CPS SCH Series Grid-tied PV Inverter
SCH100KTL-DO/US-600, SCH125KTL-DO/US-600
and
SCH100KTL-DO/US-480

Installation and Operation Manual Rev 1.8

CHINT POWER SYSTEMS AMERICA CO.

REVISON 1.8 AUGUST 2021

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Before You Start…

This Installation and Operation manual contains important information, safety guidelines, detailed planning and setup information for installation, as well as information about configuring, operating and troubleshooting the CPS SCH100KTL-DO/US-600, CPS SCH125KTL-DO/US-600 and SCH100KTL-DO/US-480 Utility Grid-tied PV Inverters. Be sure to read this manual carefully before using.

Thank you for choosing a CPS Grid-tied PV Inverter. This PV Inverter is a high performance and highly reliable product specifically designed for the North American Solar market.

Installation, commissioning, troubleshooting, and maintenance of the inverter must be done only by qualified personnel. If you encounter any problems during installation or operation of this unit, first check the user manual before contacting your local dealer or supplier. This user manual is applicable for the following models:

CPS SCH100KTL-DO/US-600, CPS SCH125KTL-DO/US-600 and CPS SCH100KTL-DO/US-480

Instructions inside this user manual will help you solve most installation and operation difficulties. Contact your local supplier if the problem still exists.

Please keep this user manual on hand for quick reference.

Chapter 1 IMPORTANT SAFETY INSTRUCTIONS (SAVE THESE INSTRUCTIONS)

Please read this user manual carefully before product installation. CPS reserves the right to refuse warranty claims for equipment damage if the user fails to install the equipment according to the instructions in this manual.

Failure to follow these instructions and other relevant safety procedures may result in voiding of the warranty and/or damage to the inverter or other property!

Warnings and symbols in this document

	**DANGER:** DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.
	**WARNING:** WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.
	**CAUTION:** CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.
	**NOTICE:** NOTICE indicates a hazardous situation which, if not avoided, could result in equipment working abnormally or property loss.
	**INSTRUCTION:** INSTRUCTION indicates important supplementary information or provides skills or tips that can be used to help you solve a problem or save you time.

Markings on the product

	**HIGH VOLTAGE:** This inverter works with high voltages. All work on the product must only be performed as described in this document.
	**HOT SURFACE:** The equipment is designed to meet international safety standards, but surfaces can become hot during operation. Do not touch the heat sink or peripheral surfaces during or shortly after operation.
	**EARTH GROUND:** This symbol marks the location of grounding terminal, which must be securely connected to the earth through the PE (protective earthling) cable to ensure operational safety.

WARNING:

All the installation and wiring connections should be performed only by qualified technical personnel. Disconnect the inverter from PV modules and the AC grid before maintaining and operating the equipment.

Risk of electric shock and fire. Use only with PV modules that have a maximum system voltage of rating of 1500V or higher.

Electric shock Hazard. The DC conductors of this photovoltaic system are normally ungrounded but will become intermittently grounded without indication when the inverter measures the PV array isolation.

Shock Hazard. The inverter is energized from both ac and dc sources. Disconnect all sources before servicing.

For continued protection against risk of fire, replace only with same type and ratings of fuse.

DANGER:

Please disconnect the inverter from AC grid and PV modules before opening the equipment. Make sure hazardous high voltage and energy inside the equipment has been discharged.

Do not operate or maintain the inverter until at least 5 minutes after disconnecting all sources from DC and AC sides.

NOTICE:

This inverter is designed to connect AC power only to the public grid. Do not connect the AC output of this equipment directly to any private AC power equipment.

CAUTION:

CPS SCH100KTL/US-600, CPS SCH125KTL/US-600 and CPS SCH100KTL/US-480 inverters are approx. **72kg (158 lbs)**. Please ensure the mounting bracket is properly installed before hanging the inverter and wire-box on the bracket.

INSTRUCTION:

Please check with your local electricity supply company before selecting a grid standard. If the inverter is operated with a wrong grid standard, the electricity supply company may cancel the interconnection agreement.

Placing the inverter into operation before the overall system complies with the national rules and safety regulations of the application is not permitted.

WARNING: The DC Switch is rated to break loads under normal operating conditions. However, a DC short circuit could be hazardous and the following procedures should be followed before turning OFF the DC Switch under fault conditions.

If there is a fault and it is safe to access the inverter:

1. Read/record the fault code(s) displayed on the APP interface.
2. Turn OFF the inverter via the APP or Remote access.
3. Turn OFF the AC feed breaker.
4. Turn OFF the AC Switch.
5. If possible, read the DC MPPT currents displayed on the APP interface:
    a. If the MPPT current is <125A or the irradiation is obviously low, turn OFF the DC switch.
    b. If it is safe to open the wire-box, proceed with troubleshooting procedures listed in Table 6-2. Make sure appropriate safety precautions and PPE are used.
6. If it is not possible to read the DC MPPT currents through the APP interface, and no fire, smoke or voltage (AC or DC) to ground is present in the enclosure:
    a. Follow general safety practices including PPE to open the wire-box.
    b. Measure the DC current on each string. If zero, open the fuse holder for each string reading approximately zero amps.
    c. If the DC current is >0.25A, do not open the fuse holder.
    d. When all possible fuse are open, measure the total MPPT current. If it is <125A, turn OFF the DC switch.
    e. If turning OFF the DC switch causes smoke, then (if safe) turn the DC switch back ON and wait until low irradiation ~30min prior to sunset to continue troubleshooting.

If there is a fault and it is unsafe to access the inverter:

1. Notify someone else. Initiate emergency mitigation plan if necessary. a. If smoke or fire exists, procure a fire extinguisher.
2. If a fire has escaped the inverter enclosure – notify 911 immediately!
3. Turn OFF the AC feed breaker as soon as possible/safe.
4. If safe but conditions are deteriorating, consider: a. Using the fire extinguisher. b. Cutting the string conductors – one cable at a time with insulated cutters (while wearing appropriate PPE).

5. Monitor conditions until low irradiation ~30min prior to sunset. If safe, turn OFF AC and DC switches on the inverter and proceed with normal troubleshooting procedures listed in Table 6-2.

Chapter 2 Overview

2.1 Inverter for Grid-tied PV Systems

3-Phase String Inverters are designed for use with carport, commercial rooftop, and large-scale PV grid-tied systems. The system is generally made up of PV modules, DC power distribution equipment, PV inverter and AC power distribution equipment (Figure 2-1). The inverter converts the DC from PV modules to AC with the same frequency and phase as the AC grid. All or part of the AC power is supplied to local loads, and the surplus power is supplied to the electricity grid.

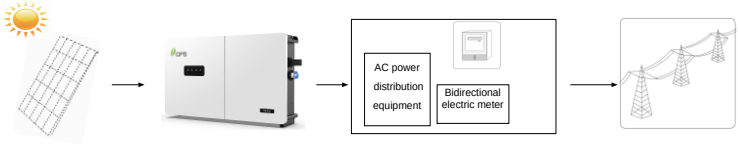


Figure 2-1 Grid-tied PV system

2.2 Product Features

- **High conversion efficiency**： Advanced 3-level conversion technology with SVPWM; Max. efficiency: 99%； CEC efficiency: 98.5%
- **Grid adaptability:** IEEE 1547, Rule 21, ISO-NE and HECO standards applicable (Future); Reactive power adjustable; PF value: ±0.8, Remote Curtailment.
- **Flexible communication:** Supports standard Modbus RS485 and TCP/IP communications to ensure compatibility with 3rd party monitoring and control systems.
- **Wide DC input voltage range**： Operating DC Input Voltage Range: 860-1450Vdc for CPS SCH100KTL-DO/US-600 and CPS SCH125KTL-DO/US-600 inverters; 750-1450Vdc for CPS SCH100KTL-DO/US-480 inverters; Max DC input voltage: 1500V
- **Long Service Life:** Uses thin-film and electrolytic capacitors to extend inverter's service life.
- **High protection degree:** NEMA 4X enclosure meets the demanding needs of both indoor and outdoor use.
- **Intelligent Integration:** Integrated load break rated DC disconnect switches, and up to 20 fused string inputs eliminate the need for external combiner boxes, simplifying installation.

2.3 Product Protection Functions

- ✓ Reverse polarity protection of DC input
- ✓ AC and DC Short circuit protection
- ✓ Anti-islanding protection with bi-directional frequency perturbation
- ✓ DC Input and AC output over-voltage protection
- ✓ DC Input over-current protection
- ✓ DC input insulation against ground monitoring
- ✓ DC injection of AC output
- ✓ AC output voltage and frequency monitoring
- ✓ Leakage current against ground monitoring
- ✓ External environmental temperature monitoring
- ✓ IGBT power module temperature monitoring

2.4 Smart Inverter Functions and default Activation

Function	**IEEE1547-2014**	**Rule 21**	**ISO-NE**
Anti-islanding	Enabled	Enabled	Enabled
Low/High Voltage Ride-Though	N/A	Enabled	Disabled
Low/High Frequency Ride-Though	N/A	Enabled	Enabled
Dynamic Volt/VAR Operation	N/A	Enabled	Disabled
Ramp Rate	N/A	Enabled	Enabled
Fixed Power Factor	N/A	Disabled	Disabled
Reconnect by “Soft-Start”	N/A	Enabled	Enabled
Frequency-Watt	N/A	Enabled	Disabled
Volt/Watt	N/A	Enabled	Disabled

2.5 Schematic Diagram and Circuit Design

The basic electrical schematic diagram of CPS SCH100KTL-DO/US-600, CPS SCH125KTL-DO/US-600 and CPS SCH100KTL-DO/US-480 inverters are shown in Figure 2-2.

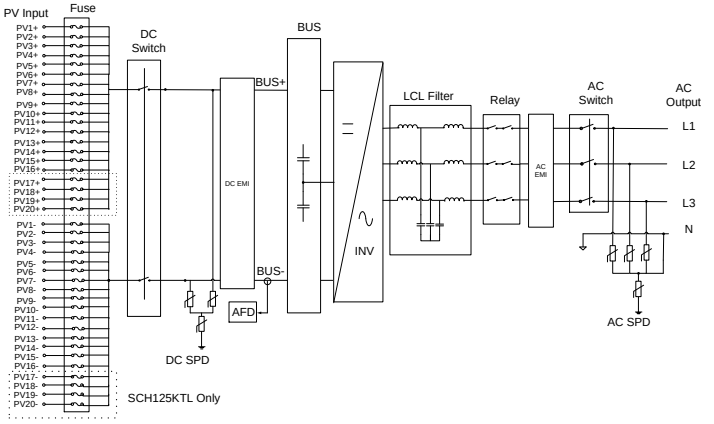
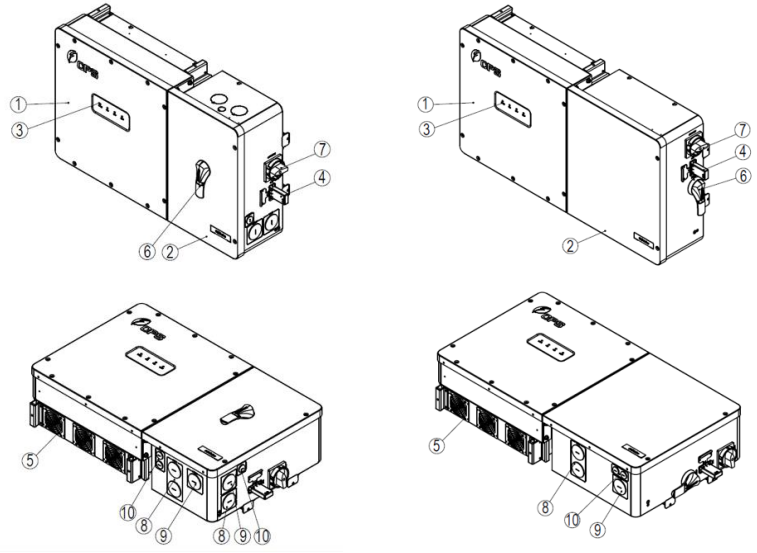


Figure 2-2 Schematic Diagram of the 100/125kW Inverter

The input from PV source circuits passes through surge protection circuitry, DC EMI wave filter, to bus capacitance. The inverter then converts the DC voltage to 3-phase AC voltage. Most of the high frequency AC harmonics are removed with a wave filter. The output AC is connected to the grid via two-stage relay. There is also a three-phase SPD at the AC output side.

2.6 Appearance and Main Item Description



Inverter with Centralized Wire-box　　Inverter with Standard Wire-box

Figure 2-3 Appearance of the CPS SCH100/125KTL-DO/US-600 and SCH 100KTL-DO/US-480 Inverters

Main items of the Inverter:

① Main inverter enclosure
② Inverter wire-box
③ LED indicator lights
④ WiFi module
⑤ Cooling fans
⑥ DC switch: DC power on/off
⑦ AC switch: AC power on/off
⑧ DC Input cable entry
⑨ AC output cable entry
⑩ Communication cable entry

2.7 Anti-islanding Detection

The SCH100KTL-DO/US-600, SCH125KTL-DO/US-600 and SCH100KTL-DO/US-480 inverters include Anti-Islanding detection as required by UL1741/IEEE1547. The inverter will continuously make bi-directional perturbations to the frequency of the output current by injecting a small amount of reactive power in order to detect a possible islanding condition. If the grid is stable, these small perturbations will have negligible effects on the system voltage frequency. However, in an islanded condition the changes in reactive power will force the frequency of the system voltage to deviate significantly, which will trigger the inverter to cease operation and disconnect from the grid.

2.8 DC Ground Fault Protection

The inverters include residual current detection as part of the DC ground fault detection method required by UL1741. If there is a ground fault in the PV array, the ground fault detection circuitry will detect leakage current and trigger an alarm. The inverter will cease operation if the leakage current exceeds 500mA.

2.9 Surge Suppression

Standard Waveform Peak Values		
Surge Category	Ring Wave	Combination Wave
B	6kV/0.5kA	6kV/3kA

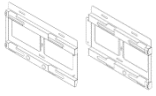
- "Standard 1.2/50μs - 8/20μs Combination Wave"
- "Standard 0.5μs - 100 kHz Ring Wave"

Chapter 3 Installation

Below is the installation procedure for the SCH100KTL-DO/US-600, SCH 125KTL-DO/US-600 and SCH100KTL-DO/US-480 inverters. Please read carefully and install the products following the step-by-step instructions.

The inverter and other main items are shipped in two separate packages, consisting of: A) The main inverter enclosure; B) The wire-box, mounting bracket, user manual and accessory kit. Before installation, please check that the following items are included in the packages:

Table 3-1 Main Items

No.	Item	Figure	QTY	Note	Box
(1)	Main enclosure of the PV inverter		1	The PV inverter	A
(2)	Wire-box of the PV inverter	 Standard wire-box  Centralized wire-box	1	Wire-box will vary depending on the model ordered (Standard wire-box with integrated DC fuse inputs or Centralized wire-box without DC fusing to be used with external DC combiner)	B
(4)	Mounting bracket		1	Bracket to mount the PV inverter (left bracket: inverter, and right bracket: wire-box). Right bracket will vary depending on the model of wire-box ordered.	B
(5)	Accessory kit		1	Kit contains all necessary hardware and accessories for installation	B

The Accessory kit (5) contains items listed below:

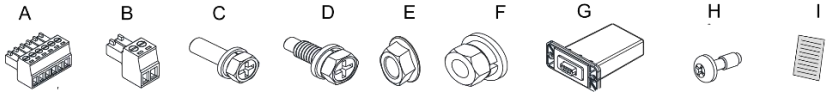


Table 3-2 Accessory Kit

No.	Item	QTY	Note
(A)	6-pin PCB connector plug	1	For RS485 communication
(B)	2-pin PCB connector plug	1	For power supply
(C)	M8x25mm machine bolts with integrated lock washer	6	For mounting backet installation
(D)	M6x18mm Phillips screw	4	4 for inverter and mounting bracket; 1 for Ground connection
(E)	M8 hexagon nuts with flange	7	To connect the left and right wall bracket, and securing the main inverter to the wire-box, 1 spare
(F)	M10 nut with flat gasket and spring washer	3	For AC terminal connections
(G)	WiFi communication module	1	Enables mobile app interface via CPS Connect Pro app
(H)	Philips screw	1	Spare (for wire-box cover)
(I)	User Manual	1	PV inverter installation and operation manual

INSTRUCTION:
The items in the Accessory Kit **Table 3-2** above are for the standard configuration. The accessories provided may vary if optional parts are purchased.

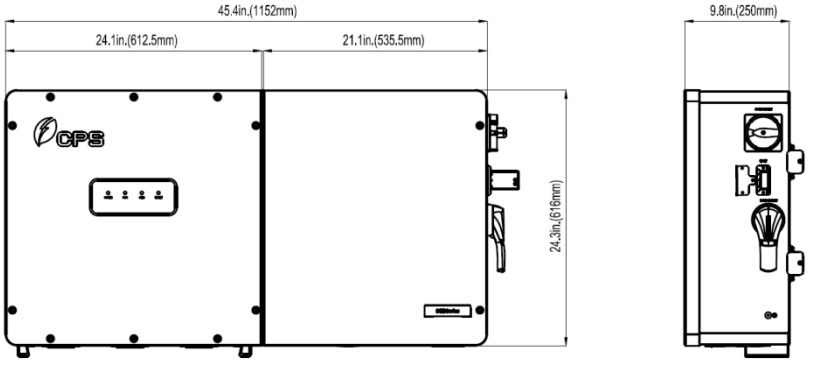
3.1 Recommendations Before Installation

See **Chapter 8**, Technical Data for specification ranges and limits.

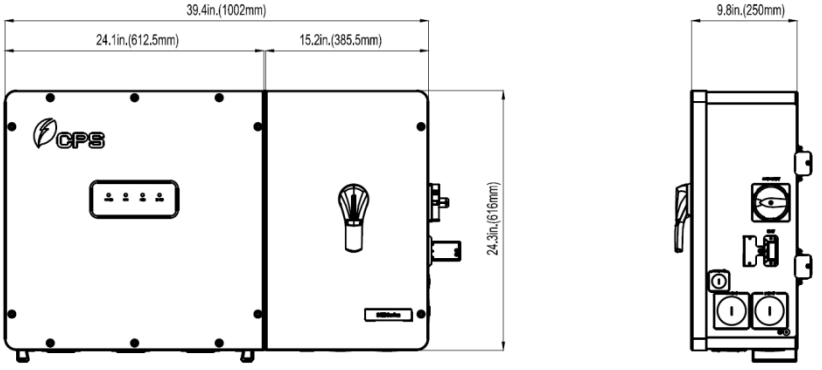
- ✓ Check that the product environmental specifications (protection degree, operating temperature range, humidity and altitude, etc.) meet the requirements of the specific project location.
- ✓ Make sure that the power grid voltage is within range for the grid standard chosen.
- ✓ Ensure that the local electricity supply authority has granted permission to connect to the grid.
- ✓ Installation personnel must be qualified electricians or those who have received professional training.
- ✓ Wear and use proper PPE (personal protective equipment) during installation.
- ✓ Sufficient space according to Figure 3-4 and 3-5 must be provided to allow the inverter cooling system to operate normally.
- ✓ Install the inverter away from flammable and explosive substances. This includes unmaintained grass.
- ✓ Avoid installing the inverter in locations that exceed the temperature limits specified for the inverter to prevent undesirable power loss.
- ✓ Do not install the inverter near an electromagnetic source which can compromise the normal operation of electronic equipment.
- ✓ The PV Array is not grounded.
- ✓ The conduits entries meet the following:
    - ✓ ALL Conduit Entries must use water-tight fittings.
    - ✓ ALL Conduit Entries should use sealant around wires inside wire-box to prevent moisture ingress.
    - ✓ ALL Conduit Fittings should be metal to contain any thermal event in the wire-box – cause by moisture ingress.

3.2 Mechanical Installation

(1) Dimensions



100/125kW Standard Wire-box



100/125kW Centralized Wire-box

Figure 3-1 Dimensions of CPS SCH100/125KTL-DO/US-600 and CPS SCH100KTL-DO/US-480 Inverter

(2) **Installation Method (see Figure 3-2):**

Make sure that the mounting structure (bearing wall, rack, etc.) is suitable to support the inverter weight. Follow the mounting guidelines below:

(a) If the location permits, install the inverter vertically.

(b) If the inverter cannot be mounted vertically, it may be tilted backward to 15 degrees from horizontal.

(c) Do not mount the inverter leaning forward.

(d) Do not mount the inverter upside down.

(e) Do not mount the inverter horizontal installation.

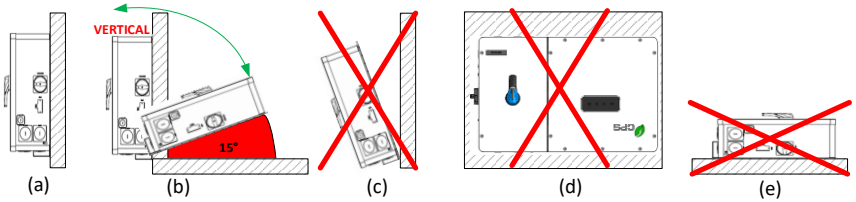


Figure 3-2 Inverter Mounting Options

NOTICE:

If the installation environment allows, avoiding direct sunlight from the inverter, avoiding direct rain and snow, can extend the life of the inverter (See **Figure 3-3**). Direct sun install does not impact warranty.

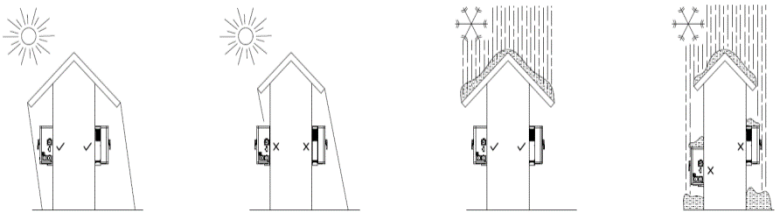


Figure 3-3 Inverter Mounting Suggestion

(3) **Installation Space Requirement (see Figure 3-4a, b, and c):**

The distances between the inverters or the surrounding objects should meet the following conditions:

(A) Minimum Height from the ground (12 Inches minimum):
    a. MUST Prevent Water damage in flood prone areas.
    b. SHOULD Allow for ease of fan replacement
    c. MUST meet NEC 6' – 7" maximum height to disconnect.

(B) Minimum height between air intake or air exhaust. 6-inches is the smallest allowable distance.
    a. The distance MUST be great enough to allow low impedance to air flow.
    b. The distance SHOULD allow easy fan replacement access.

(C) The NEC specifies the maximum allowable height for a disconnect MUST be 6' - 7" Maximum.

(D) The distance between side by side inverters SHOULD be greater than 18".
    a. This dimension depends on if the inverters are stacked and staggered (Figure 3-4a) or not. The stacked and staggered configuration does not require a baffle since the exhaust of the lower unit is directed between the inverters above.

(E) The distance between side by side inverters SHOULD be greater than 12" – except in case (D) above.

(F) (F1) This dimension will be determined primarily by the structural strength required to support the inverters. There MUST be a vertical chimney for the exhaust air of at least 50 square inches directly above and per inverter. (F2) The clearance above the inverter chimney MUST be greater than 6" per stacked inverter. The front and rear of this dimension MUST be open to allow horizontal air-flow.

(G) (G1) In the case of a wire-way installed between the stacked inverter, the clearances MUST meet (B) and (C) above. For a 10" wire-way this would be 22" minimum. (G2) If no wire-way is installed, the minimum clearance MUST be greater than 18".

(H) In the staggered configurations, the vertical alignment MUST be as shown.

If inverters are stacked and meet (C), Baffles must be installed unless the inverters are staggered per Figure 3-4a. This configuration also allows ease of conduit routing without a wire-way.

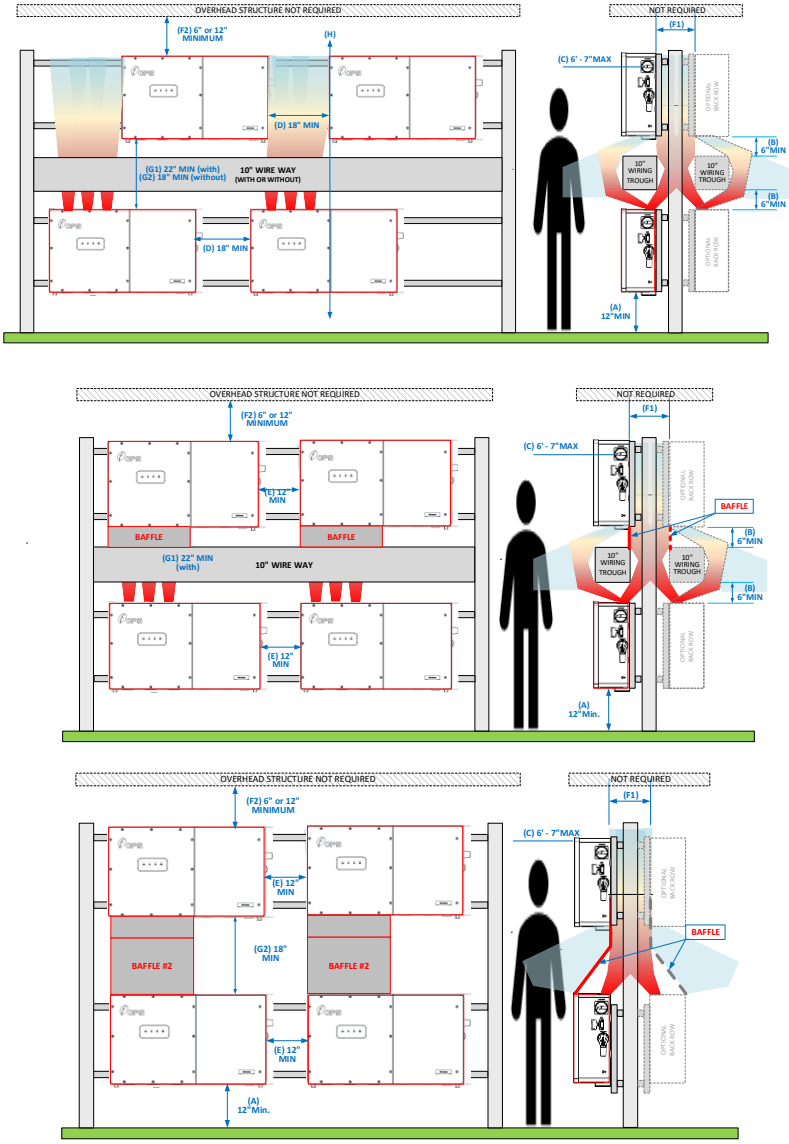


Figure 3-4a, b, c
Inverter Rack/Frame Mounting Dimensions

(4) **Mounting the Inverter onto the Bracket**

Tools Required: Electric drill (Φ10mm/0.4in. head), No. 13 wrench, pencil/marker, No.2 Phillips head screwdriver.

(1) Mark 6 holes on the wall or bearing surface for attaching the inverter mounting bracket as shown in **Figures 3-6a** and **3-6b**.

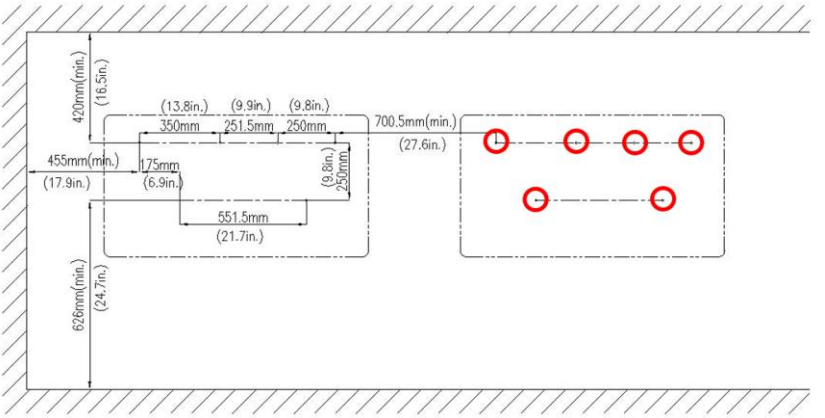


Figure 3-6a 100/125kW Standard Wire-box Bracket Mounting Pattern

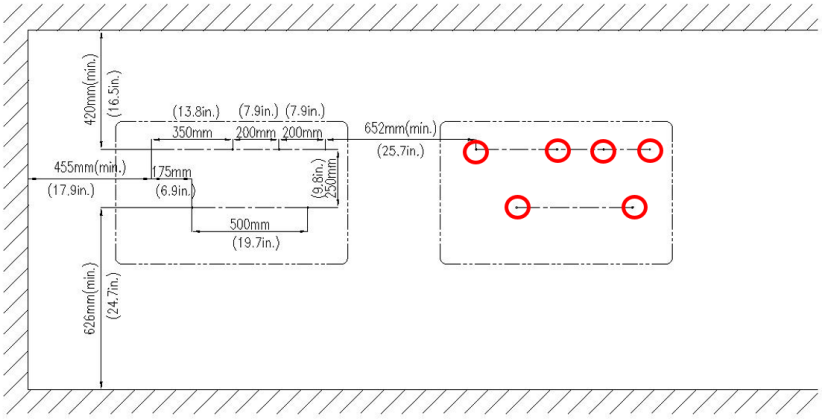
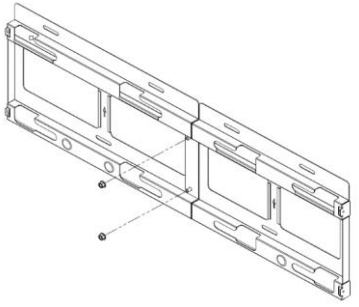


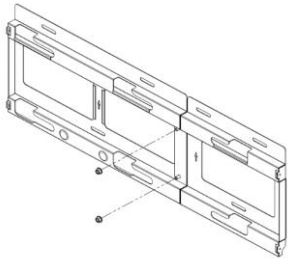
Figure 3-6b 100/125kW Centralized Wire-box Bracket Mounting Pattern

INSTRUCTION:

Before installing the brackets, first connect the left and right wall mounting brackets with 2 PCS M8 flange nuts (**See Figure 3-7)** (torque 12.5 Nm (110 in-lbs))



100/125kW Standard Wire-box



100/125kW Centralized Wire-box

Figure 3-7 Left and Right Wall Brackets Combination

(2) **Mounting the Bracket.** Tools Required: Electric drill (Φ10mm/0.4in. head), No. 13 wrench.

Drill holes at the marked positions with a 10mm (0.4in.) drill and insert the **M8 Expansion Anchors** ① into the holes; fasten the **Mounting Bracket** ② with the **M8x25 Assembling Bolts** ③ in the accessory kit. **Figure 3-8** and **3-9**.

Figure 3-8 Drill holes, set Anchors, and tighten Assembling Bolts

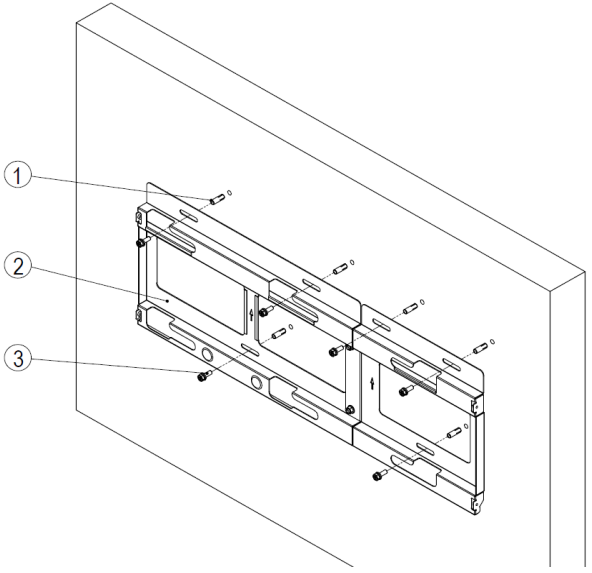


Figure 3-9 Secure the Mounting Bracket

CAUTION:
The main enclosure of the CPS SCH100KTL-DO/US-600, SCH125KTL-DO/US-600 and SCH100KTL-DO/US-480 inverters is approx. 55kg (121 pounds).
Ensure the mounting bracket is properly installed before hanging the inverter on the bracket. It is recommended to have at least 2 people to mount the inverter due to the weight of the equipment.

(3) **Install the Main Inverter Enclosure.** Tool required: No. 2 Phillips head screwdriver.

First remove the cover plate on the right of the main enclosure. Reserve the screws and cover (**Figure 3-10**).

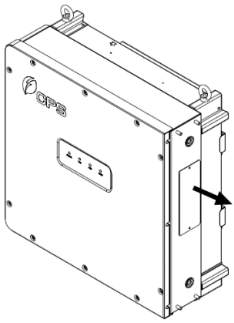


Figure 3-10 Remove the cover of Main Enclosure

Following method A or B, mount the main enclosure by aligning the mark on the top of the main unit with the opening of the wall bracket (**Figure 3-11**), setting the main enclosure in the track.

A. Lift mounting: screw two lifting eye bolts M10 (2pcs) into the studs at the top of the inverter. Use sling rope or bar (inserted through both lifting eye bolts) to lift the inverter onto the bracket. The minimum angle between the two sling ropes should be less than 90 degrees (**Figure 3-11**).

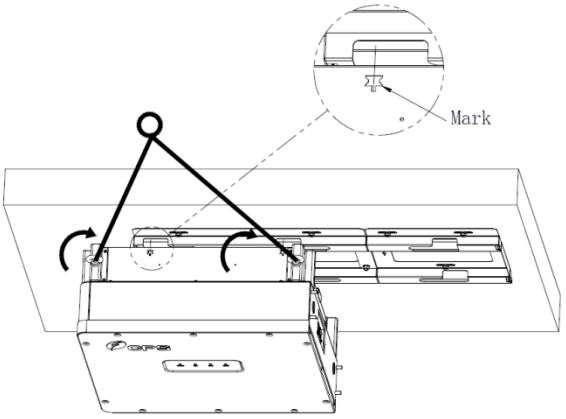


Figure 3-11 Mount the Main Enclosure on the Bracket by Lifting Sling

B. Manual mounting: Two people are needed to properly lift by the handle positions marked in **Figure 3-12** and mount the inverter onto the bracket.

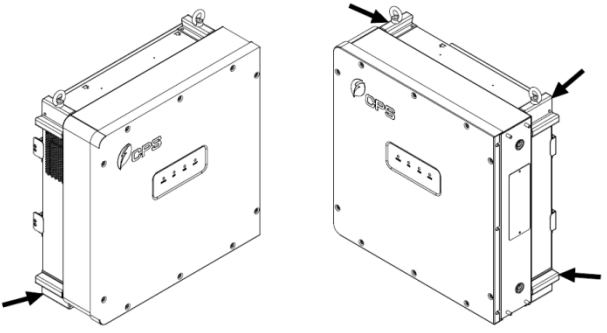


Figure 3-12 Grab Handle Position

After hanging, push the enclosure to the right to its final position (**Figure 3-13**) and secure with M6x18 combination screw (torque: 6Nm (53 in-lbs)).

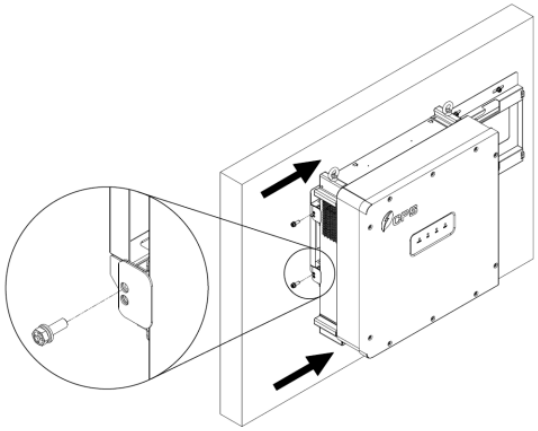


Figure 3-13 The main Enclosure Position

(4) **Install the wire box.** Tools required: No. 2 Phillips head screwdriver, 13mm hex head wrench.

A. Remove the connector cover on the left of the wire box, Save the cover and screws (see **Figure 3-14**).

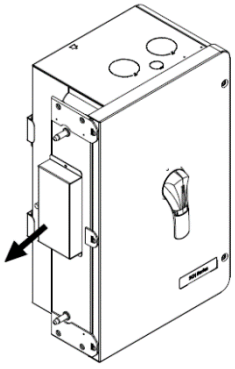


Figure 3-14 Wire Box Cover

B. Aligning the mark on the wire-box with the bracket (**Figure 3-15**), hang the wire-box on the right side of the wall bracket. Push the wire-box left to its final position meeting the main inverter enclosure.

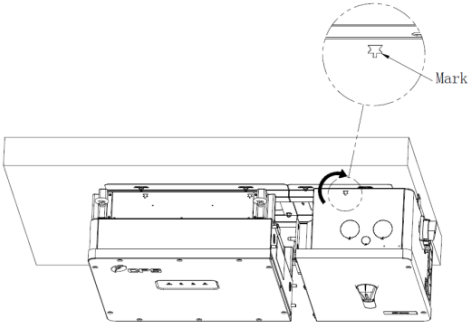


Figure 3-15 Wire-box Position

C. Connect the wire-box to the main enclosure, using the **M8 Flanged Nut** (4pcs) (torque: 12.5Nm (110.6 in-lbs). Secure the wire-box to the bracket with **M6x18** combination screw (torque: 6Nm (53 in-lbs)) (**Figure 3-16**). **This connection provides the ground bond for the Inverter (Main) Enclosure. Failure to properly install may result in shock or equipment failure.**

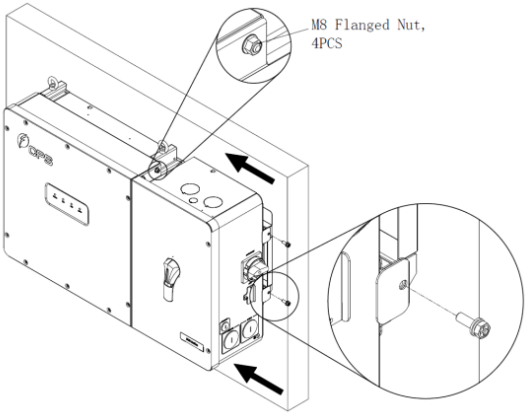


Figure 3-16 Installation of the Wire-box

D. Tighten the M8 nuts following the following order 1→2→3→4 and repeat to confirm that all the nuts are tightened securely. (**Figure 3-17**)

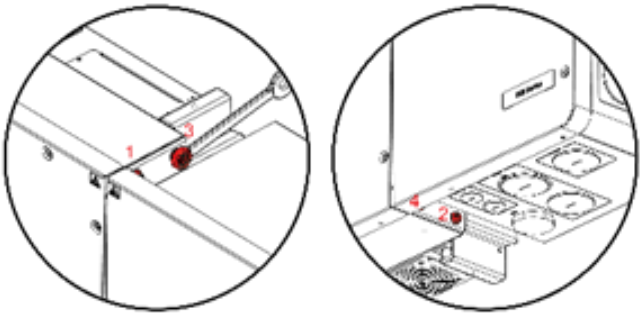


Figure 3-17 Tighten the M8 nuts

CAUTION!

The total weight of the inverter is approx.80kg (176 pounds). Please ensure the mounting is properly installed before hanging the inverter on the bracket.

CAUTION!

Please be careful with your hand when pushing the unit.

(5) **Storing the connector covers.** Tool required: No. 2 Phillips head screwdriver.
Attach the inverter's connector cover and wire-box connector cover shown in Figure 3-10 and Figure 3-14 to the top of the inverter and wire-box. (**Figure 3-17**)
Torque value of 1.6N.m (14.2in-lbs.).

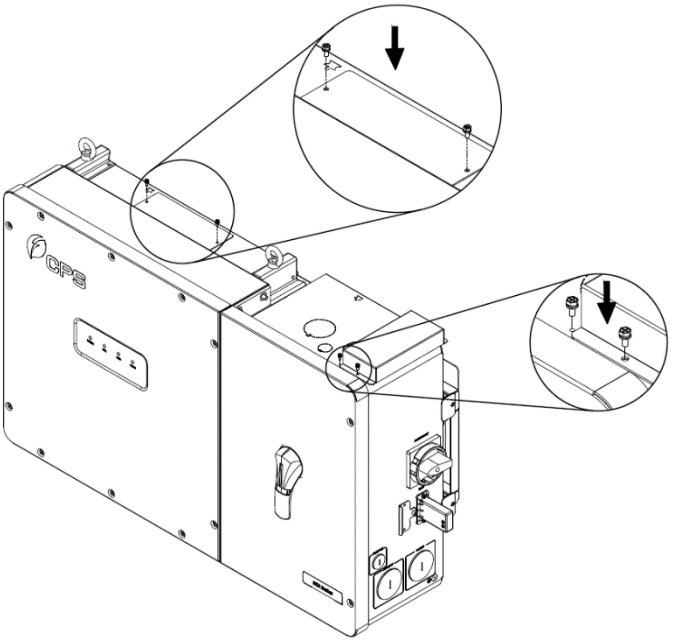


Figure 3-17 Attach the Cover to the top of the Inverter

NOTICE!

Cover and screws may be required for servicing in the future.
Covers do not provide waterproof protection.
Please check water-proof seal after removing the cover plate.

(6) **Install the WiFi Module.** Tools required: No.2 Phillips head screwdriver.

INSTRUCTION:
The WiFi module is required for the commissioning of the inverter. This step does not need to be completed until commissioning. If multiple inverters are connected to the same data network only ONE WiFi module is required. Install the WiFi module in the first inverter in the network which contains the Flex Gateway. The WiFi module should be removed after commissioning is complete. See **Section 3.3.5** and **Chapter 4** for more information.

As shown in **Figure 3-16**, remove the two M4x10 fixing screws on the DB9 connector cover, rotate the DB9 connector cover to expose the connector, and install the WiFi module by plugging into the connector and inserting the two screws just removed. Pay attention to the control torque (torque 1.6Nm (14 in-lbs)), to ensure that the seal remains waterproof.

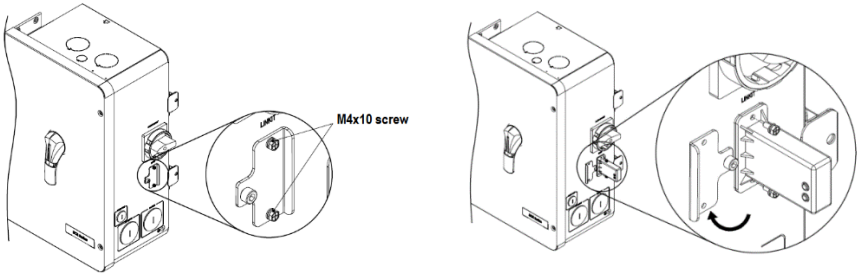


Figure 3-16 Installation of the WiFi Module

(7) **Optional Anti-Theft Padlock.**

The anti-theft padlock is used to prevent the inverter from being stolen when the equipment is installed outdoors. You can lock the inverter on the bracket, as shown in **Figure 3-18**:

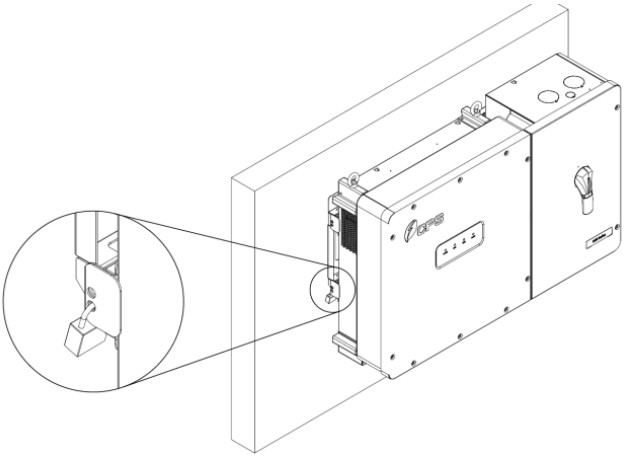


Figure 3-18 Location of the Anti-Theft Padlock

The anti-theft padlock should meet the requirement of the dimensions shown in **Figure 3-19**.

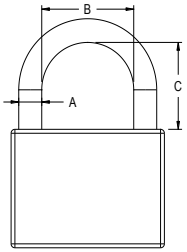


Figure 3-19 Dimensions of Anti-Theft Padlock

3.3 Electrical Installation

3.3.1 Removing/Replacing the Wire-box Cover

Tool required: **No.3** Phillips head screwdriver. Tabs hold the left side of the cover in place and it is secured by two screws on the right side. Use a **No**.3 Philips head screwdriver to remove the 2 screws on the wire-box. Pull the right side of the cover away from the wire-box approximately 1 inch before sliding the cover right to release the tabs. This will free the cover from the enclosure and allow the cover to be removed. (**See Figure 3-20**)

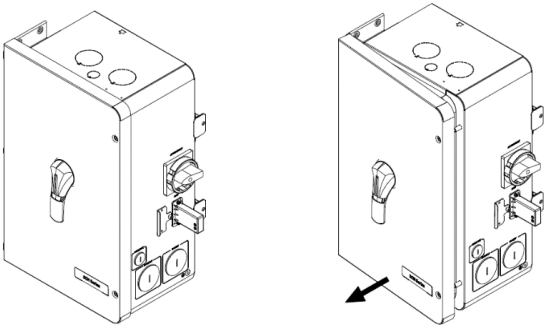


Figure 3-20 Removing the Wire-box Cover

To replace the cover, reverse the order of the above steps use a **No.3** Philips head screwdriver to replace the 2 screws on the cover. Torque to 4Nm (35.4 in-lbs).

INSTRUCTION:

It is important to use hand tools (e.g. Screwdriver or T-handle, #3 Phillips) and not power drivers or other types of screw drivers. During installation, it is recommended to hold the cover in alignment with balanced force. Partially engage the screws into the threaded inserts before tightening. Maintain alignment to avoid thread damage, and after screws are fully engaged torque to 4Nm (35.4 in-lbs).

3.3.2 Wire-box Details

(1) **Exterior Wire-box Details**

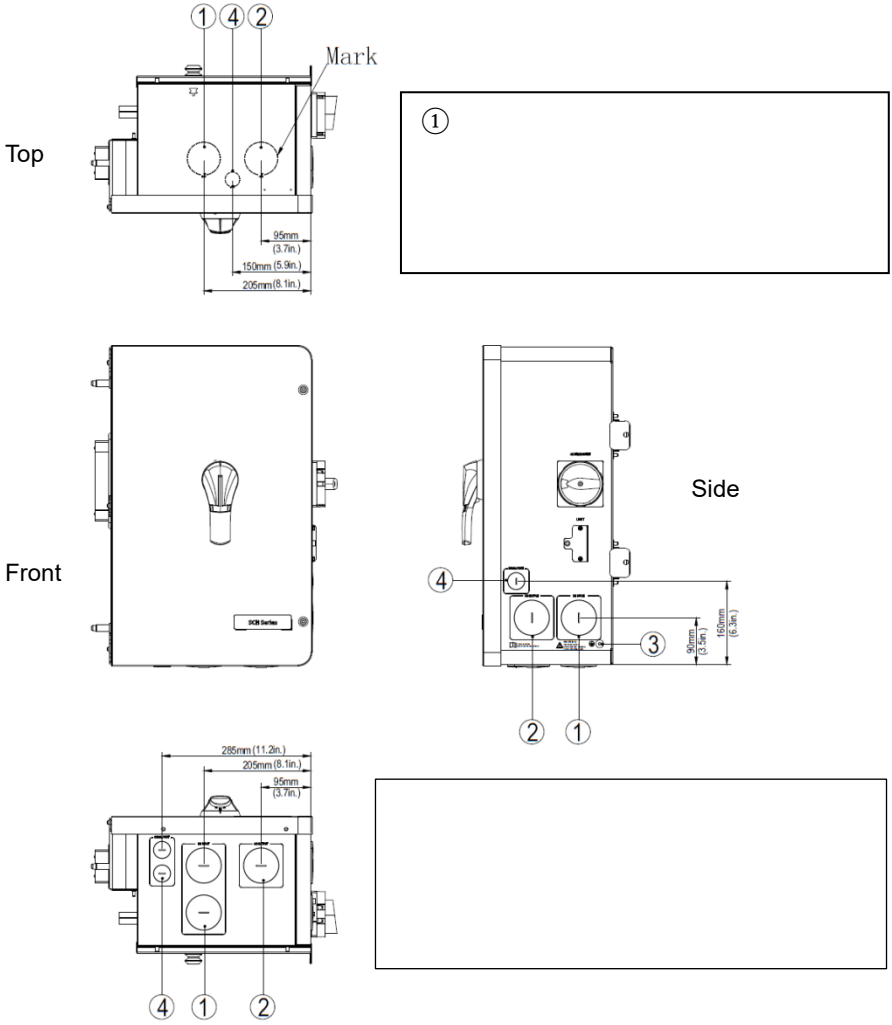


Figure 3-21A Conduit Knock-out Locations (Centralized Wire-box)

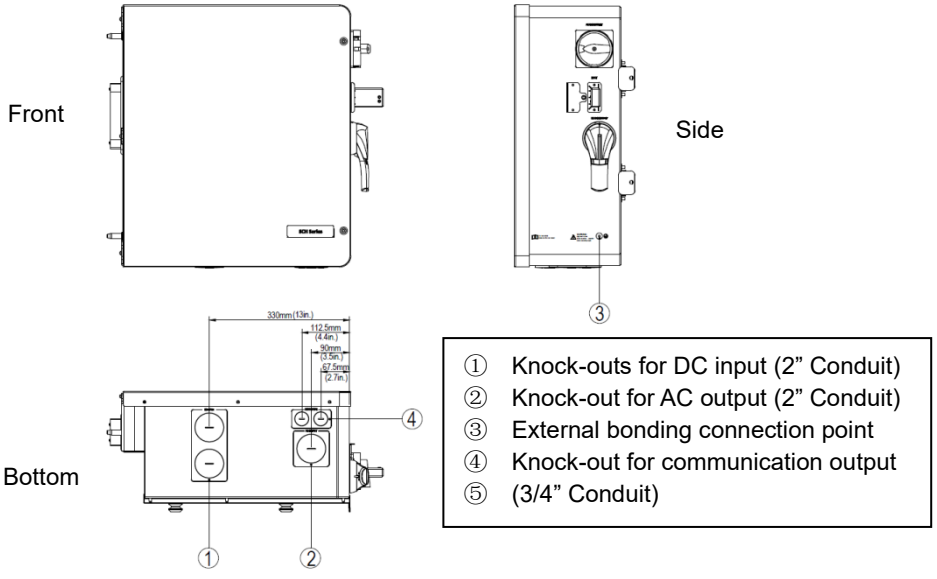
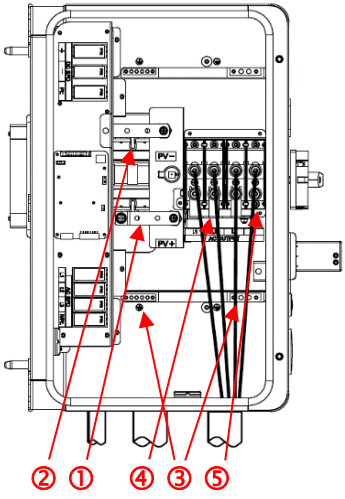


Figure 3-21B Conduit Knock-out Locations (Standard Wire-box)

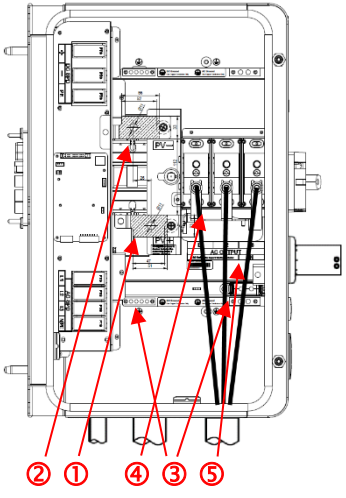
(2) **Interior Wire-box Details**



① Positive DC input connections
② Negative DC input connections
③ AC output terminals
④ Grounding terminals
⑤ Neutral Terminal

NOTE: 2-inch knockouts can be enlarged if the hardware from the larger size does not interfere with the installation of the cover or other components. Enlarged holes should be centered in the original hole if possible.

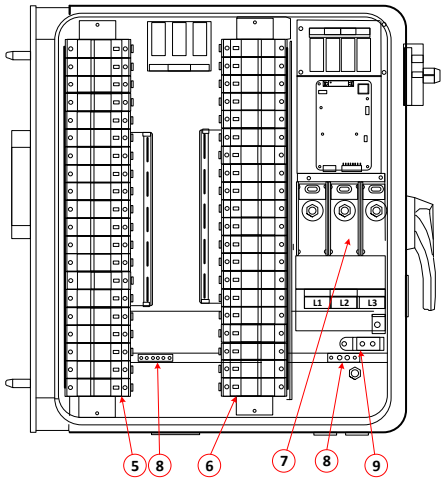
Figure 3-22A Internal Connection Points (Centralized Wire-box Ver #1)



① Positive DC input connections
② Negative DC input connections
③ AC output terminals
④ Grounding terminals
⑤ Neutral Terminal

NOTE: 2-inch knockouts can be enlarged if the hardware from the larger size does not interfere with the installation of the cover or other components. Enlarged holes should be centered in the original hole if possible.

Figure 3-22B Internal Connection Points (Centralized Wire-box Ver #2)



5	Positive DC input connections
6	Negative DC input connections
7	AC output terminals
8	Grounding terminals
9	Neutral Terminal

Figure 3-22B Internal Connection Points (Standard Wire-box)

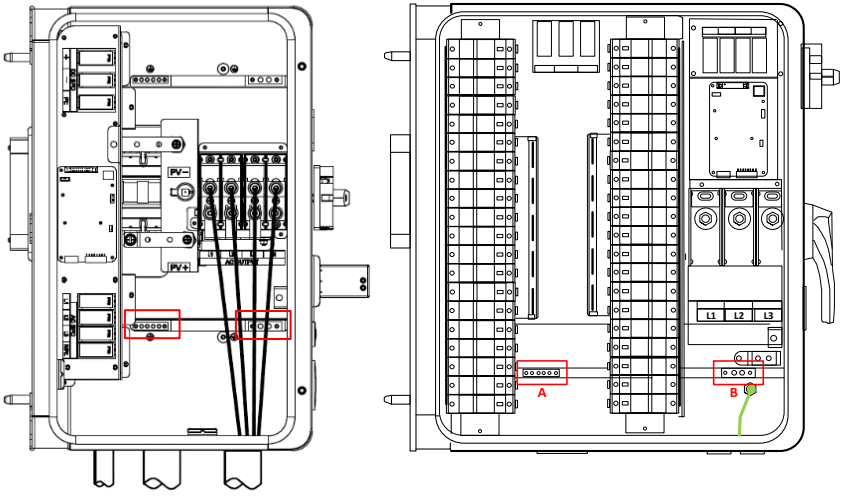
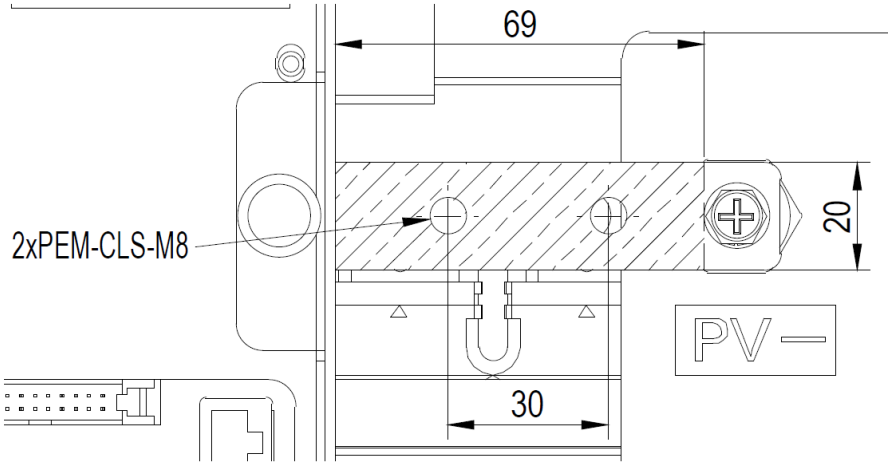


Figure 3-23 Internal Grounding Points

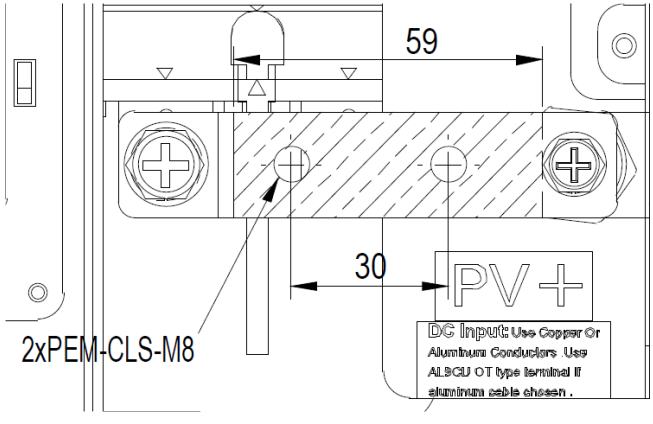
Table 3-3 Cable Specifications

DC Cable Specifications for Standard wire-box	
Terminal	Conductor
DC input(+ / -) Standard Wire box	#12-8AWG Cu Only (90°C fuse holder rating) Cable overall diameter: ＜7.3mm
DC input(+ / -) Central Wire-box Ver #1	Cu/Al Conductor size determined by: NEC Calculations, Site Voltage Drop Requirements and DC Terminal Dimensions. See Figures for Centralized Wire-box Version #1 dimensions. (90°C rated) Allows for single or parallel 1-Hole Lugs on 30mm (1.181”) Centers – M8 Threaded inserts, use lugs with 5/16” or 3/8” hole.
DC input(+ / -) Central Wire-box Ver #2	Cu/Al Conductor size determined by: NEC Calculations, Site Voltage Drop Requirements and DC Terminal Dimensions. See Figures for Centralized Wire-box Ver #2 dimensions. (90°C rated) Allows for single or parallel 1-Hole Lugs top and bottom – 0.43” (11mm) through holes, use lugs with 3/8” or 1/2” hole.
AC and Ground Cables specifications	
Position	Conductor
AC output (L1/L2/L3) Standard WB (L1/L2/L3/N) Central WB	Cu/Al Conductor determined by NEC calculations and the maximum terminal lug dimensions in Figure 3-25 and 3-26. Terminal block is rated for 90°C Note: AC output hole diameter need be increased to 2-1/2 or 3 inch for larger cable diameters. Note: Aluminum Conductors connections should use a NO-Oxidation grease coating.
PE	Gnd “A” #4~14AWG, Gnd “B” #2~14AWG (Cu/Al)
RS485 communication	
RS485 communication	UTP CAT-5e or 3x#22~18AWG communication cable (e.g. Belden 3106A)



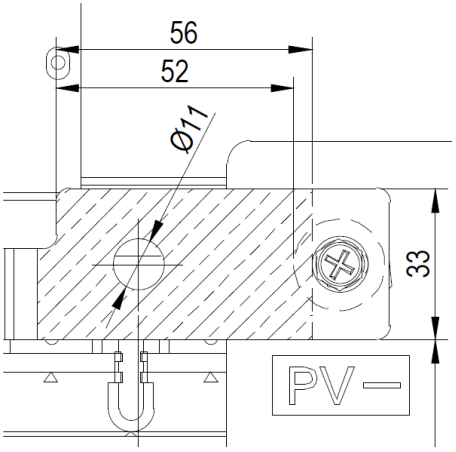
Centralized Wire-box Ver #1

DC BUS CONNECTION DIMENSIONS (PV-)



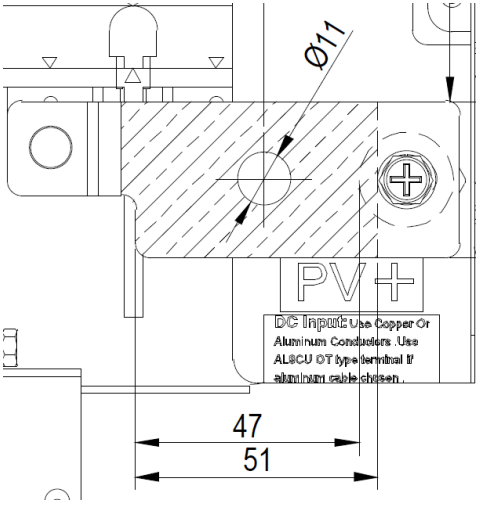
Centralized Wire-box Ver #1

DC BUS CONNECTION DIMENSIONS (PV+)



Centralized Wire-box Ver #2

DC BUS CONNECTION DIMENSIONS (PV-)



Centralized Wire-box Ver #2

DC BUS CONNECTION DIMENSIONS (PV-)

Table 3-4 Tools Required for Cable termination

No.	Tools	Remark
1	#2 Phillips head screwdriver	DC Cable for wire-box
2	13mm/17mm hex socket wrench	AC terminal block (L1-L3)
3	13mm hex socket/5mm hex drive wrench	AC terminal block（N）
4	10mm hex socket wrench	External grounding/bounding
5	5mm flat screwdriver	Internal grounding bar
6	1.5mm flat screwdriver	RS485 communication terminal
7	Diagonal pliers	Cut cable
8	Wire stripping pliers	Remove jacket
9	Crimping pliers	Crimp terminal

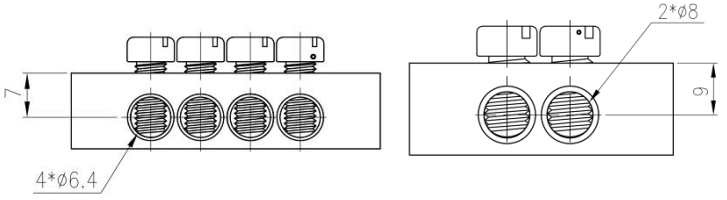
Table 3-5 Torque value

Torque Table	SI Unit	USCS
ELECTRICAL CONNECTIONS		
DC String Wiring for Standard WB	3 N-m	26.5 in-lbs
DC Cable for Centralized WB (Version #1)	14.2 N-m	126 in-lbs
DC Cable for Centralized WB (Version #2)	22.5 N-m	200 in-lbs
AC terminal M10 (L1 - L3) Standard & Central Ver #2 WB	22.5 N-m	200 in-lbs
AC terminal Screw-clamp (N) Standard & Central Ver #2 WB	14N-m	120 in-lbs
AC terminal M8 (L1 - L3) Central Ver #1 WB	14.2 N-m	126 in-lbs
AC terminal M8 (N) Central Ver #1 WB	14.2N-m	126 in-lbs
Internal grounding bar A	3 N-m	26.5 in-lbs
Internal grounding bar B	5 N-m	45 in-lbs
Internal grounding stud	6 N-m	52.8 in-lbs
External grounding point	6 N-m	52.8 in-lbs
RS485 Communication	0.2 N-m	1.8 in-lbs
MECHANICAL CONNECTIONS		
Inverter to Bracket	6 N-m	52.8 in-lbs
Cover	4 N-m	35.4 in-lbs
Main to Wire Box	12.5 N-m	111 in-lbs
Fan Replacement	1.6 N-m	14.2 in-lbs

3.3.3 AC and Ground Connection

The following describes how to connect the AC and ground cables between the inverter and the AC grid:

1) Connect the Ground cable as shown in Figure 3-21A or 3-21B item 3 - Bond the Inverter to local grounding point – drive ground rod or equivalent.
2) Remove the waterproof plugs from the AC output of the wiring box and install appropriately sized conduit and conduit fittings into the hole. Then route the cables through the conduit inside the wiring box.
3) A Circuit Ground should be run with the AC Power cables and connected to the internal ground bus.
4) A separate Ground wire should bond the Wire Box to the local ground connection for personnel safety. By bonding at this location is easy for operator to determine the inverter is safely grounded.
5) Connect the AC (L1, L2, L3, N) cables to the terminal block and connect the ground cable to the internal grounding terminal block. The Neutral conductor is not required.



Ground Terminal A Ground Terminal B

Figure 3-24 The size for Ground Terminal (Figure 3-23)

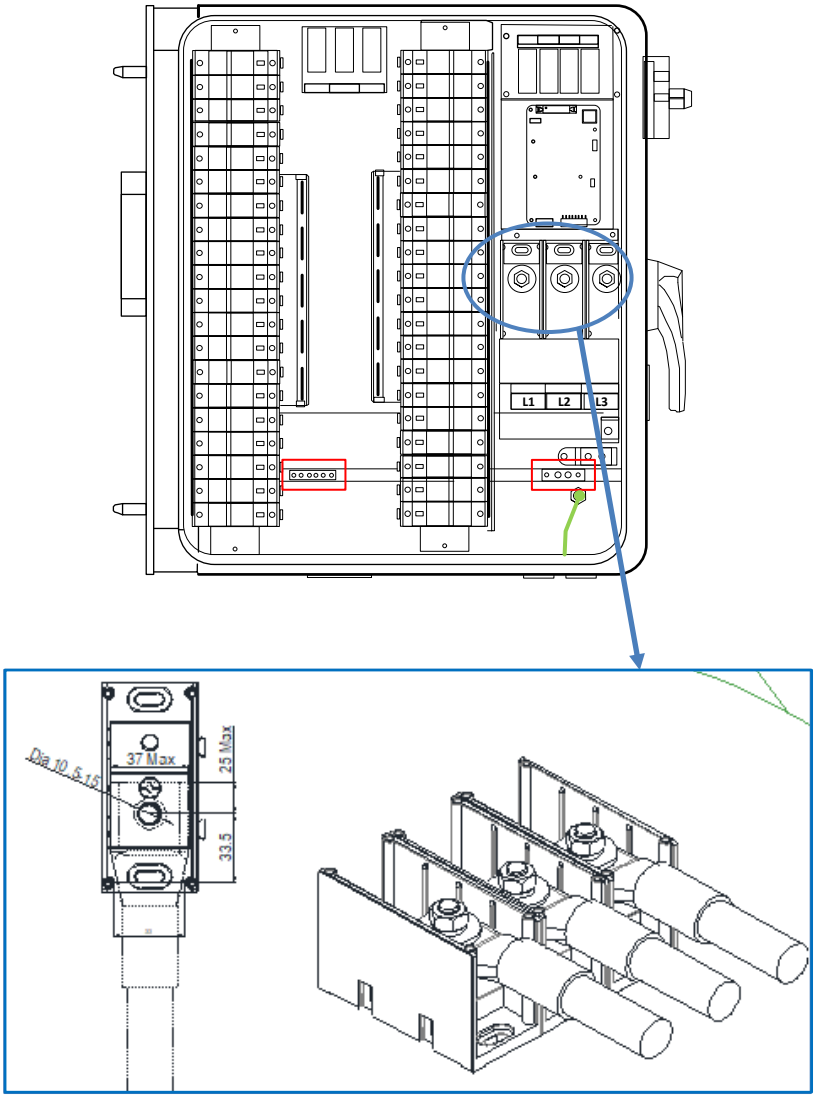


Figure 3-25 AC Output Cable Connection (Distributed Wire-box)

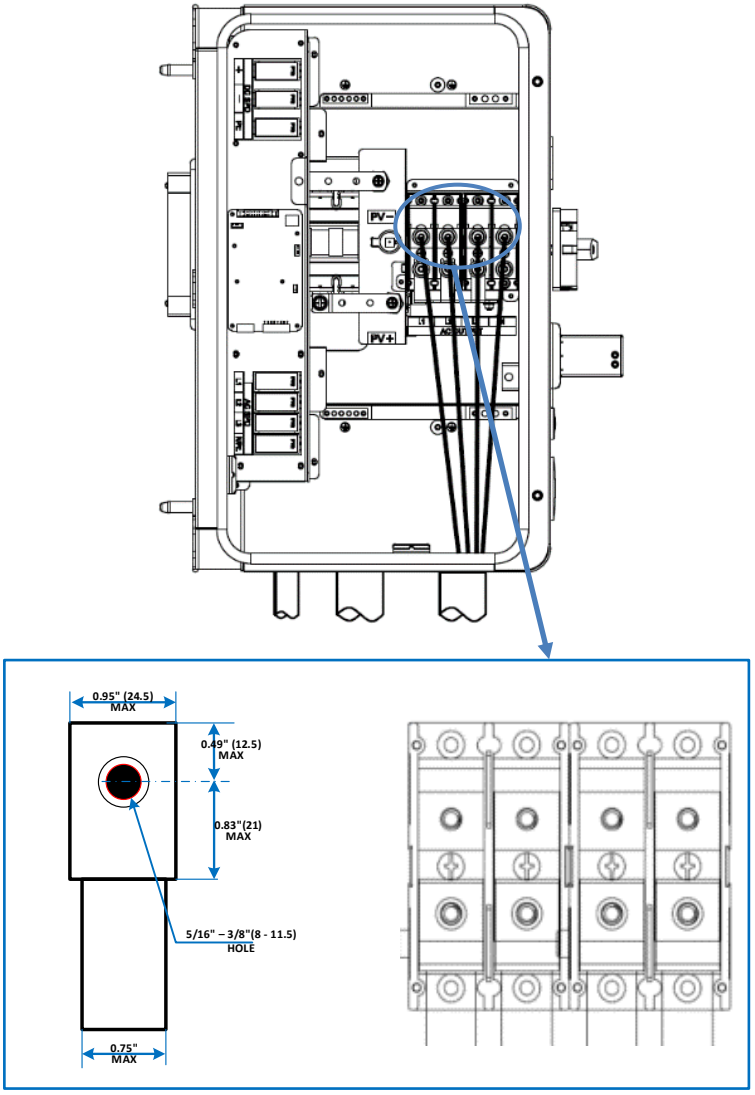


Figure 3-26 AC Output Cable Connection (Centralized Wire-box Ver #1)

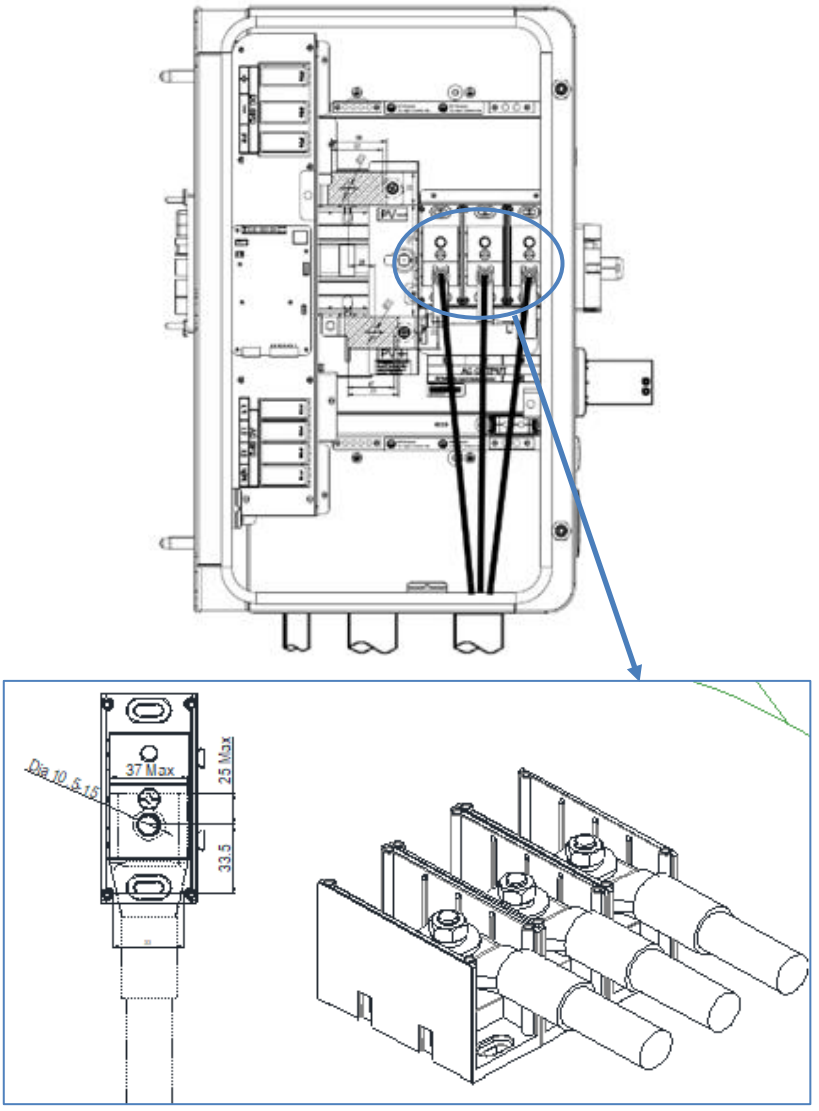


Figure 3-27 AC Output Cable Connection (Centralized Wire-box Ver #2)

When the output of the inverter is connected to the grid, an external AC circuit breaker is required to be installed to safely disconnect the inverter from the grid should an overcurrent event occur. The minimum size breaker is determined by NEC calculations. The internal temperature of the AC Panel must be considered and appropriate derate applied to prevent nuisance tripping.

Table 3-11 Specification of AC breaker selection

Inverter	Max AC OCPD
CPS SCH100KTL-DO/US-600	200A
CPS SCH125KTL-DO/US-600	200A
CPS SCH100KTL-DO/US-480	200A

The SCH100KTL-DO/US-600 and SCH125KTL-DO/US-600 inverters operate at 600VAC/Wye output, while the SCH100KTL-DO/US-480 inverters operate at 480VAC/Wye output. If another voltage/configuration is required, a transformer may be necessary.

NOTICE:

Transformer Configurations:

3W Wye and 4W Grounded Wye is recommended.

Floating 3W Wye 3W Delta Configuration is acceptable but require external GFCI.

The presence of a Grounding Transformer or YG : d causes voltage regeneration – Loss of Single Phase must be mitigated external to Inverter due to regenerated voltage present at inverter AC terminals.

Open and Grounded Delta configurations are not acceptable.

Up to 30 inverters may be connected in parallel for use with a single transformer.

3.3.4 DC Connection

DC fuse configuration

CPS SCH100/125KTL-US-600 and SCH100KTL-DO/US-480 inverters are equipped with 20A DC fuses. Customers must verify that the appropriate fuses are installed depending on the actual configuration of PV strings.

1) Each DC input from the PV strings requires fuse protection.
2) The rated voltage of the fuse should be 1500Vdc.
3) The rated current of the fuse is generally 1.56 × short circuit current from the PV strings, rounded to the next available fuse size. NEC2017 alternate calculation method may yield a smaller fuse.

The following table lists the fuse type, specifications and number under the rated voltage and power range of 20 strings of PV panels.

Table 3-12 DC Fuse selection

100-125 kW	Brand	15A/1500V	20A/1500V
	ADLER	A742150b00	A742200b00
	SINOFUSE	RS308-PV-5F15A	RS308-PV-5F20A

Note 1: The 1500VDC ADLER fuse series are recommended. Detailed information is available for customers to find and download from http://www.adlerelectric.com/.

	**WARNING: Use of different fuses or incorrectly sized fuses can cause damage to equipment or create unsafe working conditions. Any damage resulting from incompatible fuses is not covered by warranty.**

DC Cable Connection

To ensure the optimum performance of the inverter, please read the following guidelines before performing any DC connections:

(a) Confirm the DC configuration and ensure that the maximum open circuit voltage of the PV modules is lower than 1500Vdc under any conditions;

(b) Confirm that the PV strings for the MPPT of the inverter are of the same type and specification before connection.

(c) Check the polarity (Figure 3-20) before terminating the DC cables of PV strings according to the following steps:

i. Use a multi-meter to measure the PV strings' cable ends and check the polarity.

ii. The positive (+) terminal of cable should match the positive (+) terminal of inverter's DC input.

iii. The negative (-) terminal of cable should match the negative (-) terminal of inverter's DC input.

(d) Remove the liquid-tight hole plugs from the DC input of the wiring box and install 2-inch conduit and conduit fittings into the holes. Then route the cables through the conduit inside the wiring box.

(e) Connect the DC cables to the fuse holders and tighten the screws or Nuts per Torque Table above.

NOTICE:

It is important to use a multi-meter, rated at least 1500V to check the polarity of the DC input conductors to avoid any risk of reverse polarity.

A reversed string is extremely hazardous and will result in a blown fuse when the irradiation is high. The voltage across the blown fuse will be 2x Voc and could prevent proper fuse operation resulting in a fire.

Table 3-13 Tools Required for Conductor Termination

Tools	Remark
No. 2 Phillips bit and a Torque driver	PV String connections (Standard wire-box)
	PV output conductor connections (Centralized wire-box)
Diagonal pliers	Cut cable
Wire stripping pliers	Remove jacket

Choose the conductor size and material for the inverters according to the following configuration table:

Table 3-14 Cable Specifications

Terminal	Cable
DC input (+ / -) Standard wire box	Screw Clamp Fuse Holder: 12 - 6AWG (Copper only)
DC input (+ / -) Centralized Wire-box	Busbar, M10 bolts: 500kcmil CU/AL. Max. (1 termination per pole), 300kcmil CU/AL Max. (2 terminations per pole) *Lugs not supplied. * Use 5/16 or 3/8" tubular lug sized for the application.
Ground terminals	12 – 6AWG

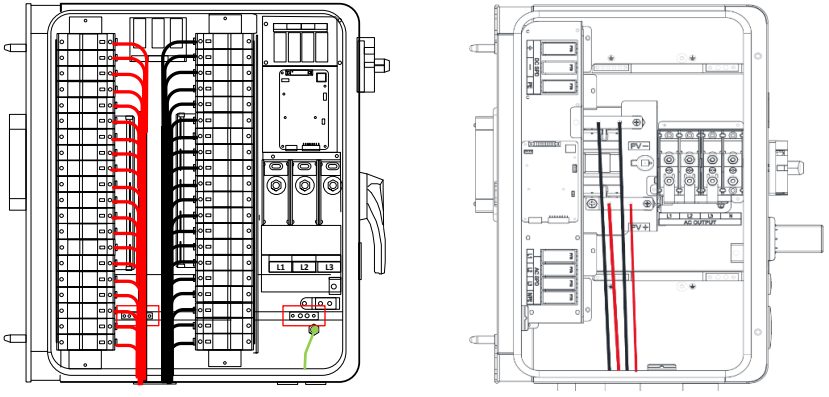


Figure 3-28 connect the DC cable (Check the POLARITIES)

3.3.5 Communication Connection

CPS SCH100KTL-DO/US-600, SCH125KTL-DO/US-600 and SCH100KTL-DO/US-480 inverters support industry standard SunSpec and Modbus RS485 communication. Below is a description of the components of the communication card and its location in the inverter wire-boxes.

Communication board description

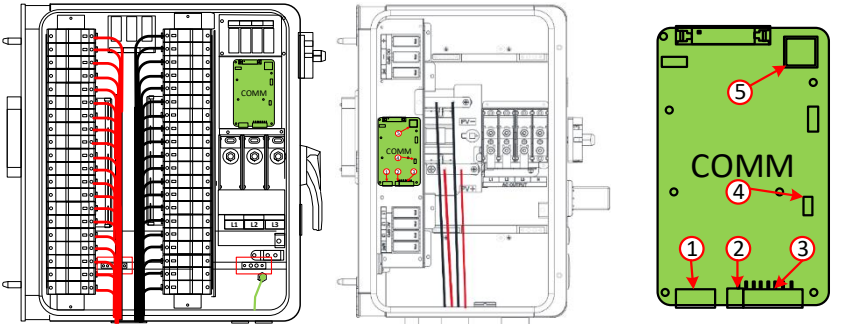
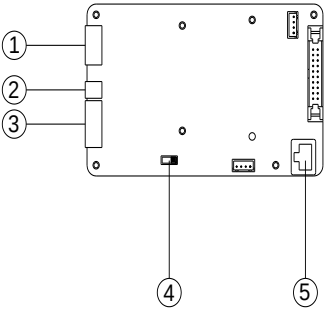


Figure 3-29 Communication Board



① RS485 (Reserved)

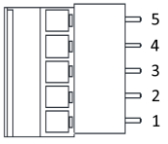
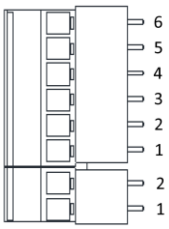
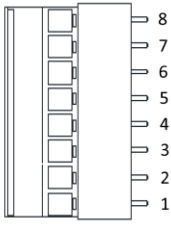
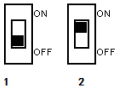
② Power port (2pin connector)
1. GND
2. +12V

③ RS485 port (6pin connector)
1. 485_A
2. 485_B
3. 485_GND
4. 485_A
5. 485_B
6. 485_GND

④ Selector Switch (S201): 120Ω terminal resistor switch for communications.
1. ON: Enable the termination resistance
2. OFF: Disable termination resistance

⑤ RJ45(Reserved)

Table 3-15 Communication Connection Interfaces

Item	Picture	Configuration description
① RS485 (Debug Only)		Debug Only
② 12V port ③ RS485 port (2+6pin connector) New Comm Board		6 -----RS485_GND (Common) 5 -----RS485_B 4 -----RS485_A 3 -----RS485_GND (Common) 2 -----RS485_B 1 -----RS485_A 2 ----- +12V 1 -----12V_GND
② ③ RS485 port (8pin connector) Old Comm Board		8 -----RS485_GND (Common) 7 -----RS485_B 6 -----RS485_A 5 -----RS485_GND (Common) 4 -----RS485_B 3 -----RS485_A 2 ----- 12V_GND 1 ----- +12V
④ RJ45		Debug Only
⑤ Selector switch for setting the 120Ω terminal resistor of the RS485 communication S201		1----- Disable the termination resistor 2----- Enable the termination resistance

RS485 communication cable connection ③:

Choose the RS485 communication cables according to the following table:

Table 3-16 Cables specifications

	Cable
RS485 communication	CAT-5e or 3x 22 - 18AWG communication cable (e.g. Belden 3106A)

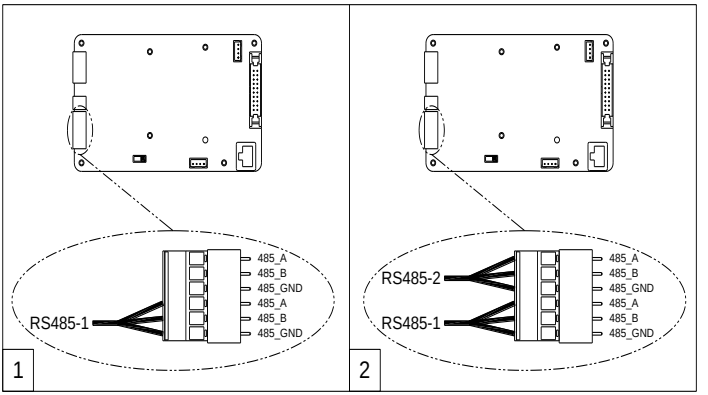


Figure 3-29a RS485 Connection (new Comm Board 6-pin)

1. Cable connection of RS485 communication (1 inverter): 6 pin connector
2. Cable connection of RS485 network communication (multiple inverters): 6 pin connector

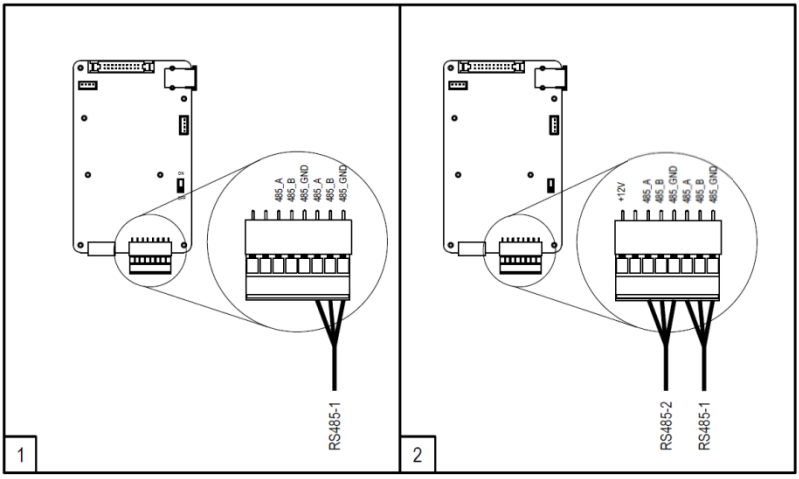


Figure 3-29b RS485 Connection (old Comm Board 8-pin)

3. Cable connection of RS485 communication (1 inverter): 8 pin connector
4. Cable connection of RS485 network communication (multiple inverters): 8 pin connector

It is recommended that industrial grade RS485 cable be used in lieu of unshielded twisted pair. Communication cable such as (CAT5) or Belden 3106A cable for RS485 5-pin connector is preferred.

RS485 network connection:

When the inverters are monitored via the RS485 communication, a unique RS485 address for each inverter can be set up through the APP interface. Use the CPS Connect app to assign an address to each inverter on the network. Up to 32 inverters can be connected together in the RS485 communication network. The daisy-chain topology is recommended for the RS485 network connection, as shown in Figure 3-30. Other communication topologies, such as the star networks, are not recommended.

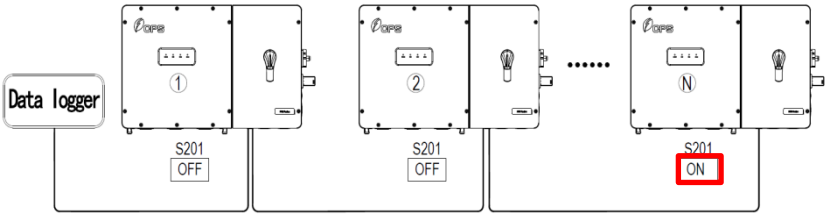


Figure 3-30 RS485 Network Connection

If there are multiple inverters in the RS485 network, the selector switch S201 of the last inverter in the daisy-chain should be in ON position, to have the 120ohm terminal resistor enabled. The selector switch S201 of all other inverters should be in the OFF position to disable the terminal resistor.

It is important to daisy chain the inverter RS485 connections to minimize noise and bus reflections. All RS485 connections must be terminated in a serial fashion and not to exceed 32 in total. Daisy Chain vs. multiple branch configuration is recommended.

	**Warning:** Risk of Electric Shock. Make sure all DC and AC power to the unit has been disconnected before opening the inverter wire-box and ensure that hazardous high voltage and power inside the equipment has been discharged. Wait at least 5 minutes before opening the wire-box.

INSTALLATION PROCEDURE

(1) Open the inverter wiring box.
(2) Bring the communication cables into the wiring box through the provided knockout holes at the bottom.
(3) Connect the RS485 wires to the green Phoenix connector ensuring correct polarity and using a shielded twisted pair cable.
(4) If the inverter is the **last** Modbus device in the daisy chain, make sure the Modbus termination switch S201 is in the ON position enabling Modbus termination. Do **not** turn the switch to the ON position in any other inverters of the daisy chain.
(5) Connect the shield or drain wire continuously, but not in contact with RS (Common) or Enclosure Ground. Single-point ground the shield/drain wire.
(6) Do not connect RS485 Common to ground.

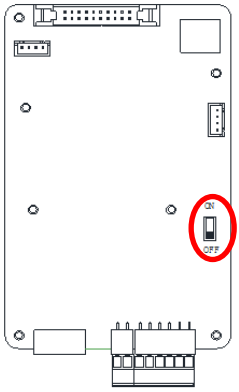
	S201 - Selector switch for the 120Ω RS-485 termination resistor **On** - Enable the Modbus (RS-485) bus termination (Applies only for the last inverter in the daisy chain) **Off** - Disable the Modbus (RS-485) bus termination. (Factory default)

Figure 3-31 The Modbus (RS485) Termination Switch (S201) Location and Settings on the LCD/Communication Board.

Chapter 4 Commissioning (Via Wireless)

WARNING:
Please follow the guidelines below before on-grid operation to eliminate possible dangers to ensure safety.

4.1 APP Download

- The inverter settings are accessed through the CPS Connect Pro application and users can download iOS version at Apple store or Android version in Google store named "**CPS Connect Pro**" (Supports Android 4.1 and IOS 9.0 or later).

CPS Connect Pro

4.2 Commissioning Checklist

4.2.1 Mechanical Installation

Make sure that the mounting bracket is secure and all the screws have been tightened to the specified torque values in the Torque Table above.

4.2.2 Cable Connections

- Make sure that all cables are connected to the right terminals and torqued to the values specified above.
- The appropriate cable management is important to avoid physical damage.
- The polarity of DC input cables must be correct and the DC Switch should be in the "OFF" position.
  (Please refer to 3.3 Electrical installation)

4.2.3 Electrical Check

- Make sure that the AC circuit breaker is appropriately sized.
- Test whether the AC voltage is within the normal operating range.
- Make sure the DC open circuit voltage of input strings is less than 1500V.

4.3 Commissioning Steps

Complete the checklist above before commissioning the inverter as follows:

1.) Turn on the AC circuit breaker.
2.) Turn on the DC circuit breaker. (Skip these two steps if there are no circuit breakers.)
3.) Switch the DC Switch to the “ON” position. When the energy supplied by the PV array is sufficient, the LED of inverter will light up. The inverter will then start up.

4.4 Connection to the inverter – Wireless

Once powered, the inverter will automatically create a wireless network that will be visible as an Access Point from the user devices (tablet, smartphone, etc.), connection to the inverter via Wi-Fi .

1.) Open the CPS Connect Pro app and select **No-LCD Inverter**.
2.) Enable the wireless connection on the device which is being used for the board setup (tablet or smartphone) and connect it to the Access Point created by the inverter system: the name of the wireless network created by the system that the connection should be established with, will be: CPLK-XXXXXXX where “X” can be found on the “LinKIT Label” placed on the side of the WiFi module.
3.) Please input the password “Password” (Capital P)
4.) Touch the **Setting** icon and input the password “1111” to access the Settings interface.
5.) Select the Inverter Parameters tab to set the Grid Code, PV Link Type, Neutral Line, RS485 and Inverter Clock” as shown in Figure 4-1.

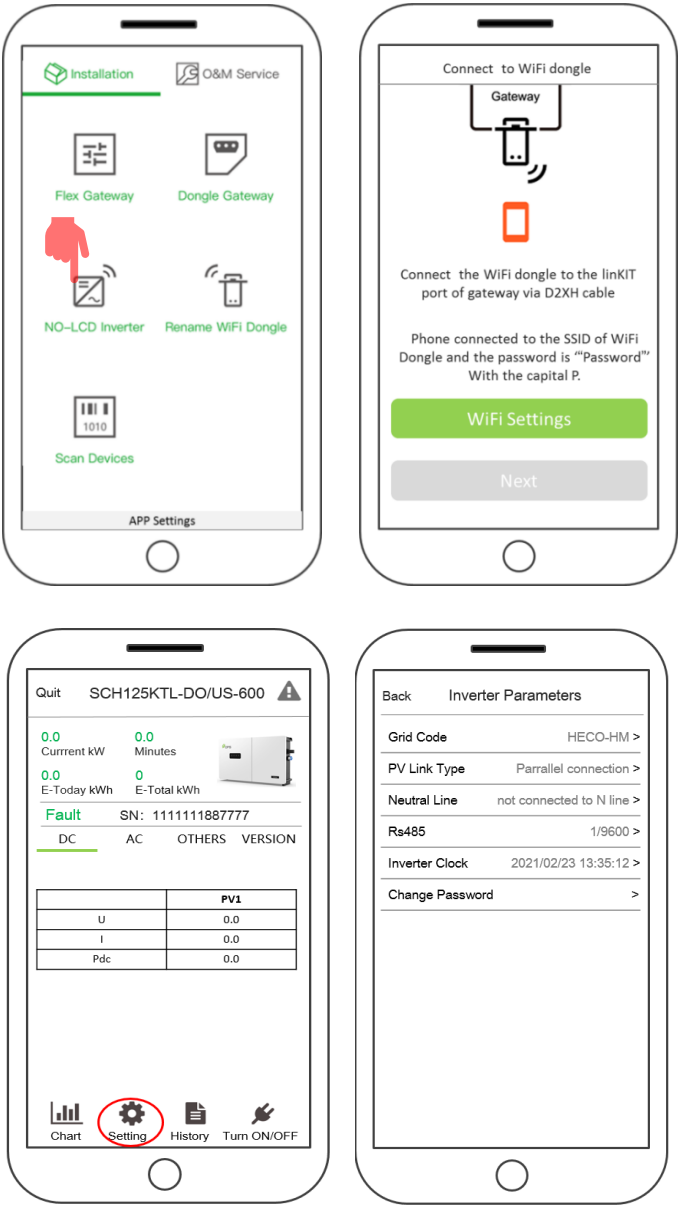


Figure 4-1 System setting

Grid Code:	3 Standard codes are available – IEEE1547, Rule21, ISO-NE. Other SRDs can be implemented by manual configuration of settings.
PV Link Type:	(N/A – 1 MPPT)
Neutral Line Setting:	Select if a neutral is connect or not
RS485:	Choose the communication data **Modbus Address** and Baud Rate (9600). **Each Inverter on a daisy chain must have a unique Modbus Address.**
Inverter Clock:	Set the system clock

INSTRUCTION:
Please check with your local electricity supply company before selecting a grid standard. If the inverter is operated with a wrong grid standard, the electricity supply company may cancel the interconnection agreement. Placing the inverter into operation before the overall system complies with the national rules and safety regulations of the application is not permitted.

When the device screen shows the normal operation status (Figure 4-2) and the “RUN” light on the LED panel is illuminated, this is an indication that the grid connection and power generation are successful.

Figure 4-2 Normal Operation Status (Summary Screen)

If the inverter fails to operate normally, the “FAULT” light will illuminate and the fault information will show on the Device screen and you can skip to **History** to check the details as shown in the Figure 4-3.

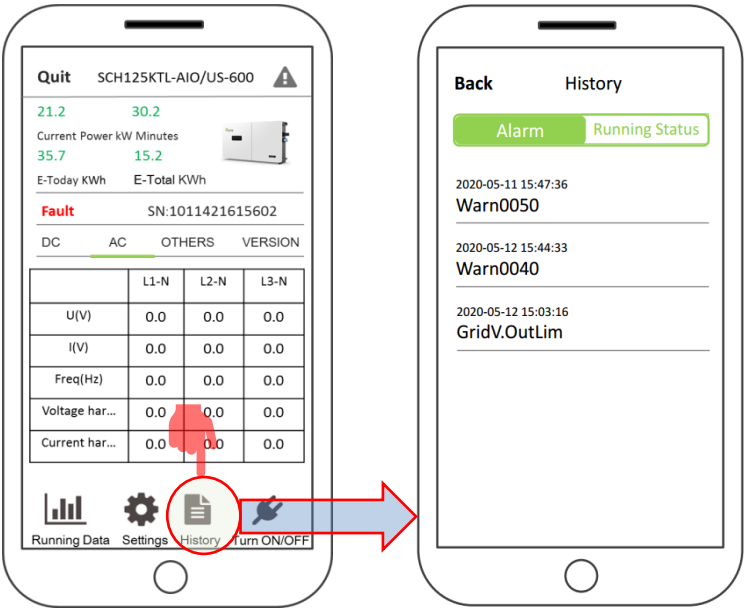


Figure 4-3 Fault Information Interface

Chapter 5 APP Interface

5.1 Overview

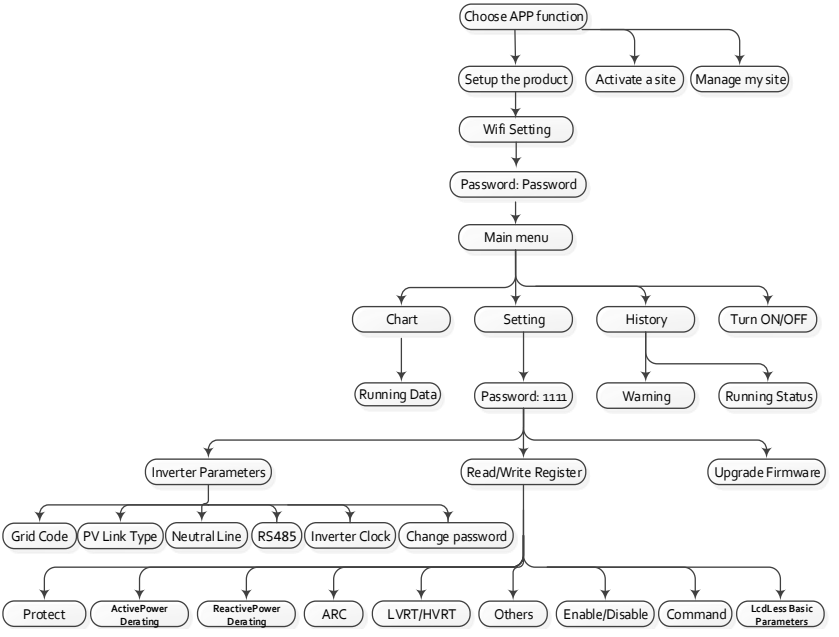


Figure 5-1 App Interface Menu Tree

5.2 Main Menu

In the Main Menu, you can access the following sub-menus:

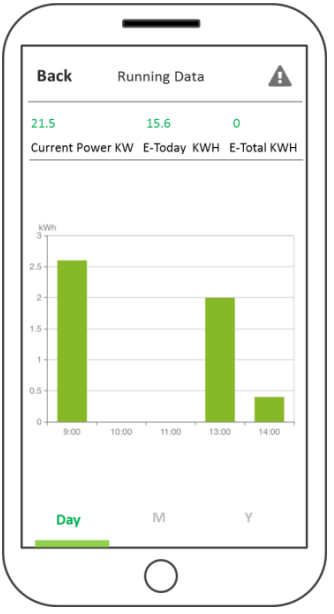
- Running Data
- Settings
- History
- Turn ON/OFF

You can also view the main information related the status and the DC, AC, OTHERS and VERSION information in the Main section:

Figure 5-2 Main Menu Screens

5.3 Running Data

In the Running Data sub-menu you can view the Power generation with Current, Day, Month, Year and Total as Following:



5.4 Settings

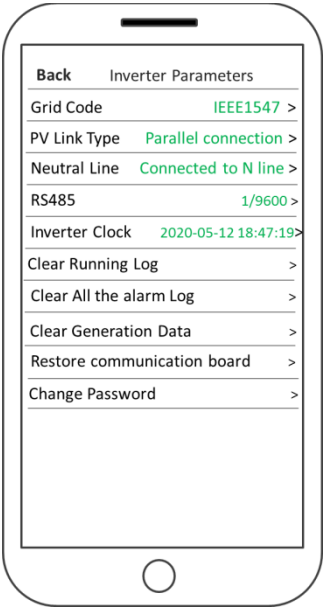
Choose the **Setting** icon and input the password “1111” as following:

In the **Setting** section it is possible to access the following sub-menus:

- Inverter Parameters
- Read/Write Register
- Upgrade Firmware

5.4.1 Inverter Parameters

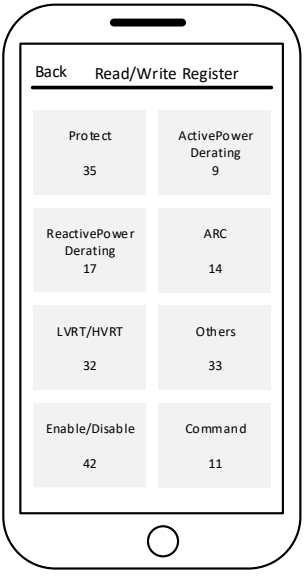
In the **Inverter Parameters** section it is possible to access the following sub-menus: Grid Code, PV Link Type, Neutral Line, RS485, Inverter Clock and Change Password as following Figure:



5.4.2 Read/Write Register

In the **Read/Write Register** section it's possible to access the following sub-menus:

1. Protect
2. ActivePowerDerating
3. ReactivePowerDerating
4. ARC
5. LVRT/HVRT
6. Others
7. Enable/Disable
8. Command



5.4.2.1 Protect

The **Protect** interface is used to display and set the Protect parameters of the AC grid voltage, frequency and recovery, etc. as following: Each of the 3 protection levels for OV, UV, OF and UF can be independently disabled. The function in Table 5.7.

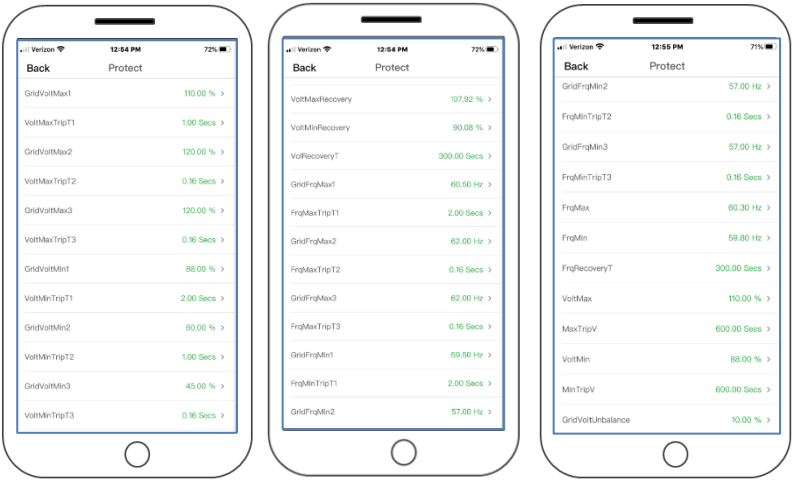


Table 5-1 The Protection Parameters (IEEE1547, Rule21 and ISO-NE)

Parameter name	Description	Range	Grid code IEEE-1547	Grid code RULE-21	Grid code ISO-NE
Grid Over Voltage Protection (Table 5.7 (13-15))					
GridVoltMax1	Threshold Level 1 Max. grid voltage	{100.00%,135.00%}	110.00%	110.00%	110.00%
VoltMaxTripTime1(S)	Trip Time Level 1 Max. grid trip voltage	{0, 655}	1.00	12.50	2
GridVoltMax2	Threshold Level 2 Max. grid voltage	{100.00%,135.00%}	120.00%	120.00%	120.00%
VoltMaxTripTime2(S)	Trip Time Level 2 Max. grid trip voltage	{0, 655}	0.16	0.16	0.16
GridVoltMax3	Threshold Level 3 Max. grid voltage	{100.00%,135.00%}	120.00%	120.00%	120.00%
VoltMaxTripTime3(S)	Trip Time Level 3 Max. grid trip voltage	{0, 655}	0.16	0.16	0.16
Grid Low Voltage Protection (Table 5.7 (16-18))					
GridVoltMin1	Threshold Level 1 Min. grid voltage	{30.00%,100.00%}	{88.00%}	{88.00%}	{88.00%}
VoltMinTripTime1(S)	Trip Time Level 1 Min. grid trip voltage	{0, 655}	{2.0}	{20.50}	{2}
GridVoltMin2	Threshold Level 2 Min. grid voltage	{30.00%,100.00%}	{60.00%}	{70.00%}	{50.00%}
VoltMinTripTime2(S)	Trip Time Level 2 Min. grid trip voltage	{0, 655}	{1.00}	{10.50}	{1.1}
GridVoltMin3	Threshold Level 3 Min. grid voltage	{30.00%,100.00%}	{45.00%}	{50.00%}	{45.00%}
VoltMinTripTime3(S)	Trip Time Level 3 Min. grid trip voltage	{0, 655}	{0.16}	{1.5}	{0.16}
VMaxRov	Recovery Max threshold grid voltage protection	{80.00%, 135.00%}	{107.92%}	{107.99%}	{105.00%}
VMinRov(V)	Recovery Min threshold. grid voltage protection	{20.00%,100.00%}	{90.08%}	{90.00%}	{91.70%}
VRcovT(S)	Recovery time of grid voltage protection	{0, 655}	{300}	{300}	{300}

Table 5-1 The Protection Parameters (Continued)

Parameter name	Description	Range	Grid code IEEE-1547	Grid code RULE-21	Grid code ISO-NE
Grid Over Frequency Protection (Table 5.7 (19-21))					
GridF.Max1	Threshold Level 1 Max. grid frequency	{60, 66}	{60.5}	{60.5}	{61.2}
FMaxTripTime1(S)	Trip time of Level 1 Max. grid frequency	{0, 655}	{2}	{299.50}	{300.0}
GridF.Max2	Threshold Level 2 Max. grid frequency	{60, 66}	{62}	{62}	{62}
FMaxTripTime2(S)	Trip time of Level 2 Max. grid frequency	{0, 655}}	{0.16}	{0.16}	{0.16}
GridF.Max3	Threshold Level 3 Max. grid frequency	{60, 66}	{62}	{62}	{62}
FMaxTripTime3(S)	Trip time of Level 3 Max. grid frequency	{0, 655}	{0.16}	{0.16}	{0.16}
Grid Low Frequency Protection (Table 5.7 (22-24))					
GridF.Min1	Threshold Level 1 Min. grid frequency	{54, 60}	{59.5}	{58.5}	{58.5}
FrqMinTripTime1(S)	Trip time of Level 1 Min. grid frequency	{0, 655}	{2}	{299.50}	{300.00}
GridF.Min2	Threshold Level 2 Min. grid frequency	{54, 60}	{57}	{57}	{56.5}
FMinTripTime2(S)	Trip time of Level 2 Min. grid frequency	{0, 655}	{0.16}	{0.16}	{0.16}
GridF.Min3	Threshold Level 3 Min. grid frequency	{54, 60}	{57}	{57}	{56.5}
FMinTripTime3(S)	Trip time of Level 3 Min. grid frequency	{0, 655}	{0.16}	{0.16}	{0.16}
FMaxRcov(Hz)	Recovery Max threshold grid Frequency protection	{54, 66}	{60.3}	{60.4}	{60.1}
FMinRcov(Hz)	Recovery Min threshold. grid Frequency protection	{54, 60}	{59.8}	{58.6}	{59.5}
FRcovT(S)	Recovery time of grid frequency protection	{0, 655}	{300}	{300}	{300}

Table 5-1a

Parameter name	Description	Range	Grid code IEEE-1547	Grid code RULE-21	Grid code ISO-NE
MOVING AVERAG PARAMETERS (Table 5.7 (25, 26))					
VMaxMovAvg	Threshold max move average Voltage	{100.00%,135.00%}	{110.00%}	{110.00%}	{110.00%}
VMaxMovAvgT	Trip time of max move average Voltage	{0, 655}	{600}	{600}	{600}
VMinMovAvg	Threshold min move average Voltage	{80.00%, 100.00%}	{88.00%}	{87.99%}	{88.00%}
VMinMovAvgT	Trip time of min move average Voltage	{0, 655}	{600}	{600}	{600}
VOLTAGE UNBALANCE (Table 5.7 (32))					
VUnbal	Threshold grid voltage unbalance	(0.01%, 10%)	(10%)	(10%)	(10%)

5.4.2.2 Active Power Derating

The **Active Power Derating** menu is used to set the active power derating parameters including Active Power Derating, Over frequency derating and High temperature frequency derating, etc. The parameters are shown in Table 5-2. To make permanent changes to these settings either on-site or via the Flex Gateway Portal, the Active Power Mode in Table 5.7 (3) must be set to ”Local Control”. The setting made in the “Remote Dispatch Mode” will reset when DC Power Cycles.

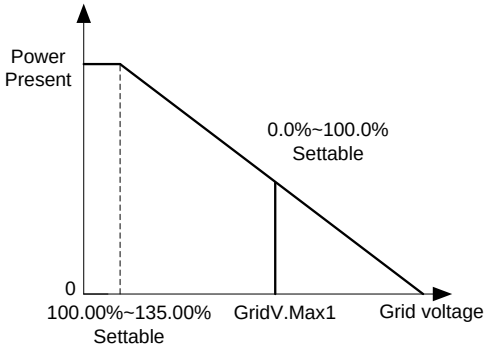


Figure 5-3 Curve of over voltage derating

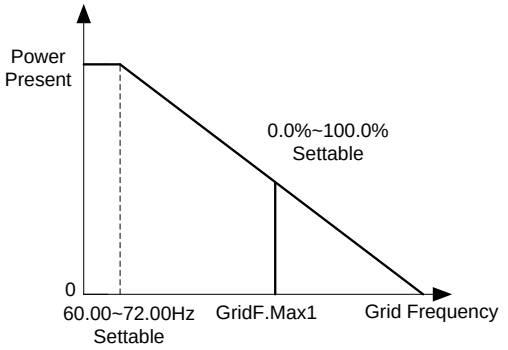


Figure 5-4 Curve of over frequency derating

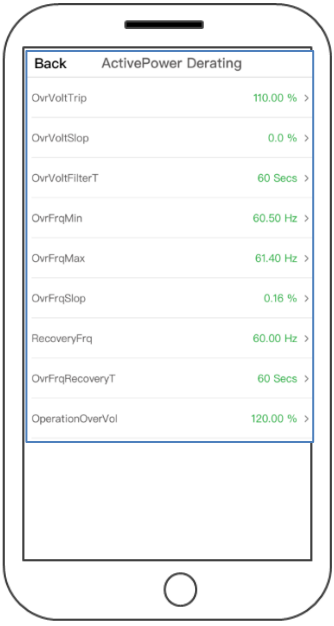


Table 5-2 Active Power Derating Setup

Parameter name	Description	Range	Grid code IEEE-1547	Grid code RULE-21	Grid code ISO-NE
OVER-VOLTAGE DERATE (Table 5-7 (34) to Enable)					
OVDeratStart	The trigger Voltage of Overvoltage derating	{100%, 135%}	{110%}	{110%}	{110%}
OVDeratRate	Rate of Overvoltage derate	{0%, 100%}	{0%}	{0%}	{0%}
OvrVoltFilterT(s)	The filtering time of Over Voltage derating	{1 ,90}	{60}	{60}	{60}
OVER-FREQUENCY DERATE (Table 5-7 (29) to Enable)					
OFDeratStart(Hz)	The trigger frequency of Over Frequency derating	{60, 72}	{60.5}	{60.1}	{60.1}
OFDeratStop(Hz)	The end frequency of Over frequency derating	{60, 72}	{61.4}	{62}	{62}
OFDeratRate(P%/Hz)	The rate of Over frequency derating	{0.01, 100}	{0.16}	{30}	{30}
OFDeratRcovFre(Hz)	The recovery frequency of Over Frequency derating	{58.8, 66}	{60}	{59.90}	{59.90}
OFDeratRcovT(s)	The recovery time of Over Frequency derating	{0,1200}	{60}	{600}	{600}
OptOverVolPrct	The Value of Operating overvoltage protect	{100%, 135%}	{120%}	{120%}	{120%}

5.4.2.3 Reactive Power Derating

The **Reactive Power Derating** menu is used to set the Grid reactive power derating parameters including PF parameters and Q(u) parameters, etc. The parameters as shown in Table 5-5. These functions are enabled according to the mode selected in Table 5-7 (2). The “REMOTE DISPATCH MODE” is used when a site controller is actively setting or changing reactive mode parameters. Any settings changes made in the “Remote Dispatch Mode” will refresh to the “Factory Default Settings” when DC power is recycled.

(1). PF Set：Set the PF value
Note: Change the reactive power by adjusting the PowerFactor

(2). PF(P) Curve：PF curve mode
Note: The power factor changes according to the power change, as shown in Figure 5-4:

INSTRUCTION:
The PF (P) Curve function is only available for IEEE-1547 grid standards.

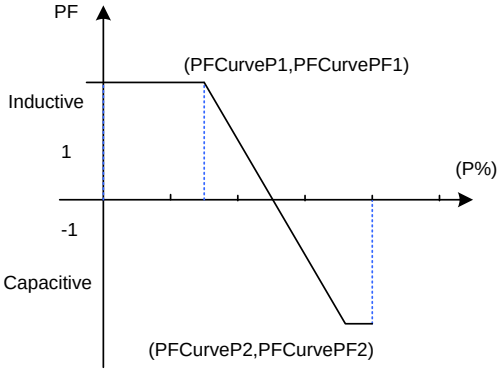


Figure 5-4 PF(P) Curve Mode

(3). Q(U) Curve: Q(U) curve mode

Note: The reactive compensation changes according to the grid voltage change, as shown in Figure 5-5.

INSTRUCTION:

The Q(U) curve function is only available for IEEE-1547 grid standards.

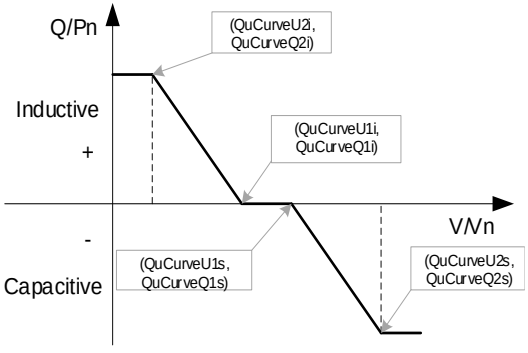


Figure 5-5 Q(U) Curve Mode

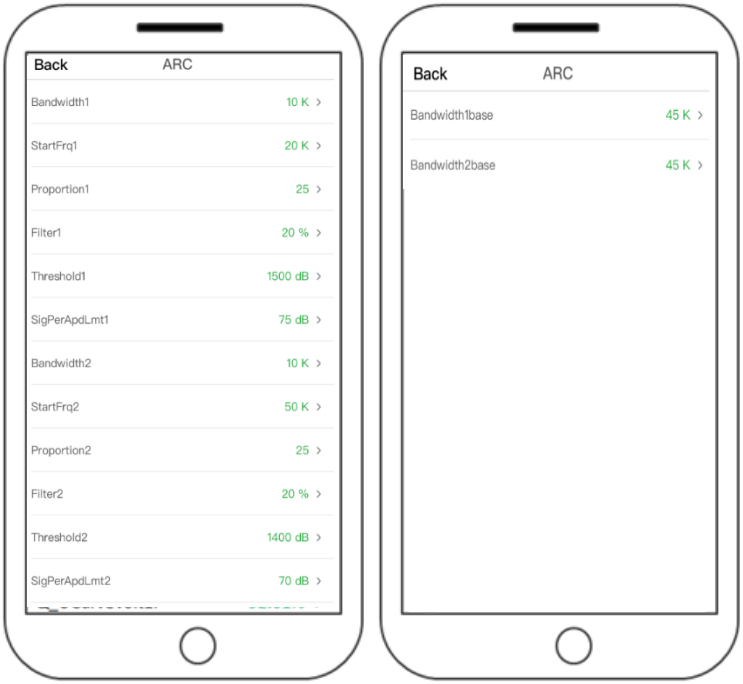
Table 5-3 Parameters of reactive power control (IEEE-1547, Rule-21 and ISO-NE)

Grid Reactive Power Derating					
Parameter name	**Description**	**Range**	**Grid code IEEE-1547**	**Grid code RULE-21**	**Grid code ISO-NE**
FIXED POWER FACTOR					
PF_Local	Local Power Factor Setting	{-1, 1}	{1}	{ -0.95}	{1}
PF(P) POWER FACTOR VS. POWER					
PF_PCurveActPw1（%）	Power of PF(P) point 1	{0,110%}	{50%}	{50%}	{50%}
PF_PcurvePF1	PF of PF(P) point 1	{-1,1}	{1}	{1}	{1}
PF_PcurveActPw2（%）	PF of PF(P) point 2	{0,110%}	{100%}	{100%}	{100%}
PF_PcurvePF2	PF of PF(P) point 2	{-1,1}	{-0.9}	{-0.9}	{-0.9}
PF_PcurveLockInV	Trigger voltage of PF(P)	{100%,110%}	{100%}	{100%}	{100%}
PF_PcurveLockOutV	PF end voltage	{90%,100%}	{90%}	{90%}	{90%}
Q(v) DYNAMIC VAR SUPPORT					
Q_UcurveVolt1s	Voltage of Q(U) point 1s	{100%, 110%}	{107.99%}	{103.30%}	{103.30%}
Q_UcurveReactPw1s	Reactive power of Q(U) point 1s	{-66%, 66%}	{0%}	{0}	{0%}
Q_UcurveVolt2s	Voltage of Q(U) point 2s	{104%,110%}	{110%}	{107%}	{107%}
Q_UcurveReactPw2s	Reactive power of Q(U) point 2s	{-66%, 66%}	{-50%}	{-30%}	{-30%}
Q_UcurveVolt1i	Voltage of Q(U) point 1i	{90% ,99%}	{92.01%}	{96.70%}	{96.70%}
Q_UcurveReactPw1i	Reactive power of Q(U) point 1i	{-66%, 66%}	{0%}	{0%}	{0%}
Q_UcurveVolt2i	Voltage of Q(U) point 2i	{80%, 92%}	{90%}	{92%}	{92%}
Q_UcurveReactPw2i	Reactive power of Q(U) point 2i	{-66%, 66%}	{50%}	{30%}	{30%}
Q_UcurveLockInP	The trigger voltage of Q(U)	{5%, 100%}	{20%}	{20%}	{20%}
Q_UcurveLockOutP	The end voltage of Q(U)	{5%, 100%}	{5%}	{5%}	{5%}

5.4.2.4 ARC

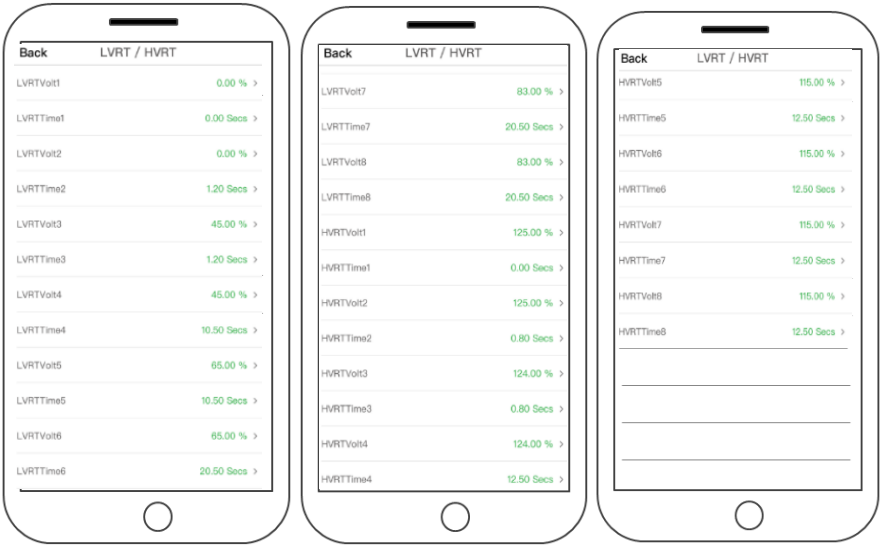
The **ARC** Fault detection parameters should ONLY be adjusted by CPS or Qualified representative. Enabled by Table 5-6 (5, 6).

Please note: Arc Fault is not an operational function for the 100/125kW Inverters.



5.4.2.5 LVRT/HVRT

The **LVRT/HVRT** menu is used to set the LVRT (Low voltage ride-through) and HVRT (High voltage ride-through) parameters as following: These functions are enabled with settings in Table 5.7-9 and 5.7-10.



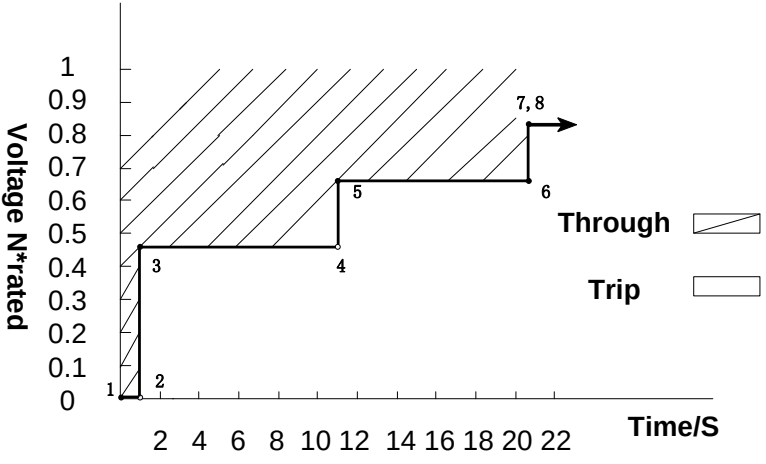


Figure 5-6 The LVRT Curve

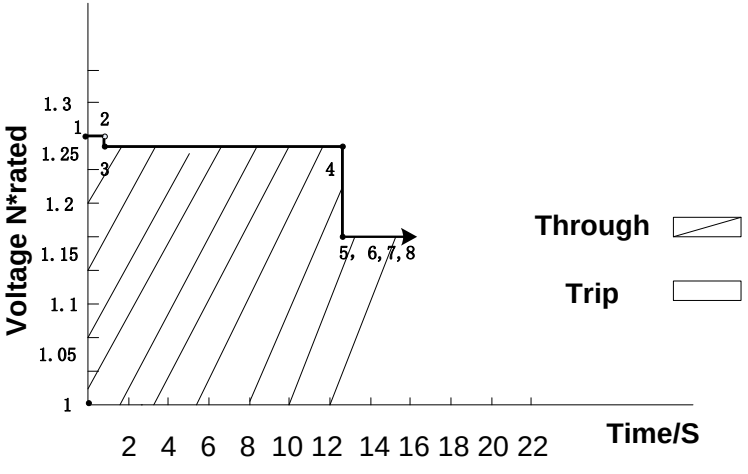


Figure 5-7 The HVRT Curve

Table 5-4 LVRT and HVRT Parameters

LVRT (Enable Table 5.7 - 9)					
Parameter name	**Description**	**Range**	**Grid code IEEE-1547**	**Grid code RULE-21**	**Grid code ISO-NE**
LVRTVoltPara (1,2)	Threshold LVRT (1st or 2nd point)	{0%, 100 -%} {0%, 100%}	{0%} {0%}	{0%} {0%}	{0%} {0%}
LVRTTimePara (1,2)	Time of LVRT (1st or 2nd point)	{0, 655} {0, 655}	{0} {1.2}	{0} {1.5.72}	{0} {0.16}
LVRTVoltPara (3,4)	Threshold LVRT (3rd or 4th point)	{0%, 100%} {0%, 100%}	{45%} {45%}	{50%} {50%}	{30%} {45%}
LVRTTimePara (3,4)	Time of LVRT (3rd or 4th point)	{0, 655} {0, 655}	{1.2} {10.5}	{1.2} {10.5}	{0.16} {0.21}
LVRTVoltPara (5,6)	Threshold LVRT (5th or 6th point)	{0%, 100%} {0%, 100%}	{65%} {65%}	{70%} {70%}	{45%} {65%}
LVRTTimePara (5,6)	Time of LVRT (5th or 6th point)	{0, 655} {0, 655}	{10.5} {20.5}	{10.5} {20.5}	{0.37} {0.37}
LVRTVoltPara (7,8)	Threshold of LVRT (7th or 8th point)	{0%, 100%} {0%, 100%}	{83%} {83%}	{88%} {88%}	{65%} {88%}
LVRTTimePara (7,8)	Time of LVRT (7th or 8th point)	{0, 655} {0, 655}	{20.5} {20.5}	{20.5} {20.5}	{3.05} {3.25}

HVRT (Enable Table 5.7 -10)					
Parameter name	**Description**	**Range**	**Grid code IEEE-1547**	**Grid code RULE-21**	**Grid code ISO-NE**
HVRTVoltPara (1,2)	Threshold of HVRT (1st or 2nd point)	{100%, 135%} {100%, 135%}	{125%} {125%}	{125%} {125%}	{120%} {120%}
HVRTTimePara (1,2)	Time of Level HVRT (1st or 2nd point)	{0, 655} {0, 655}	{0} {0.8}	{0} {0.11}	{0} {0.16}
HVRTVoltPara (3,4)	Threshold of HVRT (3rd or 4th point)	{100%, 135%} {100%, 135%}	{124%} {124%}	{120%} {120%}	{120%} {117.5%}
HVRTTimePara (3,4)	Time of Level HVRT (3rd or 4th point)	{0, 655} {0, 655}	{0.8} {12.5}	{0.11} {12.5}	{0.25} {0.25}
HVRTVoltPara (5,6)	Threshold of HVRT (5th or 6th point)	{100%, 135%} {100%, 135%}	{115%} {115%}	{110%} {110%}	{117.5%} {115%}
HVRTTimePara (5,6)	Time of Level HVRT (5th or 6th point)	{0, 655} {0, 655}	{12.5} {12.5}	{12.5} {12.5}	{0.55} {0.55}
HVRTVoltPara (7,8)	Threshold of HVRT (7th or 8th point)	{100%, 135%} {100%, 135%}	{115%} {115%}	{110%} {110%}	{115%} {110%}
HVRTTimePara (7,8)	Time of Level HVRT (7th or 8th point)	{0, 655} {0, 655}	{12.5} {12.5}	{12.5} {12.5}	{10.5} {10.5}

5.4.2.6 Others

The REF column is reference to Table 5-7 Enable functions.

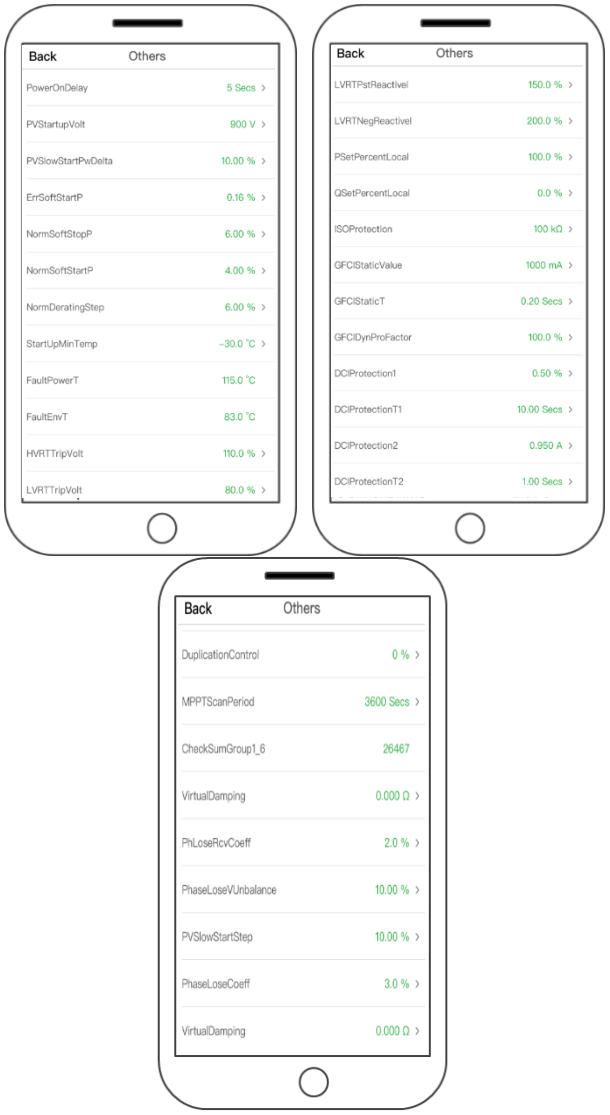


Table 5-5 Other Parameters

Parameter name	REF	Description	Range	Grid code IEEE-1547	Grid code RULE-21	Grid code ISO-NE
StartDelay (s)	N/A	Startup delay time	(0,1200)	(5)	(5)	(5)
PVStartVolt(V)	7	PV start-up voltage	(860,950)	(900)	(900)	(900)
PVPowerMutate Ratio (HECO)	35	Increasing Irradiation Power Ramp Rate	{0.01%, 10%}	{5.00%}	{5.00%}	{5.00%}
GridFaultPStaStep	N/A	Pwr Ramp after Fault	{0.01%,100%}	{0.16%}	{2%}	{2%}
StopPowerStep	11	Manual Stop Pwr Rate	{0.01%,100%}	{6.00%}	{2.00%}	{6.00%}
PsoftStaStep	N/A	Norm Start Pwr Rate	{0.01%,100%}	{4.00%}	{2.00%}	{2.00%}
PDeratingStep	N/A	Normal Pwr Derate Rate	{0.01%,100%}	{6.00%}	{100.00%}	{6.00%}
StartUpTemp	N/A	Start Up Temperature	{-35, -20}	{-30}	{-30}	{-30}
FaultPowerT	N/A	IGBT Fault Temp	94.0C	94.0C	94.0C	94.0C
FaultEnvT	N/A	Enclosure Fault Temp	78.5C	78.5C	78.5C	78.5C
HVRTTripVol	10	HVRT Trigger Voltage	{100%,135%}	{110%}	{110%}	{110%}
LVRTTripVol	9	LVRT Trigger Voltage	{70%,100%}	{80%}	{88%}	{88%}
LVRTPosCurrK	9	LVRT POS. current Coeff.	{0%,300%}	{150%}	{150%}	{150%}
LVRTNegCurrK	9	LVRT NEG. current Coeff.	{0%,300%}	{200%}	{20%}	{200%}
PSet_Pecent	3	Active power derate	{0%,110%}	{100%}	{100%}	{100%}
QSet_Pecent	2	Reactive power derate	{-66%,66%}	{0%}	{0%}	{0%}
Risomin	36	Minimum insulation resist.	{1k,2000k}	{100k}	{100k}	{100k}
GFCIStaProValue	27	Static Threshold Leakage current	{50%,400%}	{100%}	{100%}	{100%}
GFCIStaProTime	27	Static Threshold Leakage Time	{0,655}	{0.2}	{0.2}	{0.2}
GFCIDynProCoef	28	Threshold dynamic coefficient Leakage current	{0.0%,200%}	{100%}	{100%}	{100%}
DCIMax	30	Maximum DCI value	{0.1%,5.00%}	{0.50%}	{0.50%}	{0.50%}
DCIMax1Time	30	Trip time 1 of DCI value	{0.00,120.00}	{60.00}	{60.00}	{60.00}
DCIMax2 (mA)	31	Maximum DCI value2	{5,5000}	{950}	{950}	{950}
DCIMax2Time	31	Trip time 2 of DCI value	{0.00,120.00}	{1.00}	{1.00}	{1.00}
KprForRepeat	N/A	Current Replication THDi	{0%,100%}	{0%}	{0%}	{0%}
MPPTTime	4	MPPT Scan Cycle	{300,5400}	{3600}	{3600}	{3600}
CheckSumGroup	N/A					
VirtualDamping	N/A	Virtual resistance	0.00 – 5.00Ω	0.000Ω	0.000Ω	0.000Ω
PHLoseRcvCoeff	42	Phase loss recover coefficient	0.5% - 30.0%	2.0%	2.0%	2.0%
PhaseLoseVunbal	42	Phase loss fault Volt Balance	0.01% - 10%	10%	10%	10%
PVSlowStartStep	42	PV slow start step	0.01% - 100%	10%	10%	10%
PhaseLoseCoeff	42	Phase loss fault coefficient	0.5% - 30.0%	3.0%	3.0%	3.0%

5.4.2.7 Enable/Disable

The **Enable/Disable** menu is used to enable or disable the function and protect parameters as following:

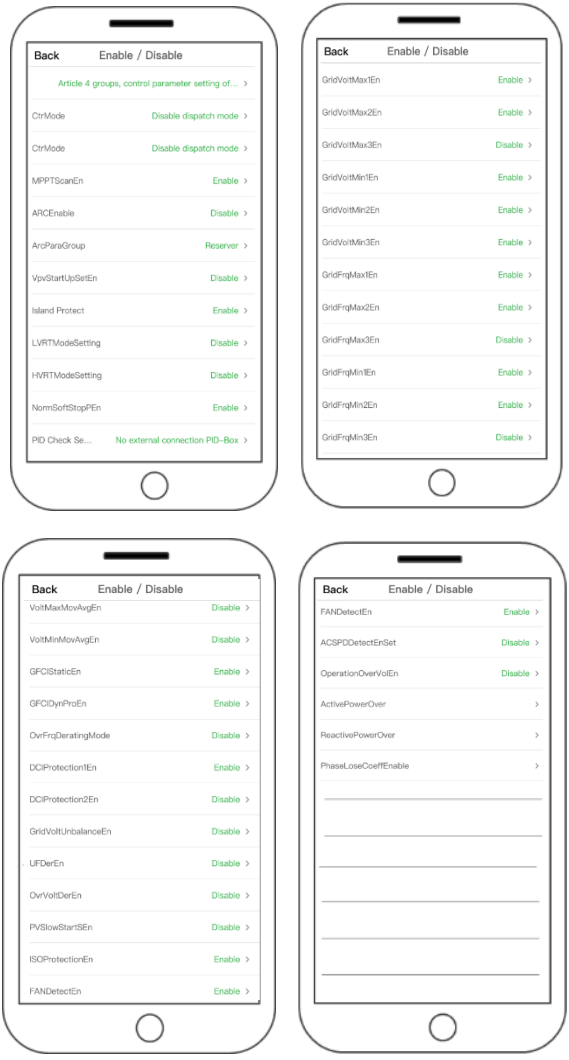


Table 5-6 The Enable/Disable Parameters (IEEE1547, Rule21 and ISO-NE)

REF	Parameter name	Description	Range	Grid code IEEE-1547	Grid code RULE-21	Grid code ISO-NE
1	CtrlParaGroup	Control Loop Parameters	{0,1,2,3,4}	{4}	{4}	{4}
2	CtrMode ReactivePwMode	Reactive power mode	Disable Dispatch Remote Dispatch Local Q Locat PF PF(P) Q(U)	{Disable}	{Disable}	{Disable}
3	CtrMode ActivePwMode	Active power mode	Disable Dispatch Remote Dispatch Local Control	{Disable}	{Disable}	{Disable}
4	MPPTScan		{Disable, Enable}	{Enable}	{Enable}	{Enable}
5	ArcEnable	AFCI Not Available	{Disable, Enable}	{Disable}	{Disable}	{Disable}
6	ARCParaGroup	AFCI Not Available	Reserved	Reserved	Reserved	Reserved
7	VpvStartUpSetEn	PV Voltage Min.	{Disable, Enable}	{Disable}	{Disable}	{Disable}
8	Island Protect	Anti-Island	{Disable, Enable}	{Enable}	{Enable}	{Enable}
9	LVRTModeSetting		Disable Enable No Q Enable w/ Q	{Disable}	{Enable w/Q}	{Disable}
10	HVRTModeSetting		Disable Enable No Q Enable w/ Q	{Disable}	{Enable No Q}	{Disable}
11	NormSoftStopPEn SoftStopEn	soft **STOP** ramp function	{Disable, Enable}	{Enable}	{Enable}	{Enable}
12	PID Check Settings		No External PID External PID Box Reserved	No External PID Box	No External PID Box	No External PID Box
13	GridVolMax1En	Grid Protection	{Disable, Enable}	{Enable}	{Enable}	{Enable}
14	GridVolMax2En	Grid Protection	{Disable, Enable}	{Enable}	{Enable}	{Enable}
15	GridVolMax3En	Grid Protection	{Disable, Enable}	{Disable}	{Disable}	{Disable}
16	GridVolMin1En	Grid Protection	{Disable, Enable}	{Enable}	{Enable}	{Enable}
17	GridVolMin2En	Grid Protection	{Disable, Enable}	{Enable}	{Enable}	{Enable}
18	GridVolMin3En	Grid Protection	{Disable, Enable}	{Disable}	{Disable}	{Disable}
19	GridFrqMax1En	Grid Protection	{Disable, Enable}	{Enable}	{Enable}	{Enable}
20	GridFrqMax2En	Grid Protection	{Disable, Enable}	{Enable}	{Enable}	{Enable}
21	GridFrqMax3En	Grid Protection	{Disable, Enable}	{Disable}	{Disable}	{Disable}
22	GridFrqMin1En	Grid Protection	{Disable, Enable}	{Enable}	{Enable}	{Enable}
23	GridFrqMin2En	Grid Protection	{Disable, Enable}	{Enable}	{Enable}	{Enable}
24	GridFrqMin3En	Grid Protection	{Disable, Enable}	{Disable}	{Disable}	{Disable}

REF	Parameter name	Description	Range	Grid code IEEE-1547	Grid code RULE-21	Grid code ISO-NE
25	VMaxMovAvgEn	Moving Avg Function .	{Disable, Enable}	{Disable}	{Disable}	{Disable}
26	VMinMovAvgEn	Moving Avg Function	{Disable, Enable}	{Disable}	{Disable}	{Disable}
27	GFCIStaEn	Static GFCI	{Disable, Enable}	{Enable}	{Enable}	{Enable}
28	GFCIDynEn	Dynamic GFCI	{Disable, Enable}	{Disable}	{Disable}	{Disable}
29	OFDerEn	ActivePowerDerate	{Disable, Enable}	{Disable}	{Disable}	{Disable}
30	DCIMax1En	DC Current Injection	{Disable, Enable}	{Enable}	{Enable}	{Enable}
31	DCIMax2En	DC Current Injection	{Disable, Enable}	{Disable}	{Disable}	{Disable}
32	VgridUnbalanceEn	Grid Voltage Imbalance	{Disable, Enable}	{Disable}	{Enable}	{Enable}
33	UFDerEn	Under Frequency Derate (Reserved)	{Disable, Enable}	{Disable}	{Disable}	{Disable}
34	VgridDerEn	Over Voltage Derate	{Disable, Enable}	{Disable}	{Disable}	{Disable}
35	PowerMutateRatio (HECO)	Increased Irradiation Ramp Rate	{Disable, Enable}	{Disable}	{Disable}	{Disable}
36	ISOEn	Insulation Resistance	{Disable, Enable}	{Enable}	{Enable}	{Enable}
37	FanDetectEn	fans detect function	{Disable, Enable}	{Enable}	{Enable}	{Enable}
38	AcSPDTesEn	AC surge protection device test function	{Disable, Enable}	{Disable}	{Disable}	{Disable}
39	OptOverVolDectEn	Over voltage detect	{Disable, Enable}	{Disable}	{Disable}	{Disable}
40	ActivePowerOver	Real Power Over N/A	{Disable, Enable}	{Disable}	{Disable}	{Disable}
41	ReactivePowerOver	KVA Overhead	{Disable, Enable}	{Disable}	{Disable}	{Disable}
42	PhaseLoseCoeff Enable	Loss of Single Phase detection with Voltage Regeneration	1.Disable 2.Enable Before Connect 3.Always Enable 4.Enhanced	{Disable}	{Disable}	{Disable}

5.4.2.8 Commands

In the **Command** section it's possible to access the following sub-menus:

- Power On/Off
- Force Restart
- Factory Reset
- Auto Test
- MPPT Scan
- CEI

"Power On/Off" menu: **Manual Turn ON/OFF**: Manual Power ON/OFF is required after regulation setting or manual (fault) shut-down.

"**Force Restart**" menu: If a fault shutdown happens, a severe fault may have occurred inside the inverter. The user can perform a force reboot for one time per Power on in this menu if the user needs to restart the inverter.

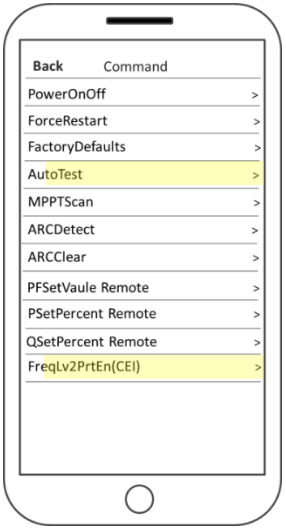
"Factory Reset" menu: The manufacturer's parameter default values can be restored when the inverter is not in operation mode. Otherwise "Fault Operated" will be reported.

“MPPTScan” menu: “**MPPTScan**” is used to execute the MPPT scanning manually. The device screen will skip to normal operation interface if the MPPT scanning succeeds, or remain on the **MPPTScan** menu interface if the scanning fails.

The MPPT scan function is used for multi-MPP tracking, and is useful if the PV panels are partly shadowed or installed with different angles. The factory default setting of MPPT scan is **Enabled**, yet can also be set to Disabled. When the MPPT scan function is enabled, the scan period is 60 minutes. The inverter will scan the maximum power point in the MPPT range, according to the following conditions:

The total input power is lower than 90% of the active power.

Once this MPPT scan function is activated on the device, it will search the maximum power point at a voltage step of 5V in the MPPT range for full load, and retrieve the maximum power point.



“AutoTest”: Only for Italian Grid Standard

“CEI”: Only for Italian Grid Standard

5.4.3 Fault Recording

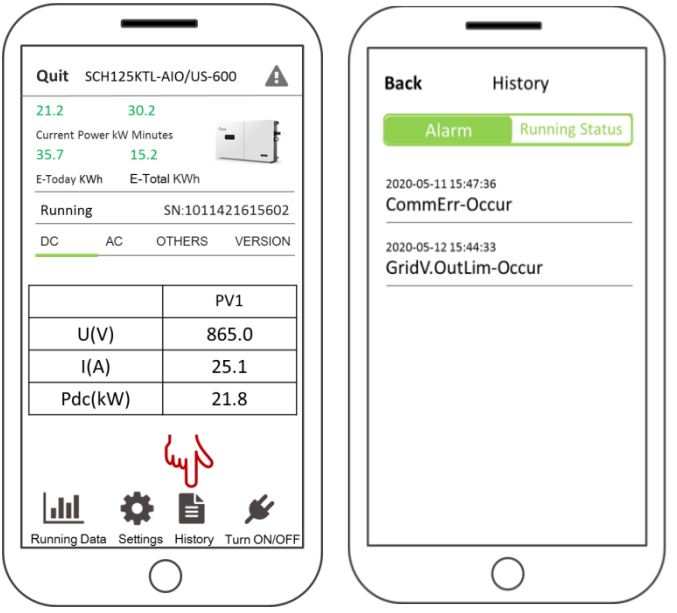
The last record can store up 128 fault records in “**Fault Record**” menu.

5.4.4 Firmware Upgrade

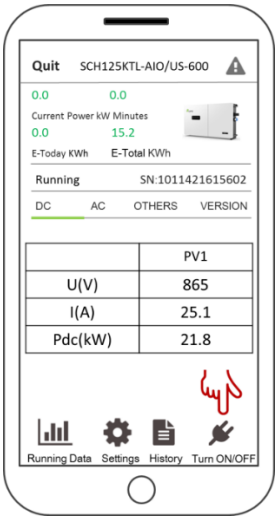
If the inverter firmware version needs to be updated, please contact the CPS Service Hotline at: +1 855-584-7168 Ext. 1.

5.5 History

There are 2 submenus in the **History** menu: “**Alarm**” and “**Running Status**”.



5.6 Turn ON/OFF



Manual Turn ON/OFF: Manual Power ON/OFF is required after regulation setting or manual (fault) shut-down. Touch to submenu **"Turn ON/OFF".** Then move the cursor to "Turn ON" to start the inverter, the inverter will start up and operate normally if the start-up condition is met. Otherwise, the inverter will go to stand-by mode.

Normally, it is not necessary to Turn OFF the inverter, but it can be shut down manually if regulation setting or maintenance is required.

Move the cursor to submenu **"Turn ON/OFF"**. Move the cursor to "Turn OFF" and ensure, then the inverter will be shut down.

Automatic Turn ON/OFF: The inverter will start up automatically when the output voltage and power of PV arrays meet the set value, AC power grid is normal, and the ambient temperature is within allowable operating range.

The inverter will be shut down automatically when the output voltage and power of PV modules are lower than the set value, or AC power grid fails; or the ambient temperature exceeds the normal range.

Chapter 6 Fault Shutdown and Troubleshooting

6.1 LED Fault and Troubleshooting

The inverters have four LED lights on the front of the units. Table 6-1 describes the lights during operation.

Table 6-1 Description of LED Light Indicators

LED light	Name	Status	Indication
POWER	Working power light	Light on	PV Energized (control panel starts to work) and AC no power on
		Flash	PV no power and AC Power on
		Light off	No Power working
RUN	Grid-tied operation indication light	Light on	In grid-tied power generation state
		Flash	Derated running status (light up 0.5s, light off 1.5s)
		Light off	In other operation status or power supply not working
GRID	Grid status indication light	Light on	Grid is normal
		Flash	Grid fault (light up 0.5s, light off 1.5s)
		Light off	Power supply not working
FAULT	Fault status indication light	Light on	Indicates a Fault
		Slow flash	Indicates Alarm (light up 0.5s, light off 2s)
		Fast flash	Protective action (light up 0.5s, light off 0.5s)
		Light off	No fault or power supply not working
ALL	Upgrade status	flash	LCD or DSP upgrading

Table 6-2 Troubleshooting of LED Lights

LED fault status	Solutions
The **Power** LED does not light up.	1. Turn off the external AC breaker 2. Switch the DC switch to “OFF” position 3. Check the PV input voltage and polarity
The **GRID** LED is blinking.	1. Turn off the external AC breaker 2. Switch the DC switch to “OFF” position 3. Check whether the grid voltage is normal and whether the cable connection of AC side is correct and secure
The **RUN** LED light is off or **FAULT** LED lights up.	Refer to **Table 6-3** for troubleshooting

6.2 Fault and Troubleshooting

The inverter will be shut down automatically if the PV power generation system fails, such as output short circuit, grid overvoltage / undervoltage, grid overfrequency / underfrequency, high environmental temperature or internal malfunction of the machine. The fault information will be displayed on the APP interface. Please refer to “5.4.3 Fault Recording” for detailed operation.

The causes of a fault can be identified based on the faults listed in **Table 6-3 to Table 6-6**. Proper analysis is recommended before contacting after-sales service. There are 4 types of faults: **Alarm**, **Protection, Fault** and **Warn**.

Table 6-3 Troubleshooting Alarm Codes

ALARM CODES	
1.CommErr	**Definition: Communication inside inverter fails**
	Possible causes: Terminal block connecters of internal communication wires have poor contact
	Recommended solutions: 1. Observe for 5 minutes and see whether the alarm will be eliminated automatically; 2. Switch off 3-phase working power supply and then reboot the system; 3. Contact after-sales service personnel
2.ExtFanErr	**Definition: Cooling fan failure by visual check**
	Possible causes: 1. Fan is blocked; 2. Fan service life has expired; 3. Fan socket connecter has poor contact.
	Recommended solutions: 1. Observe for 5 minutes and see whether the alarm will be eliminated automatically; 2. Check for foreign objects on fan blades; 3. Switch off 3-phase power supply and then reboot the system; 4. Contact after-sales service personnel
3. IntFanErr	Recommended solutions: 1. Observe for 5 minutes and see whether the alarm will be eliminated automatically; 2. Check for foreign objects on fan blades; 3. Switch off 3-phase work power supply and then reboot the system; 4. Contact after-sales service personnel.

Table 6-4 Troubleshooting Warning Codes

WARNING CODES	
Warn0030 (EepromErr)	**Definition: Internal alarm** Recommended solutions: 1. Observe for 5 minutes and see whether the alarm will be eliminated automatically; 2. Contact after-sales service personnel.
Warn0040 (DC SPD fault)	Recommended solutions: The alarm is reserved now. The alarms in field can be ignored.
Warn0050 (TempSensorErr)	Recommended solutions: 1. Observe temperature display; 2. Switch off 3-phase working power supply and then reboot the system; 3. Contact after-sales service personnel.
Warn0100 (AC SPD fault)	Recommended solutions: The alarm is reserved now. The alarms in field can be ignored.

Table 6-5 Troubleshooting Protection Codes

PROTECTION CODES	
Protect0090 (Bus over voltage)	Recommended solutions: 1. Restart inverter by recycle both AC and DC switches. Wait for 1 minute between OFF and ON for all energy to discharge. 2. If inverter cannot clear fault, replace inverter.
Protect0070 (Bus imbalance)	Recommended solutions: 1. Raise limit of IDCmax (for example, 400mA) to allow inverter more room to adjust in transient condition to cope with imbalance of impedance and voltage between Grid phases. 2. If after adjustment, alarm still occurs, replace inverter.
Protect0030 (Inverter Over Current)	Recommended solutions: 1. Restart inverter by recycle both AC and DC switches. Wait for 1 minute between OFF and ON for all energy to discharge. 2. If inverter cannot clear fault, replace inverter.
GridV.OutLim	Recommended solutions: 1. Make sure the grid connection is good. 2. Restart the inverter again.
GridF.OutLim	Recommended solutions: 1. Check the AC wires connection and AC frequency is in range; 2. Check the measurement value in LCD, if the grid frequency is in limit, restart the inverter.
Protect0020 (Grid relay error)	Recommended solutions: 1. Restart inverter by recycle both AC and DC switches. Wait for 1 minute between OFF and ON for all energy to discharge. 2. If inverter cannot clear fault, replace inverter.
TempOver (Over-temperature protection)	Recommended solutions: 1. Confirm that external ambient temperature is within the specified range of operating temperature; 2. Check whether air inlet is blocked; 3. Check whether fan is blocked; 4. Check whether the location of installation is appropriate or not; 5. Observe for 30 minutes and see whether the alarm will be eliminated automatically; 6. Contact after-sales service personnel.
Protect0180 (The sampling offset of DCI)	Recommended solutions: 1. If the inverter can start up, then recalibrate. 2. If the inverter consistently reports this alarm and cannot

PROTECTION CODES	
	start up, then replace inverter.
Protect0170 (DCI high)	Recommended solutions: 1. Raise limit of DCImax (for example, 400mA) to allow inverter more room to adjust in transient condition to cope with imbalance of impedance and voltage between Grid phases. 2. After raising limit, if inverter cannot clear fault, replace inverter.
IsolationErr (Insulation resistance low)	Check wires of PV and ground: 1. Turn OFF AC switch to disconnect inverter from Grid. 2. Open fuse drawers to de-couple PV strings from each other. Test strings with string test set. 3. Add one PV string at a time and start up inverter to see if alarm occurs. 4. If there is no alarm, turn OFF AC switches to disconnect from Grid and add in the next string. Startup inverter again. 5. Continue until you can find the string that triggers the alarm. Trace wirings of faulted string to find any leakage to Earth Ground. 6. The parameter ISOResist in hidden menu can be adjusted.
GFCIErr (leakage current high)	Check wires of PV and ground: 1. Turn OFF AC switch to disconnect inverter from Grid. 2. Open fuse drawers to de-couple PV strings from each other. Test strings with string test set 3. Add one PV string at a time and start up inverter to see if alarm occurs. 4. If there is no alarm, turn OFF AC switches to disconnect from Grid and add in the next string. Startup inverter again. 5. Continue until you can find the string that triggers the alarm. Trace wirings of faulted string to find any leakage to Earth Ground.
Protect0150 (Mini MCU Fault)	Recommended solutions: 1. Restart inverter by recycling both AC and DC switches. Wait for 1 minute between OFF and ON for all energy to discharge. 2. If inverter cannot clear fault, replace inverter.
Protect0110 (BUS over voltage (firmware))	Recommended solutions: 1. Restart inverter by recycling both AC and DC switches. Wait for 1 minute between OFF and ON for all energy to discharge. 2. If inverter cannot clear fault, replace inverter.

PROTECTION CODES	
Protect0100 (The sensor fault of leakage current)	Recommended solutions: 1. Restart inverter by recycling both AC and DC switches. Wait for 1 minute between OFF and ON for all energy to discharge. 2. If not cleared, replace Filter board or inverter.
PV Reverse (PV input reverse connection)	Recommended solutions: 1. Turn DC Switch OFF 2. Open Fuse holder to isolate PV strings 3. Use meter to find which PV string is connected in reverse polarity Correct PV string connection
PV Over current (PV Over current)	Recommended solutions: 1. Check PV input Current 2. Restart inverter by recycling both AC and DC switches. Wait for 1 minute between OFF and ON for all energy to discharge. If inverter cannot clear fault, replace inverter.
PVVoltOver	Recommended solutions: 1. Measure voltage at DC terminals in wire-box and compare with reading in Measurement menu. PV voltage must be less than 1500V in open circuit condition. If display reading is not within 2% of meter reading, replace inverter. If display reading is within 2% of meter reading, adjust number of panel in the string.
Protect0230 (Inverter open-loop self-test fault)	Recommended solutions: 1. Restart inverter by recycling both AC and DC switches. Wait for 1 minute between OFF and ON for all energy to discharge. 2. If inverter cannot clear fault, replace inverter.
ARC Protect	1. Check logic connector to Arc board to be secure. 2. Run Arc Fault Test from Settings Menu 3. If Alarm re-occurs, replace arc board or wiring box
Arcboard Err	1. Check logic connector to Arc board to be secure. 2. Run Arc Fault Test from Settings Menu 3. If Alarm re-occurs, replace arc board or wiring box

Table 6-6 Troubleshooting Fault Codes

FAULT CODES	
Fault0130 (Bus over total voltage)	Recommended solutions: 1. Restart inverter by recycle both AC and DC switches. Wait for 1 minute between OFF and ON for all energy to discharge. 2. If inverter cannot clear fault, replace inverter.
Fault0110 (Bus imbalance)	Recommended solutions: 1. Raise limit of IDCmax (for example, 400mA) to allow inverter more room to adjust in transient condition to cope with imbalance of impedance and voltage between Grid phases. 2. If after adjustment, alarm still occurs, replace inverter.
Fault0100 (Grid relay fault)	Recommended solutions: 1. Restart inverter by recycle both AC and DC switches. Wait for 1 minute between OFF and ON for all energy to discharge. 2. If inverter cannot clear fault, replace inverter.
Fault0090 (Dynamic leakage current high)	Check wires of PV and ground: 1. Turn OFF AC switch to disconnect inverter from Grid. 2. Open fuse drawers to de-couple PV strings from each other. Test strings with string test set. 3. Add one PV string at a time and start up inverter to see if alarm occurs. 4. If there is no alarm, turn OFF AC switches to disconnect from Grid and add in the next string. Startup inverter again. 5. Continue until you can find the string that triggers the alarm. Trace wirings of faulted string to find any leakage to Earth Ground.
Fault0080 (Bus Hardware over current fault)	Recommended solutions: 1. Restart inverter by recycling both AC and DC switches. Wait for 1 minute between OFF and ON for all energy to discharge. 2. If inverter cannot clear fault, replace inverter.

FAULT CODES	
Fault0060 (CPLD Fault)	Recommended solutions: 1. Restart inverter by recycling both AC and DC switches. Wait for 1 minute between OFF and ON for all energy to discharge. 2. If inverter cannot clear fault, replace Control Board or inverter.
Fault0020 (Bus over volt Hardware)	Recommended solutions: 1. Restart inverter by recycling both AC and DC switches. Wait for 1 minute between OFF and ON for all energy to discharge. 2. 2. If inverter cannot clear fault, replace inverter.
Fault0150 (Open-loop self-check failure)	Recommended solutions: 1. Restart inverter by recycling both AC and DC switches. Wait for 1 minute between OFF and ON for all energy to discharge. 2. If inverter cannot clear fault, replace inverter.

DANGER:
Please disconnect the inverter from AC grid and PV modules before opening the equipment. Make sure hazardous high voltage and energy inside the equipment has been discharged.
Do not operate or maintain the inverter until at least 5 minutes after disconnecting all sources of DC and AC.

Chapter 7 Product Maintenance

7.1 General Maintenance

To ensure optimal performance keep the Air Inlets Clean. Check the heat sink for debris using a flashlight though the fan inlets. Clogged heat-sinks will cause the fan duty-cycle to increase and reduce the life expectancy of the fans. The heat-sink can be cleaned by forcing pressurized are through the fan openings. The fans can be removed for the cleaning process.

Tight connections will optimize reliability. Connections should be checked using the torque summary table below.

Torque Table	SI Unit	USCS
ELECTRICAL CONNECTIONS		
DC String Wiring for Standard WB	3 N-m	26.5 in-lbs
DC Cable for Centralized WB (Version #1)	14.2 N-m	126 in-lbs
DC Cable for Centralized WB (Version #2)	22.5 N-m	200 in-lbs
AC terminal M10 (L1 - L3) Standard & Central Ver #2 WB	22.5 N-m	200 in-lbs
AC terminal Screw-clamp (N) Standard & Central Ver #2 WB	14N-m	120 in-lbs
AC terminal M8 (L1 - L3) Central Ver #1 WB	14.2 N-m	126 in-lbs
AC terminal M8 (N) Central Ver #1 WB	14.2N-m	126 in-lbs
Internal grounding bar A	3 N-m	26.5 in-lbs
Internal grounding bar B	5 N-m	45 in-lbs
Internal grounding stud	6 N-m	52.8 in-lbs
External grounding point	6 N-m	52.8 in-lbs
RS485 Communication	0.2 N-m	1.8 in-lbs
MECHANICAL CONNECTIONS		
Inverter to Bracket	6 N-m	52.8 in-lbs
Cover	4 N-m	35.4 in-lbs
Main to Wire Box	12.5 N-m	111 in-lbs
Fan Replacement	1.6 N-m	14.2 in-lbs

7.1.1 Check Electrical Connections

Check all the cable connections as a regular maintenance inspection every 6 months or once a year.

1.) Check the cable connections. If loose, please tight all the cables referring to “3.3 Electrical installation”.
2.) Check for cable damage, especially whether the cable surface is scratched or smooth. Repair or replace the cables if necessary.

7.1.2 Clean the Air Vent Filter

The inverter can become hot during normal operation. CPS SCH100/125KTL-DO/US-600 and SCH 100KTL-DO/US-480 inverters use built in cooling fans to provide sufficient air flow to help in heat dissipation.

Check the air vent regularly to make sure it is not blocked and clean the vent with soft brush or vacuum cleaner if necessary.

7.1.3 Replace the Cooling Fans

If the internal temperature of the inverter is too high or abnormal noise is heard assuming the air vent is not blocked and is clean, it may be necessary to replace the external fans. Attention: please disconnect the AC & DC power when replacing the fans.

Please refer to Figure 7-1 for replacing the cooling fans.

(1) Use a No.2 Phillips head screwdriver to take off the 12 screws on the fan tray. (Figure 7-1.1)

(2) Disconnect the waterproof cable connector from cooling fan. (Figure 7-1.2)

(3) Use a No.2 Phillips head screwdriver to remove the screws. (Figure 7-1.3)

(4) Attached the new cooling fans on the fan tray and fasten the cable on the fan tray with cable ties.
Torque value: 1.6 Nm (14.2 in-lbs)

(5) Install the assembled fans back to the inverter.
Torque value: 1.6 Nm (14.2 in-lbs)

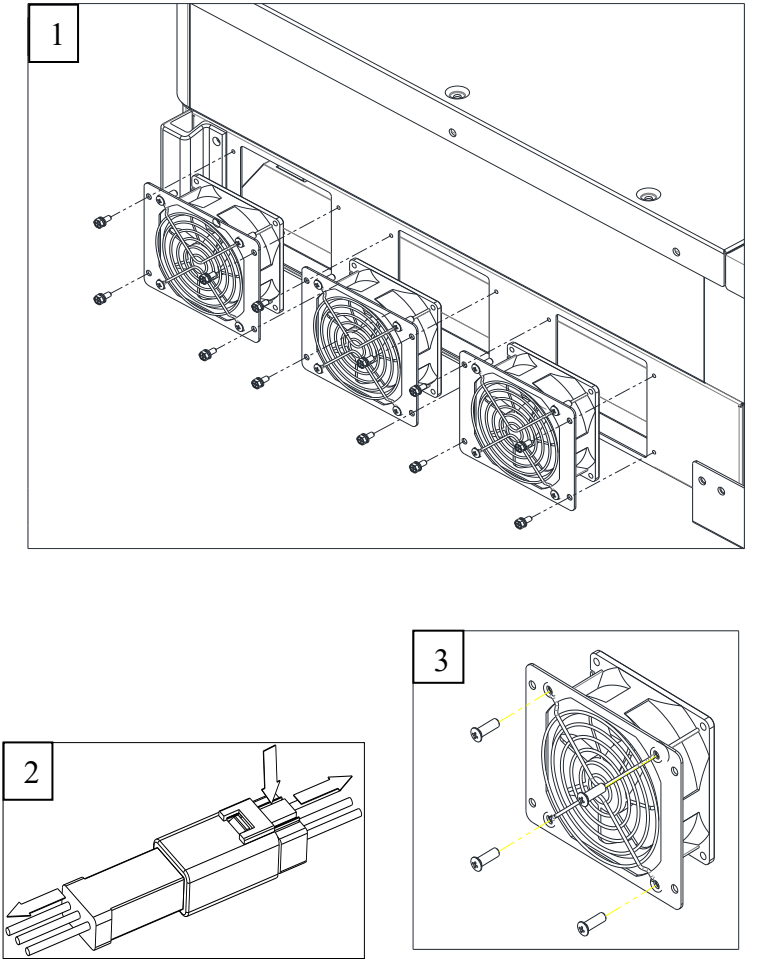


Figure 7-1 Replace cooling fans

7.4 Replace the Inverter

Confirm the following steps before replacing the inverter:

(1) The AC breaker of inverter is turned off.

(2) The DC switch of inverter is turned off.

Replace the inverter according to the following steps:

(1) Unlock the padlock if it is installed on the inverter.

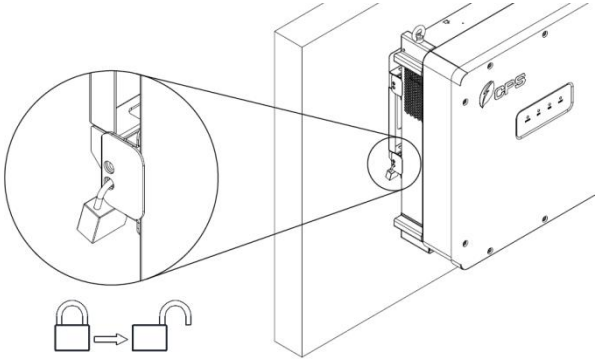


Figure 7-2 Unlock the Padlock

(2) Use a No. 3 Phillips head screwdriver to unscrew the 2 screws on top of both the wire-box and inverter to remove the connector covers.

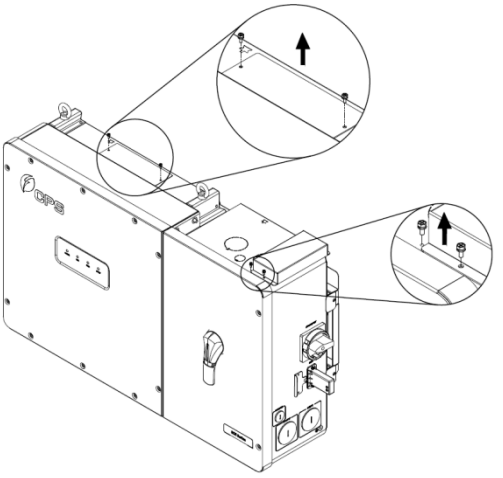


Figure 7-3 Remove the screws on both sides

(3) Use a 13mm hex head wrench to remove the 4 screws between the main inverter enclosure and the wire-box. Slide the wire-box right to disconnect the inverter from the wire-box.

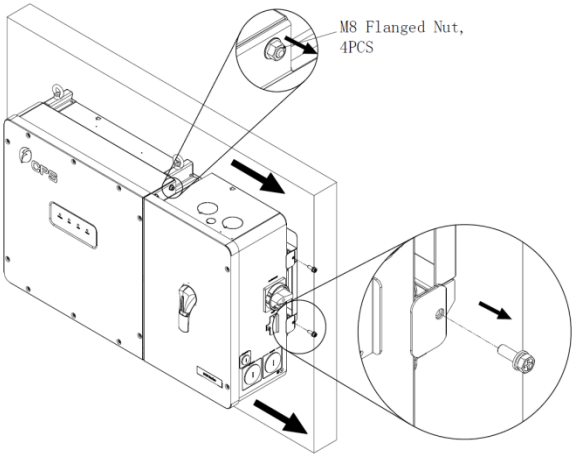


Figure 7-4 Disconnect the main housing from the wire-box

(4) Remove the screws connecting the inverter enclosure and installation rail, then slide the inverter enclosure left on the rail to remove.

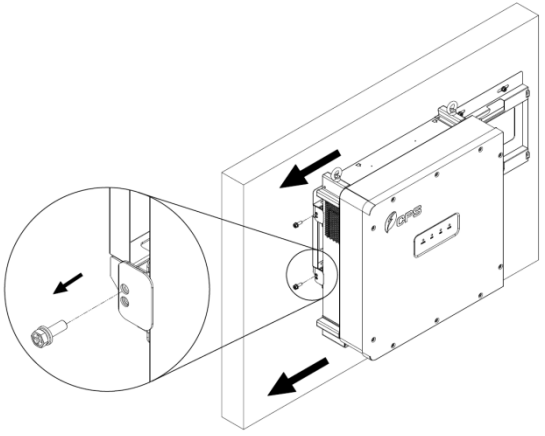


Figure 7-5 Remove the 2 screws between main housing and rail

(5) Use a No. 2 phillips head screwdriver to install the connector covers on the connector of the wire-box and inverter. Torque value: 1.6Nm (14.2 in-lbs)

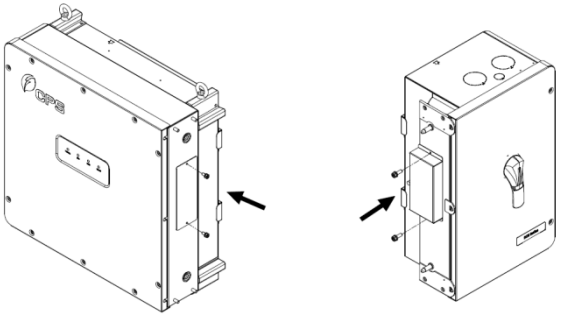


Figure 7-6 Install the Cover on the Connector of the Wire-box

Chapter 8 Technical Data

(for Reference Only – Refer to Datasheet on website for latest information)

	SCH100KTL-DO/US-600	SCH125KTL-DO/US-600	SCH100KTL-DO/US-600
DC Input – UNGROUNDED ARRAY			
Max. PV Power	187.5kWdc		
Max. DC Input Voltage	1500Vdc		
Operating DC Input Voltage Range	860-1450Vdc		750-1450Vdc
MPPT Voltage Range	870-1300Vdc		760-1300Vdc
Start-up DC Input Voltage	900V		
Number of DC Inputs	20 PV source circuits, pos. & neg. fused (Standard Wire-box); 1 PV output circuit, 1-2 terminations per pole, non-fused (Centralized Wire-box)		
Max. PV Input Current (Isc x 1.25)	275A		
DC Disconnection Type	Load rated DC Switch		
AC Output – Grounded WYE/Floating WYE/FLOATING DELTA (Note 4)			
Rated AC Output Power	100kW	125kW	100kW
Max. AC Output Power	100kVA (111KVA @PF>0.9)	125kVA/ (132KVA @ PF>0.95)	100kVA (105.3KVA @PF>0.95)
Rated Output Voltage	600Vac		480Vac
Output Voltage Range (2)	528-660Vac		423-528Vac
Grid Connection Type (3)	3Φ / PE / N (Neutral optional)		
Max AC Output Current	96.3/106.8A @ 600V	120.3/127.0A @ 600V	120.3/126.7A @ 480V
Rated Output Frequency	60Hz		
Output Frequency Range	57-63Hz		
Power Factor	>0.99 (±0.8 adjustable)		
Current THD	<3%		
AC Disconnection Type	Load-rated AC switch		
System and Performance			
Topology	Transformerless		
Max. Efficiency	99.1%		98.9%
CEC Efficiency	98.5%		98.0%
Stand-by / Night consumption	<4W		

Environment	
Enclosure Protection Degree	NEMA Type 4X
Cooling Method	Variable speed cooling fans
Operation Temperature Range	-22°F to +140°F/- 30°C to +60°C (derating from +113°F/+45°C)
Storage Temperature Range	-40F to +158°F/-40°C +70°C maximum
Operating Humidity	0-95%, non-condensing
Operating Altitude	8202ft / 2500m
Display and Communication	
User Interface and Display	LED Indicators, APP
Inverter Monitoring	Modbus RS485 / PLC Option
Site Level Monitoring	CPS Flex Gateway (1 per 32 inverters)
Modbus Data Mapping	SunSpec/CPS
Remote Diagnostics / FW Upgrade Functions	Standard with CPS Flex Gateway
Mechanical Data	
Dimensions (WxHxD) (mm)	45.28x24.25x9.84in (1150x616x250mm) with Standard Wire-box 39.37x24.25x9.84in (1000x616x250mm) with Centralized Wire-box
Weight (kg)	Inverter: 121lbs / 55kg; Wire-box: 55lbs / 25kg (Standard Wire-box); 33lbs / 15kg (Centralized Wire-box)
Mounting/Installation Angle	15- 90 degrees from horizontal
Safety	
Safety and EMC Standard	CSA-C22.2 NO.107.1-16, UL Std. No. 1741, CSA TIL M-07, FCC CFR 47 part15, ANSI C63.4-2014
Grid Standard and SRD	IEEE 1547a-2014, IEEE1547-2003(R2008), IEEE1547.1-2005(R2011), IEEE1547.1a-2015, CA Rule 21 and UL1741 Supplement A, ISO-NE

1) "Max. AC Apparent Power" rating at an operating voltage and temperature range of -30°C to +40°C (-22°F to +104°F) can output.
2) The "Output Voltage Range" and "Output Frequency Range" may differ according to the specific grid standard.
3) Wye can support the TT/TN-C/TN-S/TN-C-S, Delta cannot support Grounding system.
4) GFCI in AC Switchgear required for Floating AC systems.

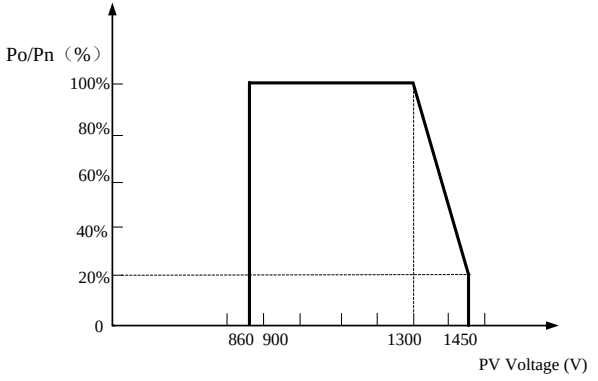


Figure 8-1
CPS SCH100/125KTL-US-600 derating curve of PV input voltage

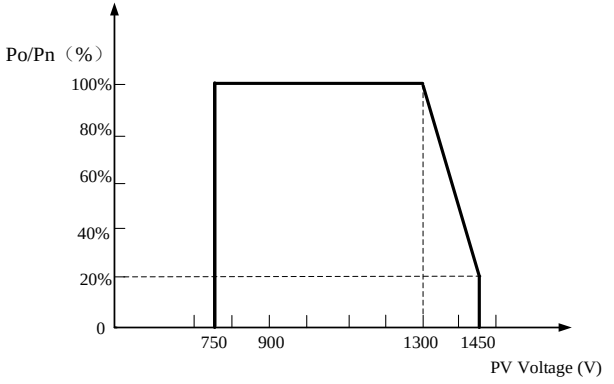


Figure 8-2
CPS SCH100KTL-US-480 derating curve of PV input voltage

When the DC input voltage is higher than 1300V, the inverter begins derating, as shown in Figures 8-1 and 8-2.

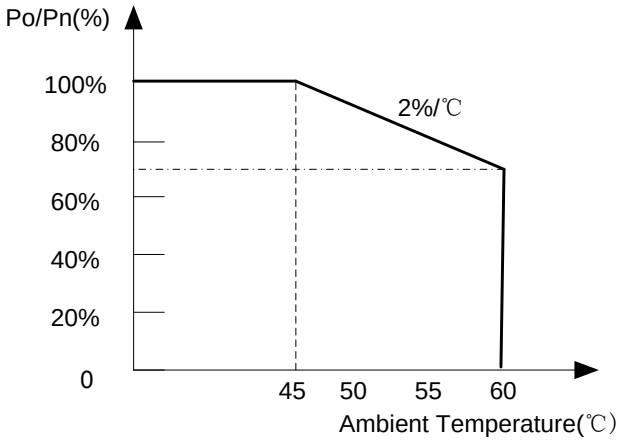


Figure 8-3 CPS SCH100/125KTL-US-600 Derating Curve with High Temperature

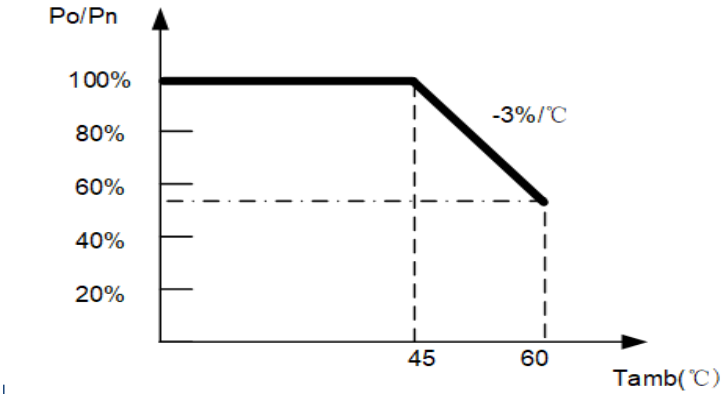


Figure 8-3 CPS SCH100KTL-US-480 Derating Curve with High Temperature

When the ambient temperature is higher than 113℉/ 45℃, the inverter output power will begin to derate, as shown in Figures 8-2 and 8-3.

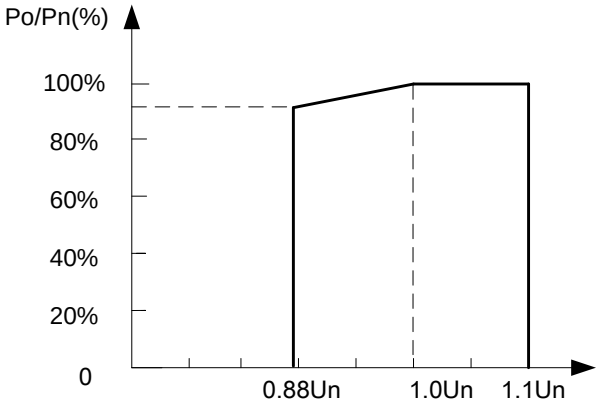


Figure 8-3
CPS SCH100/125KTL-US-600 and SCH100KTL-US-480 Derating Curve of Grid Voltage

When the grid Voltage is within 100%~110% of the rated output voltage, the inverter output power may reach 100%. When the grid voltage is lower than 100%, the inverter will limit the AC Output Current and the output power will begin to derate, as shown in Figure 8-3.

Chapter 9 Limited Warranty

The warranty policy of this product is specified in the contract; otherwise, the standard warranty is 5 years.

For service, Chint Power Systems America will provide local support. For Warranty terms, please refer to the CPS America standard warranty policy in place at time of purchase.

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