Hybrid Inverter

SUNT-6.0kW-T

User Manual

6.0kW LUMENTREE HYBRID INVERTER

Version 1.0 (29/07/2024)

Table of Contents

1.Technical Parameters

	SUNT-6.0kW-T
Battery Input Parameters	
Supported battery type	Li-Ion or Lead-acid
Nominal battery voltage (V)	48
Battery input voltage range(V)	40~60
Max. charge voltage (V)	≤60 (Configurable)
Max. charge current (A)	100 (Configurable)
Max. discharge current (A)	130 (Configurable)
Battery capacity(Ah)(Recommend)	100~2000
Charge for Li-Ion battery pack	Communicating with BMS of the battery pack
PV String Input Parameters	
Max. DC input power (W)	4000 x 2=8000
Max. DC input voltage (V)	500
MPPT voltage range (V)	120 ~ 450
Start-up voltage (V)	150
Max. input current (A)	15 x 2 =30 2 MPPT channels
AC Output Parameters (Back-Up) (Feed to essential load)	
Max. output power (W)	6000
Max. output apparent power (VA)	6000
Peak output apparent power (VA)	12000
Max. output current (A)	26
Nominal output voltage (Vac)	220/230/240 (Configurable) single phase
Nominal output frequency (Hz)	50/60(+/-0.2%) (Configurable)
Max. Bypass Current(A)	40
Shift Time(Bypass and inverter)(ms)	10
Output THD (Resistor load)	< 3%
AC input parameters(On-grid)(Bypass to essential load & Charge the battery/ Feed to home load)	
Max. input power (W) Bypass to essential load & Charge the battery	6000
Max.output power (W) Feed to home load	6000
Max.apparent input power (VA) Bypass to essential load & Charge the battery	6000
Max.apparent output power (VA) Feed to home load	6000
Nominal input/output voltage (Vac)	220/230/240(Auto adjusted to fit home grid) single phase
Nominal input/output frequency (Hz)	50/60(Auto adjusted to fit home grid)
Max. bypass current(A)	40
Shift time(Bypass and inverter)(ms)	10
Efficiency	
Max. Efficiency	97.6%
Max. Battery to Load Efficiency	94.0%
Europe Efficiency	97.0%
MPPT Efficiency	99.9%
Protection	
Battery over charge protection	Integrated
Battery low voltage protection	Integrated
Over temperature protection	Integrated
Output over load protection	Integrated
Output short circuit protection	Integrated

	SUNT-6.0kW-T
Output over voltage protection	Integrated
Certifications & Standards	
Grid regulation	VDE-AR-N4105, UNE217001,G100
Safety regulation	IEC/EN62109-1/2
EMC	IEC/EN61000-6-1/3
Ingress Protection	IP20
Operating Temperature range(℃)	-25~60

2.Safety Instructions

WARNING!

Life-Threatening Risks DUE TO FIRE OR ELECTROCUTION

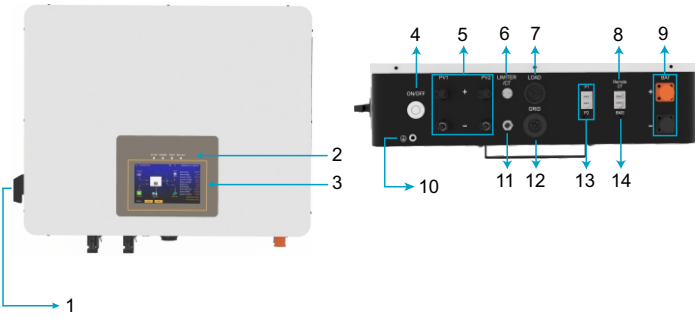
The SUNT Hybrid Inverter can only be installed by a qualified licensed electrical contractor.This is not a DIY product.

- Be sure to read this manual thoroughly before installation.
- Do not attempt to install the inverter by yourself.Installation work must be performed following national wiring standards by authorized personnel only. Do not turn on the power until all the installation work is completed.
- Always use an individual power supply line protected by a circuit breaker and operating on all wires with a distance between contacts of at least 3mm for this unit.
- The unit must be correctly grounded and the supply line must be equipped with a suitable breaker and RCD for the protection of the operator.
- The unit is not explosion-proof,do not install the product in an explosive atmosphere.
- Never touch electrical components immediately after the power supply has been turned off, since the system can still have residual energy, which may cause electric shock. Therefore after turning o ffthe power,always wait for at least 5 minutes before touching electrical components.
- This unit contains no user-serviceable parts.Always consult an authorized contractor for repairs.

3. System Overview

3.1 Product Overview

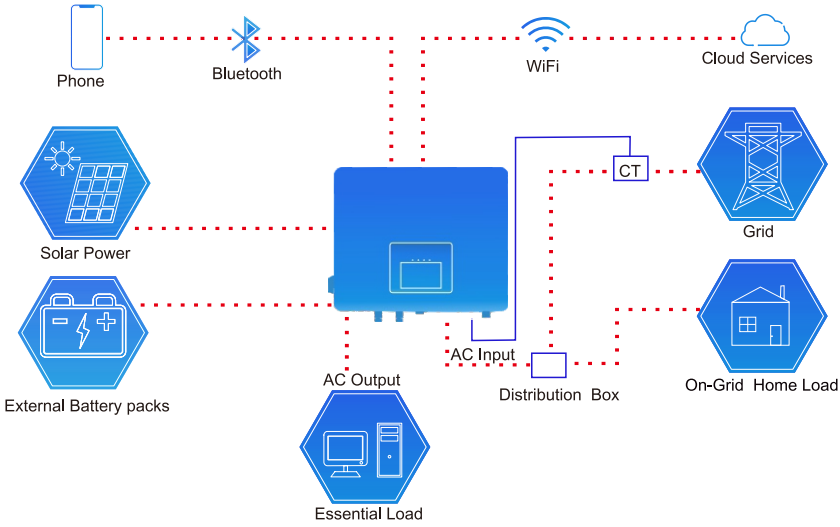
The SUNT Hybrid Inverter is a highly efficient power management equipment that allows the user to hit those ‘parity’ targets by managing power flow from multiple sources such as solar ,main electrical grid,generator,and effectively storing and releasing electric power to meet the demand of utility usage.



1.Battery Isolator Switch
2.Inverter LED Indicators
3.LCD Display
4.Power ON/OFF Switch
5.Mc4 Connectors
6.Limiter/CT
7.AC Output
8.Remote CT
9.Battery Connections
10.Ground Connection
11.Circuit Breaker
12.AC Input
13.CAN Ports For Paralleling
14.CAN Battery BMS

3.2 Basic System Architecture

The following illustration shows the basic application for this inverter/charger. It also includes the following devices to have a complete running system:



3.3 Interactive

- Easy and simple to understand display.
- Supporting Wi-Fi and Bluetooth.
- Visual power flow screen.
- Built-in MPPT Charger and AC Charger.
- Smart settable 3-stage charging for optimized battery performance.

3.4 Compatible

- Compatible with main electrical grid voltages or power generators.
- On-grid, and off-grid pure sine wave inverter.
- Auto restart while AC is recovering.

3.5 Configurable

- Fully programmable controller.
- Programmable multiple operation modes: LIMIT function mode（Economic mode) No limit function mode(UPS mode).
- Configurable battery charge/discharge current and voltage based on applications.
- Charger and discharge work time control.

3.6 Secure

- Overload/over-temperature/short-circuit protection.
- Smart battery charger design for optimized battery protection /Battery over charge and discharge protection.
- Limiting function installed to prevent excess power overflow to grid ("Zero export").

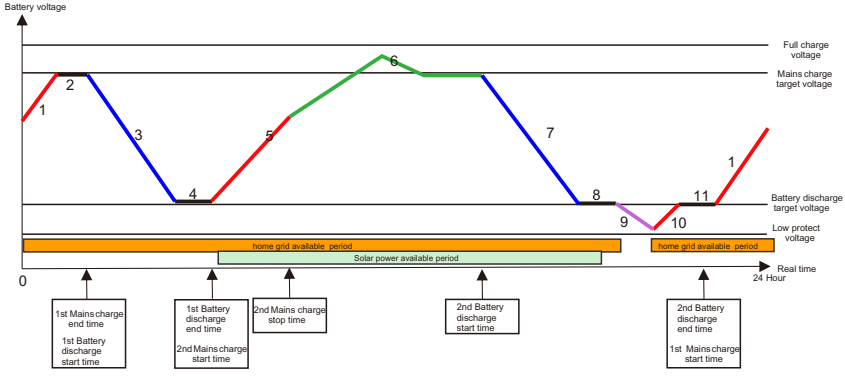
3.7 Applications

- Marine (vessel power management).
- Power shedding (home/office/factory).
- UPS (Uninterrupted Power Supply).
- Remote locations with solar and wind generators.
- Building sites.
- Military locations.
- Telecommunication.

3.8 Work Mode Explanation:

3.8.1 Limit Function Mode(Economic Mode)

(Using peak cutting and valley filling to save money)



According to the time coordinate, in the time period from “xx mains charge start time” to “ xx mains charge end time”, mains will charge the battery pack until the battery voltage reaches to “ mains charge target voltage”. This time period should be in low electric price time.
From”xx battery discharge start time” to “ xx battery discharge end time”, the inverter will feed power to home load and the load connected to the AC output, the limit function should be available in this time period to limit the feed power never exceeds the total loads (after CT), to keep “Zero export”. This time period should be in high electric price time.

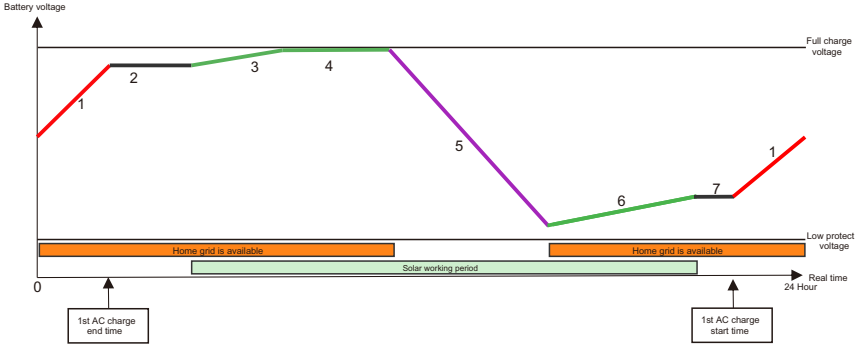
The MPPT solar charger will work at all time when the solar energy is available, in the “Solar power available period”, the solar energy will charge the battery pack in “mains charge“ period and will feed power to home grid in “the battery discharge” period. If the battery voltage is higher than the “ main charge target voltage”, then the solar energy will feed power to home grid arbitrarily, but the limit function will still be available. If the solar power is higher than the home load, the extra solar power will charge the battery pack too.

About the voltage of the battery pack:

Section “1”, “5” : Mains charge section. In these sections, the battery pack voltage will increase until reaches to “mains charge target voltage”.
Section "10", Mains charge section. If the battery voltage is lower than the "battery discharge target voltage" after U P S function, it will be charged to "battery discharge target voltage" arbitrarily. Section “2”, “4”, “8” and “11” : Keeping voltage section. Section “6”: Solar energy feeds power to home grid and charges the battery pack. Section “3” and “7”: “battery discharge” section. In these sections, the battery pack voltage will decrease until reaches to “battery discharge target voltage”.
Section “9”: U P S function enabled section.
The battery pack volume from “battery discharge target voltage” to “Low protect voltage” is for essential loads like Computers, or refrigerators that the AC power can’t be interrupted when the home grid is not available. If you have no essential loads, then you can set the “battery discharge target voltage” near to “Low protect voltage” to get more usable battery volume for charge and discharge.
If you want to keep more battery volume for essential loads when the home grid is not available, you can set the “battery discharge target voltage” much higher.
When the home grid is available, the AC output terminal is bypassed and connected to the home grid.

3.8.2 NO Limit Function Mode(Ups Mode)

In this work mode, the inverter can only be discharged via AC output, and can’t feed the home grid, Under UPS, the inverter is only capable of powering essential loads that are connected with the AC output terminal .



According to the time coordinate, in the time period from “xx mains charge start time” to “xx mains charge end time”, the home grid will charge the battery pack until the battery pack is fully charged, you also can set the 2nd mains charge time period, if you want to save electric charge money, the time periods should be in low electric price time. The MPPT solar charger will work all time when the solar energy is available, in the “Solar power available period”, the solar energy will charge the battery pack, If the battery pack is full, then the solar energy will power the essential loads connected with AC output terminal.

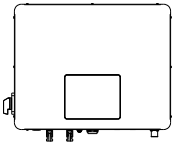
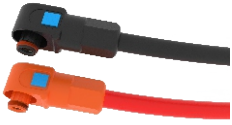
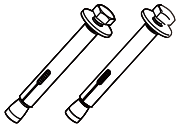
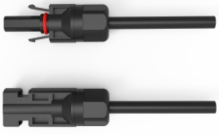
About the voltage of the battery pack:

Section “1”: Mains charge section.
Section “2” and “7”: keeping voltage section.
Section “3” and “6”: The battery pack is charged by solar energy.
Section “4”: Extra solar energy powers the essential loads.
Section “5”: UPS function enabled section, the essential loads are powered by AC output.

When the home grid is available, the AC output terminal is bypassed and connected to the home grid.

4.Installation

4.1 Parts List

	SUNT HYBRID INVERTER	1pcs		Battery Connectors (Optional)	2pcs		Expansion bolts M6X60	2pcs		Grid/Load Connectors	2pcs
	Current transformer ID	1pcs		MC4 Connectors	2pcs		User manual	1pcs		Dust cover	1pcs

4.2 DO not install the inverter in the following areas:

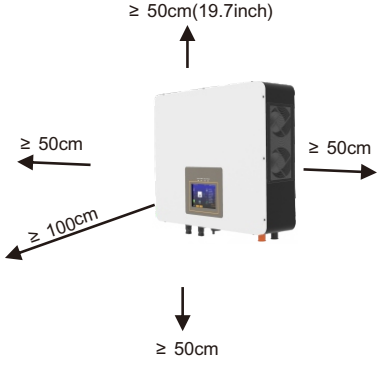
- Areas with high salt content,like the marine environment, will deteriorate metal parts,causing the parts to fail or the unit to leak water.
- Areas filled with mineral oil or containing a large amount of splashed oil or steam, such as a kitchen. It will deteriorate plastic parts, causing the parts to fail or the unit to leak water.
- Areas that generate substances that adversely affect the equipment, such as sulfuric gas, chlorine gas, acid, or alkali. It will cause the copper pipes and brazedjoints to corrode, which can cause refrigerant leakage.
- Areas that can cause combustible gas to leak, Contain suspended carbon-fiber or flammable dust, or volatile inflammable such as paint thinner or gasoline.
- Areas where there may be gas leaks and settles around the unit. It can cause fires.
- Areas where animals may urinate on the unit or ammonia may be generated.
- High altitude areas, 4000 meters above sea level.
- Environments where precipitation or humidity are above 95%.
- Areas where the air circulation is too low.

Please be advised:

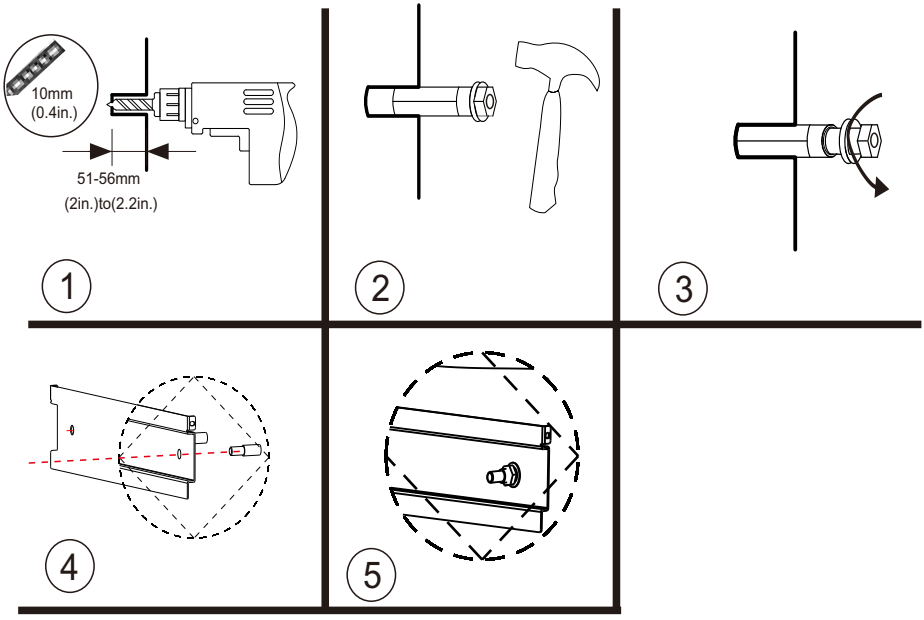
- Install the indoor unit, outdoor unit, power supply cable, transmission cable, and remote control cable at least 1 meter(3.3feet) away from a television or radio receivers. This will prevent TV reception interference or radio noise. Even if they are installed more than 1m apart, it is still possible to receive noise under some signal conditions.
- If children under 10 years old may approach the unit, take Precautions against the children from reaching the unit
- Install the indoor unit on the wall at a height of 160 cm (5.3feet) from the floor.

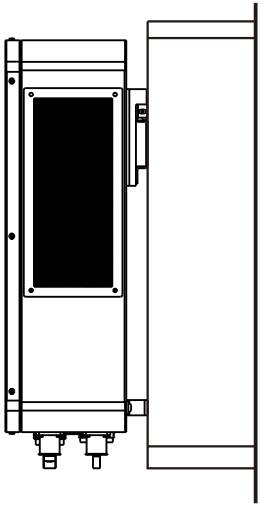
4.3 Considering the following points before selecting where to install:

- Please select a vertical wall with load-bearing capacity for installation,Concrete or other non-flammable surfaces, Installations steps are shown below.
- Install this inverter at eye level in order to allow the LCD display to be read at all times.
- For proper air circulation to dissipate heat,allow a clearance of approx 50cm(19.7inch) to the side and approx 50cm above and below the unit ,and 100cm to the front.



4.4 Mounting the Inverter





4.5 Cables Selection

There are four essential cables needed to set up the system, which are listed below.

PV Cable(connect solar panels and inverter)

Battery Cable(connect battery and inverter)

AC output Cable(connect backup load and inverter)

AC input Cable(connect utility power and inverter)

4.5.1 PV String and Cable Selection:

Before you connect the solar panels to the inverter, a suitable specification of cables should be selected. The selection of cables specifications is according to the total power and the connecting method of solar panels. You should calculate the maximum current that will transit through the cables, we mark it as Imax. First, calculate the total Pmax of the solar panels that will be connected to the inverter, we mark it as TPmax, then calculate the total Voc of them, we mark it as TVoc. Because same model PVs will be connected in series mostly, so:

1)Imax=Imp.
2)TPmax=N*Pmax.
3)TVoc=N*Voc.

Tvoc should be>150V and<500V.150V is the min.PV string voltage that will reach at the installation side(according to the max.Temperature)and 500V is the max.PV string voltage that will reach at the installation side(according to the min.Temperature).

Example of determining the sizing of the PV cable is conducted under the assumption of using 10 of 400W solar panels,with Pmax=400W;Voc=41.2V;Vmp=34.2V;Imp=11.7A.

Series Connection:

1)Imax=Imp=11.7A.
2)TPmax=10*400W=4000W.
3)TVoc=10*41.2V=412V.

Hence, based on Imax = 11.7A, refer to American Wire Gauge Chart, Max current column. The corresponding cable should be 11AWG (refer to American Wire Gauge Chart(on the next page), Max current column)

Here are some suggestions for each of the cable listed.However,each individual system will need to do some calculations in order to find the optimal cable based on the circumstances described in the examples above.

4.5.2 PV Cable

Model	Wire Size	Max Current(A)	Cable(mm^2)
6.0kW	10AWG	15x2	5.26

4.5.3 Battery Cable

Model	Wire Size	Max Current(A)	Cable(mm^2)
6.0kW	1AWG	130	42.4

4.5.4 Ac Output Cable&Ac Input Cable

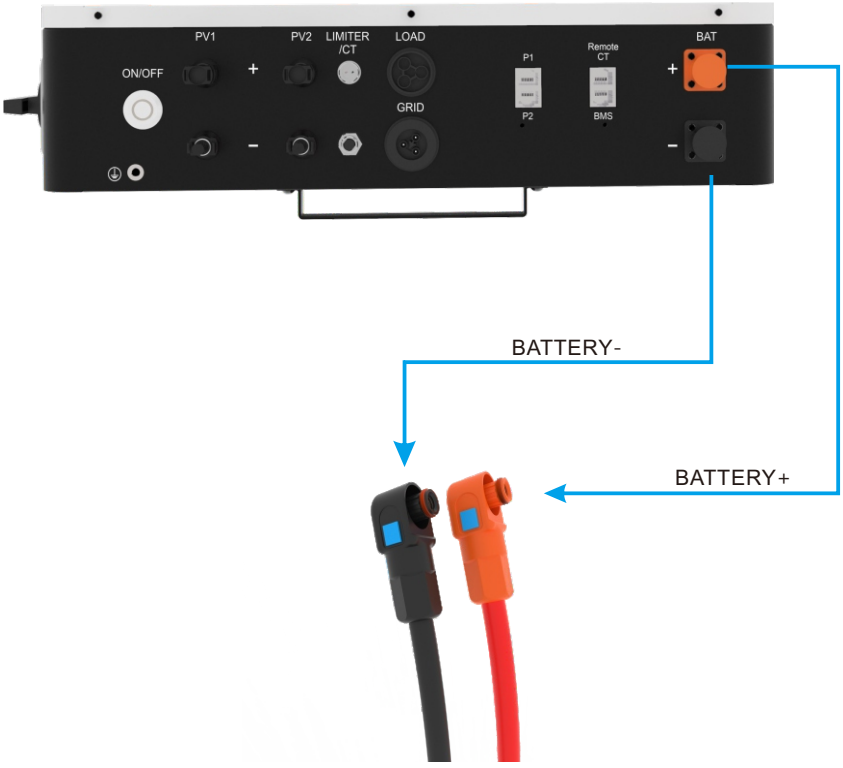
Model	Wire Size	Max Current(A)	Cable(mm^2)
6.0kW	8AWG	26	8.37

Table: American Wire Gauge (AWG) Cables/ Conductor Sizes and Properties

AWG	Diameter [inches]	Diameter [mm]	Area [mm2]	Resistance [Ohms /1000 ft]	Resistance [Ohms/ km]	Max Current [Amperes]	Max Frequency for 100% skin depth
0 (1/0)	0.3249	8.25246	53.5	0.0983	0.322424	150	250 Hz
1	0.2893	7.34822	42.4	0.1239	0.406392	119	325 Hz
2	0.2576	6.54304	33.6	0.1563	0.512664	94	410 Hz
3	0.2294	5.82676	26.7	0.197	0.64616	75	500 Hz
4	0.2043	5.18922	21.2	0.2485	0.81508	60	650 Hz
5	0.1819	4.62026	16.8	0.3133	1.027624	47	810 Hz
6	0.162	4.1148	13.3	0.3951	1.295928	37	1100 Hz
7	0.1443	3.66522	10.5	0.4982	1.634096	30	1300 Hz
8	0.1285	3.2639	8.37	0.6282	2.060496	24	1650 Hz
9	0.1144	2.90576	6.63	0.7921	2.598088	19	2050 Hz
10	0.1019	2.58826	5.26	0.9989	3.276392	15	2600 Hz
11	0.0907	2.30378	4.17	1.26	4.1328	12	3200 Hz
12	0.0808	2.05232	3.31	1.588	5.20864	9.3	4150 Hz
13	0.072	1.8288	2.62	2.003	6.56984	7.4	5300 Hz
14	0.0641	1.62814	2.08	2.525	8.282	5.9	6700 Hz
15	0.0571	1.45034	1.65	3.184	10.44352	4.7	8250 Hz
16	0.0508	1.29032	1.31	4.016	13.17248	3.7	11 k Hz
17	0.0453	1.15062	1.04	5.064	16.60992	2.9	13 k Hz
18	0.0403	1.02362	0.823	6.385	20.9428	2.3	17 kHz
19	0.0359	0.91186	0.653	8.051	26.40728	1.8	21 kHz
20	0.032	0.8128	0.518	10.15	33.292	1.5	27 kHz
21	0.0285	0.7239	0.41	12.8	41.984	1.2	33 kHz
22	0.0254	0.64516	0.326	16.14	52.9392	0.92	42 kHz
23	0.0226	0.57404	0.258	20.36	66.7808	0.729	53 kHz
24	0.0201	0.51054	0.205	25.67	84.1976	0.577	68 kHz
25	0.0179	0.45466	0.162	32.37	106.1736	0.457	85 kHz
26	0.0159	0.40386	0.129	40.81	133.8568	0.361	107 kHz
27	0.0142	0.36068	0.102	51.47	168.8216	0.288	130 kHz
28	0.0126	0.32004	0.081	64.9	212.872	0.226	170 kHz
29	0.0113	0.28702	0.0642	81.83	268.4024	0.182	210 kHz
30	0.01	0.254	0.0509	103.2	338.496	0.142	270 kHz
31	0.0089	0.22606	0.0404	130.1	426.728	0.113	340 kHz
32	0.008	0.2032	0.032	164.1	538.248	0.091	430 kHz
33	0.0071	0.18034	0.0254	206.9	678.632	0.072	540 kHz
34	0.0063	0.16002	0.0201	260.9	855.752	0.056	690 kHz
35	0.0056	0.14224	0.016	329	1079.12	0.044	870 kHz
36	0.005	0.127	0.0127	414.8	1360	0.035	1100 kHz
37	0.0045	0.1143	0.01	523.1	1715	0.0289	1350 kHz
38	0.004	0.1016	0.00797	659.6	2163	0.0228	1750 kHz
39	0.0035	0.0889	0.00632	831.8	2728	0.0175	2250 kHz
40	0.0031	0.07874	0.00501	1049	3440	0.0137	2900 kHz

4.6 Connecting the Batteries

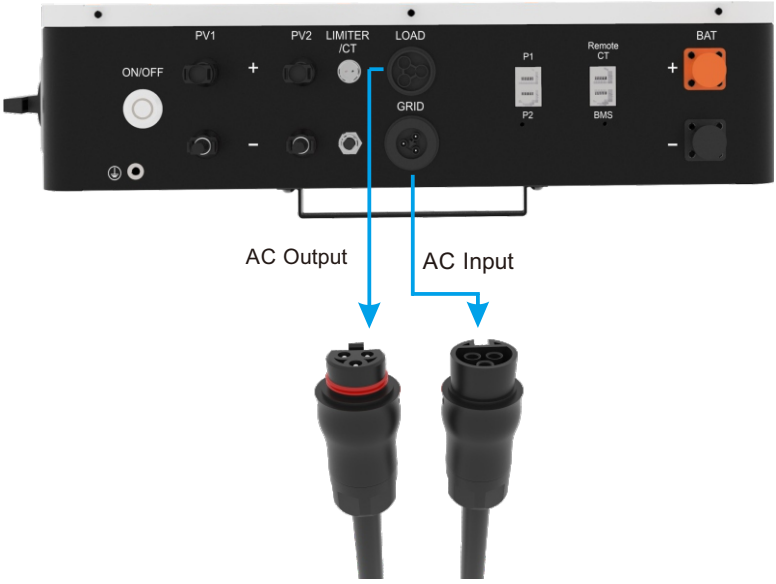
Insert the terminal of the battery cable flatly into the battery connector of the inverter.



4.7 Connecting the AC

WARNING!

All wiring and cable sizing must follow the wiring regulations and code of practices of whichever country you live in .
There are two terminal blocks with “AC Input”,“AC Output”,markings,Please DO NOT mix-connect input and output connectors.
Be sure to connect AC wires with the correct polarity.

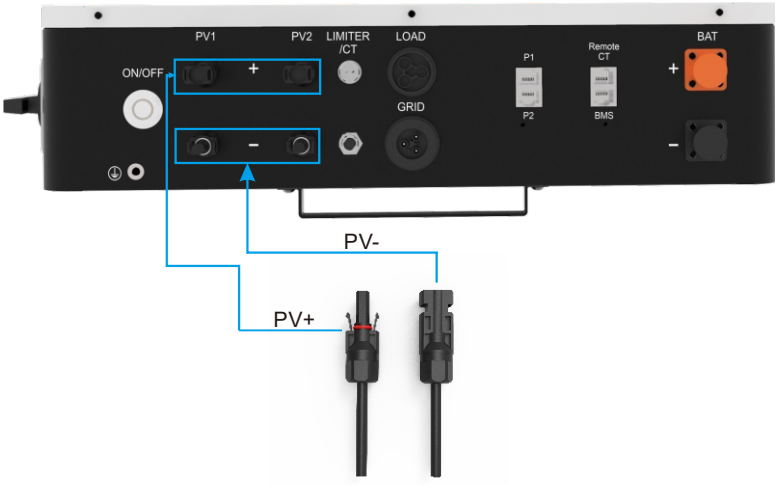


- Before making AC input/output connection,be sure to disconnect the utility grid first.
- Insert AC input wires according to polarities indicated on terminal block.
- Make sure the wires are securely connected.

4.8 Connecting the PV

WARNING!

All wiring must be performed by a qualified personnel.
It's very important for system safety and efficient operation to use appropriate cable for PV module connection.
To avoid any malfunction, do not connect any PV modules with possible current leakage to the inverter. For example, grounded PV modules will cause current leakage to the inverter. When using PV modules, please be sure NO grounding.
It is Required to use PV junction box with surge protection. Otherwise,it will cause damage on the inverter when lightning occurs on PV modules.
.

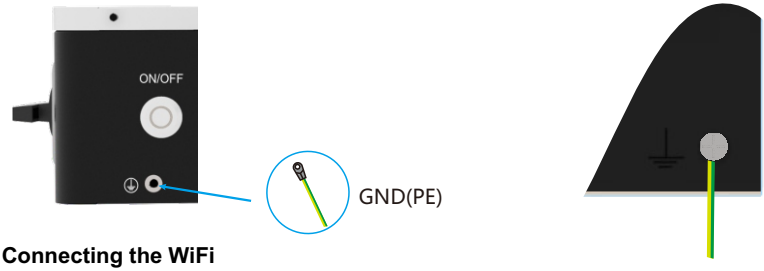


- Insert PV wires according to polarities indicated on the terminal block .
- Make sure the wires are securely connected.

4.9 Connecting the Ground

WARNING!

All wiring must be performed by a qualified personnel.
It's very important for system safety and efficient operation to use appropriate cable for the Ground connection.



4.10 Connecting the WiFi

For the configuration of Wi-Fi ,please refer to the Wi-Fi manual .

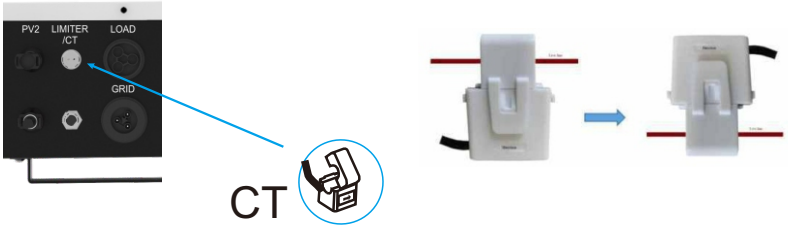
4.11 Installing the CT Coil to get LIMIT Function

The CT coil is one of the most important parts of the SUNT inverter. This device reduces the power of the inverter to prevent feeding power to the grid. This feature is also known as "Zero Export".

- Fit the coil (sensor) around the live cable on the main fuse feeding the building and run the cable back to the inverter. This cable can be extended up to an extra 10m using a similar cable.
- Connect the other end of the CT coil into the inverter terminals marked as CT coil

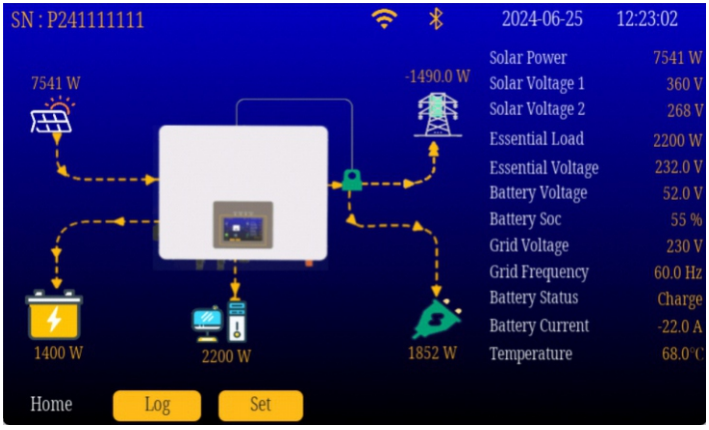
IMPORTANT

If the CT coil is clamped to the live cable in the wrong way then this CT power will have negative values instead of positive values when the power is flowing into the house/inverter. Also, the inverter export limiting function will not work properly.

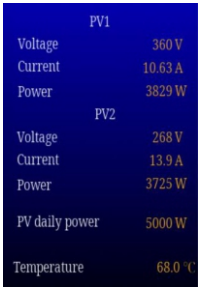


5. Operation

5.1 Home Page

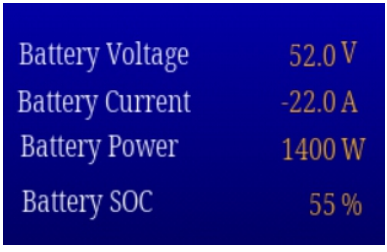


When the device is powered on, the screen displays the home page, where the power flow chart on the home page intuitively shows the current power consumption status, and the main information of the inverter on the right side ;



You can click on specific icons to view the corresponding detailed information: 

Click on the PV icon, and the detailed information of the current PV status will be displayed on the right side.



Click on the "Grid" button  , and the current grid information will be displayed on the right side.

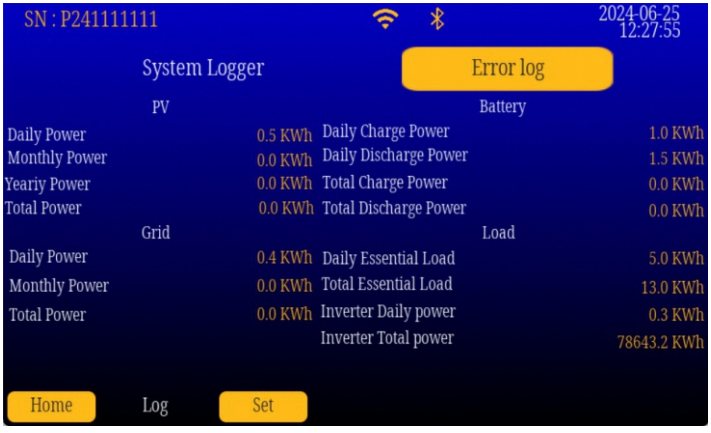
Click on the battery button , and the current battery power information will be displayed.

Click on the inverter icon in the center to return to the home page.

The status bar displays basic information, SN SN : P240229001, WIFI connection status , Bluetooth connection status , date and time 2024-05-29 17:54:18, and error prompts .

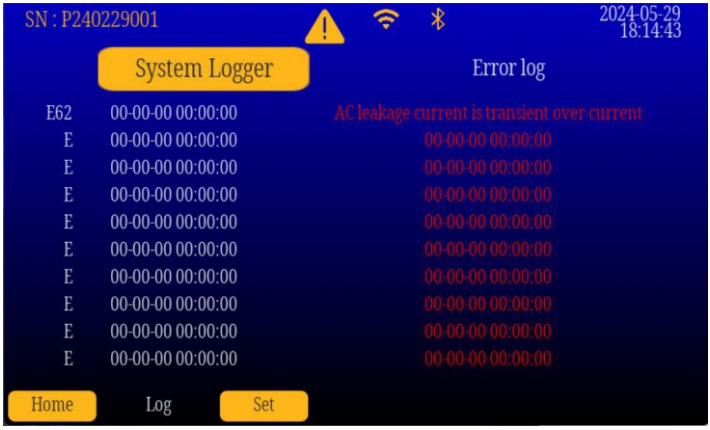
There are three buttons to switch to the Home page,Log page, and Settings page.

5.2 Log Page



The log page consists of two parts:system logs and error log. System log mainly record the electrical energy consumed and transformed by each node,which is convenient for viewing records.

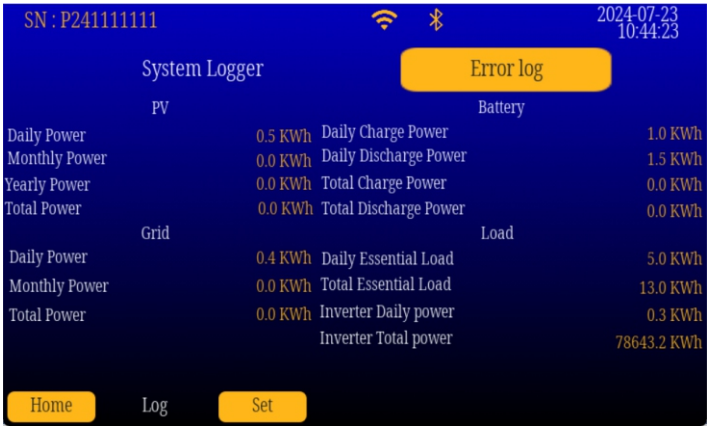
5.3 Error Logs



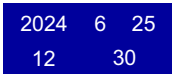
Error log mainly record the machine's error messages,with a maximum of ten entries saved.

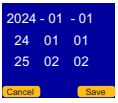
6. Setting Pages

6.1 Basic Settings Page



The interface's language currently supports multiple languages,including Vietnamese, Thailand and more to be added. You can also set backlight time,backlight brightness,and the duration of the buzzer's sound.

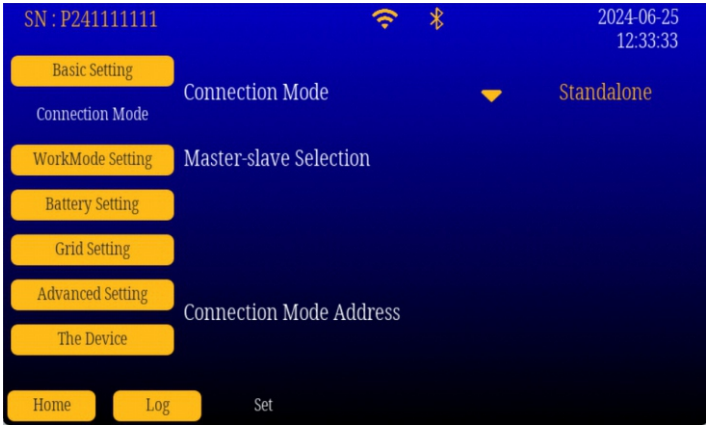
Click on the corresponding area of the date setting 

, and a selection interface will pop up, where you can slide to choose the date 

or time 

you need to set; "Save" replaces the value of the setting item, and "Close" does not change the value of the setting item.

6.2 Online Mode Settings



On this page, you can set the device's online mode. The default online mode is standalone, and clicking on the yellow arrow  will pop up the online mode 

that needs to be set. Except for the standalone mode, which does not require a master-slave distinction, other modes require specifying the master and slave machines.

When switching modes, it will default to "Master" 

/ "Master(L1)" 

. Clicking on the arrow 

will pop up the master-slave machine option list, and the available master-slave machine configurations will vary depending on the selected mode. The online address defaults to "1" 

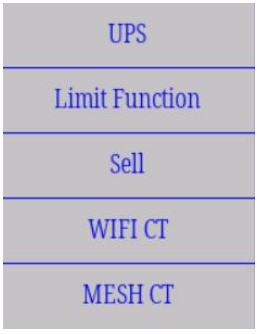
, and the address of the master machine is an unchangeable fixed address, while the default address of the slave machine can be changed according to the actual installation situation 

Click on the address value under the slave machine option to enter the value through the pop-up keyboard 

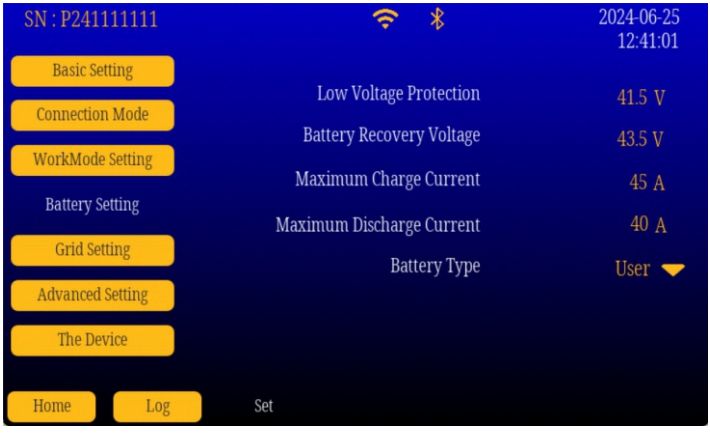
, with the maximum value for the slave machine being 15, and the minimum value not less than the default.The connection mode address for the slave unit starts from 2 with an increment of 1, meaning if you have 4 slave units with 1 master, the master connection mode address is 1, and the slave unit connection mode addresses are 2,3,4,5

6.3 Working Mode Settings

Here you can set the device's working mode. SUNT-6kW-T has five working modes: UPS, Limit Function, Sell, WIFI CT, and MESH CT.

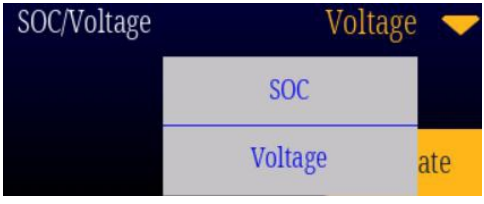


6.4 Battery Settings



On this page, you can set the battery low voltage protection point, battery recovery voltage, maximum charging current, and maximum discharging current, and you can set the user's battery type. There are three preset battery connection situations 

: dedicated battery pack, user-defined battery, and no battery.

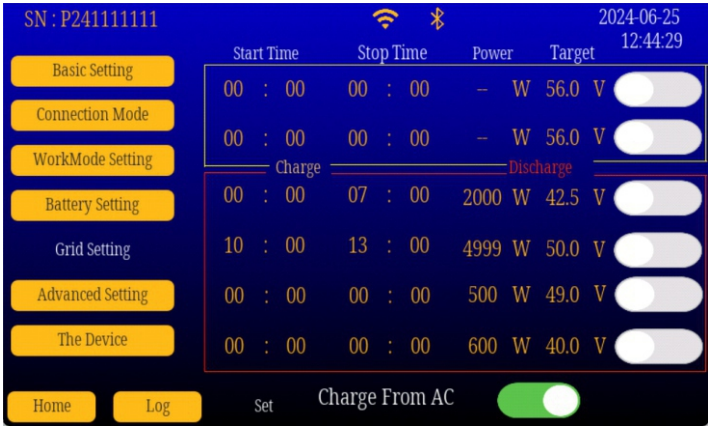


Under "Battery Pack", by connecting the battery's BMS to the inverter's interface, you can set it to SOC display mode.

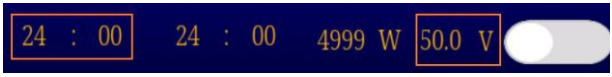
In the "User" state, only the battery voltage can be set, and SOC cannot be set.

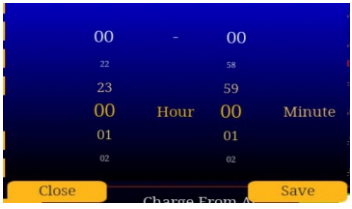
In the "NO Battery" state, the options on this page cannot be set.

6.5 Grid Settings

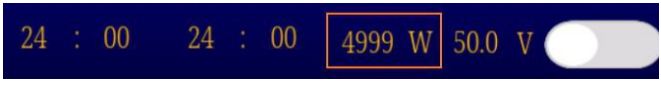


This page allows you to set charging and discharging settings. There are two charging settings and four discharging settings, providing two charging times and four discharging times. According to the set target voltage, the power during discharge can be limited.

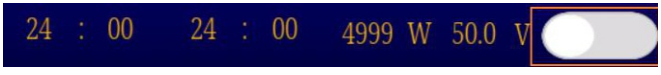


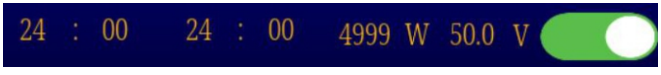


Click on the corresponding area of the time, and a time selection box will pop up. After selecting the time, click "Save" to apply the time to the clicked time node, and click "Close" to cancel the time setting. The voltage setting is the same.



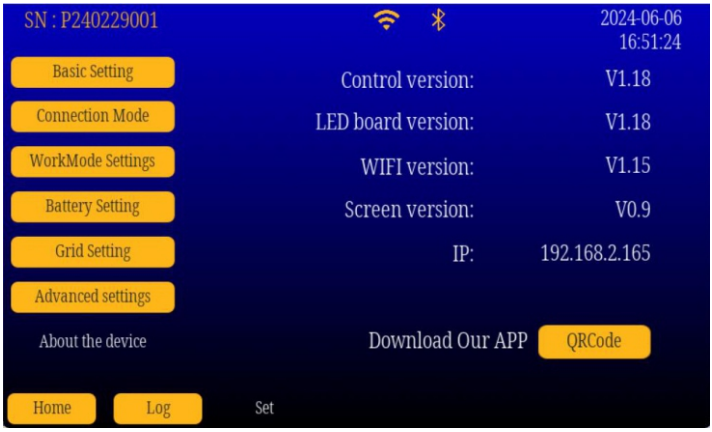
Power is entered through an input box  , with a limit of 0W to 6000W.





The enable button determines whether the time setting for this period is effective. When it is turned off, the time setting will not take effect, and when it is turned on, it will take effect.

6.6 Advanced Settings Page



This page provides the device's software version information and IP address.

7.Weight and Dimension of the Hybrid Inverter

Model	SUNT-6.0kW-T
Net Weight	15.5Kg
Gross Weight	19.0Kg
Product Size	515x420x140(mm)
Packing Size	628x538x232(mm)

8.More Support

For APP operation and more support, please scan the QR code below or enter the website below for operation.