Tower ESS

User Manual

Content

Statement of Law

This product complies with the design requirements of environmental protection and personal safety. The storage, use and disposal of the products shall be carried out in accordance with the product manual, relevant contract or relevant laws and regulations.

Customer can check the related information on the website of Jiangsu Daqin New Energy Tech (Taizhou) Co., Ltd. when the product or technology is updated.

Web URL：http://www.dyness-tech.com.cn/

Please note that the product can be modified without prior notification.

Revision History

Revision NO.	Revision Date	Revision Reason
1.0	2019.09.11	First Published
2.0	2020.03.03	Structural design changed
3.0	2020.06.28	Parameter changes
3.1	2020.09.28	1.Change the connector of the power cable 2.Change the color of Power wake button 3. Add a negative output point and a module positive point on composite plug of module, add a negative output point and a module negative point on composite socket of module. 4.Add a positive output point and a negative output point on the composite socket of BDU. 5.Update battery nameplate and module label
3.2	2021.3.2	1、Update the System Performance Parameter 2、Update Installation clearance requirements 3、Update Installation location precautions 4、Update the Grounding.
3.3	2021.3.15	Upgrade adaptive function

Safety handling of lithium batteries Guide

symbol

	**Danger**	● **Battery strings will produce high voltage DC power and can cause a lethal voltage and electric shock.** ● **Only qualified person can perform the wiring of the battery strings.**
	**Warning**	**Risk of battery system damage or personal injury** ● **DO NOT pull out the connectors while the system is operating!** ● **De-energize from all multiple power sources and verify that there is no voltage.**
	**Caution**	**Risk of battery system failure or life cycle reduction.**

 **Warning: This product is a high voltage DC system, operated by authorized person only.**

 **Danger: Before installation or operation you must read <Operation Menu> carefully.**

 **Caution:**

Before Connecting

- Please check product and packing list first after unpacking, if product is damaged or lack of parts, please contact with the local retailer;
- Before installation, be sure to cut off the grid power and make sure the battery is in the turned-off mode;
- Do not mistake the positive and negative cables and ensure there are no short circuit connection to the external device;

- It is prohibited to connect the battery to AC power directly;
- Battery system must be well grounded and the resistance must be less than 1 Ω
- Please ensured the electrical parameters of battery system are compatible to related equipment;
- Keep the battery away from water and fire.

In Using

- If the battery system needs to be moved or repaired, the power must be cut off and ensure the battery is completely shut down;
- It is prohibited to connect the battery with different type of battery.
- It is prohibited to put the batteries working with faulty or incompatible inverter;
- It is prohibited to disassemble the battery (Warranty tab removed or damaged);
- In case of fire, only dry powder fire extinguisher can be used, liquid fire extinguishers are prohibited;
- Please do not open, repair or disassemble the battery except staffs from Dyness or authorized by Dyness. We do not undertake any consequences or related responsibility which because of violation of safety operation or equipment safety standards.

Caution

- Please read the user manual carefully (in the accessories);
- If the battery is stored for a long time , it is required to charge them every six months, and the SOC should be no less than 80%;
- Battery needs to be recharged within 12 hours, after fully discharged;
- Do not expose cable outside;
- All the battery terminals must be disconnected for maintenance;
- Please contact the supplier within 24 hours if there is something abnormal.
- The warranty claims are excluded for direct or indirect damage due to items above.

1 Introduction

1.1 Brief Introduction

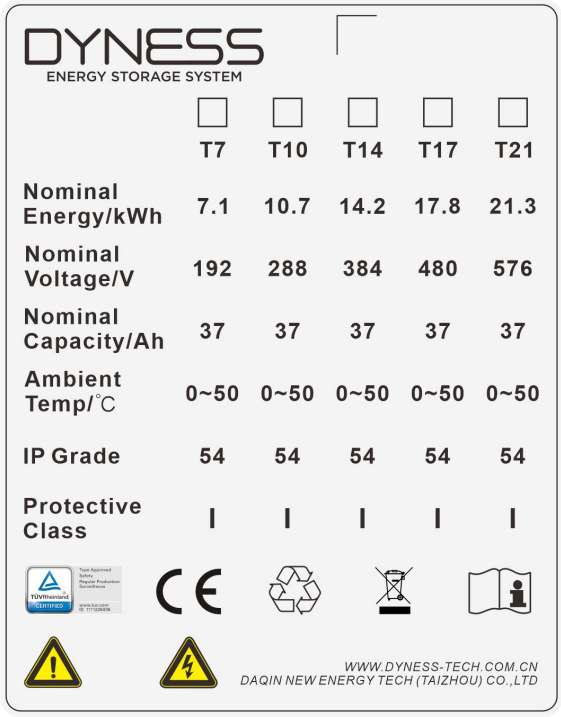
Tower is a high voltage battery storage system based on lithium iron phosphate battery, and it's one of the new energy storage products developed and produced by Dyness. it can be used to support reliable power for various types of equipments and systems. Tower is especially suitable for application scene of high power, limited installation space, restricted load-bearing and long cycle life.

1.2 Product Properties

- The whole module is non-toxic, non-polluting and environmentally friendly;
- Anode material is made from LiFePO4 with safety performance and long cycle life;
- Battery management system (BMS) has protection functions including over-discharge, over-charge, over-current and high/low temperature;
- The system can automatically manage charge and discharge state and balance current and voltage of each cell;
- Flexible configuration, multiple battery modules can be in serial for expanding voltage and Capacity.
- Adopted self-cooling mode rapidly reduced system entire noise;
- The module has less self-consumption, up to 6 months without charging; no memory effect, excellent performance of shallow charge and discharge;
- Working temperature range is from 0 to 50℃ , with excellent discharge performance and cycle life;
- Small size and light weight, standard module is comfortable for installation and maintenance;

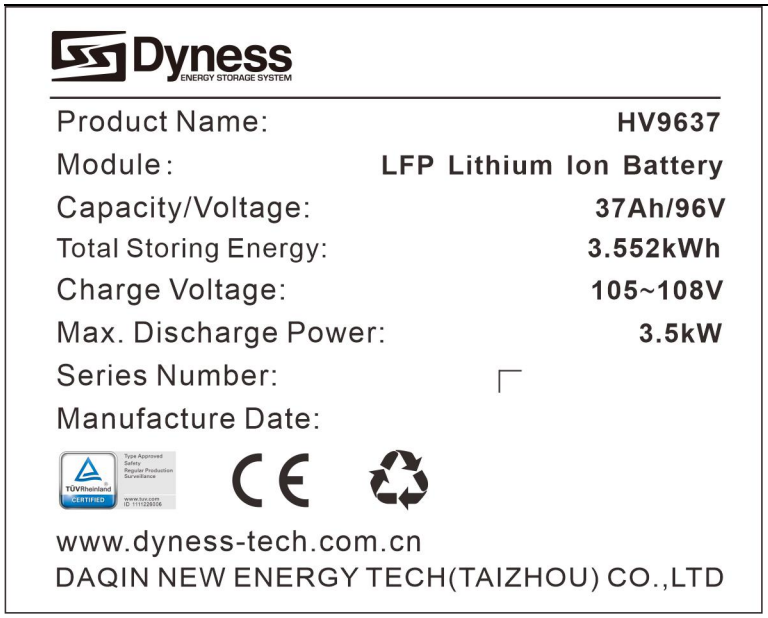
1.3 Product identity definition

Figure 1-1 Battery Energy Storage System nameplate



	Battery voltage is higher than safe voltage, direct contact with electric shock hazard.
	Be careful with your actions and be aware of the dangers.
	Read the user manual before using.
	The scrapped battery cannot be put into the garbage can and must be recycled by professional personnel or institutes.
	After the battery life is terminated, the battery can continue to be used after it recycled by the professional recycling organization and do not discard it at will.
CE	**This battery product meets European directive requirements.**
Type Approved Safety Regular Production Surveillance TÜVRheinland CERTIFIED www.tuv.com ID 2000000000	**This battery product passed the TUV certification test.**

Figure 1-2 Battery module label



2 Product Specification

2.1 System Performance Parameter

Table 2-1 The parameter of Tower system

System List	T21	T17	T14	T10	T7
Module Type	LFP	LFP	LFP	LFP	LFP
Total Storing Energy [kWh]	21.31	17.76	14.21	10.66	7.10
Usable Capacity [kWh]	21.31	17.76	14.21	10.66	7.10
Recommend Depth of Discharge	80%	80%	80%	80%	80%
Max Depth of Discharge	100%	100%	100%	100%	100%
Module configuration	6 Series	5 Series	4 Series	3 Series	2 Series
Voltage Range[Vdc]	504~657	420~547	336~438	252~328	168~219
Battery System Voltage (Vdc)	576	480	384	288	192
Battery System Capacity (Ah)	37	37	37	37	37
Battery System Charge Voltage (Vdc)	657	547.5	438	328.5	219
Battery System Charge Current [A] (Standard)	7.4	7.4	7.4	7.4	7.4
Battery System Charge Current [A] (Normal)	18.5	18.5	18.5	18.5	18.5
Battery System Charge Current [A] (Max)	37	37	37	37	37
Battery System Discharge lower-Voltage (Vdc)	504	420	336	252	168
Battery System Discharge Current [A] (Standard)	7.4	7.4	7.4	7.4	7.4
Battery System Discharge Current [A] (Normal)	18.5	18.5	18.5	18.5	18.5

Battery System Discharge Current [A] (Max)	37	37	37	37	37
Battery System Max. Charge& Discharge Current [A] (when used in communication with the inverter)	22.5	22.5	22.5	22.5	22.5
Discharge condition	-10℃~50℃	-10℃~50℃	-10℃~50℃	-10℃~50℃	-10℃~50℃
Charge condition	0℃~50℃	0℃~50℃	0℃~50℃	0℃~50℃	0℃~50℃
Max. Discharge Power [kW]	21.31	17.76	14.21	10.66	7.1
Max.Charge& Discharge Power [kW] (when used in communication with the inverter)	12.78	10.65	8.52	6.39	4.2
Short Circuit Current [kA]	1.5	1.5	1.5	1.5	1.5
Enclosure Protection (IP)	IP54	IP54	IP54	IP54	IP54
Size [mm]	1500 *504*380	1300 *504*380	1100 *504*380	900 *504*380	700 *504*380
Weight [kg]	269	228	187	146	105
Battery Module Name	HV9637	HV9637	HV9637	HV9637	HV9637
Battery Module Quantity(pcs)	6	5	4	3	2

T14

2.2 Battery Module

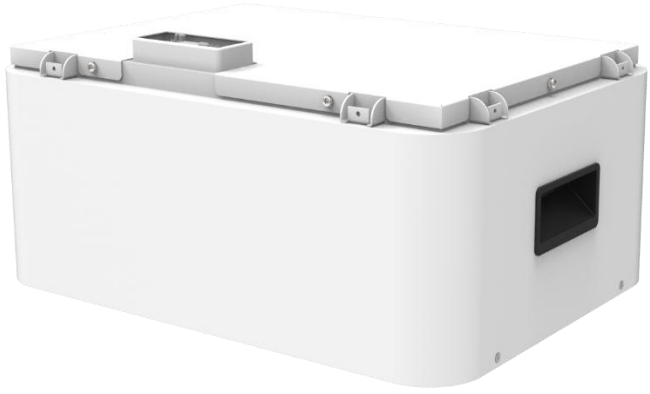


Table 2-2 Product parameters

Module Name	HV9637
Cell Technology	Li-ion(LFP)
Battery Module Capacity (kWh)	3.552
Battery Module Voltage (Vdc)	96
Battery Module Capacity (Ah)	37
Battery Module Cell Quantity (pcs)	30
Battery Cell Capacity (Wh)	118.4
Battery Cell Voltage (Vdc)	3.2
Battery Cell Capacity (Ah)	37
Battery Module Cell Quantity in Series (pcs)	30
Battery Module Charge Voltage (Vdc)	109.5
Battery Module Charge Current (Standard) [A]	7.4
Battery Module Charge Current (Normal) [A]	18.5
Battery Module Charge Current (Max.) [A]	37
Battery Module Discharge lower-Voltage (Vdc)	84
Battery System Discharge Current (Standard) [A]	7.4
Battery Module Charge Current (Normal) [A]	18.5
Battery Module Charge Current (Max.) [A]	37
Dimension(W*D*H, mm)	504*380*240
Communication mode	CAN
Pollution Degree (PD)	II
Ambient Temperature(℃)	0~50
IP Grade	IP54
Weight(kg)	41

HV9637 top interface

HV9637 bottom interface

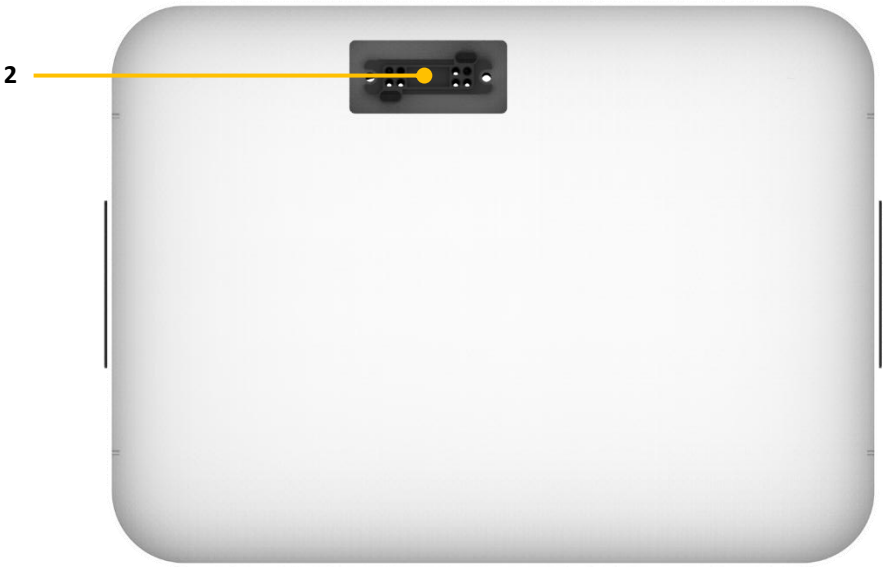
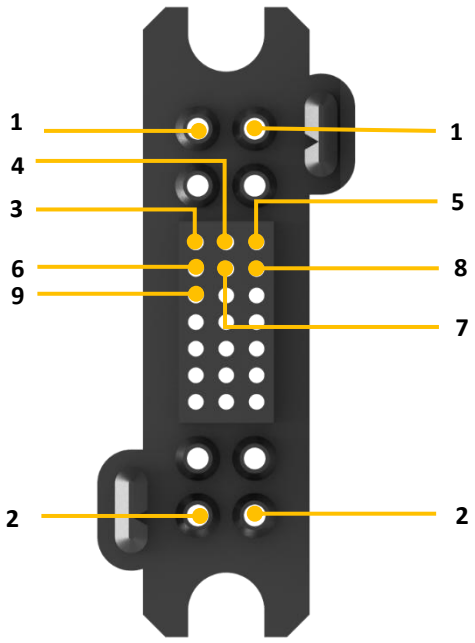
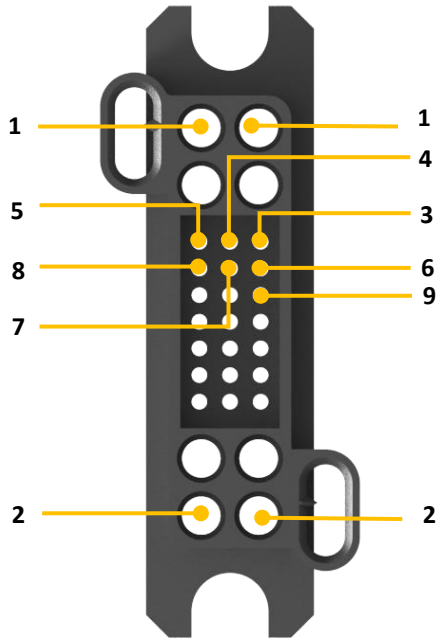


Table 2-3 Interface Definition

Item	Name	Definition
1	Composite connector-Plug	Battery module output and communication interface
2	Composite connector-Socket	Battery module output and communication interface



Composite connector-Plug



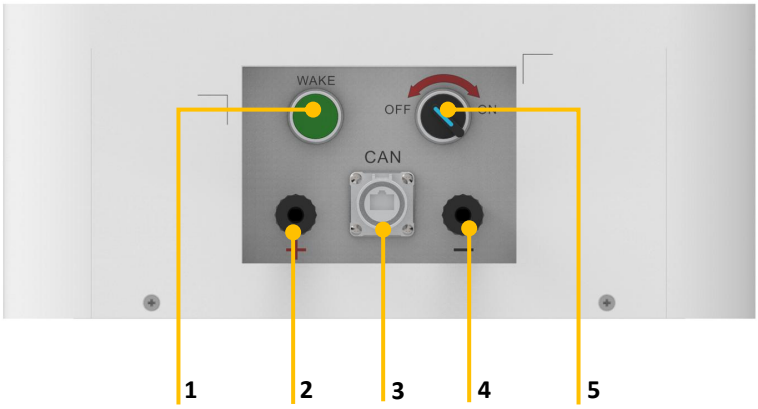
composite connector-Socket

Table 2-4 Port Definition

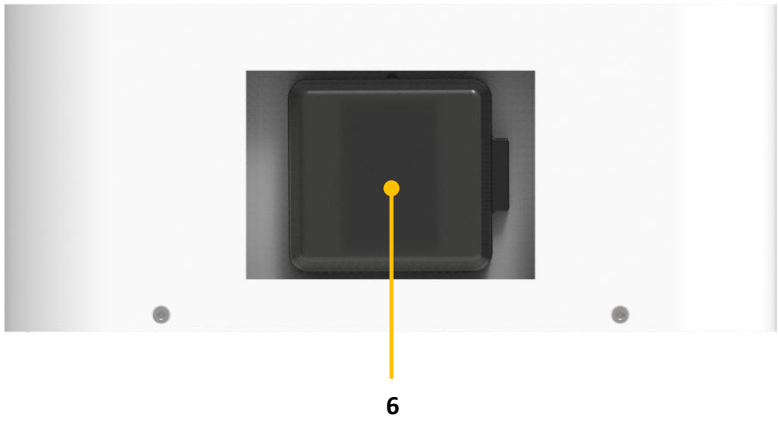
NO	Composite connector-plug	Composite connector-socket
1	Negative output	Negative output
2	Module positive	Module negative
3	SWAKE	SWAKE
4	SCANSG	SCANSG
5	SCANL	SCANL
6	SCANH	SCANH
7	24V-	24V-
8	24V+	24V+
9	SCANIN	SCANOUT

2.3 Battery Controller

BDU right interface



BDU left interface



BDU bottom interface

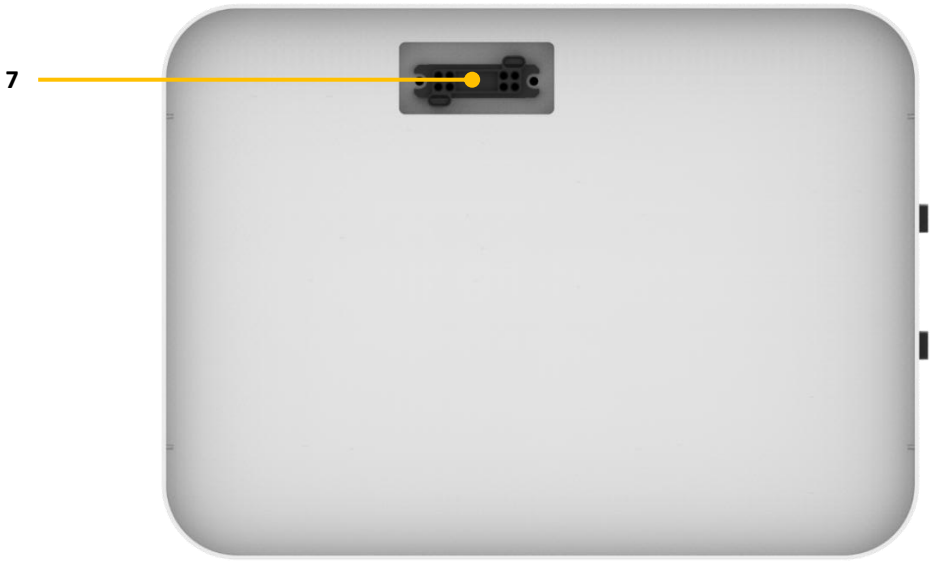
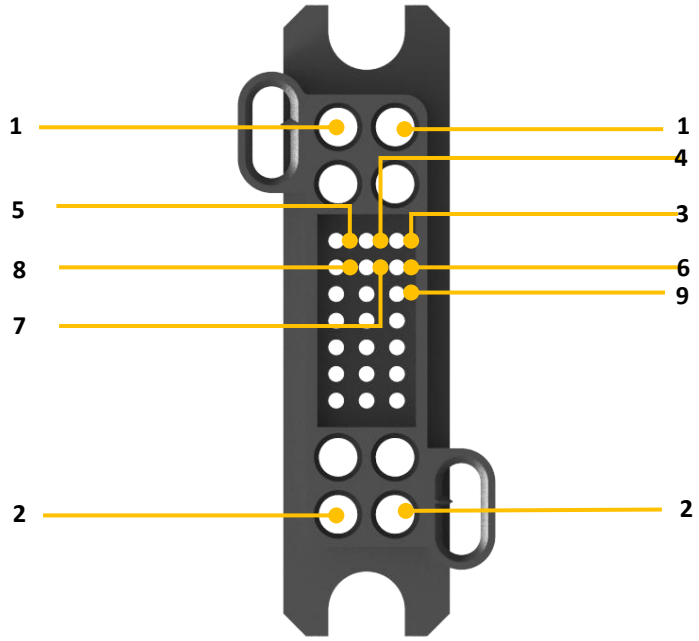


Table 2-5 Interface Definition

Item	Name	Definition
1	Power Wake Button	Long press this button 5S to start the battery system
2	External Positive socket	Connect battery system with Inverter positive terminal
3	EXT-CAN Communication Port	RJ45 communication port between the battery system and inverter
4	External Negative socket	Connect battery system with Inverter negative terminal
5	Power On switch	Turn on the switch to power the BMS system
6	DC Breaker	The master switch of the battery system,you must switch on it before switching on power on&power wake switch; Short circuit protection.
7	Composite connector-Socket	Battery module output and communication interface



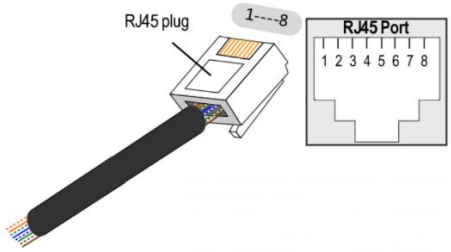
NO	Definition
1	Negative output
2	Positive output
3	SWAKE
4	SCANSG
5	SCANL
6	SCANH
7	24V-
8	24V+
9	SCANOUT

Caution: When the DC breaker is tripped off because of over current or short circuit, must wait after 30min to turn on it again, otherwise may cause the breaker damage.

Power On Button: Generally when it is at ON state, you can't turn off it during normal running condition.
Danger: Ensure Power On Switch is turned on before waking up the battery. Otherwise it will affect automatic checking process and cause danger.

Danger: DO NOT turn off the " Power On Switch" during normal running condition, only in emergency case it could be turned off directly. Otherwise will cause this battery string current surge by another battery strings.

Definition of "EXT-CAN" port pin



PIN	Color	Definition
PIN1	Orange/White	Reserved
PIN2	Orange	XGND
PIN3	Green/White	Reserved
PIN4	Blue	CANH
PIN5	Blue/White	CANL
PIN6	Green	NC
PIN7	Brown/White	Reserved
PIN8	Brown	NC

3 Installation and Configuration

3.1 Environmental Requirement

3.1.1 Cleanliness

The battery system has high voltage connectors. The environment condition will affect the isolation performance of the system.

Before installation and system power on, the dust and iron scurf must be removed to keep a clean environment. And the environment must have certain anti-dust ability.

Dust and humidity condition shall be periodic checked during the system continuous operation.

3.1.2 Temperature

Tower system working temperature range: 0℃~50℃; Optimum temperature: 18℃~30℃;

Caution: Out of the working temperature range will cause the battery system over / low temperature alarm or protection which may lead to the cycle life reduction.

3.1.3 Cooling System

It is essential to equip a cooling system to keep the battery system in a relevant temperature range.

Caution: Out of the working temperature range will cause the battery system over / low temperature alarm or protection which may lead to the cycle life reduction.

3.1.4 Heating System

It is essential to equip a heating system to keep the battery system in a relevant temperature range. If the environment is lower than 0 ℃ ,the system may be shut down for protection purpose. It is necessary to open the heating system at first.

Caution: Out of the working temperature range will cause the battery system over / low temperature alarm or protection which may lead to the cycle life reduction.

3.1.5 Fire-extinguisher System

The room must be equipped with fire-extinguisher system for safety purpose. The fire system needs to be regularly checked to be in normal condition. Refer to the using and maintenance requirements, please follow local fire equipment guidance.

3.1.6 Grounding System

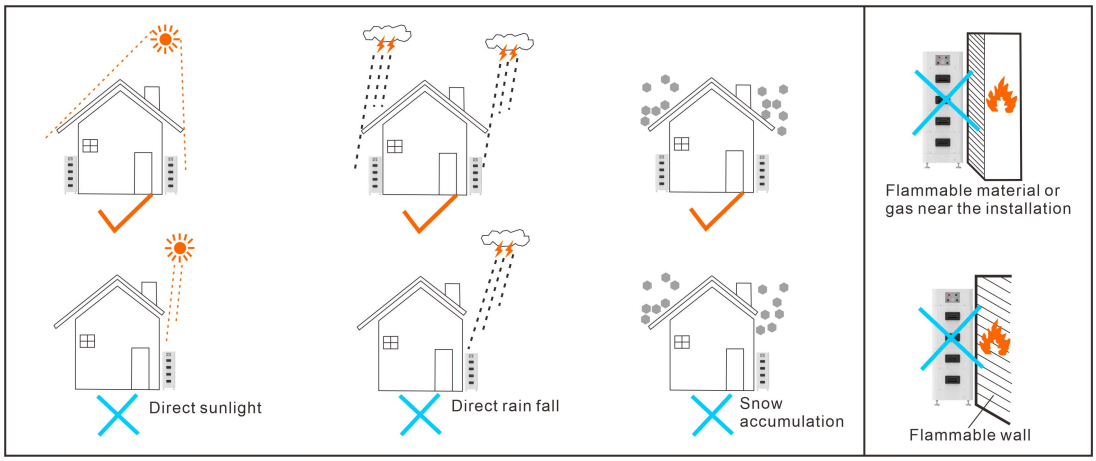
Make sure the grounding point for battery system is stable and reliable before the battery installation. If the battery system is installed in an independent equipment cabin(e.g. container), must make sure the grounding of the cabin is stable and reliable.

The resistance of the grounding system must ≤100mΩ

3.2 Installation clearance requirements

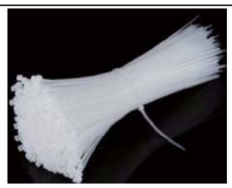
Please note that the battery should be installed with a minimum safe clearance from the surrounding equipment or battery. Please refer to the minimum clearance diagram below.

3.3 Installation location precautions



3.4 Tools

The following tools are required to install the battery pack:

 Wire Cutter	 Crimping Modular Plier	 Cable Ties
 Screw Driver Set	 Electric Screw Driver	 Sleeve Piece
 Adjustable Wrench		

NOTE:

Use properly insulated tools to prevent accidental electric shock or short circuits.

If insulated tools are not available, cover the entire exposed metal surfaces with available insulated alternatives, except their tip, with electrical tape.

3.5 Safety Gear

It is recommended to wear the following safety gear when dealing with the battery pack

Insulated gloves

Safety goggles

Safety shoes

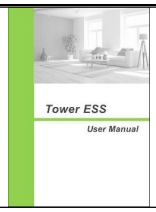
3.6 Unpacking inspection

- When the equipment arrives at the installation site, loading and unloading should be performed according to the rules and regulations, to prevent from being exposed under sunlight. Battery should not be installed in direct sunlight. Please refer to Section 3.3
- Before unpacking, the total number of packages shall be indicated according to the shipping list attached to each package, and the case shall be checked for good condition.
- In the process of unpacking, handle with care and protect the surface coating of the object.
- Open the package, the installation personnel should read the technical documents, verify the list, according to the configuration table and packing list, ensure objects

are complete and intact, if the internal packing is damaged, should be examined and recorded in detail.

Packing list is as follows:

Item	Specification	Quantity	Figure
Tower BDU	504*380*156.5mm	1 PCS	
Battery Module HV9637	96V/37Ah 504*380*240mm	4 PCS	
Tower Base	504*380*186mm	1 PCS	
Communication cable to inverter	Standard,Black /L2000mm /RJ45 plug at both sides	1 PCS	
Communication connector to BDU	RJ45 Waterproof connector	1 PCS	
Cross recessed countersunk head screw	M4*10	20 PCS	
M6 3 sets of combined screws	M6*14	1 PCS	
Ground wire	L500mm,4mm²	1 PCS	

User Manual	30Page	1 PCS	
Power cable connector	To positive pole of battery	1 PCS	
Power cable connector	To negative pole of battery	1PCS	
Power cable	Positive cable 6mm²,red,2m	1 PCS	
Power cable	Negative cable 6mm²,black,2m	1PCS	

3.7 Equipment installation

Table 3-2 Installation steps

Step1	Installation preparation	1.The environment is meeting all technical requirements: “3.1.1~3.1.6”
Step 2	Mechanical installation	1. Determine Tower placement
		2. Place the base
		3. Install battery module
		4. Install Tower BDU
Step3	Electrical installation	1. Battery system grounding (After the HV9637 module is stacked up and down, it is fixed by two screws on the left and right sides. After the screw is fixed, the shell surface of the upper and lower modules is fixed and contacted together through screws.There is a special docking point at the bottom of the battery base. Please refer to the 3.6.3.1)
Step4	Battery system self-test	1. Switch on the DC breaker of the BDU
		2. Switch on the “POWER ON” switch
		3. Press the “POWER WAKE” button for about 3S
		4. Check the system output voltage

		5. Shut down the battery system
Step5	Connecting inverter	1. Connect External Power Cable to the inverter
		2. Connect the EXT-CAN communication cable to the inverter

3.7.1 Installation preparation

1. Make sure the environment is meeting all technical requirements: “3.1.1~3.1.6”
2. Prepare equipment and tools for installation.
3. Confirm that the DC breaker is in the OFF state to ensure that it is no live operation.

3.7.2 Mechanical installation

3.7.2.1 Place the base

- Choose an appropriate place to set base.

3.7.2.2 Battery module installation

- Install all the HV9637 modules on the base from bottom to up, Referring to the following figure.

- Each module uses 4 screws to fix.

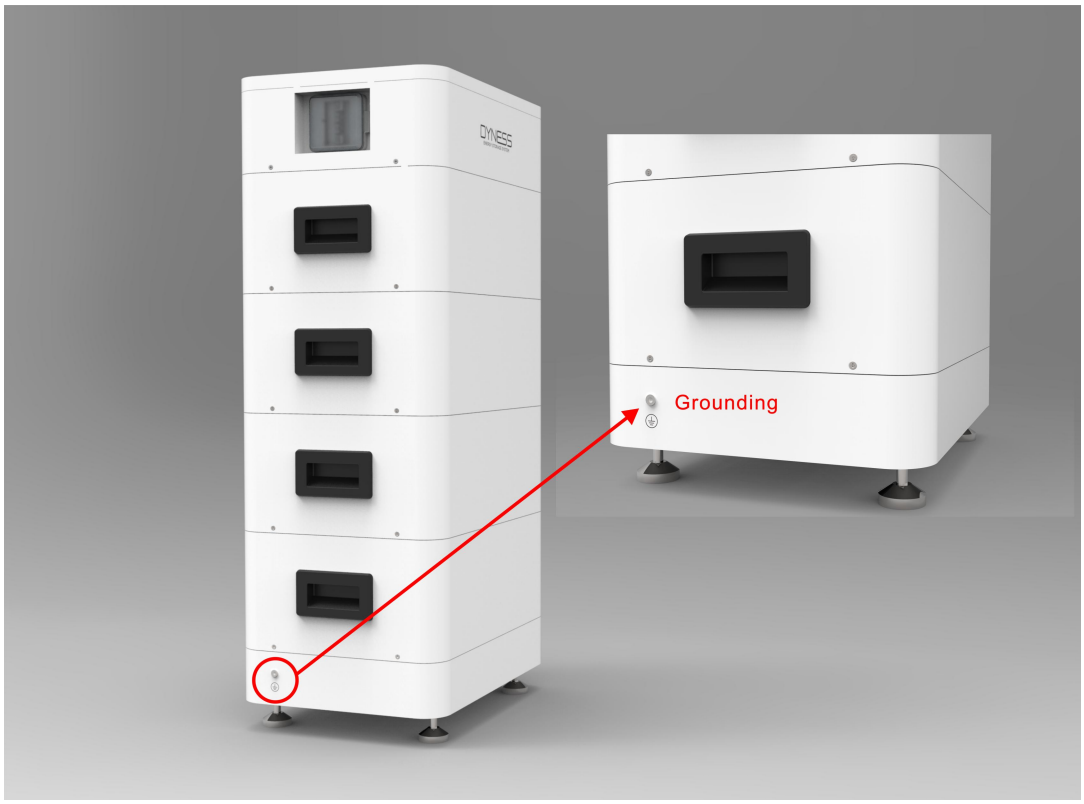
Warning: Single battery module is 41kg. It's necessary to arrange more than 1 person to install battery module if without lifting equipment, more than 2 person when install battery module in higher position.

3.7.3 Electrical installation

Danger: The battery system is high voltage DC system. Must make sure the grounding surface of the Tower is stable and reliable.

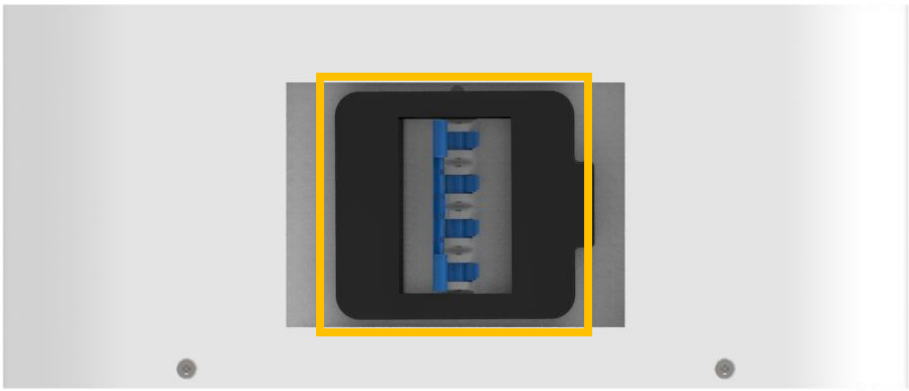
3.7.3.1 Grounding

- After the HV9637 module is stacked up and down, it is fixed by two screws on the left and right sides. After the screw is fixed, the shell surface of the upper and lower modules is fixed and contacted together through screws.There is a special docking point at the bottom of the battery base, as shown in the following figure:



3.6.4 Battery system self-test

3.7.4.1 Switch the BDU“DC BREAKER”to the "ON" state



3.7.4.2 Switch on the “POWER ON” switch

3.7.4.3 Press the “POWER WAKE” button for about 3S. The system start-up.

3.7.4.4 Use a multimeter to measure the output voltage on the positive and negative ports of the BDU

3.7.4.5 The output voltage should conform to the voltage range in the table “Table 2-1 The parameter of Tower system”. Otherwise, the system will be not working properly.

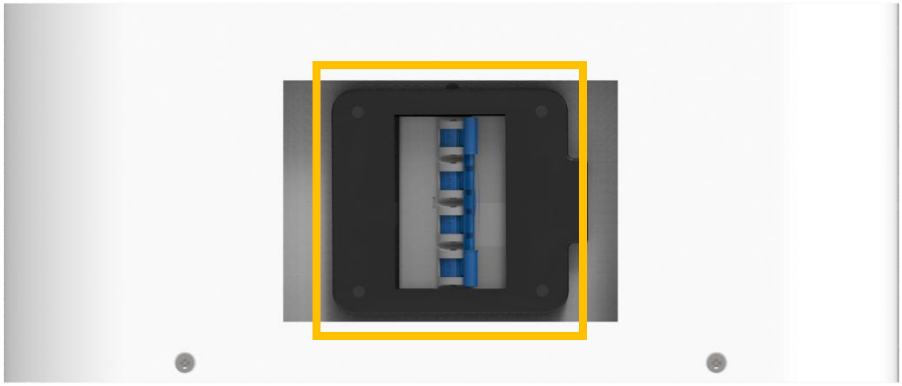
- Use a multimeter to check the output voltage is within the normal range

Danger: The voltage of the battery is too high, please pay attention to do self-protection during the measurement.

3.7.5 Shut down the system.

- Switch off the “POWER ON” switch.

- Switch the BDU “DC BREAKER” to the "OFF" state .

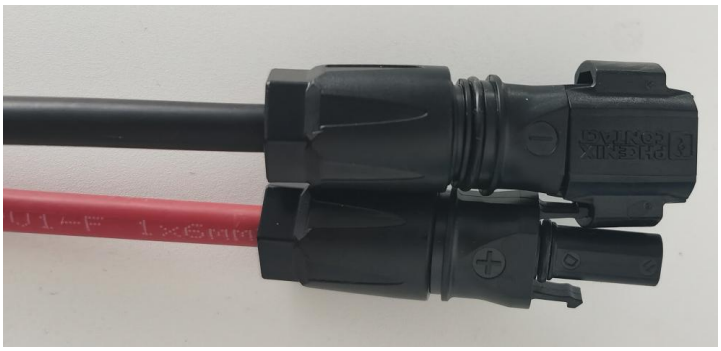


3.7.5 Connecting inverter

Caution: A external DC Breaker that operates both positive and negative conductors simultaneously between the BDU and inverter on the power cable is recommended. After waking up the BDU and ensure that the BDU is pre-charged, you can turn on it.

Danger:
Please confirm that the battery system is in the off state before connecting. It maybe cause electric shock to personnel and damage to the inverter if connect the battery directly without power off.

- Connect the positive and negative connectors with the positive and negative power cables together. Both ends must have connectors, and the connector on the inverter side is provided by the inverter. If that 2m power cable is not long enough, please find another power cable of the same specification, the length cannot be longer than 3m.



- Connect External Power Cable to the inverter;

Connect to inverter DC+ terminal Connect to inverter DC- terminal

- Connect the EXT-CAN communication cable to the inverter RJ45 CAN port.

Connect to inverter RJ45 CAN communication port

Warning:
Double check all the power cables and communication cable. Make sure the voltage of the Inverter is in the same level with the battery system.

- Switch on the inverter, to make sure all the power equipments can work normally.
- Start the battery system. Referring to the section“3.5.4”

4 Maintenance

4.1 Trouble Shooting:

Danger: The Tower battery system is a high voltage DC system, operated by professional and authorized person only.

Danger: Before check the failure, must check all the cables connection. Switches are right or not (refer to section 3.5.4), and if the battery system can be woken up normally .

No	Problem	Possible Reason	Solution
1	The battery has no voltage output, and “POWER ON”/ “POWER WAKE” Light is off.	The DC breaker of the BDU didn’t be turned on	Turn on the DC breaker of BDU
2		The "POWER ON" switch of the BDU box was not switched on	Switch on the "POWER ON" button
3		Battery is in sleep state.	Long press the "POWER WAKE" button for anout 3S
4		The fuse in the BDU box is faulty	Replace fuse
5		Battery gets into over-discharged protection	Charge the battery to relieve the protection state

6	The battery has no voltage output, but “POWER ON”/“POWER WAKE” are on	The relay in BDU is faulty	Replace a new BDU directly
7	When the battery is connected to the inverter, the DC breaker trips automatically	The circuit between the battery and the inverter has a short circuit point	Check whether there is a short circuit in the circuit between the battery and the inverter； Check if the inverter is faulty
8	Communication failure between battery and inverter	The wrong battery model type is selected on the inverter	Select correct battery model type on the inverter

4.2 Replacement of main component

Danger: The Tower battery system is a high voltage DC system, only can be operated by professional and authorized person.

4.2.1 Replacement of Battery Controller (BDU)

4.2.1.1 Turn off the whole battery system. Ensure the Negative terminal and Positive terminal have no power. The shut down progress refer to section 3.5.5

4.2.1.2 Remove the four screws on the BDU and remove the BDU from the system.

4.2.1.3 Change a new BDU. Then fix four screws.

4.3 Battery Maintenance

Danger: The maintenance of battery only can be operated by professional and authorized person.

Danger: you need turn off the battery system firstly when you do some maintenance items.

4.3.1 Voltage Inspection:

[Periodical Maintenance] Check the voltage of battery system through the monitor software. Check whether the system voltage is normal or not. For example: Check Single cell’s voltage is out of rated range or not.

4.3.2 Voltage Inspection:

[Periodical Maintenance] Check the SOC of battery system through the monitor software. Check the SOC of battery string is normal or not.

4.3.3 Cables Inspection:

[Periodical Maintenance] Visual inspect all the cables of battery system. Check the cables have broken, aging, getting loose or not.

4.3.4 Balancing:

[Periodical Maintenance] The battery system will become unbalanced if have not be charged fully for a long time. Solution: Preform the balancing maintenance (fully charged) every 3 month. Generally this maintenance progress needs to be completed when external devices such as the monitor software and battery and inverter are in good communication.

4.3.4 Output Relay Inspection:

[Periodical Maintenance] Under low load condition (low current), control the output relay OFF and ON to hear the relay has click voice, that's mean this relay can off and on normally.

5 Storage Recommendations

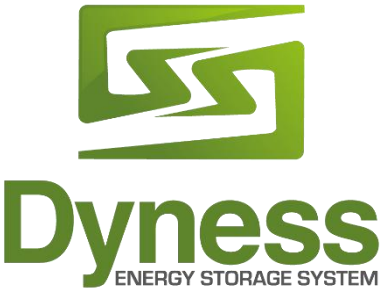
- For long-term storage (more than 3 months), the battery cells should be stored in the environment: temperature range of 5~45℃, relative humidity <65% and contains non-corrosive gas .
- The battery module should arranged in range of 5~45℃, dry, clean and well ventilated environment. The battery should be charged to 50~55% SOC before storage.
- It is recommended to active the battery system (discharge and charge) every 3 months, and the longest duration of storage without charge and discharge cannot exceed 6 months.

Caution: The cycle life of the battery will have relative heavily reduction if not follow the above instructions to store the battery for a long term.

6 Shipment

Battery module will pre-charged to 50% SOC or according to customer requirement before shipment. The remaining capacity of battery cell is determined by the storage time and condition after shipment.

- The battery modules meet the UN38.3 certificate standard.
- In particular, special rules for the carriage of goods on the road and the current dangerous goods law, specifically ADR(European Convention on the International Carriage of Dangerous Goods by Road), as amended, must be observed.



Daqin New Energy Tech (Taizhou) Co., Ltd.
Address: Building 13, Kunshan Jiangyan Industrial Park, Chenzhuang West Road, Jiangyan District, Taizhou City, Jiangsu Province, China, 225500.
Email: Sales@dyness-tech.com
Website: www.dyness-tech.com.cn