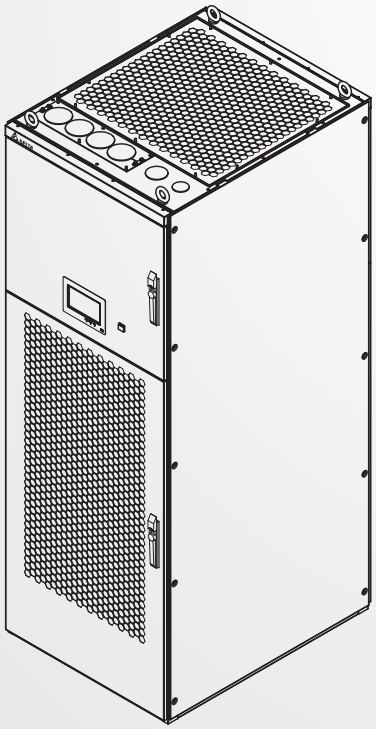


The power behind competitiveness

Delta PQC Series
400V Mixed Fixed Type Static Var Generator

User Manual

www.deltaww.com

SAVE THIS MANUAL

This manual contains important instructions and warnings that you shall follow during the installation, operation, storage and maintenance of this product. Failure to heed these instructions and warnings will void the warranty.

Table of Content

Chapter 1 : Important Safety Instructions

1.1 Installation Warnings

- The Static Var Generator (SVG) is designed for multiple applications. It shall be connected to a power grid system, in parallel with the load, as a solution for reactive power, imbalance and part of harmonics mitigation.
- Install the SVG in a well-ventilated indoor area, away from excess moisture, heat, dust, flammable gas or explosives. To avoid fire accidents and electric shock, the indoor area must be free of conductive contaminants. For the temperature and humidity specifications, please refer to ***Appendix 1: Technical Specifications.***
- The area around the SVG must be kept clear of objects to allow ventilation and easy access for operating the machine.
- The SVG shall not be exposed to the environment of corrosive gases/ particles.
- The SVG shall be installed in a cabinet with a protective marking. Appropriate ventilation channels for heat dissipation shall be maintained.
- To minimize fire and electric shock hazards, installation must be conducted by qualified personnel in a controllable working environment.
- To minimize electric shock hazards, all maintenance work must be carried out by a qualified technician, and be sure to cut off all power supply before maintenance.
- After the system power is cut off, please wait for the operating switch to cool down before you perform any operation to prevent burn injury caused by the high temperature.
- High voltage hazards! It takes at least 15 minutes for the DC capacitor to discharge. Please make sure the device has discharged completely before carrying out any operation.
- To minimize electric shock hazards, please read this Manual carefully before switching the power on, and keep this Manual properly for permanent reference.

1.2 Connection Warnings

- To prevent a possible risk of current leakage, the SVG shall be earthed properly.
- With regard to wiring, the compensation capacity and the current-carrying capacities of cables shall be taken into account.
- The SVG's power wires must be connected to a protective device. It is suggested that every module shall be equipped with an overcurrent protection device certified by a third party. The installation location shall be taken into consideration. Please choose a protection device that has enough breaking capacity.
- The capacity of the protective devices shall fit that of the SVG. Please follow the chart below to select a proper protection device in accordance with the SVG capacity.

SVG Capacity	Recommended Protection Device Model
50 kvar	Schneider NSX160H TM100D 3P3D (690V 100A)
100 kvar	Schneider NSX250H TM200D 3P3D (690V 200A)

- The short circuit parameters of the SVG are as follows:

SVG Capacity	Conditional Short Circuit Current (Icc)	Prospective Short Circuit Current for the Minimum Demand (Icp,mr)	Short Circuit Protection Device (SCPD)
50 kvar	20 kA	2.5 kA	80A Fuse *2 Type: BUSSMANN 80FE
100 kvar	20 kA	5 kA	160A Fuse *2 Type: HINODE 660GH-160

- The three-phase, four-wire SVG is applicable to the power grid system with neutral grounding.
- The CT wire shall be fastened to avoid open circuit, which will lead to high-voltage risk and secondary circuit burning.

1.3 Usage Warnings

- Only qualified service personnel can update SVG hardware and firmware.
- Since the SVG is used for reactive power and imbalance compensation of the power grid, the capacity selection of the SVG shall be subject to reactive power and imbalance content to avoid poor compensation due to insufficient capacity.
- Before installation, wiring and working on the SVG's internal circuits, please completely cut off all power supplying to the SVG.
- Since SVG is used for reactive power mitigation, external CT shall be connected to detect the reactive current.
- To guarantee sound reliability and avoid overheating, do not block or cover the air inlet and outlet.
- The thermal loss of Mixed Fixed type SVG is not bigger than 3% of rated apparent power.
- The operating environment temperature of SVG shall be between -10°C (14°F) and 55°C (131°F). The relative humidity shall be within 95% (non-condensing). For detailed derating information, please refer to ***2.3 Functions & Features***.
- The SVG system shall be installed at a place with altitude less or equal to 1000 m (3280 ft). Derating 1% per 100 m (328 ft) when the altitude is between 1000 m and 3000 m (3280 ft ~ 9842 ft). For more question, please consult Delta or Delta distributor.

- Before applying electric power to the SVG, you must allow the SVG to adjust to room temperature (20°C ~ 25°C (68°F ~ 77°F)) for at least one hour and ensure that there is no moisture condensing inside the unit.
- Do not put beverages on the SVG or any other accessory associated with the SVG.
- Do not open or remove the covers or panels of the SVG to avoid high-voltage electric shock. Only authorized Delta engineers or service personnel can do so for installation or maintenance. If you want to open or remove the covers or panels, do it only under the supervision of authorized Delta engineers or service personnel.
- Some components like fans will become worn-out due to long-term usage, and this will increase the risk of SVG failure. To replace and maintain the components, please contact Delta service personnel.
- The SVG complies with the regulations of Overvoltage Category III in IEC 62477. It is suggested that appropriate surge voltage protection devices shall be chosen in accordance with the actual power system type. If appropriate protection devices are not used, the surge voltage may exceed the SVG's capacity and cause SVG damage. If you are uncertain regarding the SVG's application, please contact Delta service personnel.

Wiring System	Recommended Model	Main Technology Indicator
3P3W	Sichuan Zhongguang Lightning ZGG40-385 (3+0) Ar	Nominal Operating Voltage U_o: 230V AC Max. Continuous Operating Voltage U_c: 385V AC Rated Discharge Current I_n: 20 kA Max. Discharge Current I_{max}: 40 kA Voltage Protection Level U_p: 1.8 kV
3P4W	Sichuan Zhongguang Lightning ZGG40-385 (3+1) r	

- You must contact Delta customer service if any of the following events occurs:
  1. Any liquid is poured or splashed on the SVG.
  2. The SVG is deformed.
  3. Any conductive powders or metals enter into the SVG.
  4. The SVG does not run normally after you carefully followed the instructions in this ***User Manual***.

1.4 Storage Warnings

- Use the original packing materials to pack the SVG to prevent any possible damage from rodents.
- If the SVG needs to be stored prior to installation, it shall be placed in a dry indoor area. The allowable storage temperature is -40°C ~ 70°C (-40°F ~ 158°F) and the relative humidity is within 95% (non-condensing).
- If the HMI needs to be stored prior to installation, it shall be placed in a dry indoor area. The allowable storage temperature is -30°C ~ 70°C (-22°F ~ 158°F) and the relative humidity is within 95% (non-condensing).

1.5 Standard Compliance

- IEC 62477-1:2016 Safety requirements for power electronic converter systems and equipment, Part 1: General
- IEC 61000-6-2:2016 Electromagnetic compatibility (EMC) Part 6-2: Generic standards - Immunity standard for industrial environments
- IEC 61000-6-4:2018 Electromagnetic compatibility (EMC) Part 6-4: Generic standards - Emission standard for industrial environments

Chapter 2 : Introduction

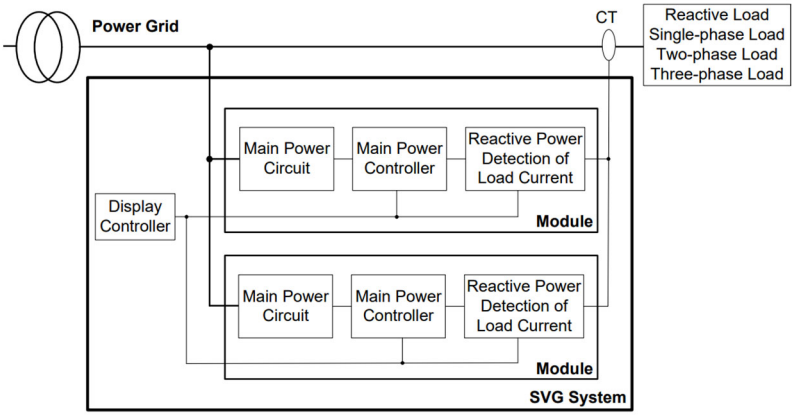
2.1 Product Introduction

The Delta PQC Series Mixed Fixed type SVG, a reactive power compensator for the three-phase power grid, is applied to the reactive power control of the power grid. Features of the device are shown as below:

- Compensates both inductive (lagging) and capacitive (leading) reactive power.
- Compensates 2nd-25th harmonic currents(selectable) with 20% of rated current output capacity, 100kvar SVG can output 30A H2-H25 harmonic compensation current.
- Correct three-phase load imbalance.
- Rapid dynamic responses, stable parameters and good harmonic compensation results.
- High efficiency and low loss. The advanced ECO mode allows you to save more energy.
- The modular design allows you to freely select different modules for the harmonic power compensation for different capacities.
- The system adopts an advanced 3-level structure and consists of digital signal processors (DSP), Field Programmable Gate Array (FPGA) and high power electronic devices, which has excellent performance and superior reliability.
- Supports remote on/off and fault monitoring via output relays and supports Modbus RTU/ TCP for remote SCADA monitoring.

Please see ***Figure 2-1*** for the SVG system block diagram.

The SVG system consists of multiple SVG modules and one system cabinet. Load current is detected by external CT and load reactive power is calculated by SVG controller. Based on the load current feedback, the controller manages power circuit to output inverse reactive power to cancel out load reactive power. The system cabinet is equipped with a HMI Display that shows the information of individual modules and control the operation of individual modules. All power modules are paralleled connection and they are independently working.



(Figure 2-1: SVG System Block Diagram)

2.2 PQC Series Mixed Fixed type SVG Product Category

The Delta PQC Series Mixed Fixed type SVG is categorized by the capacity and wiring system. ***Table 2-1*** lists the information regarding the SVG module products.

Table 2-1：PQC Series Mixed Fixed Type SVG Specifications

Product	Model	Capacity	Wiring System
SVG Module	PQCS-380-50-50MM4	50 kvar	3P4W
	PQCS-380-50-50MM3	50 kvar	3P3W
	PQCS-380-100-100MM4	100 kvar	3P4W
	PQCS-380-100-100MM3	100 kvar	3P3W
SVG Module (Maintained from the Front)	SVG Module + Pluggable terminals		
HMI Display	PQC-HMI-F (7'')	N/A	N/A
	PQC-HMI-F10 (10'')	N/A	N/A
Accessories	Pluggable terminals	N/A	N/A

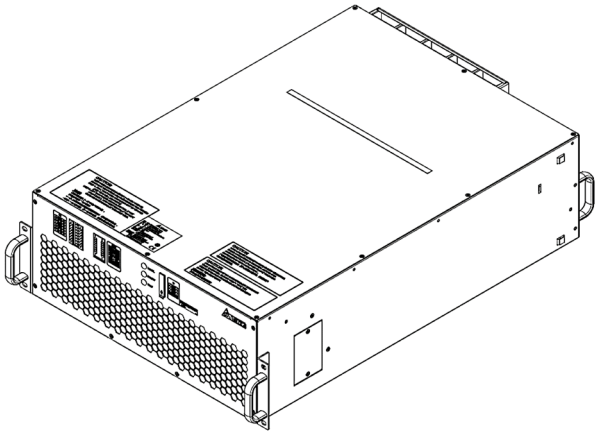
NOTE:

For detailed information regarding the Pluggable terminals, please see ***Chapter 3.5.2***.

- **SVG Module**

The SVG module is available in two wiring modes, i.e. 3P3W and 3P4W, and is available in the following output capacity: 50kvar and 100kvar.

The 3P4W module shall be connected to a neutral line, which in turn will improve its ability of compensating the zero sequence current. The 3P3W model is not required to connect to the neutral line; as a result, it is not able to compensate the zero sequence current. ***Figure 2-2*** shows the SVG module appearance.



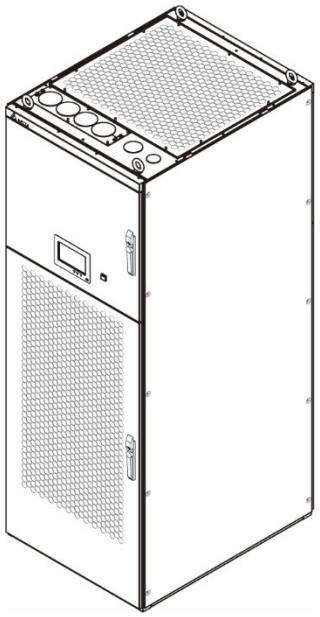
(Figure 2-2: SVG Module)

- **SVG System Cabinet**

The SVG module and the HMI Display can be installed inside a standard or customized cabinet that meets the size requirements. ***Figure 2-3*** is the SVG system cabinet.

The system capacity is determined by the capacity and quantity of SVG modules installed in the system. Customers can select modules of different quantity and capacity combination as well as the system cabinet based on their requirements. Please consult Delta or Delta distributor to verify the required capacity.

The HMI Display connects with the SVG module via an internal connection port. The HMI Display is capable of monitoring module operations and configuring parameters. The HMI Display adopts the embedded design and is suitable for all kinds of cabinets. See ***Figure 2-4 ~ Figure 2-6*** for the HMI Display appearance.



(Figure 2-3: SVG System Cabinet)

2.3 Functions & Features

- Multifunction: The SVG can simultaneously monitor and compensate for both inductive/capacitive reactive power and load imbalance.
- Superior reactive power compensation performance: The efficiency of reactive power compensation is up to 98%.
- Excellent reactive power compensation: The SVG is capable of rapid (ms-grade), precise (-0.99< PF< 0.99) and bi-directional (capacitive and inductive) reactive power compensation.
- Outstanding compensation of load imbalance: the 3P4W SVG system can realize correction for either active or reactive imbalance, and can eliminate the neutral current.
- Wide input voltage and frequency range, suitable for the applications with diesel generators and harsh power supply conditions.

Module Type	Input Voltage Range	Input Frequency Range
Mixed fixed type 400V SVG Module (3P4W)	228V ~ 456V	45 ~ 66 Hz
Mixed fixed type 400V SVG Module (3P3W)	228V ~ 480V	45 ~ 66 Hz

- Automatic detection for the input frequency. The input frequency can be 50Hz or 60Hz.
- Auto start-up for the inverter: When the AC power source is back on, the inverter will be turned on automatically.
- Wide working temperature range

Module Type	Working Temperature Range with 100% Capacity	Capacity Derating over Temperature
Mixed fixed type 50kvar SVG Module	-10°C ~ 40°C (14°F~104°F)	80% at 50°C (122°F) 50% at 55°C (131°F) 0% at 55°C above
Mixed fixed type 100kvar SVG Module	-10°C ~ 40°C (14°F~104°F)	80% at 50°C (122°F) 50% at 55°C (131°F) 0% at 55°C above

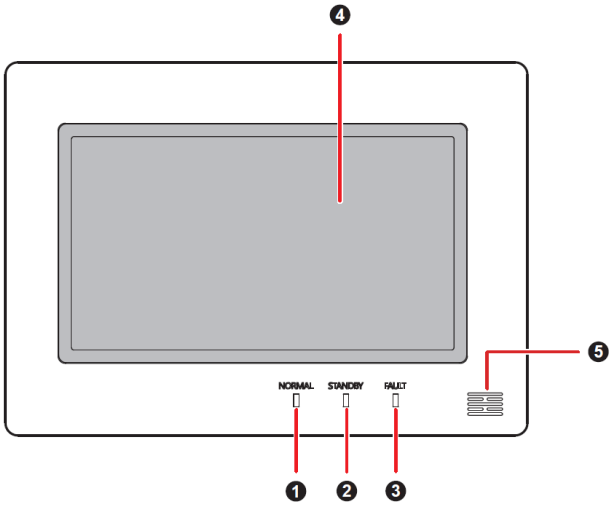
- Over temperature protection is applied on key components, such as the IGBT and inductor.
- Sound stability: SVG acts as an infinite impedance to the power grid system and has no negative effect on power system. It is able to output accurate compensation current, which has no negative effect on other equipment.
- Low power loss. The SVG supports ECO mode to allow you to save more energy.

- Integrating control: The capacitor compensation device and the Static Var Generator (SVG) can be controlled by an integrating controller to achieve higher compatibility.
- Flexible applications: Modules can be embedded into standard or customized cabinets that meet the size requirements.
- Wide capacity coverage: The capacity of a single cabinet is based on the quantity of module installed. And there is no restriction in terms of system cabinets connected in parallel.
- User-friendly Mandarin/ English interface: Parameters setting for the event log, automatic error alarm and error record.
- Complete function setup: Automatic start-up for the self-inspection function. The soft start time can be set up and the nominal output can be limited.

2.4 Product Structure and Appearance

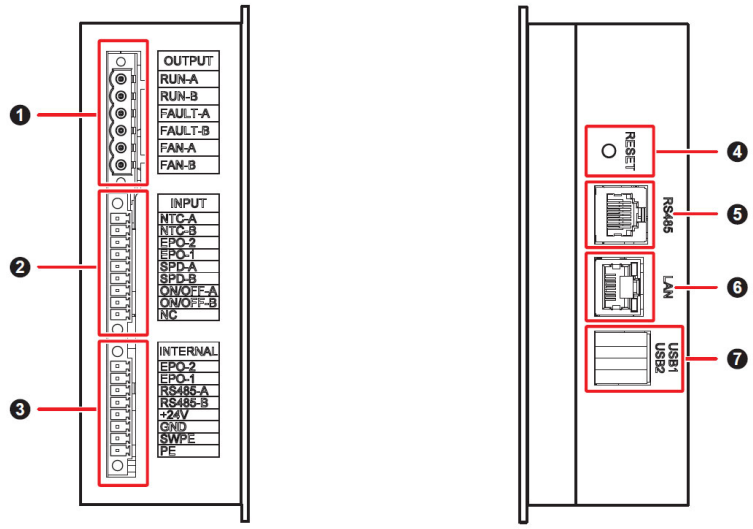
2.4.1 HMI Display

There are two kinds of HMI display. One is a 7" HMI touchscreen display (***Figure 2-4***) and another is a 10" HMI touchscreen display (***Figure 2-6***).



(Figure 2-4: PQC-HMI-F Front Side)

No.	Item	Description
❶	NORMAL (Green)	When the light is on, the SVG operates normally.
❷	STANDBY (Yellow)	When the light is on, the SVG is in standby mode.
❸	FAULT (Red)	When the light is on, the SVG is malfunctioning.
❹	Touchscreen	Users can operate the device through the touchscreen.
❺	Buzzer	Alarm sounding to warn users.



(Figure 2-5: PQC-HMI-F Left and Right Sides)

No.	Item	Description
❶	OUTPUT (Dry Contacts)	Output dry contact signals of system operation and other status.
❷	INPUT (Wet Contacts)	Input wet contact signals of system temperature, EPO and other signals.
❸	INTERNAL (MODBUS)	Communication port between the HMI and the module.
❹	RESET	Reset button for the HMI.
❺	RS485	The standard RS485 protocol for the communication with the master computer.
❻	LAN	The standard Ethernet port for the communication with the master computer.
❼	USB1 USB2	The USB communication ports.

NOTE:

1. Except for the input and output ports, other terminals are insulated. Contacting these terminals will not cause the risk of electric shock.
2. Specifications of the input and output ports are as follows.

No.	Port Definition	Port Specs
❶	OUTPUT (Dry contacts)	250Vac/ 30Vdc，2.5A
❷	INPUT (NTC)	R_{25} = 10kohm，$B_{25/85}$ = 3435，±1%
❸	INPUT (Except for NTC)	24V，10mA

For the definition of Output Dry Contact Signals interface, please refer to ***Table 2-2***.

Table 2-2: The Definition of Output Dry Contact Signals Interface

Item	Pin No	Signal	Electrical Character		Function
OUTPUT (Dry Contacts)	**1**	RUN-A	250 Vac/ 30 Vdc	2.5A	Run state (PM Run, Close)
	2	RUN-B	250 Vac/ 30 Vdc	2.5A	
	3	FAULT-A	250 Vac/ 30 Vdc	2.5A	Fault state (PM Fault, Close)
	4	FAULT-B	250 Vac/ 30 Vdc	2.5A	
	5	FAN-A	250 Vac/ 30 Vdc	2.5A	Fan control (Fan ON, Close; Fan OFF, Open)
	6	FAN-B	250 Vac/ 30 Vdc	2.5A	

For the definition of Input Wet Contact Signals interface, please refer to ***Table 2-3***.

Table 2-3: The Definition of Input Wet Contact Signals Interface

Item	Pin No	Signal	Electrical Character		Function
INPUT (Wet Contacts)	**1**	NTC-A	NA	NA	Cabinet's ambient NTC
	2	NTC-B	NA	NA	
	3	EPO-2	24V	10 mA	System EPO (Close, Enable Open, Disable)
	4	EPO-1	24V	10 mA	
	5	SPD-A	24V	10 mA	System SPD (Close, SPD Fault Open, NO Fault)
	6	SPD-B	24V	10 mA	
	7	ON/OFF-A	24V	10 mA	PM Turn ON/OFF (Close, Turn ON Open, Turn OFF)
	8	ON/OFF-B	24V	10mA	

Item	Pin No	Signal	Electrical Character		Function
INPUT (Wet Contacts)	**9**	NC			NC

NOTE:

For NTC signal, standard NTC sensor is configured to detect cabinet temperature, please consult Delta or Delta distributor for detail application.

For the definition of RS485 interface, please refer to ***Table 2-4***.

Table 2-4: The Definition of RS485 Interface

Item	Pin No	Signal	Function
RS485	**1**	Reserved	Internal using
	2	Reserved	
	3	Reserved	
	4	FG1	RS485 signal ground
	5	Reserved	Internal using
	6	Reserved	
	7	RS485A	Outer RS485 using
	8	RS485B	

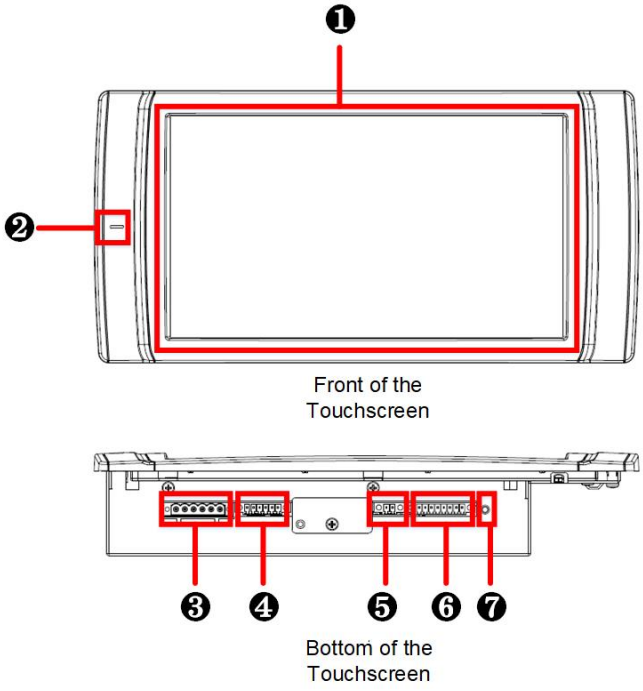
For the definition of LAN interface, please refer to ***Table 2-5***.

Table 2-5: The Definition of LAN Interface

Item	Pin No	Signal	Function
LAN	**1**	TXP	Positive end of data transmission
	2	GND	Signal ground
	3	TXM	Negative end of data transmission
	4	RXP	Positive end of data reception
	5	GND	Signal ground
	6	RXM	Negative end of data reception
	7	NC	/
	8	NC	/

NOTE:

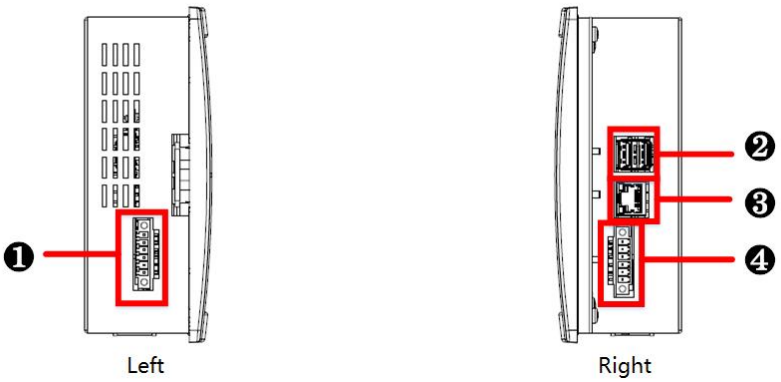
Please refer to separate Modbus mapping document about usage and configuration.



(Figure 2-6: PQC-HMI-F10 Front and Bottom)

No.	Item	Description
❶	Touchscreen	Users are able to perform operation through the touchscreen.
❷	Tri-color LED	-When the green light is on, the device is operating normally. -When the yellow light is on, the device is in standby mode. -When the red light is on, the device is malfunctioning. When a single module is connected, and the yellow and red lights flash alternately, the device is malfunctioning and in standby mode. When the green, yellow and red lights flash alternately, the device is upgrading. When multiple modules are connected, and the yellow and green lights flash alternately, some devices are operating and the others are in standby mode. When the yellow and red lights flash alternately, some devices are malfunctioning and the other are in standby mode. When the green and red lights flash alternately, some devices are operating and the others are malfunctioning.

No.	Item	Description
❸	OUTPUT (Dry Contacts)	Output dry contact signals of system operation and other status.
❹	INPUT (Wet Contacts)	Input wet contact signals of system temperature, EPO and other signals.
❺	SYN-PWM (Synchronizing Signal Output Terminals)	For the synchronizing signals.
❻	INTERNAL (MODBUS)	Communication port between the HMI and the module.
❼	RESET	Reset button for the HMI.



(Figure 2-7: PQC-HMI-F10 Left and Right Sides)

No.	Item	Description
❶	RTU	RTU communication ports.
❷	USB1 USB2	The USB communication ports.
❸	LAN	The standard Ethernet port for the communication with the master computer.
❹	EXTERNAL (Communication Terminals)	For the external RS485 and RS232 signals and the communication with the master computer.

NOTE:

1. Except for the dry contacts and wet contacts, other terminals are insulated. Contacting these terminals will not cause the risk of electric shock.
2. Specifications of the dry contacts and wet contacts are as follows.

No.	Item	Description
❶	OUTPUT (Dry Contacts)	250Vac/ 30Vdc，2.5A
❷	INPUT (Wet Contacts)	24V，10mA

For the definition of Output Dry Contact Signals interface, please refer to ***Table 2-6***.

Table 2-6: The Definition of Output Dry Contact Signals Interface

Item	Pin No	Signal	Electrical Character		Function
OUTPUT (Dry Contacts)	**1**	RUN-A	250 Vac/ 30 Vdc	2.5A	Run state (PM Run, Close)
	2	RUN-B	250 Vac/ 30 Vdc	2.5A	
	3	FAULT-A	250 Vac/ 30 Vdc	2.5A	Fault state (PM Fault, Close)
	4	FAULT-B	250 Vac/ 30 Vdc	2.5A	
	5	FAN-A	250 Vac/ 30 Vdc	2.5A	Fan control (Fan ON, Close; Fan OFF, Open)
	6	FAN-B	250 Vac/ 30 Vdc	2.5A	

For the definition of Input Wet Contact Signals interface, please refer to ***Table 2-7***.

Table 2-7: The Definition of Input Wet Contact Signals Interface

Item	Pin No	Signal	Electrical Character		Function
INPUT (Wet Contacts)	**1**	EPO-2	24V	10 mA	System EPO (Close, Enable Open, Disable)
	2	EPO-1	24V	10 mA	
	3	SPD-A	24V	10 mA	System SPD (Close, SPD Fault Open, NO Fault)
	4	SPD-B	24V	10 mA	

Item	Pin No	Signal	Electrical Character		Function
INPUT (Wet Contacts)	**5**	ON/OFF-A	24V	10 mA	PM Turn ON/OFF (Close, Turn ON Open, Turn OFF)
	6	ON/OFF-B	24V	10 mA	

For the definition of EXTERNAL (Communication Terminals) interface, please refer to ***Table 2-8***.

Table 2-8: The Definition of EXTERNAL (Communication Terminals) **Interface**

Item	Pin No	Signal	Function
EXTERNAL (Communication Terminals)	**1**	PE	PE
	2	RS485A	Outer RS485 using
	3	RS485B	
	4	Reserved	Internal using
	5	Reserved	Internal using
	6	GF2	RS485 signal ground

For the definition of LAN interface, please refer to ***Table 2-9***.

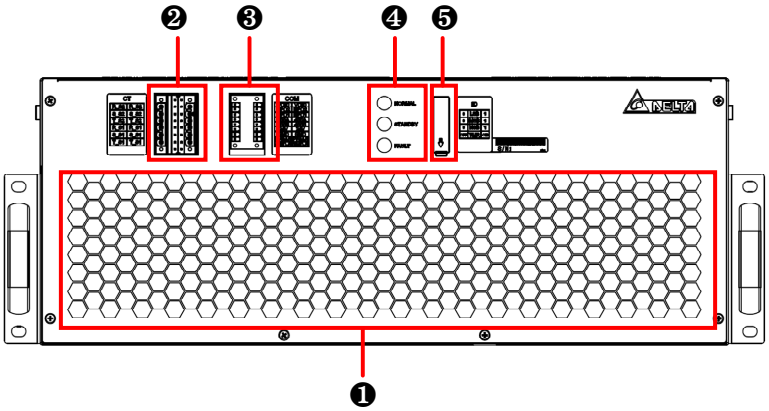
Table 2-9: The Definition of LAN Interface

Item	Pin No	Signal	Function
LAN	**1**	TXP	Positive end of data transmission
	2	GND	Signal ground
	3	TXM	Negative end of data transmission
	4	RXP	Positive end of data reception
	5	GND	Signal ground
	6	RXM	Negative end of data reception
	7	NC	/
	8	NC	/

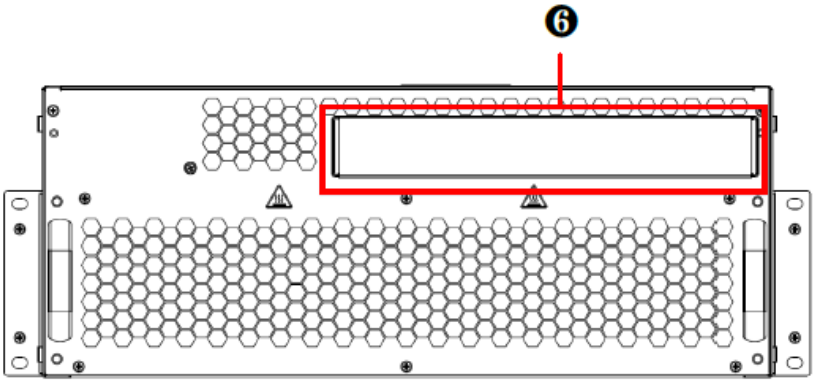
NOTE:

Please refer to separate Modbus mapping document about usage and configuration.

2.4.1 Module Exterior & Dimensions



(Figure 2-8: SVG_ Front of the Module)



(Figure 2-9: SVG_ Back of the Module)

No.	Item	Description
❶	DC Fan	DC fan for ventilation.
❷	CT	CT signal terminals.
❸	COM (Communication Terminals)	Communication terminals between the display and the module.

No.	Item	Description
❹	LED Indicators	Module status indicator: • Green (Normal): The module operates normally. • Yellow (Standby): The module is in standby mode. • Red (Fault): The module is malfunctioning.
❺	ID (DIP Switch)	Setup of the module ID and the terminal resistor.
❻	Main Power Input Terminals	Main power wiring terminals for R/ S/ T/ N/ PE.

NOTE:

1. The communication port is insulated. Contacting the port does not present the risk of electric shock.
2. The CT wire shall be fastened to avoid open circuit, which will lead to high-voltage risk and secondary circuit burning.

Table 2-10: SVG Module Dimensions and Weights

Model	Dimensions (W × D × H)	Weights (kg)
PQCS-400-50-50MM4	484 × 641.5 × 190 mm	34 kg
PQCS-400-50-50MM3	484 × 641.5 × 190 mm	33 kg
PQCS-400-100-100MM4	484 × 731.5 × 190 mm	47 kg
PQCS-400-100-100MM3	484 × 731.5 × 190 mm	46 kg

2.5 Inspection

- **Exterior**

  1. During the delivery of SVG, unexpected situations may occur. Therefore, it is suggested that you inspect the exterior packaging. If you notice any damage, please immediately Contact Delta or Delta distributor from whom you purchased the unit.
  2. The SVG system cabinet and the power module are packed individually.

- **Interior**

  1. Please check the SVG's rating label and make sure that the SVG complies with the product that you ordered.
  2. Please check if any component is damaged or loosened.
  3. Please check if there is any accessory missing.
  4. The package list of the SVG and HMI is as the chart below.

Table 2-11: Accessories with SVG Module

No.	Item	Q'ty
1	Test Report	1 PC
2	CT Cable with Terminal	1 PC
3	Communication Line with Terminal	1 PC
4	Screw (M6 × 16L)	4 PCS

Table 2-12: Accessories with SVG System Cabinet

No.	Item	Q'ty
1	Cabinet Wiring Diagram	1 PC
2	Key to Cabinet Front Door	2 PCS

Table 2-13: Accessories with 7" HMI

No.	Item	Q'ty
1	Test Report	1 PC
2	Communication Line with Terminal	1 PC
3	M5 Fixing Screw	4 PCS

No.	Item	Q'ty
4	6-Pin Terminal	1 PC
5	9-Pin Terminal	1 PC

NOTE:

Communication line needs to be purchased separately (PN: 2818245900) for configuring Mixed Fixed type Power Module.

Table 2-14: Accessories with 10'' HMI

No.	Item	Q'ty
1	Test report	1 PC
2	Communication line with terminal	1 PC
3	M5 fixing screw	4 PCS
4	6-Pin terminal	4 PCS

5. If you notice any damage, please immediately Delta or Delta distributor from whom you purchase the unit.
6. If the SVG needs to be returned, carefully repack the SVG and all accessories using the original packing materials that came with the unit.

Chapter 3 : Operation Modes

The SVG is applicable to many applications and can meet the particular installation requirements of industrial sites, power distribution rooms and IT data centers. According to different work conditions and environment requirements, SVG modules can be installed in a standard or customized cabinet. Flexible configurations and on-site capacity expansion can also be achieved based on current and subsequent capacity requirements.

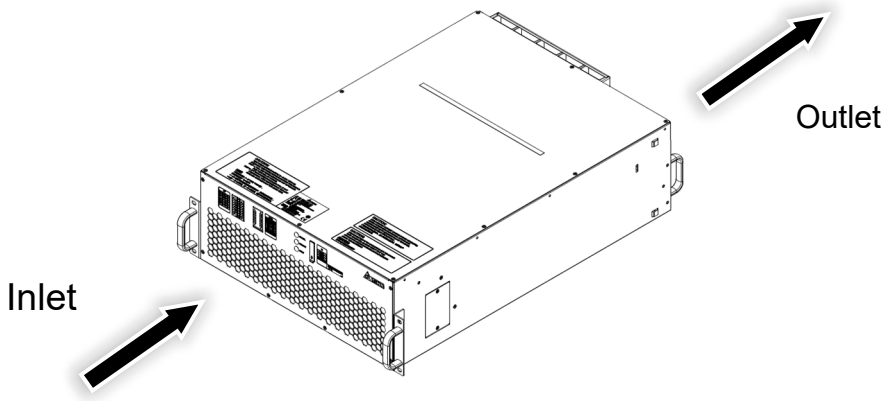
3.1 Pre-installation Confirmation

Since the installation environment varies for different users, please be sure to read this Manual carefully before installation. All installation, assembly and start-up work must be carried out by the qualified professional personnel. If the work is to be carried out by the customer, it shall be under the supervision of the qualified professional personnel. When a forklift or similar lifting equipment is used to handle the device, make sure the lifting capacity is sufficient. Please refer to ***Table 2-10*** for the SVG weight,

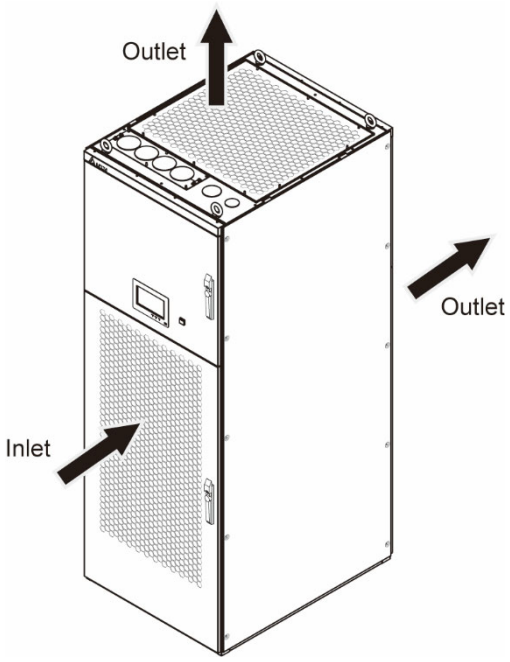
3.2 Installation Environment

1. SVG system must be installed indoors. Outdoor installation is strictly prohibited. Please take into full consideration the equipment’s standard IP30 or IP54 protection rating.
2. SVG equipment shall not be placed in a sandy/dusty area or a heavily polluted environment. If installation in such environment is required, please confirm what precaution measures shall be taken with Delta or Delta's distributor. Electrically conductive dust particles can damage the equipment. Please make sure that there are no such particles present inside the installation area.
3. Please make sure that the passageways and the placement location are large enough to accommodate the forklift and system cabinet, and verify that the installation location is capable of withstanding the weight.
4. While the SVG is operating, it makes sound at a certain noise level. Please take the noise into consideration when deciding where to install and place the unit.
5. The installation location must be kept clean and tidy. Please make sure that the input wires are properly sealed to prevent rats from rodent damage.
6. Please make sure that the installation area is spacious enough for conducting maintenance work. While installing the SVG, we suggest that the ventilation inlet openings shall be at the front and that the ventilation outlet openings shall be at the back. Maintain a clearance of 1,000 mm at the front and back of the SVG cabinet for operation, maintenance, and wiring. When installation against the wall is required, top-airflow type cabinet shall be selected. Please consult Delta or Delta’s distributor for cabinet’s airflow type. Corresponding ventilation fans shall be installed to satisfy the SVG ventilation requirement.

7. During operation, the SVG product will generate a certain amount of heat. Please ensure that the working environment is equipped with a proper cooling system to dissipate the heat so that the surrounding environment can maintain a normal operating temperature.
8. The unit has its own cooling fan that adopts the front-inlet and rear-outlet airflow design. Therefore, it is suggested that a space of 500 mm shall be maintained for heat dissipation. Figure 3-1 and Figure 3-2 show the air flow diagrams of the module and the system cabinet, respectively.
9. Individual modules and system cabinets have their own minimum ventilation requirements, these requirements must be satisfied to ensure proper cooling of the unit. The air entering the ventilation opening must be cooled properly and free of electrically conductive particles, dust, and harmful gases.
10. The SVG's operating temperature is -10 ~ 55℃ (14°F ~ 131°F). If the operating temperature is not within the range, the SVG can not be started. For detailed information refer to ***2.4 Functions & Features*** wide working temperature range.
11. The SVG system shall be installed at a place where the altitude is less than 1,000m. Please derate the SVG capacity or consult Delta or Delta distributor if the altitude limit is exceeded.
12. Install the SVG module in a customized cabinet with the IP20 protection marking. The conductive metal of the cabinet shall be distanced from the live terminal of the SVG for at least 10 mm.



(Figure 3-1: Airflow Diagram_ SVG Module)



(Figure 3-2: Airflow Diagram_ System Cabinet)

3.3 SVG Cabinet Unpacking and Hoisting

SVG module and cabinet are delivered in separate package, SVG cabinet is packed in wooden box and heavy, so it requires tools and facility to unpack and hoist.

The installer is required to abide by all Occupational Health and Safety site rules when moving carrying or lifting all SVG enclosures and power modules.

WARNING:

To guard against personal injury and/or equipment damage follow these guidelines:

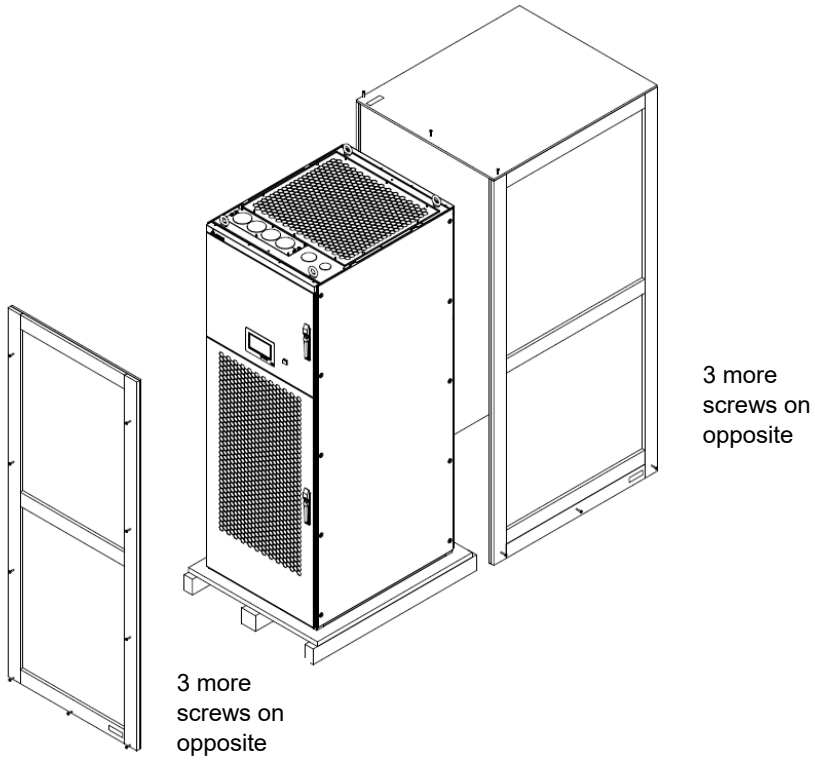
- Do not subject the enclosure/power modules to high rates of acceleration or deceleration while transporting or lifting

- Do not allow personnel or their limbs directly underneath the enclosure/power module when it is being lifted and mounted.

Delta provides multiple SVG cabinets, with different dimensions and weights, which are printed on cabinet package, or consult with Delta or Delta's distributor for such information.

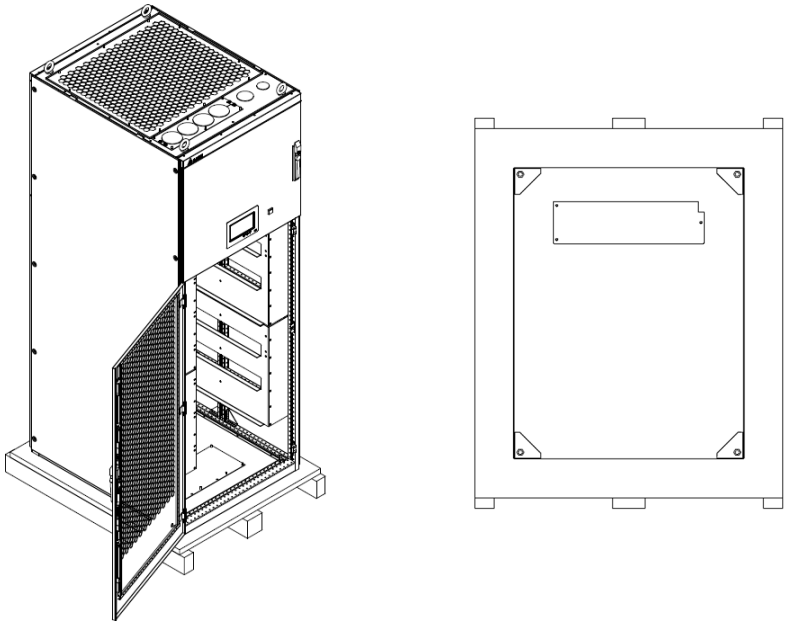
3.3.1 Unpacking SVG Cabinet

1. Remove 21 screws of SVG cabinet, 15 of which are shown in ***Figure 3-3***, and 6 of which are on hidden in the opposite side, then remove cover plate of the package.



(Figure 3-3: SVG Cabinet Unpacking Instruction_1)

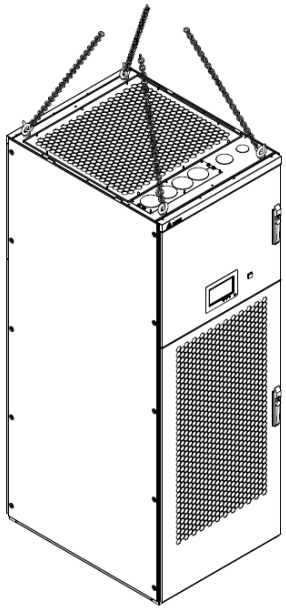
2. Open front door of SVG cabinet, remove 4 screws on bottom wooden plinth, shown in ***Figure 3-4***.



(Figure 3-4: SVG Cabinet Unpacking Instruction_2)

3.3.2 Hoisting SVG Cabinet

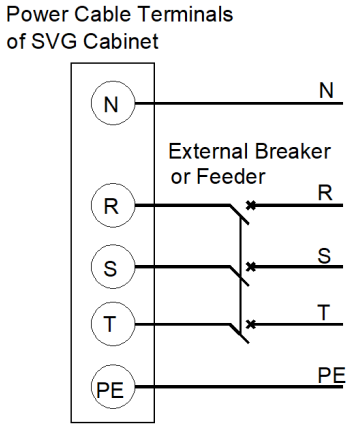
Fasten hoisting belt into hoisting pad and lift the empty SVG cabinet (without SVG modules inside), shown in ***Figure 3-5***. Please refer to SVG cabinet weight information on its package.



(Figure 3-5: Lift SVG Cabinet)

3.4 SVG Cabinet Wiring

1. Before starting SVG cabinet wiring, please make sure that power is cut off to avoid accidents.
2. Appropriate cable glands shall be used for all SVG cable entries. Where possible use the gland plates provided with the cabinet for cable entries. Remove the gland plates prior to slotting or cutting for cable entries to avoid ingress of swarf & other debris. If using large single core cables use nonferrous gland plates to reduce chance of eddy currents.
3. Selection of the cable glands must not compromise the enclosure required IP rating. Follow the cable gland installation instructions of manufacturers to ensure correct installation.
4. The SVG must be grounded properly for safety concerns.
5. Check the diameter markings on the SVG cabinet's input wires, and verify that the wire diameter and phase sequence are correct. Please follow ***Figure 3-6*** to perform wiring and refer to ***Table 3-1*** for power line specifications.



(Figure 3-6: Connection diagram of the main power wires to SVG cabinet)

Table 3-1: SVG Cabinet's Main Power Wires and Breaker Selection

SVG Rated Capacity (kvar)	Breaker Size (A)	R/S/T Wire Diameter	N Wire Diameter (3P4W)	N Wire Diameter (3P3W)	PE Wire Diameter
50 kvar	100A	35 mm^2	35 mm^2	1.5 mm^2	16 mm^2
100 kvar	200A	70 mm^2	70 mm^2	1.5 mm^2	35 mm^2
150 kvar	315A	150 mm^2	150 mm^2	1.5 mm^2	70 mm^2
200 kvar	400A	185 mm^2	185 mm^2	1.5 mm^2	95 mm^2
250 kvar	500A	240 mm^2	240 mm^2	1.5 mm^2	120 mm^2
300 kvar	630A	2×150 mm^2	2×150 mm^2	1.5 mm^2	150 mm^2

SVG Rated Capacity (kvar)	Breaker Size (A)	R/S/T Wire Diameter	N Wire Diameter (3P4W)	N Wire Diameter (3P3W)	PE Wire Diameter
350 kvar	700A	2×150 mm^2	2×150 mm^2	1.5 mm^2	150 mm^2
400 kvar	800A	2×185 mm^2	2×185 mm^2	1.5 mm^2	185 mm^2
500 kvar	400A+630A or 1000A	2×240 mm^2	2×240 mm^2	1.5 mm^2	240 mm^2
600 kvar	630A+630A or 1250A	2×300 mm^2	2×300 mm^2	1.5 mm^2	240 mm^2
700 kvar	630A+800A or 1400A	2×400 mm^2	2×400 mm^2	1.5 mm^2	240 mm^2

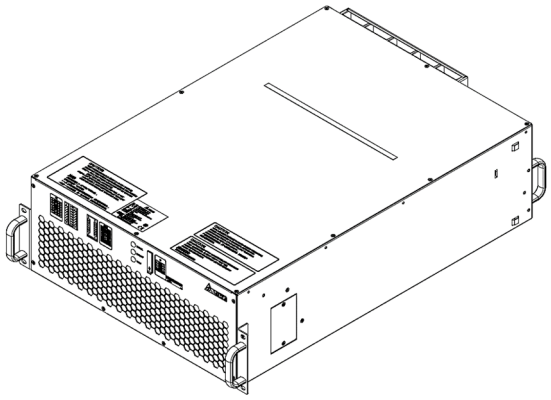
NOTE:

1. Temperature endurance of above wires shall be 70°C (158°F).
2. If the Neutral line current of SVG is bigger than phase line current, the Neutral line needs bigger diameter, please contact Delta service personnel.
3. For 3P3W model, configure 1.5 mm^2 wire on cabinet Neutral terminal is used to supply phase voltage to cabinet AC fans.
4. If the SVG only outputs reactive current, the breaker size shown in ***Table 3-1*** should be multiplied by 0.8 ~ 0.9.

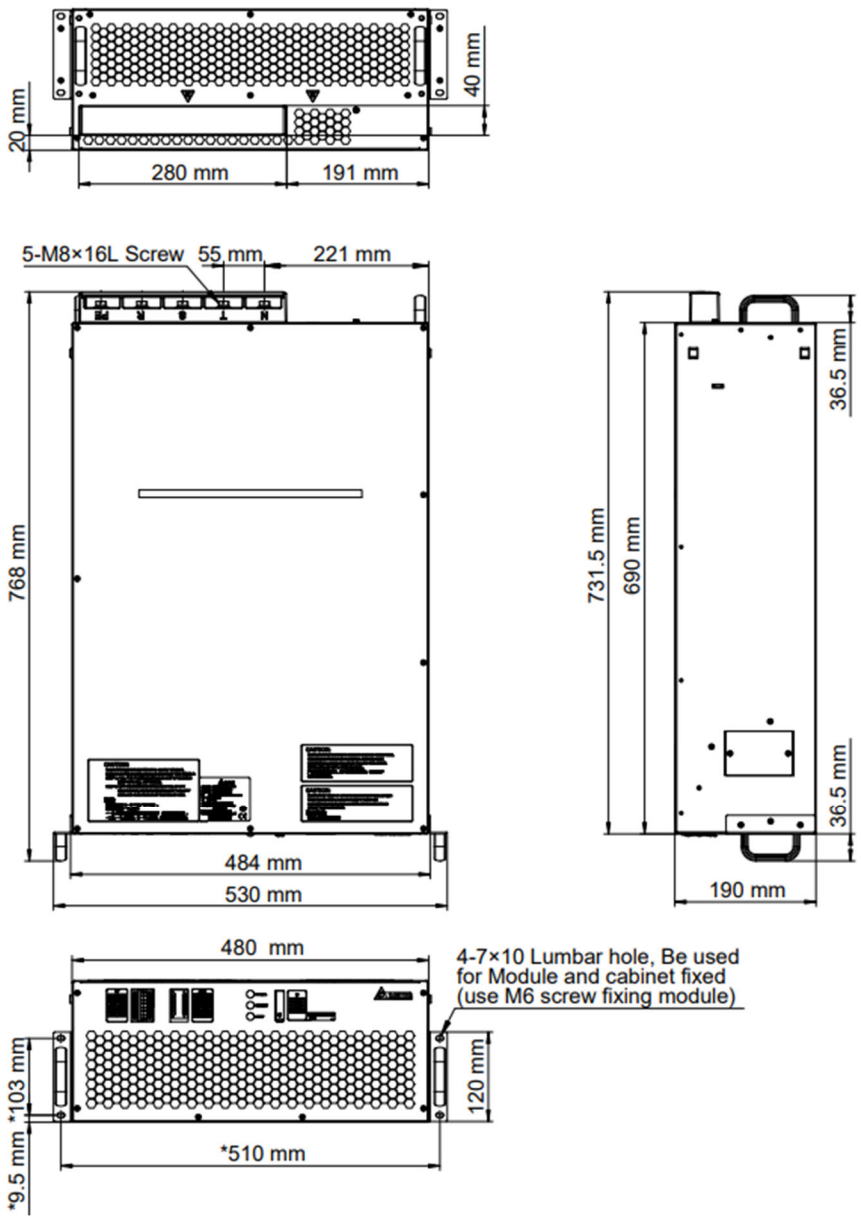
6. Connect the power wires from SVG cabinet power cable terminals to external breaker or feeder, and finally, to the power supply system.

3.5 Module Installation

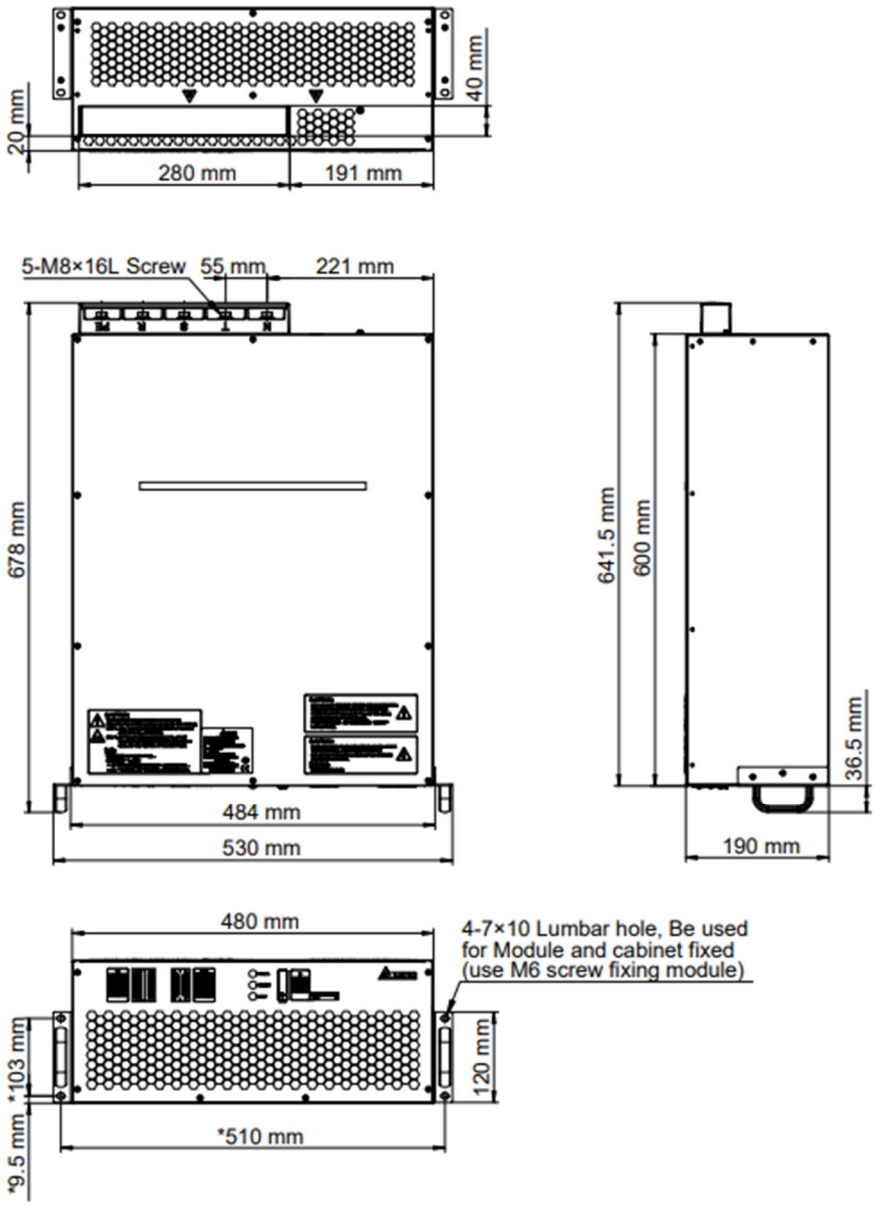
3.5.1 SVG Module Structure



(Figure 3-7: SVG Module)



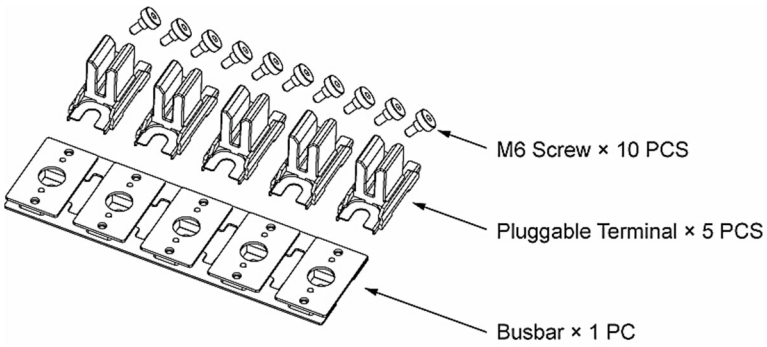
(Figure 3-8: SVG Module Dimensions_ 100kvar Models)



(Figure 3-9: SVG Module Dimensions_ 50kvar Models)

3.5.2 Pluggable terminals

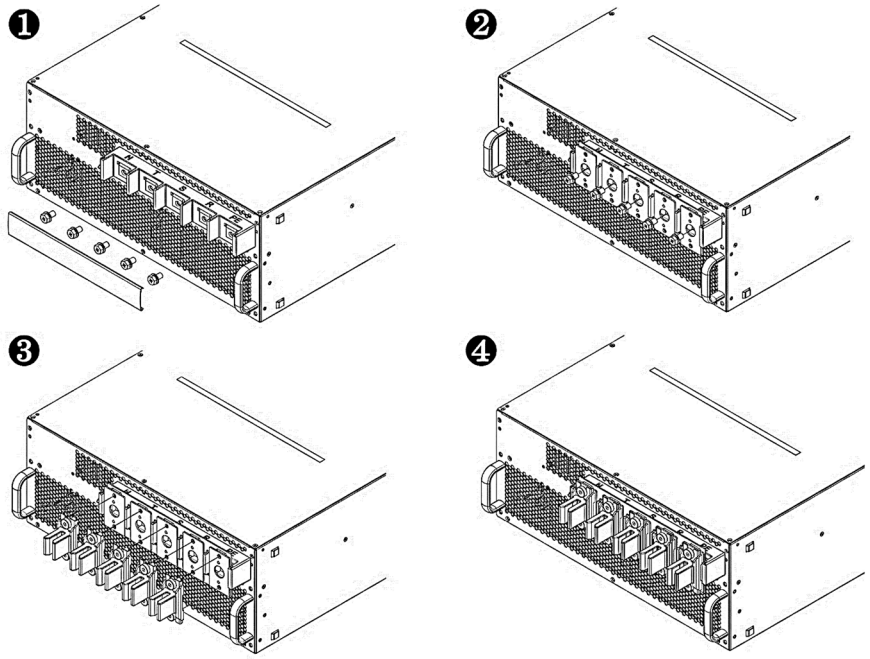
The SVG module and the Pluggable terminals (***Figure 3-10***) can be combined to be used as a Pluggable SVG module.



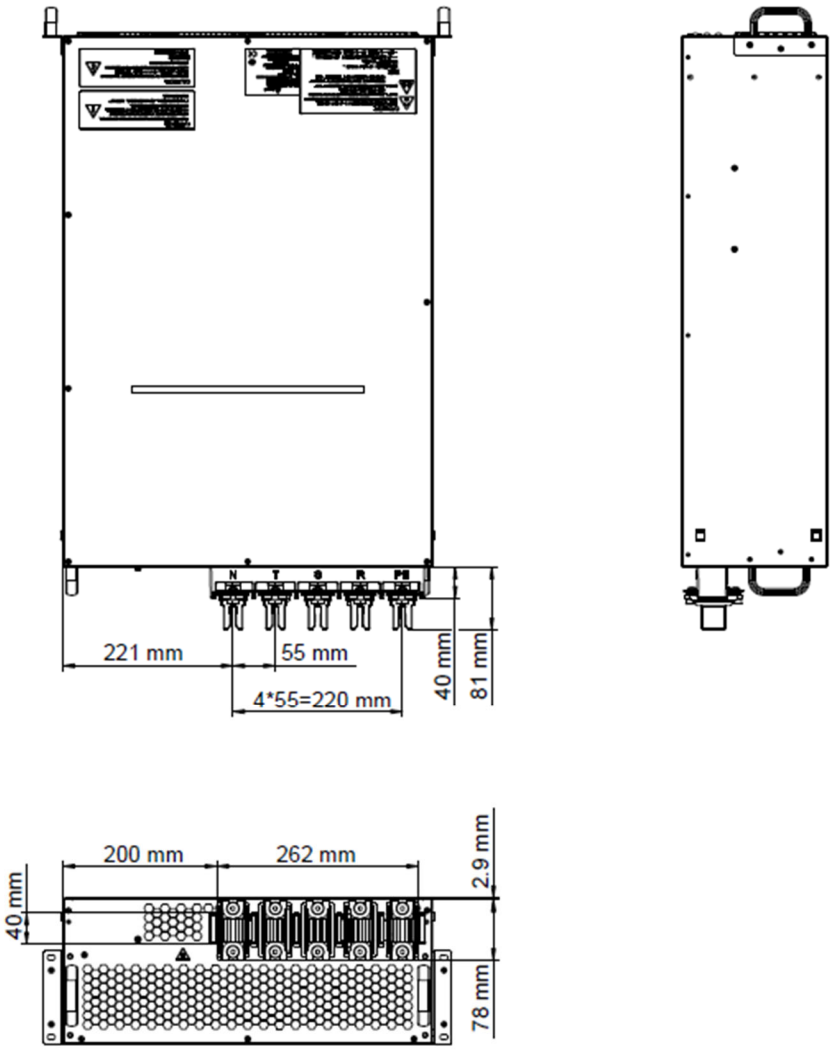
(Figure 3-10: Pluggable terminals)

The installation procedures of the Pluggable terminals are shown in ***Figure 3-11***:

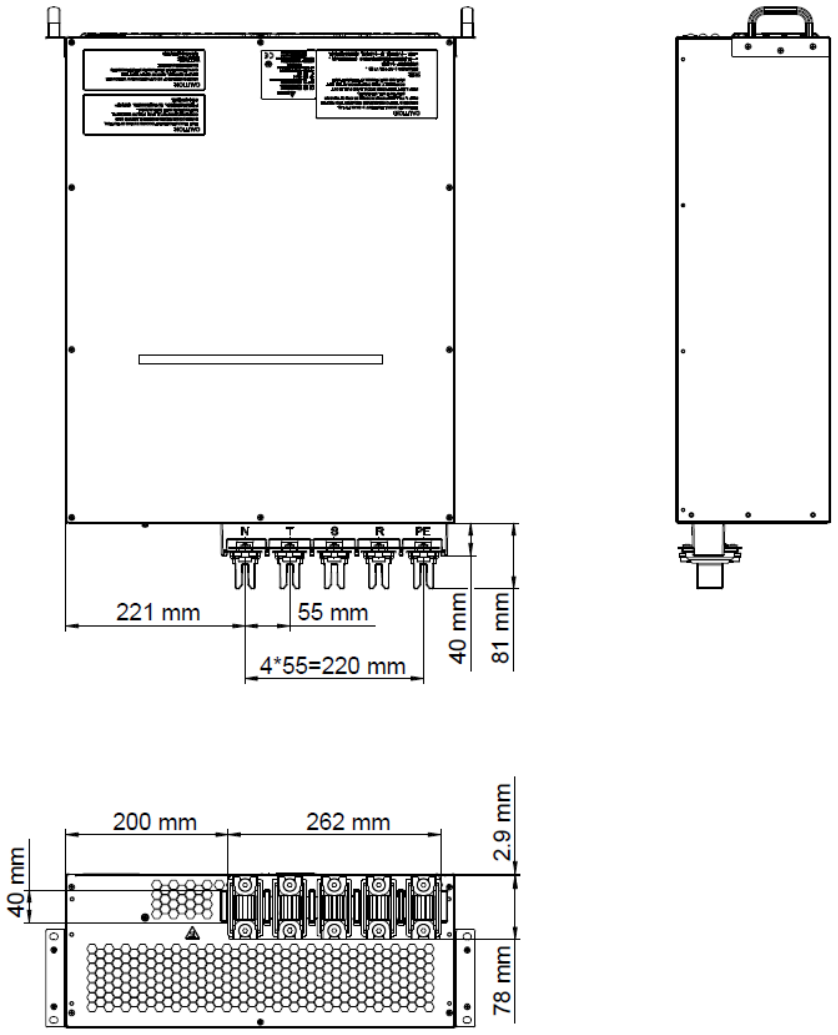
1. Remove the transparent cover and five screws on the terminal.
2. Use the five removed screws to install the busbar (15N·m).
3. Use ten M6 screws to install the five pluggable terminals (5N·m).



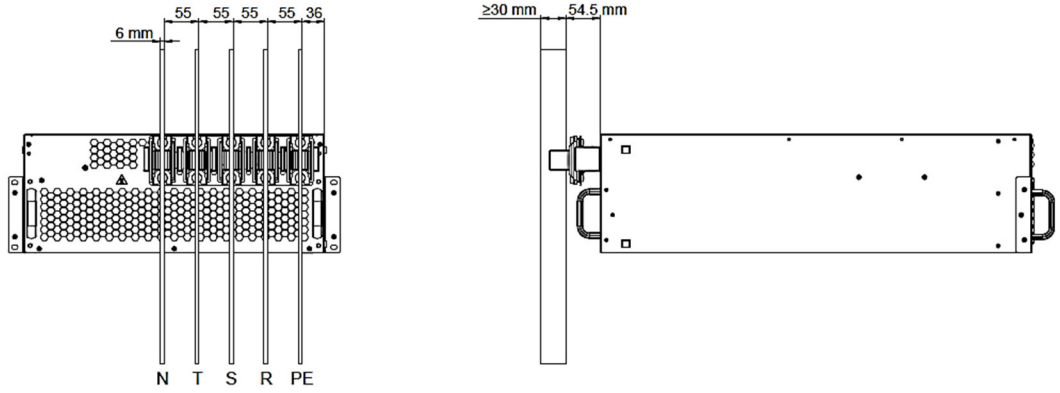
(Figure 3-11: Install the Pluggable terminals)



(Figure 3-12: SVG Module Dimensions_ 100kvar Modules (After Combination with Pluggable terminals))



(Figure 3-13: SVG Module Dimensions_ 50kvar Modules (After Combination with Pluggable terminals)

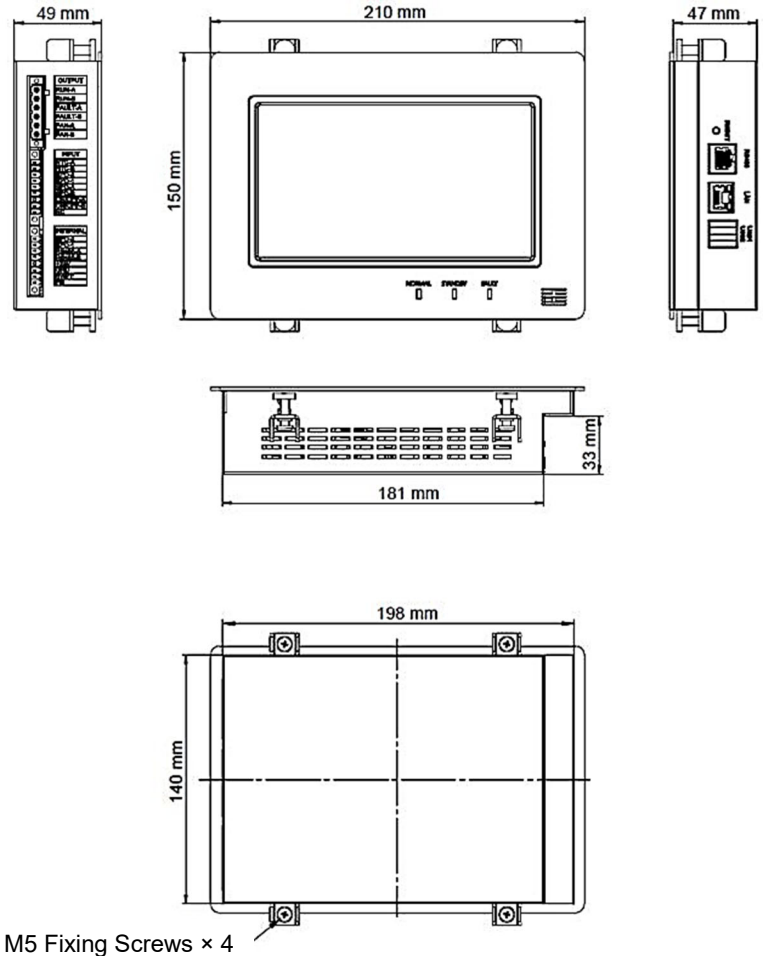


(Figure 3-14: Busbar Dimensions on the Customized Cabinet of the Pluggable Module)

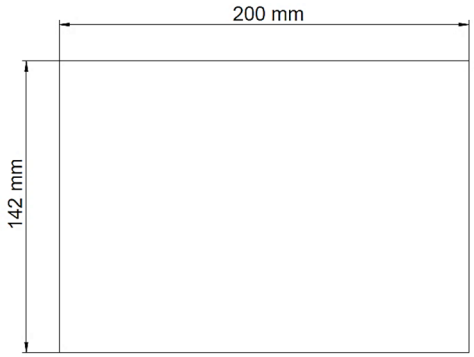
The dimensions of the busbar on the customized cabinet of the pluggable module is shown in ***Figure 3-14***. The busbar is in a rounded rectangular shape with the depth of 6 mm. The distance between busbuses shall be 55mm and the width of the busbar shall at least be 30 mm. The width of the busbar shall be decided according to the total current number of the parallel modules in the cabinet. 1.6 times of the number shall be taken into consideration. The connection points on the busbar and the pluggable modules shall be silver-plated, or the whole busbar shall be silver-plated.

3.5.3 HMI Display Structure

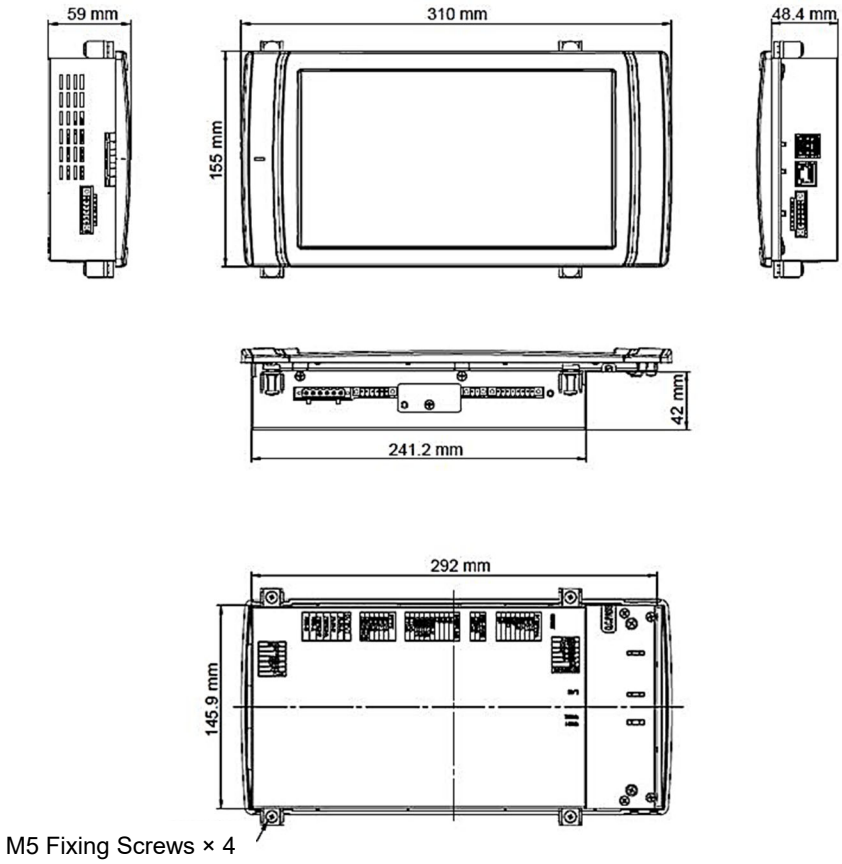
For the installation of the HMI display, please align the HMI display with the mounting holes on the cabinet and use four fastening screws to fix them together.



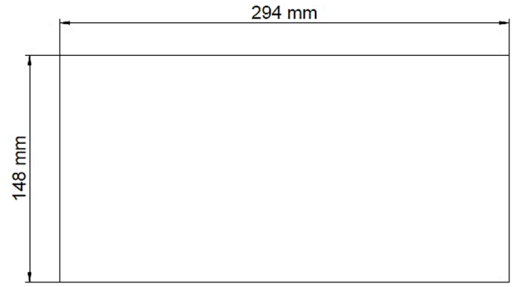
(Figure 3-15: PQC-HMI-F Structure & Dimensions)



(Figure 3-16: Mounting Hole Dimensions for PQC-HMI-F)



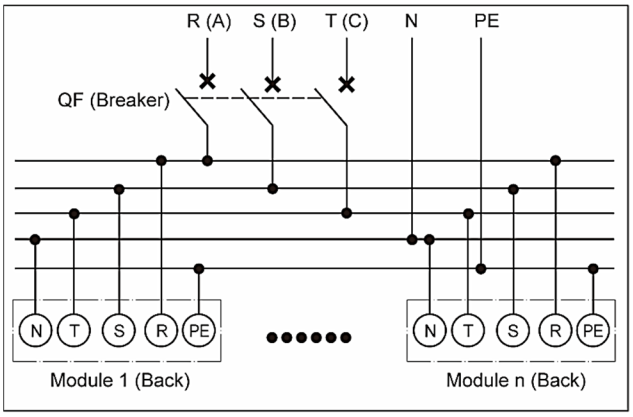
(Figure 3-17: PQC-HMI-F10 Structure & Dimensions)



(Figure 3-18: Mounting Hole Dimensions for PQC-HMI-F10)

3.5.4 Module Installation and Wiring

1. Before connecting the cables, please be sure to cut off the input power to avoid accidents.
2. The SVG must be grounded properly to avoid any possible damage caused by current leakage.
3. Check the diameter marking of SVG module's input wires, and make sure the wire diameter and phase sequence are correct. Please refer to ***Figure 3-19*** to perform wiring and refer to ***Table 3-2*** for the specifications of the power lines.



(Figure 3-19: Main Power Cables Connection)

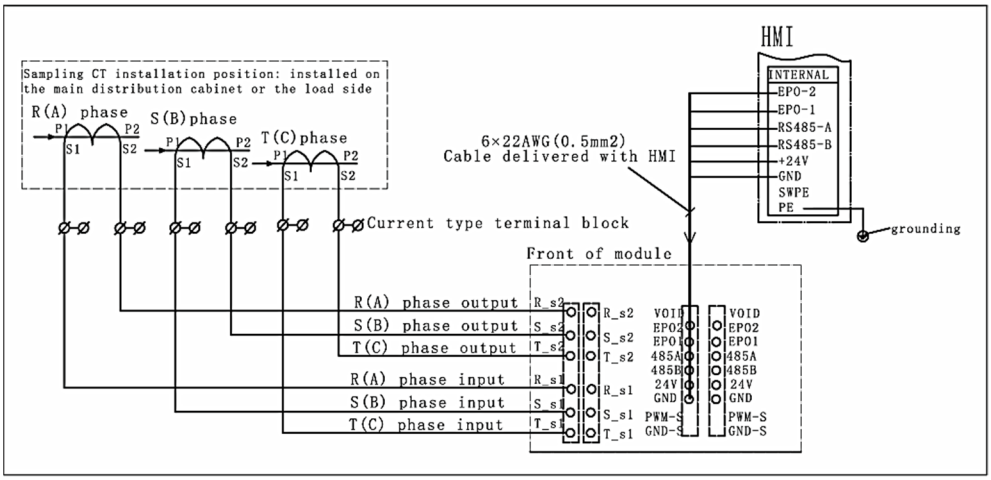
Table 3-2: SVG Module's Main Power Wires Selection

Module Type	50kvar	100kvar
R/ S/ T Wire Diameter	35 mm^2	70 mm^2
Neutral Wire Diameter	35 mm^2	70 mm^2
PE Wire Diameter	16 mm^2	35 mm^2

NOTE:

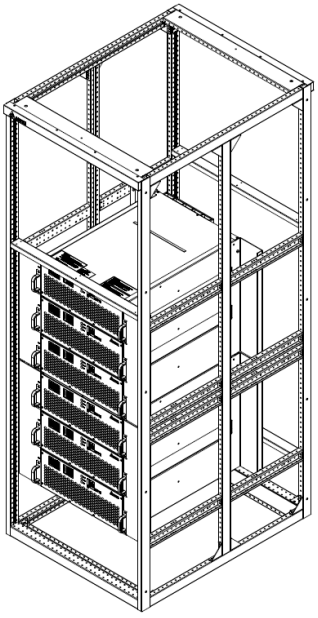
1. Wires with the temperature resistance up to 70℃ (158°F) are used for calculation of the above data.
2. If the Neutral line current of SVG is bigger than phase line current, the Neutral line needs bigger diameter, please contact Delta service personnel.

4. Connect the power wires from SVG cabinet power cable terminals to external breaker or feeder, and finally, to the power supply system (9~10N·m).
5. Check the marking of wires connecting the SVG module and the CT. Please make sure the wire diameter and phase sequence are correct. Connect the input and output wires of the CT according to ***Figure 3-20***.

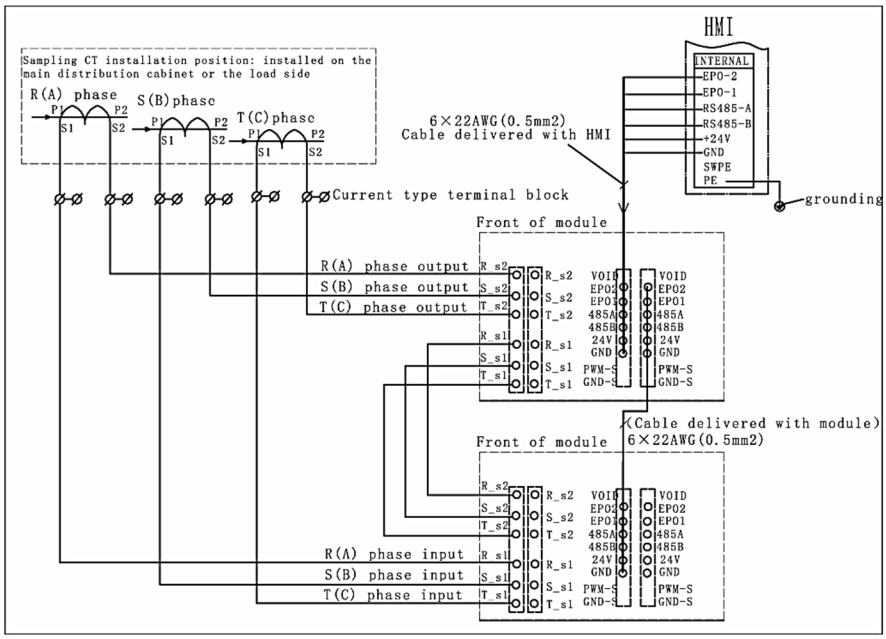


(Figure 3-20: Single Module System_ Wiring between the Display, SVG Module and CT)

6. SVG modules can be stacked directly during installation, and we suggest installing maximum 7 modules in one cabinet. ***Figure 3-21*** is the module installation diagram. Please refer to ***Figure 3-22*** for connecting CT and communication wires for double and multiple SVG modules scenario. Make a connection from the HMI's communication port to that of SVG module. When several SVG modules are connected in parallel, it is unnecessary to connect other modules to HMI connection wire; instead, communication can be established via connections between the system's internal wires.



(Figure 3-21: System Installation Diagram)



(Figure 3-22: Multiple Module Parallel System_ Wiring between the Display, SVG Module and CT)

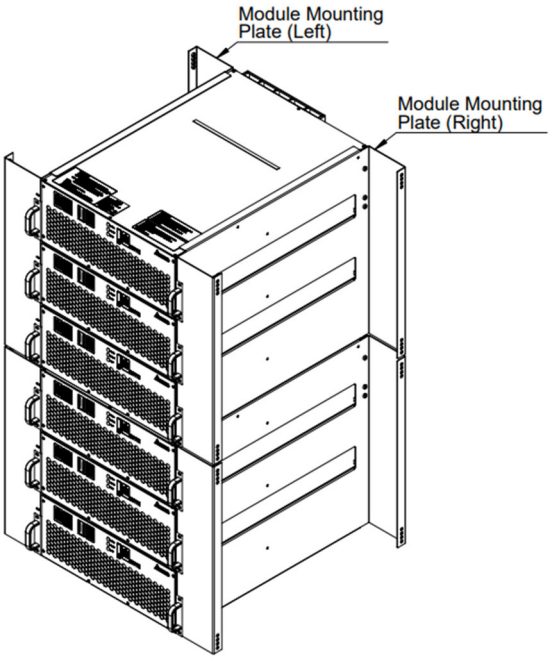
WARNING:

The display communication cables are secondary wires and shall be kept an insulation distance of no less than 100mm from the main power cables.

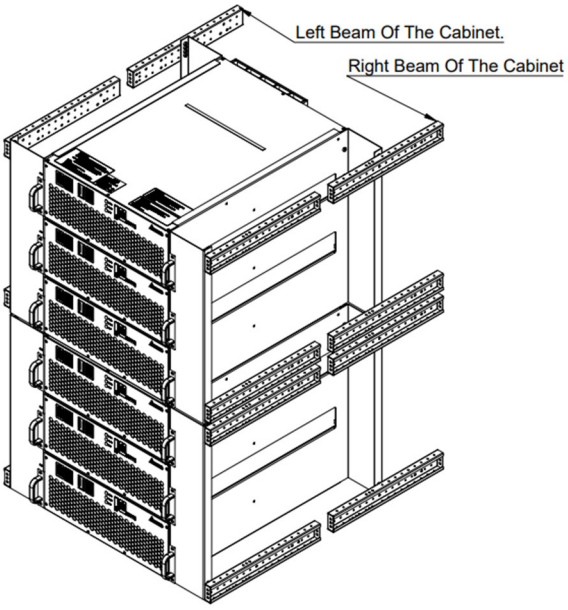
7. SVG module's supporting structure and installation procedures:

   1) Fix the module and the installation panel together as shown in ***Figure 3-23***.

   2) Fix the installation panel with the supporting beams on the left and right of the cabinet as shown in ***Figure 3-24***.

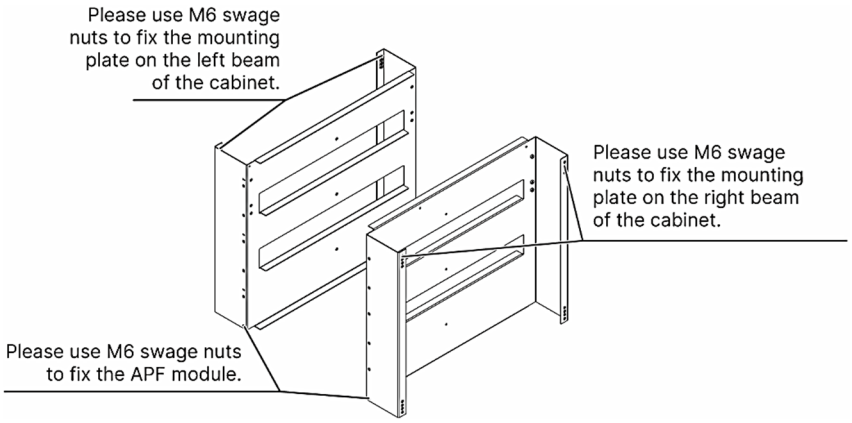


(Figure 3-23: Module Installation Diagram 1)



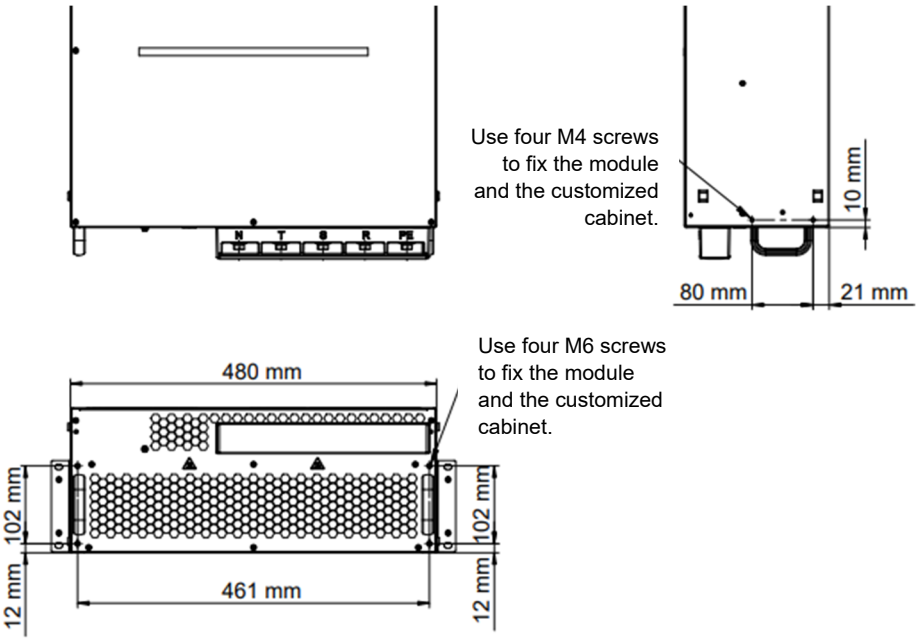
(Figure 3-24: Module Installation Diagram 2)

3) ***Figure 3-25*** shows the structure design of SVG module's installation panel. The figure below shows the design of the panel that accommodate three modules. The design is a C shape framework with a size of 800 mm width.

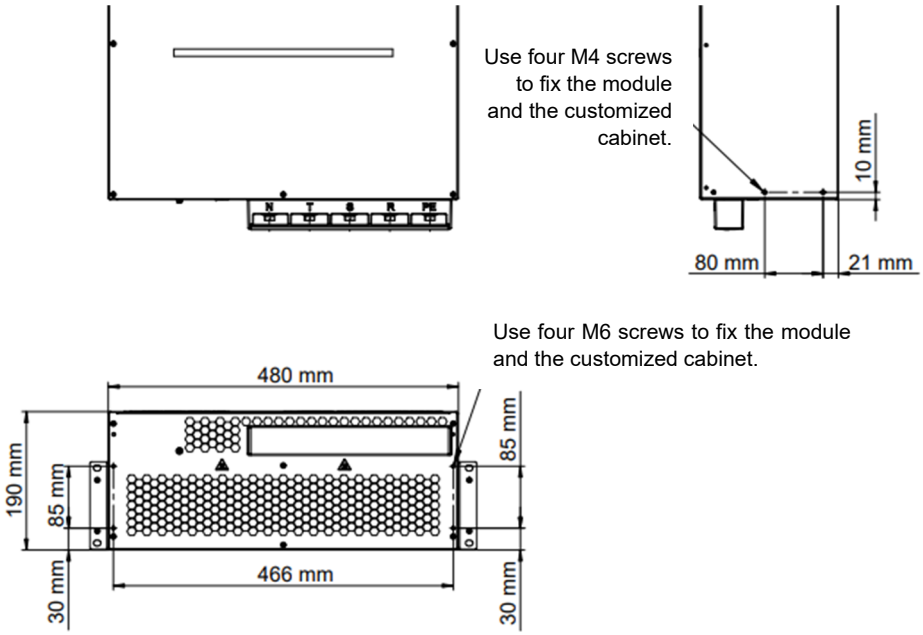


(Figure 3-25: Module Installation Diagram 3)

4) When the module is packed with the system cabinet for delivery, an extra sheet metal part is required. Please use the installation hole at the end of the module or the installation hole on the left and right sides of the module to fix the module end on the system cabinet. The size of installation hole at the end and on the side of the module is shown in ***Figure 3-26***.



(100kvar Modules)



(50kvar Modules)

(Figure 3-26: Module End and Installation Holes on the Side)

3.6 Load Current Detection for CT Installation and Wiring

3.6.1 CT Selection

1. The appropriate rated ratio of primary to secondary current shall be determined. The primary current is recommended to be 1.5*In (the actual rated current).
2. The rated voltage is more than or equal to the system voltage.
3. The selection for secondary current shall be 5A or 1A, 5A is suggested.
4. CT accuracy shall be class 0.5 or 1.0, class 0.5 is suggested
5. The nominal secondary capacity (rated load) of the CT shall meet the requirement of secondary impedance (≥ 10VA when the secondary current is 5A). The capacity and the maximum one-way wiring length from the CT to the SVG shall be calculated according to the following formula:

$$L_{max} = \frac{P_{CT} - P1}{I^2} \cdot \frac{S}{\rho} \cdot \frac{1}{2}$$

Wherein:

L_{max}	is the maximum one-way wiring length from the CT to the system cabinet (m);
P_{CT}	is the nominal secondary capacity of the CT (VA);
P1	is the capacity loss and the internal impedance of the system cabinet (each module's internal loss is around 2 VA);
I	is the secondary current of the CT (A);
S	is the cross-section area of the copper conductor (mm^2);
ρ	is the resistivity of the copper conductor (calculated according to 0.0178 Ω × m/ mm^2);

Table 3-3: Lmax and Cross-section Area When CT Secondary Current is 5A and under Single Module System

Cross-section Area of the Conductor	Lmax					
	15VA CT	20VA CT	25VA CT	30VA CT	35VA CT	40VA CT
2.5 mm^2	36 m	50 m	64 m	78 m	92 m	106 m
4 mm^2	58 m	80 m	103 m	125 m	148 m	157 m

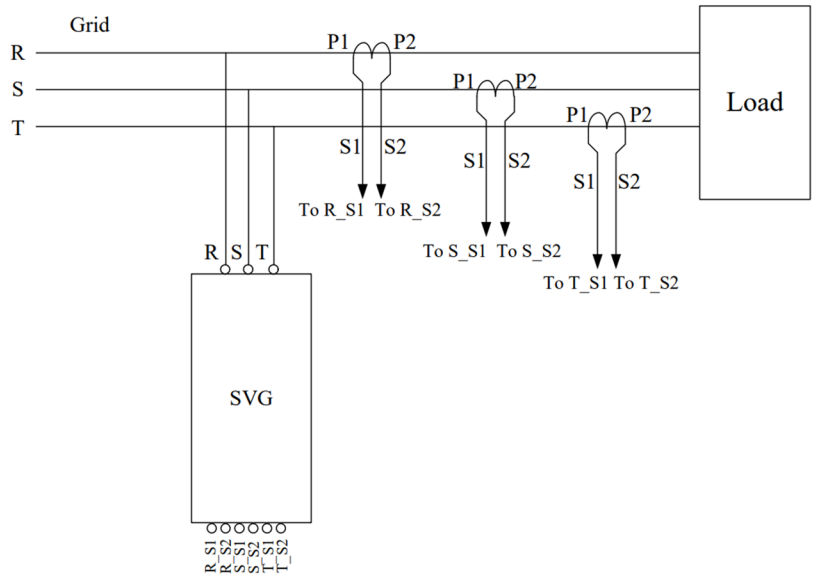
3.6.2 Basic CT Installation & Wiring

- The CT for current detection shall be located on either grid side or load side
- When it's an open loop, the CT for current detection shall be located on the load side to feed the detection signal to the SVG as shown in ***Figure 3-27***. When it's a close loop, the CT for current detection shall be located on the grid side to feed the detection signal to the SVG as shown in ***Figure 3-28***.
- A set of three CTs must be provided for current detection in an imbalance load.
- The CTs shall be oriented accurately. The default is that P1 is placed toward the grid. And the direction of all CTs must be the same.
- The phase sequences of the detection signal of the CTs must not be changed.

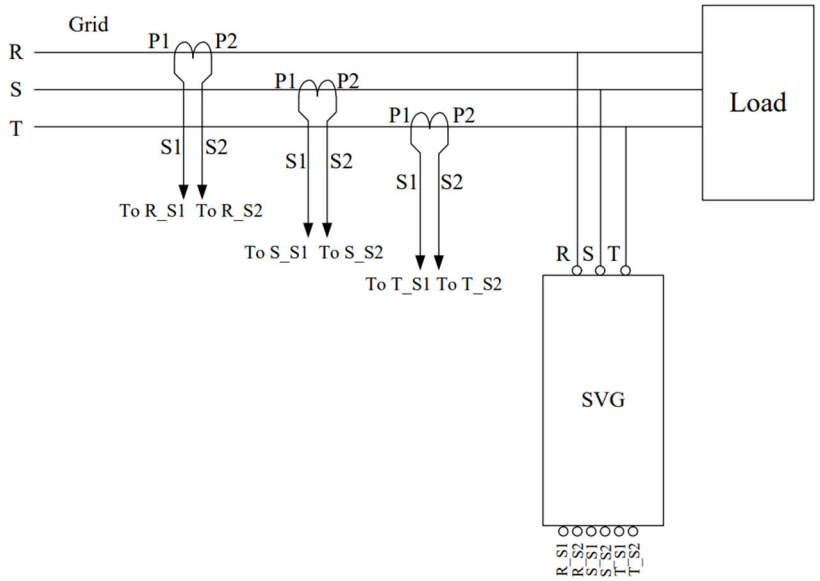
1. The secondary output S1 of CT for R-phase detection must be connected to the terminal board R_S1, and the S2 outgoing line must be connected to the terminal board R_S2.
2. The secondary output S1 of CT for S-phase detection must be connected to the terminal board S_S1, and the S2 outgoing line must be connected to the terminal board S_S2.
3. The secondary output S1 of CT for T-phase detection must be connected to the terminal board T_S1, and the S2 outgoing line must be connected to the terminal board T_S2.

NOTE:

1. When compensating a three-phase system, single CT detection can be set up (only the R-phase CT is connected).
2. Corresponding setting shall be set up in accordance with CT wiring under compensation mode; otherwise, the compensation will not be working.
3. The CT wiring shall be fastened to avoid open circuit, which will lead to high-voltage risk and secondary circuit burning.



(Figure 3-27: Basic CT Installation and Wiring Diagram_ Open Loop)

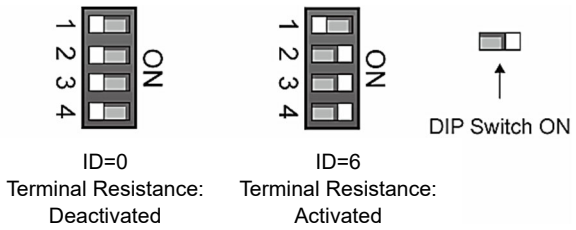


(Figure 3-28: Basic CT Installation and Wiring Diagram_ Close Loop)

Chapter 4 : SVG Operation Procedure

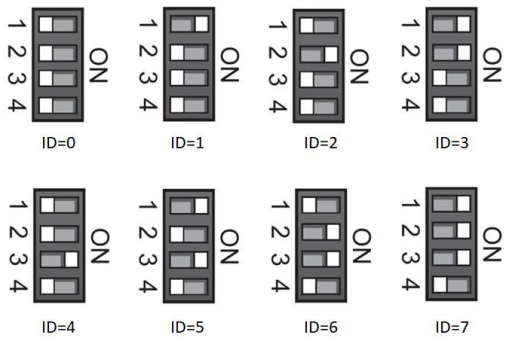
4.1 Inspection Before Start-up

- Make sure the module and the cabinet are connected properly and that all screws are tightened.
- Make sure each SVG module's ID and terminal resistance are set properly.
- The DIP switches used to set the ID and terminal resistance are as shown in ***Figure 4-1***. ***Table 4-1*** lists the locations of DIP switches 1 ~ 4.



(Figure 4-1: Schematic Diagram of DIP Switches)

Item	Item
DIP Switch 1	Setting of the first digit of ID, which is valid when it is slid to right position.
DIP Switch 2	Setting of the second digit of ID, which is valid when it is slid to right position.
DIP Switch 3	Setting of the third digit of ID, which is valid when it is slid to right position.
DIP Switch 4	Setting of terminal resistance, it is activated in right position.



(Figure 4-2: DIP Switch ID0 ~ ID7)

The numbering for system module ID shall be the same as the module numbering printed on the side of the system cabinet. The number from the top to the bottom of the system cabinet shall be in the sequence of PM0 to PM7. The terminal resistance switch for module PM7 is set on the right. Terminal resistance switches for the other modules are set on the left. The terminal resistance switch for the power module of the display is set on the right.

When several SVG modules are connected in parallel sharing the same display, please make sure that the module IDs are not repeated. Besides, please make sure that the terminal resistance DIP switch of the SVG module that locates at the farthest from the display is set to the right.

- Each module has an individual ID.
- Module quantity and compensation capacity are correct.
- Parallel communication terminals are connected properly.
- Display communication ports are connected properly.
- The CT signal cables are well connected.
- Front door of the cabinet is closed.

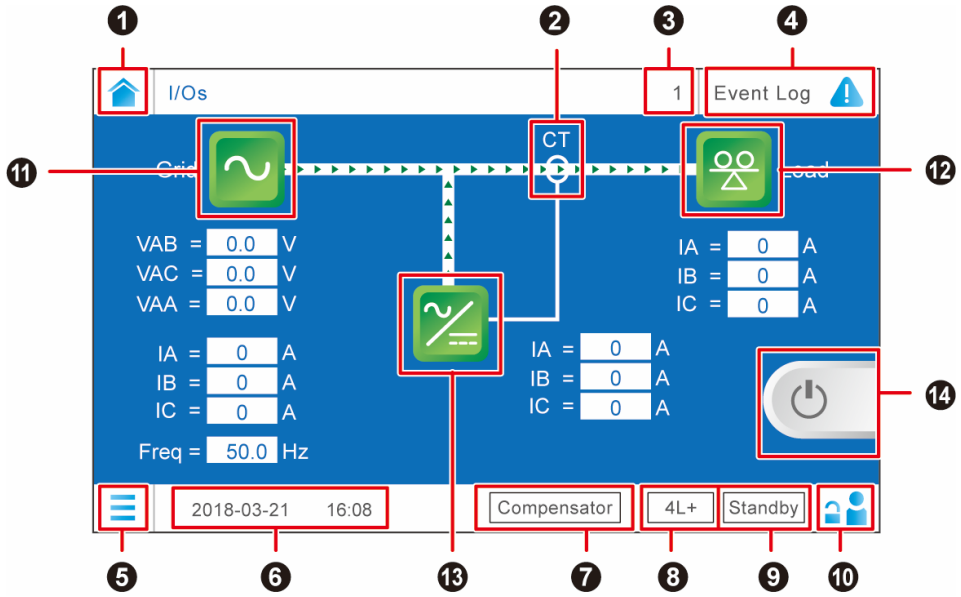
4.2 Start-up Procedures

1. Switch on the main input breaker.
2. The internal auxiliary power supply of the modules will be started, and the fans will start working. Please make sure the yellow LED indicator in front of the module illuminates. After that, the display will show the start-up interface and communicate with the modules to read the system messages and check if there is any fault.
3. Close the front door.
4. Set the system into the operating mode. Please refer to ***Chapter 5: Display and Settings*** for the detailed display settings.
4. Press and hold the ON/ OFF button on the display. And press “Yes” when the “Start-up?” window pops up. The system will be starting up.
5. When the system starts up and works properly, the green LED indicator of HMI and Power modules will be ON.

Chapter 5 : Display and Settings

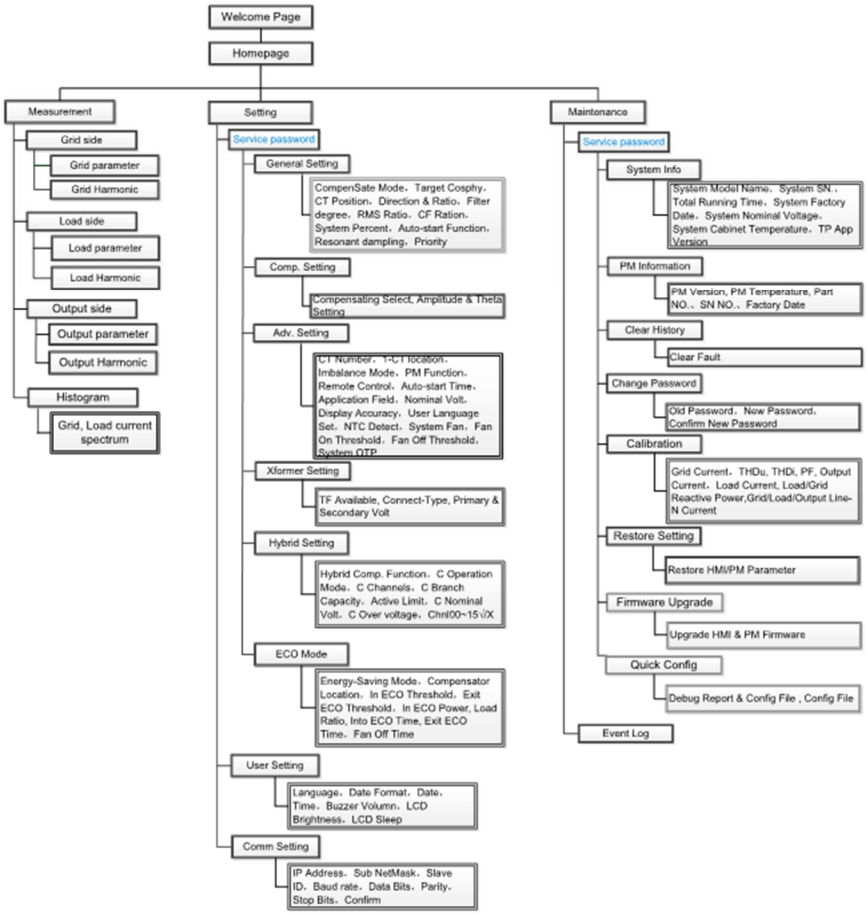
The display mainly monitors parameter display, system status and system setting of the SVG. It is available for two levels of user: User and Service Engineer. The User level is able to directly view the detailed displayed parameters in the Measurement page. While the Service Engineer level menu is protected by password, and Setting and Maintenance pages can only be set and viewed after entering the Service password..

5.1 Description of the 7” HMI Display



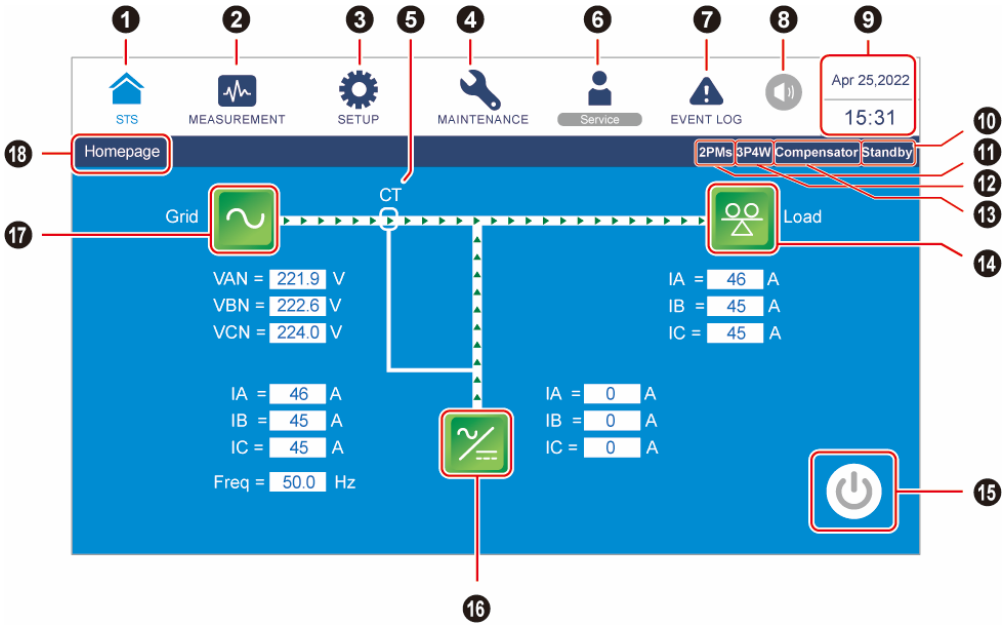
(Figure 5-1: PQC-HMI-F Screen)

Item	Description	Item	Description
❶	The "**Home**" button. Click to go back to the home page.	❽	Indicate wiring type, 3P3W / 3P4W. Indicate voltage sequence, + is Positive, - is Negative
❷	Indicate the CT Position setting.	❾	Indicate system status, Run, Standby, ECO or Fault.
❸	Indicate quantity of modules connected to this HMI.	❿	The "**Login**" button. Click to show the pop-up log-in window. Please enter the correct user name and password to proceed to the operation of a higher level.
❹	The "**Event Log**" button. Click the button to go to the "**Event Log**" screen that displays history events of the device.	⓫	The "**Grid**" button. Click to show the corresponding detailed information.
❺	The "**Menu**" button. Click to show the first level menu on the HMI.	⓬	The "**Load**" button. Click to show the corresponding detailed information.
❻	Displays the time of the system.	⓭	The "**PQC**" button. Click to show the corresponding detailed information.
❼	Displays the working mode. (Ex: compensator, source).	⓮	The "**ON/ OFF**" button. Click to turn on/ off the PQC system.



(Figure 5-2： PQC-HMI-F Display Hierarchy)

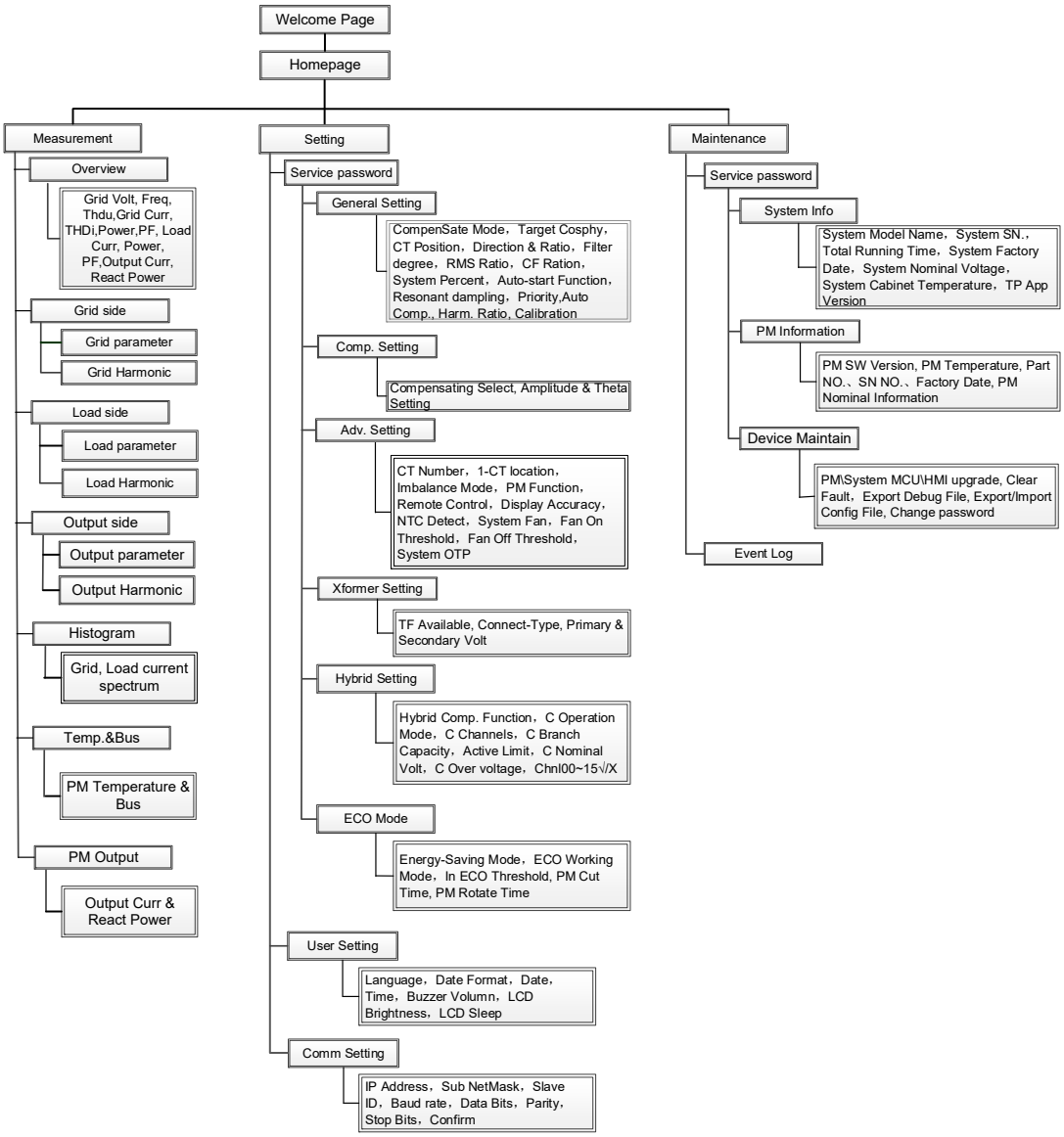
5.2 Description of the 10” HMI Display



(Figure 5-3: PQC-HMI-F10 Screen)

Item	Description
❶	The "**Home**" button. Click to go back to the home page.
❷	The "**Measurement**" button. Click to go to the measurement page of the next level.
❸	The "**Setup**" button. Click to go to the setup page of the next level.
❹	The "**Maintenance**" button. Click to go to the maintenance page of the next level.
❺	Displays the current CT location. It may be on the grid’s side or the load’s side.
❻	The "**Login**" button. Click to login.
❼	The "**Event Log**" button. Click to show all errors that occur on the device.
❽	The "**Buzzer**" button. Click to turn on/ off the buzzer.
❾	Displays the time and date on the device.

Item	Description
❿	Shows the operating status of the device, status including operating, standby and locked.
⓫	Power module quantity: The number of power module that builds a connection with the HMI.
⓬	Displays the device wiring type, including 3P3W and 3P4W.
⓭	Displays the device type, including compensator and harmonic source.
⓮	The load icon. Click to display detailed information regarding load measurement.
⓯	The ON/ OFF button. Click the button to turn on/ off the button.
⓰	The compensator icon. Click to display detailed information regarding compensator measurement.
⓱	The grid icon. Click to display detailed information regarding grid measurement.
⓲	Page name.



(Figure 5-4： PQC-HMI-F10 Display Hierarchy)

- **SVG**

1. SVG Cleaning:

   Regularly clean the SVG, especially the slits, openings and filters, to ensure that the air freely flows into the SVG to avoid overheating. If necessary, use an air blower or vacuum cleaner to clean the slits and openings and replace the filters regularly to prevent any object from blocking or covering these areas.

2. SVG Regular Inspection:

   Please contact Delta or Delta distributor for the maintenance service.

- **Fans**

Higher temperature will shorten the life span of the fan. When the SVG is running, please check if all fans work normally and make sure if air can move freely around and through the SVG. If not, please replace the fan.

NOTE:

Please Contact Delta or Delta distributor for more maintenance information. Do not perform maintenance if you are not trained for it.

Chapter 7 : Troubleshooting

If any fault message or abnormality is found, please refer to the table below for the corresponding solution.

Item	Fault Message	Possible Cause	Solution
1	SYS 485 Comm Loss	1. The communication wire is not well-connected. 2. The SVG modules have repeated IDs.	1. Check if the communication wire is firmly connected. 2. Check the DIP switches of individual modules.
2	Fuse Blowout	The input fuse is broken.	Please contact service personnel.
3	Ambient OTP	1. The air vents ate blocked. 2. The fans do not work.	Please contact service personnel.
4	BUS OVP/ UVP	BUS capacitor failure.	Please contact service personnel.
5	Fan Fail	Fan failure.	Please contact service personnel.
6	No Current Compensation/ Bad Current Compensation	The CT is not well connected.	Check if the CT wiring is correct.

Appendix 1 : Technical Specifications

Items	Functions	Description	
Electrical Specification	Rated Voltage	AC 400V	
	Input Voltage Range	AC228 ~ 456V	AC228 ~ 480V
	Electric Connection	3P4W	3P3W
	Rated Frequency	50 (60) Hz ± 10 %	
	Input Voltage THD Range	≤ 15 %	
	Rated Capacity per Module	50 kvar	100 kvar
	Rated Current per Cabinet	50 ~ 700 kvar (module combination)	
	Redundancy	Each module is an independent system	
	Reactive Power Compensation Capacity	Both inductive and capacitive reactive power	
	Reactive Power Compensation Performance	Cosφ≥0.99 after compensation (if theAPF capacity is sufficient)	
	Imbalance Correction Capability	Mitigate negative and zero sequence	
	Harmonic Elimination Range	2^{nd}~25^{th} order (Selectable)	
	Harmonic current capacity	20% of rated current, 100kvar SVG can output 30A H2-H25 harmonic compensation current	
	Imbalance Correction Capability	Mitigate negative and zero sequence	
	Full Response time	< 10 ms	

Items	Functions	Description
Electrical Specification	Instant Response time	< 100 us
	Thermal Loss	≤ 3% of SVG rated capacity
	Output Current Limitation	Automatic (100% rated capacity)
	Parallel Expansion (System)	Up to 10 Racks (7 modules per cabinet)
	MTBF	> 100,000 hours
Control Technology	Control Frequency	30 kHz
	Controller	DSP + FPGA
	Communication	Modbus RTU (RS485), Modbus TCP/IP (Ethernet)
Physical Specification	IP Grade of Cabinet	IP20, IP30, IP54 or customization
	Cooling method	Intelligent forced air cooling
	Noise Level	< 65 dB (A) at 1 m (Module)
	Dust Filter	Optional
Environmental Requirement	Ambient Temperature	-10°C ~ 55°C (14°F ~ 131°F)
	Relative Humidity	0 ~ 95% (No condensation)
	Altitude	≤ 1000 m rated capacity, 1000 ~ 3000 m (Derating 1% per 100 m)

NOTE:

1. Please refer to the rating label for the safety certification.
2. All specifications are subject to change without prior notice.

Appendix 2 : Warranty

Seller warrants this product, if used in accordance with all applicable instructions, to be free from original defects in material and workmanship within the warranty period. If the product has any failure problem within the warranty period, Seller will repair or replace the product at its sole discretion according to the failure situation.

This warranty does not apply to normal wear or to damage resulting from improper installation, operation, usage, maintenance or irresistible force (i.e. war, fire, natural disaster, etc.), and this warranty also expressly excludes all incidental and consequential damages.

Maintenance service for a fee is provided for any damage out of the warranty period. If any maintenance is required, please directly contact the supplier or Seller.

WARNING:

The individual user shall take care to determine prior to use whether the environment and the load characteristic are suitable, adequate or safe for the installation and the usage of this product. The User Manual must be carefully followed. Seller makes no representation or warranty as to the suitability or fitness of this product for any specific application.

No. : 501330790000 (QR)

Version : V 0.0

Release Date : 2022_11_23

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