# CPS SCA Series Grid-tied PV Inverter

# CPS SCA20KTL-DO-R/US-480
# and SCA25KTL-DO-R/US-480

# Installation and Operation Manual - Rev 1.0


**CHINT POWER SYSTEMS AMERICA CO.**

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# Before You Start…

**Scope**

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 SCA20KTL-DO-R/US-480 and CPS SCA25KTL-DO-R/US-480 3-Phase String Inverters. Here after in this manual this equipment may be referred to simply as the inverters. Be sure to read this manual carefully before operating or servicing the inverters.

**Audience**

The information in Chapters 2 “Overview”, 4 “Commissioning (via wireless)", 6 "APP Interface”, and 8 "Accessories" is intended for the owner and operator of the inverter, and does not require any special training or qualifications. The information in Chapters 3 “Installation”, 4 "Commissioning", 7 “Maintenance and De-Installation” is intended for qualified personnel only. Qualified personnel have training, knowledge, and experience in:

- Installing electrical equipment and PV power systems (up to 1000$V_{DC}$).
- Applying all local installation codes.
- Analyzing and eliminating the hazards involved in performing electrical work.
- Selecting and using Personal Protective Equipment (PPE).

  Installation, commissioning, troubleshooting, and maintenance of the inverter must be done only by qualified personnel.

Thank you for choosing a CPS 3-Phase String Inverter. These PV Inverters are high performance and highly reliable products specifically designed for the North American Solar market.

Instructions inside this user manual will help you solve most installation and operation difficulties. Installation, commissioning, troubleshooting, and maintenance of the inverter must be performed by qualified personnel. If you encounter any problems during installation or operation of this unit, first check the user manual before contacting CPS Customer Service. This user manual is applicable for the following models:

**CPS SCA20KTL-DO-R/US-480 and CPS SCA25KTL-DO-R/US-480**

The manual will be periodically updated or revised due to the product development or improvement. The latest version of this manual can be acquired via the website at www.chintpowersystems.com.

# 1. IMPORTANT SAFETY INSTRUCTIONS (SAVE THESE INSTRUCTIONS)

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

## Warnings and symbols in this document

| | |
|---|---|
|  | **DANGER:**<br>DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.<br>**DANGER:**<br>DANGER indique une situation dangereuse qui, si elle n'est pas évitée, entraînera la mort ou des blessures graves. |
|  | **WARNING:**<br>WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.<br>**AVERTISSEMENT:**<br>AVERTISSEMENT indique une situation dangereuse qui, si elle n'est pas évitée, pourrait entraîner la mort ou des blessures graves. |
|  | **CAUTION:**<br>CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.<br>**ATTENTION:**<br>ATTENTION indique une situation dangereuse qui, si elle n'est pas évitée, peut entraîner des blessures mineures ou modérées. |

| | |
|---|---|
|  | **NOTICE:**<br>NOTICE indicates a hazardous situation which, if not avoided, could result in the inverter working abnormally or property loss.<br>**AVIS:**<br>AVIS indique une situation dangereuse qui, si elle n'est pas évitée, pourrait entraîner un fonctionnement anormal de l'onduleur ou une perte de propriété. |
|  | **INSTRUCTION:**<br>INSTRUCTION indicates important supplementary information or provides skills or tips that can be used to help you solve a problem or save you time.<br>**INSTRUCTION**<br>INSTRUCTION indique des informations supplémentaires importantes ou fournit des compétences ou des conseils qui peuvent être utilisés pour vous aider à résoudre un problème ou vous faire gagner du temps. |

## Markings on the product

| | |
|---|---|
|  | **CAUTION:**<br>Risk of electric shock from energy stored in capacitor.<br>Do not remove cover until 5 minutes after disconnecting all sources of supply.<br><br>**CAUTION:**<br>Risk of electric shock, do not remove cover. No |

| | |
|---|---|
| | user serviceable parts inside. Refer servicing to qualified service personnel.<br>**WARNING:**<br>Electric shock hazard. The DC conductors of this photovoltaic system are ungrounded and may be energized.<br>**CAUTION:**<br>Risk of electric shock.<br>a) Both ac and dc voltage sources are terminated inside this equipment. Each circuit must be individually disconnected before servicing.<br>b) When the photovoltaic array is exposed to light, it supplies a dc voltage to this equipment.<br>**WARNING:**<br>Electric shock hazard.<br>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.<br>**ATTENTION:**<br>Risque de choc électrique.<br>Les conducteurs DC de ce système photovaltaic ne sont pas mis à la terre et peut être alimenté.<br>**ATTENTION:**<br>Risque de choc électrique.<br>a) Les deux sources de tension CA et CC sont résiliées à l`intérieur de cet équipement.<br>Débranchez chaque circuit individual avant tout |

| | |
|---|---|
| | entretien.<br>b) Quand les panneaux photovoltaïque sont exposés à la lumière, ils fournissent une tension en courant continu à l´équipement.<br>**ATTENTION:**<br>Risque de choc électrique. Les conducteurs DC de ce système photovaltaic ne sont pas mis à la terre normalement, mais deviendra mis à la terre par intermittence lorsque l'onduleur mesure l'isolement du champ photovoltaique. |
|  | **CAUTION:**<br>Hot surfaces.To reduce the risk of burns, do not touch.<br>**ATTENTION:**<br>Surface chaude. Pour réduire le risqué de brûlures ne pas toucher. |
|  | **WARNING:**<br>This AFCI device automatically resets and may only be used when allowed by NFPA 70.<br>**ATTENTION:**<br>Cet appareil AFCI se réinitialise automatiquement et ne peut être utilisé que si la norme NFPA 70 le permet. |
|  | **WARNING:**<br>For continued protection against risk of fire, replace only with same type and ratings of fuse.<br>**ATTENTION:**<br>Pour continuer d'assurer la protection contre les |

| | |
|---|---|
| | risques d'incendie, il faut remplacer les fusibles de même type et courant. |
|  | **WARNING:**<br>Hazardous voltage area under the plastic cover.<br>Do not open fuse holders under load ! Protective gear must be used/worn before accessing fuses !<br>Do not open fuse holders if bypass terminals were installed !<br>**ATTENTION:**<br>Zone de tension dangereuse sous le couvercle en plastique.<br>Ne pas ouvrir les porte-fusibles sous charge!<br>L'équipement de protection doit être utilisé / porté avant d'accéder aux fusibles!<br>N'ouvrez pas les porte-fusibles si des bornes de bypass ont été installées! |
|  | **WARNING:**<br>High touch current .<br>Earth connection essential before connecting supply.<br>**ATTENTION:**<br>Courant tactile élevé.<br>La connexion à la terre est essentielle avant de connecter l'alimentation. |
|  | For more details please see the user manual.<br>Pour plus de détails s'il vous plaît voir le manuel d'utilisation. |

**WARNING:**

All the installation and wiring connections must be performed by qualified technical personnel. Disconnect the inverter from the PV modules and the AC grid before maintaining or servicing the equipment.

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!

**Risk of electric shock and fire.** Use only with PV modules that have a maximum system voltage of rating of 1000$V_{DC}$ 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 performs the PV array isolation measurement.

**Shock Hazard.** The inverter is energized from both AC and DC sources. Disconnect all energy sources before servicing.

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

**DANGER:**

Disconnect the inverter from the AC grid and PV modules before removing covers or opening the equipment. Wait at least 5 minutes after disconnecting from the DC and AC sources before servicing or maintaining the inverter. Ensure hazardous high voltage and energy inside the inverter has been discharged prior to servicing.

**NOTICE:**

The inverters are designed to only interconnect with an AC power source as part of the public electric utility grid. Do not connect the AC output of the inverters directly to any private electric utility power

equipment. The inverters are to be installed with floating or ungrounded PV arrays only.

**CAUTION:**

CPS SCA20KTL-DO-R/US-480 and SCA25KTL-DO-R/US-480 inverters weigh approximately **22kg (48.5 pounds)**. The wirebox portion weighs approximately **6kg (13.2 pounds)**.

Ensure the mounting bracket is properly installed before hanging the inverter and wirebox on the bracket. A team of two is recommended to lift and place the inverter and wirebox into position.

**INSTRUCTION:**

Please check with your local electric utility supply company before selecting a grid standard. If the inverter is operated with an incorrect grid standard, the electric utility supply company may cancel the interconnection agreement.

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

**WARNING:**

This product can expose you to chemicals including lead, known to the state of California to cause cancer and birth defects or other reproductive harm. For more information, go to www.P65Warnings.ca.gov

# 2. Overview

## 2.1 Inverter for grid-tied PV systems

CPS SCA20KTL-DO-R/US-480 and SCA25KTL-DO-R/US-480 3-Phase Transformerless String Inverters are designed for use with an ungrounded array in carport, commercial rooftop, and large utility scale PV grid-tied systems. The system is generally made up of PV modules, a 3-Phase String Inverter with a fused combiner/disconnect, and AC power distribution equipment (Figure 2-1). The inverter converts the available DC energy from the PV modules to AC power by synchronizing the output current to 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 exported to the electric utility grid.

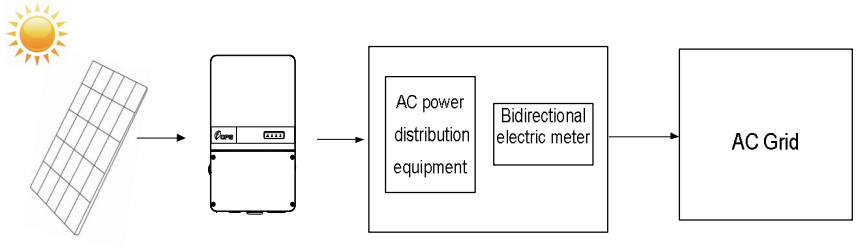



**Figure 2-1 Grid-tied PV system**

## 2.2 Product Features

- **High conversion efficiency:** Advanced 3-level conversion topology with Space-Vector PWM; Max. efficiency: 98.5%, CEC efficiency: 98.0%.
- **Grid adaptability:** IEEE 1547 Interconnect Standard and CPUC Rule 21 applicable; Reactive Power; >0.99 PF (±0.8 adjustable), and optional local or remote Active Power Curtailment.

- **Flexible communication:** Supports standard CPS Modbus RS485, SunSpec Modbus, and HTTPS/XML communications via Flex Gateway to ensure compatibility with 3rd party monitoring and control systems. The Flex Gateway enables further command/control as well as remote firmware upgrades. Flex Gateway card is an optional accessory. Refer to Flex Gateway manual for further detailed information.
- **Wide DC input voltage range:** Operating DC Input Voltage Range: 200-950$V_{DC}$; Max DC input voltage: 1000$V_{DC}$.
- **Long Service Life:** Designed with thin-film capacitors to extend inverter's service life.
- **2 MPPTs:** Multi-channel MPPT (Maximum Power Point Tracker) enables maximum design flexibility and energy harvest optimization over the life of the system.
- **Separable Wirebox:** The wirebox enables fused input of industry standard conductor assemblies.
- **High protection degree:** Powder coated aluminum NEMA 4X enclosure meets the demanding needs of both indoor and outdoor use.
- **Intelligent Integration:** Integrated load break rated DC/AC disconnect switches, and up to 6 positive fused string inputs eliminate the need for external DC combiner boxes, simplifying installation and the need for DC BOS equipment.

## 2.3 Product Protection Functions

- ✓ Reverse polarity protection of DC input
- ✓ AC and DC Short circuit protection
- ✓ Arc-fault detection and circuit interruption
- ✓ Anti-islanding detection 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
- ✓ Internal enclosure temperature monitoring
- ✓ IGBT power module temperature monitoring
- ✓ RSD function

## 2.4 Appearance and Main Item Description

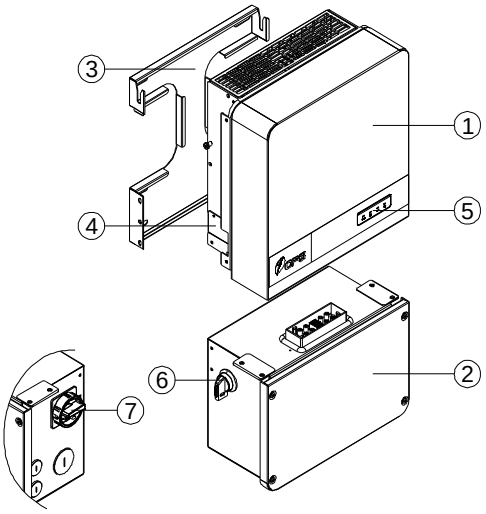



**Figure 2-2 Diagram of the Inverter assembly**

**Main items of the Inverter:**

① Main inverter enclosure
② Inverter wirebox
③ Inverter mounting bracket
④ Cooling fans

⑤ LED indicator lights

⑥ DC switch: DC power on/off

⑦ AC switch: AC power on/off

## 2.5 Schematic Diagram and Circuit Design

The basic electrical schematic diagram of CPS SCA20KTL-DO-R/US-480 and SCA25KTL-DO-R/US-480 inverters are shown in Figure 2-3. The input from PV source circuits passes through surge protection circuitry, DC EMI wave filters, and independent DC-DC boost circuitry to achieve maximum power point tracking and boost the voltages to a common DC bus. The inverter uses line voltage and frequency measurements to synchronize to the grid and converts the available PV energy to AC power by injecting balanced 3-phase AC current into the electric utility grid. Any high frequency AC component is removed by passing through a two-stage relay and EMI wave filter to produce high quality AC power.

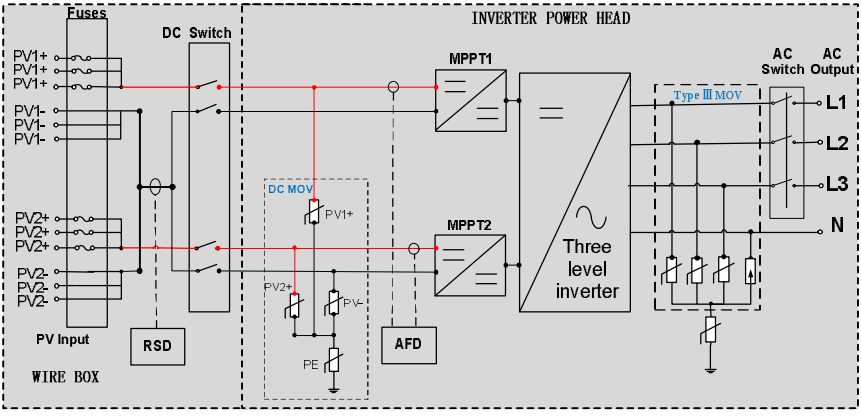



**Figure 2-3 Schematic Diagram of the CPS SCA20/25KTL-DO-R/US-480 Inverter**

## 2.6 Anti-islanding Detection

The CPS SCA20KTL-DO-R/US-480 and CPS SCA25KTL-DO-R/US-480 inverters include Unintentional Islanding detection as required by UL 1741/IEEE 1547. The inverter will continuously make bi-directional perturbations to the frequency of the output current by injecting a small amount of reactive power 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.

## 2.7 DC Ground Fault Protection

The inverters include residual current detection GFCI as part of the DC ground fault detection method required by UL 1741. If there is a ground fault in the PV array, the ground fault detection circuitry will detect leakage current, trigger an alarm, and the inverter will cease operation. See Chapter 5 for further information regarding GFCI Static and Dynamic trip thresholds and operation.

## 2.8 Surge Suppression

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

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

## 2.9 DC Arc-fault Protection

The inverters include DC Arc-fault detection compliant with UL 1699B-2018. The inverter will detect electrical noise that is indicative of a DC series arc. Upon detection of an arc-fault, the inverter will cease operation.

# 3. Installation

This chapter describes the planning and installation procedures for the SCA20KTL-DO-R/US-480 and SCA 25KTL-DO-R/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 one package, consisting of A.) the main inverter enclosure and B.) the wirebox, mounting bracket, quick installation guide, and accessory kit. Before installation, please check that the following items are included in the package:

**Table 3-1 Main Items**

| No. | Item | Q'ty | Note |
|---|---|---|---|
| (1) | Main enclosure of the PV inverter | 1 | |
| (2) | Wiring box of the PV inverter | 1 | |
| (3) | Mounting bracket | 1 | Bracket upon which the PV inverter is hung and mounted |
| (4) | Quick installation guide | 1 | PV inverter installation and operation guide |
| (5) | Accessory kit | 1 | Kit contains all necessary hardware and accessories for installation |

**Table 3-2 Accessory Kit**

| No. | Item | Q'ty | Note |
|---|---|---|---|
| (1) | M6 X18mm Phillips screw | 12 | 4 for securing the wiring box to the main enclosure; 6 for securing the inverter to the mounting bracket; 1 for the External Ground connection, 1 spare |
| (2) | 6 pin PCB connector plug | 1 | For the RS485 communication |
| (3) | 2 pin PCB connector plug | 1 | For the RS485 communication |
| (4) | Philips screw | 1 | Spare (for wire-box cover) |

**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 9, Technical Data for specification ranges and limits.

**NOTICE:**

The allowable ambient temperature range for the SCA20KTL-DO-R/US-480 and SCA25KTL-DO-R/US-480 inverters is defined based on the following conditions;

Condition 1: -40°C to 70°C, Inverter not installed, and in storage (in packaging or unpackaged).

Condition 2: -30°C to 60°C, Inverter installed, connected to electric utility grid and operating during daylight hours.

Condition 3: No low temp limit to 70°C, Inverter installed, connected to electric utility grid but non-operating (daylight or nighttime hours).

**Pre-installation checklist**

- ✓ Check that the inverter environmental specifications (protection degree, operating temperature range, humidity and altitude, etc) meet the requirements of the specific project location.
- ✓ Make sure that the electric utility grid voltage is within range for the grid standard chosen.
- ✓ Ensure that the local electric utility grid 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 3-3 and Figure 3-4 must be provided to allow the inverter cooling system to operate effectively.
- ✓ Install the inverter away from flammable and/or combustible substances.
- ✓ 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.

**NOTICE:**

**Outdoor Installations for Extended Periods without Power**

CPS advises against leaving inverters mounted outdoors for an extended period of time (more than 90 days) and/or allowing inverters exposed to cycles of freezing temperature without both DC and AC power connected to the inverters under normal operation.

The CPS inverter enclosures are designed to conform to NEMA4 (or IP65), however there exists the possibility of water condensation inside the inverter enclosure when it is left exposed to an outdoor environment without power to operate for an extended period of time. Moisture in the air could enter the power head of the inverter through the small opening between wiring box and power head during the time that the wiring box cover is opened for wiring purposes. When the inverter is exposed to temperature swings, especially in cold weather, moisture inside the inverter power head could condense over the aluminum heatsink area where inverter semiconductors are mounted. Water droplets on the heatsink may cause a short-circuit to live semiconductor devices. When the PV source is applied to the inverter, this PV power source could cause the inverter to fail and result in a short-circuit across the PV array.

If such a situation in which the inverter is mounted outdoors without operating power occurs, CPS recommends that the inverter power head be inspected for water condensation before any DC or AC power can be applied to inverter. Without inspection, customers will run the risk of having inverter electronic circuit damage when power is applied to inverter during startup. It is advised that customers contact CPS for further advice and to arrange schedule for CPS service personnel to perform inspection of inverter on site.

- CPS hotline: 855-584-7168

## 3.2 Mechanical Installation

### 3.2.1 Dimensions

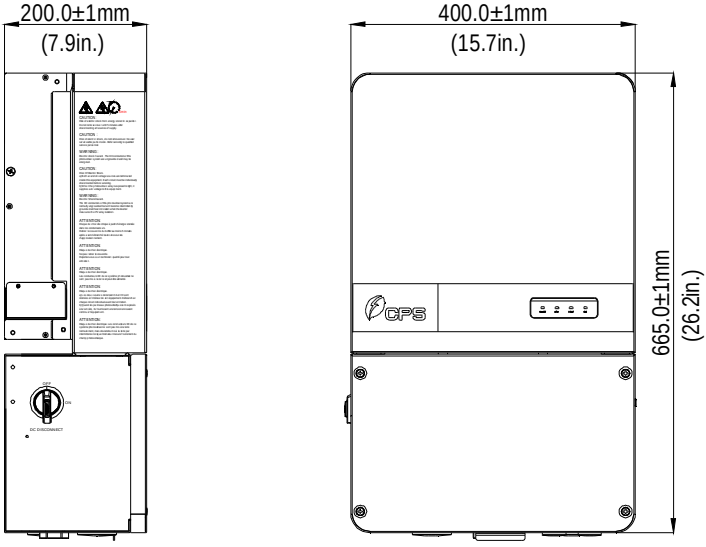



**Figure 3-1 Dimensions of the Inverter**

### 3.2.2 Installation Method (see Figure 3-2):

Ensure that the mounting structure (wall, rack, roof, etc) is suitable to support the weight of the inverter. 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 at 15-90 ° angle from vertical to horizontal.

(c) When inverter is installed under direct sunlight, the CPS Shade Cover (SSC-25ST-2) accessory is required to be installed. See Section 8.2 for more information.

(d) Do not mount the inverter leaning forward.

(e) Do not mount the inverter upside down.

(f) Do not mount the inverter horizontal.

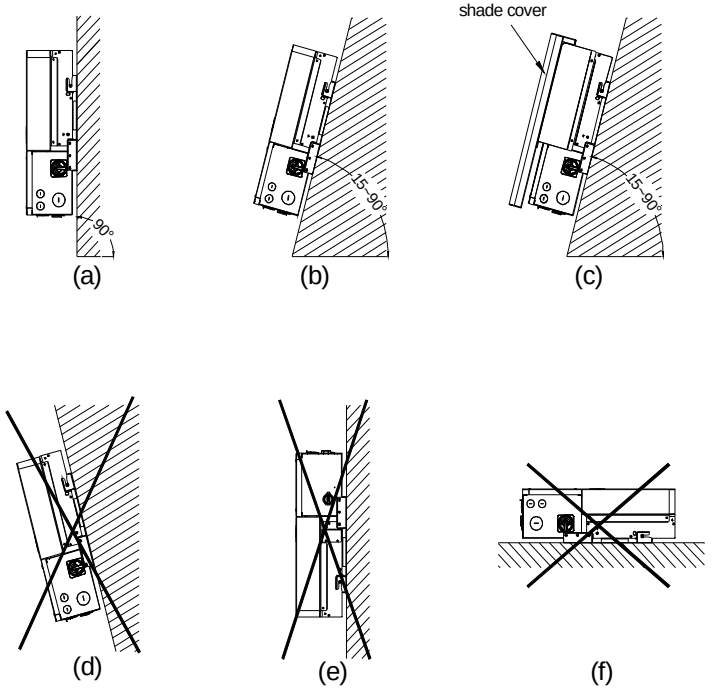



**Figure 3-2 Inverter Mounting Options**

### 3.2.3 Installation Space Requirement

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

**NOTICE:**

When inverter is installed under direct sunlight, the CPS Shade Cover (SSC-25ST-2) accessory is required to be installed. See Section 8.2 for more information.

**NOTICE:**

The spacing between two adjacently mounted inverters must be ≥11.8in (300mm). Spacing should be enlarged for installation locations with ambient temperature higher than 45°C. Ensure that the air space around the inverter is well ventilated. The spacing below the inverter is intended to the locations known to flood or have seasonal snow build up.

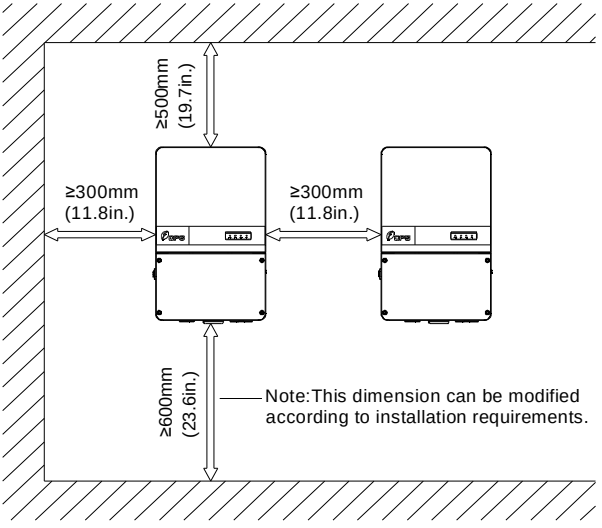



**Figure 3-3 Inverter Wall Mounting Dimensions**

### 3.2.4 Mounting the Inverter onto the Bracket

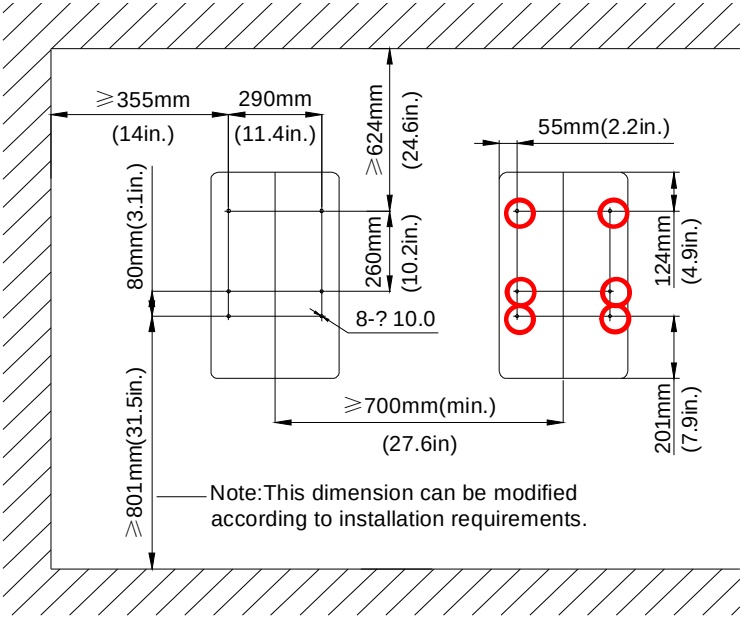



**Figure 3-4 Dimensions of the bracket anchoring holes for mounting**

Secure the bracket to the metal frame firmly with the screws fastener. (screws are not supplied by manufacturer and the holes of bracket is Φ10mm)

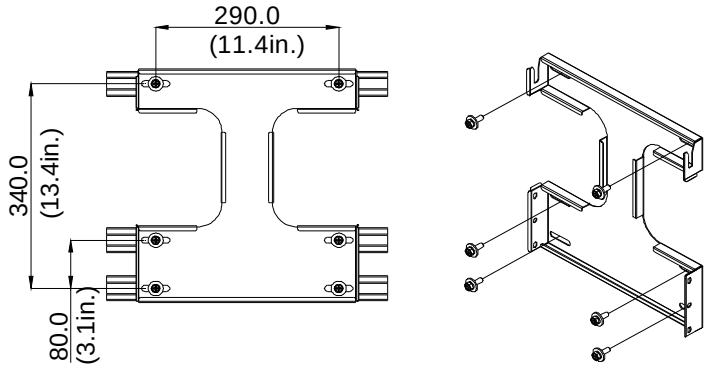



**Figure 3-5 Secure the Mounting Bracket**

**1.** Hang the inverter onto the mounting bracket as shown in Figure 3-6; Manual mounting: One person can safely lift the inverter and mount it onto the bracket.

**CAUTION:**

The main enclosure of the CPS SCA20KTL-DO-R/US-480 and SCA25KTL-DO-R/US-480 inverters is approx **22kg (48.5 pounds)**.

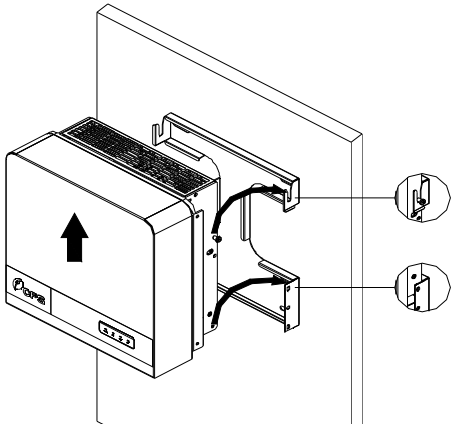


**Figure 3-6 Mount the Main Enclosure on the Bracket**

**2.** Install the wiring box

Remove screws securing the bulkhead cover at the top of the wiring box.

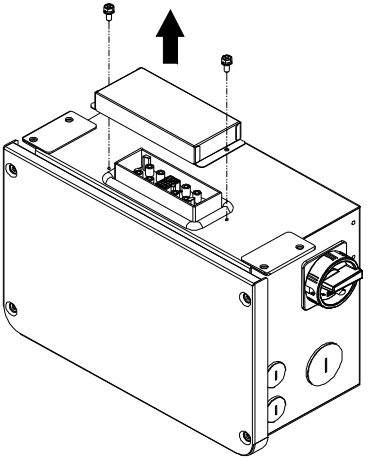


**Figure 3-7 Wiring Bulkhead Cover**

Save the bulkhead cover and screws, and attached the cover to the left side of the wiring box after the wiring box is attached to the inverter enclosure. Covers may be required in the future if an inverter or wiring box is to be removed during servicing (see step 5, Figure 3-10)

Tool required: No.2 Phillips head screwdriver

**3.** Secure the wiring box to the main enclosure by using the **M6x18 screws** (4pcs) to fasten the wiring box. (see Figure 3-8)

Tool required: No. 10 Wrench, torque value of 4 Nm (35.4in-lbs)

**CAUTION:**

Ensure that the wire-box is reliably connected to the main enclosure. This is very important for the normal operation of inverter.

**WARNING:**

Ensure the M6x18 screws (4pcs) installed in Step 3 above are pro torqued and the area under the bolt-head is clear of paint. This conne provides an electrical ground bond of the wirebox to the upper/r enclosure."

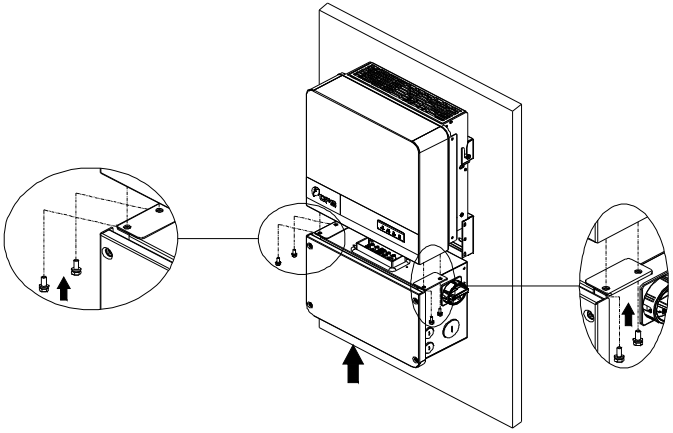


**Figure 3-8 Installation of the Wiring Box**

**4.** Attach the main enclosure and the wiring box to the mounting bracket with the **M6x18 screws** (6 pcs). (see Figure 3-9)

Tool required: No.3 Phillips head screwdriver, torque value of 4N.m (35.4in-lbs)

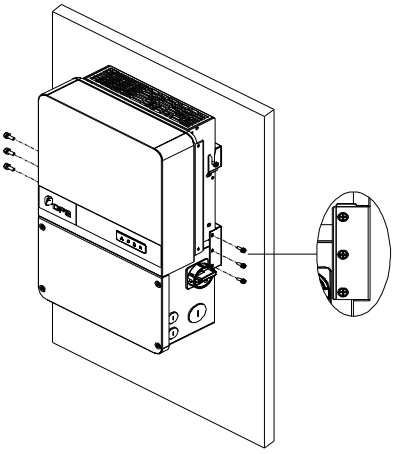


**Figure 3-9 Secure the Main Enclosure and Wiring Box to the Bracket**

**5.** Attach the bulkhead cover shown in Figure 3-7 to the left side of the wiring box. (see Figure 3-10)

Tool required: No.2 Phillips head screwdriver, torque value of 1.6N.m (14.2in-lbs)

Remark: the covers shown below do not have waterproof function.

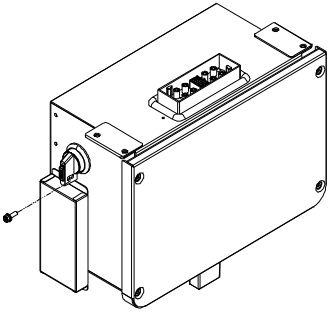


**Figure 3-10 Attach the Cover to the left side of the Wiring Box**

**6.** Optional - Install an anti-theft padlock when the installation is complete. The anti-theft padlock is used to prevent the inverter from being stolen when the equipment is installed outdoors. The inverter may be locked to the bracket, as shown in Figure 3-11:

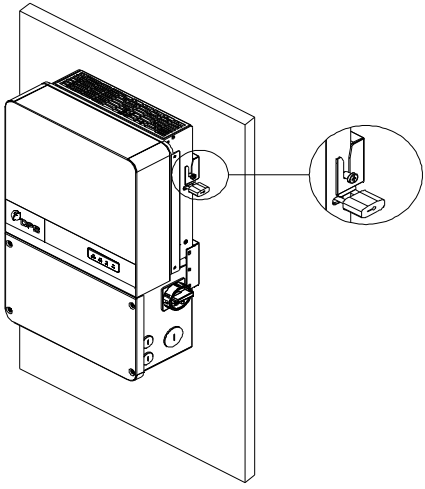


**Figure 3-11 Location of the Anti-Theft Padlock**

The anti-theft padlock shackle should meet the requirements of the dimensions shown in Figure 3-12:

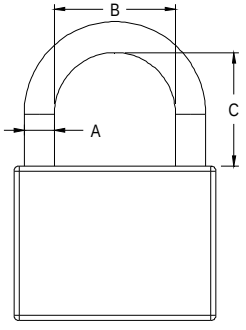



**Figure 3-12 Dimensions of Anti-Theft Padlock Shackle**

## 3.3 Electrical Installation

**NOTICE:**

The inverters must be installed in accordance with the National Electric Code, NFPA 70, and any local codes or jurisdictions. A PV array sizing tool is available for download at http://www.chintpowersytems.com and accessed by selecting the Product Downloads link to get to String Sizing tool. This is an optional tool to help guide designers by matching the PV panel type and quantity to the inverter's power rating.

### 3.3.1 Removing/Replacing the Wiring Box Cover:

Prior to installation, confirm the wiring box to be used is the wirebox as shown in Figure 3-13.

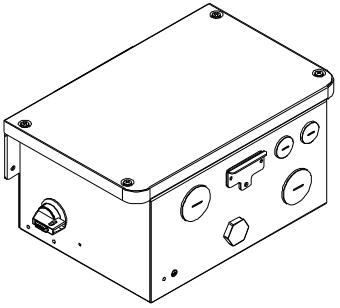


**Figure 3-13 wiring box**

**1.** Use a No. 3 Philips head screwdriver to remove the 4 screws on the wiring box and remove the cover. (See Figure 3-14)

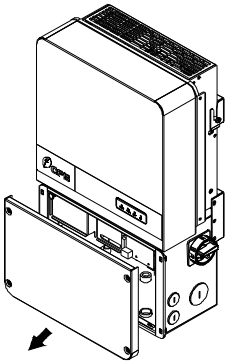


**Figure 3-14 Removing the Wiring Box Cover**

To reinstall the cover, replace cover and align the screws. Use a No. 3 Philips head screwdriver to secure the 4 screws on the cover. Torque to 35.4 in-lbs (4 N.m.)

**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 cover 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 35.4 in-lbs (4N.m).

## 3.4 Wiring boxes

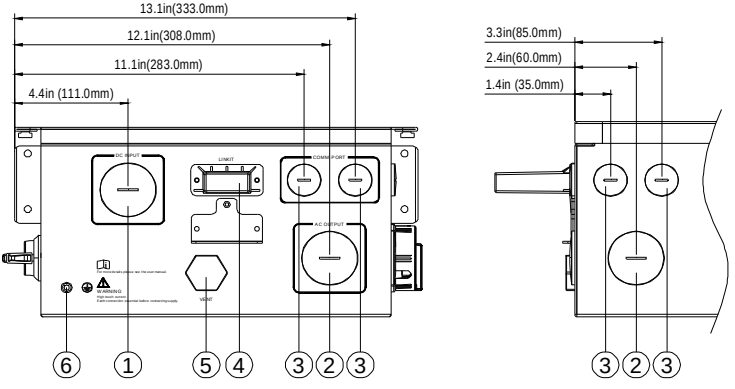



**Figure 3-15 Conduit Knock-out Locations on the wirebox**

① Knock-outs for DC input, (1) 1-1/2 inch Trade Size

② Knock-outs for AC output, (2) 1-1/2 inch Trade Size

③ Knock-out for communication, (4) 3/4 inch Trade Size

④ Linkit port

⑤ Vent

⑥ External ground connection point (M6)

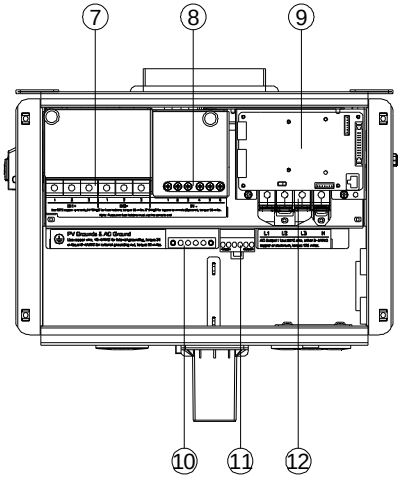



**Figure 3-16 Internal Connection Points within the wirebox**

⑦ DC Input fuse holder/terminal (positive)

⑧ DC Input terminal (negative)

⑨ Communication board

⑩ Internal ground terminal

⑪ RSD transmmiter

⑫ AC output terminal block

### 3.4.1 DC Connection

#### 3.4.1.1 Working mode

These inverters are factory configured with two MPPTs which are electrically divided into separate PV input zones: PV Input-1 and PV Input-2. Each 3-string PV input zone operates as a separate and independent MPP Tracker. Independent mode can be very useful for sites with partial shading of the

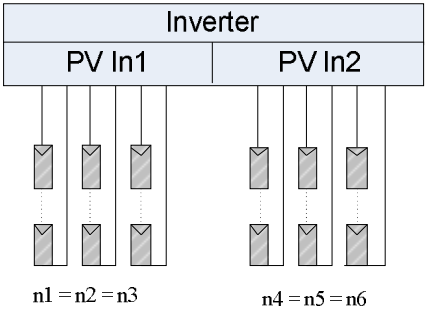
array or with arrays consisting of different tilt or azimuth. Each MPPT employs a method known as perturb and observe for seeking and tracking the maximum power point along the I/V curve of the PV array. During operation each MPPT will make small adjustments to the PV voltage and then executes a power measurement; if the PV power increases, further voltage adjustments in that same direction are performed until the PV power no longer increases.

INSTRUCTION:

PV input power may be unbalanced between the two MPPT zones. See Figure 3-17 for string/zone combinations.(The maximum input is 19kW for per MPPT of 25kW, 20kW is 15kW per MPPT)

NOTE 1: The max PV power between the two MPPT zones. see Table 3-3.

NOTE 2: When designing the PV system ensure each PV string within a single PV input zone includes the same module type (Mfg and ratings), series module count, and module orientation (tilt and azimuth) to maximize MPPT performance and energy harvest.




The total string number could be different among PV In1 and PV In2
The difference in the number of strings does not exceed one.
e.g. PV In1: PV In2 = 3:2 is priority, and 3:1 does not recommended

**Figure 3-17 Independent Mode**

**Table 3-3 DC Input Specifications (Independent Mode)**

| Specification | (Independent Mode - per MPPT) | |
|---|---|---|
| **Model** | **SCA20KTL-DO-R/US-480** | **SCA25KTL-DO-R/US-480** |
| Max PV Power | 15kW (Combined ≤ 30kW) | 19kW (Combined ≤ 38kW) |
| Max PV Voltage | 1000Vdc | 1000Vdc |
| Start-up Voltage / Power | 330 / 80W | 330 / 80W |
| Operating Voltage | 200-950Vdc | 200-950Vdc |
| MPPT Voltage Range | 560-850Vdc | 560-850Vdc |
| Maximum PV Current (Isc x 1.25) | 45A | 45A |

**Table 3-4 DC Terminal Specifications**

| Terminal | Acceptable wire range |
|---|---|
| DC input ( + / - ) | #14-8AWG (Copper only) when terminating to the fuse holders<br>#8~2AWG (Copper or Aluminum) when using the Bypass Terminal kit |

The inverters operate with ungrounded arrays, although the PV system requires a DC EGC (equipment grounding conductor) to ensure operational safety. The grounding busbars are electrically bonded by way of the inverter chassis.

### 3.4.1.2 DC Fuse Configuration/Selection

The CPS SCA20KTL-DO-R/US-480 and SCA25KTL-DO-R/US-480 inverter wire boxes include touch safe fuse holders and 15A DC fuses as a factory standard on the positive side. Ensure that the appropriate fuse values are used depending on the configuration of the PV string and by performing PV fuse sizing calculations for each string.

1. Each DC input conductor for the PV string requires fuse protection. (2014 NEC and earlier editions)

2. The voltage rating of the fuse must be at least 1000$V_{DC}$.
3. The ampere rating of the fuse is generally selected as 1.56 × module Isc of the PV string. Refer to NEC 690.8 for Circuit Sizing and Current requirements.

Verify and select the appropriate fuses for installation depending on the configuration of the PV strings.

The 1000$V_{DC}$ Sinofuse RS308 PV fuse series and Mersen HP10M PV fuse series are required as replacement fuses if necessary.

The touch safe fuse holders and wirebox internal factory wiring are designed to accept either 15A, 20A, 25A, or 30A rated fuses. The larger rated fuses may be required for combined input strings; for example, when Y branch connectors are used with DC field wiring to reduce PV source circuit home runs. CPS allows replacement of the factory installed 15A fuses with appropriate ampere ratings, however CPS does not provide nor stock these fuses.

**NOTICE:**

When installing 25A or 30A fuses, these fuses may not be installed in adjacent fuse holders. An empty or unused fuse holder must be situated between each 25A/30A fuse within each MPPT.

When Y branch connectors are used with DC field wiring to reduce PV source circuit home runs, Y-Comb Terminal Block is optional and refering to the chapter 8.3 about the detail.

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 the CPS warranty.

**NOTICE:**

Note 1: The temperature rating of the PV Source circuit conductors should be no less than 90°C (194°F).

Note 2: The recommended fuse values are configured based on the condition that the input strings are the same (module type and length).

Note 3: The temperature rating of the fuse holder terminals is (90°C) for Sinofuse or Mersen components.

#### 3.4.1.3 DC Conductor Connection

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

1. Confirm the maximum open circuit voltage of the PV modules is lower than 1000$V_{DC}$ under any conditions.
2. Confirm that the PV modules for each MPPT within the inverter are of the same type and specification before connection.

3. Ensure correct polarity of the PV Strings before terminating the DC source circuits. Referring to Figure 3-18, the wiring from the PV string pairs must be checked according to the following steps:

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

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

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

**NOTICE:**

It is important to use a multi-meter to check the polarity of the DC source circuit conductors to avoid any risk of reverse polarity.

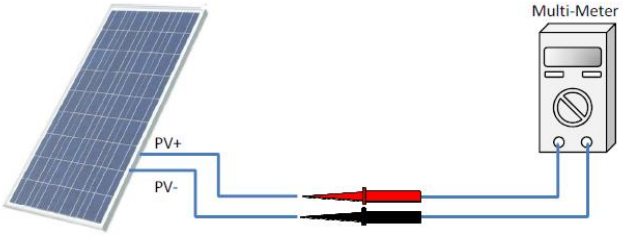



**Figure 3-18 Polarity Check**

**INSTRUCTION:**

10 AWG wire ferrules are intended to preclude the onset of stray/lose wire strands or "birdcaging" of the conductor during installation, and improve the integrity of the termination. Use of the wire ferrules is not mandatory and shall not void the product warranty if not used.
(The ferrules are not provided by CPS)

### 3.4.1.4 DC Connection for Wiringbox

**1-1/2 inch openings**. Remove the factory installed liquid-tight hole plugs from the DC knockout holes in the wiring box and install 1-1/2 inch Trade Size conduit and conduit fittings. If smaller conduit is needed use proper weather-tight reducing bushings to ensure the wiring box maintains its NEMA 4X rating. Confirm all fittings are properly tightened, and route the DC source circuit conductors through the conduit into the wiring box.

**Table 3-5 Tools Required for Cable Termination**

| No. | Tools | Remark |
|---|---|---|
| 1 | #2 Phillips head screwdriver | Fuse holder Terminal |
| 2 | Diagonal pliers or cable cutters | Cut cable |
| 3 | Wire stripping pliers | Remove jacket |
| 4 | Torque driver | Torque terminals to specification |
| 5 | Crimping pliers/tool | Ferrule crimp (optional) |

**Terminate at fuseholders**. Strip approximately 1/2 inch of the cable jacket from the end of the string conductor. Insert the conductor into the fuseholder terminal ensuring the stranding of the conductor remains firmly twisted and does not separate. Tighten the screw clamp to the torque specified in Table 3-7. Continue terminating the remaining strings in this manner for each MPPT (PVIn1 and PVIn2).

**Bypass Terminal option for wirebox.** Fuse Bypass Terminals are available as an optional accessory when external PV string fused combiners are used. The Bypass Terminals allow for larger single conductors to be terminated at each MPPT within the wirebox, bypassing the input fuses as shown in Figure 3-19. See 8 (Accessories) for installation information.

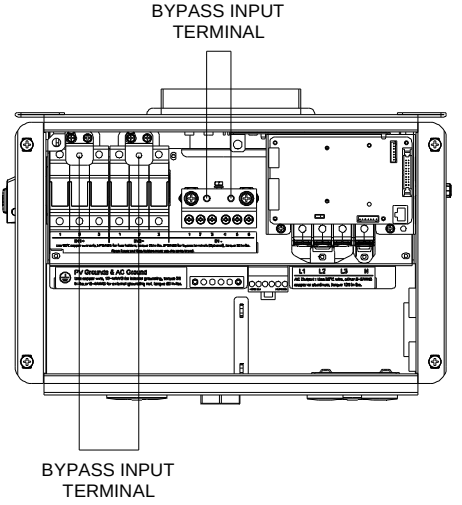



**Figure 3-19 Bypass Terminal option installed within the wirebox**

### 3.4.2 AC and Ground Connection

The following section describes the AC and ground connections.

**Acceptable Transformer Configurations**

The SCA20/25KTL inverters operate at $480V_{AC}$ output. If another voltage/configuration is required a transformer may be necessary.

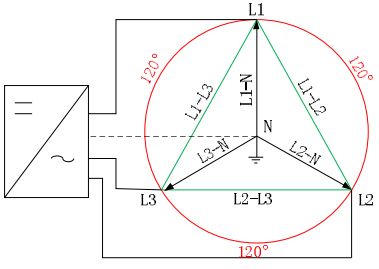
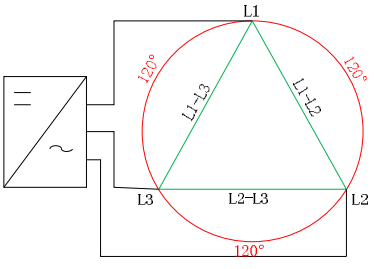
| Wye (Inverter) | DELTA (Inverter) |
| --- | --- |
|  |  |



**Fig 3-20 AC Acceptable Transformer Winding Configurations**

NOTES:

1. Transformer short-circuit impedance (Z%) should be less than 6%.
2. The transformer VA rating must be at least 100% of the sum of the connected inverter VA ratings.
3. CPS recommends the **transformer VA rating be selected** based on IEEE C57.159-2016 *Guide on Transformers for application in Distributed Photovoltaic (DPV) Power Generation Systems*. It is the responsibility of the system designer to determine and take in account the reliability of the transformer or other system parameters.
4. The transformer does not require a static shield.
5. The maximum number of inverters connected to a single transformer is 70.
6. The recommended maximum voltage-drop on the Inverter to Point of Common Coupling (to the grid) is 2% at full load – including conductor temperature considerations. Voltage drop greater than 2% may require changing the transformer tap or as a last resort adjusting the GridMaxVolt trip point settings.

### 3.4.2.1 AC Connections

This section includes instructions to connect the AC conductors to the inverter and grounding options.

**Table 3-6 Tools Required for Cable termination**

| No. | Tools | Remark |
|---|---|---|
| 1 | #2 flat screwdriver | Internal grounding bar |
| 2 | #3 Phillips head screwdriver | External grounding |
| 3 | 5mm socket head wrench | AC terminal block |
| 4 | Diagonal pliers or cable cutters | Cut cable |
| 5 | Wire stripping pliers | Remove jacket |
| 6 | Crimping pliers/tool | Crimp terminal |

**Using the 1-1/2 inch knockouts.** Remove the liquid-tight hole plug from the right side or bottom of the AC input portion of the wiring box to install 1-1/2 inch Trade Size conduit and conduit fittings into the hole. Then route the cables through the conduit inside the wiring box. If 2 or 2-1/2 inch Trade Size conduit is required.

**NOTICE:**

Terminate the Ground cable prior to terminating the AC cables.

**3.4.2.2 Grounding/Bonding.**

The inverter provides 1 grounding connection on the AC side and one bonding location. These configurations are illustrated below (Figure 3-21).

A. Grounding via the ground busbar (left) [1] This is required for grounding the equipment by running the EGC with the ungrounded conductors.
B. Bonding via the external grounding point (right) [2]. The external bonding connection is provided in case the inverter/mount needs to be bonded to a metallic structure on which it may be mounted.

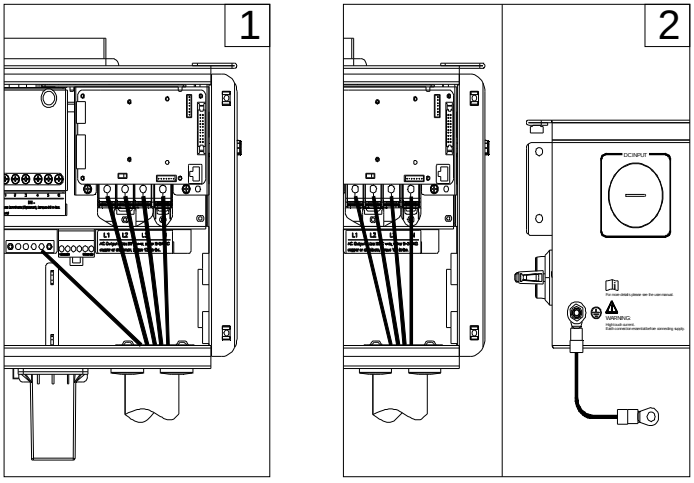



**Figure 3-21 AC Output and Ground Cable Connection**

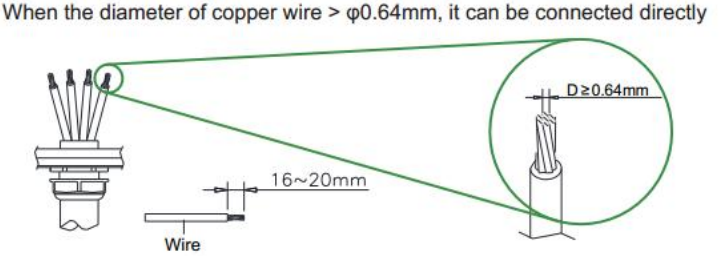
**Table 3-7 Torque and Conductor Specifications**

| Connection Point | Conductor Range | Torque Value |
|---|---|---|
| AC output | 8-2 AWG (90℃ Cu)<br>6-2 AWG (90℃ Al) | 14 N-m (120 in-lbs) |
| PE | 6-4 AWG (CU) | 5.6 N-m (50 in-lbs) |

**INSTRUCTION:**

The neutral conductor from the inverter to point of interconnection (POI) is optional. The function of the neutral, when used, is to provide a point of reference for measurement purposes that is essentially at ground potential. The neutral conductor is for control or measurement purposes only, and therefore may be sized according to NEC section 705.95(B). The ground conductor (PE) is sized to section 250.122.

Connect the AC conductors to the AC terminal block and connect the PE (GND) cable to the grounding terminal block. The neutral conductor is optional. The inverter may be wired as a 3-wire or 4-wire connection, the PE ground is ALWAYS required. When terminating the ground at the busbar a ferrule is recommended but not required. Set up the conductors referring to Figure 3-22.



When the diameter of copper wire ≤ φ0.64mm, must use casing like E25-18 to compact the wires

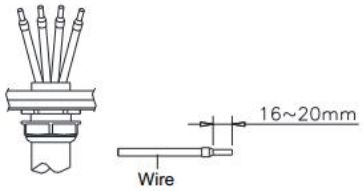



**Figure 3-22 AC output and internal ground conductor set up**

When bonding the inverter/mount to a metallic structure is required, use the OT type terminal to connect the ground conductor to the external bonding point at the bottom of the wiring box. The bonding point is located at the bottom of the **wirebox** as shown in Figure 3-23.

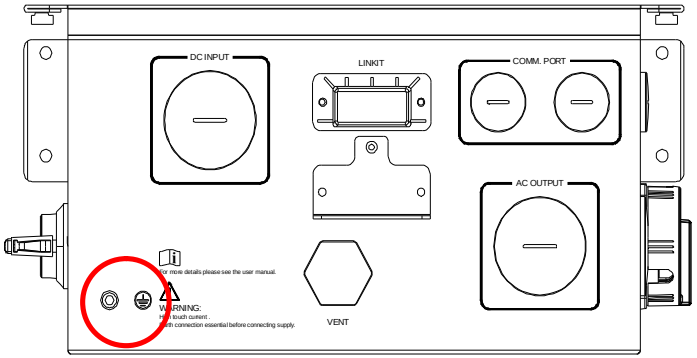



**Figure 3-23 External Ground Point Location of wirebox**

**NOTICE:**

Always connect the Ground cable before AC cable.

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 over current event occur.

The Grid connection type must be a 4-wire Wye, grounded neutral, the inverter may connect to the grid via 3 or 4-wires. The neutral conductor from the inverter to point of interconnection (POI) is optional.

Either 3-pole or 4-pole AC circuit breaker (OCPD) may be selected as per the following table. Selecting a breaker of another size may either result in nuisance tripping or rejection from the AHJ.

**Table 3-8 Specification of AC breaker selection**

| Inverter | Min AC OCPD | Max AC OCPD |
|---|---|---|
| CPS SCA20KTL-DO-R/US-480 | 39A | 45A |
| CPS SCA25KTL-DO-R/US-480 | 39A | 45A |

## 3.5 Communication Connection

CPS SCA20KTL-DO-R/US-480 and SCA25KTL-DO-R/US-480 inverters support industry standard Modbus RS485 communication. The communication board is in different places in the standard (Figure 3-24).

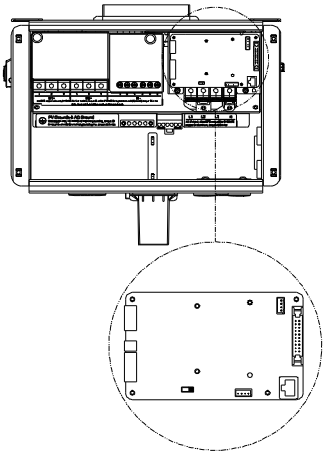


**Figure 3-24 Communication Board of wirebox**

### 3.5.1 Description of the Communication Board

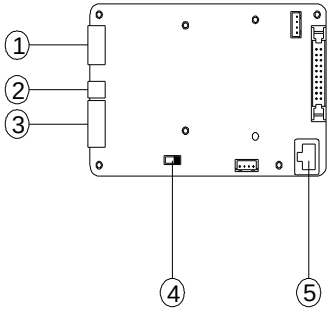



**Figure 3-25 Communication Connection Interfaces**

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)

### 3.5.2 RS485 Communication

CPS recommends the following cable for inverter RS485 communications:
UTP CAT-5e or (3) 18-22AWG communication cables.
It is recommended that industrial grade shielded RS485 cable be used in lieu of unshielded twisted pair. Communication cable such as (CAT5) or Belden 3106A cable for RS485 6-pin connector is preferred. (The RS485 communication cables has 3 conductors and a shield)

RS485 communication cables are connected via the 6-pin connector to the port labeled (2) in Figure 3-25. When creating a network of multiple inverters, the cables are terminated to the same 6-pin connector and 6-pin connector. Figure 3-26 shows a single inverter communication connection in (1) and a network configuration in (2).

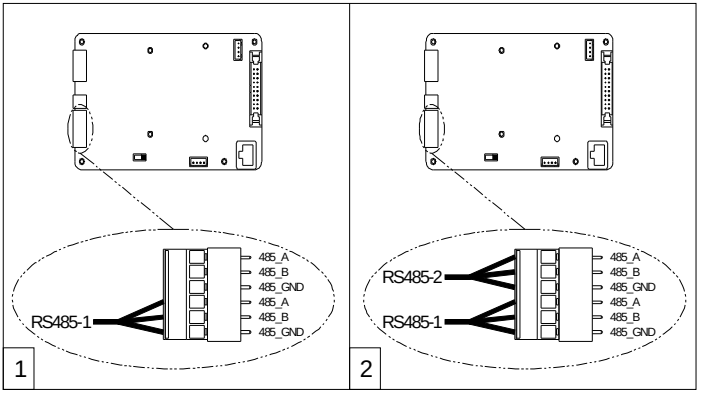



**Figure 3-26 RS485 Connection of wirebox**

### 3.5.3 RS485 Network Set-up

When the inverters are monitored via the RS485 communication, a unique RS485 address for each inverter can be set up through the APP interface. Up to 32 inverters can be connected in the RS485 communication network. The daisy-chain topology is recommended for the RS485 network connection to minimize noise and bus reflections, as shown in Figure 3-27. Other communication topologies, such as the star networks, are not recommended. All RS485 connections must be terminated in a serial fashion and not to exceed 32 in total.

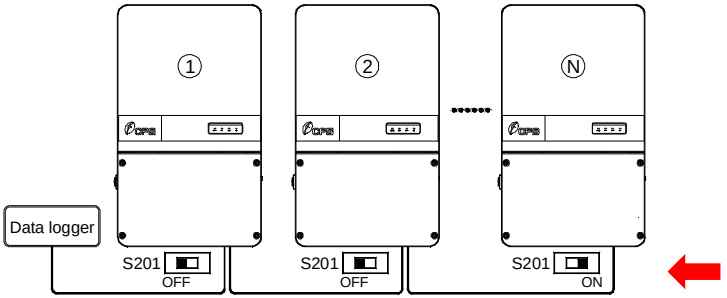



**Figure 3-27 RS485 Network Connection**

**DANGER:**

Disconnect the inverter from the AC grid and PV modules before removing covers or opening the equipment. Wait at least 5 minutes after disconnecting from the DC and AC sources before servicing or maintaining the inverter. Ensure hazardous high voltage and energy inside the inverter has been discharged prior to servicing.

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 120Ω terminal resistor enabled. The selector switch S201 of all other inverters should be in the OFF position to disable the terminal resistor.

### 3.5.4 Communication Wiring

Instructions for wiring the communications of one or a network of inverters:

1. Open the inverter wiring box. Refer to Section 3.3.1 for instructions and torque requirements when replacing cover.
2. Bring the communication cables into the wiring box through the provided knockout holes at the bottom, using similar methods to the AC and DC wiring. Conduit and knockouts must be sealed and water tight to maintain the NEMA 4X rating.
3. Connect the RS485 wires to the 6pin 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. If there is only one inverter, the Modbus termination switch S201 should be set to ON.
5. The shield of the individual cables must be open (not connected to ground) on one end – the other end of the shield must be grounded. Failure to follow this installation practice will increase lightning surge damage to the inverter and will void the warranty.

### 3.5.5 RSD connection

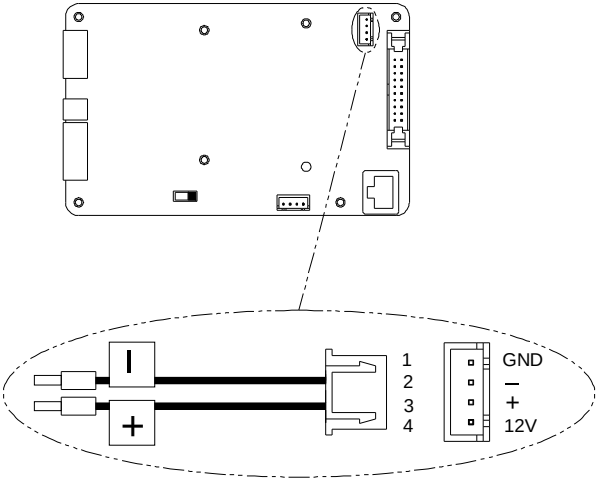



**Figure 3-28 RSD Connection**

The connection of RSD is installed in the factory. The power supply is from a 4-pin connector on the communication board. If it is the first time to be powered on when the inverter is without AC power, external power supply is needed to match with the 4-pin connector.

# 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 via mobile phone APP for human-computer interaction, and users can download iOS version at Apple store or Android version in Google store named “CPS Connect”(Support Android 4.1 and IOS 9.0 or later ).

## 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.
(Please refer to 3.2 Mechanical installation)

### 4.2.2 Cable Connections

- Make sure that all cables are connected to the right terminals.
- 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 1000V.

## 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.)

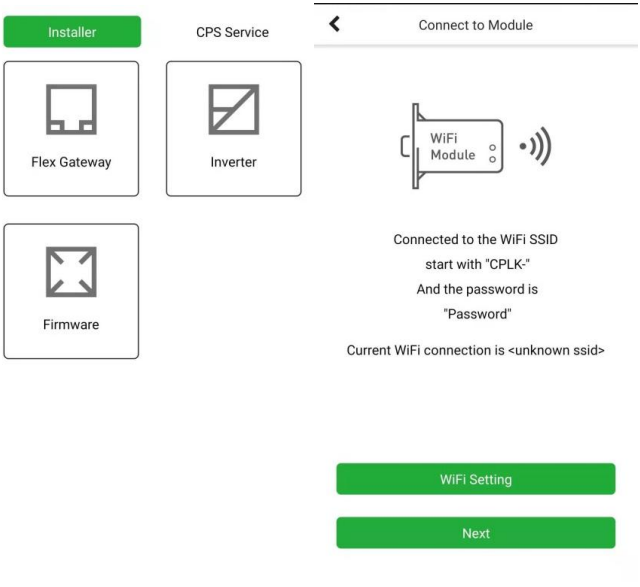
3.) Switch the DC Switch to the “ON” position. When the energy supplied by the PV array is sufficient, the LED of inverter will light up. The inverter will then start up.

## 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 .

Open the APP (CPS Connect previously mentioned)

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 LinKIT model).




Please input the password “ Password ” then setting the grid “GridStandard, PV Link Type, Neutral Line, RS485, Inverter Clock, Change Password” as shown in Figure 4-1.

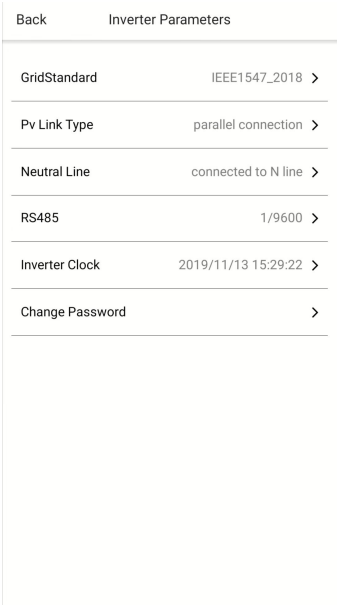



**Figure 4-1 System setting**

GridStandard: Seleting a grid standard

**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.

PV Link Type: The working mode of the DC input connection and MPP Tracker can only be configured for Parallel.

Neutral Line Setting: Setting the neutral line connect or not.

RS485: Choosing the communication data Modbus Address and Baud Rate

Inverter Clock: Setting the system clock.

Change Password： Change current password.

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.

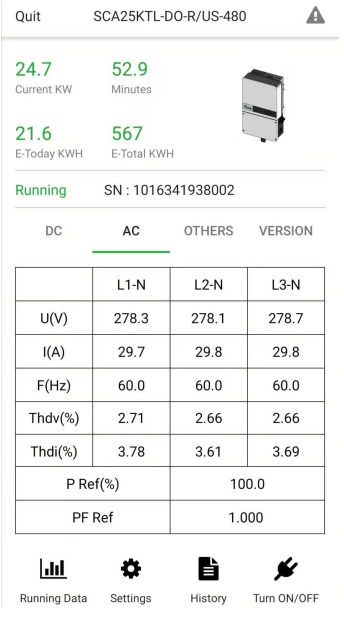



**Figure 4-2 Normal Operation Status**

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 check the detail as shown in the Figure4-3.

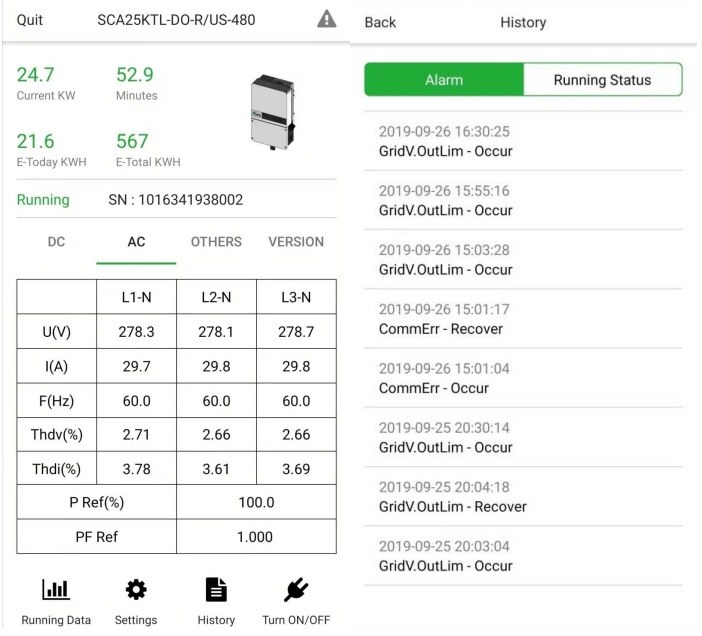
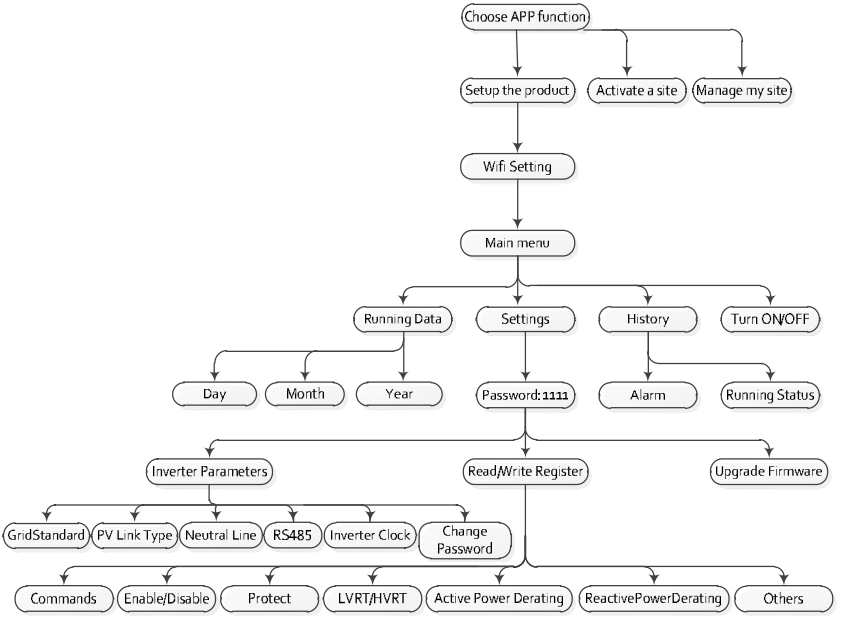



**Figure 4-3 Fault Information Interface**

# 5 APP Interface

## 5.1 Overview

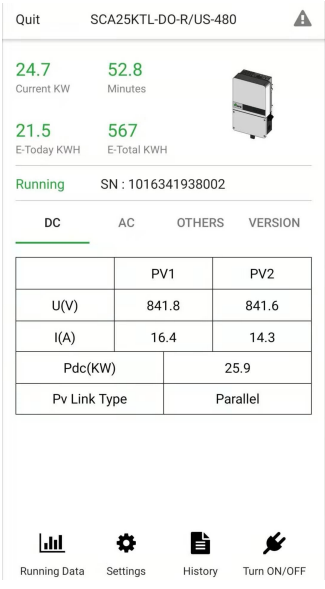


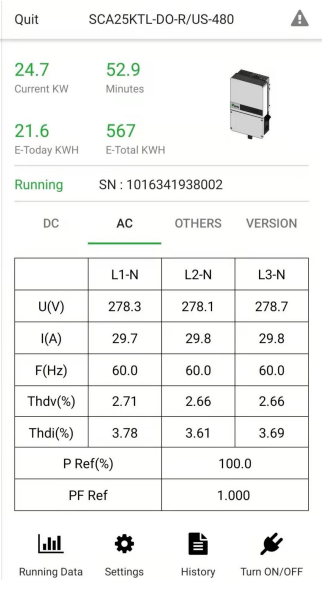

Firuge 5-1 App Interface Interview

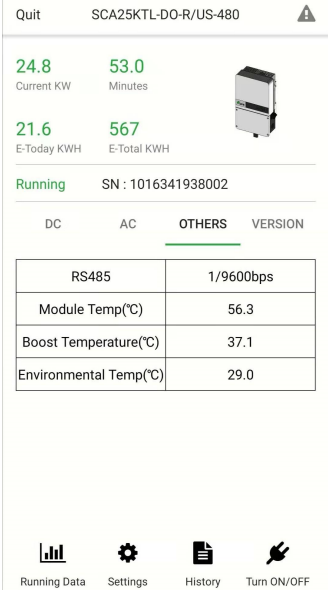
## 5.2 Main section

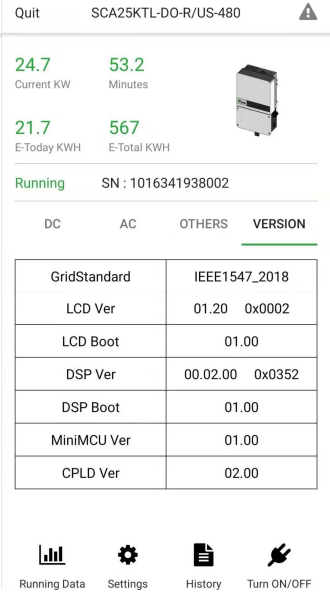
In the MAIN section it's possible to access the following sub-menus:

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


Quit
SCA25KTL-DO-R/US-480
24.7
Current KW
52.8
Minutes
21.5
E-Today KWH
567
E-Total KWH
Running
SN : 1016341938002
DC
AC
OTHERS
VERSION
PV1
PV2
U(V)
841.8
841.6
I(A)
16.4
14.3
Pdc(KW)
25.9
Pv Link Type
Parallel
Running Data
Settings
History
Turn ON/OFF

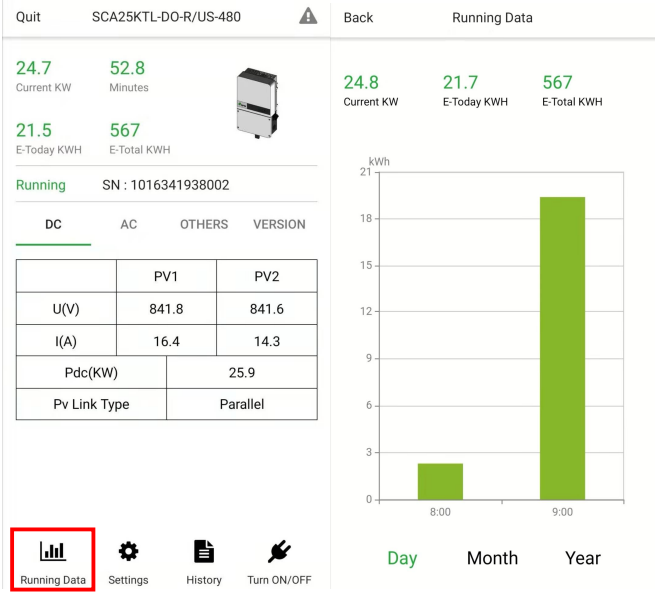

Quit
SCA25KTL-DO-R/US-480
24.7
Current KW
52.9
Minutes
21.6
E-Today KWH
567
E-Total KWH
Running
SN : 1016341938002
DC
AC
OTHERS
VERSION
L1-N
L2-N
L3-N
U(V)
278.3
278.1
278.7
I(A)
29.7
29.8
29.8
F(Hz)
60.0
60.0
60.0
Thdv(%)
2.71
2.66
2.66
Thdi(%)
3.78
3.61
3.69
P Ref(%)
100.0
PF Ref
1.000
Running Data
Settings
History
Turn ON/OFF


Quit
SCA25KTL-DO-R/US-480
24.8
Current KW
53.0
Minutes
21.6
E-Today KWH
567
E-Total KWH
Running
SN : 1016341938002
DC
AC
OTHERS
VERSION
RS485
1/9600bps
Module Temp(℃)
56.3
Boost Temperature(℃)
37.1
Environmental Temp(℃)
29.0
Running Data
Settings
History
Turn ON/OFF


Quit
SCA25KTL-DO-R/US-480
24.7
Current KW
53.2
Minutes
21.7
E-Today KWH
567
E-Total KWH
Running
SN : 1016341938002
DC
AC
OTHERS
VERSION
GridStandard
IEEE1547_2018
LCD Ver
01.20 0x0002
LCD Boot
01.00
DSP Ver
00.02.00 0x0352
DSP Boot
01.00
MiniMCU Ver
01.00
CPLD Ver
02.00
Running Data
Settings
History
Turn ON/OFF

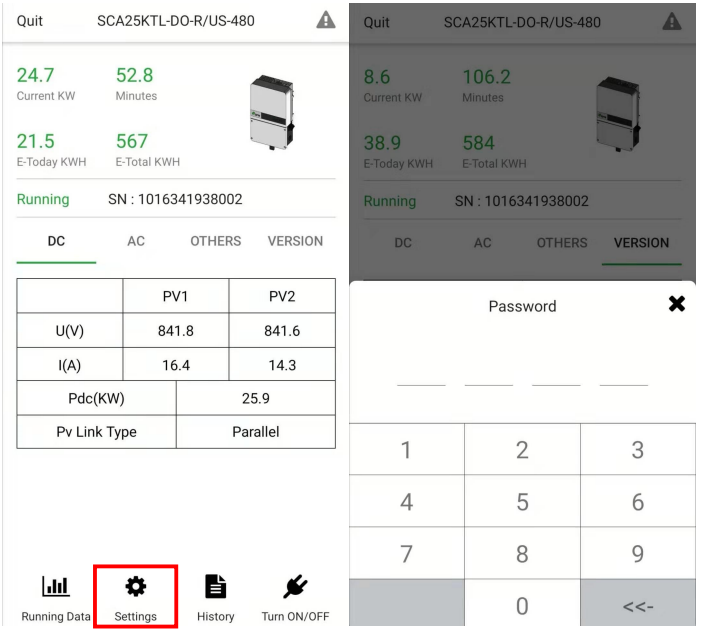
## 5.3 Running Data

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



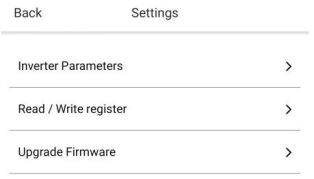
## 5.4 Settings

Choosing the Settings and input the password “ 1111 ” as following:



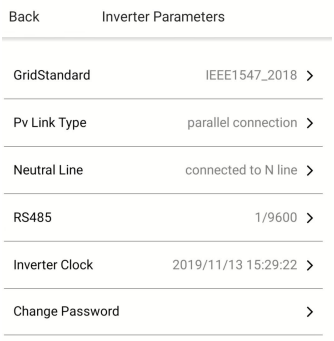

In the Settings section it’s possible to access the following sub-menus:

- Inverter Parameters
- Read/Write Register
- Upgrade Firmware




### 5.4.1 Inverter Parameters

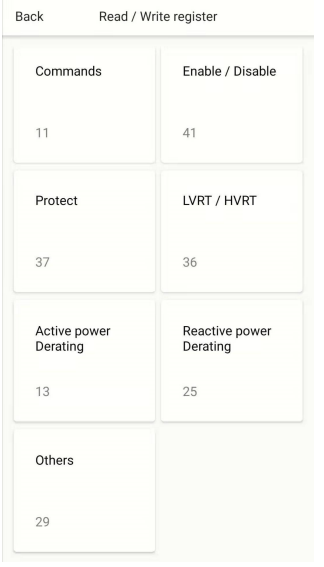
In the Inverter Parameters section it's possible to access the following sub-menus: GridStandard, PV Link Type, Neutral Line, RS 485, Inverter Clock and Change Password as following Figure:




### 5.4.2 Read/Write Register

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

- Commands
- Enable/Disable
- Protect
- LVRT/HVRT
- ActivePowerDerating
- ReactivePowerDerating
- Others




### 5.4.3 Commands

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

- Power On/Off
- ForceRestart
- FactoryDefaults
- AutoTest(CEI)
- MPPTScan
- ArcDetect
- ArcClear
- PFSetValueRemote
- PSetPercentRemote
- QSetPercentRemote
- FreqLv2PrtEn(CEI)

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

“**ForceRestart**” 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.

**“FactoryDefaults”** 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.

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 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 retreive the maximum power point.

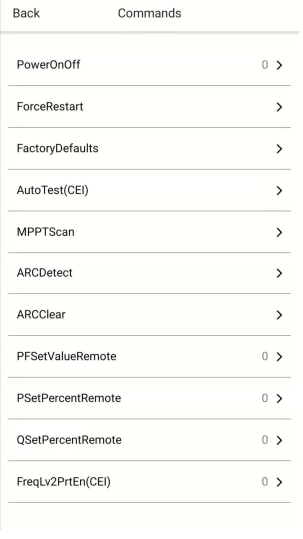
**“AutoTest(CEI)”:** Only for Italian Grid Standard

“**ARCDetect**” : Execute the “**ARC Detect**”, the inverter will stop working and test ARC.

Arcing check and protection is mainly divided into two parts, the Arcing check board is responsible for whether there is Arcing in line, and transfer Arcing protection signal to the DSP in the dominating control board. The control board DSP is responsible for the control of inverter off the grid after receiving Arcing

signal to ensure safety. The Arcing board failure will cause 'ARC board err' shown on the device and it will not connect to the grid until the arc board is OK. If there is Arcing fault, the device displays the fault which can only be cleared manually.

**"ArcClear"** is used to clear the ARC fault. The operation result will appear on the Device, ie. "Succeed" or "Failed".




### 5.4.4 Enable/Disable

Enable/Disable is used for enable or disable the function and protect parameters as following:

| Back | Enable/Disable |
|---|---|
| CtrParaGroup | 4.0 |
| CtrMode | Disable dispatch mode |
| CtrMode | Disable dispatch mode |
| MPPTScanEn | Disable |
| ARCEnable | Enable |
| Island Protect | Enable |
| LVRTModeSett... | Enable, reactive power output |
| HVRTModeSet... | Enable, reactive power output |
| NormSoftStopPEn | Enable |
| PIDCheckEn | 0 |
| GridVoltMax1En | Enable |
| GridVoltMax2En | Enable |

| Back | Enable/Disable |
|---|---|
| GridVoltMax3En | Disable |
| GridVoltMin1En | Enable |
| GridVoltMin2En | Enable |
| GridVoltMin3En | Disable |
| GridFrqMax1En | Enable |
| GridFrqMax2En | Enable |
| GridFrqMax3En | Disable |
| GridFrqMin1En | Enable |
| GridFrqMin2En | Enable |
| GridFrqMin3En | Disable |
| VoltMaxMovAvgEn | Disable |
| VoltMinMovAvgEn | Disable |

| Back | Enable/Disable |
|---|---|
| GFCIStaticEn | Enable |
| GFCIDynProEn | Enable |
| OvrFrqDeratingMode | Disable |
| DCIProtection1En | Enable |
| DCIProtection2En | Disable |
| GridVoltUnbalanceEn | Enable |
| UFDerEn | Disable |
| OvrVoltDerEn | Disable |
| PVSlowStartSEn | Disable |
| ISOProtectionEn | Enable |
| FANDetect | Enable |
| ACSPDDetectEnSet | Disable |

| Back | Enable/Disable |
|---|---|
| GridVoltUnbalanceEn | Enable |
| UFDerEn | Disable |
| OvrVoltDerEn | Disable |
| PVSlowStartSEn | Disable |
| ISOProtectionEn | Enable |
| FANDetect | Enable |
| ACSPDDetectEnSet | Disable |
| OperationOverVolEn | Disable |
| PhaseLoseCoeffEnable | 0 |
| Phase-PEEnable | Disable |
| MPPTRangEnable | Disable |
| RapidShutdownEnabBit | Disable |

**Table 5-1 The Enable/Disable Parameters (IEEE1547-2018 and Rule21)**

| **Enable/Disable** | | | |
|---|---|---|---|
| **Parameter name** | **Description** | **Setup range (lower limit, default & upper limit) IEEE1547** | **Setup range (lower limit, default & upper limit) Rule-21** |
| CtrParaGroup | The enabled control parameters group.<br>0:Article 5 groups, control parameter setting of inverter loop<br>1:Article 1 groups, control parameter setting of inverter loop<br>2:Article 2 groups, control parameter setting of inverter loop<br>3:Article 3 groups, control parameter setting of inverter loop<br>4:Article 4 groups, control parameter setting of inverter loop | {0, 4, 4} | {0, 4, 4} |
| ReactivePwModeSelect | The control mode of reactive power<br>0: Disable dispatch mode.<br>1: Remote dispatch mode.<br>2: Local control ,by Q | {Disable, Disable, Remote, Q,PF,PF(P),Q(u), Q(P)} | {Disable, Q(u), Remote, Q,PF,PF(P),Q(u) , Q(P)} |

| | | | |
|---|---|---|---|
| | 3: Local control ,by PF<br>4: PF(P)curve<br>5: Q(U) curve<br>(Association register address= 0x2200. 0x250F.0x2707. 0x2709)<br>6:Q(P)Curve | | |
| ActivePwModeSelect | The control mode of active power<br>0: Disable dispatch mode.<br>1: Remote dispatch mode.<br>2: Local control.<br>(Association register address=0x250E.0x2708) | {Disable, Disable, Remote,Local} | {Disable, Disable, Remote,Local} |
| MPPTScanEn | MPPT scan enable/disable control<br>0: Disable<br>1: Enable<br>(Association register address=0x2519) | {Disable, Disable, Enable} | {Disable, Disable, Enable} |
| ARCEnable | Arc detection enable/disable control<br>0: Disable<br>1: Enable<br>(Association register address=0x2300~0x230D) | {Disable, Enable, Enable} | {Disable, Enable, Enable} |
| Island Protect | Island enable/disable control | {Disable,Enable, Enable} | {Disable,Enable, Enable} |

| | | | |
|---|---|---|---|
| | 0: Disable<br>1: Enable | | |
| LVRTModeSetting | 0: Disable<br>1:Enable no power output<br>2:Enable reactive power output<br>3:Enable active power output | {Disable, Enable reactive power output , Enable no power output, Enable reactive power output , Enable active power output } | {Disable, Enable reactive power output , Enable no power output, Enable reactive power output , Enable active power output } |
| HVRTModeSetting | 0: Disable<br>1:Enable no power output<br>2:Enable reactive power output<br>3:Enable active power output | {Disable, Enable reactive power output , Enable no power output, Enable reactive power output , Enable active power output } | {Disable, Enable reactive power output , Enable no power output, Enable reactive power output , Enable active power output } |
| NormSoftStopPEn | Disable or Enable the soft stop function | {Disable, Enable, Enable} | {Disable, Enable, Enable} |
| Gridxx1,2ProEn | Disable or Enable the grid protect function and please refer to 5.4.2.3 setting the grid protect parameters | {Disable,Enable, Enable} | {Disable,Enable, Enable} |
| Gridxx3ProEn | Disable or Enable the grid protect function and please refer to 5.4.2.3 | {Disable, Enable, Enable} | {Disable, Enable, Enable} |

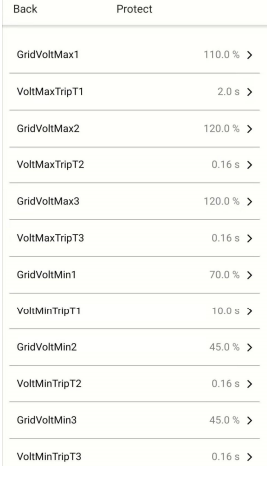
| | | | |
|---|---|---|---|
| | setting the grid protect parameters | | |
| VoltMaxMovAvgEn | Enable/disable control of limiting the upper of moving average filter<br>0: Disable<br>1: Enable | {Disable,Disable, Enable} | {Disable,Disable, Enable} |
| VoltMinMovAvgEn | Enable/disable control of limiting the lower of moving average filter<br>0: Disable<br>1: Enable | {Disable,Disable, Enable} | {Disable,Disable, Enable} |
| GFCIStaticEn | GFCI static detection enable/disable control<br>0: Disable<br>1: Enable | {Disable,Enable, Enable} | {Disable,Enable, Enable} |
| GFCIDynProEn | GFCI dynamic detection enable/disable control<br>0: Disable<br>1: Enable | {Disable,Enable, Enable} | {Disable,Enable, Enable} |
| OvrFrqDeratingMode | Over frequency derating enable/disable control<br>0: Disable<br>1~5: Enabling corresponding function<br>1：Enable<br>2：Reserver<br>3：Reserver | {Disable,Disable, Enable} | {Disable,Disable, Enable} |

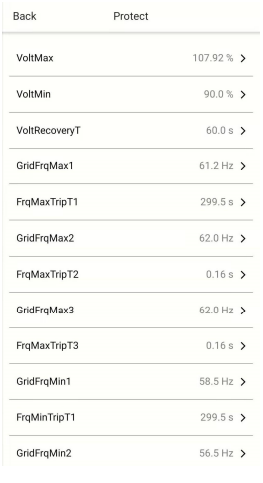
| | | | |
|---|---|---|---|
| | 4：Reserver<br>5：Reserver | | |
| DCIProtection1En | DCI protection1 enable/disable control<br>0: Disable<br>1: Enable | {Disable,Enable,<br>Enable} | {Disable,Enable,<br>Enable} |
| DCIProtection2En | DCI protection2 enable/disable control<br>0: Disable<br>1: Enable | {Disable,Disable,<br>Enable} | {Disable,Disable,<br>Enable} |
| GridVoltUnbalanceEn | Unbalance rate of grid voltage detection enable/disable control<br>0: Disable<br>1: Enable | {Disable,Enable,<br>Enable} | {Disable,Enable,<br>Enable} |
| OvrVoltDerEn | Grid voltage derating enable/disable control<br>0: Disable<br>1: Enable | {Disable,Disable,<br>Enable} | {Disable,Disable,<br>Enable} |
| PowerMutateRatio (HECO) | Only for HECO grid standard .Disable or Enable the slow start function after power mutation. And please refer to 5.4.2.7 setting the parameter. | | |
| ISOProtectionEn | ISO detection enable/disable control<br>0: Disable<br>1: Enable | {Disable,Enable,<br>Enable} | {Disable,Enable,<br>Enable} |
| FANDetect | Fan detection enable/disable control | {Disable,Enable,<br>Enable} | {Disable,Enable,<br>Enable} |

| | | | |
|---|---|---|---|
| | 0: Disable<br>1: Enable | | |
| ACSPDDetectEnSet | The AC SPD test enables settings<br>0: Disable<br>1: Enable | {Disable,Disable, Enable} | {Disable,Disable, Enable} |
| OperationOverVolEn | Operating overvoltage detection enables setting<br>0: Disable<br>1: Enable | {Disable,Disable, Enable} | {Disable,Disable, Enable} |

### 5.4.5 Protect

This interface is used to display and set the Protect parameters of the AC grid voltage, frequency and recovery, etc as following:



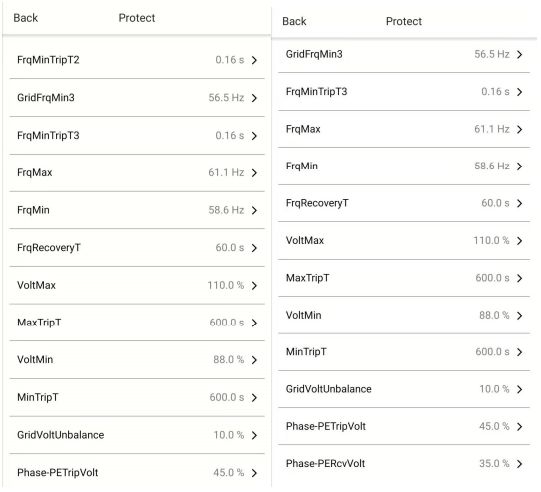



**Table 5-2 The Protection Parameters (IEEE1547-2018 and Rule21)**

| Grid Over Voltage Protection | | | |
|---|---|---|---|
| Parameter name | Description | Setup range (lower limit, default & upper limit) IEEE1547-2018 | Setup range (lower limit, default & upper limit)Rule21 |
| GridVoltMax1 | Threshold value of Level 1 Max. grid voltage | {100%, 110%, 135%} | {100%, 110%, 135%} |
| VoltMaxTripTime1(S) | Threshold value of Level 1 Max. grid trip voltage | {0, 2, 655} | {0, 12.5, 655} |
| GridVoltMax2 | Threshold value of Level 2 Max. grid voltage | {100%, 120%, 135%} | {100%, 120%, 135%} |

| | | | |
|---|---|---|---|
| VoltMaxTripTime2(S) | Threshold value of Level 2 Max. grid trip voltage | {0, 0.16, 655} | {0, 0.16, 655} |
| GridVoltMax3 | Threshold value of Level 3 Max. grid voltage | {100%, 120%, 135%} | {100%, 120%, 135%} |
| VoltMaxTripTime3(S) | Threshold value of Level 3 Max. grid trip voltage | {0, 0.16, 655} | {0, 0.16, 655} |
| Grid Low Voltage Protection | | | |
| Parameter name | Description | Setup range (lower limit, default & upper limit) IEEE1547-2018 | Setup range (lower limit, default & upper limit) Rule21 |
| GridVoltMin1 | Threshold value of Level 1 Min. grid voltage | {30%, 70%, 100%} | {30%, 88%, 100%} |
| VoltMinTripTime1(S) | Threshold value of Level 1 Min. grid trip voltage | {0, 10, 655} | {0, 20.5, 655} |
| GridVoltMin2 | Threshold value of Level 2 Min. grid voltage | {30%, 45%, 100%} | {30%,70%, 100%} |
| VoltMinTripTime2(S) | Threshold value of Level 2 Min. grid trip voltage | {0, 0.16, 655} | {0, 10.5, 655} |
| GridVoltMin3 | Threshold value of Level 3 Min. | {30%, 45%, 100%} | {30%, 50%, 100%} |

| | | | |
|---|---|---|---|
| | grid voltage | | |
| VoltMinTripTime3(S) | Threshold value of Level 3 Min. grid trip voltage | {0, 0.16, 655} | {0, 1.5, 655} |
| VMaxRov | Recovery Maxthresholdgrid voltage protection | {80 %, 107.92%, 135%} | {80%, 107.99%, 135%} |
| VMinRov(V) | Recovery Min threshold. grid voltage protection | {20%, 90%, 100%} | {20%, 90%, 100%} |
| VRcovT(S) | Recovery time of grid voltage protection | {0, 300, 655} | {0, 300, 655} |
| Grid Over Frequency Protection | | | |
| Parameter name | Description | Setup range (lower limit, default & upper limit) IEEE1547-2018 | Setup range (lower limit, default & upper limit) Rule21 |
| GridF.Max1 | Protection threshold value of Level 1 Max. grid frequency | {60, 61.2, 66} | {60, 60.5, 66} |
| FMaxTripTime1(S） | Trip time of Level 1 Max. grid frequency | {0, 299.5, 655} | {0, 299.5, 655} |
| GridF.Max2 | Protection threshold value of Level 2 Max. grid | {60, 62, 66} | {60, 62, 66} |

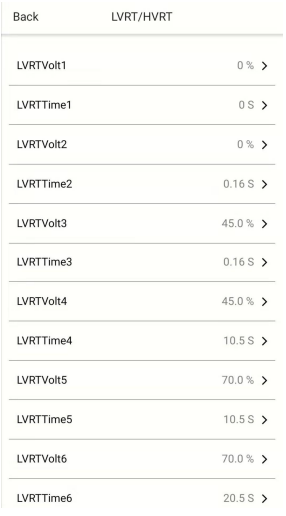
| | | | |
|---|---|---|---|
| | frequency | | |
| FMaxTripTime2(S) | Trip time of Level 2 Max. grid frequency | {0, 0.16, 655} | {0, 0.16, 655} |
| GridF.Max3 | Protection threshold value of Level 3 Max. grid frequency | {60, 62, 66} | {60, 62, 66} |
| FMaxTripTime3(S) | Trip time of Level 3 Max. grid frequency | {0, 0.16, 655} | {0, 0.16, 655} |
| Grid Low Frequency Protection | | | |
| Parameter name | Description | Setup range (lower limit, default & upper limit) IEEE1547-2018 | Setup range (lower limit, default & upper limit) Rule21 |
| GridF.Min1 | Protection threshold value of Level 1 Min. grid frequency | {54, 58.5, 60} | {54, 58.5, 60} |
| FrqMinTripTime1(S) | Trip time of Level 1 Min. grid frequency | {0, 299.5, 655} | {0, 299.5, 655} |
| GridF.Min2 | Protection threshold value of Level 2 Min. grid frequency | {54, 56.5, 60} | {54, 57, 60} |
| FMinTripTime2(S) | Trip time of Level 2 | {0, 0.16, 655} | {0, 0.16, 655} |

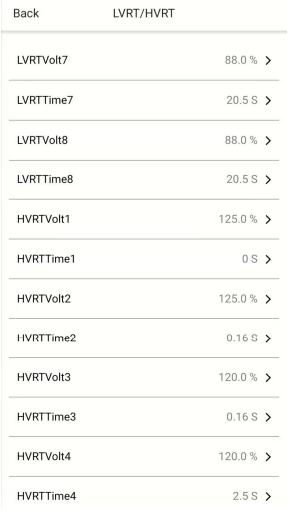
| | | | |
|---|---|---|---|
| | Min. grid frequency | | |
| GridF.Min3 | Protection threshold value of Level 3 Min. grid frequency | {54, 56.5, 60} | {54, 57, 60} |
| FMinTripTime3(S) | Trip time of Level 3 Min. grid frequency | {0, 0.16, 655} | {0, 0.16, 655} |
| FMaxRcov(Hz) | Recovery Max thresholdgrid Frequency protection | {54, 61.1, 66} | {54, 60.4, 66} |
| FMinRcov(Hz) | Recovery Min threshold. grid Frequency protection | {54, 58.6, 60} | {54, 58.6, 60} |
| FRcovT(S) | Recovery time of grid frequency protection | {0, 300, 655} | {0, 300, 655} |
| VoltMax | The upper limit grid voltage of moving average filter | {100%, 110%, 135%} | {100%, 110%, 135%} |
| MaxTripT | The trip time of the upper limit grid voltage of moving average filter | {0, 600, 655} | {0, 600, 655} |
| VoltMin | The lower limit grid voltage of moving average filter | {80%, 88%, 100%} | {80%, 87.99%, 100%} |

| | | | |
|---|---|---|---|
| MinTripT | The trip time of the lower limit grid voltage of moving average filter | {0, 600, 655} | {0, 600, 655} |
| GridVoltUnbalance | Unbalance rate of grid voltage | (0.01%,10%,10%) | (0.01%,10%,10%) |

### 5.4.6 LVRT/HVRT

"LVRT/HVRT" is used to set the LVRT (Low voltage ride through ) and HVRT (High voltage ride through ) parameters as following:



| Back | LVRT/HVRT |
|---|---|
| HVRTVolt5 | 110.0 % > |
| HVRTTime5 | 2.5 S > |
| HVRTVolt6 | 110.0 % > |
| HVRTTime6 | 12.5 S > |
| HVRTVolt7 | 110.0 % > |
| HVRTTime7 | 12.5 S > |
| HVRTVolt8 | 110.0 % > |
| HVRTTime8 | 12.5 S > |
| HVRTTripVolt | 110.0 % > |
| LVRTTripVolt | 88.0 % > |
| LVRTPstReactivel | 150.0 % > |
| LVRTNegReactivel | 200.0 % > |

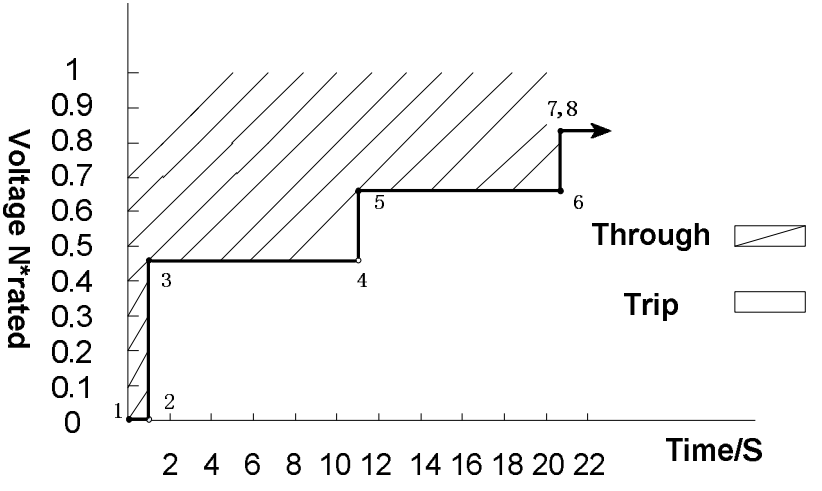



**Figure 5-2 The LVRT Curve**

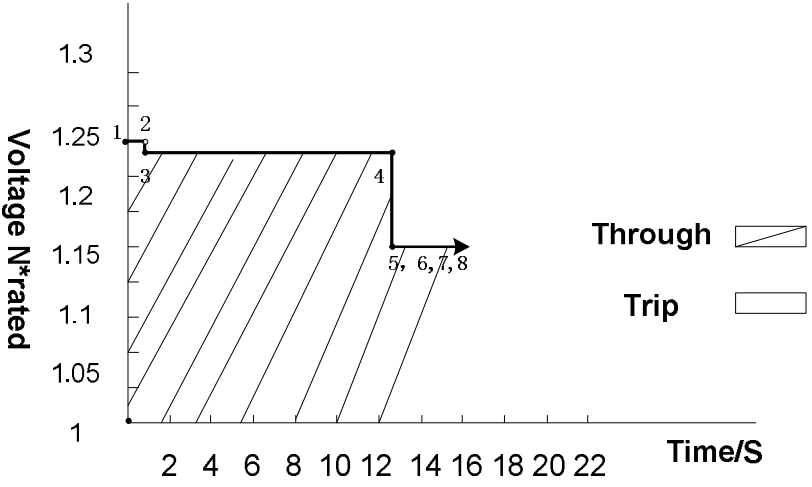



**Figure 5-3 The HVRT Curve**

**Table 5-3 LVRT and HVRT Parameters**

| LVRT | | | |
|---|---|---|---|
| Parameter name | Description | Setup range (lower limit, default & upper limit) IEEE1547-2018 | Setup range (lower limit, default & upper limit) Rule21 |
| LVRTVoltPara (1,2) | Threshold value of Low voltage ride through(first or second point) | {0%, 0%, 100%}<br>{0%, 0%, 100%} | {0%, 0%, 100%}<br>{0%, 0%, 100%} |
| LVRTTimePara(1,2) | Time of Level Low voltage ride | {0, 0, 655}<br>{0, 0.16, 655} | {0, 0, 655}<br>{0, 1.2, 655} |

| | | | |
|---|---|---|---|
| | throught( first or second point) | | |
| LVRTVoltPara (3,4) | Threshold value of Low voltage ride through(third or fourth point) | {0%, 45%, 100%}<br>{0%, 45%, 100%} | {0%, 50%, 100%}<br>{0%, 50%, 100%} |
| LVRTTimePara(3,4) | Time of Level Low voltage ride through(third or fourth point) | {0,0.16, 655}<br>{0, 10.5, 655} | {0,1.2, 655}<br>{0, 10.5, 655} |
| LVRTVoltPara (5,6) | Threshold value of Low voltage ride through(fifth or sixth point) | {0%, 70%, 100%}<br>{0%, 70%, 100%} | {0%, 70%, 100%}<br>{0%, 70%, 100%} |
| LVRTTimePara(5,6) | Time of Level Low voltage ride through(fifth or sixth point)) | {0, 10.5, 655}<br>{0, 20.5, 655} | {0, 10.5, 655}<br>{0, 20.5, 655} |
| LVRTVoltPara (7,8) | Threshold value of Low voltage ride through(seventh or eighth point) | {0%, 88%, 100%}<br>{0%, 88%, 100%} | {0%, 88%, 100%}<br>{0%, 88%, 100%} |
| LVRTTimePara(7,8) | Time of Level Low voltage ride through(seventh or eighth point) | {0, 20.5, 655}<br>{0, 20.5, 655} | {0, 20.5, 655}<br>{0, 20.5, 655} |

| HVRT | | | |
|---|---|---|---|
| Parameter name | Description | Setup range (lower limit, default & upper limit) IEEE1547-2018 | Setup range (lower limit, default & upper limit) Rule21 |
| HVRTVoltPara (1,2) | Threshold value of high voltage ride through(first or second point) | {100%, 125%, 135%} {100%, 125%, 135%} | {100%, 125%, 135%} {100%, 125%, 135%} |
| HVRTTimePara(1,2) | Time of Level high voltage ride through(t first or second point) | {0, 0, 655} {0, 0.16, 655} | {0, 0, 655} {0, 0.11, 655} |
| HVRTVoltPara (3,4) | Threshold value of high voltage ride through(third or fourth point) | {100%, 120%, 135%} {100%, 120%, 135%} | {100%, 120%, 135%} {100%, 120%, 135%} |
| HVRTTimePara(3,4) | Time of Level high voltage ride through(third or fourth point) | {0, 0.16, 655} {0, 2.5, 655} | {0, 0.11, 655} {0, 12.5, 655} |
| HVRTVoltPara (5,6) | Threshold value of high voltage ride through(fifth or sixth point) | {100%, 110%, 135%} {100%, 110%, 135%} | {100%, 110%, 135%} {100%, 110%, 135%} |
| HVRTTimePara(5,6) | Time of Level high | {0, 2.5, 655} | {0, 12.5, 655} |

| | | | |
|---|---|---|---|
| | voltage ride through(fifth or sixth point)) | {0, 12.5, 655} | {0, 12.5, 655} |
| HVRTVoltPara (7,8) | Threshold value of high voltage ride through(seventh or eighth point) | {100%, 110%, 135%} {100%, 110%, 135%} | {100%, 110%, 135%} {100%, 110%, 135%} |
| HVRTTimePara(7,8) | Time of Level high voltage ride through(seventh or eighth point) | {0, 12.5, 655} {0, 12.5, 655} | {0, 12.5, 655} {0, 12.5, 655} |

### 5.4.7 ActivePowerDerating

"ActivePowerDerating" 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 5-4.

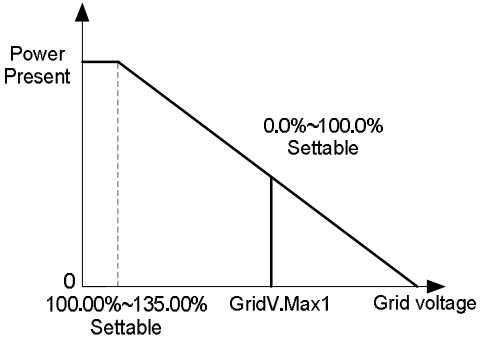



Figure 5-4 Curve of over voltage derating

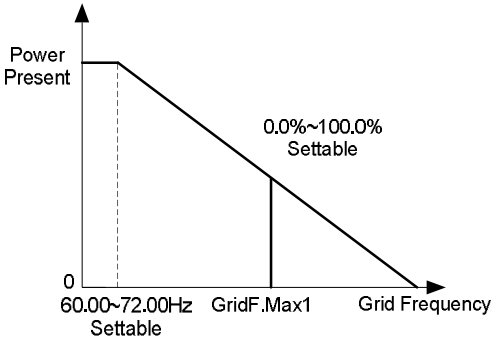



Figure 5-5 Curve of over frequency derating

| Back | ActivePower Derating |
|---|---|
| Percentage | 100.0 % |
| OvrFrqMin | 60.04 Hz |
| OvrFrqMax | 62.53 Hz |
| OvrFrqSlop | 0.16 % |
| RecoveryFrq | 59.96 Hz |
| OvrFrqRecoveryT | 60.0 s |
| VirtualDamping | 0 Ω |
| OperationOverVol | 120.0 % |
| VwCurveV1 | 106.0 % |
| VwCurveP1 | 100.0 % |
| VwCurveV2 | 110.0 % |
| VwCurveP2 | 0 % |

| Back | ActivePower Derating |
|---|---|
| OvrFrqMin | 60.04 Hz |
| OvrFrqMax | 62.53 Hz |
| OvrFrqSlop | 0.16 % |
| RecoveryFrq | 59.96 Hz |
| OvrFrqRecoveryT | 60.0 s |
| VirtualDamping | 0 Ω |
| OperationOverVol | 120.0 % |
| VwCurveV1 | 106.0 % |
| VwCurveP1 | 100.0 % |
| VwCurveV2 | 110.0 % |
| VwCurveP2 | 0 % |
| OpenLoopRespT | 10.0 |

**Table 5-4 Power Derating Setup**

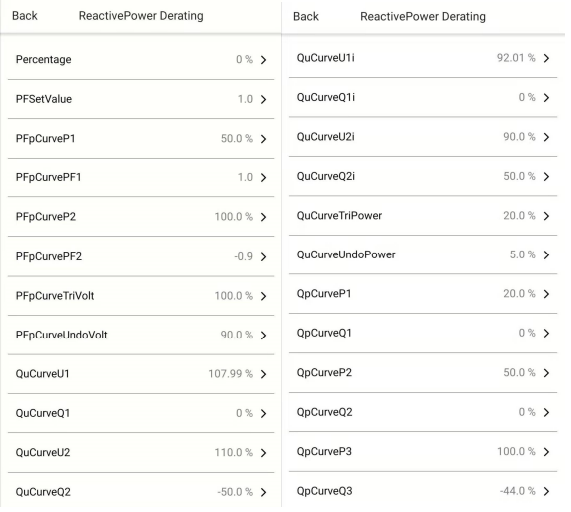
| Parameter name | Description | Setup range (lower limit, default & upper limit) IEEE1547-2018 | Setup range (lower limit, default & upper limit) Rule21 |
|---|---|---|---|
| OvrFrqMin | The trigger frequency of OverFrequency derating | {60, 60.04,72} | {60, 60.04 ,72} |
| OvrFrqMax | The end frequency or Rate of Overfrequency derating (Depends on the specific standard) | {60,62.532,72} | {60, 62.034 ,72} |
| OvrFrqSlop | The Rate of Overfrequency derating. | {0.01%,30%,100%} | {0.01%,30%,100%} |
| RecoveryFrq | The recovery frequency of OverFrequency derating | {58.8, 59.964 ,66} | {58.8, 59.964 ,66} |
| OvrFrqRecoveryT | The recovery time of OverFrequency derating | {0,60,1200} | {0,60,1200} |
| VirtualDamping | Resonance | {0,0,5} | {0,0,5} |

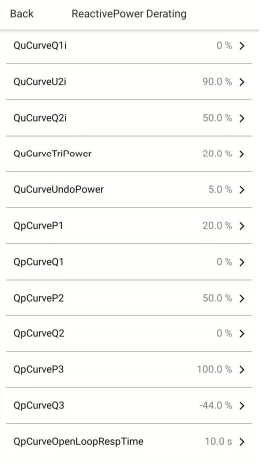
| | | | |
|---|---|---|---|
| | damping coefficient | | |
| OperationOverVol | Operating overvoltage protection value | {100%,120%,135%} | {100%,120%,135%} |
| VwCurveV1 | Grid overvoltage derating starting voltage V1 | {100%, 106%,110%} | {100%, 106%,110%} |
| VwCurveP1 | Grid overvoltage derating starting power P1 | {0%,100%,100%} | {0%,100%,100%} |
| VwCurveV2 | Grid overvoltage derating end voltage V2 | {100%,110%,135%} | {100%,110%,135%} |
| VwCurveP2 | Grid overvoltage derating end power P2 | {0%, 0%,100%} | {0%, 0%,100%} |
| OpenLoopRespT | Open loop response time | {0.5,10,90} | {0.5,10,90} |

### 5.4.8 ReactivePowerDerating

“ReactivePowerDerating”manu is used to set the Grid reactive power derating parameters including PF parameters and Qu parameters, etc. The parameters as shown in Table 5-5

Note: The PF and Q value can be adjusted by remote software if the “Remote” is selected.




(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.

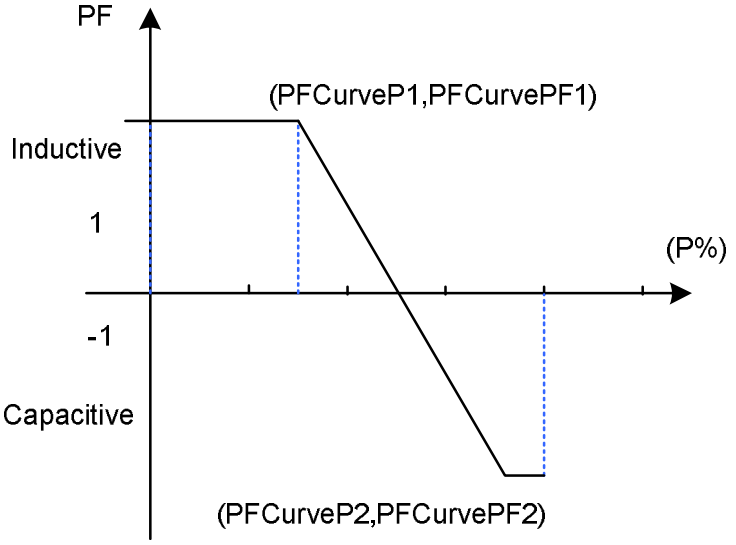



**Figure 5-6 PF(P) Curve Mode**

(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.

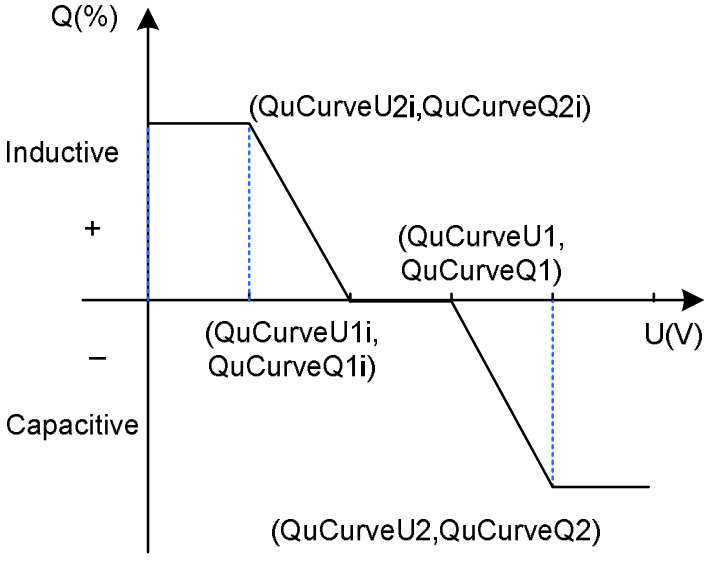



**Figure 5-7 Q(U) Curve Mode**

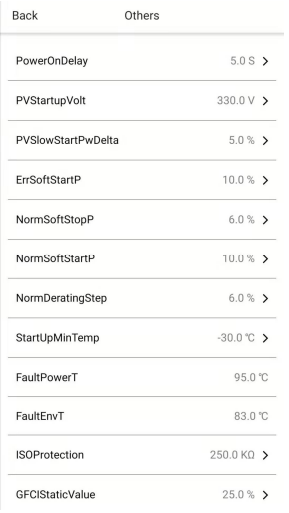
**Table 5-5 Parameters of reactive power control (IEEE1547-2018 and Rule21)**

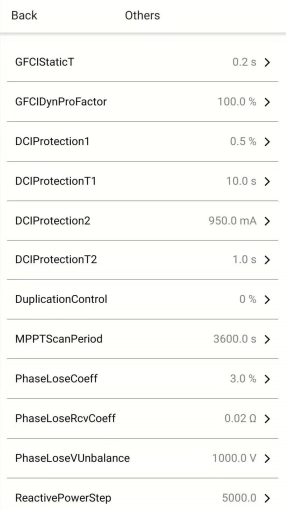
| **Grid Reactive Power Derating** | | | |
|---|---|---|---|
| **Parameter name** | **Setup range (lower limit, default & upper limit) IEEE1547-2018** | **Setup range (lower limit, default & upper limit) Rule21** | **Description** |
| PFSetValue | {-1,-0.8},{1},{0.8,1} | {-1,-0.8},{-0.95},{0.8,1} | Local Power Factor Setting |
| PFpCurveP1 | {0%,50%,100%} | {0%,50%,100%} | Power of PF(P)Curve point 1 |
| PF_PCurvePF1 | {-1,-0.8},{1},{0.8,1} | {-1,-0.8},{1},{0.8,1} | PF of |

| | | | |
|---|---|---|---|
| | | | PF(P)Curve point 1 |
| PFpCurveP2 | {0%,100%,100%} | {0%,100%,100%} | Power of PF(P)Curve point 2 |
| PF_PCurvePF2 | {-1,-0.8},{-0.9},{0.8,1} | {-1,-0.8},{-0.9},{0.8,1} | PF of PF(P)Curve point 2 |
| PFpCurveTriVolt | {100%,100%,110%} | {100%,100%,110%} | The trigger voltage of PF(P)Curve |
| PFpCurveUndoVolt | {90%,90%,100%} | {90%,90%,100%} | The end voltage of PF(P)Curve |
| QuCurveU1 | {100%,102%,110%} | {100%,103.3%,110%} | Voltage of Q(U)Curve point 1 |
| QuCurveQ1 | {-60%,0%,60%} | {-60%,0%,60%} | Reactive power of Q(U)Curve point 1 |
| QuCurveU2 | {100%,108%,110%} | {100%,107%,110%} | Voltage of Q(U)Curve point 2 |
| QuCurveQ2 | {-60%,-44%,60%} | {-60%,-30%,60%} | Reactive power of Q(U)Curve point 2 |
| QuCurveU1i | {90%,98%,99%} | {90%,96.7%,99%} | Voltage of Q(U)Curve |

| | | | |
|---|---|---|---|
| | | | point 1i |
| QuCurveQ1i | {-60%,0%,60%} | {-60%,0%,60%} | Reactive power of Q(U)Curve point 1i |
| QuCurveU2i | {80%,92%,100%} | {80%,92%,100%} | Voltage of Q(U)Curve point 2i |
| QuCurveQ2i | {-60%,44%,60%} | {-60%,30%,60%} | Reactive power of Q(U)Curve point 2i |
| QuCurveTriPower | {5%,20%,100%} | {5%,20%,100%} | The trigger power of Q(U)Curve |
| QuCurveUndoPower | {5%,5%,100%} | {5%,5%,100%} | The end power of Q(U)Curve |

## 5.4.9 Others


Back
Others
PowerOnDelay 5.0 S
PVStartupVolt 330.0 V
PVSlowStartPwDelta 5.0 %
ErrSoftStartP 10.0 %
NormSoftStopP 6.0 %
NormSoftStartP 10.0 %
NormDeratingStep 6.0 %
StartUpMinTemp -30.0 ℃
FaultPowerT 95.0 ℃
FaultEnvT 83.0 ℃
ISOProtection 250.0 KΩ
GFCIStaticValue 25.0 %


Back
Others
GFCIStaticT 0.2 s
GFCIDynProFactor 100.0 %
DCIProtection1 0.5 %
DCIProtectionT1 10.0 s
DCIProtection2 950.0 mA
DCIProtectionT2 1.0 s
DuplicationControl 0 %
MPPTScanPeriod 3600.0 s
PhaseLoseCoeff 3.0 %
PhaseLoseRcvCoeff 0.02 Ω
PhaseLoseVUnbalance 1000.0 V
ReactivePowerStep 5000.0

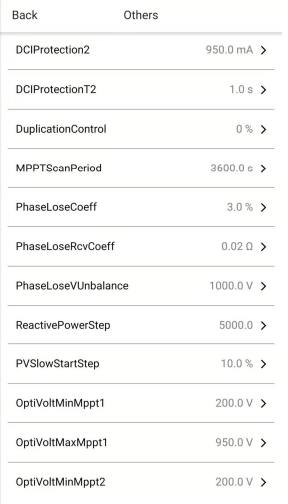

Back
Others
DCIProtection2 950.0 mA
DCIProtectionT2 1.0 s
DuplicationControl 0 %
MPPTScanPeriod 3600.0 s
PhaseLoseCoeff 3.0 %
PhaseLoseRcvCoeff 0.02 Ω
PhaseLoseVUnbalance 1000.0 V
ReactivePowerStep 5000.0
PVSlowStartStep 10.0 %
OptiVoltMinMppt1 200.0 V
OptiVoltMaxMppt1 950.0 V
OptiVoltMinMppt2 200.0 V

**Table 5-6 Other Parameters**

| Parameter name | Description | Setup range (lower limit, default & upper limit) IEEE1547-2018 | Setup range (lower limit, default & upper limit) Rule21 |
|---|---|---|---|
| PowerOnDelay | Startup delay time | (1,5,1200) | (1,5,1200) |
| PVStartupVolt | PV start-up voltage | (200, 330 ,400) | (200, 330 ,400) |
| PVSlowStartPwDelta | The output power should be slow increased due to the change of PV illumination at the Rule21 standard. | {0.01%,10%, 10%} | {0.01%,10%, 10%} |
| ErrSoftStartP | Power startup step after Grid Fault | {0.01%,0.16%, 100%} | {0.01%,2%,100%} |
| NormSoftStopP | Normal power step in soft stop | {0.01%,6%, 100%} | {0.01%,10%, 100%} |
| NormSoftStartP | Normal power step in soft startup | {0.01%,4%, 100%} | {0.01%,100%, 100%} |
| NormDeratingStep | Normal Power Derating step | {0.01%,6%, 100%} | {0.01%,100%, 100%} |
| StartUpMinTemp | The minimum startup temperature | {-35,-30,-20} | {-35,-30,-20} |
| HVRTTripVolt | The trigger Voltage of HVRT | {100%,110%,135%} | {100%,110%,135%} |
| LVRTTripVolt | The trigger Voltage of LVRT | {70%,88%,100%} | {70%,88%,100%} |

| | | | |
|---|---|---|---|
| LVRTPstReactiveI | The coefficient of positive sequence reactive current | {0%,150%,300%} | {0%,150%,300%} |
| LVRTNegReactiveI | The coefficient of negtive sequence reactive current | {0%,200%,300%} | {0%,20%,300%} |
| PSet_Pecent | Local electric dispatch Active Power setting value | {0%,100%,100%} | {0%,100%,100%} |
| QSet_Pecent | Local electric dispatch Reactive Power setting value | {-60%,0%,60%} | {-60%,0%,60%} |
| ISOProtection | Minimum insulation resistance | {1k,250k,2000k} | {1k,250k,2000k} |
| GFCIStaticValue | The static threshold value of Leakage current | {100, 250 ,1000} | {100, 250 ,1000} |
| GFCIStaticT | GFCI static protection time | {0,0.2,655} | {0,0.2,655} |
| GFCIDynProFactor | GFCI dynamic protection factor | {0%,100%,200%} | {0%,100%,200%} |
| DCIProtection1 | maximun DCI value1 | {0.1%,0.5%, 5%} | {0.1%,0.5%, 5%} |
| DCIProtectionT1 | Trip time 1 of DCI value | {0,10,120} | {0,10,120} |
| DCIProtection2 | maximun DCI value2 | {5,950,5000} | {5,950,5000} |
| DCIProtectionT2 | Trip time 2 of DCI value | {0,1,120} | {0,1,120} |

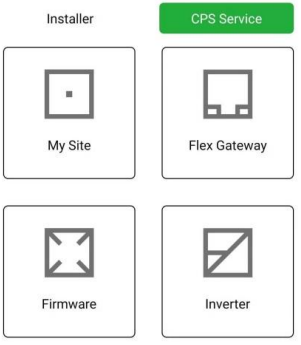
| | | | |
|---|---|---|---|
| DuplicationControl | Parameter of repetitive control | {0%,0%,100%} | {0%,0%,100%} |
| MPPTScanPeriod | MPPTScan Cycle | {300,3600,5400} | {300,3600,5400} |

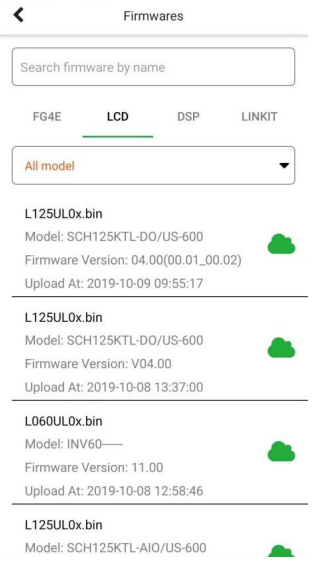
## 5.5 Fault Recording

The last record can store up 128 fault record in "**Fault Record**" menu.

### 5.5.1 Firmware Upgrade

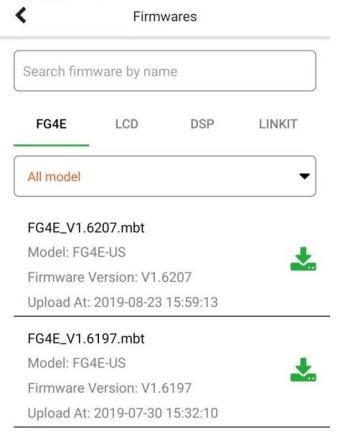
- Installer open the APP – Chint Powet Connect and select Firmware.
  - Make sure the mobile phone can access the Internet.
  - Click Firmware on the Home page
  - Log into My Site and click Firmware in the menu selection



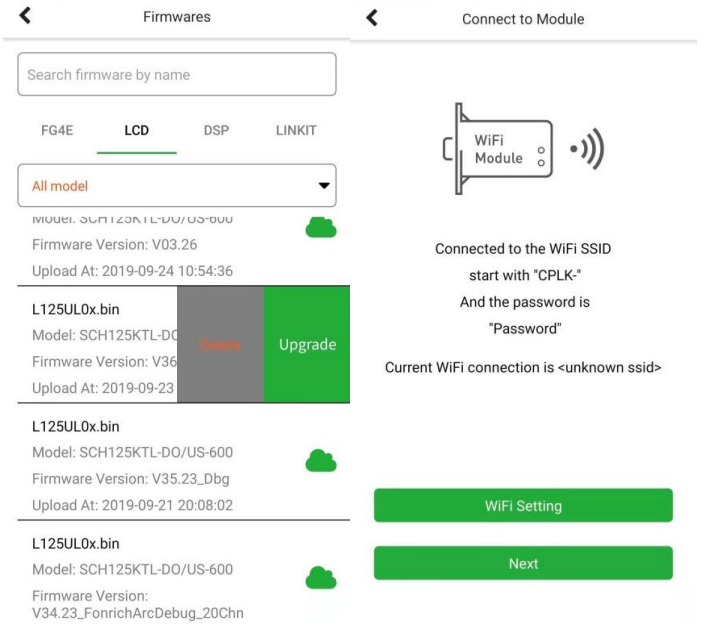
Firmwares have been released on Cloud

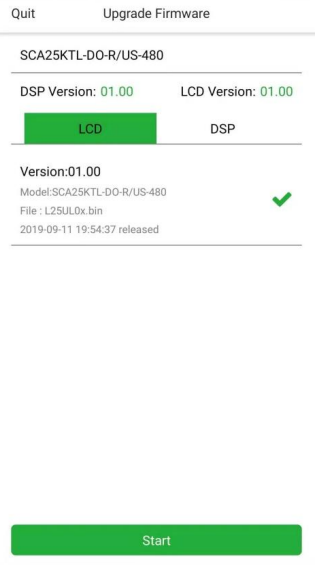
Firmwares have been downloaded in-Pocket.




### 5.5.2 Upgrade the Inverter

- Click Upgrade and connect to LinKIT
- Select the firmware file, enter the password and click Start to upgrade the Inverter.


Firmwares
Search firmware by name
FG4E
LCD
DSP
LINKIT
All model
Firmware Version: V03.26
Upload At: 2019-09-24 10:54:36
L125UL0x.bin
Model: SCH125KTL-DO
Firmware Version: V36
Upload At: 2019-09-23
Delete
Upgrade
L125UL0x.bin
Model: SCH125KTL-DO/US-600
Firmware Version: V35.23_Dbg
Upload At: 2019-09-21 20:08:02
L125UL0x.bin
Model: SCH125KTL-DO/US-600
Firmware Version:
V34.23_FonrichArcDebug_20Chn
Connect to Module
WiFi
Module
Connected to the WiFi SSID
start with "CPLK-"
And the password is
"Password"
Current WiFi connection is <unknown ssid>
WiFi Setting
Next

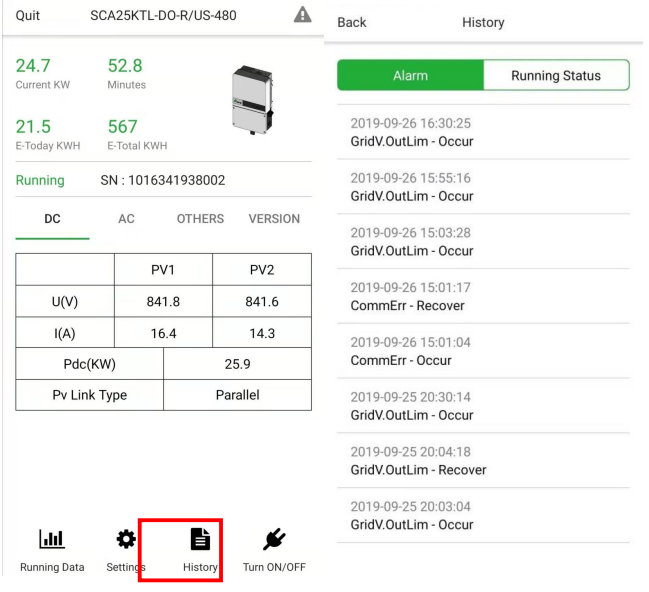

Quit
Upgrade Firmware
SCA25KTL-DO-R/US-480
DSP Version: 01.00
LCD Version: 01.00
LCD
DSP
Version:01.00
Model:SCA25KTL-DO-R/US-480
File : L25UL0x.bin
2019-09-11 19:54:37 released
Start

### 5.5.3 Upgrade the LinKIT

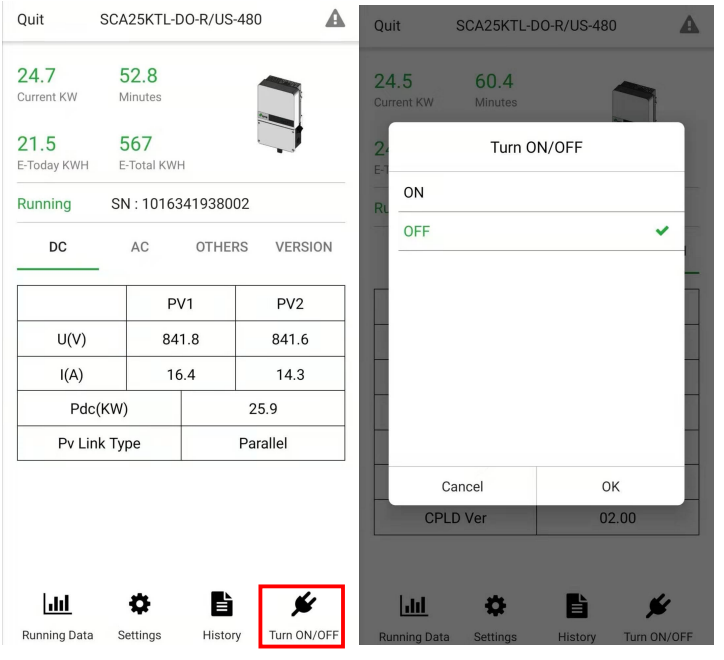
- Connect to Chint Power Connect
- Click Upgrade to upgrade the linKIT

## 5.6 History

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



## 5.7 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.

# 6 Fault Shutdown and Troubleshooting

## 6.1 LED Fault and Troubleshooting

LED information of CPS SCA20/25KTL-DO-R/US-480:


Interpretation for the indicator lights is shown in Table 6-1

**Table 6-1 LED Indication**

| LED light | Name | Status | Indication |
|---|---|---|---|
| POWER | Working power indication light | Light on | Working power |
| | | Light off | No working power |
| FAULT | Fault status indication light | Light on | Permanent fault |
| | | Fast flash | Fault (light up 0.5s, light off 0.5s) |
| | | Slow flash | Warn (light up 0.5s, light off 2s) |
| | | Light | No fault or power supply not working |

| | | | |
|---|---|---|---|
| | | off | |
| GFCI/AFCI | GFCI/AFCI status indication light | Light on | AFCI protection |
| | | Flash | GFCI fault (light up 0.5s, light off 2s) |
| | | Light off | No GFCI/AFCI fault or power supply not working |
| RSD | RSD status indication light | Green light on | Power supply working and grid checked |
| | | Red light on | Power supply working and grid not checked |
| | | Light off | Fast shutdown execution, end of discharge, no working power |

## 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 6-2. Proper analysis is recommended before contacting after-sales service. There are 3 types of fault: alarm, protection and hardware fault.

**Table 6-2 Troubleshooting cont'd**

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

| | | |
|---|---|---|
| | | will be eliminated automatically;<br>2.Check for foreign objects on fan blades;<br>3.Switch off 3-phase work power supply and then reboot the system;<br>4.Contact after-sales service personnel |

**Table6-3 Troubleshooting cont'd**

| | | |
|---|---|---|
| Warn | Warn0030 (EepromErr) | Definition:<br>Internal alarm |
| | | Recommended solutions:<br>1.Observe for 5 minutes and see whether the alarm will be eliminated automatically;<br>2.Contact after-sales service personnel |
| | Warn0040 (DC SPD fault) | Recommended solutions:<br>The alarm is reserved now. The alarms in field can be ignored. |
| | Warn0050 (TempSensorErr) | Recommended solutions:<br>1.Observe temperature display;<br>2.Switch off 3-phase working power supply and then reboot the system;<br>3.Contact after-sales service personnel |
| | Warn0100 (AC SPD fault) | Recommended solutions:<br>The alarm is reserved now. The alarms in field can be ignored. |
| Protection | Protect0090 (Bus over voltage) | 1. Restart inverter by recycle both AC and DC switches. Wait for 1 minute between OFF and ON for all energy to discharge.<br>2. If inverter cannot clear fault, replace inverter |

| | | |
|---|---|---|
| | Protect0070<br>(Bus imbalance) | 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<br>2. If after adjustment, alarm still occurs, replace inverter |
| | Protect0030<br>(Inverter Over Current) | 1. Restart inverter by recycle both AC and DC switches. Wait for 1 minute between OFF and ON for all energy to discharge.<br>2. If inverter cannot clear fault, replace inverter |
| | GridV.OutLim | 1. Make sure the grid connection is good.<br>2. Restart the inverter again. |
| | GridF.OutLim | 1. check the AC wires connection and AC frequency is in range;<br>2. check the measurement value in LCD, if the grid frequency is in limit, restart the inverter. |
| | Protect0020<br>(Grid relay error) | 1. Restart inverter by recycle both AC and DC switches. Wait for 1 minute between OFF and ON for all energy to discharge.<br>2. If inverter cannot clear fault, replace inverter |
| | TempOver<br>(Over-temperature protection) | 1.Confirm that external ambient temperature is within the specified range of operating temperature;<br>2.Check whether air inlet is blocked;<br>3.Check whether fan is blocked;<br>4.Check whether the location of installation is appropriate or not;<br>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) | 1. If the inverter can start up, then recalibrate.<br>2. If the inverter always report this alarm and can not start up, then replace inverter. |
| | Protect0170 (DCI high) | 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<br>2. After raising limit, if inverter cannot clear fault, replace inverter. |
| | IsolationErr (Insulation resistance low) | Check wires of PV and ground:<br>1.Turn OFF AC switch to disconnect inverter from Grid.<br>2.Open fuse drawers to de-couple PV strings from each other. Test strings with string test set.<br>3.Add one PV string at a time, and start up inverter to see if alarm occurs.<br>3.If there is no alarm, turn OFF AC switches to disconnect from Grid and add in the next string. Start up inverter again.<br>4. Continue until you can find the string that triggers the alarm. Trace wirings of faulted string to find any leakage to Earth Ground.<br>5. The parameter ISOResist in hidden menu can be adjusted a bit. |
| | GFCIErr (leakage current high) | Check wires of PV and ground:<br>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<br>3.Add one PV string at a time, and start up inverter to see if alarm occurs.<br>3.If there is no alarm, turn OFF AC switches to disconnect from Grid and add in the next string. Start up inverter again.<br>4. Continue until you can find the string that triggers the alarm. Trace wirings of faulted string to find any leakage to Earth Ground. |
| | Protect0150<br>(Mini MCU Fault) | 1. Restart inverter by recycle both AC and DC switches. Wait for 1 minute between OFF and ON for all energy to discharge.<br>2. If inverter cannot clear fault, replace inverter |
| | Protect0110<br>(BUS over voltage (firmware)) | 1. Restart inverter by recycle both AC and DC switches. Wait for 1 minute between OFF and ON for all energy to discharge.<br>2. If inverter cannot clear fault, replace inverter |
| | Protect0100<br>(The sensor fault of leakage current) | 1. Restart inverter by recycle both AC and DC switches. Wait for 1 minute between OFF and ON for all energy to discharge.<br>2. If inverter cannot clear fault, replace Filt board or inverter. |
| | PV Reverse<br>(PV input reverse connection) | 1. Turn DC Switch OFF<br>2. Open Fuse holder to isolate PV strings<br>3. Use meter to find out which PV string is connected in reverse polarity<br>4. Correct PV string connection |

| | | |
|---|---|---|
| | PVVoltOver | 1. Measure voltage at DC terminals in wiring box and compare with reading in Measurement menu. PV voltage must be less than 1000V in open circuit condition.<br>2. If display reading is not within 2% of meter reading, replace inverter<br>If display reading is within 2% of meter reading, adjust number of panel in the string |
| | Protect0230 (Inverter open-loop self-test fault) | 1. Restart inverter by recycle both AC and DC switches. Wait for 1 minute between OFF and ON for all energy to discharge.<br>2. If inverter cannot clear fault, replace inverter |
| | ARC Protect | 1. Check logic connector to Arc board to be secure.<br>2. Run Arc Fault Test from Settings Menu<br>3. If Alarm re-occurs, replace arc board or wiring box |
| | Arcboard Err | 1. Check logic connector to Arc board to be secure.<br>2. Run Arc Fault Test from Settings Menu<br>3. If Alarm re-occurs, replace arc board or wiring box |

**Table 6-4 Troubleshooting cont'd**

| | | |
|---|---|---|
| Fault | Fault0130<br>(Bus over total voltage) | 1. Restart inverter by recycle both AC and DC switches. Wait for 1 minute between OFF and ON for all energy to discharge.<br>2. If inverter cannot clear fault, replace inverter |
| | Fault0110<br>(Bus imbalance) | 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<br>2. If after adjustment, alarm still occurs, replace inverter |
| | Fault0100<br>(Grid relay fault) | 1. Restart inverter by recycle both AC and DC switches. Wait for 1 minute between OFF and ON for all energy to discharge.<br>2. If inverter cannot clear fault, replace inverter |
| | Fault0090<br>(Static leakage current high) | Check wires of PV and ground:<br>1.Turn OFF AC switch to disconnect inverter from Grid.<br>2.Open fuse drawers to de-couple PV strings from each other. Test strings with string test set<br>3.Add one PV string at a time, and start up inverter to see if alarm occurs.<br>3.If there is no alarm, turn OFF AC switches to disconnect from Grid and add in the next string. Start up inverter again.<br>4. Continue until you can find the string that triggers the alarm. Trace wirings of faulted string to find any leakage to Earth Ground. |

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

# 7 Maintenance and De-installation

This section defines the activities required to properly maintain the inverter and must be facilitated by qualified personnel, trained in the installation, de-installation and maintenance of inverters.

## 7.1 Product Maintenance

Maintenance is required to ensure the inverter remains in proper condition, prolonging service life and prevent potential issues.

### 7.1.1 Check Electrical Connections

Check all conductor connections as regular maintenance inspection every 6 months to one year, depending on the temperature changes at the installation site.

- Check the conductor/cable connections. If loose, tighten all the terminals to proper torque, referring to **3.3 Electrical Installation**.
- Check for damage to the conductor/cable jacket. Repair or replace any damaged conductors/cables.

### 7.1.2 Clean the Air Vent Grate

The inverter can become hot during normal operation. It uses built in cooling fans to provide sufficient air flow and help in heat dissipation.
Check the air vent grate regularly to make sure it is not blocked. Clean the grate with a soft brush or vacuum cleaner attachment if necessary. The frequency of this cleaning depends on the installation environment.

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

1. Use a No. 2 Phillips head screwdriver to remove the 2 screws on the fan tray.
2. Disconnect the waterproof cable connector from the cooling fan.
3. Use a No. 2 Phillips head screwdriver to remove the screws. Each fan is attached to the fan tray with 4 screws.
4. Attached the new cooling fans on the fan tray and screw into place. Fasten the cable on the fan tray with cable ties.
   Torque value: 0.8-1N.m (7.1-8.91in-lbs)
5. Install the assembled fan tray back on the inverter and secure with the original screws.
   Torque value: 1.2N.m (10.6in-lbs)

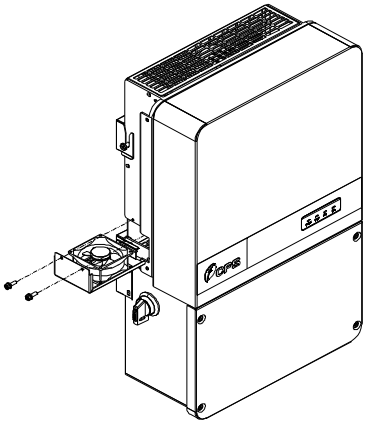


**Figure 7-1 Replacing Cooling Fans**

### 7.1.4 Replace the Inverter

Please confirm the following items before replacing the inverter:

- The AC breaker of inverter is turned off.
- The DC switch of the inverter is turned off.

Now replace the inverter according to the following steps:

**1.** Unlock the padlock if one is installed on the inverter.

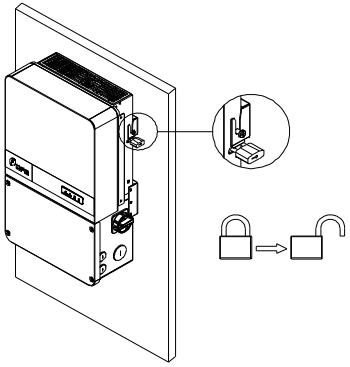


**Figure 7-2 Unlock the padlock**

**2.** Use a No. 3 Phillips head screwdriver to unscrew the 2 screws on both sides of the inverter.

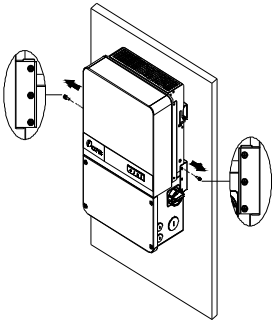


**Figure 7-3 Remove the screws on both sides**

3. Use a No. 10 Hex wrench to remove the 4 screws between the inverter and the wiring box. Lift the inverter enclosure and disconnect from the wiring box.

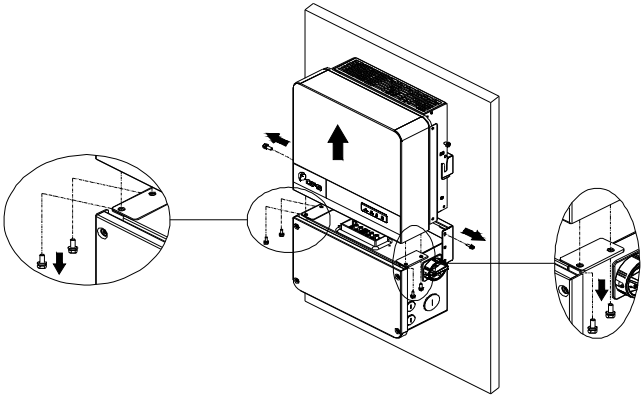


**Figure 7-4 Disconnect the main housing from the wiring box**

4. If the replacement inverter is onhand and to be installed immediately, skip this step and refer to section 3.2 for installation of the inverter. Otherwise, use a No. 2 Phillips head screwdriver to remove the 2 screws on the left side of the wiring box, and remove the bulkhead cover. Attach the cover on the connector of wiring box. Torque value: 1.6N.m (14.2in-lbs)

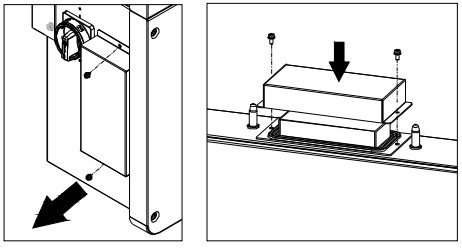


**Figure 7-5 Install the cover on the connector of the wiring box**

**DANGER:**

Please disconnect the electrical connection in strict accordance with the following steps. Otherwise, the inverter will be damaged and the service personnel's life will be endangered.

## 7.2 De-installing the Inverter

De-install the inverter and wire box assembly according to the following steps when the inverter needs to be removed:

1. Turn off the external AC breaker and/or system disconnect switch using lock-out/tag-out procedures.
2. Turn off the external DC breaker and/or disconnect switch, if present, and use lock-out/tag-out procedures.
3. Switch the inverter's AC disconnect switch to "OFF" position.
4. Switch the inverter's DC disconnect switch to "OFF" p osition.
5. Wait for 5 minutes to ensure the internal capacitors have been completely discharged.
6. Measure the AC output conductor terminal voltage against the ground. The meter should now read 0V.
7. Disconnect the AC and PE cables referring to "3.4.1.5 AC and Ground Connection".
8. Disconnect the DC cables referring to "3.4.1.3 DC Conductor Connection".

   **Caution: if PV strings terminate directly in the wiring box and do not pass through a breaker or switch that was opened in Step 2 these strings may be energized.**
9. De-install the inverter by reversing the installation steps found in section **3.2 Mechanical installation**.

# 8 Accessories

The CPS SCA20KTL-DO-R/US-480 and SCA25KTL-DO-R/US-480 inverters have several optional accessories that allow the inverter to support a wide range of real world applications.

## 8.1 Fuse Bypass Terminals

The Fuse Bypass Terminals allow for a reduction in the number of DC homeruns by combining the PV source circuits outside of the inverter wirebox and terminating with one pair of DC inputs to each of the two MPPTs. Note that external over current protection for the PV source circuits is required outside of the inverter. The MPPT positive inputs IN1+ and IN2+ are isolated from one another by design, although the MPPT negative inputs IN1- and IN2- are combined via a common bus structure.

### 8.1.1 Bypass Input Terminal Instructions:

1. Remove the wirebox cover.
2. Remove the plastic touch safe finger guards.
3. Use a No. 2 Phillips head screwdriver to install the Bypass Terminals on each bus by fastening each terminal with the M4 screws. Torque value of 14 in-lbs (1.6 Nm).
4. Use a No. 10 wrench to fasten the three pairs of DC input cables to each of the Bypass Terminals at IN1+, IN2+and IN1-, IN2- with the M6 screws. Torque value of 50 in-lbs (6.0N.m.).
5. Reinstall the plastic touch safe finger guards. Torque value #
6. Reinstall the wirebox cover. Torque to 35.4 in-lbs (4N.m).

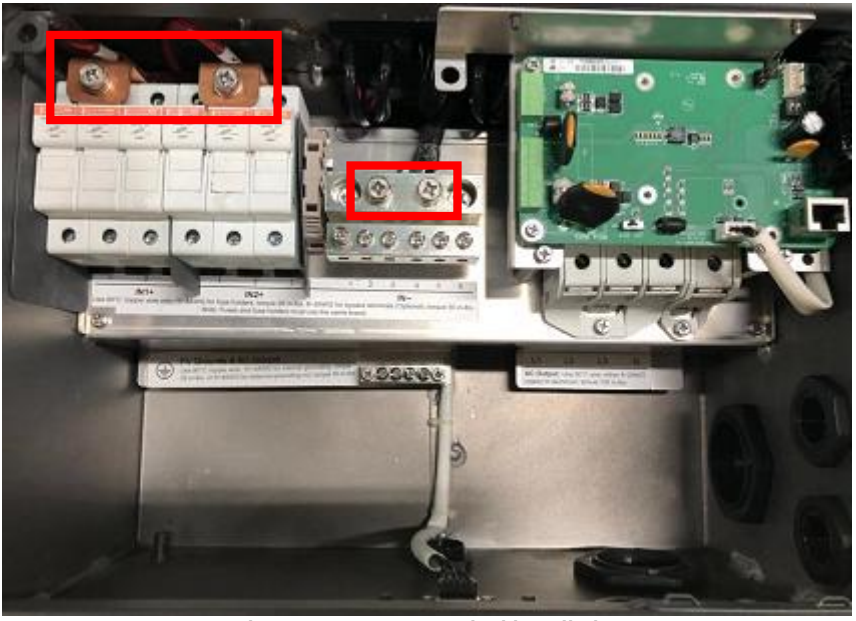


**Figure 8-1 Bypass terminal installed**

## 8.2 Shade Cover (SSC-25ST-2)

### 8.2.1 Protection from Harsh Conditions

Shade covers provide added protection for inverters against harsh environmental conditions like direct sunlight, snow, sleet, ice, hail, and reduce soiling from dust and birds. Protect your inverter for many years.

### 8.2.2 Increased Energy Production

Depending on the application and environment, shade covers will help to increase energy production by reducing potential power derating due to excessive ambient temperatures. Inverters derate in extreme temperatures to protect themselves from over temperature conditions.

Field testing at PVEL showed up to 15% reduction in operating temperatures of inverters with shade covers installed in direct sunlight. This report can be found on the CPS America website under application notes.

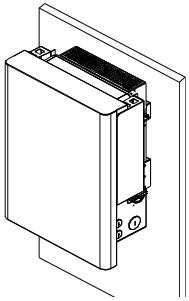


**Figure 8-2 Shade Cover installed on CPS 20/25kW inverter**

## 8.3 Y-Comb Terminal Block (Optional)

The Y-Comb is intended for use in the SCA20/25KTL-DO-R/US-480 inverters. This accessory is applied between two adjacent fuseholders within the inverter wire-box and distributes current between the two fuseholders. When products such as Y-branch connectors are used in the array field to combine the output of two strings the current is as much as 30 or 40A. In order to distribute current and provide optimal thermal results the Y-Comb is required.

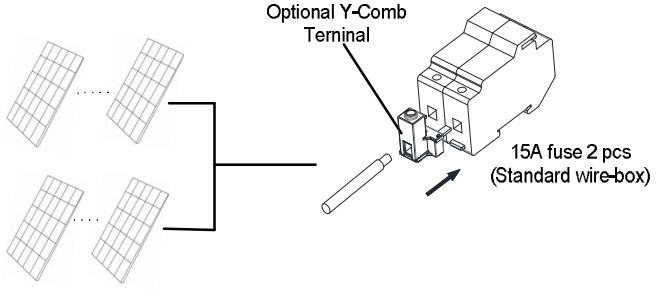



**Figure 8-3 Y-Comb Terminal Block**

# 9 Technical Data

## 9.1 Datasheet

| Model Name | CPS SCA20KTL-DO-R/US-480 | CPS SCA25KTL-DO-R/US-480 |
|---|---|---|
| **DC Input** | | |
| Max. PV Power | 30kW (15kW per MPPT) | 38kW (19kW per MPPT) |
| Max. DC Input Voltage | $1000V_{DC}$ | |
| Operating DC Input Voltage Range | $200\text{-}950V_{DC}$ | |
| Start-up DC Input Voltage / Power | 330V / 80W | |
| Number of MPP Trackers | 2 | |
| MPPT Voltage Range | $560\text{-}850V_{DC}$ | |
| Max.PV Short-Circuit Current (Isc x 1.25) | 45A per MPPT | |
| Number of DC Inputs | 6 inputs, 3 per MPPT | |
| DC Disconnection Type | Load rated DC switch | |
| DC Surge Protection | Type III MOV, $1240V_C$, 15kA $I_{TM}$ (8/20μS) | |
| **AC Output** | | |
| Rated AC Output Power | 20kW | 25kW |
| Max. AC Apparent Power | 20kVA | 25kVA |
| Rated Output Voltage | $480V_{AC}$ | |
| Output Voltage Range | $422\text{-}528V_{AC}$ | |
| Grid Connection Type | 3Φ/PE/N (Neutral optional) | |
| Max. AC Output Current[1] @$480V_{AC}$ | 25A | 31A |
| Max AC OCPD Rating | 45A | 45A |
| Rated Output Frequency | 60Hz | |
| Output Frequency Range[2] | 57-63Hz | |
| Power Factor | >0.99 (±0.8 adjustable) | |
| Current THD | <3% | |
| Max. Fault Current Contribution (1 Cycle RMS) | 28.2A | |
| AC Disconnection Type | Load rated AC switch | |
| AC Surge Protection | Type III MOV, $1120V_C$, 15kA $I_{TM}$ (8/20μS) | |

1) See Chapter 10.3.5 for Max. AC Apparent Power and Max. AC Output Current
2) The "Output Voltage Range" and "Output Frequency Range" may differ according to the specific grid standard.

| | |
|---|---|
| **System** | |
| Topology | Transformerless |
| Max. Efficiency | 98.5% |
| CEC Efficiency | 98.0% |
| Stand-by / Night Consumption | <5W |
| **Environment** | |
| Enclosure Protection Degree | NEMA Type 4X |
| Cooling Method | Variable speed cooling fans |
| Operating Temperature Range | -22°F to +140°F / - 30°C to +60°C (derating from +113°F / +45°C) |
| Non-Operating Temperature Range[3] | No low temp minimum to +158°F / +70°C maximum |
| Operating Humidity | 0-100% |
| Operating Altitude | 13,123.4ft / 4000m (derating from 9842.5ft / 3000m) |
| Audible Noise Emission | <60dBA @ 1m and 25°C |
| **Display and Communication** | |
| User Interface and Display | LED+Wi-Fi |
| Inverter Monitoring | SunSpec, Modbus RS485 |
| Site Level Monitoring | CPS Flex Gateway (1 per 32 inverters) |
| Modbus Data Mapping | CPS |
| Remote Diagnostics / FW Upgrade Functions | Standard / with Flex Gateway |
| **Mechanical Data** | |
| Dimensions (WxHxD) | Powerhead: 400mm(W)*200mm(D)*405mm(H) Wirebox: 400mm(W)*200mm(D)*260mm(H) |
| Weight | Inverter: 22kg; Wire-box: 6kg |
| Mounting / Installation Angle[4] | 15 to 90 degrees from horizontal (vertical, angled) |
| AC Termination | Screw Clamp (Wire range: #8 - #2 AWG CU/AL) |
| DC Termination | Screw Clamp, Wire range: #14 - #8AWG CU |
| Fused String Inputs (5 per MPPT) | 15A standard fuse value (Fuse values up to 30A acceptable) |
| **Safety** | |
| PV Arc-Fault Circuit Protection | Type 1 |
| Safety and EMC Standard | UL1741SA-2016, UL1699B, CSA-C22.2 NO.107.1-01, IEEE1547a-2014; FCC PART15 |
| Grid Standard and SRD | IEEE1547a-2014; FCC PART15 |
| Smart-Grid Features | Volt-RideThru, Freq-RideThru, Ramp-Rate, Specified-PF, Volt-VAr, Freq-Watt, Volt-Watt |

3) See Chapter 3.1 for further requirements regarding non-operating conditions.
4) See Chapter 3.2 for Shade Cover accessory requirement for installation angles of 75 degrees or less.

## 9.2 Measurement Tolerances

The data supplied by the inverter may differ from measurements taken by certified measuring instruments (e.g. output meters, multimeters and grid analysers). The inverter is not a measuring instrument and has wider tolerances for the measurements it makes.

The inverter tolerances are generally:

- ±5% for real-time measurements with output power below 20% nominal power
- ±3% for real-time measurements with output power above 20% nominal power
- ±4% for all statistical data

CPS inverter tolerances are specified below:

- Voltage tolerances: ±1%
- Current tolerances: ±2%
- Frequency tolerances: ±0.5%
- Power tolerances: ±3%
- Time tolerances: ±1%
- Temperature tolerances: ±2degC

## 9.3 Production Graphs

The following sections illustrate the inverter production/derating in terms of ambient temperature, altitude and grid voltage.

### 9.3.1 High Temperature Derating Graph

When the ambient temperature is higher than 113°F (45℃), the inverter output power (Pn) will begin to derate, as shown in Figure 9-1:

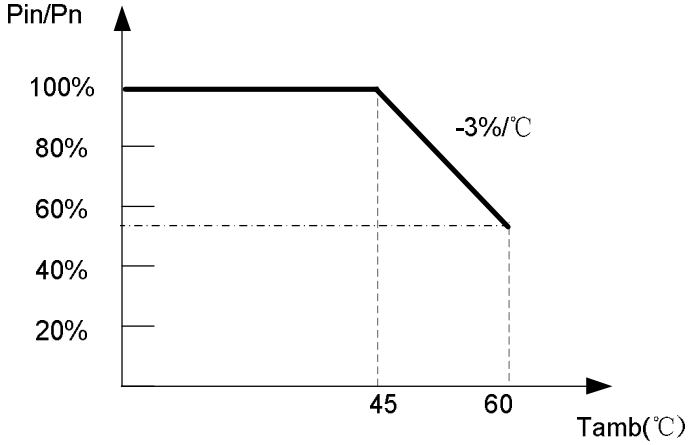



**Figure 9-1 SCA20/25KTL Derating Curve with High Temperature**

### 9.3.2 Altitude Derating Graph

When the altitude is higher than 8202.1ft (2500m), the rated output power (Pn) of the inverter will decrease, as shown in Figure 9-2:

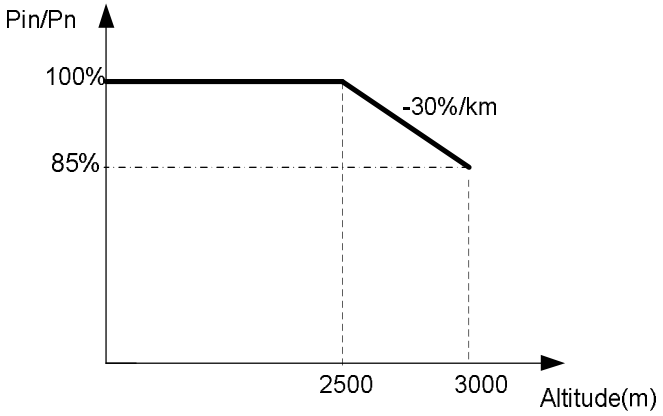



**Figure 9-2 SCA20/25KTL Derating Curve with High Altitude**

### 9.3.3 Grid Voltage Derating Graph

When the grid voltage is within 100%~110% (Un ~ 1.1*Un) of the Rated Output Voltage, the inverter output power (Pn) may reach 100%. When the grid voltage is lower than the Rated Output Voltage, the inverter will limit the AC Output Current and the output power (Pn) will begin to derate, as shown in Figure 9-3.

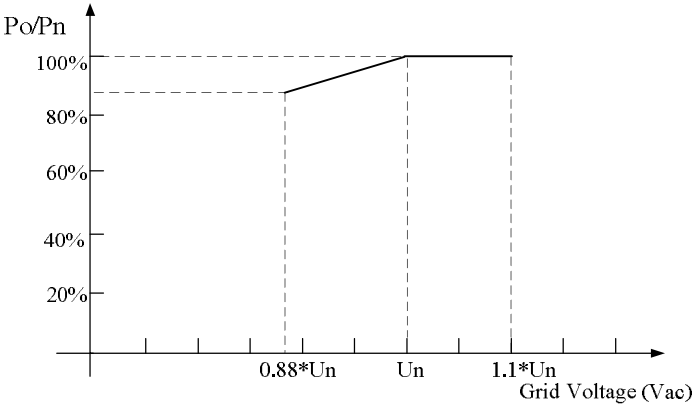



**Figure 9-3 SCA20/25KTL Derating Curve of Grid Voltage**

### 9.3.4 Reactive Power Capability

The Reactive Power Overload function is disabled by factory default (Max. AC Apparent Power is 20/25kVA and Max. AC Output Current is 25A/31A). ***Contact CPS Customer Service*** if you want to enable the function.

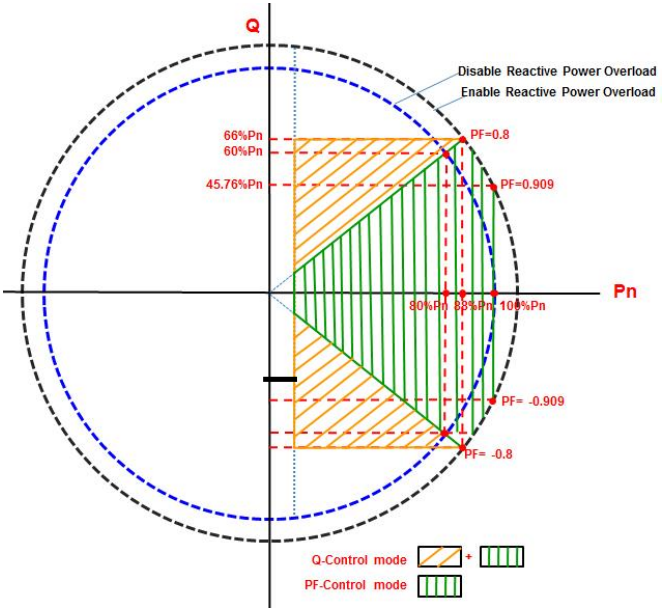



**Figure 9-4 SCA20/25KTL Reactive Power Capability**

# 10 Limited Warranty

The warranty policy of this product is specified in the contract; otherwise, the standard warranty is 10 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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Service Hotline: 855-584-7168

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