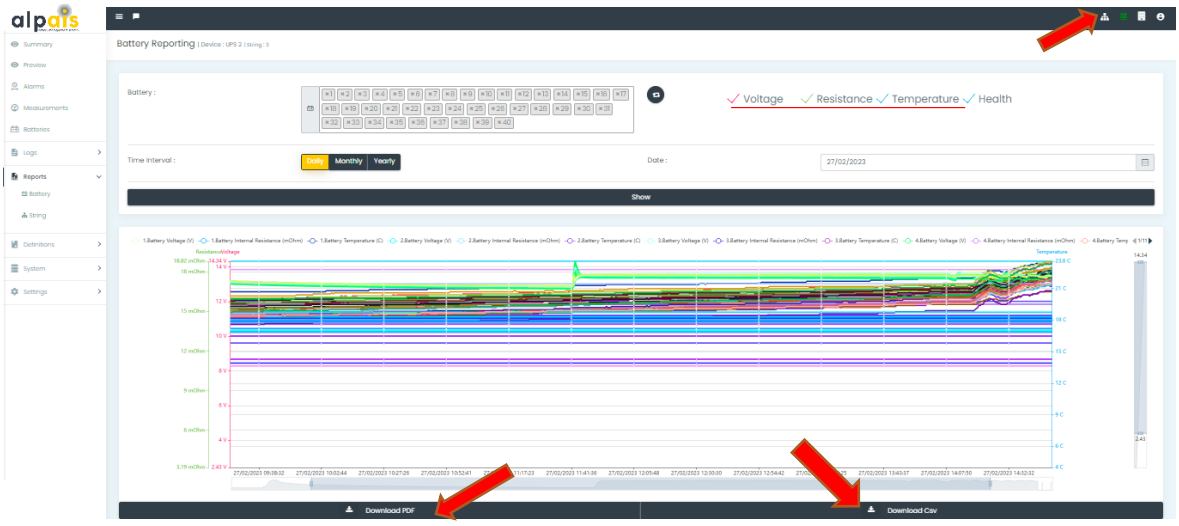


Figure 12. Report of Battery

4.9.2. Report of String

Each string is displayed optionally the voltage, temperature, and current values as a graphical representation in order to at the specified date and at specified

time intervals (see Figure 13). In addition, data of selected strings are downloaded as CSV or PDF files. String selection is made from the right corner.

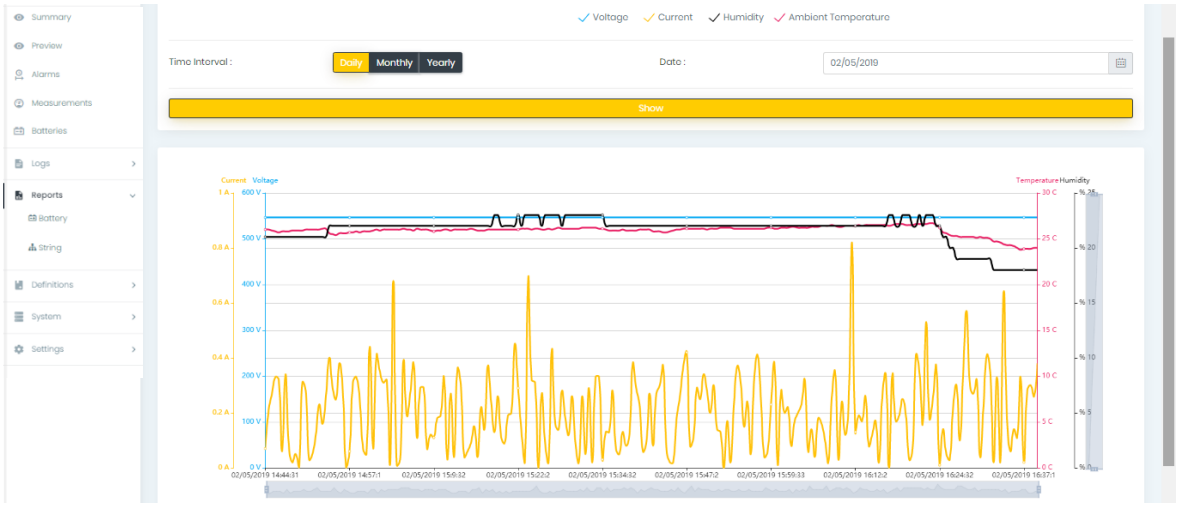


Figure 13. Report of String

ONLY THE 'ADMIN' USER WILL BE ABLE TO ACCESS THE REST OF THE INTERFACE AFTER THIS SECTION.

4.10. Definitions

4.10.1. Companies

Intracompany system information is recorded and edited. Existing company information can be edited or new companies can be added.

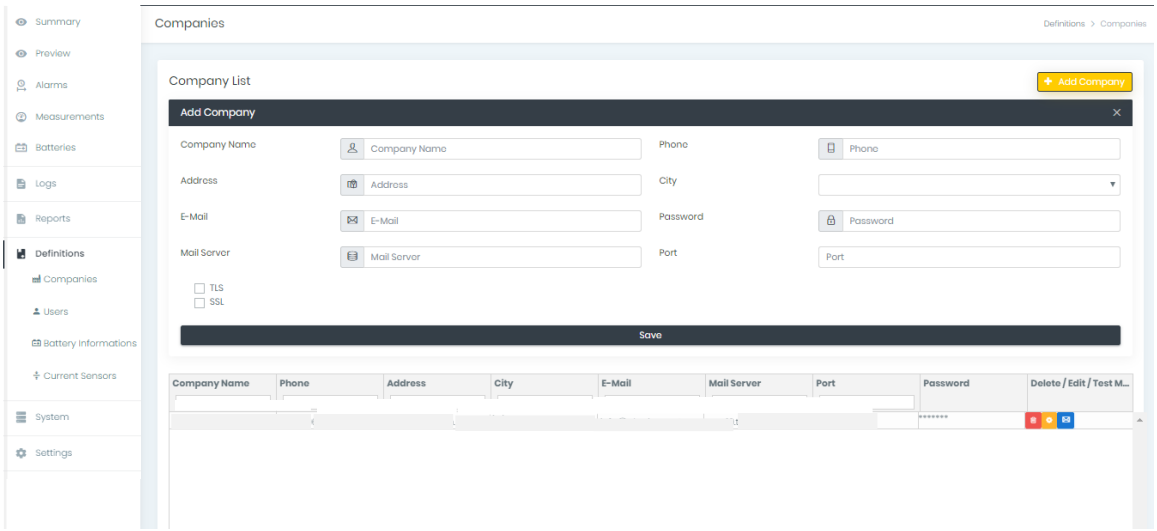


Figure 14. Company Screen

4.10.2. Users

Only the admin adds a new user. This part presents user information.

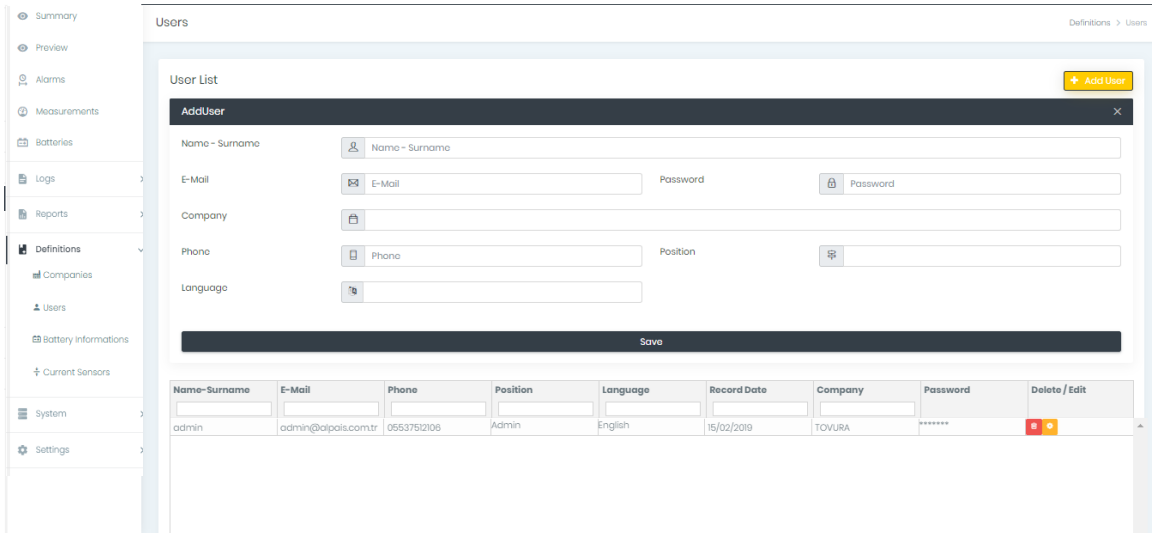


Figure 15. Users

4.10.3. Battery Information

Battery types and physical properties are regulated.

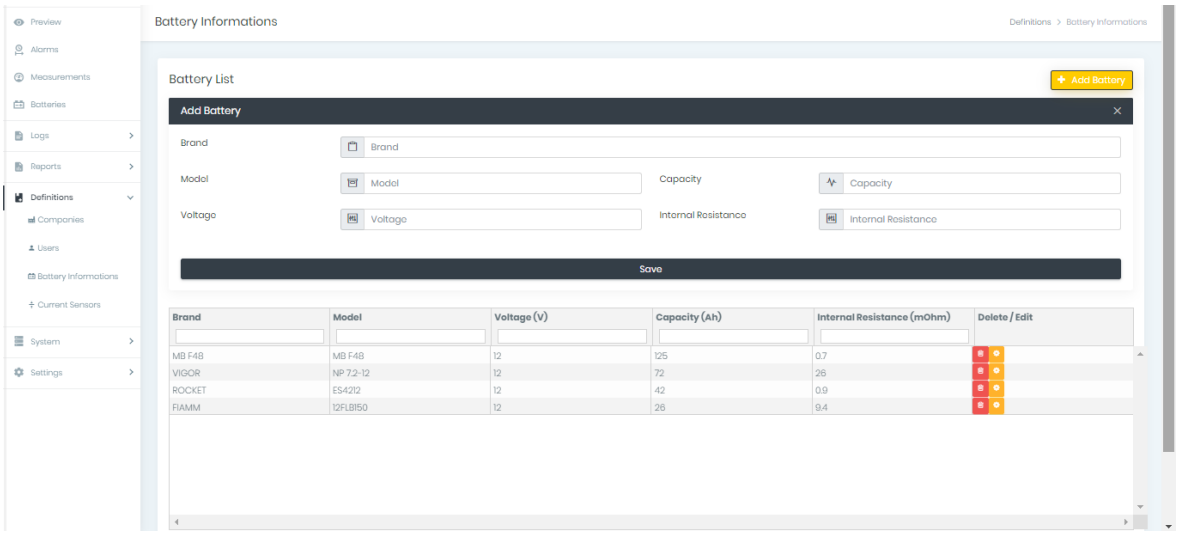


Figure 16. Battery Information Screen

4.10.4. Current Sensors

Reference sensor values are available.

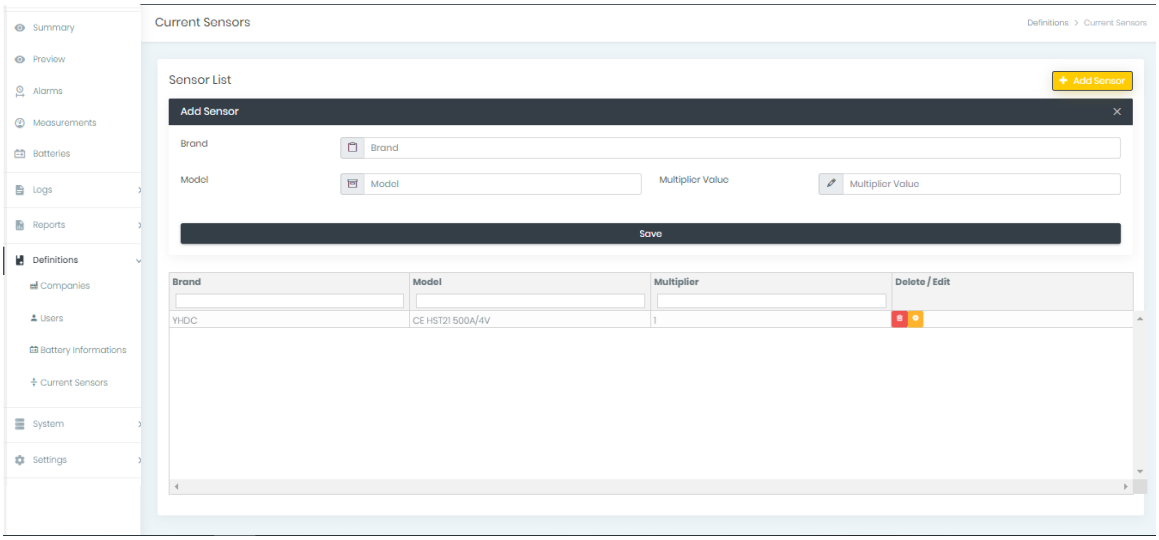


Figure 17. Sensors Screen

4.11. System

4.11.1. System Editing

This tab consists of 3 steps organizing the battery and string information within the system for the specified device. All information (battery internal resistance initial value, threshold values, limit values, etc.) is arranged here.

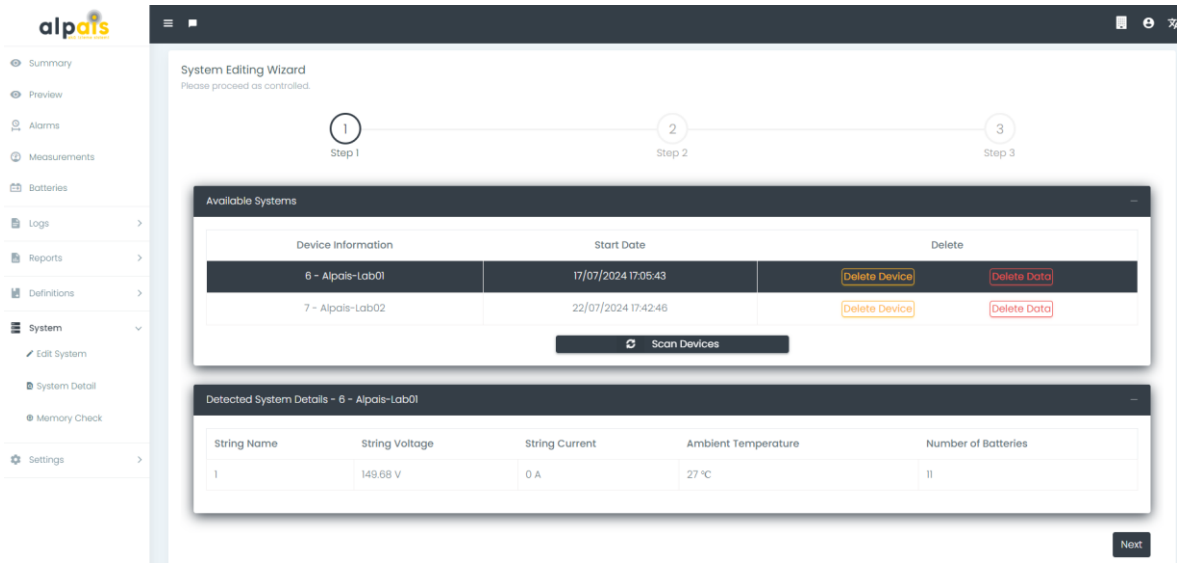


Figure 18. System Editing Screen

4.11.2. System Detail

It offers information such as system name, version, installation date, software version, device information, etc. In addition, system logs are downloaded from this page. Remote version update is done through this page.

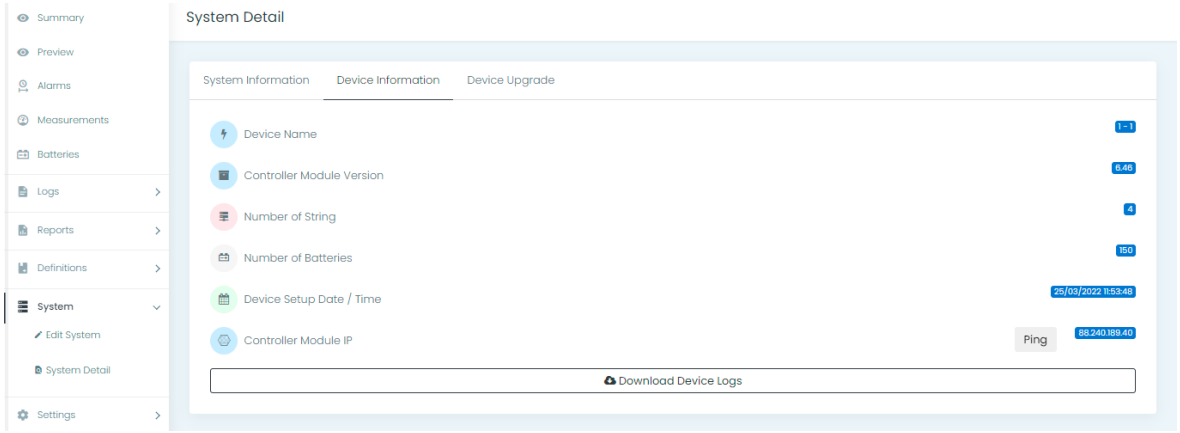


Figure 19. System Details

4.11.3. Memory Check

It shows the usage rate of the device's memory. It notifies users when the memory is 80% full. With the 'Delete Data' button, data in the desired date ranges or all data can be deleted.

(Stops sending data when memory is 85% full)

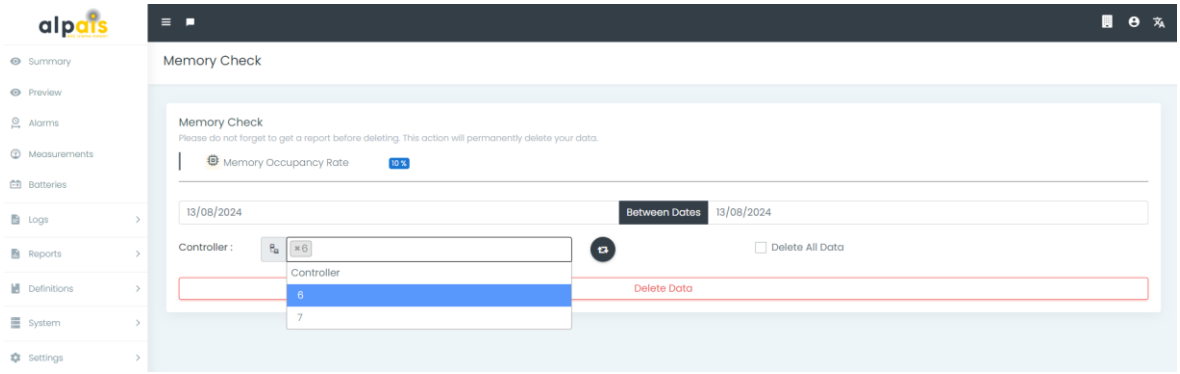


Figure 20. Memory Check

4.12. Settings

4.12.1. Inputs/Outputs

It is input/output data connection as require to activate the environmental controllers in the system according to certain alarm conditions. Input alarms are opened from this tab. Inputs can be edited or deleted later.

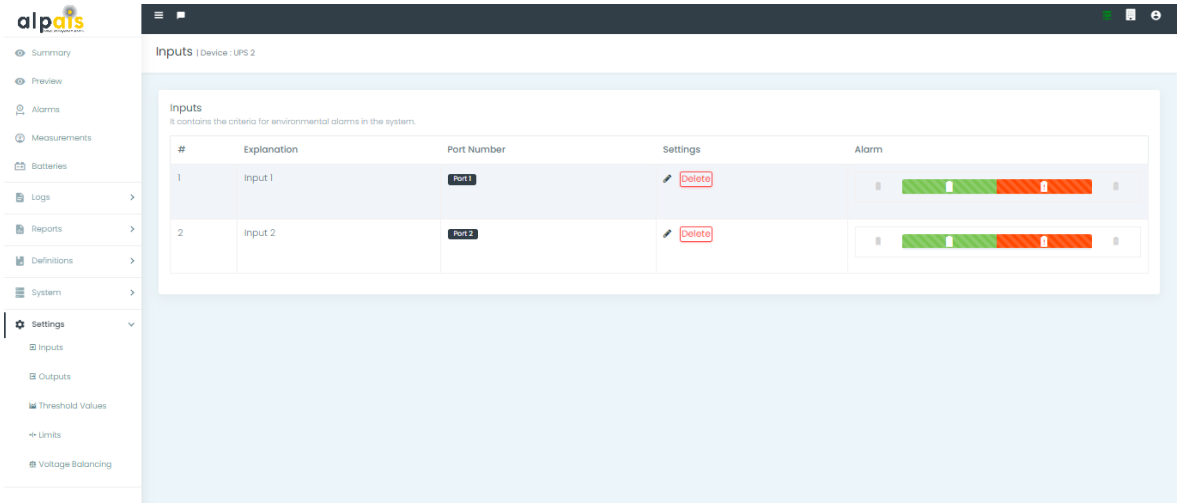


Figure 21. Input Port

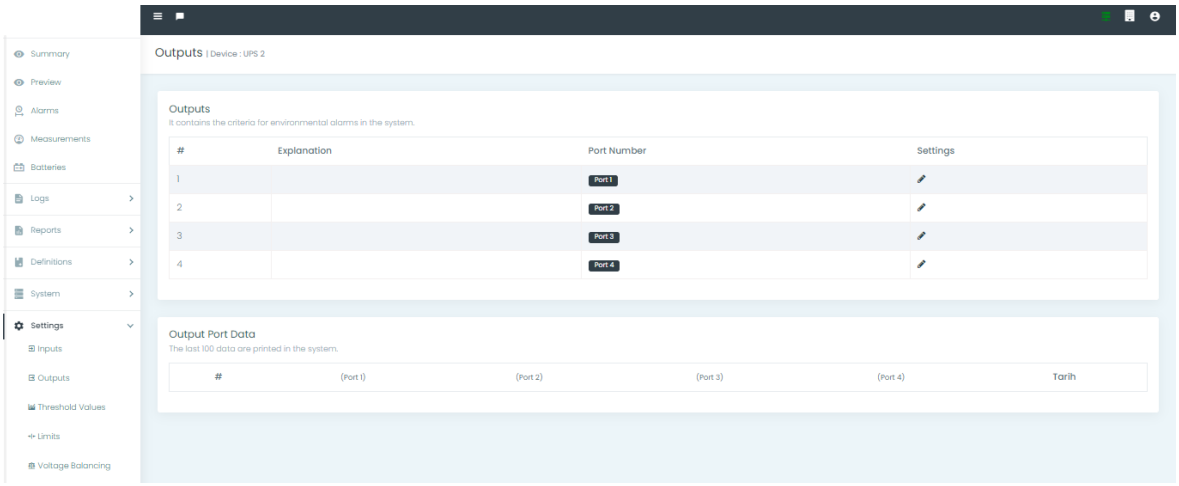


Figure 22. Output Port

4.12.2. Threshold Values

It determines the threshold values according to the current and voltage of operating modes (float-charge-discharge) for each string.

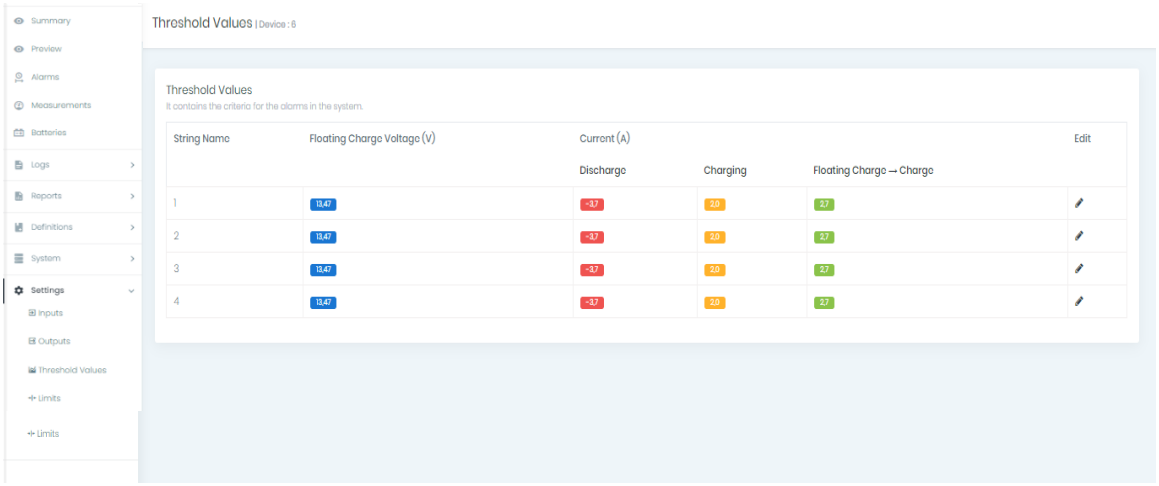


Figure 23. Threshold Value

4.12.3. Limits

It is for setting the lower and upper limits of each battery and string for the following parameters:

- Battery Voltage
- Battery Internal Resistance
- Battery Temperature
- State of Health
- String Voltage

- Ambient Temperature
- Humidity

After the limit values have been set, the ‘Save’ button is pressed as in Figure 24. After setting the limits, click the icon indicated by the arrow for the parameter to be notified. SMS, notification, and email are sent on request.

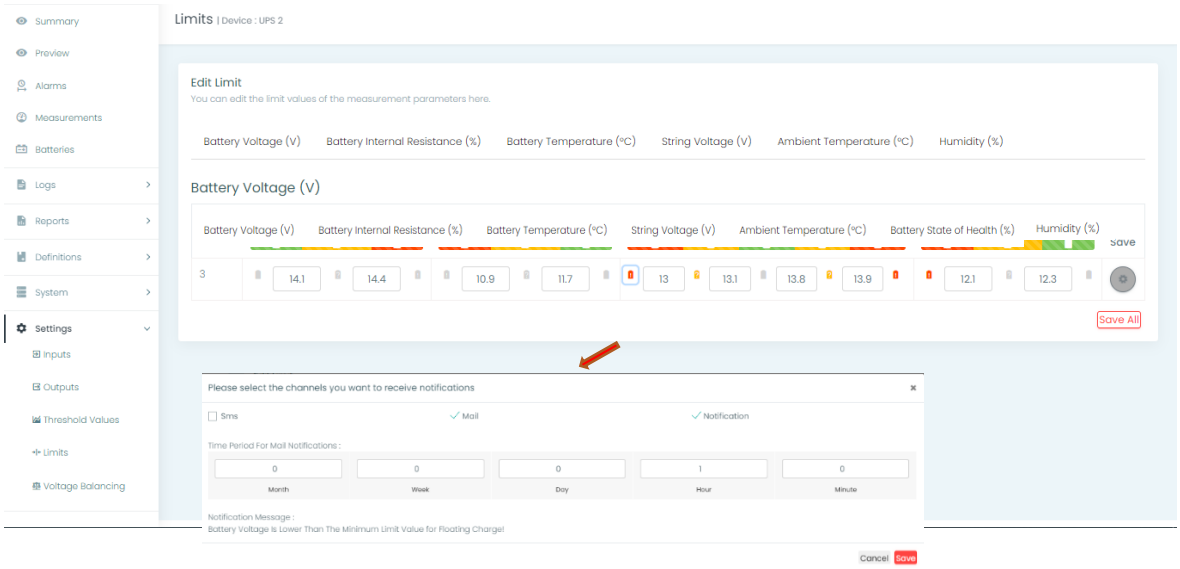


Figure 24. Limits

4.12.4. Extreme Alarm Configuration

It sets the upper limits for the overvoltage parameters of the batteries in each string. The changes made are saved with the ‘Save’ button.

The icon shown with the arrow must be clicked to report the overvoltage and overcurrent parameters. SMS, notification, and e-mail are sent upon request.

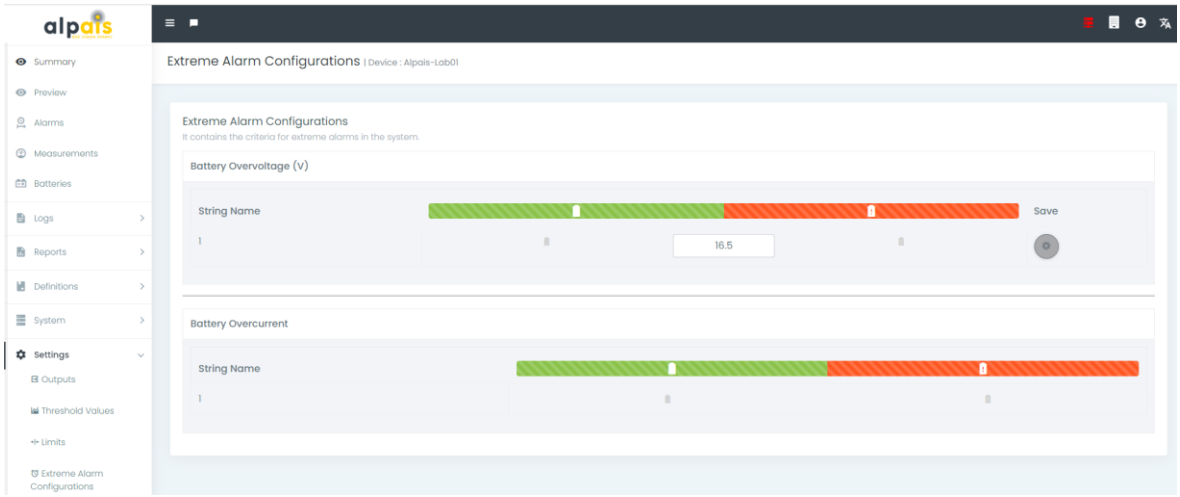


Figure 25. Extreme Alarm Configuration

4.12.5. Voltage Balancing

It is set to take action about the 'voltage balancing' property of each string. If the balancing feature on the handle is desired to be turned on, the battery type should be selected first, and the 'OFF' statement should be made 'ON' and saved with the 'Save' button. If it is suitable for the structure of your batteries, the 'Split Batteries' option should be clicked along with the balancing feature.

From the measurements page, the target voltage and the balancing(%) in each battery can be observed. The voltage balancing feature can be turned off at any

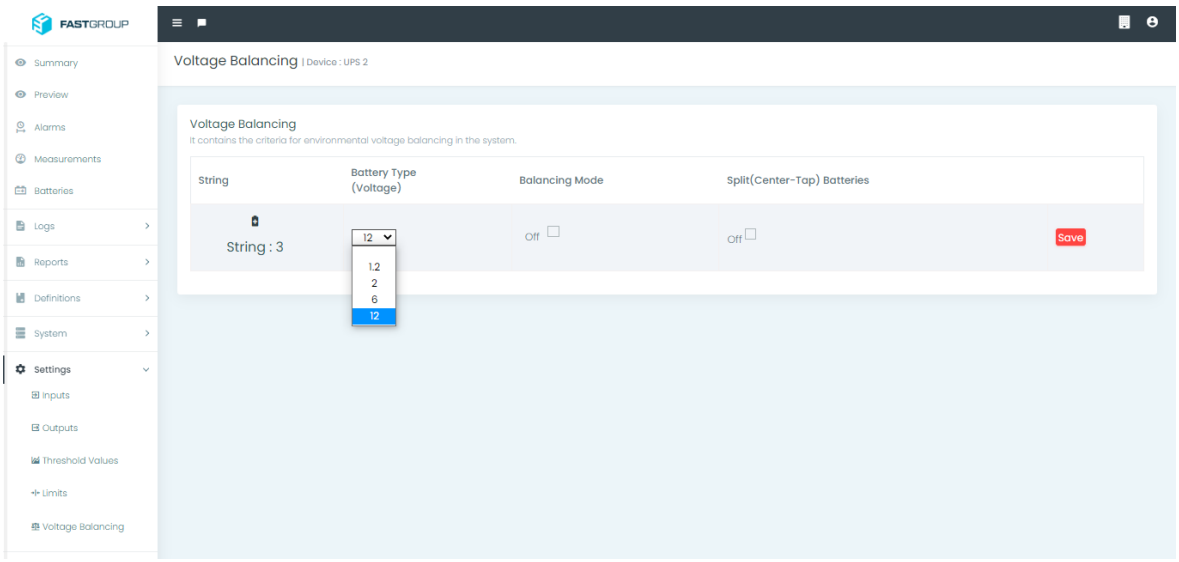


Figure 26. Voltage Balancing

4.13. Notification and Devices

According to the limit values set on the interface, if the notifications are turned on, the notification will be seen on the interface as soon as the alarm occurs. At the same time, if active, e-mail and SMS will be sent.

The device is selected from the right-hand corner. The device list is selected from the upper right corner of the interface (see Figure 27).

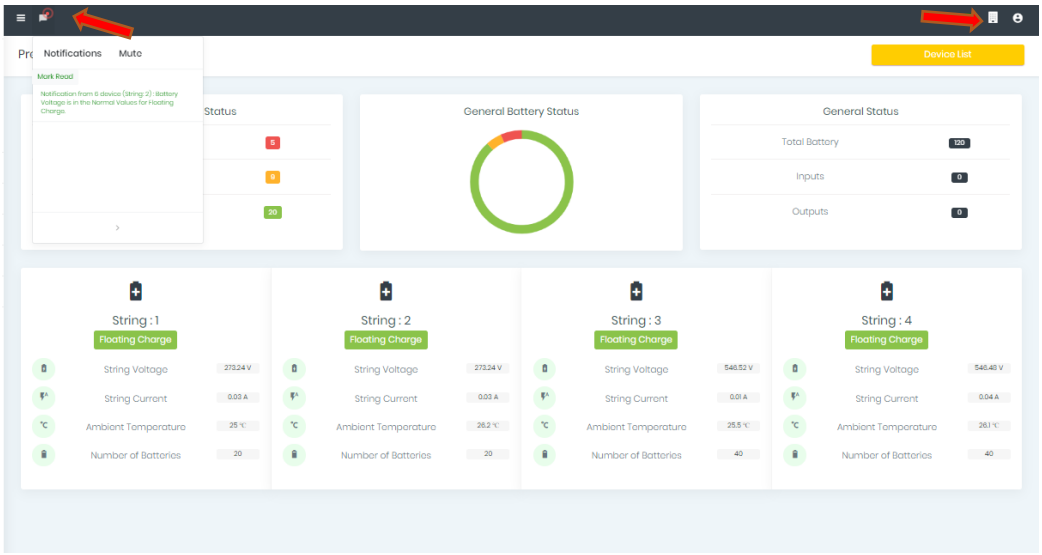


Figure 27. Notification and Devices

4.14. Exit

Exit by pressing the icon in the top right corner (see Figure 28).

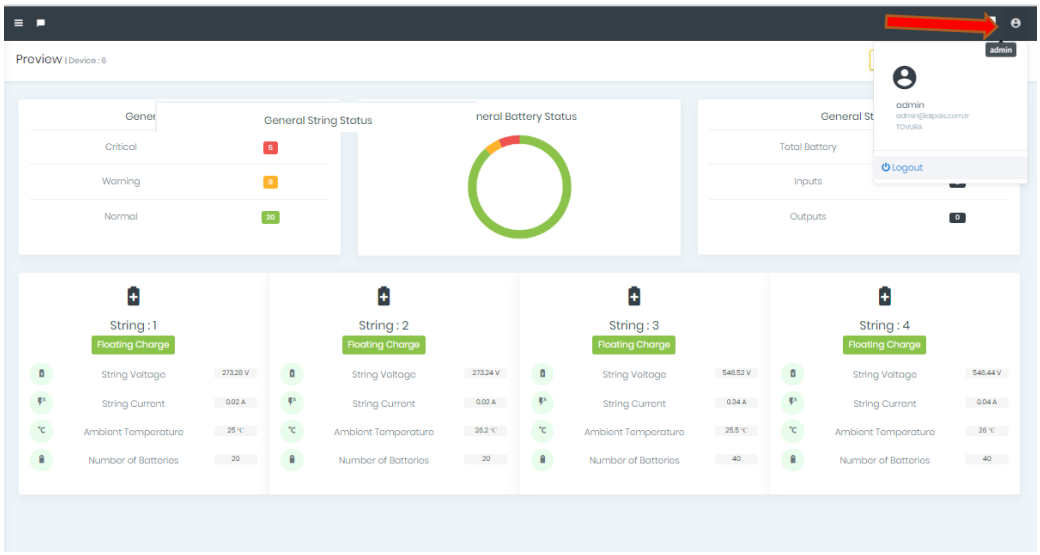


Figure 28. Exit

5.LIGHT NOTIFICATION and ALARM CASES

5.1. Control Module

The light notification definitions in the control module are as follows. Does not apply to light notifications on a Control Module with an Embedded Server.

Table 4. Control Module Light Illustration Table

No	Color	Status	Definition
1	Green	Short flashing light	The program is ready to run
2	Yellow	Short flashing light	Battery Module application on Control Module
3	Red	Continuous Light / Short flashing light	No network connection can be established via Ethernet / Verifying peripheral units

* Observe the light instructions on the control module when starting the installation. In order to see that the program works in a healthy way, first red, then yellow, and finally green light flashes.

5.2. Battery Module

In normal conditions and when the 'State' button on the control module is pressed, the light notification definitions on the battery module are as follows;

Table 5. Battery Module Normal State Light Notification Table

No	Color	Status	Definition
1	Green	0.2 sec. led @ 30 sec	Connection is available
2	Yellow	Continuous / 0.2 sec. led@5 sec / 0.7 sec. led @1 sec	IR Test / No message*/ Software update
3	Red	Continuous / 0.2 sec. led @5 sec	No Application (Only Boot Loader) / No Connection

*If data is not coming at more than 30 sec.

Table 6. Light Notification Table with Battery Module State Button Active

No	Color	Status	Definition
1	Green	0.5 sec. led@1sec	Do not overstep lower or upper limit values
2	Yellow	0.5 sec. led@1 sec	Limit values in the warning band
3	Red	0.5 sec. led@1 sec	Overstep lower or upper limit values

5.3. String Module

In normal conditions and when the 'State' button on the control module is pressed, the light notification definitions on the string module are as follows;

Table 7. String Module Normal State Light Notification Table

No	Color	Status	Definition
1	Green	0.2 sec. led @ 30 sec	Connection is available

Table 8. String Module State Button Active Light Notification Table

No	Color	Status	Definition
1	Green	0.5 sec. led@1sec	Do not overstep lower or upper limit values
2	Yellow	0.5 sec. led@1 sec	Limit values in the warning band
3	Red	0.5 sec. led@1 sec	Overstep lower or upper limit values

5.4. Sounding Notification Device

The sounding notification feature is available on the Alpais Software. Alert alarms can be intercepted by buttons on the software. The sounding notification feature is optional and can be disabled if desired.