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Delta PQC Series Wall-Mounted Active Power Filter (APF)

User Manual

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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.

Table of Contents

Chapter 1 : Important Safety Instructions

1.1. Safety Precautions

- The Active Power Filter (APF) is designed for industrial applications. It shall be connected to a power grid system, in parallel with harmonic nonlinear loads, as a solution to harmonics mitigation.
- 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 at the top and bottom of the APF for well ventilation and convenient maintenance.
- To minimize fire and electric shock hazards, installation must be conducted by qualified service personnel in a controllable working environment.
- To minimize electric shock hazards, all maintenance work must be carried out by qualified technician. Before maintenance, ensure that all power supply is completely cut off.
- 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 a 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, for instance, a breaker. Besides, take the installation position of the equipment into consideration and choose the protective devices with adequate breaking capacity.
- The capacity of the protective device 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 an external CT for current detection (CT: Current transformer).
- To guarantee sound reliability and avoid overheating, do not block or cover the air inlet and outlet of the APF.
- The working temperature range of wall-mounted APF is -10°C to 55°C, APF starts to de-rate from 50°C, and APF will not work when ambient temperature exceeds 55°C.
- The APF system shall be installed at a place with altitude less or equal 1,000m. Please de-rate APF capacity or consult Delta or Delta distributor if the altitude limit is exceeded.
- When installation, ensure that the height from the ground to the top of the APF is not less than 1800mm. After installation, ensure that no objects are placed on the APF's air outlet; otherwise, the objects might drop into the air outlet to influence the APF ventilation and operation.

1.4. Storage Precautions

- Please use the original packing material to protect the APF in order to avoid damage by rodents.
- If you don't install the APF immediately after receiving it, please store the APF in a dry and ventilated indoor place, where shall be maintained between -40°C and 70°C with relative humidity no higher than 95%.

1.5. Symbols

Item	Symbol	Description
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 button (Emergency Standby)

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 APF are shown as below:

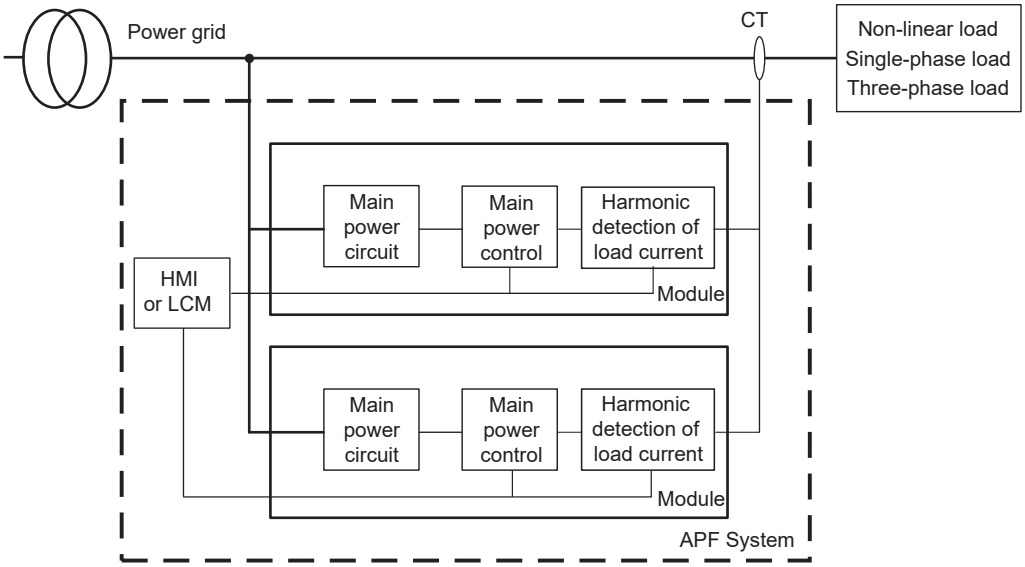
- Compensates 2^{nd} ~ 50^{th} harmonic currents (selectable) .
- Compensates both inductive and capacitive reactive power.
- Correct three phase load imbalance.
- Rapid dynamic responses, stable parameters and good harmonic compensation results.
- High efficiency and low thermal loss.
- The system adopts 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.
- Supports remote power on/ off functions via computer monitoring.

Please see ***Figure 2-1*** for the APF block diagram. The APF system is composed of a wall-mounted APF module (with a Bracket to support wall-mounting structure and provide protection), and a Display. There are two types of Displays, one is Touch Panel HMI (HMI), which is touch-screen type, and the other one is non-touch-screen type, called Liquid Crystal Monitor (LCM).

The external CT is used for detection of load current and feedback to wall-mounted APF module, APF will calculate each order harmonic components, and 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.

Please note that the wall-mounted APF module, the Display and the Bracket are packed separately, so you should purchase them separately.

The wall-mounted APF module can work either alone or in parallel with others. The HMI or LCM monitors and controls the wall-mounted APF module online, one HMI or LCM is able to monitor multiple wall-mounted APF modules.



(Figure 2-1: APF System Block Diagram)

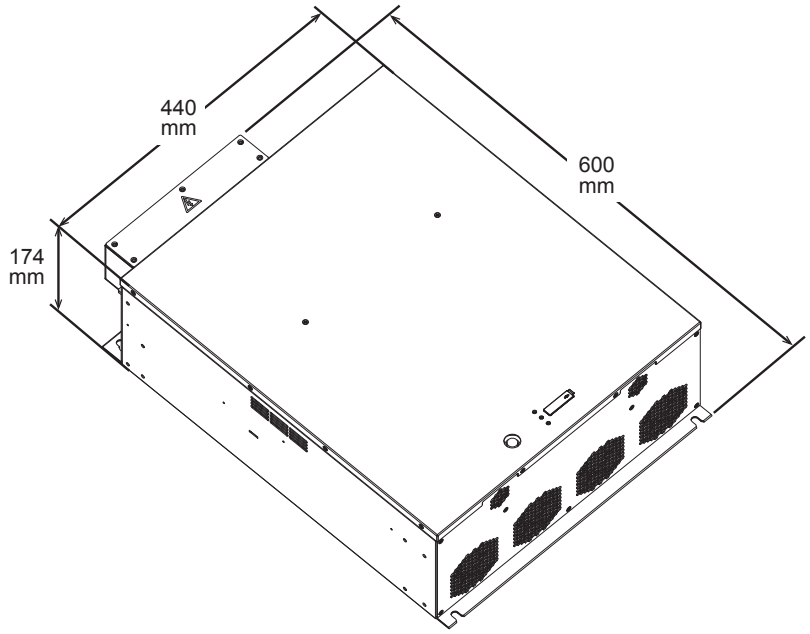
2.2 PQC Series APF Wall-mounted Module Category

The PQC series APF product includes the wall-mounted module, the Display and the wall-mounted Bracket. ***Table 2-1*** lists the wall-mounted APF module's model, capacity and wiring system, as well as LCM, HMI and Bracket information.

Table 2-1: PQC Series APF Wall-mounted Module Specifications

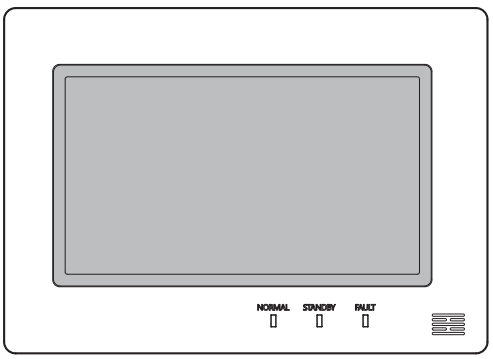
Product	Model	Capacity	System
Wall-mounted APF Module	PQCA-400-50-50WM4	50A	3P4W
LCM	PQC-LCM-W	N/A	N/A
HMI	PQC-HMI-W	N/A	N/A
Wall-mounted Bracket	3313192900-SP	N/A	N/A

The APF's wall-mounted APF module is available in one wiring type, i.e. 3P4W, and is available in one specifications in terms of the output current, i.e. 50A. 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. ***Figure 2-2*** shows the APF's wall-mounted module.



(Figure 2-2: PQC Series Wall-mounted APF Module)

Use the provided communication connection cable (along with the HMI or LCM) to connect the HMI or LCM's DATABUS port and the wall-mounted APF module's communication terminals. After that, you can use the HMI or LCM to monitor the operation status of the wall-mounted APF module and set up relevant parameters. ***Figure 2-3*** shows the HMI appearance and ***Figure 2-4*** shows the LCM appearance.



(Figure 2-3: HMI)

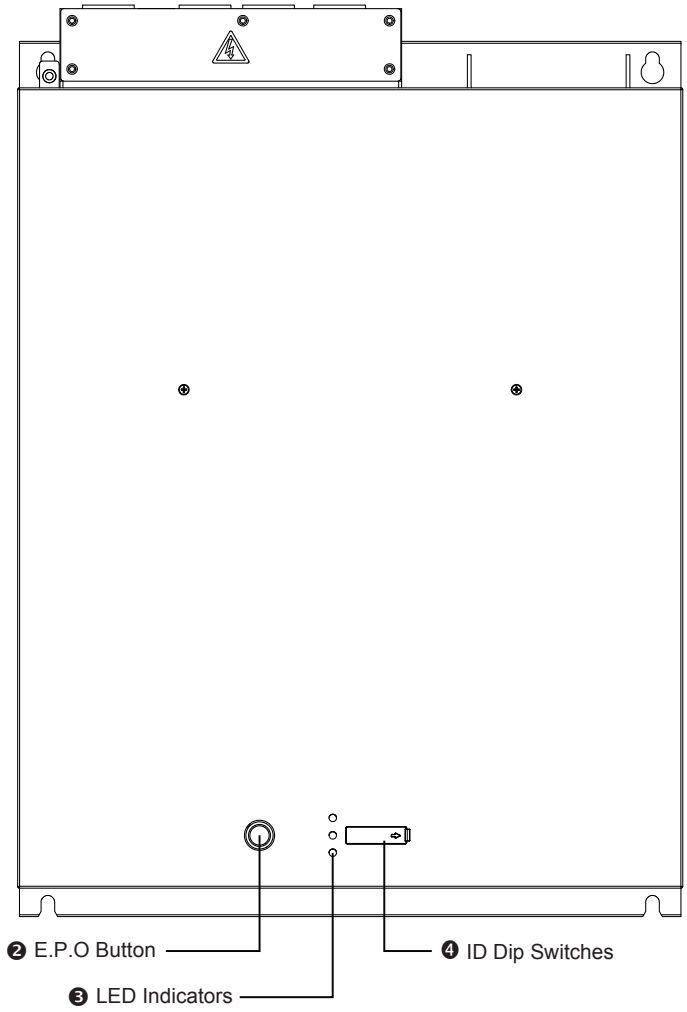
2.3. Functions & Features

- Multifunction: the APF can simultaneously realize the purposes of harmonic, reactive and three-phase unbalance compenation.
- 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.
- Wide input voltage and frequency ranges, suitable for the applications with diesel generators and harsh power supply conditions, line voltage: 308V ~ 456V.
- 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.
- Applicable to all work conditions: the device is able to operate under high temperature up to 55°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 standby function (E.P.O), etc.

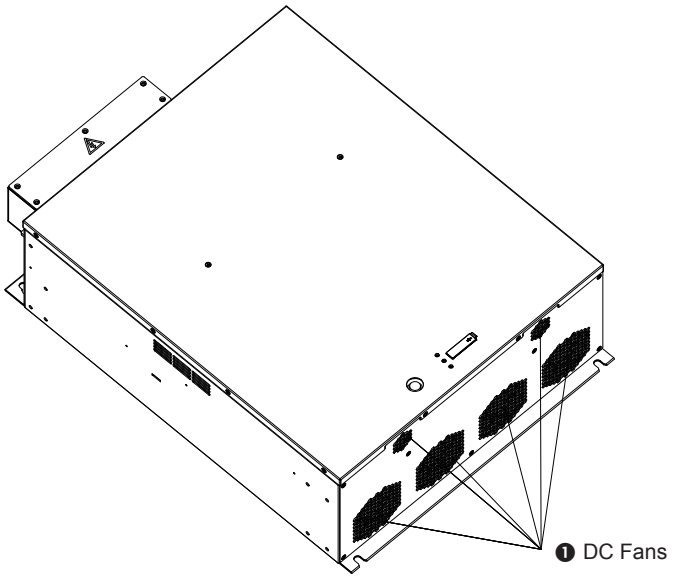
(Figure 2-4: LCM)

2.4. Mechanism & Appearance

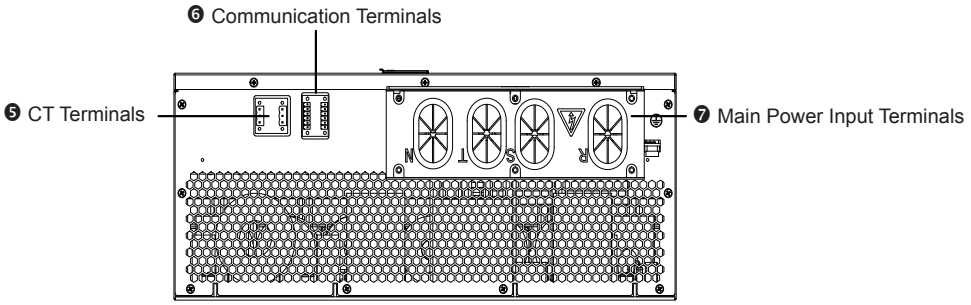
2.4.1 Wall-mounted APF Module Appearance and Dimensions



(Figure 2-5: PQC Series Wall-mounted APF Module_Front View)



(Figure 2-6: PQC Series Wall-mounted APF Module _Side View)



(Figure 2-7: PQC Series Wall-mounted APF Module _Top View)

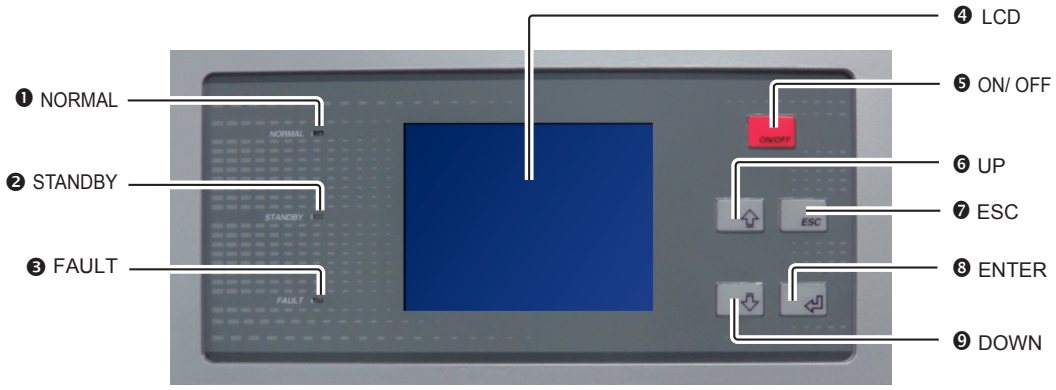
No.	Item	Description
❶	DC Fans	Heat dissipation DC fans.
❷	E.P.O	Emergency Standby button.
❸	LED Indicators	Wall-mounted module's status indicators: • Green (normal): Normal. • Yellow (standby): Standby • Red (fault): Fault
❹	ID Dip Switches	Please refer to ***Chapter 4: APF Operation Procedures.***
❺	CT Terminals	For CT signal.
❻	Communication Terminals	For communication signal.

No.	Item	Description
❼	Main Power Input Terminals	For main power input wiring (R/ S/ T/ N/ PE).

Table 2-2: PQC Series Wall-mounted APF Module Dimensions & Weight

Model	Dimenisions (W*H*D)	Weight
PQCA-400-50-50WM4	440×600×174mm	30kg

2.4.2 LCM (Liquid Crystal Monitor) Display



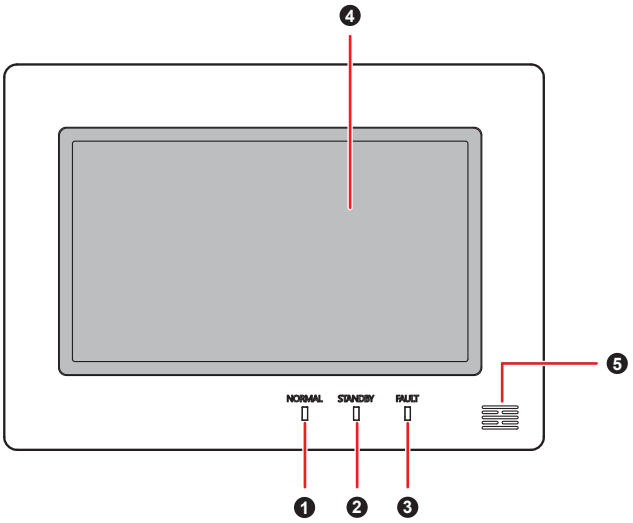
(Figure 2-8: LCM_ Front View)

No.	Item	Description
❶	NORMAL LED (green)	Illuminates when the APF system is normal.
❷	STANDBY LED (yellow)	Illuminates when the APF system is in standby status.
❸	FAULT LED (red)	Illuminates when the APF system has abnormalities.
❹	LCD Display	Displays both Chinese and English fonts.
❺	ON/ OFF Key	Press and hold the key for 3 seconds to switch on/ off the APF system.
❻	UP Key	Press the key to move the menu items upward or to increase the parameter setting value.
❼	ESC Key	Press the key to return to the previous menu or to save the parameter setting when exit.
❽	ENTER Key	Press the key to go to the next page or to confirm the parameter setting.
❾	DOWN Key	Press the key to move the menu items downward or to reduce the parameter setting value.

(Figure 2-9: LCM_ Rear View)

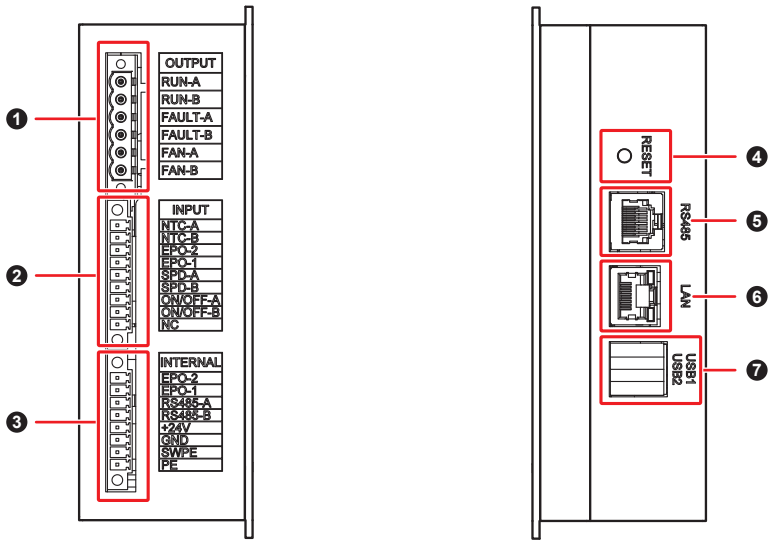
No.	Item	Description
❶	DATABUS	The communication interface between the LCM and the wall-mounted module.
❷	RS232	The standard RS232 interface.
❸	Dry/ Wet Contact	Dry and wet contact terminals.
❹	SPD Status	Cabinet's SPD (Surge Protection Device) status feed-back terminal.
❺	E.P.O Status	Cabinet's E.P.O (Emergency Standby) button status feedback terminal.

2.4.3 HMI (Touch Panel Human Machine Interface) Display



(Figure 2-10: HMI_ Front View)

No.	Item	Description
❶	NORMAL(Green)	Illuminates when the APF system is normal.
❷	STANDBY(Yellow)	Illuminates when the APF system is in standby status.
❸	FAULT(Red)	Illuminates when the APF system has abnormalities.
❹	Touch Screen	Data display and parameters setting.
❺	Buzz	Sound alarm.



(Figure 2-11: HMI_ Side View)

No.	Item	Description
❶	Output Signal	Output system information such as run/ standby status, etc.
❷	Input Signal	Input remote control instruction, etc.
❸	Modbus	Communication Terminal between HMI and APF module.
❹	RESET	Reset HMI.
❺	RS485	Standard RS485 interface.
❻	LAN	Standard Ethernet interface.
❼	USB	Standard USB interface.

2.5. Package Inspection

NOTE:

The APF includes the wall-mounted APF module, LCM / HMI and Bracket, which are packed separately. And they should be separately purchased.

- **Exterior**

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

- **Interior**

  1. Please check the rating labels of the wall-mounted module and the LCM/ HMI 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 wall-mounted APF module and the LCM/ HMI.
  5. If any damage is found, please contact your supplier.
  6. To return goods, please use the original packing material to pack the wall-mounted module, the LCM/ HMI, the Bracket and all standard accessories.

Table 2-3: Standard Accessories of the Wall-mounted Module

No.	Item	Quantity
❶	CT Terminal Block (3-pin)	2 PCS
❷	Communication Terminal Block (6-pin)	2 PCS
❸	Main Power Input Terminal_ R/ S/ T/ N	4 PCS
❹	PE Terminal	1 PC
❺	Terminal Screw M6*12L	5 PCS

Table 2-4: Standard Accessories of the LCM / HMI

No.	Item	Quantity
❶	Fastening Screw	5 PCS (LCM) 4 PCS (HMI)

Chapter 3 : Installation and Wiring

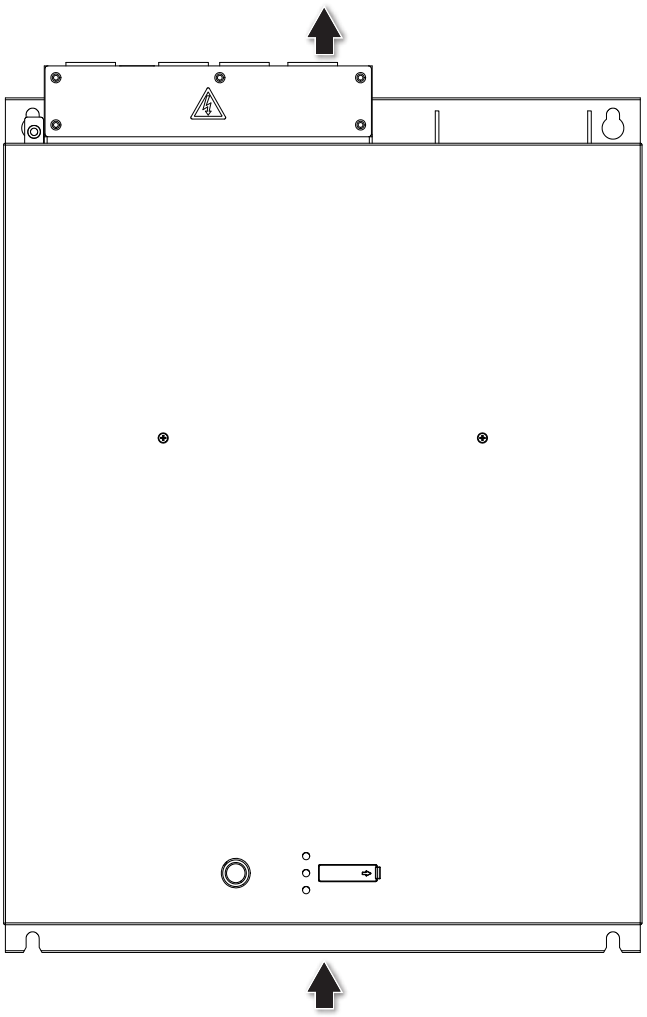
The APF is applicable to many applications and can meet the particular installation requirements of industrial sites, power distribution rooms and computer rooms. The wall-mounted APF module can be installed on a load-bearing wall or in a cabinet.

3.1 Pre-installation Confirmation

Since the installation environment varies for different users, please read this Manual carefully before installation. All installation, assembly and start-up work must be carried out by qualified professional personnel. If you want to carry out installation, assembly and start-up work by yourself, it shall be under the supervision of qualified professional personnel.

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 wall-mounted APF while installing. For a higher protection degree requirement, please contact your distributor.
2. The APF device shall not be installed in a place close to dust sources or subject to heavy environmental pollution. Since the conductive dust will damage the device, make sure the installation place is free of conductive dust.
3. Make sure installation and supporting components are capable of bearing weight of APF.
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 that enough space is left in the installation area for maintenance. When installation, ensure that the height from the ground to the top of the wall-mounted APF is not less than 1800mm. This avoids any object from being placed on the top of the APF and from dropping into the APF.
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 at the bottom and air outlet on the top as well as on the sides; thus, it is recommended to leave at least a 500mm space both on the top and at the bottom, and some ventilation space on the sides of the APF for ventilation purpose. ***Figure 3-1*** illustrates the air inlet & outlet schematic diagrams of the APF.



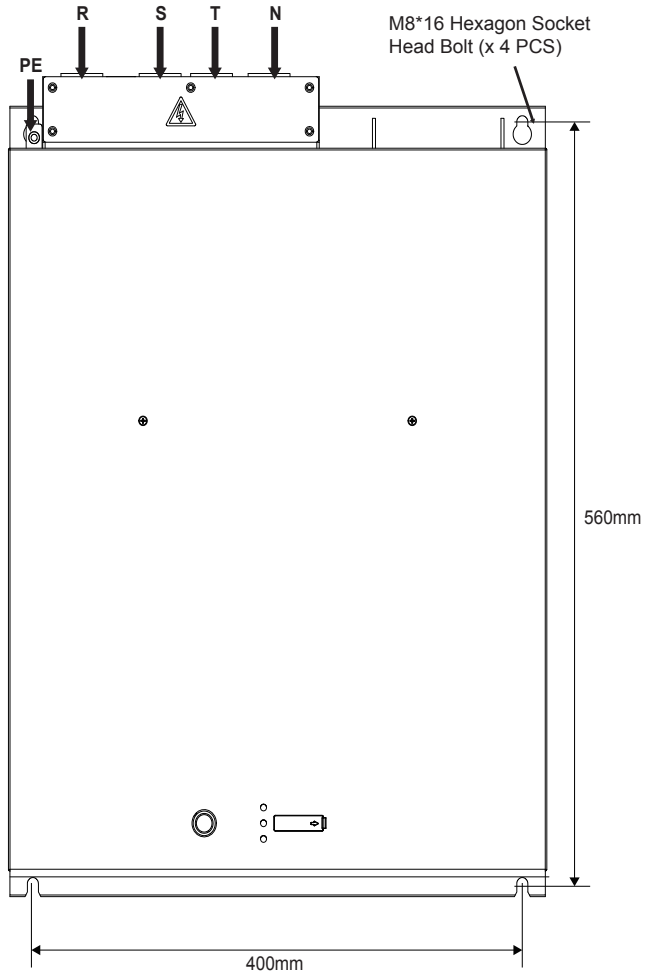
(Figure 3-1: Air Inlet & Outlet Schematic Diagrams of the APF)

9. The APF has a minimum vent flow requirement, which shall be met to guarantee the normal cooling of the device. For the APF mounted in a cabinet, please ensure the cabinet has sufficient vent flow to cool the device.
10. The working temperature range of wall-mounted APF is -10°C to 55°C, APF starts to de-rate from 50°C, and APF will not work when ambient temperature exceeds 55°C.
11. The APF system shall be installed at a place with altitude less or equal 1,000m. Please de-rate APF capacity or consult Delta or Delta distributor if the altitude limit is exceeded.
12. The APF's main power input terminals are covered by the protection covers. Before removing the protection covers or wiring, please ensure that the power is off. Before powering on, make sure the protection covers are re-installed.

3.3 Installation of the Wall-mounted Module

When the wall-mounted APF module needs to be installed in a cabinet, ensure that the cabinet has the design of air inlet at the bottom and air outlet on the top. Please rivet or weld the M8 hexagon nuts (not provided; Q'ty: four) on the cabinet's four pillars, and then use the M8*16 hexagon socket head bolts (not provided; Q'ty: four) to install the wall-mounted module into the four pillars' M8 hexagon nuts.

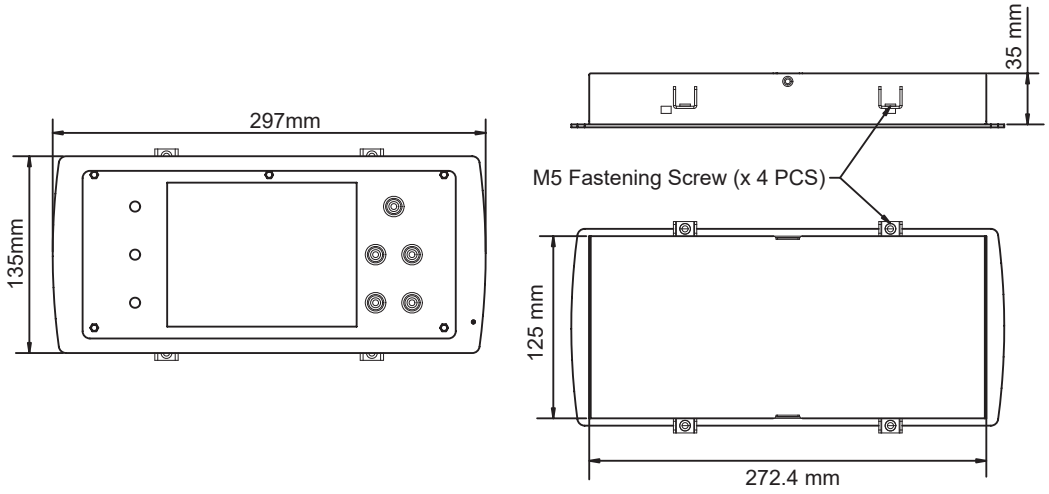
When the wall-mounted module needs to be installed on a wall, ensure that the wall is constructed by the reinforced concrete and is capable of bearing the weight of the module. The use of 4 pieces of M6 stainless steel expansion bolts are suggested for installation. When installation, ensure that the height from the ground to the top of the wall-mounted module is not less than 1800mm.



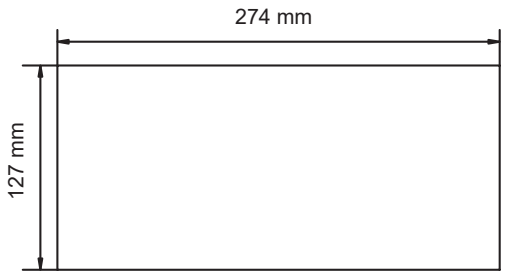
(Figure 3-2: Wall-mounted Module Installation Dimensions_ Front View)

3.4 Installation of the LCM

When installation, please use the provided fastening screws (packed in the LCM package) to install the LCM into the mounting holes of the customer provided panel. After installation, use the provided LCM connection wire (along with the LCM) to connect the LCM's DATABUS port and the wall-mounted APF module's communication terminals.



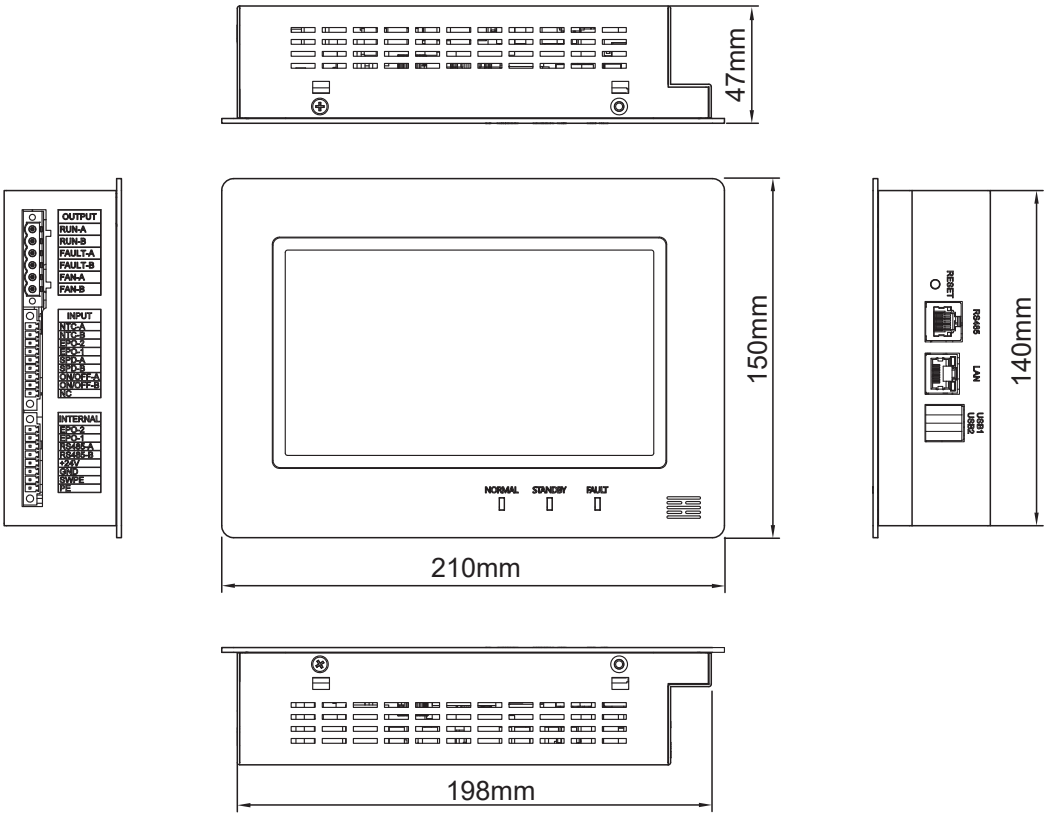
(Figure 3-3: LCM Structure & Dimensions)



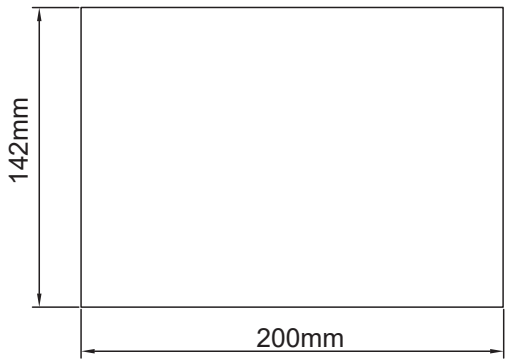
(Figure 3-4: Mounting Hole Dimensions of the LCM)

3.5 Installation of the HMI

When installation, please use the provided fastening screws (packed in the HMI package) to install the HMI onto the wall-mounted APF module. After installation, use the provided HMI connection wire (in HMI package) to connect the HMI's DATABUS port and the wall-mounted APF module's communication terminals.



(Figure 3-5: HMI Structure & Dimensions)



(Figure 3-6: Mounting Hole Dimensions of the HMI)

3.6 Wiring of the Wall-mounted Module

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

Table 3-1: Wall-mounted APF Module's Power Line Specifications

Wall-mounted APF Modue Rating	50A
Wire Diameter_ R/S/T	35 mm^2
Wire Diameter_ N	35 mm^2
Wire Diameter_ PE (protective earthing)	25 mm^2
Breaker Rated Current	80A

Table 3-2: Wall-mounted APF Module's Power Line Tightening Torque

Bolt Size	Torque Value (N-m)
M6	8

3.7 CT Installation & Wiring

3.7.1 CT Selection

1. The appropriate rated ratio of primary to secondary current shall be determined. The primary current is recommended to be 1.7*In (the actual rated current).
2. The rated voltage is 0.5KV or 0.66KV.
3. The secondary current is 5A or 1A.
4. CT accuracy shall be 0.5 class.
5. The secondary capacity (rated load) of CT shall meet requirement of secondary impedance (≥5VA when secondary current is 5A). The capacity and the maximum one-way wiring length from the CT to APF shall be calculated according to following formula:

Wherein:

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

Wherein:

Lmax:	the maximum one-way wiring length from the CT to the wall-mounted module (m);
P_{CT}:	the nominal secondary capacity of the CT (VA);
P_1:	the capacity loss caused by the internal impedance of the wall-mounted module and the contact resistance (about 0.08Ω, when the secondary current is 5A, the loss is about 2VA in total);
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 wire (calculate according to 0.0178 Ω x m/ mm^2);

Take I=5A as an example, refer to the following table for quick CT selection.

Table 3-3: Quick CT Selection

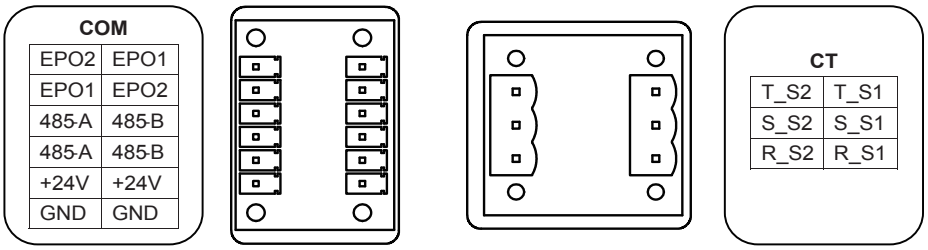
CT Ratio	CT Primary Current : 5A CT Primary Current ≥ 1.7* Maximum Load Current
CT Accuracy	Class 0.5
CT Secondary Capacity (VA)	1~2 Modules: ≥ 10VA
	3~4 Modules: ≥ 15VA
	5~7 Modules: ≥ 20VA
	>7 Modules, consult Delta or Delta distributor

3.7.2 Basic CT Installation & Wiring

The CT for current detection shall be located on load side, which generates harmonic, to feed the detection signal to the APF. The wall-mounted APF module's CT terminals is shown in ***Figure 3-7***.

- A set of three CTs must be provided for current detection of the load.
- The CTs must be connected 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 CT terminal R-S1, and the S2 outgoing line must be connected to the CT terminal R-S2.
2. The secondary output S1 of CT2 for S-phase detection must be connected to the CT terminal S-S1, and the S2 outgoing line must be connected to the CT terminal S-S2.
3. The secondary output S1 of CT3 for T-phase detection must be connected to the CT terminal T-S1, and the S2 outgoing line must be connected to the CT terminal T-S2.

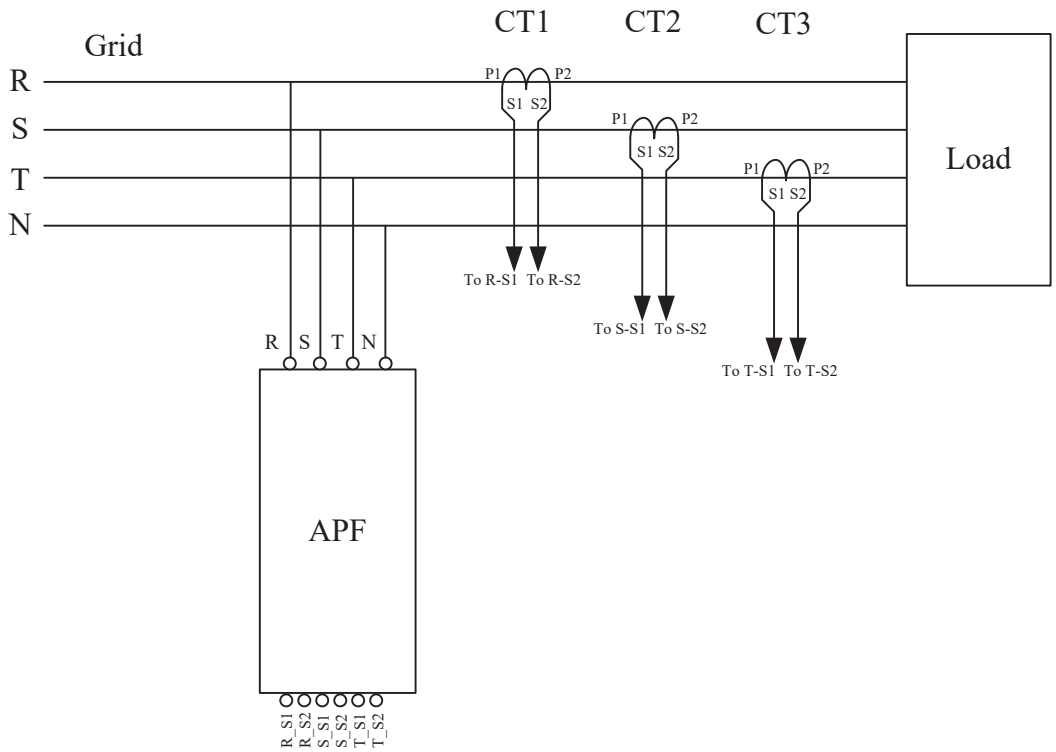


(Figure 3-7: Communication Terminals and CT Terminals on the Wall-mounted Module)

NOTE:

Hazards! The CT terminals at customer side have high voltage! Do not touch them with your bare hands. Before wiring or removal of power lines, turn off the wall-mounted module and short the customer's CT terminals.

For basic CT installation and wiring diagram, please refer to ***Figure 3-8***.



(Figure 3-8: Basic CT Installation and Wiring Diagram)

NOTE:

CT Connection of APF has a lot of variations, depending on different site conditions, please consult Delta or Delta's distributor for more details.

3.7 Wiring Communication Terminals

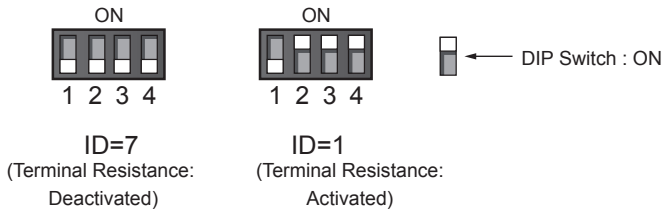
Please see ***Figure 3-7*** for the locations of the communication terminals on the wall-mounted module. One row of the communication terminals can be connected to the LCM/ HMI (using the LCM/ HMI connection wire packed in the LCM/ HMI), and the other row of the communication terminals can be connected to another wall-mounted APF module to establish a parallel system.

Chapter 4 : APF Operation Procedures

4.1 Inspection Before Start-up

- Make sure each E.P.O (Emergency Standby) button in the OFF status.
- Make sure each wall-mounted APF module's ID and terminal resistance are set properly.
- Make sure each wall-mounted APF 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)

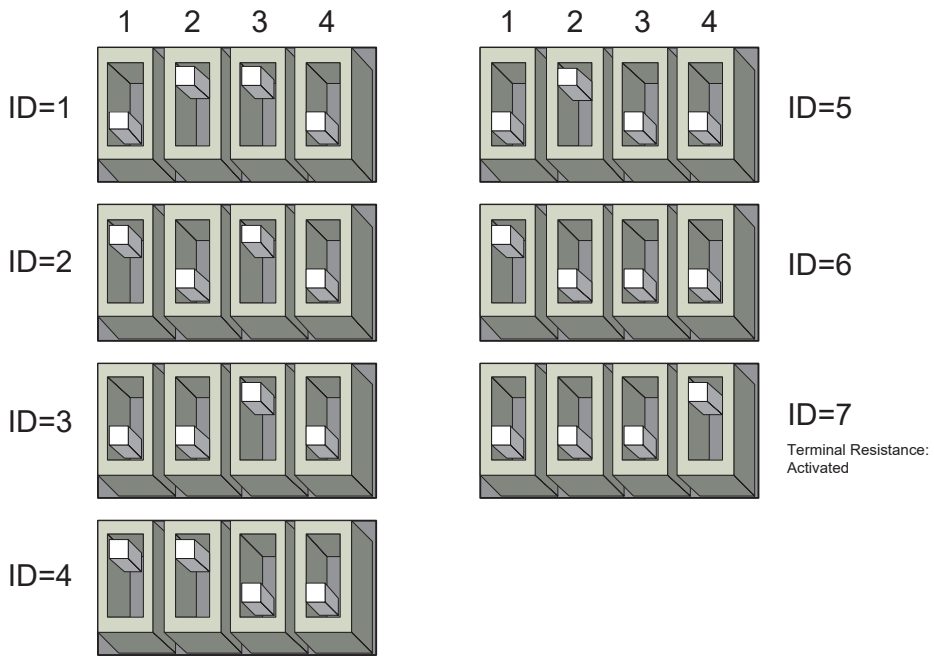
Table 4-1 Positions of DIP Switches

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, it is activated in lower position.

The wall-mounted module's ID setting shall be made in the sequence of 1~7.

When several APF modules are connected in parallel, sharing same LCM or HMI, make sure that IDs of all modules are not repeated. If quantity of APF modules is more than 4, terminal resistance DIP switch of the APF module that locates at the farthest from the LCM/ HMI shall be set to UPPER position, and terminal resistance DIP switches of the other APF modules shall be set to LOWER position. If APF module quantity is less or equal 4, all terminal resistance DIP switches shall be set to LOWER position.

Refer to ***Figure 4-2*** for ID setting from 1~7.



(Figure 4-2: APF Module ID and Terminal Resistance Setting)

- The IDs of all modules are not repeated.
- The module quantity and compensation capacity are confirmed.
- The connections among each of paralleled modules are well connected.
- The connections of LCM/ HMI's DATABUS ports are well connected.

4.2 Start-up Procedures

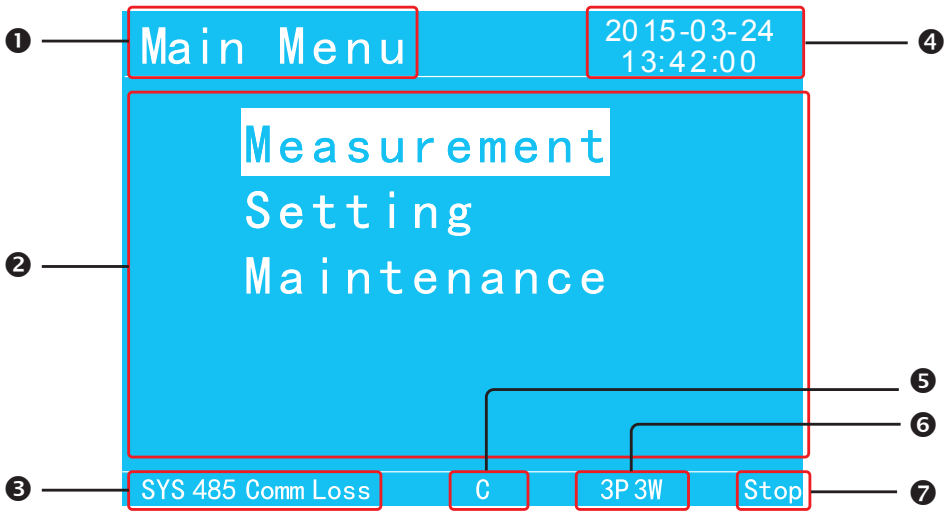
1. Switch on main input breaker (external).
2. The internal auxiliary power supply of the modules will be started, the fans will rotate, and the yellow LED indicators in front of the modules will illuminate. After that, the LCM/ HMI will go into the Start screen, communicate with the modules, read the system messages and check if there is any fault.
3. Set the system into the operating mode. Please refer to ***Chapter 5: Display and Settings*** for the detailed LCM and HMI settings.
4. Press and hold the ON/ OFF button on the LCM for 3 sec, and release it after the buzzer rings. After that, the system starts up. Or Press ON/ OFF button on HMI and the system will starts up after confirmation.
5. When the system starts up and works properly, the green LED indicator on the LCM or HMI will illuminate.

Chapter 5 : Display and Settings

There are two types of APF displays, one is Touch Panel HMI (HMI), which is touch-screen type, and the other one is non-touch-screen type, called Liquid Crystal Monitor (LCM). Both LCM and HMI monitor the APF system parameters and display the status and settings of the system.

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.

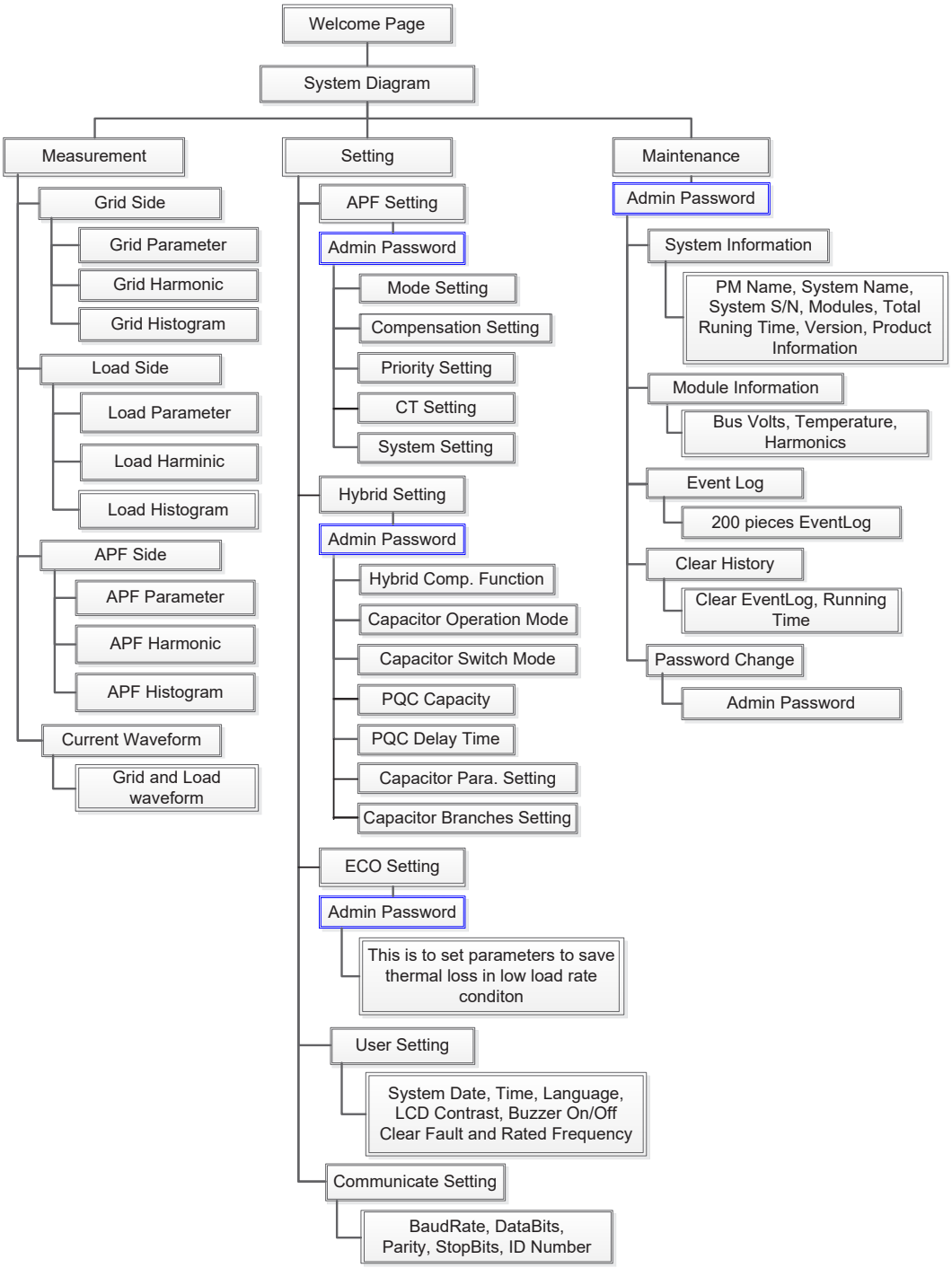
5.1 Description of LCM Display



(Figure 5-1: LCM Display)

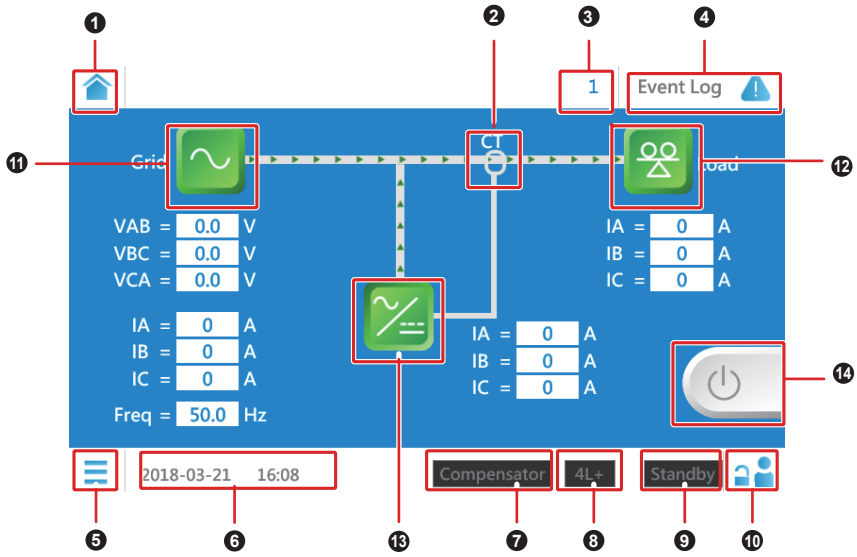
Item	Description
❶	Displays the title.
❷	Displays the contents relevant to the title.
❸	Displays the real-time fault message of the system.
❹	Displays the time of the system.
❺	Displays the system functions (C: Compensator/ S: Harmonic Source).
❻	Displays the system wiring mode (three-phase three-wire/ three-phase four-wire)
❼	Displays the system operating status (running/ stop).

5.2 LCM Display Hierarchy



(Figure 5-2: LCM Display Hierarchy)

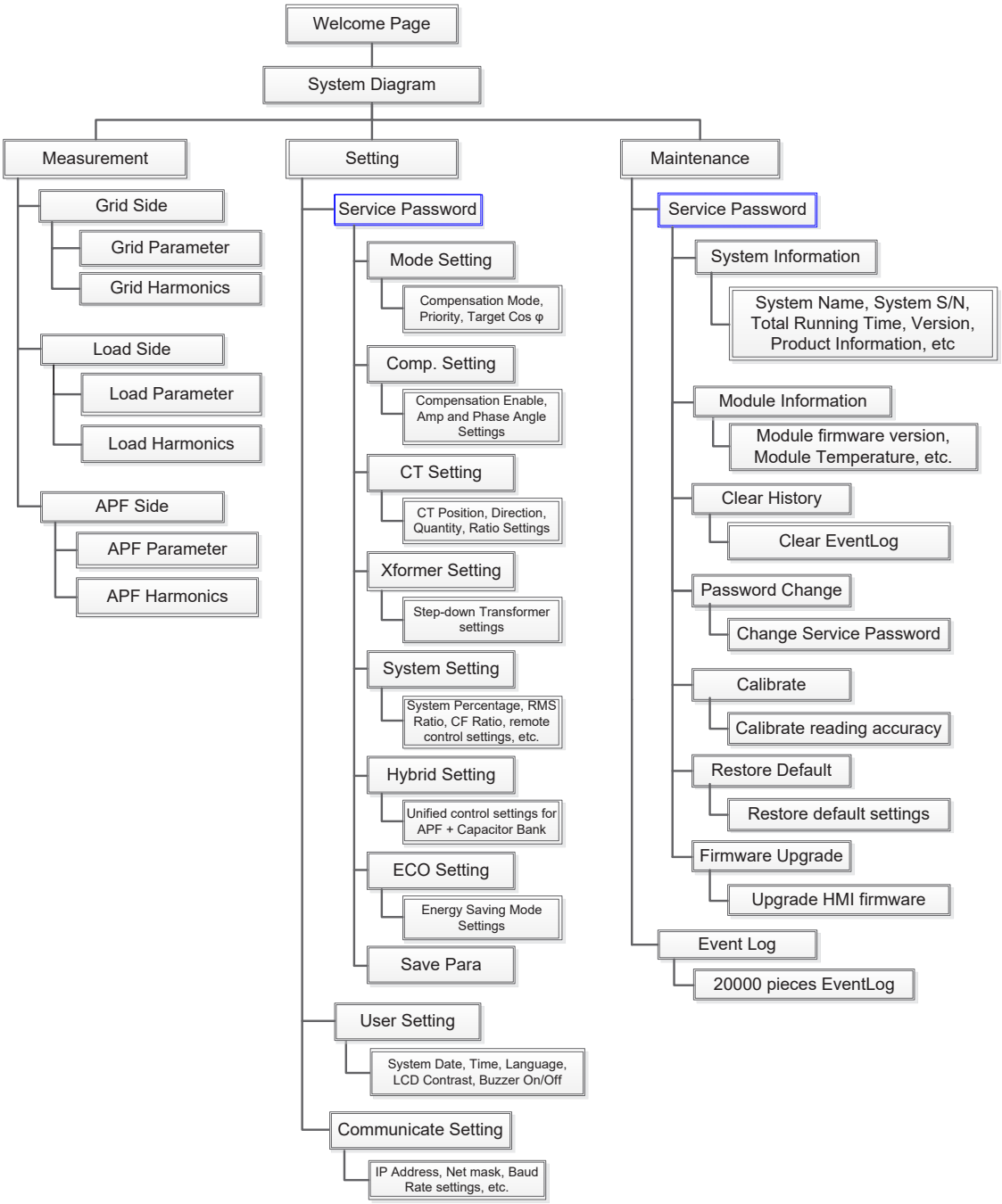
5.3 Description of HMI Display



(Figure 5-3: HMI Display)

Item	Description	Item	Description
❶	"**Home**" button, return to home page.	❽	Indicate system wiring type, 3P3W or 3P4W.
❷	Indicate the CT Position setting.	❾	Indicate system status, Run, Standby or Fault.
❸	Indicate quantity of modules connected to this HMI.	❿	"**Login**" button, enter the "Login" page.
❹	"**Event Log**" button, turn to "Event Log" page.	⓫	"**Grid**" button, enter the grid side data page.
❺	"**Menu**" button, show HMI menu.	⓬	"**Load**" button, enter the load data page.
❻	Display time.	⓭	"**PQC**" button, enter the APF output data page.
❼	Indicate working mode, Compensator or Harmonic Source.	⓮	"**ON/ OFF**" button, turn on / off the APF system.

5.4 HMI Display Hierarchy



(Figure 5-2: HMI 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 or abnormality is found, please refer to the table below for the corresponding solution.

Item	Fault Message Shown on the LCM	Possible Cause	Solution
1	SYS 485 Comm Loss	1. The LCM or HMI communication wire is not well connected. 2. The wall-mounted modules have repeated IDs.	1. Check if the LCM communication wire is firmly connected or not. 2. Check the DIP switches of every wall-mounted module.
2	E.P.O Fault	The E.P.O button on the wall-mounted APF module is pressed.	Check all E.P.O buttons and make sure they are in the OFF status.
3	PM Numbers Error	1. Incorrect configuration of wall-mounted module quantity in the LCM. 2. The wall-mounted modules have repeated IDs.	1. Compare the wall-mounted module quantity with the setting of PM Number in the LCM. 2. Check the DIP switches of every wall-mounted module.
4	Fuse Blowout	The input fuse is broken.	Please contact service personnel.
5	Ambient OTP	1. The air vents are blocked. 2. The fans do not work. 3. The IGBT is damaged.	Please contact service personnel.
6	BUS OVP/UVP	Failure of BUS capacitor.	Please contact service personnel.
7	Fan Fail	Failure of fans.	Please contact service personnel.

Item	Abnormality	Possible Cause	Solution
1	No current compensation	The CT is not well connected.	Follow the CT wiring diagram shown in ***Figure 3-6*** to check if the CT wiring is correct.

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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