

ALPAIS BATTERY MONITORING SYSTEM INSTALLATION AND SERVICE MANUAL

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1.SAFETY INFORMATION

Before using, read this service manual to ensure correct usage through understanding. After reading, keep it in a safe place for future reference. Misuse of this product can result in personal injury or physical damage. All installation instructions must be strictly followed.

Various symbols are used in this manual to ensure proper use and prevent dangers and material damage. The meanings of these symbols are explained below.

ABOUT THE SYMBOL			
Â	CAUTION	Indicates situations that, if ignored, could result possibly in personal injury or physical damage.	
Â	WARNING	Indicates situations that, if ignored, could result in death or serious injury.	
Â	DANGER	Indicates situations that, if ignored, could possibly result in personal injury or even death.	



DANGER

HAZARDOUS VOLTAGE

Batteries and battery cabinets contain potentially lethal voltages. To avoid electrical shock or burn, turn of main supply and control voltages before performing installation or maintenance. Even when the AC power is cut off, there is energy in the batteries, so battery intervention should be done with personal protective equipment.



Δ

WHEN YOU WORK NEAR LEAD-ACID BATTERIES:

WARNING

1. A staff member should be within reach of the person performing the action or close enough to come to help in the event of an accident.

2. Equipped safety glasses and protective clothing should be used. Eye contact should be avoided when working around the battery. If battery acid comes into contact with skin or clothing, the contact area should be immediately washed with soap and water. If the acid comes into contact with the eyes, they should be washed with cold water for at least 10 minutes and medical attention should be sought as soon as possible.

3. Care should be taken when working with metal tools (screwdriver, washer, etc.) around a battery. If a metal tool is dropped near the battery, it may cause a spark or short circuit between the battery terminals and some other metal parts. Either event can cause a dangerous electric shock hazard, fire or even explosion.

4. Personal items such as rings, bracelets, necklaces and watches should be removed when working with a lead acid battery. A lead-acid battery can short-circuit a metal ring or other piece of jewelry that can cause severe burns.

WARNING

RISK OF EXPLOSIVE GASSES.

Batteries generate explosive gasses during normal operation, and when discharged or charged.

The manufacturer is not responsibility for any damage caused by mishandling that is beyond normal usage defined in this service manual.



2.ACRONYMS

Acronym	Definition
BMS	Battery Monitoring System
UPS	Uninterruptible Power Source
DC	Direct Current
AC	Alternating Current
SNMP	Simple Network Management Protocol



3.INTRODUCTION

In general, the ALPAIS Battery Monitoring System (BMS) is an electronic system that monitors a battery and battery pack by preventing the battery from operating outside the safe working area and by calculating the desired data and reporting the data that monitors the environment. ALPAIS Battery Monitoring System (BMS) is a combination of hardware and software that instantly monitors the values of the batteries used in critical energy infrastructures, determines the problems that may occur in each battery, detects battery failures, and informs the user about the battery status with the interface software. Battery Monitoring System works like a protector and ensures that the batteries remain within the optimum operating range by examining the operating conditions.

The general features of ALPAIS and its benefits to the user are given below;

Features and Benefits

- Extends the lifetime of the batteries in the infrastructure.
- Reduce maintenance and replacement costs through effective protective and preventive maintenance.
- Provides maximum benefit with minimum workforce.
- Ensures remote access, giving you the opportunity to manage your business anytime, anywhere.
- Provides planned battery procurement by avoiding emergency situations.
- Enables the identification and verification of the warranty status with recorded data and reporting.
- Ensures improvements in business insurance premiums as risks are reduced to a minimum.
- Keeping your staff away from battery racks/chambers and vulnerable areas makes sure their safety and activities continue without interruption. This allows you to focus on your core activities by simplifying your work safety and health planning.



3.1. System Structure

ALPAIS is a battery monitoring system that measures and records the voltage, internal resistance, temperature, and string current in the battery series or parallel on a string basis.

The modular architecture of the system has the benefit to be easily customizable (see <u>APP 1</u>) to record other parameters on request (i.e. humidity, temperature sensor etc.).

The ALPAIS BMS consists of the battery (cell) module, String Module, Control Module, and accessories of this modules, each module functions as follows;

Module Name	Remark
Battery Module	Determination single battery voltage, temperature, resistance, health.
(BATMOD-XXX)	Balancing feature for series connected batteries.
String Module	Determination the string voltage, string current,
(STRMOD-XXX)	ambient temperature and humidity.
Control Module	Realization battery data acquisition, control,
(CONMOD-XXX)	alarm and event logging upload
Accessories	Power Supply, Measuring Cable, Data Cable,
	Current sensor and Current Measuring Cable

Table 1. Modules and Definition Table

System components and their definitions are given in <u>APP 1</u> and the system structure is given in Figure 1 and Figure 2;



Figure 1. Structure of ALPAIS



Figure 2. Structure of ALPAIS with Embedded Server



3.2. Application

Battery monitoring system:

- Support to monitor single unit between 1V-16V batteries.
- Support to monitor single group 1-120 units' batteries.
- Support up to 4 string per system.
- Measurement max. group voltage 1-2500V
- Measurement current -500A --- +500A
- $_{\odot}$ $\,$ Measurement internal resistance 100u Ω --- $65m\Omega$

3.3. Measurement

Each Battery Module (BATMOD) continuously measures the following battery parameters:

- Voltage: The Battery Module measures the real-time voltage of the battery.
- Temperature: The Battery Module measures the negative pole temperature of the battery. Series connected modules have voltage-balancing features.
- Internal resistance (IR): The Battery Module measures the internal resistance of the battery.
- State of Health (SoH): The Battery Module measures the deterioration level of the battery and the health of the battery.

The String Module (STRMOD) continuously measures for each string of batteries:

- Voltage: The String Module measures the real-time voltage of the string.
- o Current: The String Module measures the real-time current of the string.

The Control Module (CONMOD) continuously measures the data it receives from the Battery Module and String Module:

- Battery Data Acquisition: The String Module collects data from COM1 to COM2 via two RJ12 ports and communicates with the battery using a UART communication line. All data is transferred to the Control Module via the UART communication line.
- RS485 Interface: The Control Module provides one RS485 interface, and supports the international common MODBUS-RTU protocol.
- Ethernet Communication: The Control Module provides one Ethernet interface, and supports the international common MODBUS-TCP and SNMP.



4.PRODUCT DETAILS AND INSTALLATION

4.1. Operating Conditions

- $_{\odot}$ Operating Temperature: 0°C \sim +50°C
- Storage Temperature: −10°C ~ +70°C
- \circ Working Humidity:5 % ~ 90 % RH
- Atmosphere Pressure: 80 110 kPa

4.2. ALPAIS Features

ALPAIS BMS is divided into a Battery Module, a String Module, and a Control Module.

4.2.1. Battery Module

The Battery (cell) Module is specially designed as highly integrated smart module for VRLA, VLA and Ni-Cd batteries, which can quickly and accurately measure the batteries voltage, resistance, and negative pole temperature.



• Indicate Light Illustration

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;

No	Color	State	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

Table 2. Battery Module Normal State Light Notification Table

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



Table 3. Light Notification Table with	Battery Module State Button Active
--	------------------------------------

No	Color	State	Definition
1	Green	0.5 sec. led@1 sec	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

Dimensions (mm)



Figure 3. Dimensions of Battery Module

4.2.2. String Module

String Module is specially designed as a highly integrated smart module for VRLA, VLA, and Ni-Cd batteries, which can quickly and accurately measure the string voltage, charge and discharge current other parameters.

• Indicate Light Illustration

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 4. String Module Normal State Light Notification Table

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

Table 5. 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

• Dimensions (mm)



Figure 4. Dimensions of String Module

4.2.3. Control Module

The Control Module collects and compiles data from the battery monitoring and String Module. It communicates with the user interface and transmits the data it collects.





o Indicate Light Illustration

The light notification definitions in the Control Module are as follows. Does not apply to light notifications on embedded server-enabled Control Module.

Νο	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

Table 6. Table of Light Notifications of Control Module

• Dimensions (mm)



Figure 5. Dimensions of Control Module



4.2.4. Current Sensor

A current sensor is used for each string to measure the current passing through each string. (50 \approx 500 A)

• The Main Terminal Definitions

Table 7. Current Sensor Main Terminal Definitions Table

Νο	Symbol	Definition
1	15 V+	+15 V terminal input
2	15 V-	-15 V terminal input
3	Vout	Output voltage
4	0 V	GND

Dimensions (mm) 0



Figure 6. Dimensions of Current Sensor

4.3. Installation and Assembly



Absolutely read the safety information before installation!

Step	Description	Control
1	Preparation of the site survey and necessary installation information (<u>APP 2</u>) by the customer	
2	Confirmation of site survey and installation information	
3	Making necessary occupational safety prevention and preparations (gloves, protective goggles, etc.)	



4	Preparation of the necessary hand tools (<u>APP 3</u>)	
5	Turning OFF the battery circuit breaker in the handle	

4.3.1. Preparation of Batteries

It is checked whether the batteries are disconnected from the power. If not, the battery in each string is numbered. It is recommended to number S1-1 or K1-1. (SA-B: String ranch A and B. Battery)



4.3.2. Installing Measuring Cable

The measurement cable is inserted by removing the measurement cable socket to the terminals of the batteries in the relevant string and it is tightened back with the appropriate torque. This process is repeated for each battery as specified.



Busbar Type Jumper

Cable Type Jumper



The connection shape of the measuring cables must be as follows;



4.3.3. Connecting the Battery Module to the Battery

The application surfaces of the batteries are cleaned. The Battery Modules are fixed to this surface with the help of double-sided tape.

The empty end of the measuring cable is connected to the Battery Module with the help of the connector. This process applies to all batteries in that string. In this case, each of the Battery Modules must flash the yellow. If the Battery Modules have not received the address before, they also flash a red light.



4.3.4. Connecting the String Module

The String Module is positioned in front of the 1. Battery Module at an appropriate point for each string. The current sensor is also fixed so that it passes through the power cable to the first battery of the corresponding string. Its wiring is made between the String Module and the current module.





4.3.5. Batteries and String Data Connection

The prepared data cables firstly are connected to the String Module from the 'J3' output and finally are connected to the 'J2' input of the first Battery Module. This connection also continues until you reach the J2 input of the last Battery Module. The 'J3' output of the last Battery Module will stay idle. This process is repeated for each string.



4.3.6. Connecting the Control Module

All the strings for the Control Module are taken into consideration and assembled by selecting a suitable location. The 12V / 2A adapter from the 220 V line, which was prepared before installation, is connected and the Control Module is powered up by the adapter. The red light in the Control Module is expected to illuminate.



From the string output (P1-P2-P3-P4) of the Control Module, the 'J2' input of the String Module in the corresponding string is connected to the data cable. After the Control Module has been configured (see <u>4.4</u>), Control Module automatically loads the current software to the Battery Modules in each string .



4.4. Control Module Configuration

Netconf service application is used to change the required parameter settings (IP address, Upgrade, Offset, etc.) on the Control Module. The installer will provide 'NetConf' file from the manufacturer.

4.4.1. Netconf Physical Connection

The installer must make the necessary connection between the 'RS422 converter' and the Control Module as described; It should be connected from the B(D-) terminal on the RS422 converter to the 2nd pin of the serial communication port and from the A(D+) terminal on the RS422 converter to the 1st pin of the serial communication port.



Figure 7. Serial Communication Port

NOTE: In order to identify the required port after the connection, the appropriate driver must be installed or installed. (See https://sparks.gogo.co.nz/ch340.html 64-bit or 32-bit software for Windows can be downloaded directly).



4.4.2. Netconf Application Communication

NetConf interface opens. As shown in the Figure 8, the connected port is detected by the program. When the detected port is selected, the connection is provided with a 'Connect' button. The Baudrate value registered in CONMOD is automatically detected.

Connection / Communication	ALPAİS Service Interface						
	Ethemet Connection Speed : 100 Mbps (25 MHz)						
	Connectio	on / Communication	Network	Firmv	vare U	pgrade	
Select COM 🗸	CONNECT	COM3 ~	Configur	ation	ARP	Ping	
COM4	CONNECT	Com Established with CONMOD					
		Abort			S	static IP	
Network Configurations	Abort Commu	nication Before Leaving!			102.1	69 000	
Firmware Upgrade	Firmware	Versions			192.1	00.000	
System Parameters	CONMOD	: V6.48			255.2	55.255	
Abort	BATMOD A Bootloader	: V1.25			192 1	68 000	

Figure 8. NetConf Interface

4.4.3. <u>Netconf / Network Settings</u>

First, 'Network_Configurations' button is selected. On the right screen, the 'Bring' button displays the network information installed in the Control Module (see Table 8). This information is arranged according to the area to be installed and updated with the Update button (see Figure 9).

Table 8. Network Configuration Table

Name	Description
IP Address	The IP address of the Control Module.
Destination IP	The IP address of the interface.
NetMask	It is a network mask.
Gateway	The address of the gateway.
MAC Address	Control Module has a MAC address.
Destination Port	60000 (Port is the data stream).
Unique_ID	The number given to the device in the interface.
NTP Address	It measures algorithms, delays on the network and on the target machine. The IP address to synchronize the clock must be entered.

Network settings are made on different pages for two types: without an embedded server (Ethernet Mode) and with an embedded server.

Ethernet Conne	ction Speed : 10 Mbps (2.5 MHz)					alpais Ser	vice Interface Version 4.36
Connectio	n / Communication	Network FW U	pgrade System CON	MOD BATM	IODs Tem	p. Offset Bala	ncing Test
ARODT	COM3 ~	Ethernet Mode	Embedded Server				
ADORT	Com Established with CONMOD	Configuration	ARP Ping				
Abort Commun	nication Before Leaving!		Ctatia ID		D	Dunomio ID	
Firmware	Versions		Static IP		٢	Dynamic IP	
BATMOD A	PI : V5.25	-	192.168.001.241	IP Addre	SS	000.000.000.0	00
Bootloader	: V1.32		255.255.255.000 Netmask		k	000.000.000	
String Info String 1: No	D t Connected		192.168.001.001	Gatewa	у	000.000.000.0	00
String 2: No String 3: No String 4: No	it Connected it Connected it Connected		Destin	ation IP	192.168.	001.103	
			CONMOD MAC A	Address	AE:32:FD:98:12:C6		
Status Info	o - Quick Commands		Destinati	ion Port	60000		
Idle System			Un	niaue ID	00007		
Measurement M	lode 🗸 System Reset		NTPA	Address	192 168	001 103	
Apply	Number of Weeks				102.100.		
Buzzer is OFF	Get Events		Rea	ad	Update	•	
Send Bu:	zzer Erase Event Log						
_				Get Tin	ne		
Ethemet Conner	ction Speed : 10 Mbps (2.5 MHz) n / Communication	Network FW U	pgrade System CON	MOD BATM	/IODs Tem	alpars Ser p. Offset Bala	vice Interface Version 4.36
ARODT	COM3 ~	Ethernet Mode	Embedded Server				
ADURT	Com Established with CONMOD						
Abort Commun	nication Before Leaving!						
- Firmware	Versions						1
BATMOD AF	PI : V5.25		IP	Address	192.168.0	01.103	
Bootloader	: V1.32			Netmask	255.255.2	55.000	
String 1: No String 2: No	t Connected t Connected			Gateway	192.168.0	01.001	
String 3: No String 4: No	t Connected t Connected		Primary DN	IS Server	008.008.0	800.80	
Status Info	o - Quick Commands		Secondary DN	IS Server	008.008.0	04.004	
Idle System			L	Jnique ID	00007		
Measurement M	ode 🗸 System Reset		MAC	Address	:::	::	
Apply	Number of Weeks of Events to Log						
Buzzer is OFF	Get Events		Rea	ad	Updat	e	
Send Buz	Erase Event Log						

Figure 9. Network Configuration Setup

4.4.4. Netconf / Message Display and Software Update

All transactions made by CONMOD under the name 'Status Info' are written as messages. This message can be used to check which operation CONMOD is



currently performing or which operation it cannot perform. With the 'System Reset' button, CONMOD can be soft reset (See Figure 10).

The 'Firmware Upgrade' button is selected to load the current BATMOD application in CONMOD when in the Installation mode. Select the BATMOD application in .bin format with the 'Choose File' button on the right. The new BATMOD application will be loaded to CONMOD with 'Load File'. The desired string will be selected with the 'Upgrade BatMods Firmware' button, and BATMODs will be applied.

Connectio	on / Communication	Network	Firmware Upgrade	System Parameters	Conmod Parameters
	COM3 ~				
CONNECT	Com Established with CONMOD				
	Abort				
Abort Commu	nication Before Leaving!		(Choose File Fi	leName
Firmware CONMOD BATMOD A Bootloader	Versions : V6.48 PI : V3.04 : V1.25			Load File	
String 1: No	ot Connected		APLC	ode Update Status	
String 2: V2 String 3: No	ot Connected				
String 4: No	ot Connected				
Status Inf	o - Quick Commands				
Performing M	leasurements on Strings		Strin	ng-1 🗌 String-2 🗌	String-3 String-4
Measurement N	Node 🗸 System Reset	í –		Upgrade BATMO	Os Firmware
	Number of Weeks of Events to Log		BATN	10D Firmware Upload S	tatus
Buzzer is OFF	Get Events				
Send Bu	Izzer Erase Event Log				
String-1	String-2 String-3 String-4				
	IR TEST(Strings)				

Figure 10. Firmware Upgrade

4.4.5. Netconf / Installation and Measurement Mode

'Installation Mode' is selected from the lower left section and the 'OK' button is pressed for Installation Mode. Batteries are expected to receive addressing. After the confirmation command has been received, the display will show the number of batteries in each string. The 'Measurement Mode' option is selected and the verification code waits for Measurement Mode. In measurement mode, a data



All events written to CONMOD can be downloaded in txt format with the Get Events button. Logs are taken weekly, the number of weeks to be selected is written in the box. A string-based internal resistance test is performed on each string with the 'IR TEST' button. (See Figure 11).

Connection / Communication	Networ	Firm	ware U	pgrade	Syste	m Parameters	Conmod	Parameters
COM3	Configu	Iration	ARP	Ping				
Com Established with CONMO	D							
Abort			S	Static IP			CP	Dynam
Abort Communication Before Leaving!			192	168 000	025	IP Addr	ess	192 168 (
Firmware Versions CONMOD : V6.48 BATMOD API : V3.04			255.2	255.255	.000	Netma	sk	255.255.2
Bootloader : V1.25 String 1: Not Connected			192.1	168.000.	.001	Gatew	ау	192.168.0
String 2: V2.44 String 3: Not Connected String 4: Not Connected	S	JCCESS			De	stination IP ×	078.1	87.133.026
Status Info - Quick Commands Performing Measurements on Strings		utomatic tring 1-> tring 2-> tring 3-> tring 4->	Address R 40 pcs 40 pcs 40 pcs 40 pcs 0 pcs	esolution (Completed	d 1 Port ue ID	60000 0000)
Measurement Mode System Reset			-	_		dress	078.1	87.133.026
OK Number of Weeks 1 Buzzer is OFF Get Events Send Buzzer Frase Event Loc	×		Me	asuremer (nt Mode DK	~	Upd	ate
	-					Get Ti	me	
String-1 String-2 String-3 String	4							
IR TEST(Strings)								

Figure 11. Installation and Measurement Mode

4.4.6. <u>Netconf / System Parameters</u>

The 'System_Parameters' button is selected to change the system parameters on the right-hand screen, the 'Bring' button displays the parameter information that is loaded in the Control Module for each string (see Table 9). This information is arranged according to the area to be installed for each string and updated with 'Update' button (see Figure 12).

Table 9. System Parameter Setup Table

1		
	Namo	Description
	Name	Description



Bat-mod and Str-Mod Device	The versions should be selected according to
Туре	the known battery and lever modules.
Current Sensor Coil Number	The number must be indicated by the same cable through the current sensor.
Current Sensor Max. Magnitude	Maximum current value of the current sensor
(A)	in each string
Batteries Default Max Voltage(mV)	The maximum voltage value stated in the technical documents of the batteries should be written.
Batteries Default Charge(mAmp*h)	Ah value of batteries
Batteries Default Internal	It is the internal resistance value specified in
Resistance (microOhm)	the technical document of the batteries.
Internal Resistance	The periodic IR measurement time and the number of batteries to be measured must be set.

Connectio	Connection / Communication		Firmware Upgrade	System Parameters	Conmod Parameters	Temperat
CONNECT	COM3 ~ Com Established with CONMOD		Choose String String 4	System Parame Bat-Mod Device Type	ters Str-Mod Device Type	
Abort Commun Firmware CONMOD BATMOD A Bootloader String 1: No String 2: V2 String 3: No String 4: No Status Inf Performing N Measurement N	Abort inication Before Leaving! Versions Versions Vers		Bring Update	Image: New 3.0 Current 500 Current 1 Current Batteries Parant Batteries Parant 13500 Batteries Parant 13500 Batteries Parant 13500 Batteries Parant 14 V 4 V 4 Measure 0_ Measure 0_ Measure 0_ Measure 0_ Measure	Interval - Week ment Interval - North ment Interval - North ment Interval - North ment Interval - North	(microC im)
OK Buzzer is OFF Send Bu	Number of Weeks 1 ÷ of Events to Log 1 ÷ Get Events Erase Event Log String-2 String-3 String-4 IR TEST(Strings)		Choose a Strin	g To Check Bootloader Firmwa	are Versions BSL FimV Check	

Figure 12. System Parameters



4.4.7. Netconf / CONMOD Parameters

To make CONMOD settings, the 'Conmod Parameters' button is selected. 'Conmod Mode' is selected according to the way CONMOD communicates. In the first installation, when 'Normal Mode' is selected, all strings must be tested for internal resistance once. The internal resistance test can be observed via BATMODs or the Netconf screen. The BATMODs will alternately flash their yellow light during the IR test. After the internal resistance measurement process is completed, 'Smart Mode' should be selected and the determined % margin value should be entered. In addition, optionally, the string can be selected to perform manual/periodic internal resistance measurement in floating charging or idle states. 'Slave ID' is required for operation in Modbus protocol. To save each feature, the desired state can be selected by pressing the 'Update' button. The current status is displayed with the 'Bring' button. (See Figure 13).



With the 'Erase EEPROM' button, related previously configured data is reset.

ALPAIS Serv	ice Interface	_					-		×
Ethernet Conne	ction Speed : 10 Mbps (2.5 MHz)					alpa	Service Interface	/ersion	4.36
Connectio	n / Communication	Network FW Upgra	ade Svstem	CONMOD	BATMODs Te	mp. Offset	Balancing Tes	st	
10007	COM3 ~	User Admin Ma	nual Address	ing RTC	R&D Logs		5		
ABORT	Com Established with CONMOD	To apply the change to the Conmod Mode, the "Update" button on the "User" tab is used							
Abort Commun	nication Before Leaving!		C	onmod Mode	e Embedde	ed Server 🗸			
Firmware CONMOD BATMOD Al Bootloader	Versions : V8.02 PI : V5.25 : V1.32	Erasing the EEPRC	M or external Erase f	W Flash sets th EPROM	ARNIN e parar Old Versie No Web	ed Server ion	alues and is irre	versit	ble!
String 1: No	t Connected			E	rase Both				
String 2: No String 3: No String 4: No	t Connected t Connected t Connected		EEP	ROM Test	Flash Tes	st			
Status Info	o - Quick Commands		🗆 Er	ase	Erase				
Idle System			□ w	rite	□ Write				
Measurement M	lode V System Reset				Test				
Apply	Number of Weeks	CONMOD	Mode an	d EEPR	OM erasin	ng are d	one by a	dm	in
Buzzer is OFF	✓ Get Events	only. Char	iges are	made	by enterir	ng the p	bassword		
Send Bu	Erase Event Log	EEPROM Sector 1	Page Erase	0	•		Erase		

Figure 13. CONMOD Parameters

Additionally, manual addressing can be done for each arm of the device.

ALPAIS Server	vice Interface	-	□ ×
Ethemet Conne	ection Speed : 10 Mbps (2.5 MHz)	alpars Service Inter	rface Version 4.36
Connectio	n / Communication	Network FW Upgrade System CONMOD BATMODs Temp. Offset Balancing	Test
ARODT	COM3 v	User Admin Manual Addressing RTC R&D Logs	
ADORT	Com Established with CONMOD		
Abort Commu Firmware CONMOD BATMOD A Bootloader	nication Before Leaving! Versions : V8.02 PI : V5.25 : V1.32	Password	
String Inf String 1: No String 2: No String 3: No String 4: No	0 ot Connected ot Connected ot Connected ot Connected	String 1 5 String 2 5 String 3 5 String 4	5

4.4.8. Netconf / BATMOD Sleep Mode

In case no measurement can be made on the Battery Modules, the Battery Modules go into sleep mode within 5 minutes and minimize power consumption. If the measurements are made, the modules automatically wake up and perform their duties. However, in addition to this feature, BATMODs can be manually put into sleep mode and woken up via Netconf.



ALPAIS Serv	ice Interface						X
Ethernet Conne	ction Speed : 10 Mbps (2.5 MHz)						alpars Service Interface Version 4.36
Connectio	n / Communication	Network	FW Upgra	ade Syst	em CON	MOD BA	TMODs Temp. Offset Balancing Test
ABORT COM4 Com Established with CONMOD							
						String	
Abort Commun	nication Before Leaving!		ſ	Read]		Password
CONMOD BATMOD A	#	Sleep	Limit LEDs	Amber LED	Red LED		
Bootloader	: V1.32	1					Login
String Inf	0	2					BATMOD Mode
String 1: V2	.44	3					Sleep Wake Up
String 2: No	t Connected	4					oleep Wake op
String 3: No String 4: No	t Connected	5					BATMOD LED
ounig i. No	il connected	6					Amber
Status Inf	o - Quick Commands	7					Alliber
Idle System		8					Auto Wake Up
	9						
		10					String 1 String 2 String 3 String 4
	System Reset	11					Read Undate
Apply	Number of Weeks of Events to Log						

4.4.9. Netconf / Temperature Offset

Press the 'Temperature Offset' button to adjust the temperature offsets of each string and battery. Click the 'Update' button for the changes made in each string. The current status is displayed with the 'Read' button (See Figure 14).

Connection / Communication		ork Firr	mware	Upgi	ade	System	Param	eter	s Co	nmod P	aramete	ərs	Temp	oerature	Offset	
COM3 ~																
CONNECT Com Established with CONMOD																
Abort		String erature Of	i 1 fsets (°C	10)	Temp	String perature Of	2 fsets (°C/	(10)	Temp	String erature Of) 3 ffsets (°C/	10)	Temp	String erature O)4 ffsets (°C	/10)
Abort Communication Before Leaving!		Bat. No	Offset	^		Bat. No	Offset	^		Bat. No	Offset	^		Bat. No	Offset	^
Firmware Versions	•	0	0		•	0	0		•	0	0		•	0	0	
BATMOD API : V3.04		1	0			1	0			1	0			1	0	
Bootloader : V1.25		2	0			2	0			2	0			2	0	1
String 1: Not Connected		3	0			3	0			3	0			3	0	
String 2: V2.44 String 2: Not Connected		4	0			4	0			4	0			4	0	1
String 3: Not Connected		5	0			5	0			5	0			5	0	1
etting three connected		6	0			6	0			6	0			6	0	1
Status Info - Quick Commands		7	0			7	0			7	0			7	0	1
Performing Measurements on Strings		8	0			8	0			8	0			8	0	1
		9	0	¥		9	0	\checkmark		9	0	\checkmark		9	0	~
Measurement Mode V System Reset OK Number of Weeks		Read	Update			Read	Update			Read	Update			Read	Update	

Figure 14. Temperature Offset



4.4.10. Netconf / Balancing

In order to activate the balancing feature on the desired string, the battery type must be selected and the 'Mode' option must be clicked. If the battery connection is as follows, 'Split' should also be clicked.



Click the 'Update' button for the changes made in each string. The current status is displayed with the 'Read' button (See Figure 15).

The Split option is selected, and the number of battery packs in the series is divided into two and their numbers must be equal. The targeted voltage values for each string are calculated and the batteries are balanced as a percentage according to this target.

Balancing activation can also be done from the interface.



Connection / Communication	Network FW	Upgrade	System	CONM	OD BA	TMODs Temp.	Offset Balancin	g Tes	t
ABORT COM4 Com Established with CONMOD		Strir	ng	Мо	de	Split (Center-Tap)	Турө	_	
Abort Communication Before Leaving!		1					12 V 🗸		
Firmware Versions CONMOD : V7.179 RATMOD ADI : V5.25		2					12 V ~	-	
Bootloader : V1.32		3					12 V 🗸	-	
String Info String 1: Not Connected		4					12 V 🗸	-	
String 2: Not Connected String 3: V2.44 String 4: Not Connected				Rea	ad	Update		_	
Status Info - Quick Commands	String 3 🛨		R	ead	String	1st Half Targe	ot 2nd Half Ta	arget	
Idle System	Battery Number	State	Duty (%)	^					
Measurement Mode V System Reset	13	\checkmark	4		1	0 m		mV	Read
Apply Number of Weeks	14	\checkmark	21						
of Events to Log	15	\checkmark	0		2	0 m	NV 0	mV	Read
Buzzer is OFF Get Events	16	\checkmark	37						
Send Buzzer Erase Event Log	17	\checkmark	31		0	10045	10045		
	18	\checkmark	7		3	13645 m	IV 13645	mv	Read
String 1 String 2 String 3 String 4	19	\checkmark	36						
IB TEST(Strings)	20	\checkmark	22		4	0 m	V 0	mV	Read
in the control in the second	01		1						

Figure 15. Balancing-Equalizing

NOTE: When using the Balancing feature, the Battery Module connections should go parallel with the connections of the batteries with each other.

With the 'Abort' button, the connection line is released and the process is completed.

4.5. ALPAIS Software Installation

- a) We will check the Site Survey Information given to us by the relevant company before the installation (see <u>APP 2</u>).
- b) System requirements are completed and checked (see <u>APP 4</u>).
- c) ALPAIS software is installed (see <u>5</u>).
- d) Software is introduced to the user interface and tested.

NOTE: Control Modules with embedded web server feature do not require software installation. SKIP CHAPTER 5. Only network settings should be made.



5. ALPAIS SOFTWARE CONFIGURATION

In the product with Embedded Server, the 'SOFTWARE CONFIGURATION' section is skipped. See directly to section 6.

The software installation must be done after completing the system requirements. If the installation will take place on the virtual server, the server version in the institution should be specified in the site survey. The customer is given a CD or USB stick and an Image File (.ova or .ovf extension) to install the software on his own server. The customer will install the software.

The server is to be installed on a local PC (Windows operating system is installed), those steps should be followed;

- a) The Image File is provided with the CD or USB memory to the customer to install on the local PC. The existing Image file has .ova or .ovf extension.
- b) If the local PC is not Linux-based, VM VirtualBox Software is installed on the PC. (See <u>https://www.virtualbox.org/wiki/Downloads</u>)
- c) 'Image File' supplied to the customer opens via VM VirtualBox. (See Figure 16)



Figure 16. WM VirtualBox Software

d) To import, select the Image File and click on 'Next'. How much space (memory) should be allocated to the program on the local PC from the 'Device Settings' section? Recommended memory is at least 4GB. The selected options should not be changed. (See Figure 17).



Import Virtual Appliance

Appliance to import

Please cho import clou	ose the source to import appliance from. This can be a local file system to import OVF archive or one of known cloud service providers to ud VM from.	
Source:	Local File System	•
Please cho (OVF). To	use a file to import the virtual appliance from. VirtualBox currently supports importing appliances saved in the Open Virtualization Format continue, select the file to import below.	
<u>F</u> ile:	C:\Users\AMD\Documents\Windows 10.ova	
Appliance	settings	

These are the virtual machines contained in the appliance and the suggested settings of the imported VirtualBox machines. You can change many of the properties shown by double-clicking on the items and disable others using the check boxes below.

Virtual	System 1			
3	Name	Windows 10 Pro		
	Guest OS Type	🐝 Windows 10 (64-bit)		
	CPU	4		
	RAM	10240 MB		
<u> </u>	DVD	\checkmark		
	USB Controller	\checkmark		
- 🏚	Sound Card	Intel HD Audio		
- 6	Network Adapter	Intel PRO/1000 MT Desktop (82540EM)		
~ 🥠	Storage Controller (SATA)	AHCI		
	Virtual Disk Image	Windows 10-disk001.vmdk		
	Base Folder	C:\Users\AMD\VirtualBox VMs		
6	Primary Group	/		
Machine	Rase Folder: C:\Users\AM	ID/VirtualBox VMs		
Machine	base roluer:			
MAC Ad	ddress Policy: Include only NAT	network adapter MAC addresses		
Additi	onal Options: 🗹 Import hard d	rives as VDI		
Appliano	e is not signed			
			Restore Defaults Import Cance	1

Figure 17. Import Image File

In VirtualBox Software, go to Network page in Settings. Select your Ethernet Network Interface Controller as a Bridge Adapter. Otherwise, the PC cannot communicate with the virtual server.

🧾 General	Network						
System	Adapter 1	Adapter 2	Adapter 3	Adapter 4			
Display	Enable Network	vork Adapter					
Storage		Attached to:	Bridged Adapter	-			
🔶 Audio		Name:	Realtek PCIe FE Fan	nily Controller			•
Network		Advanced	Realtek PCIe Intel(R) Dual	FE Family Contr Band Wireless-/	oller AC 3165		
🚫 Serial Ports		Adapter Type:	Intel PRO/1000 MT I	Desktop (82540EM)			~
🄗 USB	Pi	romiscuous Mode:	Deny				•
Shared Folders		MAC Address:	080027FDE09	96			G
User Interface			Cable Connecte	ed			
			Port Forwar	ding			
					ОК	Can	cel

Figure 18. Bridge Settings



📃 General	System
System	Motherboard Processor Acceleration
Display	Base Memory:
Storage	4 MB 24576 MB
🕩 Audio	Boot Order: 🗹 😰 Hard Disk 🗈
Network	✓ Optical □ □ standard
Serial Ports	Proppy Network
🖉 USB	Chipset: PIIX3
Shared Folders	Pointing Device: USB Tablet
User Interface	Extended Features: V Enable I/O APIC
	Enable <u>E</u> FI (special OSes only)
	Hardware Clock in <u>U</u> TC Time
	SCancel ⊘OK

The following option must be checked wherever installed with Virtualbox.

Figure 19. Time Settings

e) After clicking the Import message, the file is expected to get. After double-clicking on the file, it is waiting for the login screen to open. (If the Change Network Settings screen appears the first time the file is opened, press OK without making changes.) Login with the user name and password. (See Figure 20). See <u>APP 5</u> for remote access. After access, the following input screen is displayed.



Figure 20. Login

f) After the login information, 'nmtui' is written to the console screen to make Network configuration settings. (see Figure 21)


🔁 Alpais [Çalışıyor] - Oracle VM VirtualBox	_		\times
Dosya Makine Görünüm Giriş Aygıtlar Yardım			
CentOS Linux 7 (Core) Kernel 3.10.0-862.11.6.el7.x86_64 on an x86_64			
livedemo login: root Password: Last failed login: Wed Feb 6 17:21:53 +03 2019 from 218.92.1.169 There were 8 failed login attempts since the last successful logi Last login: Wed Feb 6 17:21:21 on tty1 [root@livedemo ~]# nmtui_	on s n.	sh:not	ty

Figure 21. Console Screen

g) All operations are followed sequentially as shown in the Figure 22. 'IPV4 Configuration' is set manually. If there is one-to-one connection with the Control Module, only the IP Address is given. Prefix must be entered as Subnet Mask (see <u>APP 6</u>). If not, the gateway information should be given with the IP address. All changes are saved with 'Ok' button (IP Address and Gateway must be given according to customer request).



Figure 22. Edit Connection

h) Returning to 'NetworkManager TUI' page follows the Operations in the Figure 23. Check whether the connection is active and return to the 'NetworkManager TUI'



page. (To be active, it should look like the Figure 23). Finally, 'Quit' is output from the tab.



Figure 23. Connection Activation

i) The Ethernet port of the Control Module is connected to the Ethernet port of the PC or modem using an Ethernet cable. The program restart as given 'reboot' command on the console screen. Re-entry must be made. 'ip addr' command is written to the console screen the accuracy of the given IP Address is queried.



Figure 24. IP Address Verification

j) From the PC's 'Network Connections', go to the 'Ethernet Properties.' Following the operations in the Figure 25, an IP Address is defined to the PC.

Ethernet S	Status	×		Ethernet Prope
		N	tworking	
ion Connectivity:	No Internet access		Intel(R) 82	2574L Gigabit Network Conn
Connectivity:	No Internet access	4		-
edia State:	Enabled		This connection	uses the fellowing items
uration:	8 days 00:27:18		Client fo	nr Microsoft Networks
eed:	1.0 GDps		File and	l Printer Sharing for Microsoft
Details			QoS Pa	icket Scheduler ft Network Adapter Multiple
			✓ Link-La;	yer Topology Discovery Ma
ity		-2	Link-Lay	ver Topology Discovery Re
			🗹 📥 Internet	Protocol Version 4 (TCP/IF
Sent —	Received		Install	Uninstall
/tes: 15.101.279.124	17.277.893.631		Description	
			Transmission (Control Protocol/Internet Pr
Properties 🚱 Disable	Diagnose		across diverse	interconnected networks.
	Close			
ternet Protocol Versio	on 4 (TCP/IPv4) Prope	erties ×		
in get IP settings assigned au pability. Otherwise, you neer	tomatically if your network su d to ask your network adminis	upports strator		
ne appropriate IP settings.				
Obtain an IP address automat	ically			
Use the following IP address:				
address:	192.168.2.23	1		
ibnet mask:	255.255.255.0	i II		
efault gateway:	192, 168, 2, 1			
	192.100.2.1			
Obtain DNS server address au	tomatically			
Use the following DNS server a	addresses:			
eferred DNS server:	8.8.8.8			
ternate DNS server:	8.8.4.4			
Validate settings upon exit				
	Adva	nced		
	Adva	Ac		

Figure 25. PC Ethernet Setup

k) 'Command Prompt' is written to the PC's search field. 'IPCONFIG' command is written to the console screen and the supplied PC IP address is verified. C:\Users\gozde>IPCONFIG

c. (osers (Bozde) From 10
Windows IP Configuration
Ethernet adapter VirtualBox Host-Only Network:
Connection-specific DNS Suffix .: Link-local IPv6 Address : fe80::7c21:fb7e:8fc9:11fb%9 IPv4 Address : 192.168.56.1 Subnet Mask : 255.255.255.0 Default Gateway :
Wireless LAN adapter Yerel Ağ Bağlantısı* 1:
Media State : Media disconnected Connection-specific DNS Suffix . :
Wireless LAN adapter Yerel Ağ Bağlantısı* 2:
Media State : Media disconnected Connection-specific DNS Suffix . :
Ethernet adapter Ethernet:
Connection-specific DNS Suffix .: Link-local IPv6 Address : fe80::a8a3:ede2:9b2a:8f12%16 IPv4 Address : 192.168.2.12 Subnet Mask : 255.255.0 Default Gateway : 192.168.2.1

Figure 26. PC IP Address Verification



 Before this step, the Control Module is reset (Powered off). The Control Module must be configured at this stage. The procedures in Figure 27 are followed to verify that the Server IP Address and the PC IP Address are communicating. The 'ping Server IP Address' command is entered on the console screen and the data flow is observed (Ex: ping 192.168.2.6). The data stream is interrupted with CRTL+C.

```
Microsoft Windows [Version 10.0.19042.867]
(c) 2020 Microsoft Corporation. Tüm hakları saklıdır.
C:\Users\gozde>ping 192.168.2.6
Pinging 192.168.2.6 with 32 bytes of data:
Reply from 192.168.2.6: bytes=32 time<1ms TTL=64
Reply from 192.168.2.6: bytes=32 time<1ms TTL=64
Reply from 192.168.2.6: bytes=32 time<1ms TTL=64
Ping statistics for 192.168.2.6:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum = 0ms, Average = 0ms</pre>
```

Figure 27. Server IP Address Communication

- m) Depending on the structure of the company, extensions may change such as .ova .
- n) Access to the Interface via the browser and the server IP address.

5.1. Automatic Start of Virtual Server

The following steps must be followed for the virtual server to start automatically.

• The shortcut to the virtual server is added to the desktop. Left-click on the screen. Click the 'Create Shortcut on Desktop' button.

🔞 Oracle VM Vir	rtualBo	ox Manager			
File Machine	Help	3			
New Settings	Start	Discard			Details G Snapshots (1)
Window	s 7 (Sr	🔜 📃 General			Preview
Ubuntu	red Of	Name: Operating System	Windows 7 Windows 7 (64	4 bit)	
Powe	0	Settings	Ctrl+S		
	Đ	Clone	Ctrl+0	rd Diale	Windows 7
	83	Remove	Ctrl+R	Paging	
		Start			
		Pause	Ctrl+P		
	0	Reset	Ctrl+T		Preview
	\bigtriangledown	Close	÷.		
	0	Discard saved state	Ctrl+J		
	団	Show Log	Ctrl+L		
	G	Refresh		rd Disk	Ubuntu
		Show in Explorer		Paging, PAE/NX	
	5	Create Shortcut on Deskt	top		
	BÛ	Sort			



• The created shortcut is copied to 'C:\ProgramData\Microsoft\Windows\Start Menu\Programs\StartUp'.

📥 🛃 📕 = CA		-	
File Home Share	View		~ (
🔶 🔶 👻 🛧 🏪 🔒 🚾	ata\Microsoft\Windows\Start Menu\Programs\StartUp	 Search Wir 	ndows 10 (🔎
Windows 10 (C:) ^ FSD	Name OneDriveTemp	Date modified 9/7/2017 1:19 PM	Type File folder
OneDriveTemp	PerfLogs	3/18/2017 2:03 PM	File folder
PerfLogs	Program Files	9/5/2017 2:53 PM 9/6/2017 10:19 PM	File folder File folder
Program Files	ProgramData	8/23/2017 2:13 PM	File folder
Program Files (Users	4/5/2017 7:28 PM	File folder
ProgramData	Windows	9/6/2017 10:19 PM	File folder
Users V < 8 items 2 items selected			

5.2. Modbus-RTU Features

Many different applications can be used to test CONMOD's MODBUS-RTU connection. Below are descriptions for the most common application. Many of these expressions are used.

🚟 Modbus Tester - www.modbu	s.pl			_ 🗆	×
About Modbus Tester			Polls	Valid responses	-
Read Status : Not Connected			0	0	C
Write Status : Not Connected			0	0	(
Modbus Settings View Data Com	munication Spy				
Modbus	BS settings			ingo	
RTU mus		With	CONMOD, the	COM	
	Baud rate : 9600 🖵		The bau	ud rate	
	Data bits : 🛛 🛛 🖵		·		
	Parity : NONE 🗸		Data bits, pa	arity and	
	Stop bits : 🛛 🖵		stop bits spec	cified and	
	Time out : 1000	[m s] →	used by the	user are	
			entered.		



🚟 Modbus Tester - www.modbus.pl			_ 🗆 🗙
About Modbus Tester		Polls	Valid responses
Read Status : Not Connected		0	0 C
Write Status : Not Connected		0	0 (
Modbus Settings [View Data] Communication Spy			
Status : Not connected	Address V	alue	^
Device address : 1	2		
Data type : 0 : Coils 💌	3 • The 'S	Slave ID' set from f application mus	n the st be
Start address : 1	5 entered	1.	
Length : 100	• The d	ata type is selec registers)	ted. (ex: 4
Scan rate : 1000 [ms]	8 • It is c	letermined from	which
Data format : Bit 🔹	g address	s the data will st	art.
	11 determ	ined.	yeu uata is
	12		
Connect Disconnect	13		
	14		

After all the parameters are edited, click 'Connect'. It will read 'Read OK' on the Read Status screen. Data will be written in the table on the right screen. Also, the number of 'Polls' and 'Valid Responses' must be equal.

5.3. MODBUS-TCP/IP Features

Many different applications can be used to test CONMOD's MODBUS-RTU connection. Below are descriptions of the most common applications. Many of these expressions are used.

Tx = 0: Err = 0: ID = 1: F = 03: SR = 1000ms	Connection Setup		×
No connection	Connection		ОК
Alias 00000	Modbus TCP/IP	~	
0 0	Serial Settings		Cancel
1 0	COM1	~	Mode
	9600 Baud 🗸		ORTU OASCI
• The IP address of the device is entered.	8 Data bits 🗸 🗸		Response Timeout 1000 [ms]
	Even Parity ~		Delay Between Polls
7 0	1 Stop Bit	Advanced	20[ms]
9 0	Remote Modbus Server		
	IP Address or Node Name		
	192.168.2.4		
	Server Port	Connect Timeout	0 IPv4
	502	3000 [ms]	



x = 2	5: Err = 0: ID =	= 1: F = 03: SR	= 1000ms		Read/Write Definition X
					Slave ID: 1 OK
	Alias	40000	Alias	40010	a construction of the state of the second seco
0				12957	Function: US Read Holding Registers (4x) Cancel
1		11		12942	Address: 40001 Protocol address E a 40011 -> 10
2		12923		12943	Modbus Address. (0 to 65535)
3		12941		0	Then use function 03 and Modeus address 6.
ļ.		12943		0	Scan Rate: 1000 F1 for help.
		12949		0	Disable
5		12942			Read/Write Disabled
7		12953			
3		12950			View
9		13006			Rows
					Hide Alias Columns PLC Addresses (Base 1)
					Address in Cell

Register table must be requested from the manufacturer for MODBUS RTU and MODBUS TCP/IP.

5.4. SNMP

V1, V2, and V3 SNMP versions are supported as requested by the customer. MIB file is shared by the manufacturer.



6.USER INTERFACE

Installation, configuration, adjustment, alarm notification, and monitoring related to the system are performed via web-based ALPAIS software. The ALPAIS Software is run on a Linux-based operating system to maintain system stability.

General Information

1. Battery and string-based monitoring within the BMS is performed. For each item listed below, alarm limits can be programmed and assigned by assigning upper, lower, and warning limits.

- Voltage Value for Each Battery.
- $_{\odot}$ $\,$ Internal Resistance Value and Health for Each Battery.
- Temperature Change for Each Battery.
- State of Health for Each Battery.
- Current Value for Each String
- Ambient Temperature Value
- Ambient Humidity
- Extreme Voltage and Current

2. When alarm conditions occur, the software is had the ability to give the following parameters as visual or audible alerts (see <u>7</u>).

3. Measured data except the internal resistance value is measured in 30 second period. The internal resistance value is measured in weekly periods. In addition, the internal resistance measurement period can be adjusted arbitrarily.

4. Each Battery Module has a voltage balancing feature for series connected batteries.

5. All the data is recorded and they should be able to be displayed as a spreadsheet in many formats (e.g. Microsoft Excel, PDF). Recording conditions are determined every 30 seconds in case of an alarm and/or warning, and once an hour in daily data.

6. The system supports Modbus RTU, Modbus TCP/IP*, and SNMP protocols.

7. The system manages the alarm data through the software.

8. The system is able to report various parameters.

9. The BMS software be able to run both on the local network and the internet.

10. Installed systems in physically different countries, cities, and regions belonging to the same user can be monitored from a single point with ALPAIS software.

11. The battery monitoring system input screen must be password protected.

* Only battery monitoring system with embedded server supports MODBUS-TCP.



6.1. Introduction to the User Interface

For the embedded server Control Module, the IP address set in the <u>Netconf / Network</u> <u>Settings</u> section is written on the browser screen. In other cases, the Server (Destination) IP address set in the <u>Netconf / Network Settings</u> section is written to the browser screen.

The following screen will open in the browser. Login with username and password.



Figure 28. Interface Login

alpais		= =							7.0
Summary		Summary							(
Preview									
Alarms		General Devi	ces Status	Ge	eneral Battery Sta	tus		General De	evices Status
Measurements		Critical	2	Critic	al	44			
Batteries		Warning	0	Warni	ng	8		(
Logs	>	Normal		Norm	al				
Reports	>								
Definitions	>	-							
System	>	Device Status List							
Settings	2	Devices	Connection	Devices Status	String 1	String 2	String 3	String 4	Total Current
		Alpais-Lab01	×	•	•				0 A
		Alpais-Lab02	×	•		•			0.04 A

After logging in, a language selection is made from the upper right corner.

Installation and settings will be made for the system connected via the interface. Before the installation, the 'Definitions' on the interface must be entered. Then 'Edit System' should be done from the 'System' tab. Finally, the threshold and limits of the system installed on the 'Settings' tab should be set.

6.2. Interface Screen – Definitions

6.2.1. Companies

First of all, the company to be installed must be registered in the interface. For this process, click on the Definitions-Companies tab. Then click the 'Add Company' button. Enter the company information in the table that opens. The important point here is mail and server and port information. Finish the process by clicking the 'Save' button. The registered company will appear as a list at the bottom of the page. E-mail notifications will be sent to users via e-mail registered as a company. Therefore, after the company is registered, you must perform the mail test successfully with the 'Test Mail' icon at the bottom right. If a test e-mail message is received as 'Failed', check your e-mail, password, server, and port information (See Figure 29).

The icons on the right of the list line are used to edit or delete the companies added to the list.

alp <mark>ars</mark>	1	≣ ■								8 9 ×
Summary		Companies								
Preview										
📮 Alarms		Company List								+ Add Company
Measurements		Add Company								×
🖽 Batteries		Company Name	ALP ENERJI SIST.	BIL. VE ILET. TEKN. HIZ	. SAN. TIC.	Phone		+90 ~ (345)	343 43 4	
🗈 Logs	>	Address	🕅 Atakent Mah. V	atan Cad. No:40/1 B	asiskele / KOCAELI	City		愈 Kocaeli		
Reports	>	State								
Definitions	~	51315	1 Başıskele							
m Companies		E-Mail	info@alpais.com	n.tr		Password	1	⊕	S	Successful!
≛ Users		Mail Server	₿ s			Port	1	34	Test	mail was sent successfu
Battery Information		TLS								
+ Current Sensors		SSL								UK
System	>				\$	Save				
Settings	>	Company Nam Phone	Address	City	State	E-Mail	Mail Server	Port	Password	Delete / Edit
		ALP ENERJI SIST. BI +90 (252) 525	25 Atakent Mah. Vat.	Kocaeli	Başiskele	info@alpais.com	smtp.office365.c	457	******	

Figure 29. Definitions-Companies

6.2.2. <u>Users</u>

For this process, click on the Definitions>Users tab. Then click the 'Add User' button. Enter the user information in the table that opens. Finish the process by clicking the 'Save' button. There are 3 different structures as a position. (See Figure 30).



Admin: Can access and make changes to the settings of all existing companies and the devices under this system. It can also access all e-mails.

Company Admin: He can only access and make changes to the settings of the company he is registered with and the devices under it. At the same time, it can access the e-mails of the registered company.

Company User: It can only access the settings of the registered company and the devices under it. At the same time, he can access the e-mails of the registered company.

The icons on the right of the list line are used to edit or delete the users added to the list.

	alpars		≡ ₽									e
0	Summary		Users	sers								
0	Preview											
© ₽	Alarms		User List								+ Add User	
٢	Measurements		AddUser								×	
	Batteries		Name - Surname	2	Name - Surname							
	Logs	>	E-Mail		-Mail			Password	A Pressure	and .		
	Reports	>										
H.	Definitions	~	Company	8								
I	🖬 Companies		Phone		Phone			Position	ŝ	Admin		
	Lusers		Language	(1						Company l	Jser	
	Battery Informations									Company /	amin	
	+ Current Sensors						Save	•				
System >												
~	Settinge	,	Name-Surname	E-Mail	Phone	Position	Language	Record Date	Company	Password	Delete / Edit	
-	B-		admin	admin@alpais.co	05322067013	Admin	English	10/02/2023	FAST GROUP	*****	8 •	*

Figure 30. Definition-Users

6.2.3. Battery Information and Current Sensors

For this process, click on the Definitions>Battery Information tab. Then press the 'Add Battery' button. Enter the battery information used in the table that opens. Finish the process by clicking the 'Save' button. The 'Internal Resistance (mohm)' parameter is to be considered here. This value is directly used for the internal resistance base value when the IR option is selected in the battery type (See Figure 31). To add a current sensor, click the Definitions-Current Sensors tab and click the 'Add Sensor' button. Enter the sensor information to be used in the table that opens. Finish the process by clicking the 'Save' button.

alpars	≡ ₽					B 6
 Summary 	Battery Information	S				
Preview						
💁 Alarms	Battery List					+ Add Battery
② Measurements	Add Battery					×
🗃 Batteries	Brand	Brand				
🖹 Logs >	Model	Model		Capacity	₩ Capacity	
Reports >	Voltage			Internal Resistance		
Definitions V	5	Voitage			internal kesistance	
d Companies	_					_
Lusers	_			3075		
Battery Informations	Brand	Model	Voltage (V)	Capacity (Ah)	Internal Resistance (mOh Delet	e / Edit
+ Current Sensors						
	ROCKET	ES4212	12	42	0.9 🙃 오	A
System >	MB F48	MB F48	12	125	0.7 8 •	
	VIGOR	NP 7.2-12	12	72	26	
🔅 Settings 🛛 🗲	FIAMM	12FLB150	12	26	9,4 🖲 오	

Figure 31. Definitions-Battery Information

6.3. Interface Screen - System

6.3.1. Edit System

After the physical connections and software installation, the devices will come to the 'System Setup' screen. From here, click on the relevant device. First, the device's general information will open. With the 'Next' button, you move to the next page.

alpars		≡ ₽					. 0
 Summary 		System Editing Wizard					
Preview							
⊖ Alarms			1		2	3	
Measurements			Step 1	S	itep 2	Step 3	
🖽 Batteries		Available Systems					-
Logs	>	Device	Information	Start Date		Delete	٦.
🗟 Reports	>	36	- LIPS 2	10/02/2023 16:03:30			a 11.
Definitions	>						
System	~			ta so	can Devices		
🖌 Edit System							
System Detail		Detected System Deta	ils - 36 - UPS 2				
Settings	>	String Name	String Voltage	String Current	Ambient Temperature	Number of Batteries	
		3	545.88 V	0.11 A	22.5 ℃	40	
						N	ext

Figure 32. System Setup



On the next page, the device name and model are entered first. Then the battery internal resistance initial value and limit values are selected. The selection is explained in detail in the relevant title (See <u>6.2.2.</u>, <u>6.4.2.</u>). If the battery internal resistance initial value is selected as 'Present Values', the last measured internal resistance value is taken as a basis for each battery separately. If 'Values in Battery Type' is selected, a certain value is assigned as the initial value to all batteries in the string.

alp <mark>ars</mark>		≡ ■		a e
 Summary 		Edit System		
Preview				
⊖ Alarms		System Editing Wizard		
Measurements				
🖻 Batteries		0-	(2)	3
Logs	>		зтер 2	step 3
Reports	>	Device Information		-
Definitions	>	Device Name *	Device Model *	Device Notification Repeat Time *
System 3	~	Alpais-Lab01		\leq
 Edit System 		Battery Internal Resistor Initial Value	ecent Values Values in Battery Type Limit Values Recent Values Default Val	ues

Figure 33. Internal Resistance Base Value and Limit Values

After the battery's internal resistance initial value is selected, adjustments are made for each string. The critical parameter here is the battery type selection. If the initial value is selected as 'Value in Battery Type', the base value will be taken according to the battery type defined here. (See Figure 34).

If the limit values are selected as 'Present Values', the last values held separately for each string are recorded as the internal limit value. If 'Default Values' is selected, the default values are saved as limit values according to the battery type (2V-12V) selection in each string. Critical notifications will be selected with default values. In case of notification, the interface will come as a notification message and e-mail.

After the settings of all strings are made, the next page is passed with the "Next" button.

String Setting	
String Informations	
String Name *	
Z Battery Type VIGOR	Battery Type must be
Current Sensor	pre-registered in the
Current Sensor Type YHDC YHDC	Current Sensor Multiplier *
Threshold Values	
Floating Charge Voltage (mV) = 13400	Current Discharge (mA)
Current Charge (mA)	Current Floating ChargeCharge (mA)

Figure 34. Battery Type Selection

In the last step, the company selection is made so that the relevant device is under the desired company. The installation process is terminated by clicking the 'Save' button (See Figure 35).

alpars		≣ ₽		
Summary		Edit System		
Preview				
on Alarms		System Editing Wizard Please proceed as controlled.		
Measurements				
🖽 Batteries			(2)	(3)
🖹 Logs	>	step i	Company information	Step 5
Reports	>	Select Company	must be needed	
Definitions	>	Company Information :	must be pre-registered	
System	~	ALP ENERJI	in the 'Definitions' tab.	
Edit System		TEST DSA		
System Detail			🖺 Save	

Figure 35. Company Selection

It is used to edit the information of the existing device. In addition, the device's history data or the device itself can be deleted from this tab.



6.3.2. Internal Resistance Base Value

• Installation on New Batteries

The internal resistance values of new batteries settle within the first 6 months from the first use. Therefore, as internal resistance base values within the first 6 months; The first measurement test values to be made after installation will be taken as the base value for each battery. Therefore, the reference value for each battery will be the first measurement value of that battery.

When applying this method, it should be confirmed whether the internal resistance test results are in a region close to each other in the 20-30% band of the average value. If there is a value outside of this band, in order to determine that it is not sourced from the battery production line; measuring cable, tightening torque value, etc. The source of the deviation should be understood by checking the elements and necessary corrections should be made. If there is no improvement, the relevant battery should be focused on, if any, it should be checked with a standard test device, if necessary, planning should be made for the replacement of the battery.

• Installation on Existing Batteries

If the battery monitoring system is installed on existing batteries; The distribution of the first results obtained in the first internal resistance test to be made will be examined, the average of the region where the distribution is concentrated will be taken and the result will be evaluated as the internal resistance base value that will be valid for all batteries and input will be made to the interface.

6.3.3. System Detail

The software version of the existing device, device name, module version, etc. information such as this tab. At the same time, the temperature unit and date format can be changed from this tab. (See Figure 36).

alp <mark>ars</mark>	5	≡ ■	📕 🖩 🛛 🛪
 Summary 		System Detail	
Preview			
Alarms		System Information Device Upgrade	
Measurements		Alpais Software Version	888
🖽 Batteries			20-08-2024 11:44:07
Logs	>	O Date / Time	
Reports	>	Q ElasticSearch Service Status	Active
Definitions	>	PostgreSQL Service Status	Active
System	0	Memory Occupancy Rate	10 %
🖌 Edit System		🗜 Temperature Unit	× 2°
System Detail		Date Format	DD/MM/YYYY -
@ Memory Check			

Figure 36. System Detail

6.4. Interface Screen – Settings

6.4.1. Inputs

For external devices (gas sensor etc.) entries are saved, and alarm notifications are opened from this tab. Defined entries can be deleted and edited later.

	alpars		≡	-						E		8
o	Summary		Inp	puts Device : UPS 2								
0	Preview											
ß	Alarms			nputs contains the	criteria for en	vironmental alarms in the syste	em.					
3	Measurements			#	Explanatio	n	Port Number	Settings	Alarm			
	Batteries			1	Input 1		Port1	Jelete			П	
B	Logs	>										
	Reports	>		2	Input 2		Port 2	Delete			1	
M	Definitions	>										
=	System	>				Edit Inputs			×			
\$	Settings	~				Explanation						
1	Inputs					Input 1						
	Cutputs								Cancel Save			
	M Threshold Values											
	+I+ Limits											
	🖶 Voltage Balancing											

Figure 37. Inputs

6.4.2. Threshold Values

Threshold values will be set for each string. To edit the default values, click the edit button on the right of the sleeve line. Relevant values are entered on the screen that opens. The process ends with the 'Save' button.



Floating Charge Voltage: The recommended floating charge voltage value of

the battery is entered. This voltage is used to decide whether the system is idle or floating states.

Discharge Current: When the string current value exceeds this limit, it will show the discharge status.

Charge Current: When the system is discharged or idle, the string current value will show the charge status when it exceeds this limit.



Floating Charge Current: When the system is in floating charge, the string current value will show the charge status when the value exceeds this limit. Current values can be seen in the adjacent graph.

alpars	≡ ■						Ξ. Θ
 Summary 	Threshold	Values Dev	vice : UPS 2				
Preview							
Q Alarms	Threshold It contains t	d Values the criteria for th	e alarms in the system.				
② Measurements	String No	ame	Floating Charge Voltage (V)	Current (A)			Edit
🛅 Batteries				Discharge	Charging	Floating Charge \rightarrow Charge	\frown
E Logs >	3		13,4	-0,8	0,6	0,8	
Reports >							
Definitions >		Edit Thre	shold Value (Sting : 2)			×	
System >		Floating C	Charge Voltage (mV)				
🕏 Settings 🗸		Current L	Discharge (må)				
⊞ Inputs		A -80	10				
₿ Outputs		Current	Charge (mA)				
🕍 Threshold Values		A 600)				
+I+ Limits		Current	Floating Charge \rightarrow Charge (mA)				
⊕ Voltage Balancing		A 800)				
					Cancel	Save	



6.4.3. Limits

Limits will be set for each string. The recommended limit values are given below without the customer's request. Changes are made to the parameter in the relevant string on the device to be updated. Either click on the 'Save' button on the right of the handle to be changed. If changes have been made to more than one string and parameter, click the 'Save All' button at the bottom right of the page (See Figure 39).

 Summary 		Limits Devi	ce:52			
Preview						
Alarms		Edit Limit	it the limit values of the measurement of	arramatora hara		
Measurements		rou can ea	ic the inflic values of the medsurement p	aran meneris mene.		
🖽 Batteries		Battery V	oltage (V) Battery Internal Resista	ance (%) Battery Temperature (°C)	String Voltage (V) Ambient Temperature (°C)	Battery State of Health (%) Humidity (%)
🖹 Logs	>	Battery	Voltage (V)			
Reports	>	String	Charge	Discharge	Float Charge	Idle
Reports Definitions	> >	String Name	Charge	Discharge	Plaat Charge	Idle
Reports Definitions System	> > >	String Name	Charge	Discharge	Hoat Charge	Ide Save 1 12.1 12.3 0
 Reports Definitions System Settings 	> > > ~	String Name 2 3	Chorge	Discharge	Post Charge 0 2 0 13 13.1 13.8 13.9 13 13.1 13.8 13.9	Image: Color Color Save Image: Color Image: Color Image: Color Image: Color Image: Color Image: Color Image: Color Image: Color Image: Color Image: Color Image: Color Image: Color Image: Color Image: Color Image: Color Image: Color
Reports Definitions System Settings Hinputs	> > >	String Name 2 3 4	Charge	Discharge	Post Charge P P P P P P P P P P P P P P P P P P P P	Image: constraint of the state of
Reports Definitions System Settings Bi Inputs E Outputs	> > >	String Name 2 3 4	Charge	Discharge 2 1 1 1 1 1 1 1 1 1 1 1 1 1	Image: Point Charge Image: Point	Ide Save 1 121 123 0 1 121 123 0 1 121 123 0 1 121 123 0
Reports Definitions System System Dinputs Outputs Unputs Unpu	> > ~	String Name 2 3 4	Charge	Discharge 2 1 1 1 1 1 1 1 1 1 1 1 1 1	Image: Point Charge Image: Point	Image: Constraint of the state of

Figure 39. Limits

Battery Voltage: Must be entered separately for charge, discharge, floating charge, and idle states. The following recommended values can be entered for 2V, 6V, 8V, and 12V batteries.

		To Set Limit and Alarm Values								
Status	Max.	Max.	Min.	Min.						
	Charge	Charge	Decharge	Decharge	Min. IDLE	Min. IDLE				
	Warning	Alarm	Alarm	Warning	Alarm (V)	Warning (V)				
Battery	(V)	(V)	(V)	(V)						
12 V	14.1	14.4	10.9	11.7	12.1	12.3				
8 V	9.4	9.6	7.26	7.8	8.1	8.2				
6 V	7.05	7.2	5.45	5.85	6.1	6.2				
2 V	2.35	2.4	1.82	1.95	2.02	2.1				

EX: In the charging state, any battery will generate a warning when the voltage exceeds 14.1 V.

In case of discharge, it will generate an alarm when any battery voltage drops below 10.9 V.



		To Set Limit	and Alarm Values	
Status Battery	Min. F. Charge Alarm (V)	Min. F. Charge Warning (V)	Max. F. Charge Warning (V)	Max. F. Charge Alarm (V)
12 V	13	13.1	13.8	13.9
8 V	8.7	8.73	9.2	9.3
6 V	6.5	6.55	6.9	6.95
2 V	2.17	2.18	2.3	2.32

Battery Internal Resistance: If the recommended limit values are max. 30% above the base value, it can create a limit for the warning state, and if it is above max. 50%, it can create a limit for the alarm state. When any battery exceeds 30% of the base value, it will create an alarm status when the warning status exceeds 50%.

Battery Temperature: Limit values will vary according to the environment. Therefore, the limit will be set for alarm conditions at max. and min. values. When any battery temperature goes below the specified min value and above the specified max. Value, it will create an alarm condition.

Battery Health: Limit values will vary according to the environment. Therefore, the limit will be set for alarm conditions at max. and min. values. When any battery health goes below the specified min value and above the specified max. Value, it will create an alarm condition.

String Voltage: It will be written automatically based on the values set in the battery voltage limits. Changes cannot be made.

Ambient Temperature: Limit values will vary according to the environment. Therefore, the limit will be set for alarm conditions at max. and min. values. When any string temperature goes below the specified min. value and above the specified max. Value, it will generate an alarm condition.

Humidity: Limit values will vary according to the environment. Therefore, the limit will be set for warning and alarm conditions at max values. When the humidity value of any string exceeds the determined max. warning value, it will create an alarm condition when the warning condition exceeds the max. alarm value.



6.4.4. Extreme Alarm Configurations

There are two system alarms (overvoltage and current alarms) to control the voltage and current passing through each battery. The overvoltage value is set and recorded for each string. Press the 'Save' button after each change. If desired, notifications can be created for these situations.

alp <mark>ars</mark>		≡ ▶	. . e 🛪
Summary		Extreme Alarm Configurations Device : Alpais-Lab01	
Preview			
Alarms		Extreme Alarm Configurations It contains the criteria for extreme alarms in the system.	
Measurements		Battery Overvoltage (V)	
Botteries			
E Logs	>	String Name Save	
Reports	>	1 16.5	
Definitions	>		
System	>	Battery Overcurrent	
Settings	~		
E Outputs		String Nome	
🕍 Threshold Values		· · · · · · · · · · · · · · · · · · ·	

Figure 40. Extreme Alarms

6.4.5. Voltage Balancing

Set the balancing mode to 'ON' for voltage balancing on the desired string By battery type. Press the 'Save' button after each change. If the battery connection is suitable, Split should be set to 'ON'. See the target voltage and the voltage of

each battery on the 'Measurements' page. To turn off the voltage balancing, select the 'OFF' setting and press the 'Save' button.

		= •				e
 Summary 		Voltage Balancing Dev	vice : UPS 2			
Preview						
O Alarms		Voltage Balancing It contains the criteria for envi	ironmental voltage balancing in the	system.		
② Measurements Batteries		String	Battery Type (Voltage)	Balancing Mode	Split(Center-Tap) Batteries	
E Logs	>	Etripa - 3	12 🗸	Off		Save
Reports	>	String . S	1.2			
Definitions	>		6			
System	>		12			
Settings	~					
Inputs						
B Outputs						
Ma Threshold Values						
+I+ Limits						
🐵 Voltage Balancing						

Figure 41. Voltage Balancing



6.4.6. Interface Notification and Mail Notification Feature

In order to be informed of any normal, warning or alarm situation, it may be requested to receive an SMS, notification, or e-mail notification on the subject. In this case, the icon next to each parameter and status is clicked. From the page that opens, the feature of receiving notifications in the interface or receiving notifications by mail is clicked. In addition, the frequency of the normal status, warning or alarm notification can be set from the incoming page. After the changes made, the 'Save' button should be pressed (See Figure 42).



Figure 42. Notification and E-mail



7.EVENTS AND ALARMS

When alarm conditions occur, the software is had the ability to give the following parameters as visual or audible alerts.

- 1. The system is had the ability to configure predetermined or programmed limits on the battery, string, or system.
 - Battery and String Voltage
 - Internal Resistance Rise
 - Charge / Discharge Period
 - Battery Temperature
 - Ambient Temperature/Humidity
 - State of Health (SoH)
 - Extreme Batttery Voltage and Current
- 2. The system is had 2 dry contact outputs to control external systems / devices.
- 3. The internal resistance measurement period is programmable at the entire system or string level.
- ALPAIS sends an email when the corresponding alarm condition occurs. Each email transmission is included details about the system device information, battery, string, date, time, and alarm type (Voltage, Internal Resistance, Current, Temperature, Discharge / Charge)
- 5. Battery parameters data can be recorded and reported once an hour if there is no alarm in the battery. If the string state is in charge or discharge state and there is an alarm situation in the battery parameters, the data can be recorded and reported every 30 seconds.
- 6. If one of the extreme cases occurs, the system will stop performing balancing and internal resistance.
- 7. The situations where voltage balancing will not be activated are as follows;
 - Condition of not be a healthy communication between the Control Module and the Battery Modules,
 - Condition for does not matching the battery and the selected battery type,
 - Condition of the string state to be not charge or floating charge,
 - Condition that it coincide with the time of periodic internal resistance measurement or manual internal resistance measurement,
 - Condition of being 10% above or below any battery target voltage in the string.

8.OTHER FUNCTIONS

8.1. Data Collection

Control Module is provided 4-channel RS485 communication, collects battery data at setting time, equipped with control connection alarm and internal resistance test. The Control Module is collected the data of each battery and each string. Each Control Module is supported maximum 4 string connections. Each RS485 channel is connected with max. 120 Battery Modules. The ID number of the Battery Module unit in each group must be different.

Group No	Channel	Description
Group 1	Serial Interface A	
Group 2	Serial Interface B	One Control Module is connected with 4 battery group. The
Group 3	Serial Interface C	number of batteries in each group cannot be more than 120.
Group 4	Serial Interface D	

Table 10. Control Module Channel Table

8.2. Communication

String Modules and Battery Modules are provided information to the Control Module. They are provided this communication with UART. The distance between the batteries must not be more than 1 m in order to ensure the communication qualities. In addition, the total distance of UART communication line should not exceed 50 m. It can be wakened by the Control Module or base station.

Control Module is provided communication with internet and computers via Ethernet or RS485. In addition, Ethernet line cable should not be longer than 3 m. Communication is supported by the international MODBUS-RTU/TCP protocol. Modbus will be shared with the relevant user on request. The communication parameters are Counter Address ID and Baud Rate.



9. MAINTENANCE AND TROUBLESHOOTING

Table 11. Maintenance and Troubleshooting Table

Problems	Causes	Solutions		
For Control Module				
No power after power on	Power supply failure	 1.Check the terminal and make sure with correct power supply 2. Check mains voltage 		
NocommunicationCommunication1.Check the network setwith the serverinterference2.Check ALPAIS IP Cont		1.Check the network settings 2.Check ALPAIS IP Configuration		
Cannot communication with the battery/String Module	Communication interference	Check the data cables where the Battery Module and String Module is connected to the Control Module.		
Cannot communication with Netconf Tools	Communication error	1.Check the Netconf data cable whether it is in the correct port2. Check the computer's driver.		
	odule			
No led light after power on	Power cannot input to the device	 Check whether the proper power is supplied on the + and - terminal Test for proper battery voltage. Check the cable connection 		
Control Module cannot communication with the Battery Module	Unit ID of the module is incorrect	1.Check whether address of the module is the same as main device2.Check whether the connections between modules are in the correct order.		
	Communication interference	Check data cables (from J3 to J2).		



	Voltage measurement wrong	 1.Check battery voltage with multimeter. 2.Check the measuring cable. 	
Measuring value incorrect or incompatible with aim	Temperature measurement wrong	 Check that the sensor on the battery measuring cable is not damaged. Check the offset values from Netconf. 	
	Internal resistance or health measurement wrong	 Check whether measurement IR compatible with device rated parameter. Check the measuring cable. 	
For String Module			
No led light after power on	Power cannot input in the device	Check if the String Module is connected to the Control Module. The Control Module must have power.	
Control Module cannot communication with the String Module	Communication interruption	Check data cable between string and Control Module.	
Mananakan	Current measurement wrong	1.Check whether measurement current compatible with device rated parameter (from Netconf).2.Check hall sensor communication.	
incorrect or incompatible with aim	Temperature measurement wrong	 Check that the sensor on the current measuring cable is not damaged. Check the offset values from Netconf. 	
	Humidity measurement wrong	Check whether the String Module is air-permeable or not.	



10. TECHNICAL SPECIFICATIONS

Table 12. Control Module Technical Specifications Table

Control Module		
Operating Condition		
Operating Temperature	0-50°C (32-122°F)	
Storage Temperature	-10-70°C (14-158°F)	
Relative Humidity Ratio	5% - 90% RH	
Atmospheric Pressure	80 – 110 kPa	
Power Input	12VDC @1.5-2A	
Max. Power Consumption	20 Watt	
Communication Interface		
RS-485	Modbus RTU	
Ethernet	SNMP, MODBUS TCP/IP (optional)	
Features		
Number of String	4 Strings can be monitored	
Number of String Module	1 String Module at each String	
Number of Battery Module	120 Battery Module at string, 480 Battery Modules in total	
Battery Nominal Voltage	1,2V – 12V Batteries	
String Voltage	1,2V – 2500VDC	
Input/ Output		



Relay Output	2 x Dry Contact Output, 400V (AC- DC) 120mA (optionally digital)	
Digital Input	2 x 12-24VDC	
Electrical Isolation	2000 V	
Physical Characteristics		
Dimensions (H x W x D)	40,5 x 200 x 95,5 mm or 40,5 x 130 x 95,5 mm	
Enclosure	Metal	
Color	Grey	

Table 13. Battery Module Technical Specifications Table

Battery Module		
Compatibility		
Battery Type	VRLA,Ni-Cd,VLA / 1.2V,2V,6V,12V	
Battery Voltage Monitoring		
1.2 V Type Voltage Range	0.9-3 VDC	
2 V Type Voltage Range	1.5-3 VDC	
6 V Type Voltage Range	4.5-7.5 VDC	
12 V Type Voltage Range	9-15 VDC	
Resolution	1 mV	
Accuracy	0.05 % ± 6 mV	
Internal Resistance Monitoring		
Resistance Range 0.1 – 64m ohms		



Resolution	1µOhm	
Accuracy	±2 %	
Temperature Monitoring		
Temperature Range	0-50°C (32-122°F)	
Resolution	0.1°C	
Accuracy	±2 °C	
State of Health Monitoring (option	nal)	
State of Health Range	0 - 100 %	
Resolution	1 %	
Accuracy	±5 %	
Protection		
Isolation	2000 V Opto Isolation	
Short Circuit Protection	Max. 3.5A (Internal Fuse)	
Reverse Polarity Protection	Provides protection at rated voltage against reverse connection	
Operating Conditions		
Operating Temperature	0-50°C(32-122°F)	
Storage Temperature	-10-70°C(14-158°F)	
Relative Humidity Ratio	5%-90% RH	
Atmospheric Pressure	80-110kPa	
Power		
Power Consumption	50mA @2V Battery	



	10mA @12V Battery	
Operating Current		
Nominal Operation	10mA – 50mA	
Internal Resistance Measurement During Test	0.167 A/dk	
Sleep mode	<10 mA	
Communication		
Data Transmission Interface	Serial Modbus Protocol	
Features		
Auto Addressing	Automatically obtain address during installation or replacement	
Voltage Balancing	Voltage balancing feature on string	
Accuracy (optional)	±0.05 V	
Physical Characteristics		
Dimensions (H x W x D)	91 x 63 x 29 mm	
Enclosure	ABS	
Color	Semi-Transparent	



Table 14. String Module Technical Specification Table

String Module			
Current Monitoring			
Current Range	0-500A		
Resolution	10 mA		
Accuracy	1%		
Current Sensor	Hall Effect Sensor		
Ambient Temperature Monitoring			
Temperature Range	0-50°C (32-122°F)		
Resolution	0.1°C		
Accuracy	±2 °C		
String Voltage Monitoring			
Voltage Range	1-2500 VDC		
Resolution	10 mV		
Accuracy	0.1%		
Humidity Monitoring			
Humidity Range	5% - 90% RH		
Resolution	1% RH		
Accuracy	5%		
Protection			
Isolation	2000 V Opto Isolation		



Short Circuit Protection	Max. 3.5A (Internal Fuse)		
Operating Conditions			
Operating Temperature	0-50°C(32-122°F)		
Storage Temperature	-10-70°C (14-158°F)		
Relative Humidity Ratio	5%-90% RH		
Atmospheric Pressure	80-110kPa		
Power			
Power Consumption	1.2 Watt		
Operating Current			
Nominal Operation	100 mA		
Communication			
Data Transmission Interface	Serial Modbus Protocol		
Physical Characteristics	Physical Characteristics		
Dimensions (H x W x D)	91 x 63 x 29 mm		
Enclosure	ABS		



11. APPENDIX

APP 1. SYSTEM COMPONENTS OF ALPAIS

SYSTEM STRUCTURE		EXPLANATION	PRODUCT CODE
CONTROL MODULE		Control Module*	CONMOD-B
		Control Module with Embedded Software	CONMOD-B01
STRING MODULE		String Module with Temperature and Humidity Sensors	STRMOD-ENV
		1.2V Battery Module	BATMOD1.2 (BATMOD1.2-T)
		2V Battery Module	BATMOD02 (BATMOD02-T)
BAI		6V Battery Module	BATMOD06 (BATMOD06-T)
		12V Battery Module	BATMOD12 (BATMOD12-T)
	DATA CABLE	Cable Terminal: RJ12 Input, L:xx cm	DATACABOXX
		L:30cm, 40cm, 50cm, 100cm, 150cm, 300cm, 500cm, 10m or 20m	
		***Optionally Halogen free type ***	
		** Optionally 10m and 20m**	
		Cable Terminal: Faston Type, L:30 cm	MEACAB-F-30
	BATTERY MEASUREMENT CABLE	Cable Terminal: O Type, r:5 mm L:30 cm	MEACAB-O-M5-30
		Cable Terminal: O Type, r:6 mm L:30 cm	MEACAB-O-M6-30
ACCESSORIES		Cable Terminal: O Type, r:8 mm L:30 cm	MEACAB-O-M8-30
		Cable Terminal: O Type, r:10 mm L:30 cm	MEACAB-O-M10-30
		***Optionally Halogen free type ***	
		Rated Input: 50A (Measure Range : $0 \pm 100A$)	CS050
	CURRENT SENSOR	Rated Input: 100A (Measure Range : $0 \pm 200A$)	CS100
	CORRENT SENSOR	Rated Input: 200A (Measure Range : $0 \pm 400A$)	CS200
		Rated Input: 500A (Measure Range : $0 \pm 1000A$)	CS500
	POWER SUPPLY	12V DC Power Supply	PA-12-2
CONTROL MODULE CABINET SOLUTION		Dimensions: 300x600x165mm (for 1 Control Module)	PTC-1
		Dimensions: 500x600x165mm (for 2 Control Module)	PTC-2

*The minimum specifications of your PC or server that you will use for the software of the non-embedded Control Module should be 4 GB of RAM, a 1 gigahertz (GHz) processor and 25 GB of free hard disk space.

Note: Our solutions vary according to user demand. The standard dimensions and product dimensions can be changed according to the requirements of the Project if technically appropriate.



APP 2. INFORMATION FOR SITE SURVEY REQUIREMENTS

BATTERY MONITORING SYSTEM INFORMATION FOR SITE SURVEY REQUIREMENTS

1. USER INFORMATION

•	Contact Persor	1	Company/Confirmation		
*	Name Surname	2:	Name of Company:		
*	E-mail:		 Installation Location: 		
•	Contact Person	Company/Confirmation			
*	Name Surname:	Name of Company:			
*	E-mail:	 Installation Location: 			

2. INSTALLED BATTERY INFRASTRUCTURE INFORMATION**

** The Site Survey should be filled for each different type of rack layout to determine the length of cables.

Note. If the project has more than one location/room, each location/room requires 1 pcs Control Module.

Battery Information				Infrastructure Information		
*	Battery Brand:			 Number of Battery on each String: 		
*	Battery Model and Capacity:			 Number of String: 		
 Battery Type: Lead Acid Nickel Acid Type 				 String Current Sensor Value: 50 A 200 A 500 A 100 A 1000 A String Link Section: 		
				(Value written on the cable between UPS and battery)		
*	Battery Nominal		□ 4 V □ 1.2 V	 ♦ UPS-Rectifier- Other Model and 		
*	Measured Voltage:	V		Brand:		

 220 V AC Power Supply: 	🗆 Yes	🗆 No	

3. BATTERY MEASURING CABLE INFORMATION

Dis	tance Between	Battery Lead 1	Ferminal:	cm				
 Lead 	Lead Terminal Screw Thickness:							
□ 5 mm (M5)	□ 6 mm) (M6)	□ 8 mm (M8)	10mm(M10)	12 mm (M12)	6.3 mmFASTON			

4. BATTERY / SHELF LAYOUT INFORMATION

 Total Number of Shelves: 	
Number of Batteries in Each Shelf:	
 Number of Batteries in Each Row: 	



	Data Cable Length Between Side-by-Side Battery Modules:	 Max. 100 cm
	 Data Cable Length Between 	
	Back-to-Back Battery Modules:	Max. 100 cm
Maran I	 Battary Madula Data Cabla 	
	Length Shelf to Shelf:	Max. 100 cm
	Data Cable Length Between	
	Back-to-Back Battery Modules:	Max. 1000 cm
	✤ Data Cable Length Between	
	String and Control Modules:	Max. 1000 cm

NOTE: The total line length can be a maximum of 1000 cm.



5. PRODUCT INFORMATION AND OPTIONS

Measurement			Extra Costumer Demands
Battery Voltage	Battery Temperature	İ	
Battery (Cell) IR	String Current		

6. SOFTWARE REQUIREMENT INFORMATION

Only for non-embedded server option

•	Infrastructure to Install Software						
	Virtual Serve	er	A Computer in the Network		A Computer outside Net.		
	ESXi Versio	on	<u></u> ו				
	□ 6.0						
	6.5						
•	IP Information	on					
			IP Address	Subnet	Mask	Gateway	
•	Software			Add	1.	Address	
	Caratural		IP Address	Subnet	Mask	Gateway	
*	Module			Ado	1.	Address	
*	 Port to Open 		60000, 80, 22				
•	Mail Server	[nfo	ormation				
•	F-Mail		SMTP Server	E-m	ail	Password	
*	Noti.		Add.				
					TLS		
•	Infrastructur	e to	o Install Software	·			
	Virtual Serve	er	A Computer in tl	he Network		omputer outside Net.	
	ESXi Versio	on					
	□ 6.0						
	6.5						


IP Information					
*	ALPAIS Software	IP Address	Subnet Mask Add.	Gateway Address	
*	Control Module	IP Address	Subnet Mask Add.	Gateway Address	
*	Port to Open	60000, 80, 22			
Mail Server Information					
*	E-Mail Noti.	SMTP Server Add.	E-mail	Password	
□ SSL				□ TLS	

7. PERSONNEL INFORMATION

Survey Personnel:	Contact:
Company:	Signature:



APP 3. HAND TOOLS REQUIRED FOR INSTALLATION

The recommended hand tools to be used in the installation are as follows;

- □ Crimping Pliers
- □ Plug Crimping Pliers
- \Box Socket Set
- □ Industrial Gloves
- □ Multimeter
- □ Cable Tester

Tools may differ depending on the installation location.

APP 4. SYSTEM REQUIREMENTS

• 1 Server (If not in Embedded Server Control Module feature)

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



APP 5. REMOTE ACCESS

First of all, the personnel (that will make remote access) should open Putty program on PC. If the program is not available, it must be downloaded free of charge (<u>https://www.putty.org/</u>). Putty is an open-source software that provides connection to the Linux operating system server on the network. The server connected to Putty can be managed with various commands through the terminal.

- a) The server opens to the internet with a specific port from the other side.
- b) The personnel that make remote access, will open the Putty program.
- c) The following places are filled.

PuTTY Configuration Category:	? X Basic options for your PuTTY session	•	IP Address of the server to be accessed remotely
Logging Terminal Keyboard Bell Features Window	Specify the destination you want to connect to Host Name (or IP address) Port 192.168.1.103 22 Connection type: Raw Raw Telnet		Port of the server to be accessed remotely
Appearance Behaviour Translation Colours Connection Data Proxy Telnet Rlogin SSH SSH Serial	Load, save or delete a stored session Saved Sessions Default Settings Load Save Delete Close window on exit: Always Never Only on clean exit		SHH should be selected.
About Help	Open Cancel		

- d) After pressing 'Open' button, the input screen appears.
- e) Access to server / device is provided with user name and password.
- f) Return to <u>5</u> for subsequent operations.



APP 6. SUBNET MASK ADJUSTMENT SAMPLE

The Subnet Mask prefix must be entered when the IP address is given in the VMware Program. In the 'Address' section shown in Figure 22, the Subnet Mask should be entered with IP.

Sample:

IP Address to Enter: 192.168.2.6

The Subnet Mask: 255.255.255.0

Assuming that, Subnet Mask is calculated as a prefix;

		255
HEX	FF	
DEC	255	
OCT	377	
BIN	1111 1111	

The BIN value was calculated as 1111 1111. So, every 255 is 8 and 1 means 8. In the example given, the Subnet Mask has 3 pieces of 255 so it has 24 pieces in total.

In Figure 22, the IP and Subnet Mask given in the example to the 'Addresses' section on the IPV4 CONFIGURATION page are entered as follows;

Addresses: 192.168.2.6 / 24

IP Add. Subnet M