

6.4 Basic Settings

Basic Settings

☒ Time Syncs

☐ Beep

☒ Auto Dim

Brightness

Year

2023

Month

9

Date

26

Hour

18

Minute

0

Day of the Week

Tues

☐ Factory Reset

☐ Lock Out All Changes

**Factory Reset:** Reset all parameters of the inverter.

**Lock Out All Changes:** Enable this menu for setting parameters that require locking and can not be set up. Be fore performing a successful factory reset and locking the systems,to keep all changes you need to type in a password to enable the setting.

The password for factory settings is 9999 and for lock out is 7777.

PassWord

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DEL

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9

CANCEL

0

OK

6.5 Battery Settings

Battery Settings

Lithium

Use Battery v

Use Battery %

No Battery

Battery Capacity

Max Charge

Max Discharge

Revive Battery

200 Ah

50.0 Adc

40.0 Adc

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**Lithium:** Battery Selection

**Battery Capacity:** Enter the size of the battery bank connected to the system.

**Use Battery V:** Displays battery charge in terms of voltage.

**Use Battery %:**Only the lead-acid battery capacity is displayed for server use.

**Max Charge/Discharge:** Set the max charge/discharge rate for the batteries.

**No Battery:** Tick this item if no battery is connected to the system.

**Revive Battery:** Tick this feature will help recover a battery that is over discharged by slowly charging from the solar array or grid.

Battery Settings

Recharge

Charge Rate

☐ Gen Charge

30 %

40.0 Adc

Recharge

Charge Rate

☐ Grid Charge

30 %

40.0 Adc

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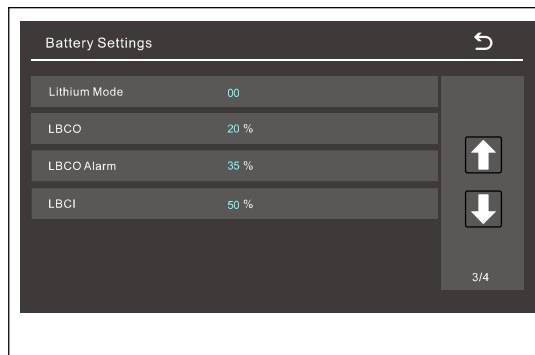
**Recharge = 30%:** System will automatically start a connected generator to charge the battery bank when SOC at 30%.

**Charge Rate = 40Adc:** The maximum generator charging current.

**Gen Charge:** Uses the generator input of the system to charge battery bank from an attached generator.

**Charge Rate = 40Adc:** The maximum grid charging current.

**Grid Charge:** It indicates that the grid charges the battery.

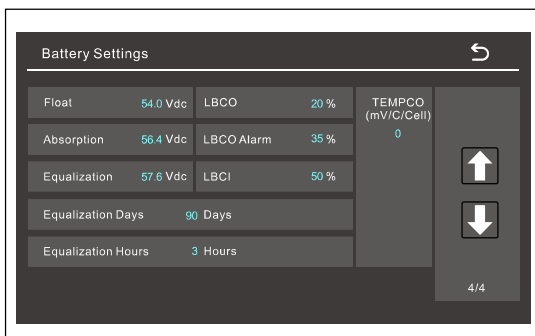


**Lithium Mode:** This is BMS protocol.

**LBCO 20%:** The inverter will shut down if the SOC below this value.

**LBCO Alarm 35%:** The inverter will alarm if the SOC below this value.

**LBCI 50%:** AC output will resume if Battery voltage at 50%.



Float, Absorption, Equalization are three stages of charging the battery.

**LBCO 20%:** The inverter will shutdown if the SOC below this value.

**LBCO Alarm 35%:** The inverter will alarm if the SOC below this value.

**LBCI 50%:** After the battery low voltage alarm, the alarm information

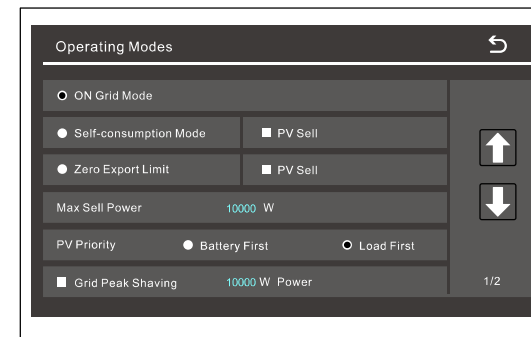
above 50% is cleared.

This is for professional installers, you can keep it if you do not know.

Recommended battery settings:

Battery Type	Absorption	Float	Equalization
AGM(or PCC)	14.4V(57.6V)	13.5V(53.6V)	14.4(57.6V)
Gel	14.1V(56.4V)	13.5V(54.0V)	
Wet	14.7V(59.0V)	13.7V(55.0V)	14.7(59.0V)
Lithium	Follow its BMS voltage parameters		

## 6.6 Operating Modes



**On Grid Mode:** The inverter will sell any excess power produced by the solar panels back to the grid. If time of use is active, the battery energy can also be sold into grid.

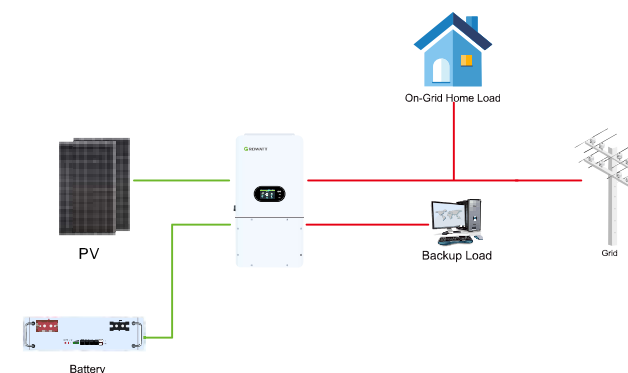
The PV energy will be used to power the load and charge the battery and then excess energy will flow to grid.

Power source priority for the load is as follows:

1. Solar Panels.
2. Grid.
3. Battery (The current battery voltage/SOC exceeds the set voltage/SOC).

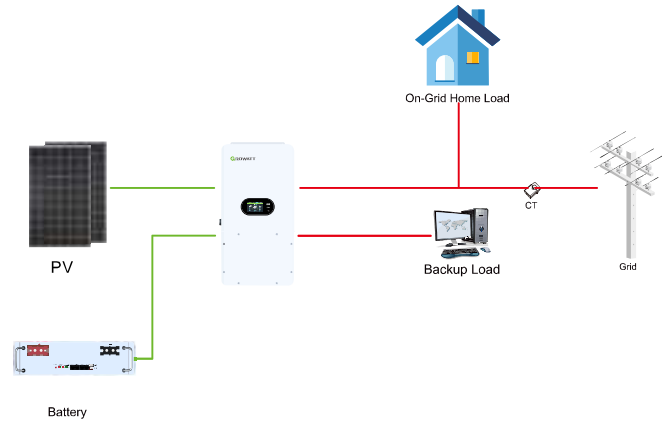
**Self-consumption Mode:** Hybrid inverter will only provide power to the backup load connected.

The hybrid inverter will neither provide power to the home load nor sell power to grid. The built-in meter will detect power flowing back to the grid and will reduce the power of the inverter only to supply the local load and charge the battery.



**Zero Export Limit:** Hybrid inverter will not only provide power to the backup load connected but also give power to the home load connected. If PV power and battery power is insufficient, it will take grid energy as supplement. The hybrid inverter will not sell power to grid. In this mode, a meter is needed. The installation method of the meter please refer to chapter 2.6 Meter Connection.

The external meter will detect power flowing back to the grid and will reduce the power of the inverter only to supply the local load, charge battery and home load.



**PV Sell:** "PV sell" is for Self-consumption Mode or Zero Export Limit Mode: When this item is active, the surplus energy can be sold back to grid. When it is active, PV Power source priority usage is as follows: load consumption and charge battery and feed into grid.

**Max Sell Power:** Allowed the maximum output power to flow to grid.

**PV Priority:** PV Power source priority.

**Battery First:** PV power is firstly used to charge the battery and then used to power the load. If PV power is insufficient, grid will make supplement for battery and load simultaneously.

**Load First:** PV power is firstly used to power the load and then used to charge the battery. If PV power is insufficient, grid will make supplement for battery and load simultaneously.

**Grid Peak Shaving:** when it is active, grid output power will be limited within the set value. If the load power exceeds the allowed value, it will take PV energy and battery as supplement, If still can't meet the load requirement, grid power will increase to meet the load needs.

Operating Modes

Time Of Use

Grid Charge	Gen	Time	Power	Battery
<input type="checkbox"/>	<input type="checkbox"/>	00:00 04:00	10000	48V
<input type="checkbox"/>	<input type="checkbox"/>	04:00 08:00	10000	48V
<input type="checkbox"/>	<input type="checkbox"/>	08:00 12:00	10000	48V
<input type="checkbox"/>	<input type="checkbox"/>	12:00 16:00	10000	48V
<input type="checkbox"/>	<input type="checkbox"/>	16:00 20:00	10000	48V
<input type="checkbox"/>	<input type="checkbox"/>	20:00 00:00	10000	48V

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**Time Of Use:** It is used to program when to use grid or generator to charge the battery, and when to discharge the battery to power the load. Only tick "Time Of Use" then the follow items (Grid Charge, Gen Time, Power, Battery) will take effect.

**Note:** when in ON Grid Mode and click time of use, the battery power can be sold into grid.

**Grid Charge:** Utilize grid to charge the battery in a time period.

**Gen:** Utilize diesel generator to charge the battery in a time period.

**Time:** The time displayed on the inverter, range of 00:00-23:59.

**Power:** Max charge and discharge power of battery allowed.

**Battery(V or SOC %):** Battery SOC % or voltage at when the action is to happen.

**Gen:** The generator does not currently support Time Of Use.

Operating Modes

Time Of Use

Grid Charge	Gen	Time	Power	Battery
<input checked="" type="checkbox"/>	<input type="checkbox"/>	00:00 04:00	10000	80%
<input checked="" type="checkbox"/>	<input type="checkbox"/>	04:00 08:00	10000	80%
<input checked="" type="checkbox"/>	<input type="checkbox"/>	08:00 12:00	10000	80%
<input checked="" type="checkbox"/>	<input type="checkbox"/>	12:00 16:00	10000	80%
<input checked="" type="checkbox"/>	<input type="checkbox"/>	16:00 20:00	10000	80%
<input checked="" type="checkbox"/>	<input type="checkbox"/>	20:00 00:00	10000	80%

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**For example:**

During 09:00-18:00, when battery SOC is lower than 80% it will use grid to charge the battery until battery SOC reaches 80%.

During 18:00-09:00, when battery SOC is higher than 80%, hybrid inverter will discharge the battery until the SOC reaches 80%.

## 6.7 Grid Settings

Grid Settings

Grid Mode

☐ General Standard

IEEE-1547-2003

IEEE-1547-2018

CA Rule 21

HECO 14H

ISO NE2021

PREPA

Grid Type

☐ 120/240V Split Phase

120/208V 3 Phase

127/220V 3 Phase

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**Grid Mode:** Please follow the local grid code and then choose the corresponding grid standard.

**Grid Type:** Set the Grid Type.

Grid Settings

Grid Frequency

☒ 50Hz
 ☐ 60 Hz

Reconnection Time

300 s

PF

1.000

Enter Service Frequency

High

60.50 Hz

Low

55.50 Hz

Enter Service Voltage

High

253.9 Vac

Low

220.1 Vac

Grid Frequency Range

High

60.50 Hz

Low

59.30 Hz

Grid Voltage Range

High

264.0 Vac

Low

211.2 Vac

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**Grid Frequency:** Set the grid frequency.

**Reconnection time:** The waiting time period for the inverter to connect the grid again.

**PF:** This is used to adjust the inverter's reactive power.

**Enter Service Frequency/Voltage:** Grid-connected voltage frequency range.

**Grid Frequency/Voltage Range:** Grid voltage frequency protection range.

### Grid Settings

<input checked="" type="checkbox"/> Q(V)	<input type="checkbox"/> FW	<input type="checkbox"/> VW	
V1: 220.8 V Q1: 0.44	Fstart: 60.50 Hz	Vstart: 254.4 V	<div>↑</div> <div>↓</div>
V2: 235.2 V Q2: 0.00	Fstop: 62.00 Hz	Vstop: 264.0 V	
V3: 244.8 V Q3: 0.00	RT: 5.0 s	RT: 10.0 s	
V4: 259.2 V Q4: -0.44	Normal Ramp Rate 100.0%/s	Soft Start Ramp Rate 100.0%/s	
Response Time 5.0 s			3/4

**Q (V):** It adjusts the inverter reactive power according to the set grid voltage.

This function adjusts inverter output (active and reactive) power when grid voltage changes.

**FW:** This series inverter is able to adjust inverter output power according to grid frequency.

**VW:** It adjusts the inverter active power according to the set grid voltage.

Grid Settings

L/HVRT

HV1: 264.0 V14.64 s

HV2: 288.0 V0.06 s

LV1: 211.2 V24.24 s

LV2: 168.0 V12.24 s

LV3: 120.0 V12.34 s

L/HFRT

HF1: 61.20 Hz300.00 s

HF2: 62.00 Hz0.06 s

LF1: 56.80 Hz300.00 s

LF2: 57.00 Hz0.06 s

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**HV1:** Level 1 overvoltage protection point.

**HV2:** Level 2 overvoltage protection point.

**LV1:** Level 1 undervoltage protection point.

**LV2:** Level 2 undervoltage protection point.

**LV3:** Level 3 undervoltage protection point.

**HF1:** Level 1 over frequency protection point.

**HF2:** Level 2 over frequency protection point.

**LF1:** Level 1 under frequency protection point.

**LF2:** Level 2 under frequency protection point.

**14.64s:** Trip time.

## 6.8 Generator Settings

**Generator Settings**

<input type="radio"/> Automatic Start	generator Rated Power	1 W
<input checked="" type="radio"/> Smart Load Output	<input type="checkbox"/> On Grid Always On	
OFF	95 %	ON 100 %
AC Couple Frequency High	62.00 Hz	
<input type="radio"/> Micro Inv Input	<input type="checkbox"/> On Grid Always On	

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**Generator Rated Power:**

Allowed Max. power from diesel generator.

**Smart Load:** Reserved

**AC Couple:** Reserved

Generator Settings

High Voltage Limit

270.0 Vac

Low Voltage Limit

180.0 Vac

High Frequency Limit

65.00 Hz

Low Frequency Limit

45.00 Hz

Warmup Time

300 s

Cooldown Time

300 s

Maximum Run Time

24.0 h

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**High/Low Voltage Limit:**

Generator-connected voltage range.

**High/Low Frequency Limit:**

Generator-connected frequency range.

**Warmup Time:** After startup, the amount of time the generator runs (no-load) before the inverter is connected to the generator.

**Cooldown Time:** The amount of time the generator runs (no load) after the shutdown command is issued before the generator is actually shut down.

**Maximum Run Time:** When automatically started, the cumulative time allowed for continuous operation of the generator within 24 hours. The generator can be operated manually for any length of time.

## 6.9 Advanced Functions

Advanced Functions	
<input checked="" type="checkbox"/> Solar Arc Fault ON	<input type="checkbox"/> Clear Arc_Fault
<input checked="" type="checkbox"/> Signal ISLAND MODE	<input type="checkbox"/> BMS_Eirr_Stop
Backup Delay 5 s	<input type="checkbox"/> Gen Peak-shaving
CT Ratio 2000.1	

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**Solar Arc Fault ON:** This is AFCI function.

**Gen Peak-shaving:** Enable When the power of the generator exceeds the rated value of it, the inverter will provide the redundant part to ensure that the generator will not overload.

**BMS\_Err\_Stop:** When it is active, if the battery BMS failed to communicate with

inverter, the inverter will stop working and report fault .

**Signal ISLAND MODE:** when the inverter connects grid,the ATS port will output 240Vac and it is used to cuts off Earth-Neutral(load port N line) bond via connect external relay. When the inverter disconnects from the grid,ATS port voltage will be 0 and the Earth-Neutral bond keeps on, More details, please refer to above picture.

**Clear Arc Fault:** Clear AFCI error messages.

**Backup Delay:** Reserved.

**Gen Peak-shaving:**Reserved.

Advanced Functions

☒ Parallel

☐ Master

☒ Slave

Modbus SN 01

☐ A Phase

☒ B Phase

☒ C Phase

☒ EX\_Meter For CT

☒ A Phase

☒ B Phase

☒ C Phase

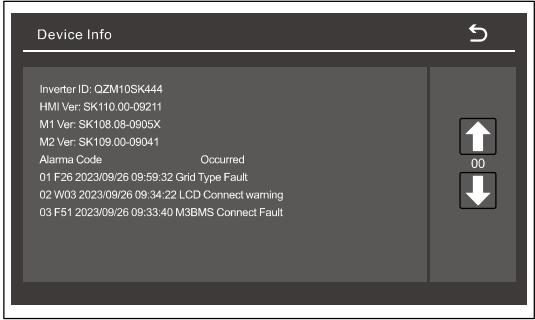
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**Ex\_Meter For CT:**Single energy storage inverter status check is to use SM-US meter.

6.10 Device Info.



**Inverter ID:** This is the ID of the inverter.

**HMI/M1/M2 Ver:** This is the software version number of the inverter.

7 Fault Information and Processing

Warnings identify the current status of the inverter(Max), warnings do not related to a fault and it does not affect the normal running of the inverter. When a warning with a number after it appears in the display, it indicates a warning code and is usually cleared through an orderly shutdown/re-set or a self-corrective action performed by the inverter.

Warning Code	Description	Solutions
W01	Fan lock warning	1. Check for objects stuck on the fan blades. 2. If the warn still exists, please contact us for help.
W02	Meter connect warning	1.Check whether the instrument connection is correct. 2. If the warn still exists, please contact us for help.
W05	Different input grid	1.Check whether the grid connection is correct. 2.If the warn still exists, please contact us for help.
W65	Output short out warning	1. Output is short circuit. 2.Shut down and restart to check whether the machine can work normally. 3.If the warn still exists,please contact us for help.
W69	Battery energy is too low	1. Please charge for 10 minutes before inverter. 2. If the warn still exists, please contact us for help.
W81	PV energy is too low	1. Check whether the PV voltage is too low. 2. If the warn still exists, please contact us for help.
W82	Battery voltage is too low	1. Check if the battery voltage is too low. 2. If the warn still exists, please contact us for help.
W87	Battery loss warning	1. There is no electric voltage at the input end of the machine battery. 2. After confirming that the battery voltage is normal, turn on the machine to check whether it can work normally. 3.If the warn still exists,please contact us for help.
W88	AFCI current over	1.After shutdown,check whether the connection between the panels and between the panels and the machine is in good contact. 2.Restart inverter.

		3.If the fault still exists,please contact us for help.
W90	Insulation Low	1.After shutdown, check if the panel shell is reliably grounded. 2.If the fault still exists,please contact us for help.
W91	AFCI communication fault	1.After shutdown,check if the AFCI line inside the machine has fallen off. 2.If the fault still exists,please contact us for help.
W92	AFCI self-test fault	1.Restart inverter. 2.If the fault still exists,please contact us for help.

Errors codes identify a possible equipment failure, fault or incorrect inverter setting or configuration,any or all attempts to correct or clear a fault must be performed by qualified personnel.Typically, the error code can be cleared once the fault is removed.Some of error code as table shows below, may indicate a fatal error and require you to contact the supplier for help.

Error Code	Description	Solutions
F17	Grid angle fault	1. Check whether the mains input phase Angle is normal. 2. Shut down and restart the machine to check whether it can work properly. 3.If the warn still exists,please contact us for help.
F18	Inverter over current fault	1.Please check whether the backup load power and common load power are within the range. 2.Restart and check whether it is in normal. 3.Seek help from us, if can not go back to normal state.
F19	MDSP-SDSP connect fault	1. Check whether the two DSP on the control board work and the LED4/ED5 light is on. 2.If the warn still exists,please contact us for help.
F22	Output overload fault	1. Check the backup load connected, make sure it is in allowed power range. 2. If the fault still exists, please contact us for help.

F23	Output over current fault	1. Check the backup load connected, make sure it is in allowed power range. 2. If the fault still exists, please contact us for help.
F26	AC leakage current is transient over current	Leakage current fault 1. Check PV side cable ground connection. 2. Restart the system 2~3 times. 3. If the fault still exists, please contact us for help.
F27	GFCI fault	1. When inverter is in Split phase(120Vac) the backup load port N line needs to connect ground. 2. If the fault still exists, please contact us for help.
F33	PV over current fault	1. Check the backup load connected, make sure it is in allowed power range. 2. If the fault still exists, please contact us for help.
F35	BUS voltage unbalance fault	1. Please wait for a while and check whether it is normal. 2. When the hybrid in split phase mode, and the load of L1 and load. of L2 is big different, it will report the F26. 3. Restart the system 2~3 times. 4. Seek help from us, if can not go back to normal state.
F37	Battery charging current over fault	1. Check PV module connect and battery connect. 2. When in the off-grid mode, the inverter startup with big power load, it may report F37. Please reduce the load power connected. 3. Turn off the DC switch and AC switch and then wait 1 minute,then turn on the DC/AC switch again. 4. Seek help from us, if can not go back to normal state.
F38	Battery discharging current over fault	1.Check the backup load connected, make sure it is in allowed power range. 2. If the fault still exists, please contact us for help.
F40	PV over voltage fault	1. Check whether the PV voltage is too high. 2. If the fault still exists, please contact us for help.

F41	Heat sink high temperature failure	1.Heat sink temperature is too high. 2.Check whether the work environment temperature is too High. 3. Turn off the inverter for 10mins and restart. 4. Seek help from us, if can not go back to normal state.
F42	Transformer high temperature failure	1.Check whether the work environment temperature is too high. 2.Turn off the inverter for 10mins and restart. 3. Seek help from us, if can not go back to normal state.
F44	AFCI self-check fault	1.Check whether wires is broken. 2.If the fault still exists, please contact us for help.
F51	M3_BMS connect fault	1. It tells the communication between hybrid inverter and battery. 2. If the fault still exists, please contact us for help.
F54	CAN fault	1. When in parallel mode, check the parallel communication cable connection and hybrid inverter communication address setting. 2. During the parallel system startup period, inverters will report F54.when all inverters are in ON status, it will disappear automatically. 3. If the fault still exists, please contact us for help.

## 8 Data Sheet

Model	SPH 10000TL-HU-US
<b>PV Input Data</b>	
Max Recommended PV Power	15000W
DC/AC Ratio	1.5
PV Input Voltage(V)	370V(130V-525V)
MPPT Range(V)	150V-450V
Start-up Voltage(V)	130V
PV Input Current(A)	22A+22A+22A
No. of MPPT Trackers	3
No. of PV strings per MPP trackers	2/2/2
<b>Battery Data</b>	
Battery Type	Lead-acid or Li-Ion
Nominal Voltage(V)	48V
Battery Voltage Range(V)	40-60V
Max. Charging Current(A)	200A
Max. Discharging Current(A)	200A
<b>output Data (On Grid)</b>	
Rated Voltage	120/240V (Split phase)
Continuous power output(W)	10000W
Nominal Output Current(A)	41.7A
Max. AC Current(A)	50A
Power Factor	0.8 leading to 0.8 lagging
Output Frequency	50/60Hz
Grid Type	Split phase
THDI	<3%
<b>Backup Power (Off Grid)</b>	
Rated Voltage	120/240V(Split Voltage)
AC Nominal Output Power(W)	10000W
Peak Power(grid off)	1.5 times of rated power, 5 S
AC Output Rated Current(A)	41.7A
Output Frequency	50/60Hz
Switch Time	< 10ms



Efficiency	
Max. Efficiency	98.10%
Euro Efficiency	97.60%
MPPT Efficiency	99.90%
Protection	
PV Switch	Yes
BAT reverse protection	Yes
Output over current protection	Yes
AC short-circuit protection	Yes
PV Input Lightning Protection	Yes
Anti-islanding Protection	Yes
PV String Input Reverse Polarity Protection	Yes
Insulation Resistance Monitoring	Yes
Residual Current Monitoring Unit	Yes
AFCI protection	Yes
Surge Protection	DC Type II / AC Type II
Certifications and Standards	
Grid support regulation	IEEE 1547-2003、IEEE 1547-2018、CA Rule 21、 HECO 14H、ISO NE2021、PREPA
Safety	IEC62109-1, IEC62109-2
EMC	EN61000-6-1, EN61000-6-3, FCC Part 15 Class B
General Data	
Operating Temperature Range(°C)	-25~60°C , >45°C Derating
Cooling	Smart cooling
Noise(dB)	<30 dB
Communication with BMS	RS485; CAN
Weight(kg)	42.5
Size(mm)	457.2W*874H*255.6D
Protection Level	IP65
Installation Style	Wall-mounted
Warranty	5 years

## 9 Appendix I

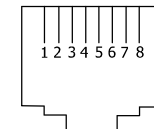
Approved battery brand from Growatt.

Brand	Model	RS485 or CAN	Inverter Setup
SACOLAR	STR 5.5-A1	RS485	00
		CAN	01
Energys	OGHB 1548-Li	CAN	02

## 10 Appendix II

Definition of RJ45 Port Pin for BMS.

NO.	BMS
1	RS485B
2	RS485A
3	/
4	CAN-H
5	CAN-L
6	GND
7	/
8	/



## 11 Appendix III

### FCC COMPLIANCE STATEMENT:

This device complies with part 15 of the FCC Rules.

Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference.
- (2) This device must accept any interference received, including interference that may cause undesired operation.

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

Reorient or relocate the receiving antenna.

Increase the separation between the equipment and receiver.

Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

Consult the dealer or an experienced radio/TV technician for help.

Warning: Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

### FCC Radiation Exposure Statement

The device has been evaluated to meet general RF exposure requirement.

The device can be used in mobile(min20cm) exposure condition.