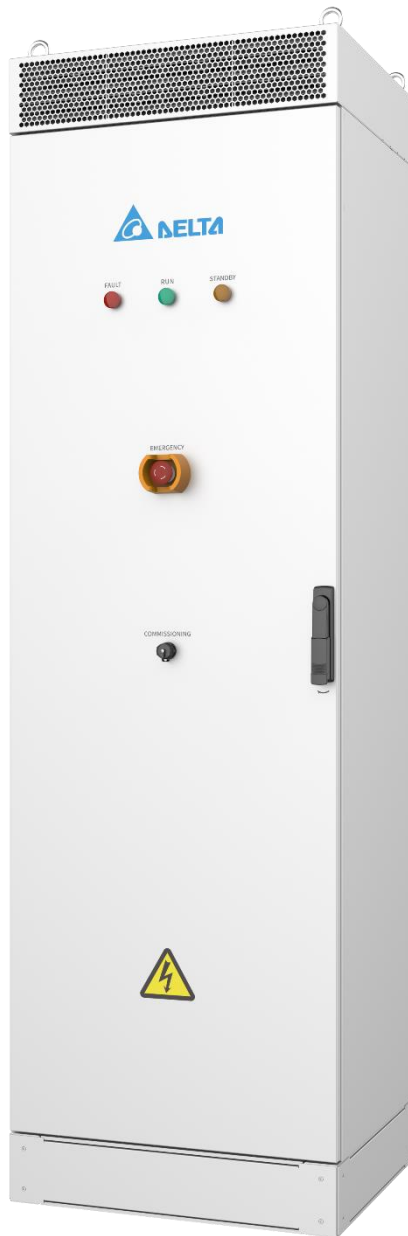




PCS125HV Power Conditioning System

Installation Manual



Version: 1.1.17

TABLE OF CONTENTS

About this Manual	1
Version Control	1
Purpose	3
Scope	3
Audience	3
Organization	3
Safety Symbols and Terminologies	4
Introduction	6
Overview	6
Features	7
Applications	7
Accessories	8
Storing	8
Installation	7
Before You Begin	7
Foundation	10
Location and Ventilation Requirements	12
Unpacking the 1-Unit PCS125HV	16
Unpacking the 2-Unit PCS125HV	17
Installing the PCS Onsite	18
Securing a Cabinet in a Final Location	27
Wiring Instructions	28
Safety	28
Wire Sizing and Ratings	29
Preparation of Cables	30
Preparation of Bolts and Cable lug	30
Communication and I/O Wiring and terminal resistor setting	32
Wiring	41
Warranty	51

	52
Specifications	52
Packing List	54
Cable Lug Spec	54
Glossary	55
Screw Torque Table	57

FIGURE 1. SYSTEM ARCHITECTURE	6
FIGURE 2. DELTA PCS125HV SYSTEM BLOCK DIAGRAM	6
FIGURE 3. KEY	8
FIGURE 4. GROUNDING LAYOUT.....	9
FIGURE 5. FOUNDATION DRAWING	10
FIGURE 6. MOUNTING LAYOUT AND ANCHORING HOLES PLACEMENT VARIATIONS (TOP VIEW)	11
FIGURE 7. FRONT AND SIDE VIEWS OF A DELTA PCS125HV	12
FIGURE 8. DIAGRAM OF PCS AIRFLOW DESIGN (SIDE VIEW).....	13
FIGURE 9. FRONT AND REAR MAINTENANCE CLEARANCE DISTANCE	14
FIGURE 10. MAINTENANCE CLEARANCE DISTANCE IN PARALLEL INSTALLATION	14
FIGURE 11. TOP VIEW OF DOOR CLEARANCE	15
FIGURE 12. REMOVING ALL WALLS OF 1-UNIT PCS125HV	16
FIGURE 13. REMOVING ALL WALLS 2-UNIT PCS125HV.....	17
FIGURE 14. EYE BOLTS LOCATIONS.....	20
FIGURE 15. EYE BOLTS LIFTING	21
FIGURE 16. RELEASING A PCS FROM A PALLET.....	23
FIGURE 17. REMOVING LEFT AND RIGHT BASE COVERS.....	24
FIGURE 18. LATERAL HANDLING OF PCS.....	24
FIGURE 19. REMOVING FRONT/REAR BASE COVERS.....	25
FIGURE 20. RELEASING A PCS FROM A PALLET.....	25
FIGURE 21. FRONT/REAR SIDE HANDLING.....	26
FIGURE 22. SECURING A CABINET WITH ANCHORING BOLTS	27
FIGURE 23. INSERTING A POWER CABLE INTO A CABLE LUG, DEPTH REFERENCE DIAGRAM	31
FIGURE 24. PREPARATION OF AC/DC CABLES.....	31
FIGURE 25. COMMUNICATION AND I/O CONNECTION LOCATION	32
FIGURE 26. COMMUNICATION WIRING THROUGH THE FRONT SQUARE HOLE.....	32
FIGURE 27. RING TERMINAL CONNECTION	34
FIGURE 28. CNR6 PIN ASSIGNMENT	34
FIGURE 29. CNS8 PIN ASSIGNMENT.....	35
FIGURE 30. CNR7 CONNECTOR WITH TERMINAL RESISTOR.....	36
FIGURE 31. RECOMMEND COMMUNICATION CONNECTION DIAGRAM.....	37
FIGURE 32. CNR3, CNR11 PIN ASSIGNMENT	38
FIGURE 33. SWR4 ASSIGNMENT	38
FIGURE 34. SWR3, SWR5, SWS5 ASSIGNMENT.....	39
FIGURE 35. CONNECTED BY ETHERNET	40
FIGURE 36. REMOVE THE PROTECTIVE COVER.....	41
FIGURE 37. REMOVE THE PROTECTIVE COVER.....	42
FIGURE 38. TAKE DOWN BOTTOM PANEL	43
FIGURE 39. UNSCREW GLAND NUT	43
FIGURE 40. LEAD CABLES.....	44
FIGURE 41. INSTALL BOTTOM PANEL	44
FIGURE 42. INSERTING A POWER CABLE INTO A CABLE LUG, DEPTH REFERENCE DIAGRAM	45
FIGURE 43. PREPARATION OF AC/DC CABLES.....	45
FIGURE 44. DC TERMINAL.....	46
FIGURE 45. AC TERMINAL.....	47
FIGURE 46. GROUNDING CABLE CONNECTION WITH GROUNDING COPPER BAR	48
FIGURE 47. SCREW GLAND NUT	49
FIGURE 48. REMOVE THE ADHESIVE TAPE ON DC SPD.....	50
FIGURE 49. REMOVE THE ADHESIVE TAPE ON AC SPD	50
FIGURE 50. CABLE LUG SPEC.....	54



TABLE 1: VERSION CONTROL	1
TABLE 2: AC WIRE SIZING AND RATINGS	29
TABLE 3: DC WIRE SIZING AND RATINGS	29
TABLE 4: GROUNDING WIRE SIZING AND RATINGS	29
TABLE 5: COMMUNICATION AND I/O WIRE SIZING AND RATINGS	30
TABLE 6: COMMUNICATION AND I/O CONNECTION	33
TABLE 7: CNR6 PIN ASSIGNMENT	34
TABLE 8: AUXILIARY POWER INTERFACE CONNECTOR	35
TABLE 9: DRM MODE DEFINITION	36
TABLE 10: CNR7 PIN ASSIGNMENT	36
TABLE 11: CNR3, CNR11 PIN ASSIGNMENT	38
TABLE 13: TERMINAL RESISTORS SWITCHES SETTING OF SINGLE PCS FOR ETHERNET COMMUNICATION	40
TABLE 14: TERMINAL RESISTORS SWITCHES SETTING OF PARALLEL PCS FOR ETHERNET COMMUNICATION	40
TABLE 15: TECHNICAL SPECIFICATIONS OF THE DELTA PCS125HV	52
TABLE 16: ICC DECLARATION (R.M.S. VALUE, ICP,MR, DEVICE).....	53
TABLE 17: PACKING LIST	54
TABLE 18: SCREW TORQUE TABLE FOR M3~M5 SCREWS.....	57
TABLE 19: SCREW TORQUE TABLE FOR M6~M16 SCREWS.....	57



Copyright

The ownership and all intellectual property rights of this Installation Manual (this “Manual”), including but not limited to the content, data, and figures contained herein are vested by Delta Electronics, Inc. (“Delta”). The Manual can only be applied to the operation or use of the product. Any disposition, duplication, dissemination, reproduction, modification, translation, extraction, or any other usage of this Manual is prohibited without obtaining Delta’s prior written permission. As the product will be developed and improved continuously, Delta may modify or update the Manual from time to time without any notice. Delta will do its best to keep the Manual updated and maintain the accuracy of the Manual. Delta disclaims any kinds or forms of warranty, guarantee, or undertaking, either explicitly or implicitly, including but not limited to the completeness, accuracy, non-infringement, merchantability, or fitness for particular purpose or usage.

Copyright © 2019 Delta Electronics, Inc. All Rights Reserved.

About this Manual

Version Control

Table 1: Version Control

Rev.	Change Description	Date
1.0.0	First release.	29Apr2021
1.0.1	1. updated description about automatic disconnection device; 2. added description about AC and DC disconnect switch; 3. added description about noise level and protection.	13May2021
1.0.2	1. updated description about grid-tied and off-grid mode operation 2. added description about of SPD tape	11Jun2021
1.0.3	1. add noise symbol and instruction in page4 2. add prevent flood safety instruction in page4 3. add M12 expansion bolts (not provided with PCS125HV) note in page8 4. change voltage rating of IO wire from 600V to 300V, in page26 5. add multi-core shield cable note in page30 6. change wire diameter of auxiliary power input from AWG 16-22 to AWG 16, in page32 7. update distance requirement above the PCS in page11 8. add BMS connection methods and corresponding terminal and TR description 9. add battery temperature sensor connector in page33 10. correct some grammatical errors	29Jul2021
1.0.4	1. add notes about setting power quality response modes in page6 2. change some statement about GFD in page14 3. change some statement about wire size in page25 4. Correct figure35 in page38 and add some corresponding notes.	10Aug2021 24Aug2021
1.1.0	1. change description about mode switching in page6	6Sep2021
1.1.1	1. add description about RCM/RCD device in page14 and 15 2. add description about a temperature sensor come with battery in page33 3. add description of capability of PCS operate in parallel in page36	29Nov2021
1.1.2	1.change the space request	
1.1.3	1.Add PCS parallel installation 2.Change mounting layout 3.Change installation space 4.Change ventilation path indication 5.Add cable trench.	10Feb2022
1.1.4	1.Add gland sealing	1April2022
1.1.5	1.Add PCS installation material 2.Change mounting layout figure4 3.Add air inlet rate requirement 3.Change installation space requirement figure8-10 4.Add cable lug and fixing bolts requirement 5.Delete CNR1, CNR2, CNS10 and BMS communication 6.Add packing list 7.Add cable lug spec 8.Change figure 36, Figure 37 9.Change figure 2	24April2022
1.1.6	1. Add 3P4W system diagram in Figure2 2. Modify table2, table3, table4, table5 3. Change grounding standard 4. Change cable lug and fixing bolts quantity 5. Change grid code to IEEE1547 6. Add 3P4W AC cable connection 7. Add grounding drawing 8. Add surge arrester safety	5July2022

1.1.7	1. Modify 3P4W system diagram in Figure2 2. Replace all figures 3. Change grounding connection method	11Aug2022
1.1.8	1.Change Table 7 info 2.Add DC side voltage protection setting requirement	26Aug2022
1.1.9	1.Add CRD function 2. Add PCS nameplate info	15Sep2022
1.1.10	1.Add installation procedure picture	08Oct2022
1.1.11	1.PCS parallel connection amount is change to 10	13Jan2023
1.1.12	1.Add PCS location requirement on seaside	23Feb2023
1.1.13	1. Add isolation transformer requirement 2. Add power cable connection requirement for multi PCS parallel connection	29Mar2023
1.1.14	1.Add storing requirement	7Apr2023
1.1.15	1.Define PCS IP and debug IP	13Jun2023
1.1.16	1.Correct AC Icc and Icp,mr 2.Correct DC Icc and Icp,mr	9Aug2023
1.1.17	1. Modify system block diagram	30Aug2023

Purpose

The purpose of this Installation Manual is to provide an explanation and standard procedure for installing the Delta Power Conditioning System PCS125HV series product.

Scope

The manual provides safety guidelines, detailed planning and setup information, the standard procedure of installing the PCS. It does not provide details of batteries.

Audience

The manual is intended for anyone who needs to install Delta PCS125HV. Installers should be certificated technicians or electricians.

Organization

This manual is organized into the following chapters:

- Chapter 1: "About the Manual"
- Chapter 2: "Introduction"
- Chapter 3: "Installation"
- Chapter 4: "Wiring Instructions"
- Chapter 5: "Warranty"
- Chapter 6: "Appendix"

Important Safety Instructions

Save these Instructions

General Safety Instructions (EN)

This manual contains important instructions for PCS that should be followed during installation and maintenance.

PCS is designed and tested to meet all applicable International safety standards. However, like all electrical and electronic equipment, safety precautions must be observed and followed during installation and operation of PCS to reduce the risk of personal injury and to ensure a safe installation.

Installation, commissioning, service, and maintenance of PCS must only be performed by qualified personnel that are licensed and/or satisfy state and local jurisdiction regulations.

Before starting installation or commissioning of the PCS, read through the entire manual and note all DANGER! WARNING! CAUTION! and NOTICE! Statements.

Safety Symbols and Terminologies



Note:

Indicates additional information that is relevant to the current process or procedure.



WARNING!

Warning information appears before the text it references to emphasize that the content may prevent damage to the device or equipment.



CAUTION!

CAUTIONS APPEAR BEFORE THE TEXT IT REFERENCES. CAUTIONS APPEAR IN CAPITAL LETTERS TO EMPHASIZE THAT THE MESSAGE CONTAINS VITAL HEALTH AND SAFETY INFORMATION.



INFORMATION!
INFORMATIONS!

INFORMATION provided that when known and used will ensure optimal operation of the system.



HIGH VOLTAGE WARNING! Indicates hazardous high voltages are present, which, if not avoided, will result in death or serious injury. Thus, only authorized and trained personnel should install and/or maintain this product.



Hot surface



Equipment grounding conductor (PE)



Wait for a prescribed amount of time before engaging in the indicated action.



The product generates loud noises. When working on the product, wear hearing protection

Safety Instructions

The PCS installation must be performed by an authorized electrician as per the US Standard or local requirements.

- The PCS section does not contain user-serviceable parts. For all service and maintenance, a Delta repair technician or authorized service partner is required for onsite maintenance services.
- Read all of these instructions, cautions, and warnings for the PCS and associated PCS documentation.
- Before connecting the PCS to the AC distribution grid, approval must be received by the appropriate local utility as required by national and state interconnection regulations and must be connected only by qualified personnel.
- In operation, the PCS wiring and connections can have hazardous high voltages and currents present, thus only authorized and qualified personnel shall install and/or maintain the PCS.
- In some operation instances, the PCS chassis and heat sink surfaces may become hot.
- The product generates loud noises. When working on the product, wear hearing protection.
- The lowest height of electrical components in the cabinet is away from the bottom of the base is 130mm. When installing on site, the foundation of the basement shall be designed to consider preventing flood to the PCS.

Introduction

Overview

Delta's Power Conditioning System (PCS) is a bi-directional conversion system that converts power between energy storage and grid, along with energy and grid power quality management features.

It supports demand charge management by peak shaving, enables load shifting for time-of-use savings, and provides real power and reactive power compensation to improve power quality by power command from site controller or EMS.

With Delta's PCS solution you can realize the fullest value of an energy storage system.

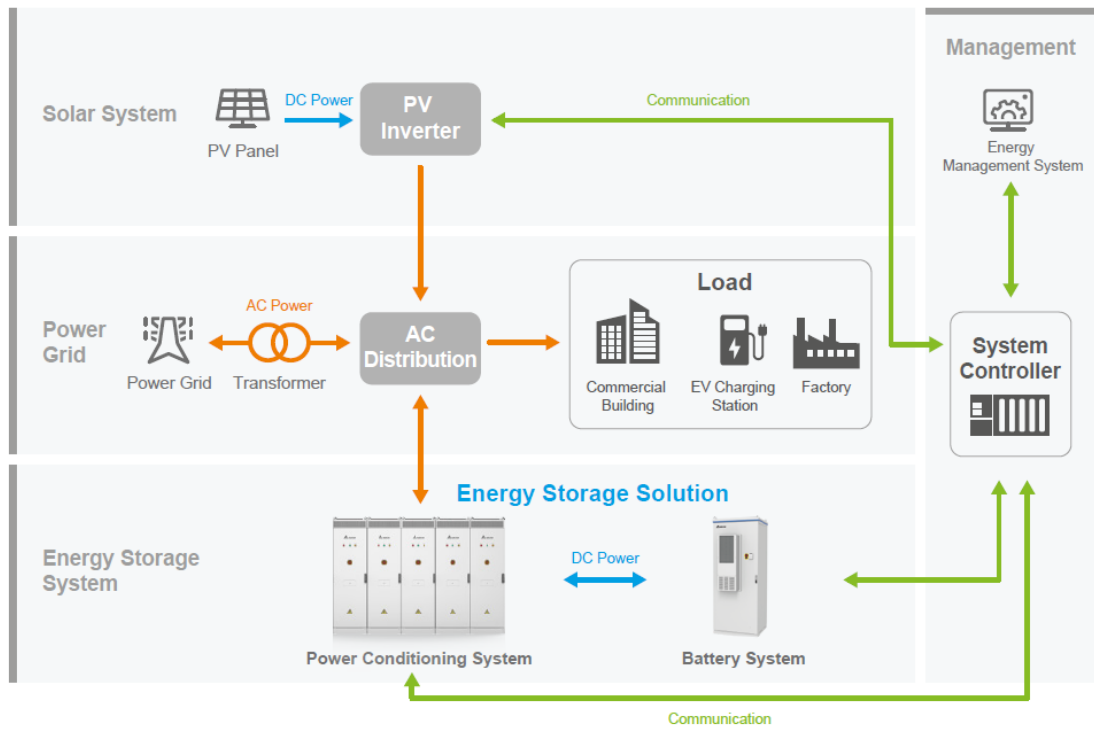


Figure 1. System Architecture

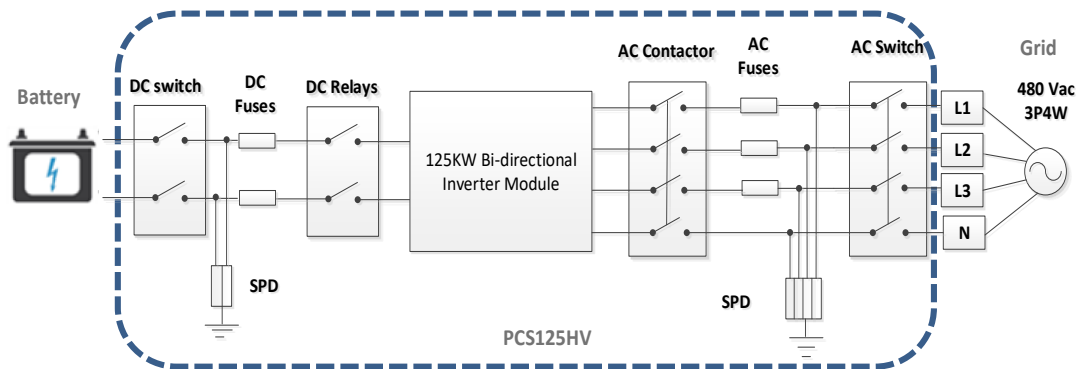


Figure 2. Delta PCS125HV System Block Diagram

- Power capacity: 125 kW; AC voltage: 480 Vac
- High voltage input: up to 1350Vdc
- High efficiency: Peak 98%
- Quick power response time (<20 ms exclude communication delay)
- IP55 design for outdoor application
- Scalable with multiple units in the configuration
- Black start capability for power backup
- Support both off-grid mode and grid-tied mode operation

Applications

- Real and reactive power compensation
- Off-grid operation for power backup
- Demand charge management/peak shaving
- Load shifting for time-of-use savings



Note:

1. **The PCS supports operation in grid-tied mode. The internal relays inside PCS are designed as an automatic disconnection device. When grid voltage or frequency is abnormal, the internal relays will automatically disconnect with the grid according to IEEE1547 requirements.**
2. **The PCS supports operation in off-grid (power back up) mode. There is only one couple of AC output ports of PCS to supply the local load when PCS is operating in off-grid mode.**
3. **The PCS can support grid-tied mode and off-grid mode transition, user can refer to chapter 5 of Operation Manual <PCS125HV_OM> and <PCS125HV GT_SA mode switching method> about the detail of the mode transition.**
4. **Before the first debugging of PCS, users need to confirm the protection values such as overvoltage and under voltage of batteries, and reset the reasonable DC side overvoltage and under voltage protection thresholds of PCS according to the actual protection values of batteries. Otherwise, there may be a fire or other danger to the battery operation.**



Note:

(about setting power quality response modes)

The PCS have the capability of operating in modes which will contribute to maintaining the power quality at the point of connection with the customer installation; or provide characteristics which are outside the typical operation of an inverter for the purpose of providing support to a grid.

These various operating modes may be enabled or disabled in an inverter and may include the following: Volt response modes, Fixed power factor or reactive power mode, Power response mode and Power rate limit.

User can refer to chapter 6.2, 6.7, 6.8, 6.9 and 6.10 of Operation Manual <PCS125HV_OM> respectively for each power quality response mode settings.

Accessories

Check that the following items are included. Contact your vendor if any item is missing or appear damaged. The items are listed in appendix packing table.








1xKey

Figure 3.Key

The key is tied to the hoisting ring and it is transported with the PCS125HV.

PCS Nameplate

 Grid Support Transformerless Utility Interactive Inverter		Made in China
Grid-tied mode operation	Range of dc operating voltage:	750V-1350V 
	Maximum dc discharging current:	157A
	Maximum dc charging current:	151A
	Nominal ac voltage:	480V,3~ or 480/277V,3N~
	Range of ac voltage:	422-528V
Off-grid mode operation	Maximum continuous ac current:	151A
	Nominal ac frequency:	60Hz
	Power factor:	>0.99 (-1 leading to 1 lagging, continuously adjustable)
	Maximum continuous ac power:	125kVA
	Range of dc operating voltage:	750V-1350V 
Model :	Rated output voltage:	480V,3~ or 480/277V,3N~
	Rated output power:	125kW/kVA (Linear load) 100kW/kVA (RCD load)
	Maximum input current(dc)	157A
Operating temperature:	Rated output current(ac):	151A
Enclosure type:	PCS125HV	
Storage type:	-30 to 60°C , derating >45°C	
		Type 3R
		Lithium-ion,lead-acid,flow battery
This device complies with Part 15 of FCC Rules: Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.		UL1741 CSA107.1 IEEE1547 IEEE1547.1
		

–the symbol  is used for DC;

– the symbol 3~ is used for three-phase AC;

– the symbol 3N~ is used for three-phase AC with a neutral conductor.

Storing

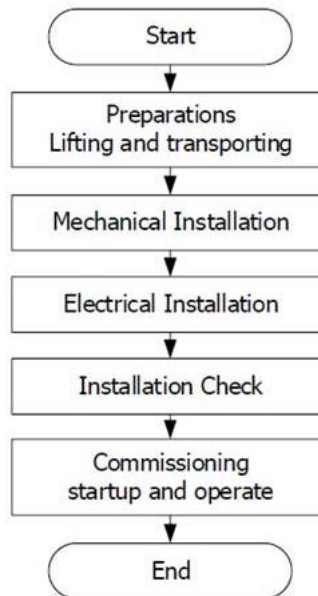
- To avoid any condensation inside PCS cabinet, store it indoor in a dry warehouse.
- Storage temperature is between -30°C and 60°C, the humidity is lower than 95% and non-condensing.
- Place PCS on a solid, flat, dry, and vegetation-free ground. The ground must support the PCS evenly from below, ie, there must be no twisting or stress.
- Place PCS on wooden support pallet.



- PCS should not be tilted or inverted.
- Protect the interior of PCS from rain water and dust. At the minimum, cover the air inlet and outlet gratings.

Installation

This chapter describes how to mount and install the PCS, including the information about recommended tools, groundwork preparation, location and ventilation considerations, unpacking, moving, and mounting. Read this chapter and plan your PCS layout and installation accordingly. The installation procedure is shown as following picture.



Before You Begin

Recommended Tools

The following tools are recommended for a successful installation:

- 1 x PH2*100 mm Phillips screwdriver
- 1 x PH3*100 mm Phillips screwdriver
- 1 x M8 hex bolt socket wrench
- 1 x M12 hex bolt socket wrench
- 1 x M5 hex bolt socket wrench
- 1 x M4 Allen wrench
- 1 x M4 Torx(T15) L-type wrench
- Concrete drill
- Hydraulic crimping tools (capable to crimp cable lugs)
- Wirecutter
- Wire stripper
- Diagonal pliers

Recommended Material for Installation 3P3W PCS (One Unit)

- 4 x 1500V, 2 AWG cables for DC (battery) connection
- 6 x 600V or greater, 2 AWG cables for AC connection (3P3W PCS)
- 1 x 600V or greater, 3 AWG cables for grounding

- 300V or greater, 16 AWG wires for communication or I/O connection.
- 1 x Ethernet cable with shield and RJ45 connector, CAT6 cables for communication with PC
- (N-1) x Ethernet cables with shield and RJ45 connector, CAT6 cable for N units of PCS parallel installed
- 4 x (M12*45) expansion bolts for fixing PCS on foundation.
- 22 x (M8*35) bolts for fixing cable lugs (3P3W)
- 11 cable lugs per one PCS, refer to appendix cable lug spec.

Recommended Material for Installation 3P4W PCS (One Unit)

- 4 x 1500V, 2 AWG cables for DC (battery) connection
- 8 x 600V or greater, 2 AWG cables for AC connection (3P4W PCS)
- 1 x 600V or greater, 3 AWG cables for grounding
- 300V or greater, 16 AWG wires for communication or I/O connection.
- 1 x Ethernet cable with shield and RJ45 connector, CAT6 cables for communication with PC
- (N-1) x Ethernet cables with shield and RJ45 connector, CAT6 cable for N units of PCS parallel installed
- 4 x (M12*45) expansion bolts for fixing PCS on foundation.
- 26 x (M8*35) bolts for fixing cable lugs (3P4W)
- 13 cable lugs per one PCS, refer to appendix cable lug spec.

Grounding Instructions

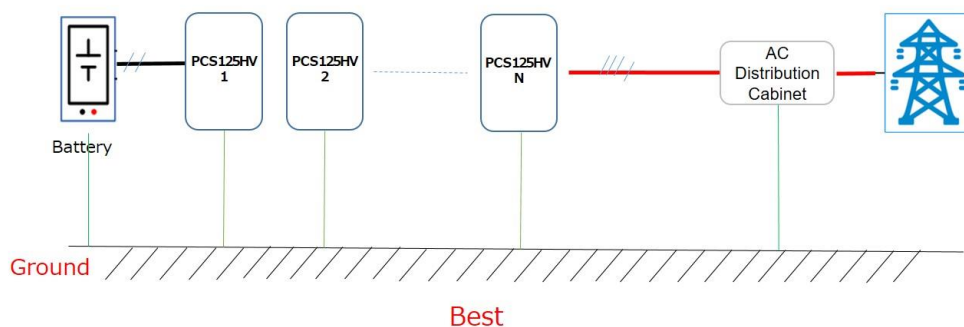


WARNING!

Grounding: All input and output circuits are isolated from the enclosure. System grounding, when required by Sections 250 of NEC, ANSI/NFPA 70, is the responsibility of the installer.

An equipment grounding conductor or a grounded, metal, and permanent wiring system is required for the PCS connection. This should run with circuit conductors and connected to the equipment grounding bar on the PCS. the resistance of PCS grounding should be required to less than 4ohm.

And we recommend each electrical equipment grounding independently to avoid mutual interference.



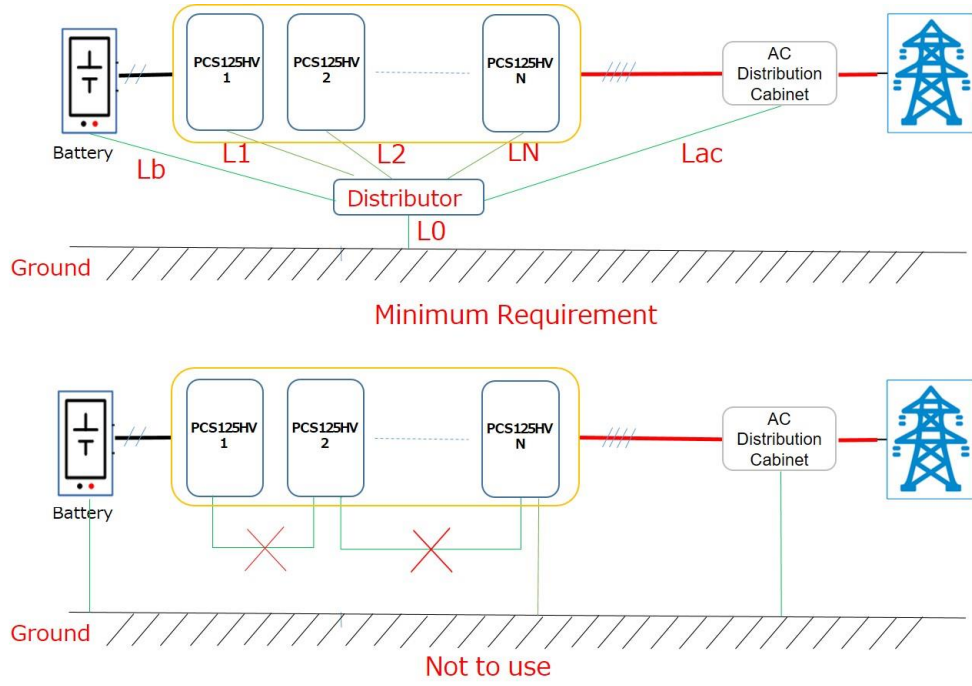


Figure 4. Grounding Layout

Foundation

The PCS cabinet is recommended to be mounted on a concrete floor. Follow the illustration below to prepare the groundwork.

Before installing a PCS cabinet, it is recommended to have a solid foundation established. If multi PCS (maximum 10 units) parallel installed, should retain the cable trench in foundation, the trench is 260mm width and 200mm depth as shown in following picture. The following information is provided to serve as a guide for the setup of a recommended foundation.

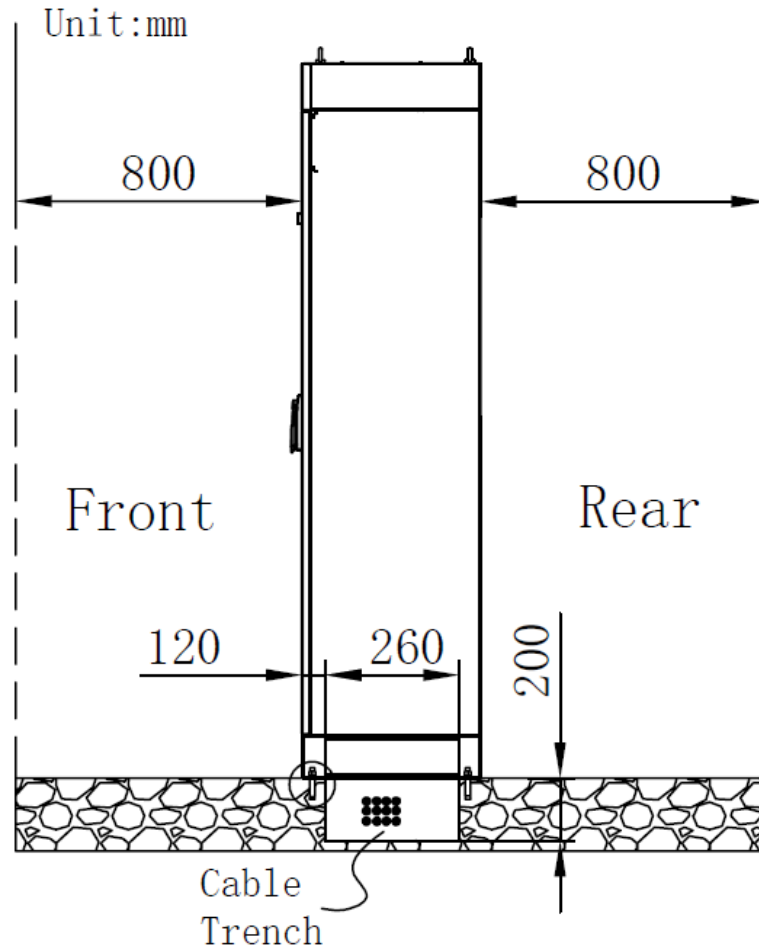


Figure 5. Foundation drawing

The footprint boundary area of the PCS is 600 x 500 mm, and the mounting point as show in figure 6.

1. Mounting by the front and rear sides of the unit base: Drill four holes for M12 expansion bolts (not provided with PCS125HV) at the 4 corners of an area of 437 x 300mm as marked in number 2.

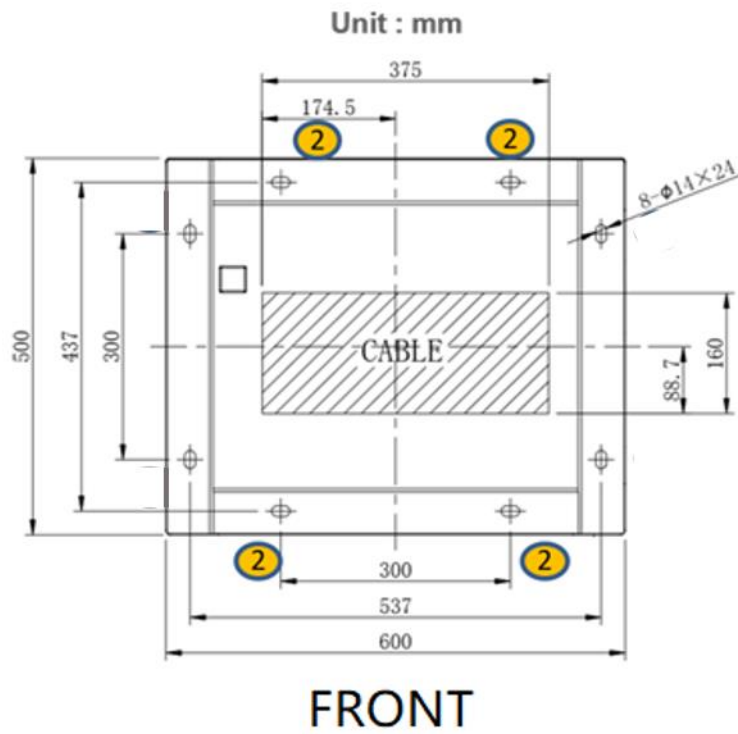


Figure 6. Mounting Layout and Anchoring Holes Placement Variations (Top View)

- Once the anchoring holes are completed, insert the expansion sleeves (not provided with PCS125HV) into the anchoring holes:
- Separate the nuts and washers from the bolts.
- Once the expansion sleeves are individually separated, insert each one into the anchoring holes.

Location and Ventilation Requirements

Dimensions

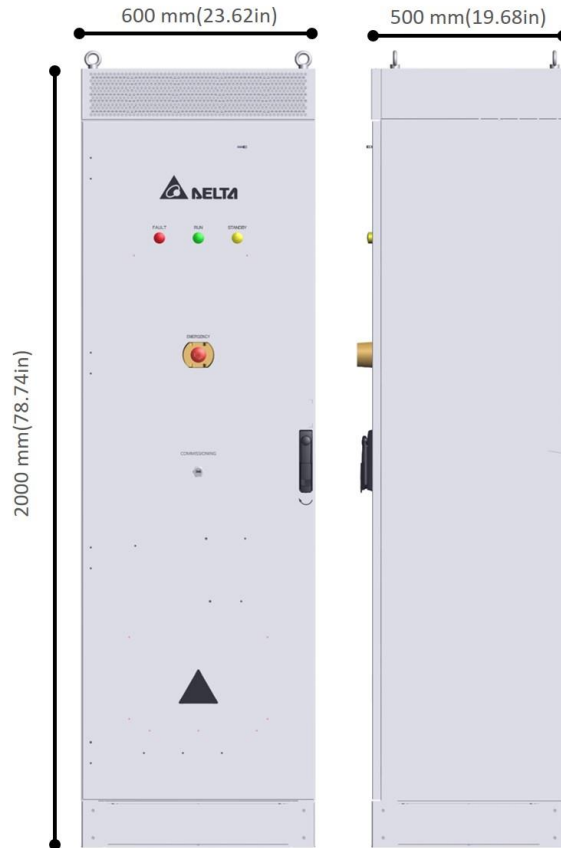


Figure 7. Front and Side Views of a Delta PCS125HV

Location Considerations

To fully experience the benefits and reliability of the PCS design, follow the provided guidelines:

- The PCS unit is rated IP55 and configured for outdoor installations.
- Install the PCS in an accessible location by following local requirements or Australian Standard for enclosures, door clearances, and proximity to other equipment.
- For optimal PCS life and performance, it is suggested not to mount the PCS in direct sunlight, especially in hot climates. If the unit must be mounted in direct sunlight, a metal sun-shield is recommended but not required.
- The PCS is forced-air-cooled. The cabinet is separated into two compartments: front and rear compartments.

In the case of the front compartment, the fan circulates internally and transmits heat to the external environment through the case for heat dissipation, as shown in figure 8.

From the rear compartment, the air is drawn in through vents at the lower part of the rear side, and exhaust air is emitted from vents in the front of the roof. The air inlet and outlet must not be blocked, and the installation location should be sufficiently ventilated to prevent the PCS heat output from increasing the ambient temperature beyond the PCS's rating.

- Under certain operating conditions, the PCS emits an audible noise. It is advisable to install away from living accommodations to protect against noise levels.
- The PCS should not be installed in an excessively dusty area, as this may decrease the performance of the air cooling system.
- The PCS must not be installed in areas in which dust containing conductive particles (e.g. iron filings) may form.
- The inlet air rate of PCS should keep 410cfm at least.

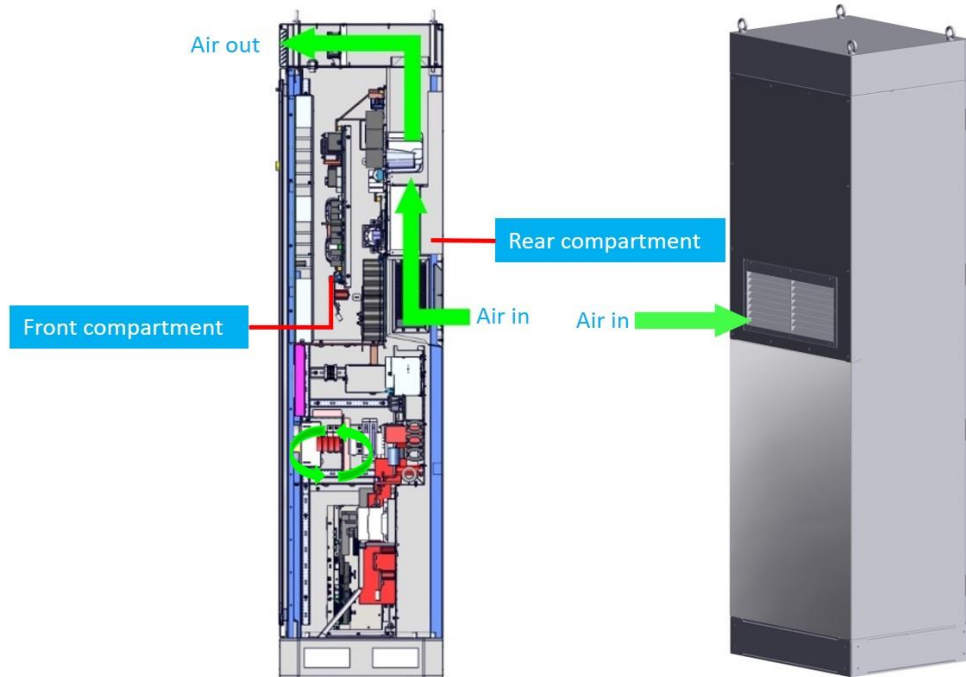
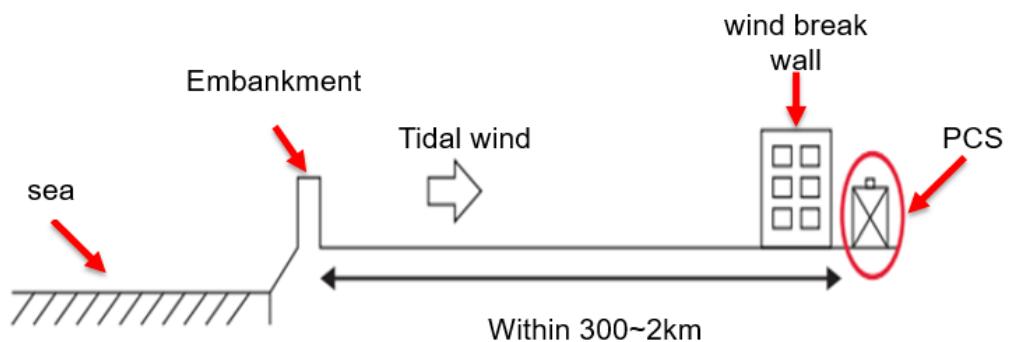


Figure 8. Diagram of PCS Airflow Design (Side View)

- Measure the level and vertical of the foundation with horizontal ruler. Ensure the tilting of the foundation surface below the PCS cabinet is less than 0.2 degrees.
- After you put the PCS on the foundation and measure the tilting of PCS cabinet again, ensure it is less than 0.2 degree.
- If PCS installed location is next to seaside, the distance is less than 2 kilometers, should build wind break wall to protect PCS against sea wind corrosion. In addition, the location should have good drainage system and can't be flooded.



Maintenance distance requirements

A minimum distance behind the PCS is required for maintenance from the rear side as shown in figure 8.

When the PCS fixing screws are installed in front and rear, the front and rear of PCS need at least 800mm installation space.

When PCS installed on final location, the left of PCS need at least 309mm for opening dooring space, but multi PCS parallel installed on site, the far left PCS need at least 309mm, and the gap between PCS cabinet should be more than 15mm.

Above the PCS maintenance space need at least 100mm installation and maintenance space.

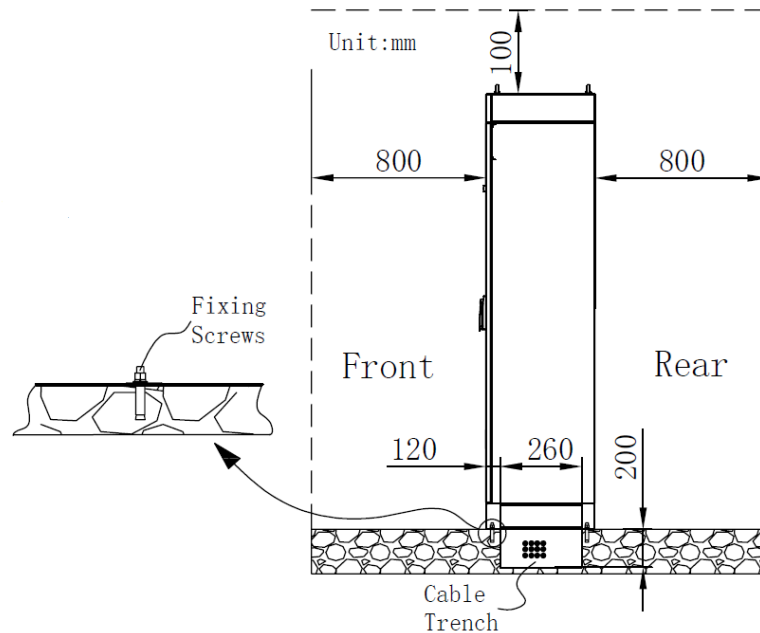


Figure 9. Front and Rear Maintenance Clearance Distance

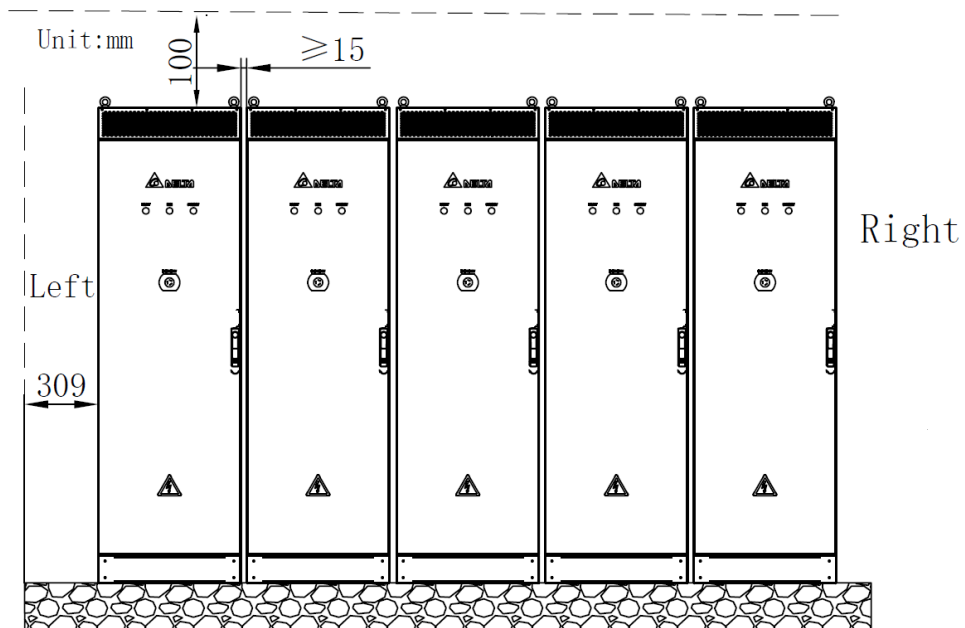


Figure 10. Maintenance Clearance Distance in Parallel Installation

Opening the door space

When installing the PCS, consider the necessary ventilation space as well as the

space requirements to allow access when opening the door. At the same time, 309mm space should be reserved for door opening as shown in the following figure.

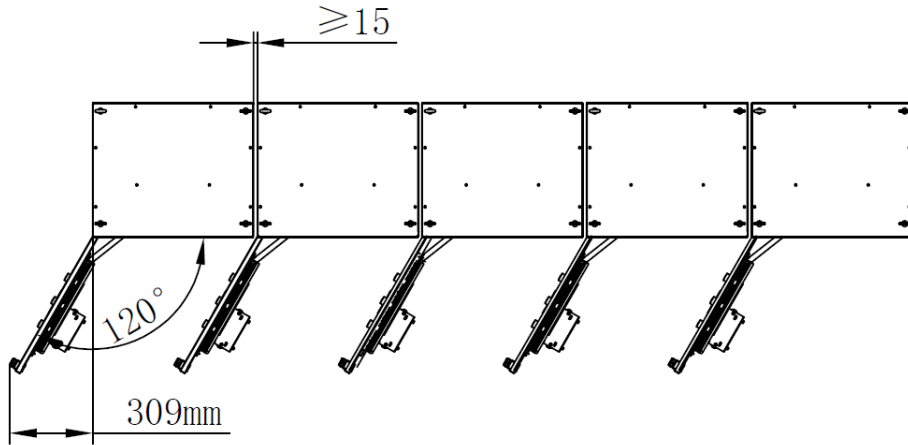


Figure 11. Top View of Door Clearance

Unpacking the 1-Unit PCS125HV

Use a forklift to move and place the crate containing the PCS and the wooden pallet in a designated location. Make sure the location is clean and prepared before moving the crate.



WARNING!

The PCS and crate have a combined weight of approximately 300 kg. DO NOT attempt to lift and/or move the package/unit by hand. The unit is extremely heavy. Attempting to move the unit by hand may lead to injury, damage, and even possibly death.



WARNING!

Before opening the package, make sure the Tip Tell label is OK. If the Tip Tell label shows the PCS has toppled and fell, immediately contact Delta and the Shipping Company.

1. Use a ladder to reach the top of the PCS.
2. Remove the screws securing the top cover.
3. Remove the top cover.
4. Remove the screws securing the left and right sidewalls from the shipping package.
5. Remove the right and left sidewalls
6. Remove the screws securing the front and rear walls from the shipping package.
7. Remove the front and rear walls.

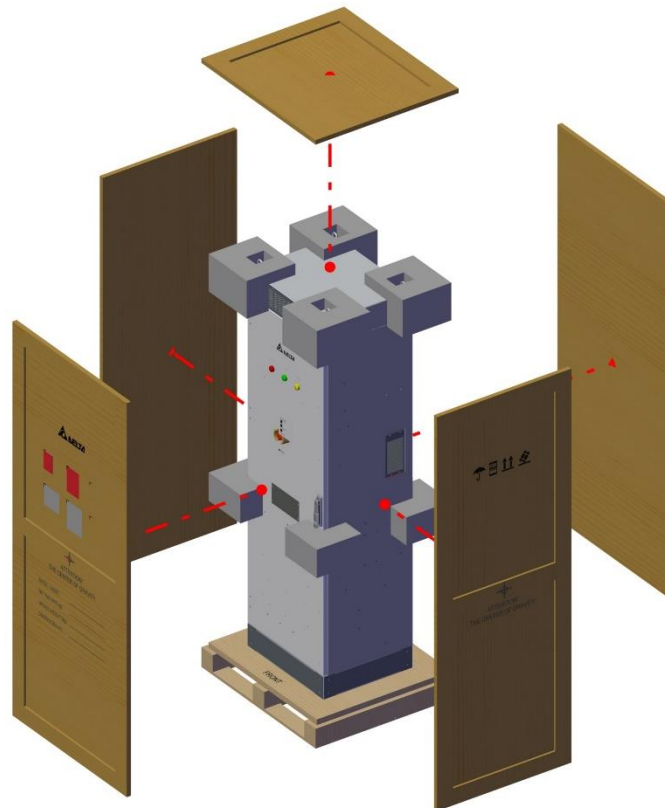


Figure 12. Removing All Walls of 1-Unit PCS125HV

Upon unpacking the unit, inspect the unit for signs of damages that may have been caused during shipping. If any sign of damage is found, immediately contact Delta and the shipping company.

Unpacking the 2-Unit PCS125HV

Use a forklift to move and place the crate containing the PCS and the wooden pallet in a designated location. Make sure the location is clean and prepared before moving the crate.



WARNING!

The PCS and crate have a combined weight of approximately 600 kg. DO NOT attempt to lift and/or move the package/unit by hand. The unit is extremely heavy. Attempting to move the unit by hand may lead to injury, damage, and even possibly death.



WARNING!

Before opening the package, make sure the Tip Tell label is OK. If the Tip Tell label shows the PCS has toppled and fell, immediately contact Delta and the Shipping Company.

1. Use a ladder to reach the top of the PCS.
2. Remove the screws securing the top cover.
3. Remove the top cover.
4. Remove the screws securing the left and right sidewalls from the shipping package.
5. Remove the right and left sidewalls
6. Remove the screws securing the front and rear walls from the shipping package.
7. Remove the front and rear walls.

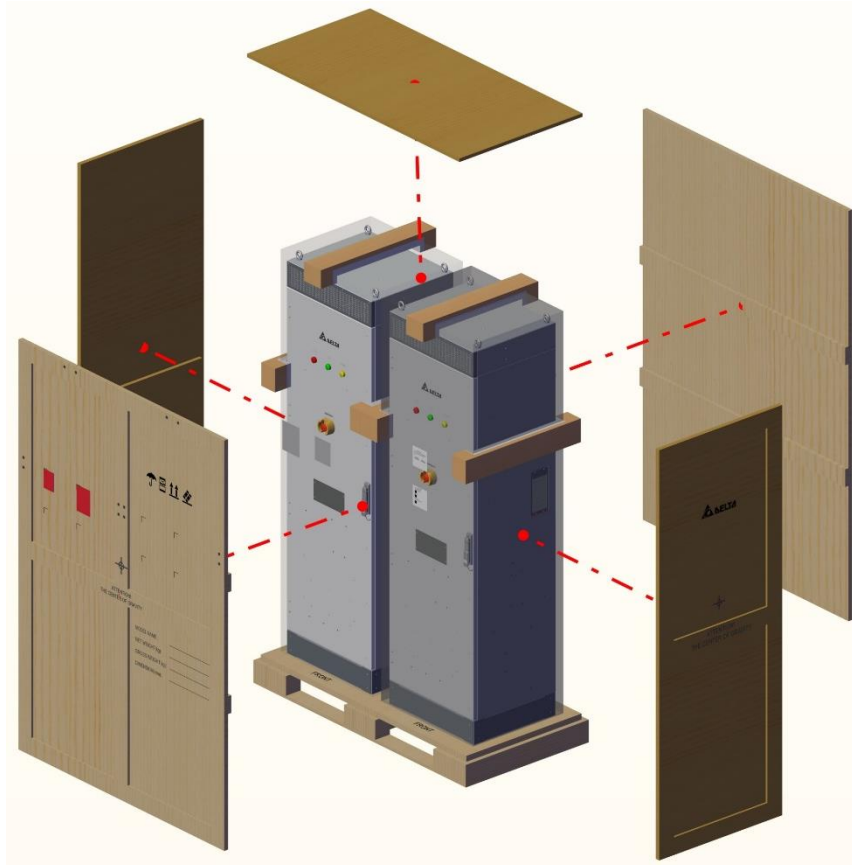


Figure 13. Removing All Walls 2-Unit PCS125HV

Upon unpacking the unit, inspect the unit for any signs of damages that may have been caused during shipping. If any sign of damage is found, immediately contact Delta and the shipping company.

Installing the PCS Onsite

Safety Considerations

The following safety information is intended to reduce the risk of accidents:

- Keep the floor around the PCS clean to prevent metallic dust, iron, or other metal fillings from being drawn inside the device, consequently causing short circuits.

Closed area installations:

- The floor and surrounding area around the PCS must use non-flammable material.
- A portable powder fire extinguisher must be installed within easy reach of the PCS.
- An automatic fire extinguishing system should be installed and enabled for the site.
- Access to the installation site should be restricted to qualified service personnel.

Surge Arrester Safety

The function of the lightning and surge protection system is to protect the devices, functional isolations, and over voltage-sensitive consumer equipment of the PCS. The PCS is equipped with a Class II SPD to cover the system when not placed in a direct lightning strike area.

Due to the wide surge energy, voltage, and frequency range of overvoltage in lightning strike areas, it is recommended:

1. Where the system is equipped with an external lightning protection system(LPS) or protection against effects of direct lightning is otherwise specified, Class I SPDs shall be installed by end user.
2. Where the system is not equipped with an external lightning protection system(LPS) and where the occurrence of a direct lightning strike to the overhead lines between the last pole and the entrance of the installation is to be taken into consideration, Class I SPDs at or near the origin of the electrical installation shall be installed by end user.
3. Class II SPDs shall be installed as close as possible to the origin of the installation in the system, for example in the upstream distribution board for PCS.

Battery Ground Fault Concerns

The following are concerns surrounding the potential risks of DC ground faults and the possible causes and need to be installed by end user.



WARNING!

To prevent possible escalation into serious or catastrophic ground faults, it is recommended to equip the corresponding Ground Fault Detection (GFD) equipment and follow strict maintenance guidelines.

The primary concerns with any Battery Ground Fault include three principle areas:

1. Fire due to ground fault.
2. Risk to personnel due to ground or battery fault.
3. Risk to system reliability due to ground fault.

To prevent possible ground fault risks, it is recommended to equip the corresponding GFD equipment. We suggest to consult your battery vendor about the detailed GFD equipment requirements.

Please be noted there is DC Insulation Detection circuits equipped inside this PCS, but if PCS is installed in a grounded system, a Residual Current Monitoring (RCM) Device is necessary to do GFD function. A type B (universal current sensitive) RCM device is recommended. It is recommended to install RCM on the AC side. The measuring range of the ground fault current of the RCM shall be at least from 10mA to 500mA. The warning and fault signal of the RCM shall go to the EMS or site controller. If the ground

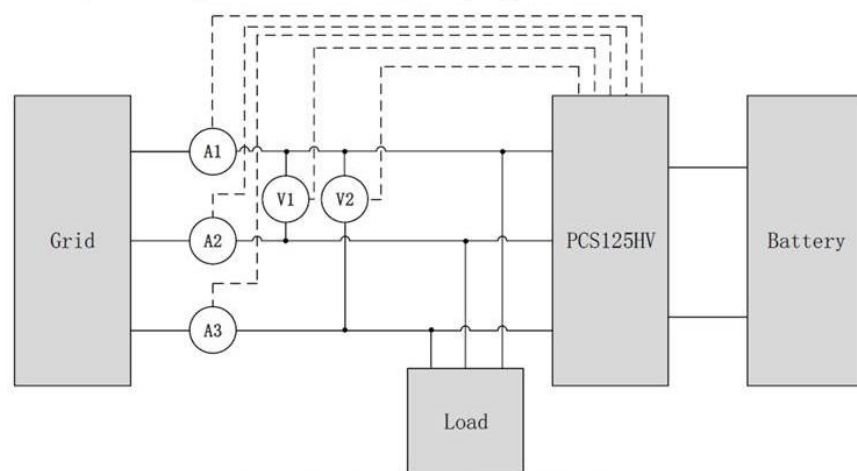
fault happen, EMS or site controller shall send “shut down” command to PCS to shut down the energy storage system. And person who manage the site shall go to the site to check and find the ground fault point. Unless the fault is resolved, the system can’t be re-started.

If the PCS is installed in an ungrounded system, when a ground fault occurs, the PCS will report a ground fault, and the upper computer controller can remotely access the fault register [0x06FE] to obtain the fault status. The “IMD Low Fault” means the internal DC Insulation Detection circuits detect the low insulation resistance. And person who manage the site shall go to the site to check and find the ground fault point. Unless the fault is resolved, the system can’t be re-started.

06FE	1790	Uint16	EN_FAULT_SYS_SYSTEM	b7: IMD Low Fault	PCS Off	R	0	65535	0
------	------	--------	---------------------	-------------------	---------	---	---	-------	---

CRD function

PCS has CRD function which can protect energy flow from battery to grid, the required configuration of voltage and current sampling circuit as below shown.



AC and DC Disconnect Switch Concerns

There are two disconnect switches inside the PCS125HV, one for AC side and another for DC side.

1. AC disconnect switch has a load-breaking capacity and can break under normal voltage and current.
2. DC disconnect switch does not have load-breaking capacity for voltage above 1000Vdc. If the battery system operating voltage is higher than 1000Vdc, this DC disconnect switch shall not break under load. To break the DC side between the battery system and PCS under load, an external DC disconnect switch with load breaking capacity complying with the local standard is recommended to install in the energy storage system. The recommended DC switch rating is 1500Vdc / 200A.

Acoustic Noise Concerns

This PCS is designed to produce less noise by fan speed control. When the PCS is operating at full load in an environment with ambient temperature below 25°C, the measured acoustic noise at 1m distance is below 70dB. But if the ambient temperature is higher than 25°C, the maximum acoustic noise at 1m may be up to 75dB. So we will recommend people who will work near the PCS, to wear earplugs or earmuffs for protection from the noise.

WARNING!



The weight of the PCS is distributed on a small surface of the floor. It is necessary to verify the floor load-bearing capacity.

All service and maintenance personnel must be trained in normal as well as emergency procedures.

Chain Hoist Installation

The dimensions and weights specified must be taken into consideration when mounting the PCS. All lifting equipment and lifting components (hooks, bolts, lifts, slings, chains, etc.) must be properly sized and rated to safely lift and hold the weight of the PCS during the mounting process.

CAUTION!



TO MOVE THE PCS, USE LIFTING EQUIPMENT THAT HAS AN APPROPRIATE RATED LIFT CAPACITY.

CAUTION!



IF USING LIFTING LUGS, BE SURE THE SPREADER BAR IS SUFFICIENTLY LONG TO PREVENT DAMAGE TO THE HOOD AND BE SURE TO USE A MINIMUM OF FOUR STRAPS OF SUFFICIENT LENGTH.

CAUTION!



THE UNIT WEIGHS APPROXIMATELY 230 KG/ 550 LBS. TO PREVENT POSSIBLE DAMAGE OR INJURY ANY LIFTING DEVICE MUST BE RATED TO WITHSTAND THE MAXIMUM REQUIRED WEIGHT.

CAUTION!



THE UNIT SHOULD NOT BE INSTALLED WITH THE CABINET DOORS OPEN.

1. Locate the eye bolts on each corner of the PCS.
2. Check the eye bolts are properly tightened to the frame.



Figure 14. Eye Bolts Locations

WARNING!



Before proceeding with the normal operation of the hoist, the operator(s) must be trained in accordance with the hoist manufacturer's operation manual. Failure to read and comply with any of the instructions and limitations noted in this manual and the hoist manufacturer's manual can result in product failure, serious bodily injury or death, and/or property damage.

Follow the initial start-up procedures for the hoist as described in the manufacturer's operation manual. Do not attempt operation until all start-up procedures have been fulfilled.

The load attachment may differ from the following figure depending on the type of chain hoist used. The following is a depiction to illustrate a possible scenario.

WARNING!



Keep hoist lines plumb. The working load limits of hoisting equipment apply only to freely suspended loads on plumb hoist lines. If the hoist line is not plumb during load handling, side loads are created which can destabilize the load and cause structural failure or tip-over, with little warning.

3. Connect the hoist to the eye bolts on the cabinet. Make sure the load is secured before making any attempt to move it. The recommended diagonal length of the sling is 2 to 2.5 m (6.56 to 8.2 ft.).
4. Follow the hoist manufacturer's guidelines on moving the load as described in the manufacturer's operation manual.

WARNING!



Check on Sling Angle. Ensure that the sling angle is always greater than 45° and preferably greater than 60° . When the horizontal distance between the attachment points on the load is less than the length of the shortest sling leg, then the angle is greater than 60° and generally safe.



Figure 15. Eye Bolts Lifting



5. Once the PCS is placed in its final installation site, secure the PCS to the site as described in “Securing a Cabinet in a Final Location” on page 25.
6. Remove the hoist.

Forklift Installation



CAUTION!

TO MOVE THE PCS, USE A FORKLIFT THAT HAS AN APPROPRIATELY RATED LIFT CAPACITY AND A 915 CM (36-INCH) FORK SPAN.



CAUTION!

THE ENCLOSURE MUST BE LIFTED FROM THE BOTTOM. THE ENCLOSURE MUST BE SUPPORTED ON ALL FOUR SIDES WHEN LIFTING. PRECAUTIONS MUST BE TAKEN TO AVOID TIPPING OF THE ENCLOSURE FRONT TO BACK AND SIDE TO SIDE DURING LIFTING BECAUSE THE CENTER OF GRAVITY OF THE ENCLOSURE IS NOT THE CENTER OF THE ENCLOSURE.

1. Unpack the PCS, see “Unpacking the Unit” on page 15.
2. Using the forklift to move the PCS.

Removing the PCS125HV from the left/right side:

- a. Remove the front and rear side panels and hexagonal nuts and washers securing the cabinet to the pallet.



Figure 16. Releasing a PCS from a Pallet

- b. Remove the screws securing the side base covers.
- c. Remove the base covers. Place them on a clean work surface for later use. The covers must be re-installed after the completion of cabinet installation and cable routing



Figure 17. Removing Left and Right Base Covers

- d. Align the forklift with the bottom channels on the cabinet, see the following image.
- e. Once aligned, insert the forks into the channels until they are completely through the opposite side of the insertion channels.



WARNING!

Take care the unit is balanced and no risk to prevent it fall.

- f. Carefully lift the cabinet.



Figure 18. Lateral Handling of PCS

- a. Remove the front and rear side panels.

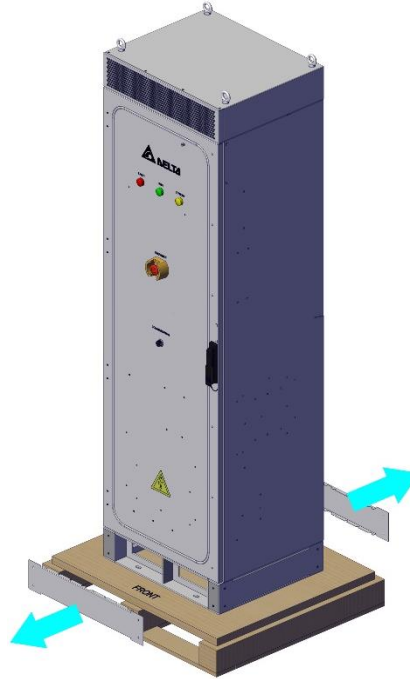


Figure 19. Removing Front/Rear Base Covers

- b. Remove the hexagonal nuts and washers.



Figure 20. Releasing a PCS from a Pallet

- c. Remove the screws securing the front/rear base covers.
- d. Align the forklift with the bottom channels on the cabinet, see the following image.
- e. Once aligned, insert the forks into the channels until they are completely through the opposite side of the insertion channels.



WARNING!

Take care the unit is balanced and no risk to prevent it fall.

- f. Carefully lift the cabinet.



Figure 21. Front/rear Side Handling

3. Once the PCS is placed in its final installation site, secure the PCS to the site as described in “Securing a Cabinet in a Final Location” on page 25.

Securing a Cabinet in a Final Location

1. First, insert a washer in the anchoring bolt followed by a nut.
2. Turn the nut until it is lowered in the bolt. Do not tighten at this time. All nuts must be inserted in their respective anchoring bolts.
3. Repeat for the remaining anchoring bolts.
4. Once all nuts are inserted, tighten the anchoring bolts in ascending order. See the following figure.
5. Move on to the opposite side of the bolt and tighten the bolt.
6. Repeat in the same manner for the remaining anchoring bolts.

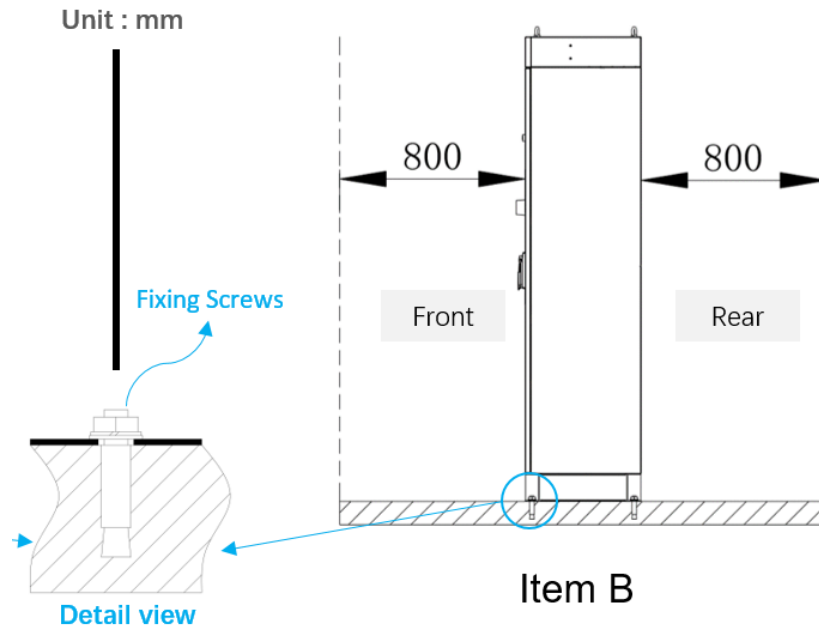


Figure 22. Securing a Cabinet with Anchoring Bolts

Wiring Instructions

This chapter describes how to perform the system wiring and cabling procedures.

Read the Safety section first and follow the rules carefully before doing any wiring and cabling works to ensure personal safety.

Safety



Shock Hazard: Ensure that no DC voltage is being supplied to the PCS and that no AC voltage is present on the AC wiring. Failure to do so could cause serious injury or death. A warning label is provided to inform all personnel that multiple sources of power are available inside. This label is installed on the outside of the door and should remain clearly visible. Ensure all sources of power are OFF or disconnected before servicing.

The Delta PCS125HV contains electrical components carrying potentially lethal voltages and currents. Extreme caution should be exercised around the system, especially when the cabinet door is open once it's installed. Before opening the cabinet, all supply power should be disconnected using a standard physical lock-out procedure and the service personnel should wait 5 minutes prior to opening the enclosure door.



WARNING!

Grounding: All input and output circuits are isolated from the enclosure. System grounding, when required by Sections 690.41, 690.42, and 690.43 of NEC, ANSI/NFPA 70, is the responsibility of the installer.

Wire Sizing and Ratings

AC Wire Sizing and Ratings

Recommended the AC power cables as per the following wiring specifications. Other wire sizes are also acceptable if they can meet the local standard or regulation.

Table 2: AC Wire Sizing and Ratings

Cable Type	Solid Copper Conductor
Voltage Rating	600 Volts or greater
Temperature	90°C or greater
Gauge	2 AWG
Insulation	PVC, XLPE
According to	UL subject 758, UL 1581, CSA C22.2
Flame Test	V-1
Quantity	6 (2 for L1, 2 for L2, 2 for L3) for 3P3W
	8 (2 for L1, 2 for L2, 2 for L3, 2 for N) for 3P4W

DC Wire Sizing and Ratings

Recommended the DC power cables as per the following wiring specifications. Other wire sizes are also acceptable if they can meet the local standard or regulation.

Table 3: DC Wire Sizing and Ratings

Cable Type	Solid Copper Conductor
Voltage Rating	1500 Volts or greater
Temperature	90°C or greater
Gauge	2AWG
Insulation	PVC, XLPE
According to	UL subject 758, UL 1581, CSA C22.2
Flame Test	V-1
Quantity	2 per battery set (1 for positive, 1 for negative up to 2 sets)

Grounding Wire Sizing and Ratings



All ground wiring must meet the following specifications:

1. The grounding wire sizing must be not less than 4AWG.
2. Wire sizing and ratings are recommended in the previous tables by the manufacturer.

If wiring other than posted is used, the wiring must comply with the local regulations.

Table 4: Grounding Wire Sizing and Ratings

Cable Type	Solid Copper Conductor
Voltage Rating	600 Volts or greater
Temperature	90°C or greater
Gauge	3AWG

Quantity	1
----------	---

Communication and I/O Wire Sizing and Ratings

Here are the requirements for the communication and I/O wires:

Table 5: Communication and I/O Wire Sizing and Ratings

Cable Type	Solid Copper Conductor
Voltage Rating	300 Volts or greater
Temperature	90°C or greater
Gauge	16 AWG
Material	Copper
Quantity	Depending on customer needs

Preparation of Cables

This section describes how to prepare the corresponding cables and wires to meet the specified requirements, see section “Wire Sizing and Ratings” on page 24.

- 4 x 1500V, 2 AWG cables for DC (battery) connection
- 6 x 600V or greater, 2 AWG cables for AC connection (for 3P3W)
- 8 x 600V or greater, 2 AWG cables for AC connection (for 3P4W)
- 1 x 600V or greater, ≥ 4 AWG cables for grounding
- 300V or greater, 16 AWG wires for communication or I/O connection.
- 1 x Ethernet cable with shield and RJ45 connector, CAT6 cables for communication with PC
- (N-1) x Ethernet cables with shield and RJ45 connector, CAT6 cable for N units of PCS parallel installed

Preparation of Bolts and Cable lug

- 22 x (M8*35) bolts for fixing cable lugs (3P3W)
- 26x (M8*35) bolts for fixing cable lugs (3P4W)
- 11 cable lugs per one 3P3W PCS, refer to appendix cable lug spec.
- 13 cable lugs per one 3P4W PCS, refer to appendix cable lug spec.



Note:

Wiring must comply with the local NEC regulation.

Preparing AC/DC Cables

The following guidelines describe how to prepare the AC/DC cables for a grid or battery connection. When crimping a cable, a hexagonal crimping method is recommended.

1. Strip the head of the insulator of the AC and DC power cables. Insert the exposed part of the power cable into the junction hole of the corresponding cable lug.
2. Continue inserting the cable until its head reaches the wire inspection indicator, as shown in the following figure:

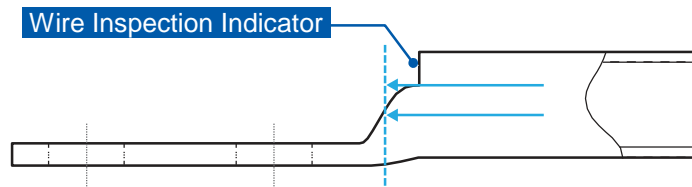


Figure 23. Inserting a Power Cable into a Cable Lug, Depth Reference Diagram

3. For safety purposes, use heat shrinkable tubing on the junction between the cables and lugs. The voltage rating of the heat shrinkable tubing should be at least 1500 V for DC power cable or 600 V for AC power cable. Make sure the exposed part of the junction between the cables and lugs is fully covered by the tubing, as shown in the following figures.
4. Prepare the cables as follows:

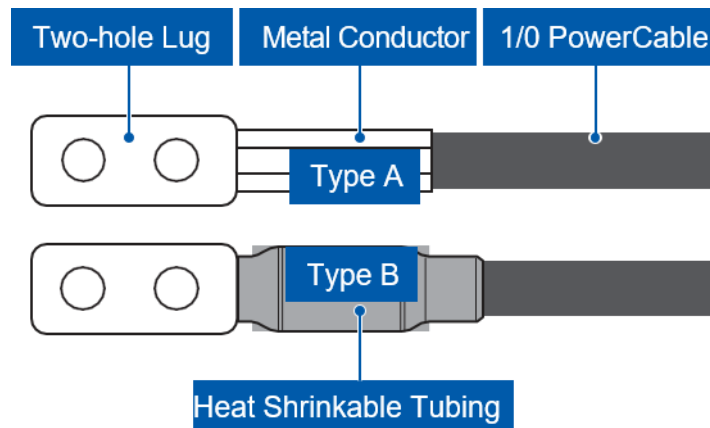


Figure 24. Preparation of AC/DC Cables



Note:

We recommend two-hole lugs for cable connection, but in some cases if customer want to use single-hole lugs, the lug type and connection way should meet local standard and regulation.

Communication and I/O Wiring and terminal resistor setting

Get the wires with connectors or terminals prepared for communication and I/O connection through the front square hole of the unit base

Plug these connectors into the relevant connector bases built-in at the inner left side wall of the cabinet adjacent to the DC terminals as the following figure:

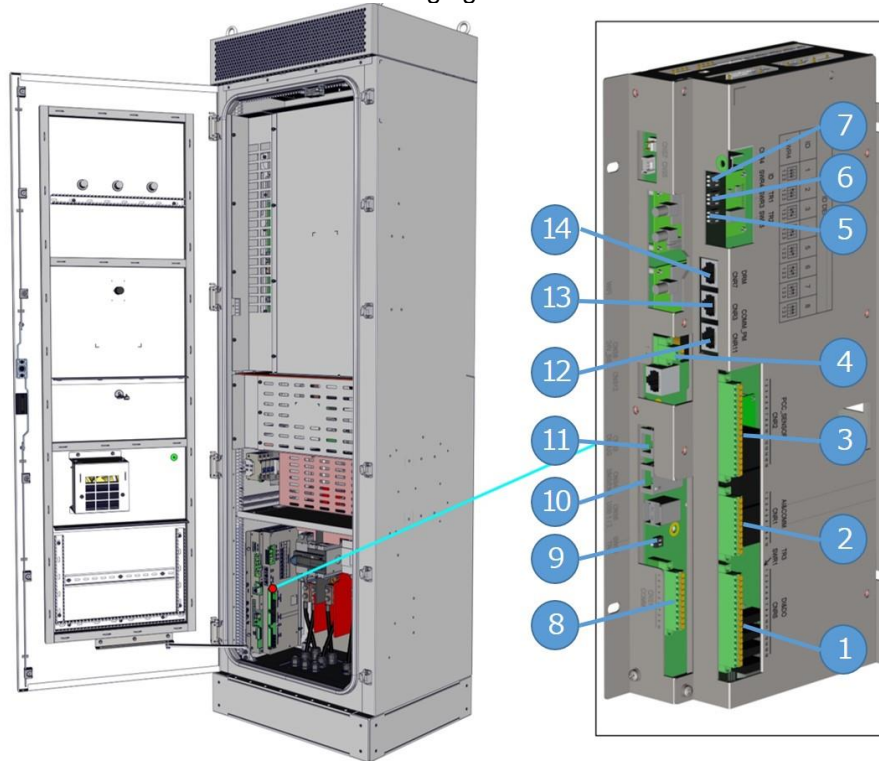


Figure 25. Communication and I/O Connection Location



Figure 26. Communication wiring through the front square hole

Table 6: Communication and I/O Connection

No.	Connector	Description
1	CNR6	I/O terminal 16-pin connector
2	CNR1	Reserved for temperature sensor to MCU 10-pin connector
3	CNR2	For external grid or load current sensing 16-pin connector
4	CNS8	Black Start auxiliary power (24V) 2-pin connector
5	SWR5	Terminal resistor switches for RS485 and CAN For CNR11
6	SWR3	Terminal resistor switches for RS485 and CAN For CNR3
7	SWR4	ID setting resistor switches
8	CNS10	CAN communication for BMS 10-pin connector
9	SWS5	Terminal resistor switches for RS485 and CAN For CNS10
10	CNS4	Ethernet interface for ESS/BMS(PCS IP address can't be 192.168.0.xxx)
11	CNS3	Debug interface for FAE(Static IP is 192.168.0.136)
12	CNR11	PCS parallel RS485 & CAN communications RJ45 connector
13	CNR3	PCS parallel RS485 & CAN communications RJ45 connector
14	CNR7	Interface for DRM function RJ45 connector

I/O Connector (CNR6)

The CNR6 connector is for digital I/O connection. Take out the green 16-pin connector (CNR6) from the accessory kit, and connect prepared AWG 16 wires to pin 1~16 of this connector as shown in figure 25. It's recommended to substitute the wires with a multi-core shield cable. The shielding layer should be crimped with ring terminal whose diameter D=5.5. And the ring terminal need be connected to a grounding screw as shown in figure 27

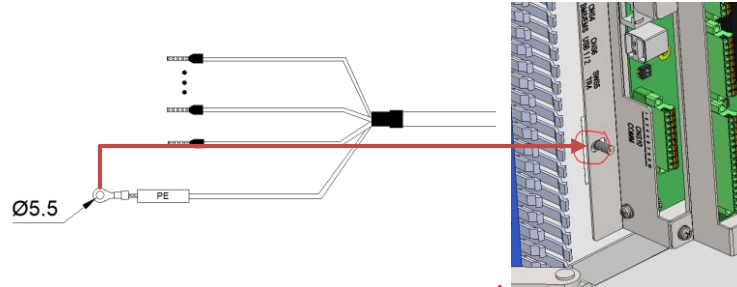


Figure 27. Ring terminal connection

The Remote EPO connector is also a wet input from custom. Only normal close EPO is supported. When the function is reserved, the shorting stub between CNR6-15 and CNR6-16 should be retained.

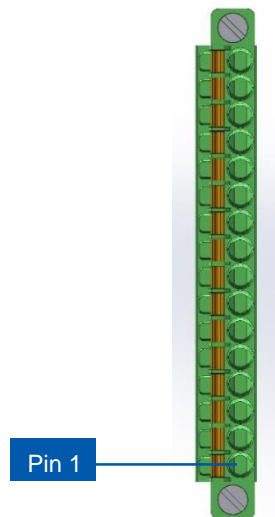


Figure 28. CNR6 Pin Assignment

Table 7: CNR6 Pin Assignment

Item	Pin Assignment (Reserved)	Notes
CNR6	15. REPO_2	Remote EPO, Wet Contact for customer, Normal Close.
	16. REPO_1	

Auxiliary Power Interface Connector (CNS8)

The CNS8 connector is used for optional auxiliary power input with 24Vdc 0.5A.

When the grid side and battery side are both disconnected, the controller of PCS can be supplied by this terminal.

When the grid side or battery side are connected, the controller of PCS will be supplied by internal auxiliary power.

Connect two AWG 16 wires to the 2 pin connector as per the pin assignment table below.

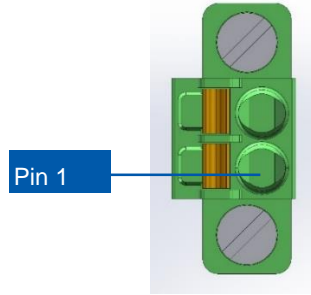


Figure 29. CNS8 Pin Assignment

Table 8: Auxiliary Power Interface Connector

Item	Pin Assignment	Notes
CNS8	1: Vdc-1	24Vdc, 0.5A;
	2: GND	

DRM Connector (CNR7)

PCS125HV supports all the demand response modes (DRMs) defined in the standard AS/NZS 4777.2. The CNR7 connector is an RJ45 socket that can be connected to a demand response enabling device (DRED).

Table 9: DRM mode definition

Mode	Requirement
DRM 0	Operate the disconnection device
DRM 1	Do not consume power
DRM 2	Do not consume at more than 50 % of rated power
DRM 3	Do not consume at more than 75 % of rated power AND supply reactive power if capable
DRM 4	Increase power consumption (subject to constraints from other active DRMs)
DRM 5	Do not generate power
DRM 6	Do not generate at more than 50 % of rated power
DRM 7	Do not generate at more than 75 % of rated power AND absorb reactive power if capable
DRM 8	Increase power generation (subject to constraints from other active DRMs)

NOTE Demand response modes of [Table 3.1](#) are as described in AS/NZS 4755.3 series of Standards.

The DRM function can be used or reserved.

If the DRM function is not used, keep the RJ45 terminal which has a settled resistor as shown in the following figure connected to CNR7. If the DRM function is used, an RJ45 terminal which is complied with the standard should be connected to CNR7.

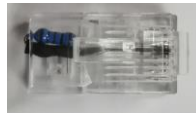


Figure 30. CNR7 connector with Terminal resistor

Table 10: CNR7 Pin Assignment

Item	Pin Assignment	Notes
CNR7	1: DRM1/5	FOR DRM function
	2: DRM2/6	
	3: DRM3/7	
	4: DRM4/8	
	5: REF GEN/0	
	6: COM LOAD/0	
	7: Shorted to PIN 8	
	8: Shorted to PIN 7	

Ethernet Communication Connector (CNS4)

The CNS4 connector is used for Ethernet communication. Use a common Ethernet cable to connect to a site controller or EMS.

Please be noted if one uses PC to connect with a PCS Ethernet port, there may be a connection issue due to the Ethernet Card compatibility in some PCs. In this case, we can suggest an Ethernet-USB converter to connect with PCS.

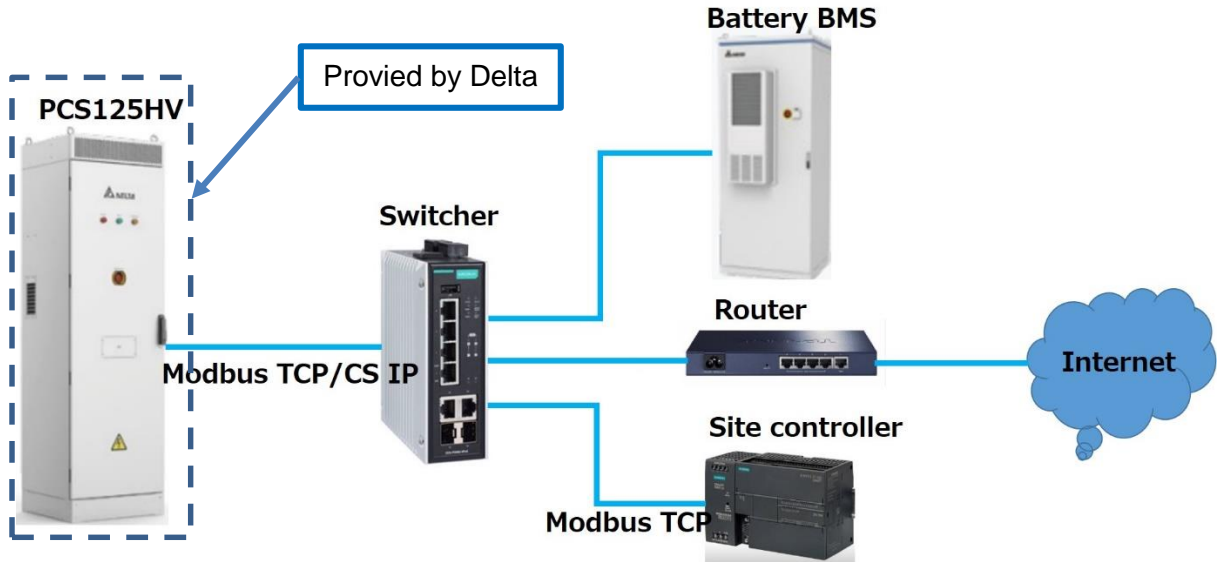


Figure 31. Recommend communication connection diagram

Communication Connector (CNR3, CNR11)

Multiple PCSs can be connected in parallel to fulfill different power requirement of site application. To make the PCSs operate in parallel correctly, the following connection method should be followed. The CNR3 and CNR11 connectors are for communication with other PCS in parallel operation. Prepare two RJ45 connectors with shielded Ethernet cables, and the wires to the pin 1~8 of the RJ45 connector, and it should be connected as the graphic and pin assignment below:

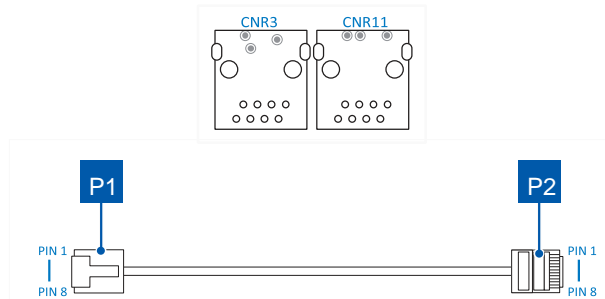


Figure 32. CNR3, CNR11 Pin Assignment

Table 11: CNR3, CNR11 Pin Assignment

Item	Pin Assignment	Notes
CNR3, CNR11	1: RS485A_P	PCS parallel RS485 communications
	2: RS485B_P	
	3: #SYSDISABLE	PCS parallel I/O
	4: CANH_P	PCS parallel CAN communications
	5: CANL_P	
	6: PGD	
	7: RS485A_M	Monitor RS485 communications
	8: RS485B_M	

ID setting switches (SWR4)

The SWR4 switches are used to set the ID of PCS in parallel.

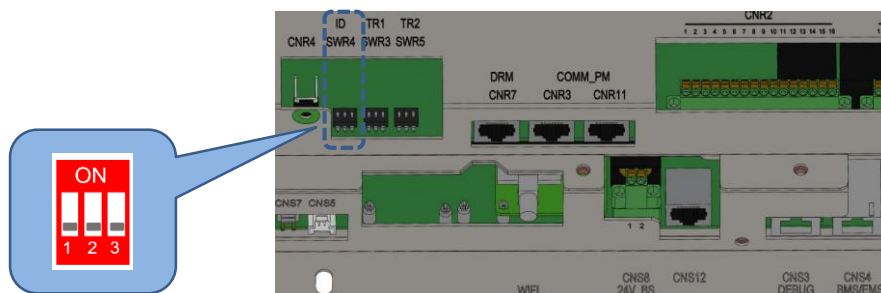


Figure 33. SWR4 Assignment

The ID of PCS should be set according to the following table.

Table 12: ID setting of SWR4

ID DEFINITION								
ID	1	2	3	4	5	6	7	8
SWR4								

Terminal resistor setting switches (SWR3, SWR5, SWS5)

The SWR3 and SWR5 switches are used to set the terminal resistors of RS485 and CAN for PCS parallel communication. Make sure the SWS5 switches is off. When the switch is placed at the upper side (ON Marking), the corresponding terminal resistor is connected.

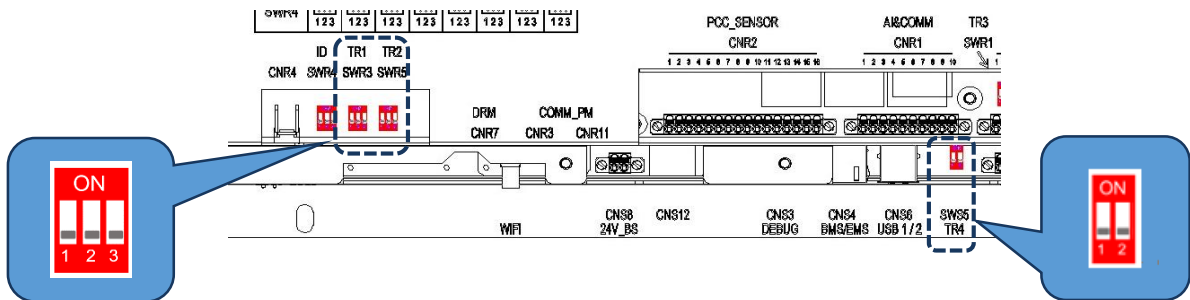


Figure 34. SWR3, SWR5, SWS5 Assignment

Connected by Ethernet

When a single PCS#1 is used, make sure the connector CNR3 is not connected. When multiple PCSs are used, make sure the connector CNR11 of the last PCS#N is not connected.

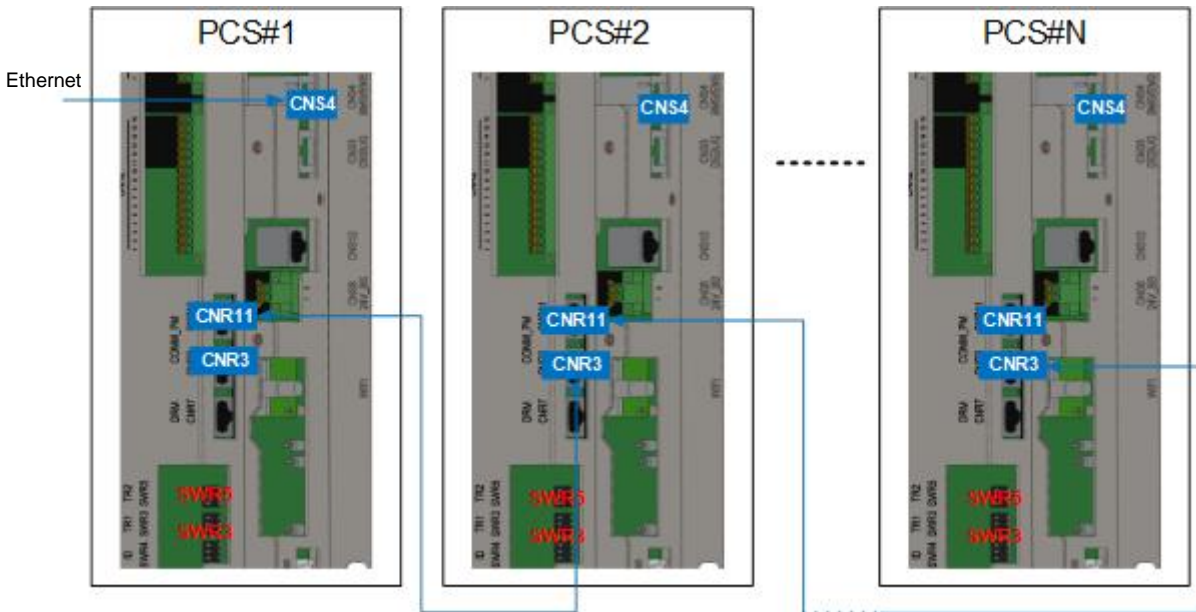


Figure 35. Connected by Ethernet

Terminal resistors setting

The terminal resistor switches SWR3 and SWR5 must be set according to the following two tables.

Table 13: Terminal resistors switches setting of single PCS for Ethernet communication

Mode	Switches	1# PCS
Single	SWR3-1	√
	SWR3-2	√
	SWR3-3	√
	SWR5-1	√
	SWR5-2	√
	SWR5-3	√
		 SWR3 SWR5

Table 14: Terminal resistors switches setting of parallel PCS for Ethernet communication

	Switches	1# PCS(master)	n# PCS	Last PCS
Parallel	SWR3-1	√	×	×
	SWR3-2	√	×	×
	SWR3-3	√	×	×
	SWR5-1	×	×	√
	SWR5-2	×	×	√
	SWR5-3	×	×	√
			 SWR3 SWR5	 SWR3 SWR5

Wiring

Power cable connection requirement

1. For grid-tied mode application, PCS grid side can be IT system or TN system. It's not necessary to add a transformer to isolate the PCS and grid power.

2. For off-grid mode application, PCS125HV have two type configuration: 3P3W or 3P4W.

If the configuration of PCS is 3P4W, PCS can support the single phase load without transformer.

If the configuration of PCS is 3P3W, PCS should add the transformer to support single phase load.

The transformer requirement is as below:

2.1 The transformer is designed for voltage on the low voltage windings, that can exhibit a voltage gradient dv/dt up to 675V/us to ground.

2.2 When the PCS is running, it can produce a peak voltage of up to +/-1350V (phase to ground), and the transformer low-voltage side windings insulation strength should be able to withstand the peak voltage.

2.3 The short-circuit impedance of the transformer should be between 5% and 7%, and the transformer wiring group may choose YNd11, where the capital letters represent the transformer primary winding group, and the lowercase letters indicate the transformer secondary winding group. And the secondary side is connecting to PCS.

3. If multi PCS are parallel connected, AC&DC power cable don't allow to be connected in serial mode as low right illustration. AC cable can be connected to one AC distributor cabinet and DC cable can be connected to battery cabinet directly.

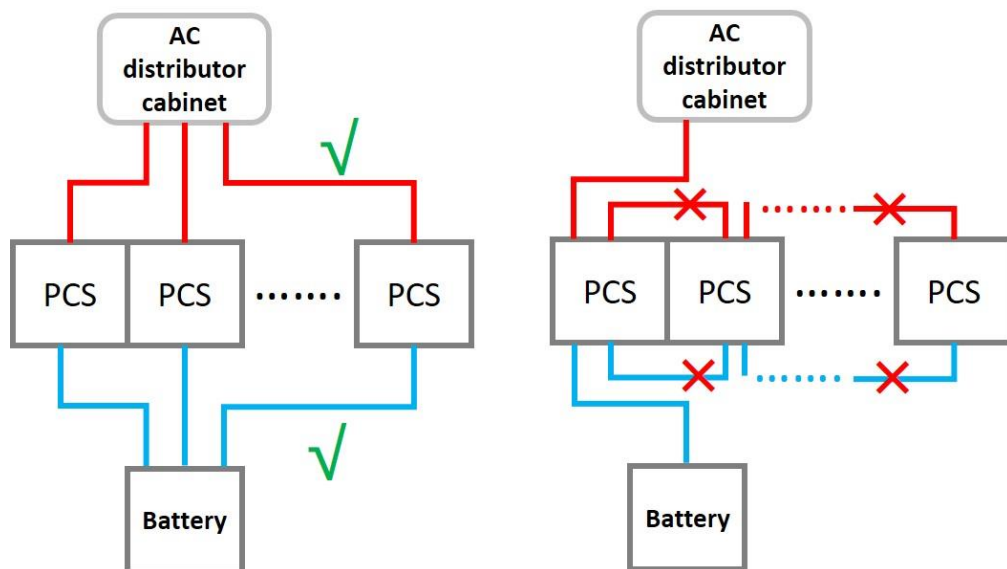


Figure 36. Remove the Protective Cover

General Introduction

For wiring convenience, you can make the cables and wires go from the left, right, front, or rear bottom side or the bottom of the unit into the cabinet.

After removing the protective cover, you can also see several labels marked as "DC+", "DC-", "L1", "L2", "L3", and "N" along with relevant terminals.

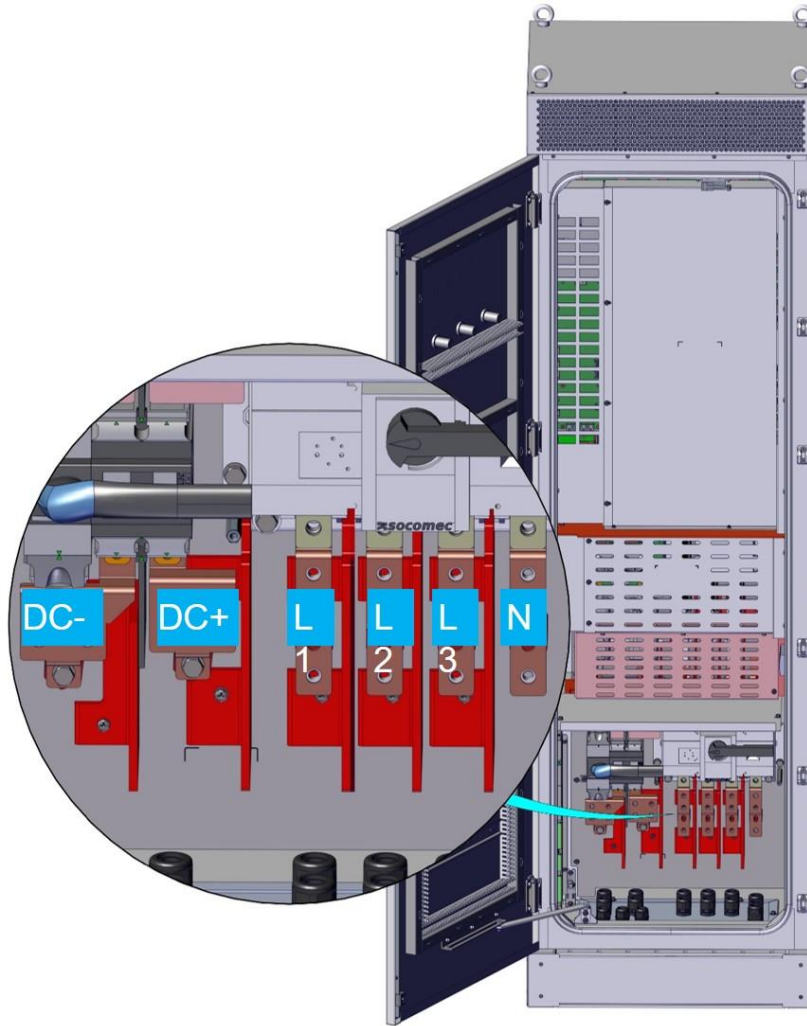


Figure 37. Remove the Protective Cover

Leading Cables and Wires into cabinet

The following sections will be described in the case of wiring from the bottom of the unit as an example. As for the other cases, need to remove the relevant side cover of the unit base to lead the cables and wires into the cabinet base.

1. Remove the PCS bottom panel, then unscrew the gland nut and pull out seal from gland.

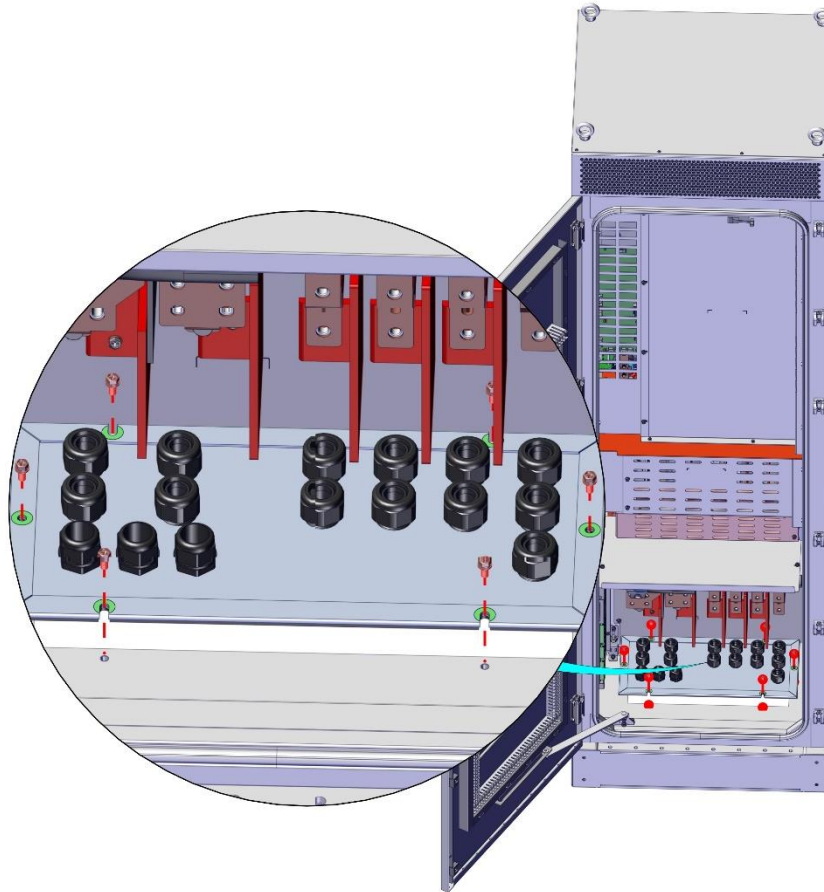


Figure 38. Take down bottom panel

2. Unscrew gland nuts and pull out seal from gland.

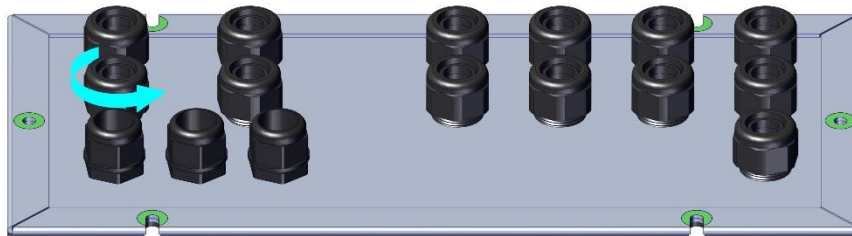


Figure 39. Unscrew gland nut

3. Lead cables and wires into cabinet through gland, seal and gland nut.

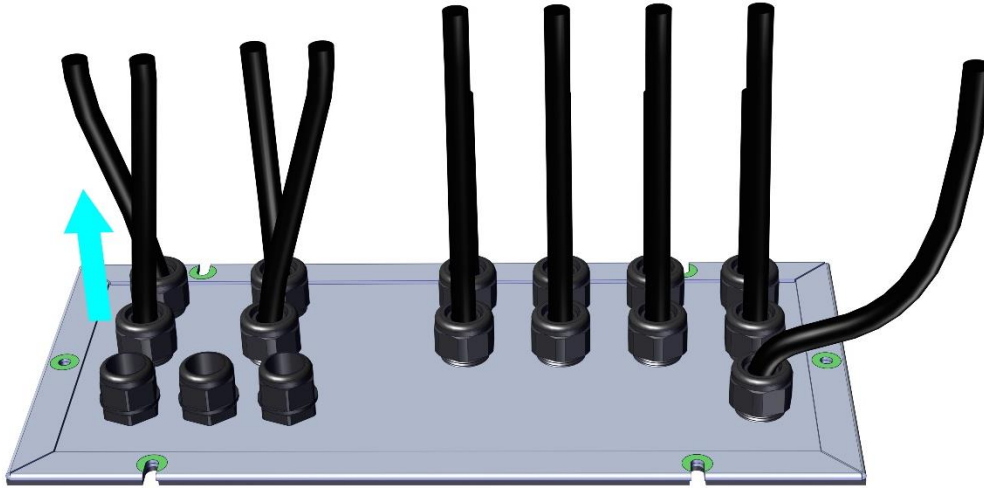


Figure 40. Lead cables

4. Secure bottom panel on PCS chassis.

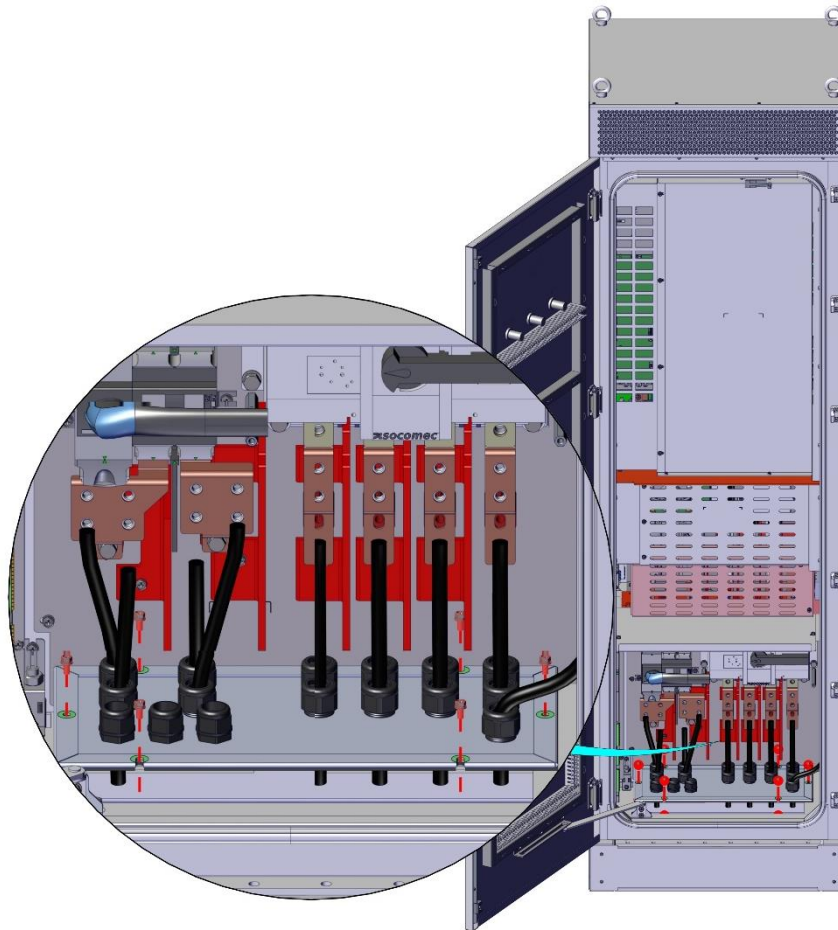


Figure 41. Install bottom panel

Preparing AC/DC, and Grounding Cables

The following guidelines describe how to prepare the AC/DC cables for a grid or battery connection. When crimping a cable, a hexagonal crimping method is recommended.

5. Strip the head of the insulator of the AC and DC power cables. Insert the exposed part of the

power cable into the junction hole of the corresponding cable lug.

6. Continue inserting the cable until its head reaches the wire inspection indicator, as shown in the following figure:

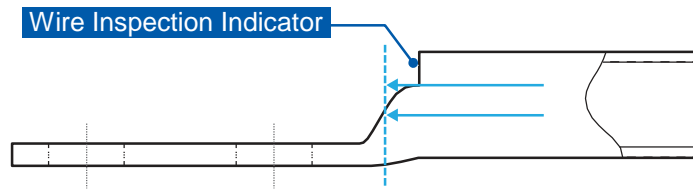


Figure 42. Inserting a Power Cable into a Cable Lug, Depth Reference Diagram

7. For safety purposes, use heat shrinkable tubing on the junction between the cables and lugs. The voltage rating of the heat shrinkable tubing should be at least 1500 V for DC power cable or 600 V for AC power cable. Make sure the exposed part of the junction between the cables and lugs is fully covered by the tubing, as shown in the following figures.
8. Prepare the cables as follows:

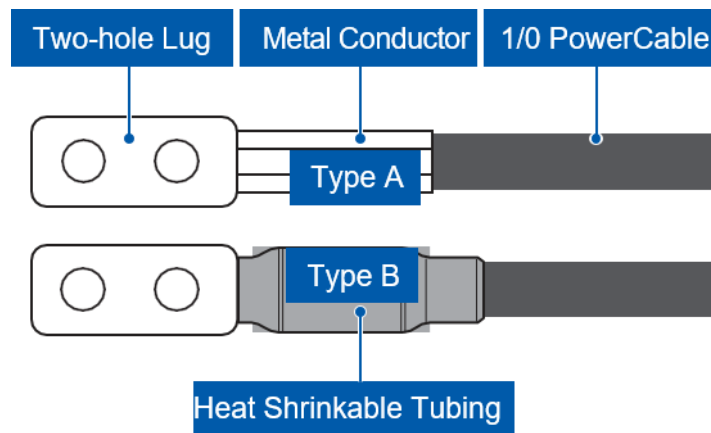


Figure 43. Preparation of AC/DC Cables



Note:

We recommend two-hole lugs for cable connection, but in some cases if customer want to use single-hole lugs, the lug type and connection way should meet local standard and regulation.

DC Wiring

1. **Prepare DC cables:** Prepare two 1/0 AWG (50 mm²) sizes 1500V cables for DC wiring. The PCS can support up to 2 sets of battery connection, and each set of battery connection requires two cables (one for positive, the other for negative). Connect the DC cables to the two-hole lugs which are available, and use heat shrinkable tubing on the junction between the cables and lugs to prevent the exposure of the conductive part.
2. **Connect DC cables to DC terminals:** There are two labels indicating the polarity of the terminals: “DC+” for positive, and “DC-” for negative, secure DC cables to the relevant “DC+” and “DC-” terminals. Fasten the bolts (M8*35) with torque wrench, the torque lists in table 19.

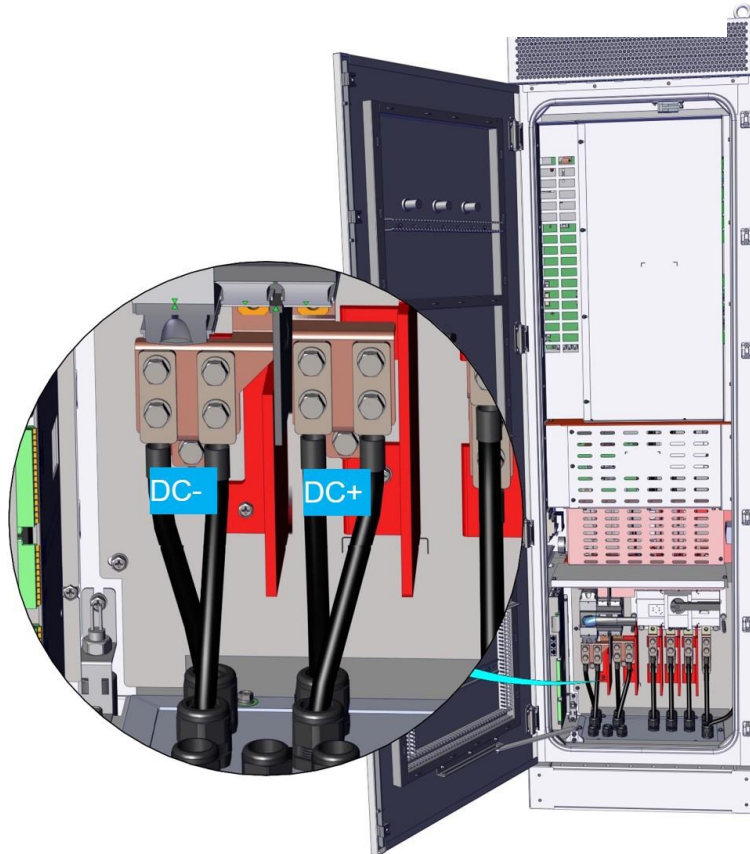


Figure 44. DC Terminal

1. **Prepare AC cables:** Prepare four 1/0 AWG (50 mm²) 600V cables for AC wiring. The PCS supports 3-phase/4-wire connection type AC wiring with L1, L2, and L3 phase and Neutral terminals. Attach the AC cables to the two-hole lugs, and use a thermal casing to prevent the exposure of the naked part.
2. **Connect AC cables to AC terminals:** There are three labels indicating the phase of the terminals: "L1" for L1 phase, "L2" for L2 phase, "L3" for L3 phase, and "N" for Neutral phase. secure AC cables to the relevant "L1", "L2", "L3" and "N" terminals. Fasten the bolts (M8*35) with torque wrench, the torque lists in table 19.

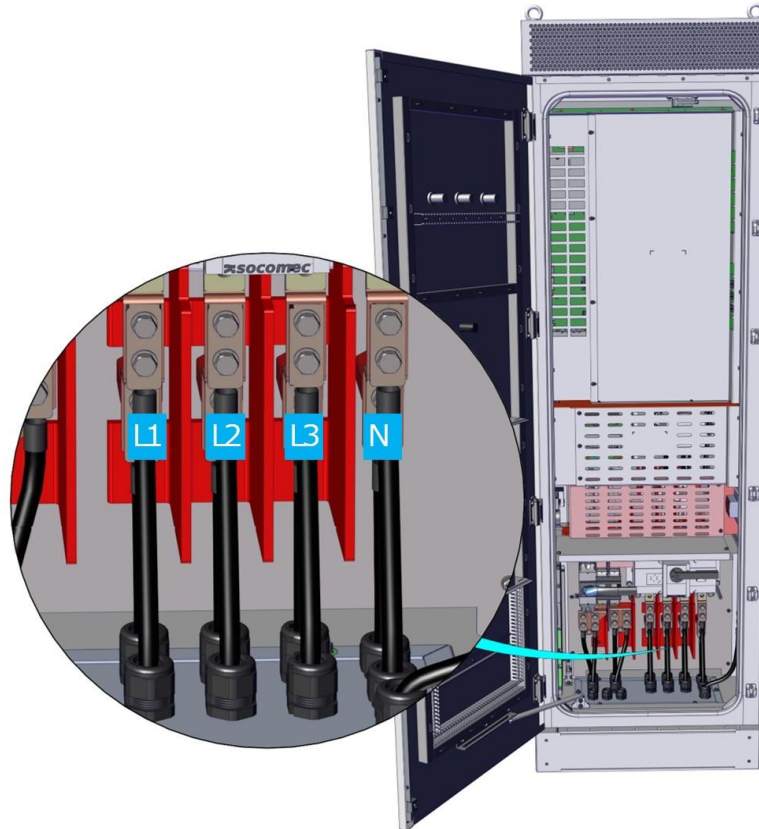


Figure 45. AC Terminal

Grounding

Prepare one 2 AWG (35 mm²) 600V cables for grounding protection.

Then use a socket or adjustable wrench to connect and secure the grounding cable lugs to the grounding copper plate at the inner sidewall of the cabinet adjacent to the AC terminals as shown below, Fasten the bolts (M8*20) with torque wrench, the torque lists in table 19.

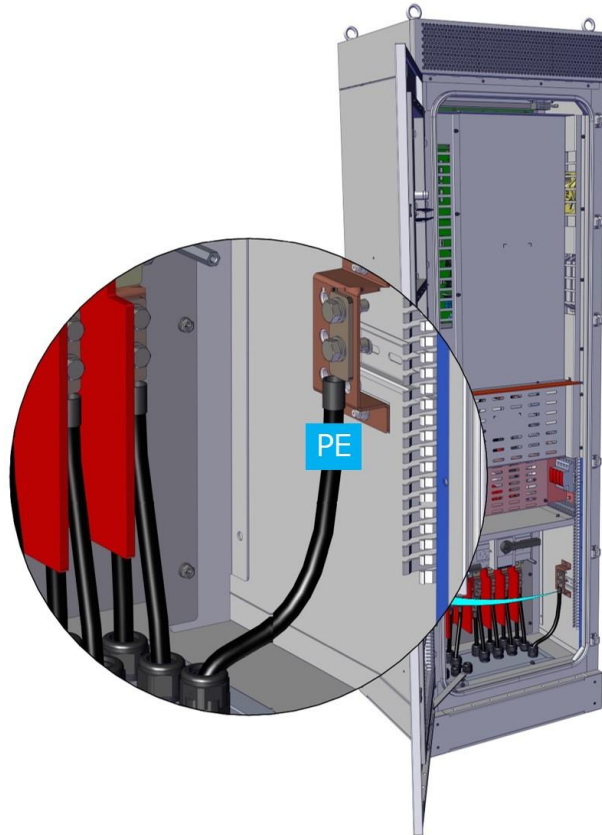


Figure 46. Grounding Cable Connection with Grounding Copper Bar



Note:

The grounding cable only needs a 2AWG (35 mm²) cable.

It's recommended to connect the protection grounding wires of PCS125HV and battery cabinet to earth individually.



Note:

The wire sizing and ratings are recommended by the manufacturer. If non-recommended wiring is used, it should comply with local regulations.

After you finish the wiring, should fasten gland to seal the gap.

Sealing Cable gland

1. At last, adjust the layout of cable and insert the seal into cable gland, then screw all gland nuts, ensure there is no gap in gland.

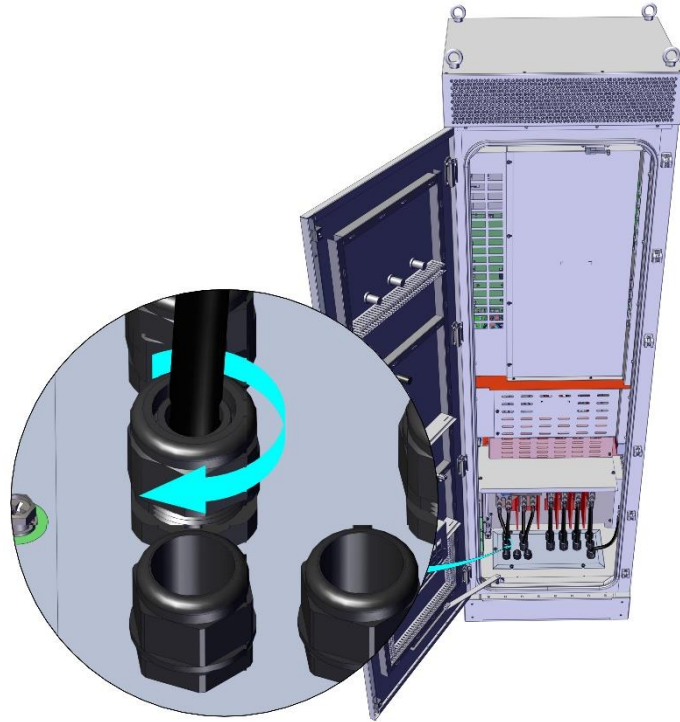


Figure 47. Screw gland nut

2. Reinstall and secure the safety protective cover.

As suggested by the device vendor, adhesive tape is used to fix the SPD module to SPD base support before shipping out of the factory. One needs to remove the adhesive tape on both SPDs.

Be careful not to be scratched by the cover plate.



Figure 48. Remove the adhesive tape on DC SPD

Be careful not to be scratched by the cover plate.



Figure 49. Remove the adhesive tape on AC SPD

Warranty

The warranty may be void and invalid when the product has been exposed to the following conditions:

1. used in a manner inconsistent with any instructions provided hereby or the given specifications;
2. damaged by water, earthquake, lightning, or typhoons;
3. operated in unusual circumstances such as strikes, riots, wars, or nuclear disasters;
4. repaired, modified, moved, or installed by any party without Delta's prior written authorization;
5. damage due to accidents such as fire, inundation, unusual electric shock, power failure, or shipping;
6. damaged by rodents, improper temperature, humidity, or any unmet environmental requirement;
7. deliberately damaged;
8. corresponding GFD equipment is not equipped.

Additional charges and costs may apply when maintenance services are required due to the improper maintenance of the product.

Appendix

Specifications

Table 15: Technical Specifications of the Delta PCS125HV

Item	Description
Grid-tied Operation	
Rated Grid Voltage	480 Vac (3P,PE)
Grid Voltage Range	422 ~ 528 Vac
Rated Grid Frequency	60 Hz
Frequency Range	59.3~60.5 Hz
Rated AC Power	125 kVA / kW
Rated AC Current	151 A
Current THD	< 3%
Power Factor	-1 to 1, continuously adjustable
Battery Input Performance	
DC Voltage Range	750 ~ 1,350 Vdc for 3P3W ¹⁾²⁾
Rated Discharge Power	128 kW
Rated Charge Power	122 kW
Max. Discharge DC Current	157A
Max. Charge DC Current	151A
Standalone Mode Performance	
Rated Output Voltage	480 Vac (3P4W)
Rated Output Power	125 kVA/kW with linear load; 100 kVA with RCD load ($I_{pk} \leq 240A$) ³⁾
Rated Output Current	151A
Power Factor	>0.99 (-1 leading to 1 lagging, continuously adjustable)
Overload Capacity	110% for 30 mins
Output Voltage THD	< 3% @ liner load
Environment	
Max Altitude	4,000 m, de-rating >2000m
Operating Temperature	-30 °C to +60 °C, de-rating >45°C
Humidity	0 to 95% RH, no-condensing
Cooling	Forced air with speed control
Acoustic Noise	< 70 dB @ 1 m @ rated condition,max 75dB
IP Degree	Type 3R/IP55
Interface & Communication	
User Interface	LED, EPO, Ethernet
Emergency Stop	Local EPO button & remote control
Communication	Ethernet/ Modbus TCP
System Characteristic	
Peak Efficiency	98%

Standby Loss	<25W
Dimensions (W x D x H)	600mm x 500 mm x 2000mm
Net Weight	<230 kg
Standard Compliance	
Certificate (in plan)	UL1741, UL1741 SB, IEEE1547, FCC part 15 class A
Product Conformity	RCM
Applicable Battery Chemistry	Lithium-ion, lead-acid battery, flow battery
1) Output power will be de-rating if DC voltage is higher than 1250V. 2) The minimum DC voltage should be larger than 750V if the load is 100% unbalanced load. 3) Transformer or motor load or rectifier load, which has a large inrush current (Ipk>240A) is not included.	
*Specifications are subject to change without prior notice.	

Table 16: Icc declaration (r.m.s. value, Icp,mr, device)

Characteristics of SCPD					
Ports	Icc	Icp,mr	Type	Location	Specification
AC	50kA	10kA	HEA250 · Hollyland	FU1, FU2, FU3	Rated current: 250A; rated voltage:690V; Interrupt rating: 80kA.
DC	50kA	5kA	PV312-2XL- T250A1500V SINOFUSE	FU4,FU5	Rated current: 250A; rated voltage:1500V; breaking capacity: 50kA.

Table 17: Packing list

Type	Description	QTY	Unit
Device	Delta Converter	1	PCE
Fitting	Key	1	PCE
Document	Packing List	1	PCE
	Product Certificate	1	PCE
	Factory Test Report	1	PCE

Cable Lug Spec

Material	High Conductivity Seamless Copper Tube
Plating	Electro-Tin
Wire Size	2 STR/FLEX
Wire Type	Stranded Copper: Class B & C, Compact, Class G, H, I, K, M, Locomotive
Wire Strip Length	11/16 in.
Stud Size	3/8 in.
UL Listed Wire Connector	Yes, for applications up to 35kv. Consult cable manufacturer for voltage stress relief instructions with applications greater than 2000 volts.
UL Temperature Rating	90° C
C.S.A Certified Wire Connector	Yes
Panduit Color Code on Barrel	BROWN
Panduit Die Index No. on Barrel	P33
Alternate Industry Die Index No. () on Barrel	(10)

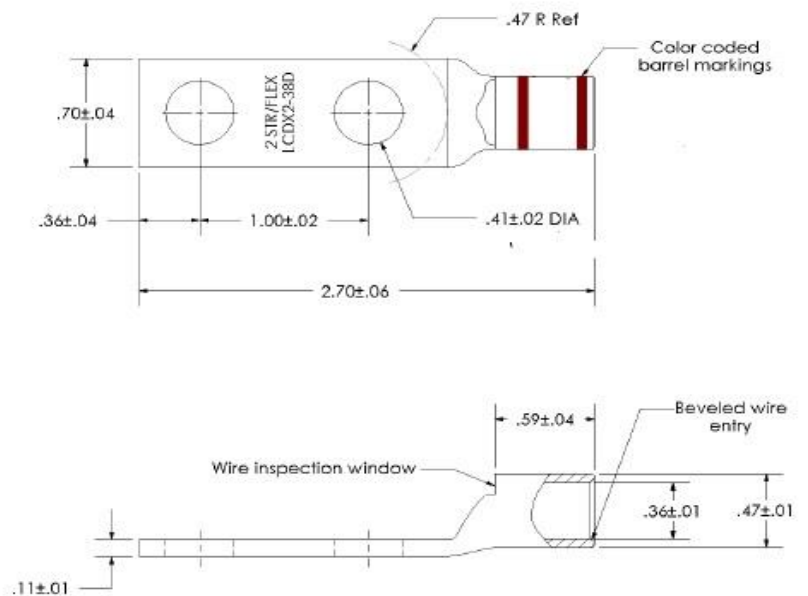


Figure 50. Cable lug spec

Glossary

- AC
Abbreviation for “Alternating Current”.
- AHJ
Abbreviation for “Authority Having Jurisdiction” (electrical inspector).
- AWG
American Wire Gauge.
- Basic Insulation
Insulation to provide basic protection against electric shock.
- BMS
Battery management system.
- DC
Abbreviation for “Direct Current”.
- EMC
The Electro-Magnetic Compatibility (EMC) concerns the technical of the mutual influencing of electrical devices through electromagnetic fields caused by them.
- EPO
Emergency power off.
- ESS
Energy storage system.
- Galvanic isolation
Non conductive connection between two component parts.
- GEC
Grounding Electrode Conductor
- GET
Grounding Electrode Terminal
- IEEE
The Institute of Electrical and Electronics Engineers or IEEE is an international non-profit, professional organization for the advancement of technology related to electricity.
- IMI
Isolation Monitor Interrupter
- ISC
Short Circuit Current

- Local utility company

A local utility company is a company that distributes electricity over the grid.

- PCS

Power Conditioning System, an electrical device that converts DC direct voltage into AC voltage and/or direct current into alternating current.

- Power dissipation

Power dissipation is designated as the difference between absorbed power and power of a device or process yielded. Power dissipation is released mainly as heat.

- PVC

Polyvinyl chloride.

- RJ-45

Abbreviation for standardized eight-pole electrical connector connection. RJ stands for Registered Jack (standardized socket).

- RS-485 (EIA485)

Differential voltage interface on which the genuine signal is transmitted on one core and the negated (or negative) signal on the other core.

- SPD

Surge protection device.

- THD

Total harmonic distribution.

- Icc

Conditional short-circuit current.

- SCPD

Short-circuit current protective device.

- Icp,mr

Minimum required prospective short-circuit current.

Screw Torque Table

- The torque level for M3~M5 screws is 4.8, refer to the following torque standard table to make sure the washers are in close contact with the screws.

Table 18: Screw Torque Table for M3~M5 Screws

		Screw Assembly Torque Standard			Unit: N·m
Screw Type		M3	M4	M5	
Screw Thread		Standard	Standard	Standard	
Material		N/A			
Securing	Secured				
Steel Plate	Steel Plate	0.8 ± 0.15	1.4 ± 0.2	3.0 ± 0.2	
Steel Plate	Aluminum Plate	0.7 ± 0.1	1.4 ± 0.15	3.0 ± 0.2	
Aluminum Plate	Aluminum Plate				
Plastic	Aluminum Plate	0.6 ± 0.1	0.8 ± 0.15	1.2 ± 0.2	
Plastic	Steel Plate	0.6 ± 0.1	0.8 ± 0.15	1.2 ± 0.2	
PWB	Steel Plate	0.6 ± 0.2	1.0 ± 0.2	N/A	
Insulator	Copper Plate	0.6 ± 0.2	1.2 ± 0.2	1.6 ± 0.2	

- The torque level for M6 or bigger screws is 8.8, refer to the following torque standard table to make sure the washers are in close contact with the screws.

Table 19: Screw Torque Table for M6~M16 Screws

		Screw Assembly Torque Standard					Unit: N·m	
Screw Type		M6	M8	M10	M12	M14	M16	ST5.5
Screw Thread		Standard	Standard	Standard	Standard	Standard	Standard	Customized
Material		N/A						
Securing	Secured							
Steel Plate	Steel Plate	5 ± 1	12.5 ± 1	25 ± 2	42 ± 3	N/A	100 ± 10	5.5 ± 1
Copper Plate	Copper Plate	5 ± 1	12.5 ± 1	25 ± 2	42 ± 3	N/A	100 ± 10	N/A
Insulator	Copper Plate	5 ± 1	10 ± 1	12.5 ± 2	N/A	N/A	N/A	N/A