

The power behind competitiveness

Delta PQC Series Fixed Type Active Power Filter

User Manual

Save This Manual

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

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Table of Contents

Chapter 1 : Important Safety Instructions	1
1.1. Safety Precautions	1
1.2. Wiring Warnings	1
1.3. Usage Warnings	2
1.4. Storage Precautions	2
1.5. Symbols	2
Chapter 2 : Introduction	3
2.1 Product Introduction	3
2.2 APF Series Product Category	4
2.3 Functions & Features	6
2.4 Mechanism & Appearance	7
2.4.1 LCM (Liquid Crystal Monitor)	7
2.4.2 Appearance & Dimensions of the Power Module	8
2.5 Package Inspection	10
Chapter 3 : Installation and Wiring	12
3.1 Pre-installation Confirmation	12
3.2 Installation Environment	12
3.3 Fixed-type Module	14
3.3.1 Fixed-type Module Structure	14
3.3.2 LCM Structure	18
3.3.3 Wiring of the Fixed-type Module	19
3.4 CT Installation & Wiring for Current Detection of Harmonic Source	26
3.4.1 CT Selection Precautions	26
3.4.2 Basic CT Installation & Wiring	26
Chapter 4 : APF Operation Procedure	28
4.1 Checks Before Start-up	28
4.2 Start-up Procedures	29
Chapter 5 : LCM Display and Settings	30
5.1 Description of LCM Display	30
5.2 LCM Display Hierarchy	31

Chapter 6 : Maintenance -----	32
Chapter 7 : Troubleshooting -----	33
Chapter 8 : Warranty -----	34

Chapter 1 : Important Safety Instructions

1.1. Safety Precautions

- The active power filter ('APF') is designed for industrial applications. It shall be connected with a power grid system and in parallel with harmonic sources (i.e. nonlinear loads) as a means to control harmonics.
- The APF shall not be exposed to rain or wet conditions, and shall be away from any flammable fluid, gas or explosives.
- Adequate space shall be left in the front and at the back of the APF for well ventilation and convenient maintenance.
- To minimize fire and electric shock hazards, installation must be conducted by the qualified personnel in a controllable working environment.
- To minimize electric shock hazards, all maintenance work must be carried out by the qualified technician, and be sure to cut off all power supply before maintenance.
- High voltage hazards! It takes over 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.
- When the APF is used in IT applications, please install an insulation resistance detection device so that the alarm will go off when protection earth fault is detected.

1.2. Wiring Warnings

- To prevent a possible risk of current leakage, the APF shall be earthed properly.
- With regard to wiring, the compensation capacity and the current-carrying capacities of cables shall be taken into account.
- The incoming lines of the APF shall be connected with appropriate protective devices. It is recommended to provide every module with an over-current protective device with a third-party certification. Besides, take the installation positions of auxiliary equipment into consideration and choose the protective devices with adequate breaking capacity.
- The capacity of the protective devices shall fit that of the APF.
- To prevent scaling caused by high temperature, after the power is cut off, the operating switch shall be allowed to cool down before being operated again.
- The three-phase, four-wire APF is applicable to the power grid system with neutral grounding.



1.3. Usage Warnings

- Since the APF is used for harmonic compensation of the power grid, the capacity selection of the APF shall be subject to the harmonic content to avoid poor compensation due to insufficient capacity.
- Since the APF is used for harmonic control, it shall be connected to harmonic current from an external source for CT testing (CT: Current transformer).
- To guarantee sound reliability and avoid overheating, do not block or cover the air inlet and outlet.
- The working temperature range of the APF is -10°C - 50°C, beyond which the APF will not work.

1.4. Storage Precautions

- Please use the original packing material to protect the APF in order to avoid damage by rodents.
- If the customer will not install the APF immediately after receiving the equipment, please be sure to store the APF in a dry and ventilated indoor place, which shall be maintained between -40°C and 70°C with relative humidity no higher than 95%.

1.5. Symbols

Item	Symbol	Meaning
1	R	Phase R of three-phase power supply
2	S	Phase S of three-phase power supply
3	T	Phase T of three-phase power supply
4	N	Neutral line
5		Main grounding terminal
6		E.P.O key
7	XT	Terminal board
8	QF	Circuit breaker
9	XK	Auxiliary switch

Chapter 2 : Introduction

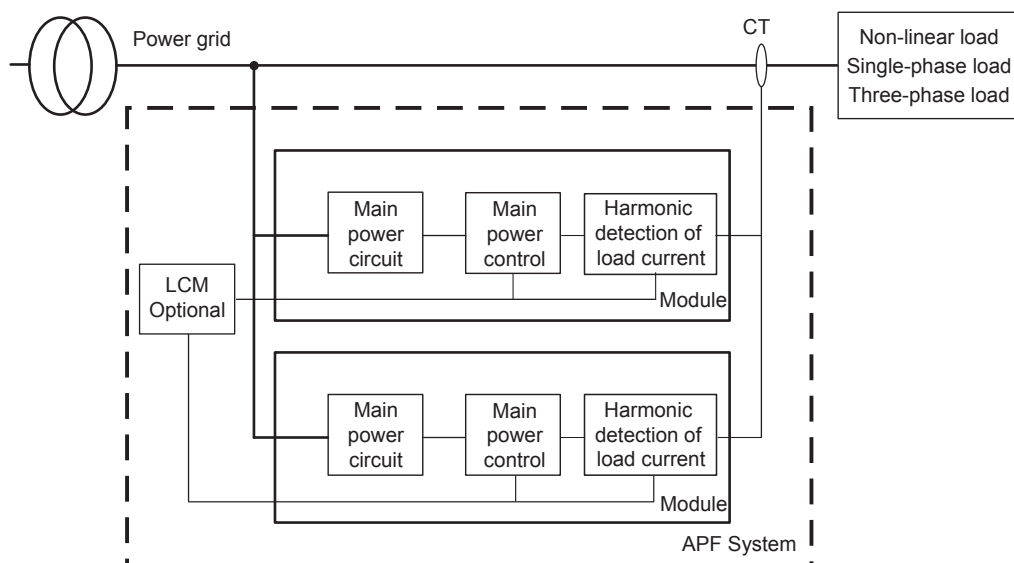
2.1 Product Introduction

The active power filter ('APF'), a harmonic compensator for the three-phase power grid, is applied to the harmonic control of the power grid. Features of the device are shown as below:

- Compensates a wide range of harmonic frequency and any randomly specified harmonic.
- Rapid dynamic responses, stable parameters and good harmonic compensation results.
- High efficiency and low thermal loss.
- Modular design offers a variety of coordination with various compensation capacities.
- The system adopts an advanced 3-level structure and consists of digital signal processors (DSP), large programmable controllers and high power electronic devices, which has excellent performance and superior reliability.
- Provides perfect system protection functions.
- Supports remote power on/ off functions via computer monitoring.

Please see **Figure 2-1** for the APF system block diagram. The APF system is composed of a fixed-type module, a LCM (Liquid Crystal Monitor) and a system cabinet. The external CT is used for the detection of load current in the module and extraction of harmonic components, based on which, the main power controller controls the main power circuit to generate reverse harmonic current; in this way, the load-carrying harmonic components are counteracted.

Each standard system cabinet can be connected to up to 7 modules in parallel. As for the non-standard cabinet, the quantity of the modules installed inside could be varied according to different design. Please note that the fixed-type module and the LCM are packed separately. If you would like to buy both of them, you should purchase them separately. The LCM monitors and controls the fixed-type module online. If monitoring function is not required, there is no need to buy and install the LCM.



(Figure 2-1: APF System Block Diagram)

2.2 APF Series Product Category

The APF series product includes the fixed-type module and the LCM. **Table 2-1** lists the fixed-type module's model, capacity and wiring system, as well as the LCM's model information.

Table 2-1: PQC Series APF_ Fixed-type Module & LCM Specifications

Product	Model	Capacity	Wiring System
Fixed-type Module	PQCA-400-50-50FM3 (4)	50A/ 400V	Three-phase three-wire/ four-wire
	PQCA-400-75-75FM3 (4)	75A/ 400V	Three-phase three-wire/ four-wire
	PQCA-400-100-100FM3 (4)	100A/ 400V	Three-phase three-wire/ four-wire
	PQCA-690-100-100FM3	100A/ 690V	Three-phase three-wire
LCM	PQCMA-LCM	N/A	N/A

• Fixed-type Module

The fixed-type module is a terminal-wiring design, which can be easily installed into a standard or non-standard system cabinet. Subject to the customer's requirement of equipment capacity, the modules can be easily connected in parallel for capacity expansion.

The module is available in two wiring modes, i.e. 3P3W and 3P4W, and is available in three specifications in terms of the output current, i.e. 50A, 75A and 100A. The 3P4W module shall be connected to the neutral line, and it is able to compensate the current of neutral line, including zero sequence fundamental current and 3rd harmonic current; however, for the 3P3W module, it is unnecessary to connect the neutral line, and the module is unable to compensate the current of neutral line, such as zero sequence fundamental current and 3rd harmonic current, which are generated by single phase loads.

Figure 2-2 shows the fixed-type module.



(Figure 2-2: External View of 75A Fixed-type Module)

• System Cabinet

The fixed-type module and LCM can be easily installed in any standard or non-standard system cabinet that has the correct size. For 3P4W application, the cabinet must be connected to the neutral line and equipped with 3P4W modules; for 3P3W application, the cabinet is unnecessary to be connected to the neutral line but must be equipped with 3P3W modules. **Figure 2-3** shows the standard system cabinet.

The system capacity depends on the specifications & quantity of the modules installed in the system cabinet. Customers can depend on their capacity requirements to determine the required quantity of the modules and the required system cabinet, or consult the local distributor about the required capacity.



(Figure 2-3: External View of the Standard System Cabinet)

2.3 Functions & Features

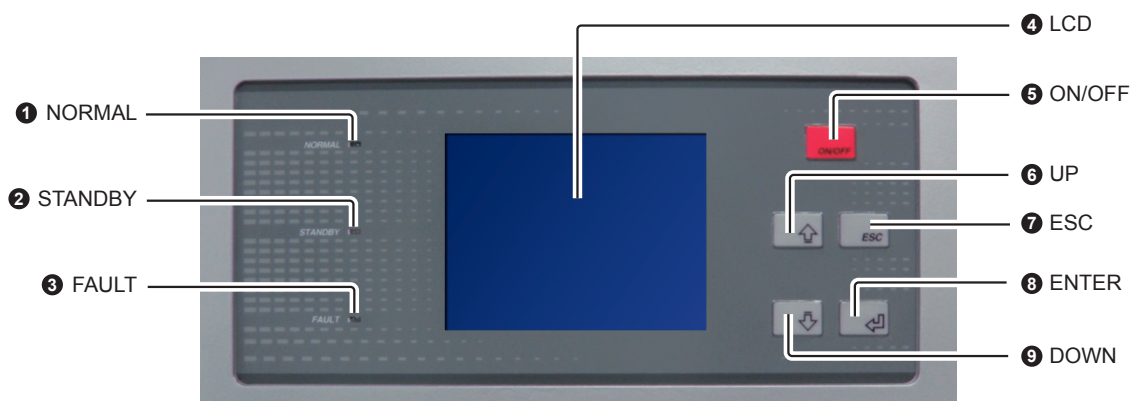
- Multifunction: the APF can simultaneously realize the purposes of harmonic, reactive and three-phase unbalance control.
- Superior harmonic control effects: up to 97% harmonics of the system can be effectively filtered.
- Excellent compensation of reactive power: the device can realize rapid (ms-grade response), precise ($-0.99 < PF < 0.99$) and bi-directional (both capacitive and inductive compensations) reactive power control.
- Outstanding compensation of unbalanced three-phase: the device can realize correction for either active or reactive unbalance, and can eliminate the neutral current (for the three-phase four-wire series only).
- Wide input voltage and frequency range, suitable for the applications with diesel generators and harsh power supply conditions.

Module Type	Upper Limit	Lower Limit
400V Module	Line Voltage: 456V	Line Voltage: 308V
690V Module	Line Voltage: 880V	Line Voltage: 432V

- Low power loss (lower than 3% of rated device power) and actual efficiency >97%.
- Sound stability: the device acts as an infinite impedance to the power grid system and has no effect on the impedance of the power grid system; it is able to produce accurate and flawless output waveform, which has no effect on other equipment.
- Simple and flexible applications: thanks to the modular design, it can be easily embedded into other cabinets to work with PDU.
- Wide capacity coverage: for a single system cabinet, its capacity depends on the quantity of the installed modules; for parallel, its capacity is unlimited since there is no limited connection for parallel system cabinets.
- Applicable to all work conditions: the device is able to operate under high temperature up to 50°C and salt spray corrosive conditions, can withstand grade-9 seismic intensity and is compatible with the diesel engine generating system.
- User-friendly interface (in both Chinese and English): event log, automatic fault alarm, alarm history and other parameter setting functions.
- Complete functions: automatic self-checking start, settable soft start time, emergency stop (E.P.O.), etc.

2.4 Mechanism & Appearance

2.4.1 LCM (Liquid Crystal Monitor)



(Figure 2-4: LCM_Front View)

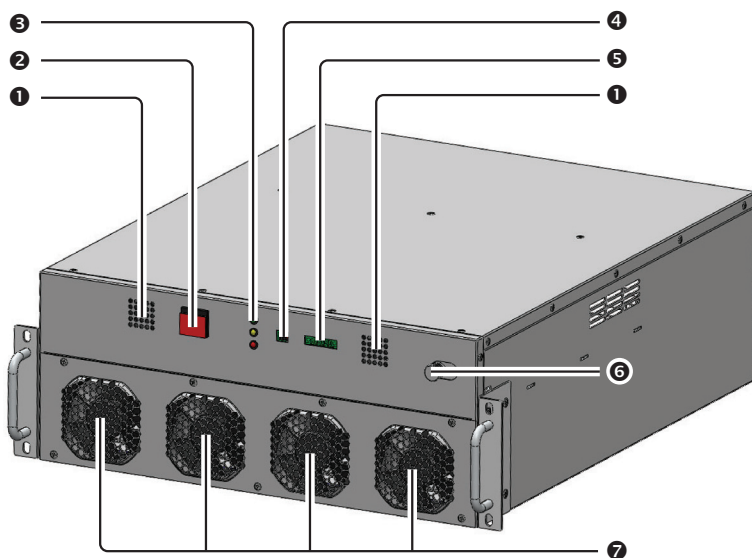
Item	Name	Description
①	NORMAL LED (green)	Illuminates when the APF system is normal.
②	STANDBY LED (yellow)	Illuminates when the APF system is in standby status.
③	FAULT LED (red)	Illuminates when the APF system has abnormalities.
④	LCD Display	Displays both Chinese and English fonts.
⑤	ON/ OFF Key	Press and hold the key for 3 seconds to switch on/ off the APF system.
⑥	UP Key	Press the key to move the menu items upward or to increase the parameter setting value.
⑦	ESC Key	Press the key to return to the previous menu or to save the parameter setting when exit.
⑧	ENTER Key	Press the key to go to the next page or to confirm the parameter setting.
⑨	DOWN Key	Press the key to move the menu items downward or to reduce the parameter setting value.



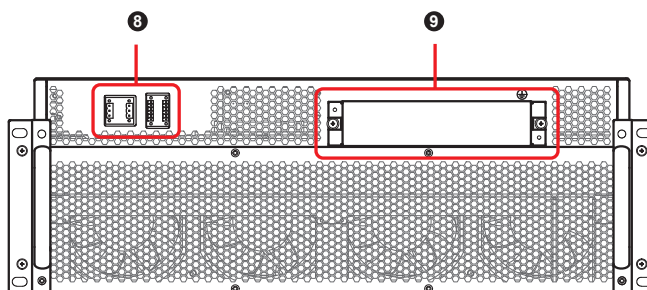
(Figure 2-5: LCM_Rear View)

Item	Name	Description
1	DATABUS	The communication interface between the LCM and the fixed-type module.
2	RS232	The standard RS232 interface.

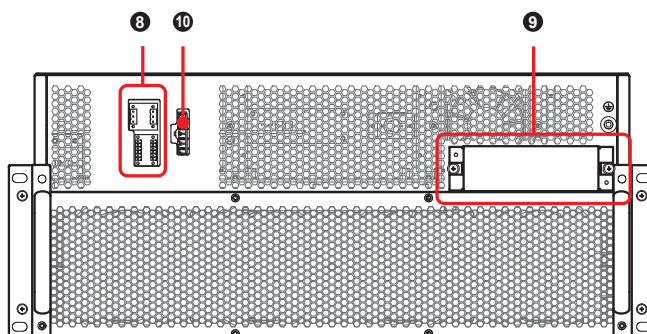
2.4.2 Appearance & Dimensions of the Fixed-type Module



(Figure 2-6: External View of the Fixed-type Module)



Rear View_400V Module



Rear View_690V Module

(Figure 2-7: Rear View of the Fixed-type Module)

Item	Name	Description
①	DC Fans	DC fans for heat dispersion.
②	E.P.O Button	Emergency power off button. Press it to shut down the device and release it to switch on the device.
③	LED Indicators	<ul style="list-style-type: none"> Green (Normal): the module is functioning properly. Yellow (Standby): the module is in standby mode. Red (Fault): the module has abnormalities.
④	DIP Switches	Set the module ID and terminal resistance.
⑤	Databus Communication Ports	The ports are reserved for module settings, program update, etc.
⑥	Mechanical Lock	The module shall be plugged into the system cabinet and push the lock rightward and tightly fix the lock; otherwise, the fault alarm will be triggered and the module cannot work properly.
⑦	DC Fans	DC fans for heat dispersion.

Item	Name	Description
⑧	Signal Transfer Terminals	Include communication terminals and CT terminals.
⑨	Main Power Input Terminals	For main power input wiring (R/ S/ T/ N/ PE)
⑩	Auxiliary Power Terminals	For connecting 230V auxiliary power.



NOTE: Since the DATABUS port is provided with insulation isolation, it is safe to touch it.

Table 2-2: PQC Series APF_ Fixed-type Module Dimensions & Weight

Model	Dimensions (W×D×H)	Weight
PQCA-400-50-50FM3	440 x 522 x 174 mm	40Kg
PQCA-400-50-50FM4	440 x 522 x 174 mm	40.5Kg
PQCA-400-75-75FM3	440 x 522 x 174 mm	41.5Kg
PQCA-400-75-75FM4	440 x 522 x 174 mm	42Kg
PQCA-400-100-100FM3	600 x 725 x 220 mm	63Kg
PQCA-400-100-100FM4	600 x 725 x 220 mm	65Kg
PQCA-690-100-100FM3	600 x 725 x 270 mm	78Kg

2.5. Package Inspection



NOTE: The APF includes the fixed-type module and the LCM, which are packed separately. If you would like to buy both of them, you should separately purchase them.

• Exterior

Some unpredictable situations might occur during transportation. It is recommended that you inspect the exterior packaging after receiving the fixed-type module and the LCM. If you notice any damage, please contact your supplier.

• Interior

1. Please check the rating labels of the fixed-type module and the LCM to see if the products conform to your order.
2. Please check if any parts are damaged or loose.
3. Please check if the accessories are complete.

4. Please see the tables below for the standard accessories of the fixed-type and the LCM.
5. If any damage is found, please contact your supplier.
6. To return goods, please use the original packing material to pack the fixed-type module, the LCM and all standard accessories.

Table 2-3: Standard Accessories of the Fixed-type Module

No.	Item	Quantity
①	User Manual	1 PC
②	CT Wire	1 PC
③	Communication Wire	1 PC
④	AC Power Wire (for 690V 100A)	1 PC
⑤	Screw M6*16L	4 PCS

Table 2-4: Standard Accessories of the LCM

No.	Item	Quantity
①	LCM Connection Wire	1 PC
②	Fastening Screw	4 PCS

Chapter 3 : Installation and Wiring

The APF 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, the fixed-type module can be installed in a customized cabinet or standard cabinet, and flexible configuration and on-site capacity expansion can be realized based on the current and subsequent capacity requirements.

3.1 Pre-installation Confirmation

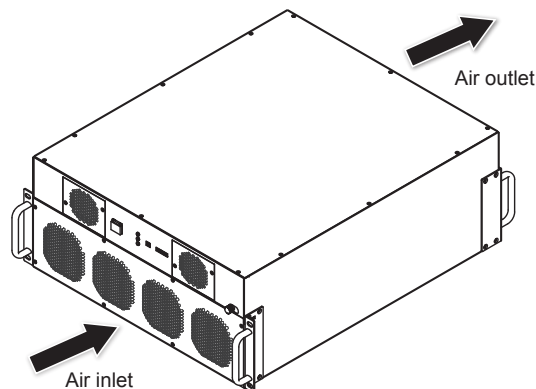
Since the installation environment varies for different users, please be sure to read this Manual carefully before installation. All installation, assembly and start-up work must be carried out by the qualified professional personnel. If the work is to be carried out by the customer, it shall be under 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 2-2** for the APF weight.

3.2 Installation Environment

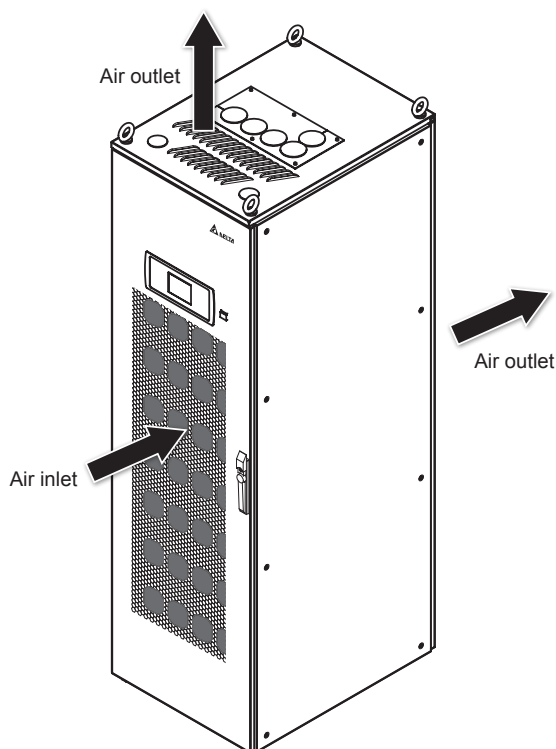
1. The APF device can only be installed indoors. Do not install the device for outdoor use. Be sure to consider the IP21 protection degree of the device while installing. For a higher protection degree requirement, please contact the distributor.
2. The APF device shall not be installed in a place close to dust sources or subject to heavy environmental pollution. Because the conductive dust will damage the device, make sure the installation place is free of conductive dust.
3. Make sure the transport route and placement location are firm and big enough to accommodate the APF system cabinet and forklift.
4. Since some noise can be generated during the operation of the APF, please take the noise effects into account when choosing the installation position.
5. Keep the installation area clean. Please note that wiring routes must be hermetic to prevent possible damage from rodents.
6. Make sure enough space is left in the installation place for future maintenance. For the purpose of ventilation, avoid installing the APF against the wall. A space of 1500mm shall be left in front of the device for front operation, maintenance and wiring.
7. Since some heat can be generated during the operation of the APF, please make sure the cooling system of the installation environment is sufficient for heat dissipation, so that the ambient temperature will not exceed the normal working temperature of the device.
8. The device is equipped with cooling fans, and is designed with air inlet in the front and air outlet at the back; thus, it is recommended to leave at least a 500mm space both at the front and the back for ventilation purpose. **Figure 3-1** and **Figure 3-2** illustrate the air inlet

& outlet schematic diagrams of the fixed-type module and system cabinet.

9. Every module and system cabinet have their minimum vent flow requirements, which shall be met to guarantee the normal cooling of the device. The air must be properly cooled and treated to be free of conductive particles, heavy dust or hazardous gas before being fed into the device through the air inlet.
10. The working temperature range of the APF is $-10^{\circ}\text{C} \sim 50^{\circ}\text{C}$, beyond which the APF will not work.
11. Do not use the device in a place above an altitude of 1000m. If such a installation place can not be avoided, please consider derating, or contact the distributor.
12. The fixed-type module is recommended to be used in a customized system cabinet with at least IP20 protection degree, in which, a distance of at least 10mm shall be kept between the conductive metal cabinet parts and the live terminals of the module.
13. When the fixed-type module is used separately, the live terminals at the back of the module must be provided with insulation caps. Please ask your supplier for insulation caps.



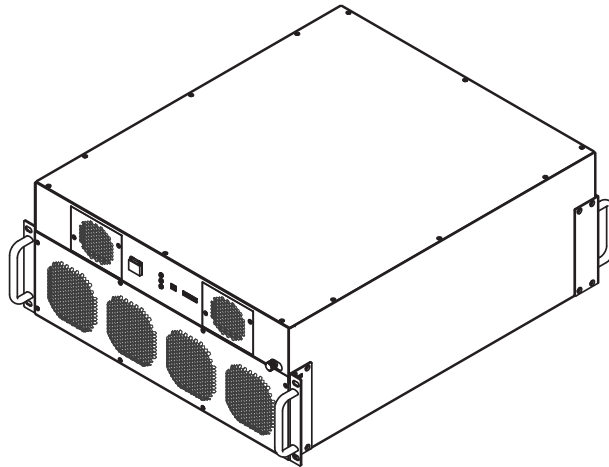
(Figure 3-1: Air Inlet & Outlet Schematic Diagram of the Fixed-type Module)



(Figure 3-2: Air Inlet & Outlet Schematic Diagram of the System Cabinet)

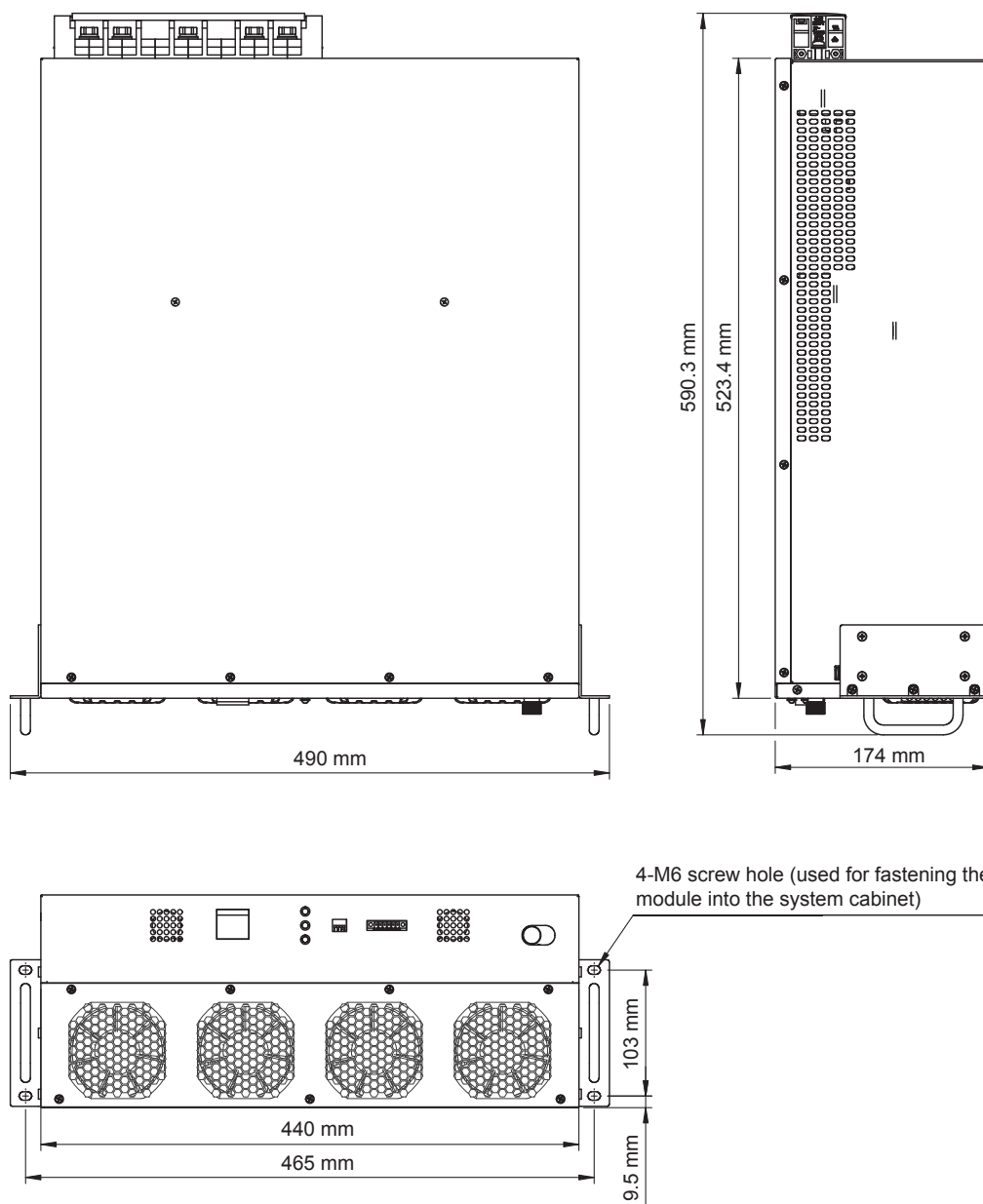
3.3 Fixed-type Module Structure & Wiring

3.3.1 Fixed-type Module Structure

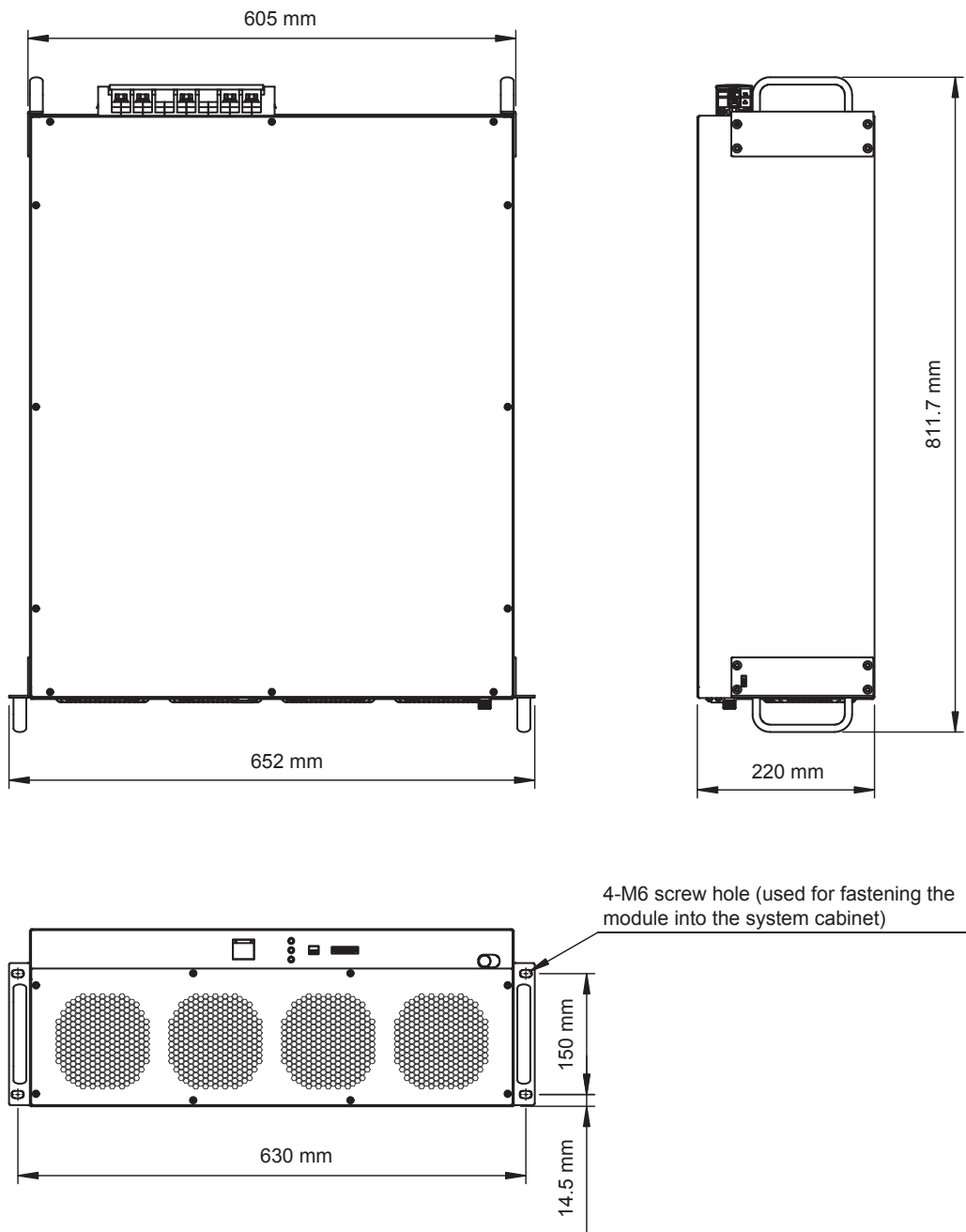


(Figure 3-3: Side View of the Fixed-type Module)

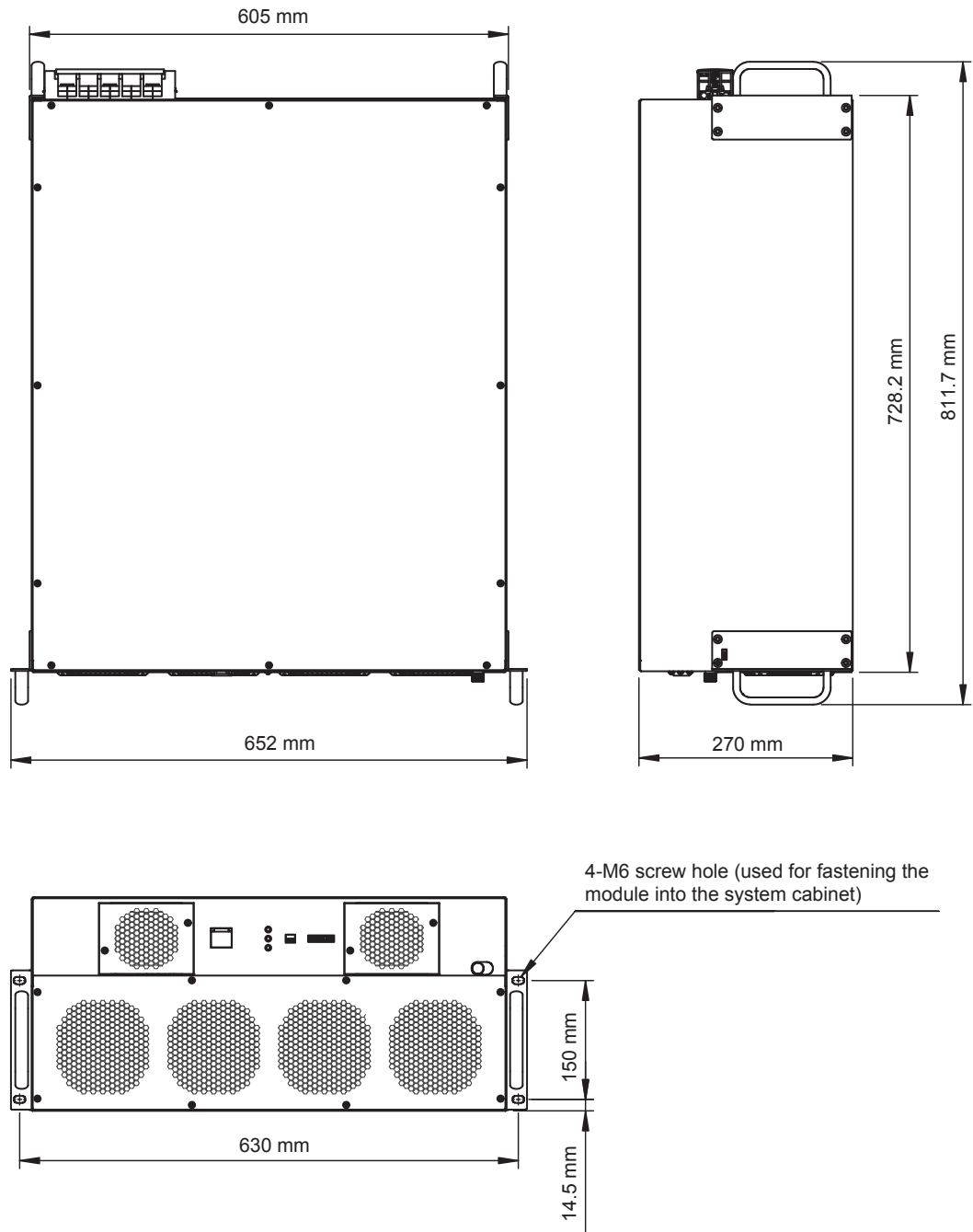
- Fixed-type module installation dimensions diagram (three sizes, 400V below 75A (including) module, 400V 100A module and 690V 100A module).



(Figure3-4: Installation Dimensions Diagram_ 400V below 75A (including) Module)



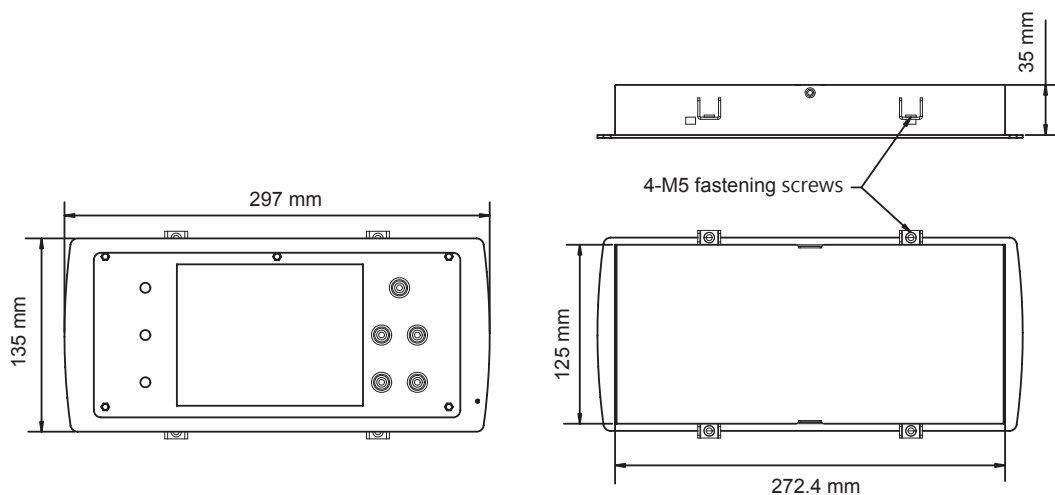
(Figure 3-5: Installation Dimensions Diagram_ 400V 100A Module)



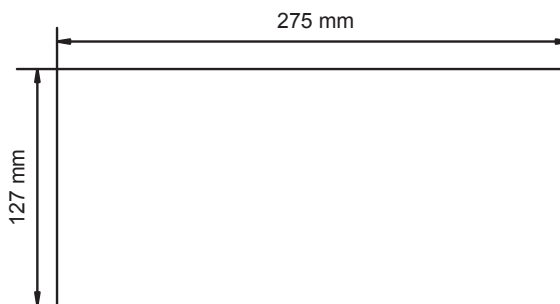
(Figure 3-6: Installation Dimensions Diagram_ 690V 100A Module)

3.3.2 LCM Structure

When installation, please use the provided fastening screws (packed in the LCM package) to install the LCM on the system cabinet. After installation, use the provided LCM connection wire (packed in the LCM package) to connect the LCM's DATABUS port and the fixed-type module's communication terminals.



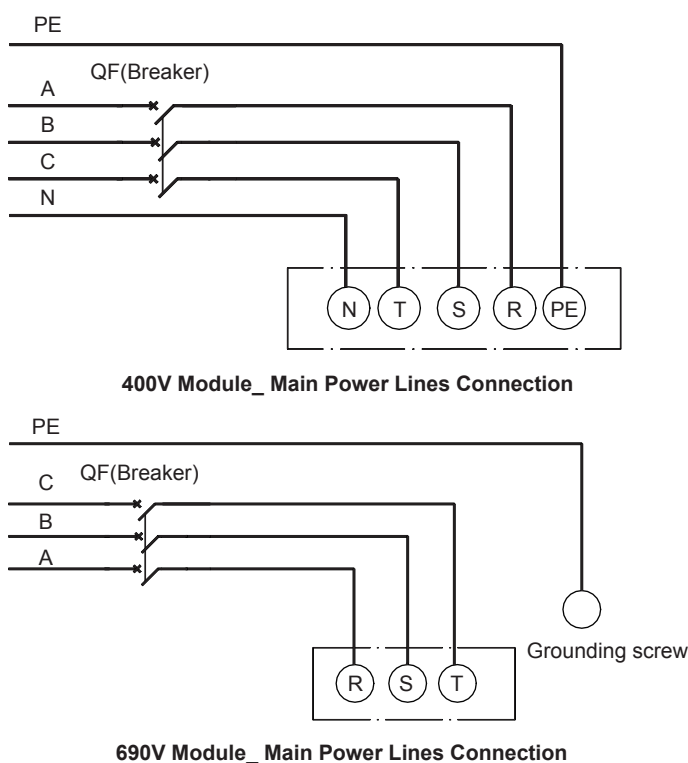
(Figure 3-7: LCM Structure and Dimensions)



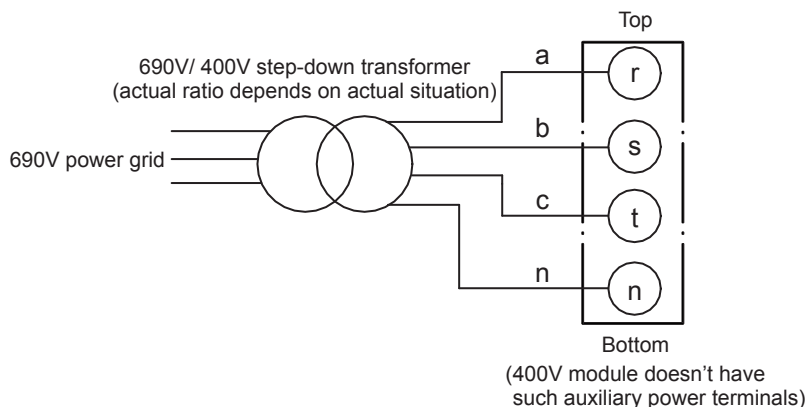
(Figure 3-8: Mounting Hole Dimensions of the LCM)

3.3.3 Wiring of the Fixed-type Module

1. Before connecting the cables or electronics, please be sure to cut off the input power of the fixed-type module to avoid accidents.
2. The fixed-type module must be grounded properly to avoid any possible damage caused by current leakage.
3. Check the diameter marking of the fixed-type module's input wires, and make sure the wire diameter and phase sequence are correct. Please refer to **Figure 3-9** to perform wiring and refer to **Table 3-1** for the specifications of the power lines. Please note that 690V module should connect with 230V auxiliary power (see **Figure 3-10**).



(Figure 3-9: Connection Diagram of Main Power Lines on Rear Panel of the Fixed-type Module)



(Figure 3-10: 690V Module Auxiliary Power Connection Diagram)



NOTE:

1. The 690V module can function normally only after it has the input of the auxiliary power.
2. The auxiliary power's line voltage should be in the range of AC 342V~430V (RMS value) and phase voltage should be in the range of AC 198V~250V (RMS value); otherwise, the module will be burned out. The actual ratio of the auxiliary power's transformer depends on on-site situation; if the transformer is not installed, voltage protection devices should be additionally used. Either of which aims to secure the auxiliary power's voltage not out of the range.
3. Each module's required auxiliary power is around 400VA (3-phase power).
4. The calculation of total capacity of the step-down transformer connected to the auxiliary power should take the quantity of the fixed-type module and the required power of other auxiliary devices (such as heat dispersion fan used for cooling down the system cabinet) into consideration, and a certain amount of margin should be reserved.

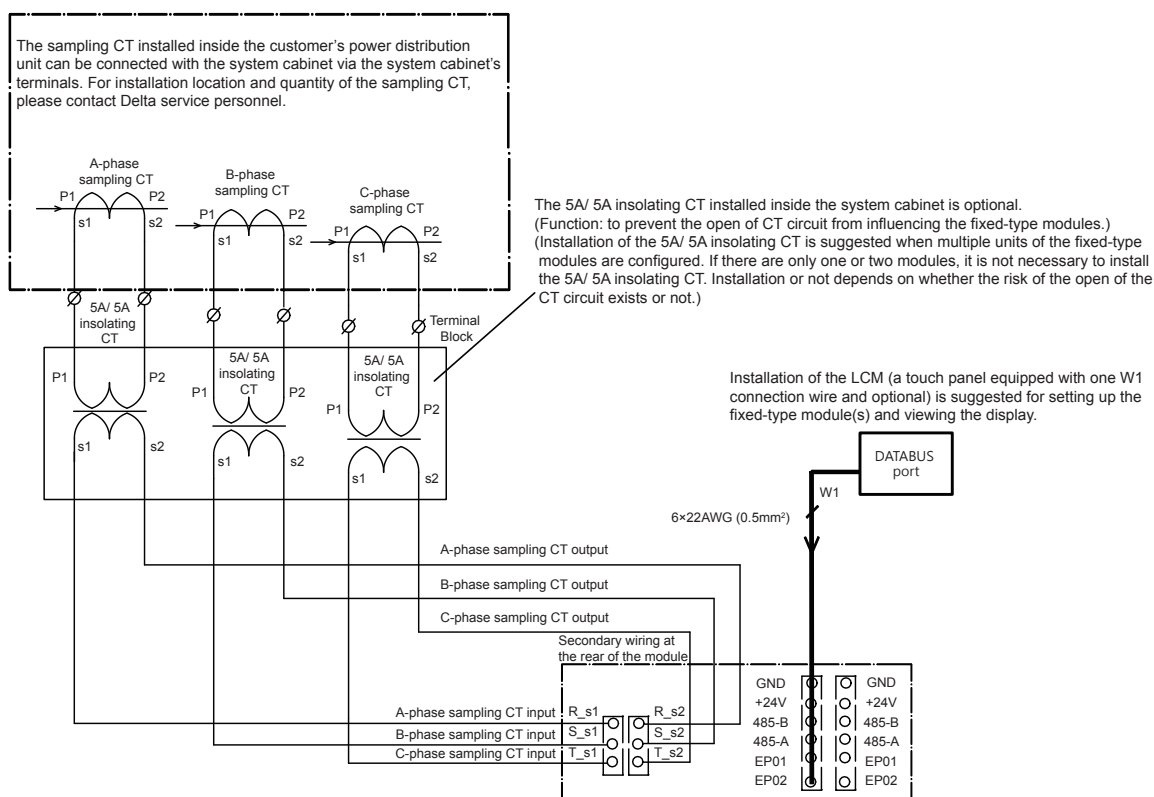
Table 3-1: Fixed-type Module Wiring Table

Module Type	50A	75A	100A
R/ S/ T/ N Current	50A	75A	100A
R/ S/ T/ N Wire Diameter (Cables with temperature resistance up to 105°C are suggested)	25mm ² (105°C) or 35mm ² (70°C)	35mm ² (105°C) or 50mm ² (70°C)	50mm ² (105°C) or 70mm ² (70°C)
PE (protective earthing) (Cables with temperature resistance equal to those of R/ S/ T/ N cables are suggested)	16mm ²	25mm ²	35mm ²

**NOTE:**

The selection of wire diameter shall be verified in this manner: under the highest ambient temperature, when the highest harmonic compensation current and the maximum content of high-order harmonic exist, and several modules are synchronously running with full load, after long-time operation, the insulation layer temperature of the cable with the most severe heating conditions (the innermost cable in case of several cables) shall not exceed the permissible longtime working temperature. Connect the power lines to the switchgear of the PDU cabinet, and finally to the electrical access point of equipment on the bus-tie.

4. Check the marking of wires connecting the fixed-type module and the CT, and make sure the wire diameter and phase sequence are correct. Connect the input and output wires of the CT according to **Figure 3-11**.



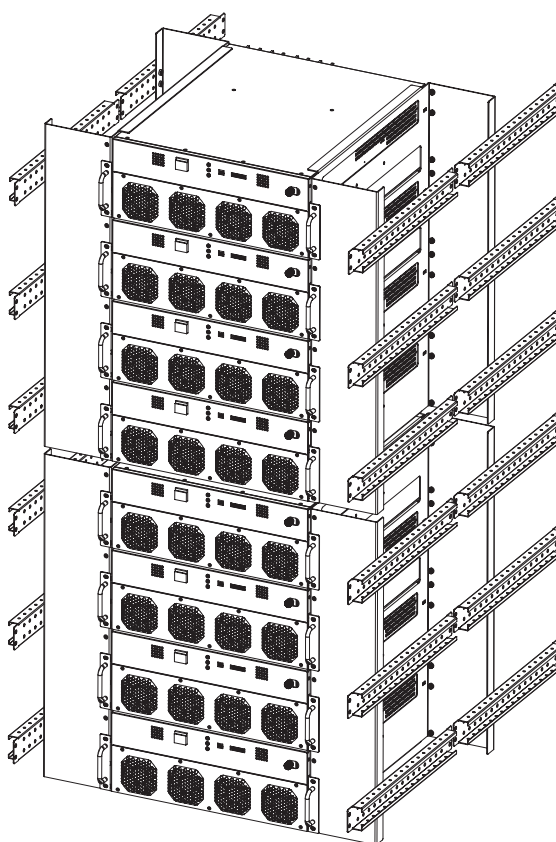
(Figure 3-11: Wiring Connection between the Rear of the Fixed-type Module and the CT)

5. The fixed-type modules can be directly stacked while installing with no upper limit of modules connected in parallel. Please define the upper limit of the fixed-type modules installed in a single cabinet based on the installing height in the PDU cabinet. **Figure 3-12** is the installation diagram of multiple units of the fixed-type modules. Please refer to **Figure 3-13** for the connection among the CT, fixed-type modules and the LCM. Use the provided LCM connection wire (packed in the LCM package) to connect the LCM's DATABUS port and the fixed-type module's communication terminals. When several fixed-type modules are connected in parallel, it is unnecessary to connect other modules to the LCM connection wire; instead, the communication can be realized via the connection between the internal wires of the system.

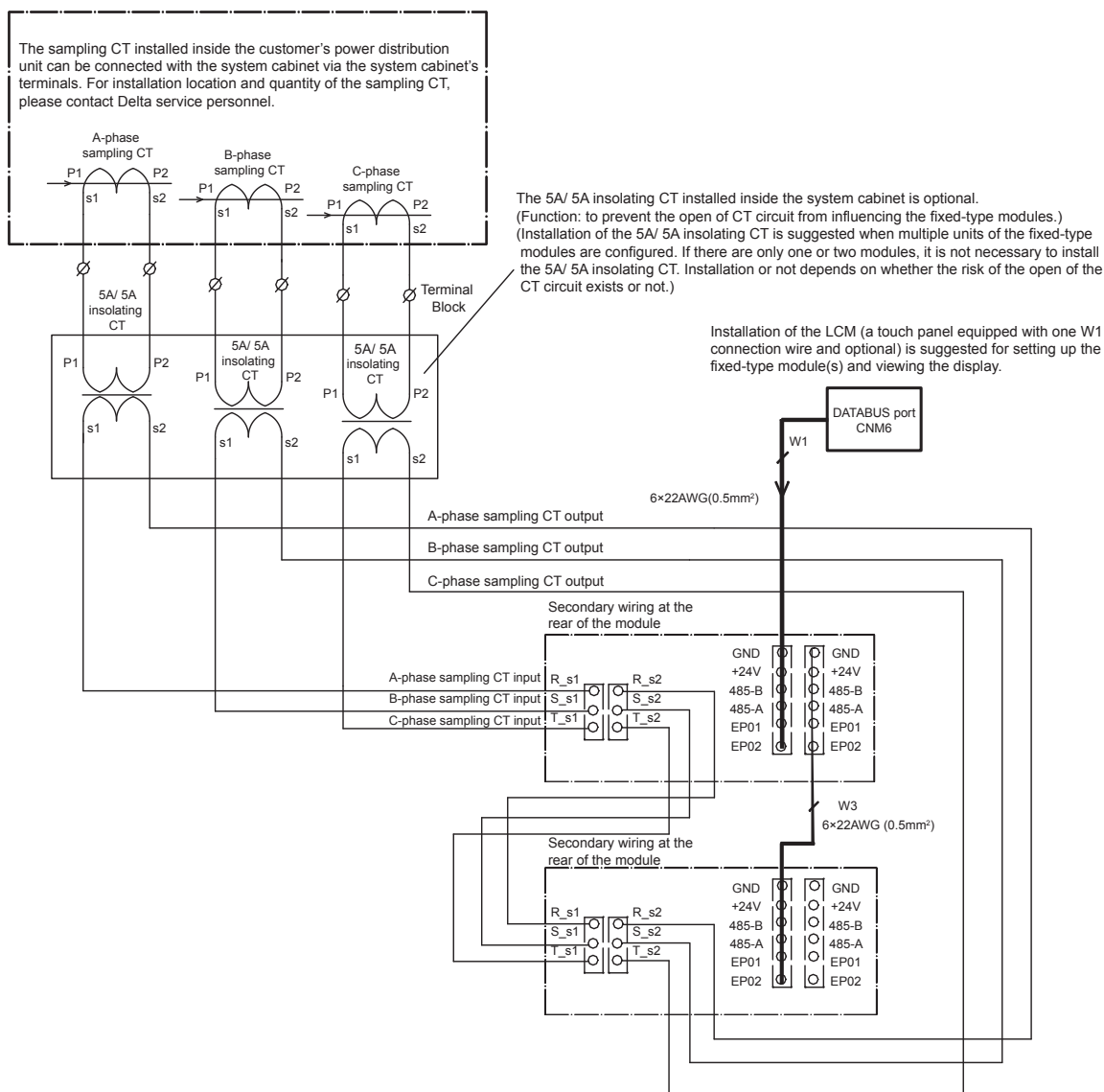


NOTE:

The LCM connection wire (packed in the LCM package) is part of the secondary circuit, and shall be kept an insulation distance no less than 5.5mm from the primary circuit of the main power.



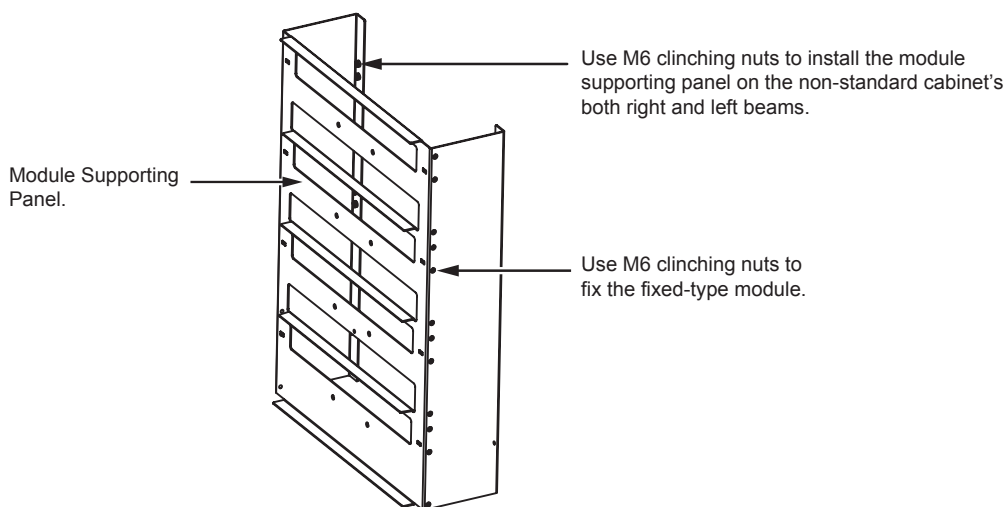
(Figure 3-12: Fixed-type Modules & System Cabinet Installation Diagram)



(Figure 3-13: Wiring Connection among the Rear of the Fixed-type Modules, the LCM and the CT)

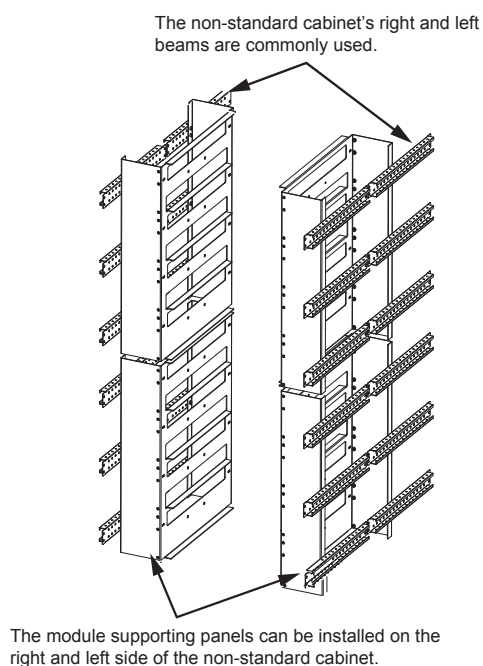
6. Fixed-type module's supporting methods and installation procedures:

- 1) **Figure 3-14** shows the design of the module supporting panel, which is a C shape framework with a size of 800mm wide that can accommodate at maximum four fixed-type modules.



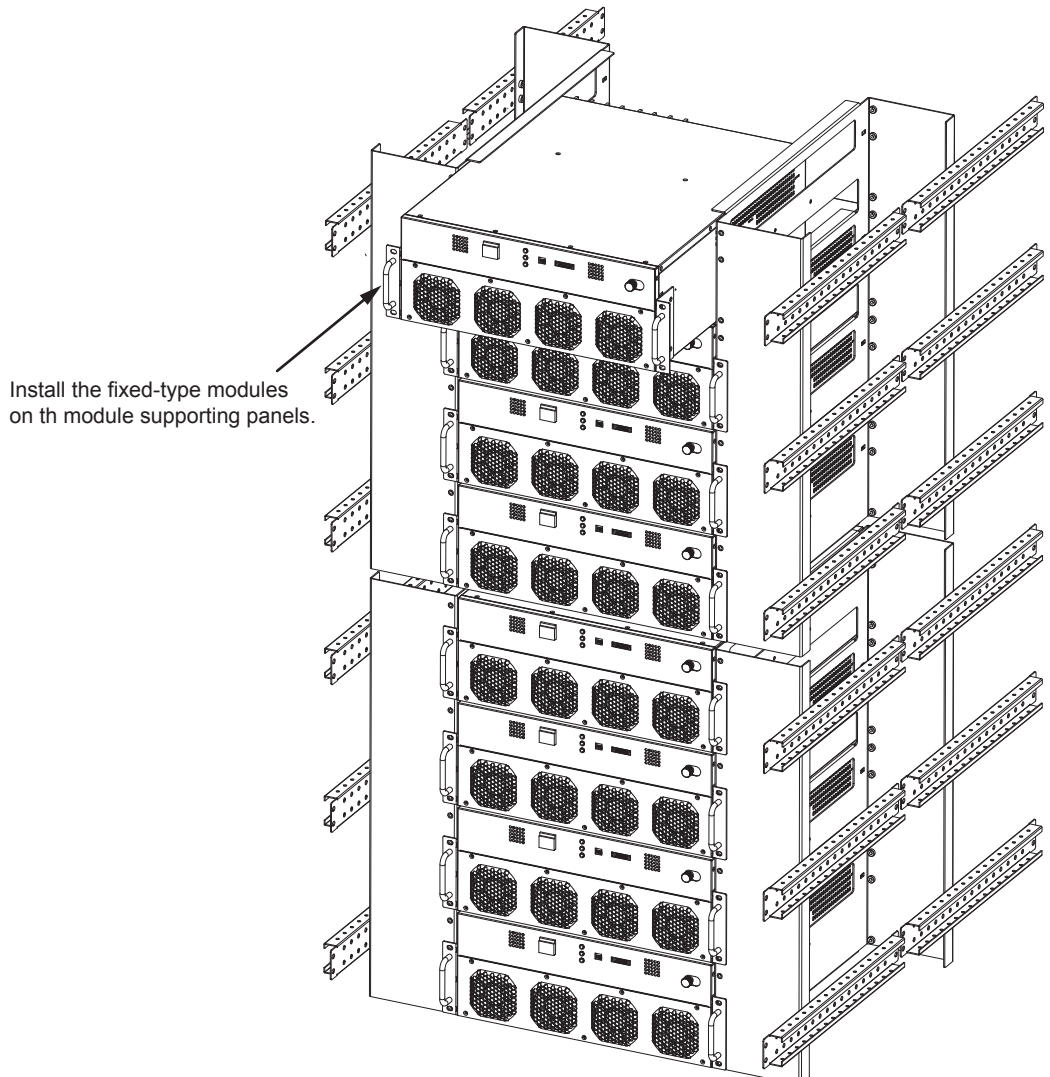
(Figure 3-14: Fixed-type Module Installation Step 1)

- 2) Install the module supporting panels on the non-standard cabinet's both right and left beams. Please see **Figure 3-15**.



(Figure 3-15: Fixed-type Module Installation Step 2)

- 3) Install the fixed-type modules on the module supporting panels. Please see **Figure 3-16**.



(Figure 3-16: Fixed-type Module Installation Step 3)

3.4 CT Installation & Wiring for Current Detection of Harmonic Source

3.4.1 CT Selection Precautions

1. The appropriate rated ratio of primary to secondary current shall be determined. The primary current is recommended to be $1.2 \cdot I_n$ (the actual rated current of the testing point).
2. The rated voltage is 0.5KV or 0.66KV.
3. The secondary current is 5A or 1A.
4. The nominal secondary capacity (rated load) of the CT shall meet the requirement of secondary impedance ($\geq 5VA$ when the secondary current is 5A). The capacity and the maximum one-way wiring length from the CT to the active power filter shall be calculated according to the following formula:

$$L_{\max} = \frac{P_{ct} - P_1}{I^2} \cdot \frac{S}{\rho} \cdot \frac{1}{2}$$

Wherein:

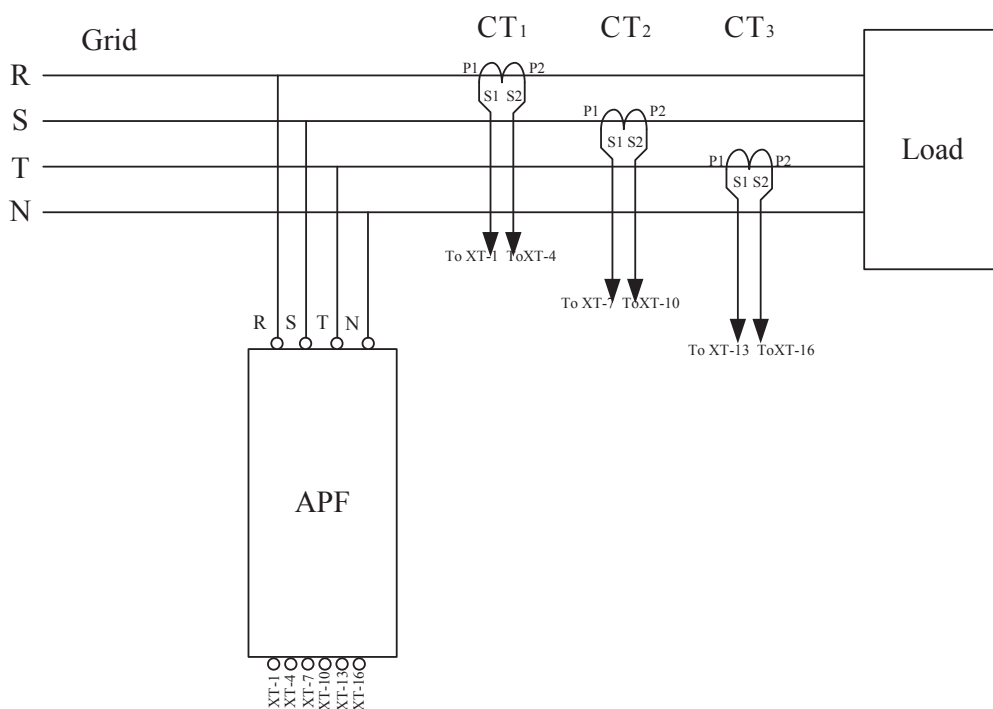
L _{max} :	the maximum one-way wiring length from the CT to the system cabinet (m);
P _{ct} :	the nominal secondary capacity of the CT (VA);
P ₁ :	the capacity loss and the internal impedance of the system cabinet (each module's internal loss is around 2VA);
I:	the secondary current of the CT (A);
S:	the cross-section area of the copper conductor (mm ²);
ρ:	the resistivity of the copper conductor (calculated according to 0.0178 Ω× m/mm ²);

3.4.2 Basic CT Installation & Wiring

The CT for current detection shall be located on the side of the harmonic source to feed the detection signal to the APF, as shown in **Figure 3-17**.

- A set of three CTs must be provided for current detection of the harmonic source.
 - The CTs must be oriented accurately.
 - The phase sequences of the detection signal of the CTs must not be exchanged.
1. The secondary output S1 of CT₁ for R-phase detection must be connected to the terminal board XT-1, and the S2 outgoing line must be connected to the terminal board XT-4.

2. The secondary output S1 of CT₂ for S-phase detection must be connected to the terminal board XT-7, and the S2 outgoing line must be connected to the terminal board XT-10.
3. The secondary output S1 of CT₃ for T-phase detection must be connected to the terminal board XT-13, and the S2 outgoing line must be connected to the terminal board XT-16.



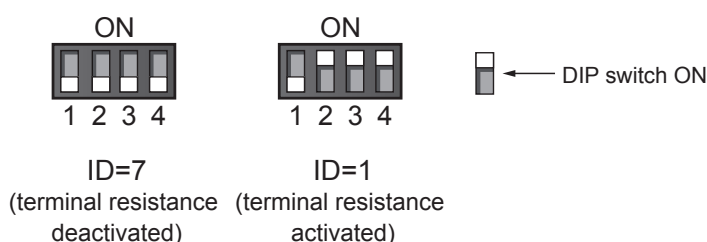
(Figure 3-17: Basic CT Installation and Wiring Diagram)

Chapter 4 : APF Operation Procedure

4.1 Checks Before Start-up

- Make sure each E.P.O button is released.
- Make sure each module is plugged in place and each mechanical lock is turned to the LOCK position and fastened.
- Make sure each 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 positions of DIP switches 1~4.



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

Table 4-1 Positions of DIP Switches

Position	Description
DIP Switch 1	Setting of the first digit of ID, which is valid when it is slid to the lower position
DIP Switch 2	Setting of the second digit of ID, which is valid when it is slid to the lower position
DIP Switch 3	Setting of the third digit of ID, which is valid when it is slid to the lower position
DIP Switch 4	Setting of the terminal resistance

The module ID setting of the system cabinet shall be made in the sequence of the module No. marked on the side of the system cabinet where the module locates, that is, PM1 ~ PM7 from top to bottom of the system cabinet, and the ID shall be set accordingly. The terminal resistance DIP switches of all modules shall be set to the lower position, except that of the module PM7 which shall be set to the upper position, i.e., the terminal resistance DIP switch of the power module which locates the furthest from the LCM shall be set to the upper position.

If several system cabinets are connected in parallel and the communication lines are interlinked, make sure the ID of all modules are not repeated, and the terminal resistance DIP switch of the module which locates the furthest from the LCM is set to the upper position.

- The ID of all modules are not repeated.
- The module quantity and compensation capacity are confirmed.
- The connections on the rear panel are made properly.
- The connections of the LCM communication ports are made properly.
- Close the front door.

4.2 Start-up Procedures

1. Switch the main breaker of the system to the ON position.
2. Switch the breakers corresponding to all the modules of the system to the ON position; here, the internal auxiliary power supply of the modules will be started, the fans will rotate, check if the yellow LED indicators in front of the modules are lit. The LCM will go into the Start screen, communicate with the modules, read the system messages and check there is no fault.
3. Close the front door.
4. Set the system into the operating mode. Please refer to **Chapter 5: LCM Display and Settings** for the detailed LCM settings.
5. Press and hold the ON/ OFF button on the LCM panel for 3 sec, and release it after the buzzer rings, now, the system starts.
6. When the system starts and works properly, the green LED indicator on the LCM will be lit.

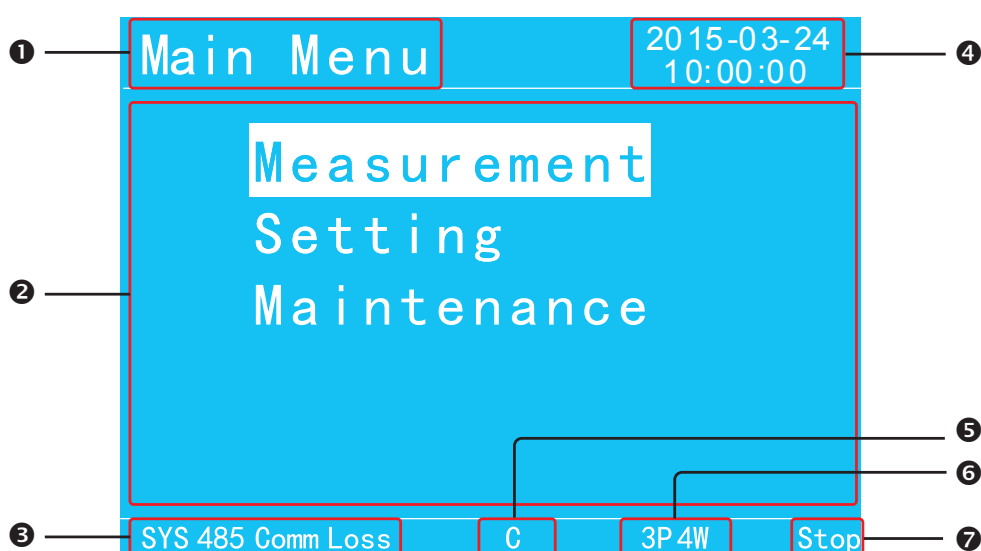
Chapter 5 : LCM Display and Settings

The control panel is mainly used to monitor the APF system parameters and display the status and settings of the system. It is available for two levels of user: User and Administrator.

The User is able to directly view the detailed displayed parameters in the measurement page and the user settings.

The Administrator is protected by password. The APF settings and maintenance page can only be set and viewed after entering the Administrator password.

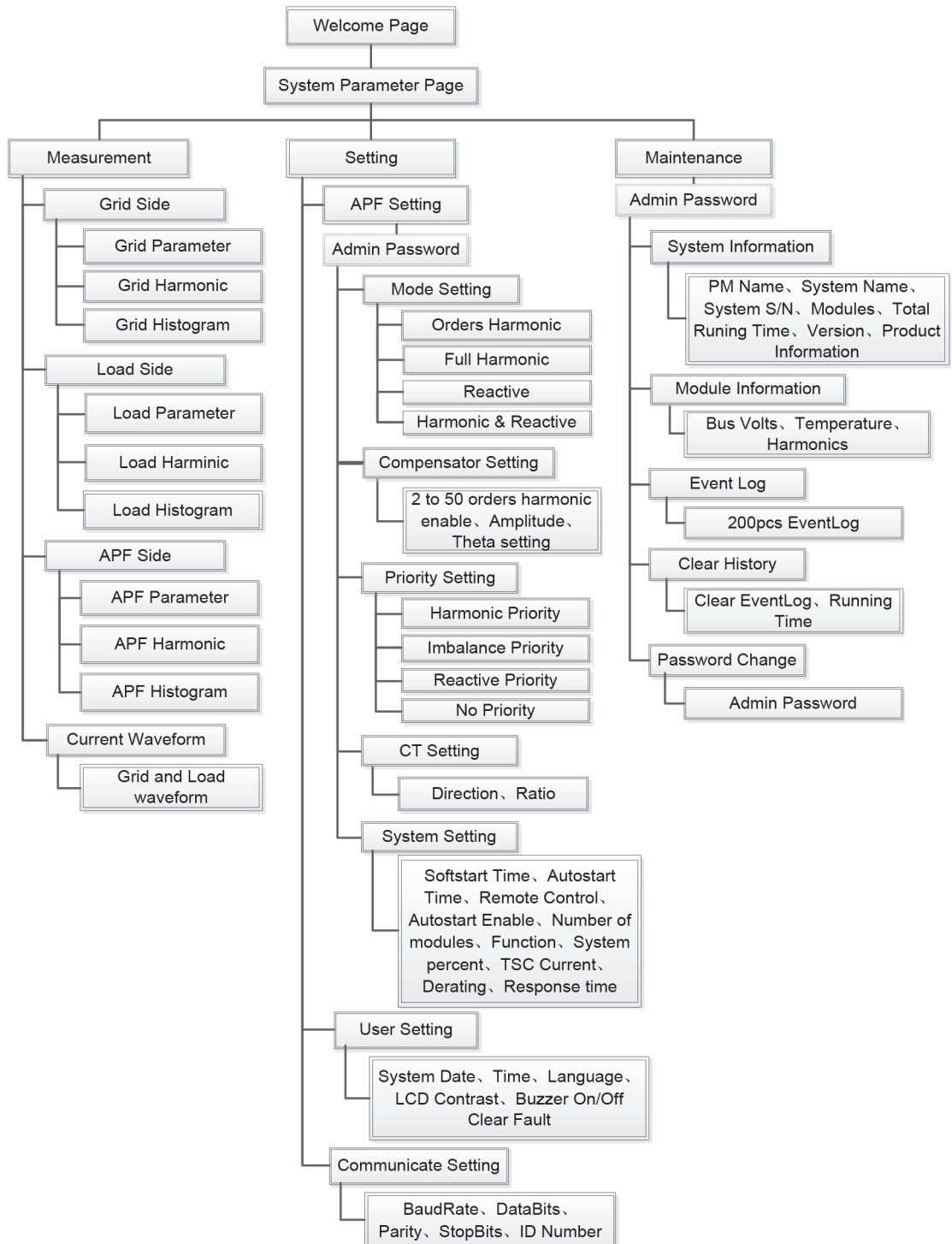
5.1 Description of LCM Display



(Figure 5-1: LCM Display)

Item	Description
①	Displays the title.
②	Displays the contents relevant to the title.
③	Displays the real-time fault message of the system.
④	Displays the time of the system.
⑤	Displays the system functions (C: Compensator/ S: Harmonic Source).
⑥	Displays the system wiring mode (three-phase three-wire/ three-phase four-wire)
⑦	Displays the system operating status (running/ stop).

5.2 LCM Display Hierarchy



(Fig. 5-2: LCM Display Hierarchy)

Chapter 6 : Maintenance

- **Cleaning of the APF:** please contact service personnel for regular cleaning of the APF (every 6 months; however, it is recommended that the customer clean up the dust on the baffles of air inlet and outlet every 3 months).
- **Regular inspection of the APF:** please contact service personnel for maintenance of the APF (every 6 months).

Chapter 7 : Troubleshooting

If any fault message 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 lines are not connected properly. 2. There are repeated module IDs.	1. Check the communication lines for reliable connection. 2. Check the DIP switches of every module.
2	Grid Phase Sequen	Wrong wiring.	Please check the wiring and phase sequence. If anything wrong is found, please contact service personnel.
3	E.P.O Fault	The E.P.O button on the module or on the system cabinet is pressed.	Check all E.P.O buttons and make sure they are in the OFF status.
4	PM Numbers Error	1. Incorrect configuration of module quantity in the LCM. 2. There are repeated module IDs.	1. Compare the module quantity with the configuration of module quantity in the LCM. 2. Check the DIP switches of every module.
5	Fuse Blowout	The input fuse is broken.	Please contact service personnel.
6	Ambient OTP	1. The air vents are blocked. 2. The fans do not work. 3. The IGBT is damaged.	Please contact service personnel.
7	BUS OVP/ UVP	Failure of BUS capacitor.	Please contact service personnel.
8	Fan Fail	Failure of fans.	Please contact service personnel.
9	Curr Detect Fail	The CT is not connected properly.	Check the CT wiring according to the CT wiring diagram.
10	Mechanic Unlock	The mechanical lock is not in place.	Check the mechanical lock.

Chapter 8 : 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 should 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.

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