# Active Harmonic Filter Getting Started Guide



Three phase active harmonic filter for 400V/50Hz grid, with 50~150A rating

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| Issue:         | APFM2019-1.2 |
|----------------|--------------|
| Revision Date: | 2019-7       |

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This manual is suitable for 35A 50A 75A 100A 150A except physical appearance and size.

# Contents

| Preface   | 1 |
|---|---|
| Standard packaging  | 1 |
| Unpacking and Inspection                                  | 1 |
| APF/SVG module installation preparation                   | 1 |
| Caution   | 2 |
| 1 Safety information                                      | 4 |
| 1.1 Danger and Warning Definitions                        | 4 |
| 1.2 Notes for Installations                               | 4 |
| 1.3 Disposing   | 5 |
| 2. APF technical information                              | 6 |
| 2.1 working principles                                    | 6 |
| 2.2 Electrical Features&Specifications                    | 6 |
| 2.3 APF Dimensions  | 8 |
| 2.4 APF terminals   | 9 |
| 3.Installation and electrical distribution1               | 1 |
| 3.1 Mechanical (the size is for 150A module as example)1  | 1 |
| 3.2 Electrical Installation1                              | 2 |
| 3.2.1 Electrical Installation for one-set type1           | 2 |
| 3.2.2 Electrical Installation for multi-set installation1 | 3 |
| 3.2.3 CT installation1                                    | 5 |
| 3.2.3.1 (recommended)CT fixed in load side1               | 5 |
| 3.2.3.2 CT is fixed in power grid1                        | 7 |
| 4 Operation of APF19                                      | 9 |
| 4.1 Power ON/OFF of SVG1                                  | 9 |
| 4.1.1 Power ON steps1                                     | 9 |
| 4.1.2 Power OFF steps1                                    | 9 |
| 4.1.3 Manual/auto operation1                              | 9 |
| 4.2 Operation of HMI panel20                              | 0 |
| 4.2.1 7 inch APFM HMI20                                   | 0 |
| 4.2.1.1 Central HMI screen wiring2                        | 1 |
| 4-3 inch APF HMI2   | 2 |

| 4.2.2.1 Paran          | 23                       |    |
|------------------------|--------------------------|----|
| 5 Customization&softwa | re update                |    |
| 5.1 Customization      |                          | 26 |
| 5.1.1Function          |                          |    |
| 5.1.2Appeara           |                          |    |
| 5.2 Software           |                          |    |
| 6 Trouble shooting     |                          |    |
| Appendix 1             | Accessories introduction |    |

## Preface

These devices use the advanced DSP as main controller, and IGBTs to form NPC topology to achieve better performance.

## Standard packaging

Module (SVG/APF)

1\*manual (or electronic manual)

1\*protection cover (only for wall mounted type, 1 module 1 cover)

#### \* No screws included

## Unpacking and Inspection

Upon unpacking, please check for:

- Any damage occurred during transportation;
- Check whether the rated values on the nameplate of the drive are in accordance with your order.
- Our product is manufactured and packed at the factory with great care. If there is any error, please contact any of our distributors or us.
- The user manual is subjected to change without notifying the customers due to the continuous process of product improvements.

## APF/SVG module installation preparation

1. the standard package is not packed with breaker and current transformer. If need, please advise while ordering.

2.We recommended open-type current transformer for easy installation.



open-type current transformer

3.SVG /APF module should be protected by superior breaker. If the breaker is not installed, it is not convenient and protective for debug etc.

Note: SVG /APF module accessories guide is in Appendix 1

## Caution

#### CT is connected wrong

If APF CT is connected wrong, the harmonic current will be increased and do harm for power grid and other units.

#### Voltage input is over value

APFM/SVG M should be used under rated voltage range. For special Condition, please add step-up voltage or step-down voltage units.

#### Lightning impulse protection

The lightning overcurrent protection component is built in the APFM/SVG

#### Altitude impacts capacity

While SVG/SVG installed in above 1000meter, the actual compensation capacity is changed like below chart.



#### Altitude and output compensation capacity

# 1 Safety information

# 1.1 Danger and Warning Definitions

| 4 | Contains information, which is necessary for avoiding a risk of damage to the product or other equipment. |
|---|---|
|   | Contains information, which is essential for avoiding a safety hazard.                                    |

## 1.2 Notes for Installations

Please read the manual carefully before installation.

The debugging and maintenance of SVG shall be conducted by engineer(s) appointed by the manufacturer or the agent, otherwise personal injury and device damages might be caused; the maker shall not be responsible for such kinds of damages.

SVG is only for commercial/industrial use, it can't be used as energy-saving equipment related with any Life-support devices.





The earth leakage current of this model goes between 3.5 mA~1,000mA. Before power supply is connected, please ensure that the device is reliably grounded.

During selection of instantaneous RCCB or RCD component, the possible transient and steady earth leakage current shall be taken into consideration when the device is started.

Residual current circuit breakers (RCCBs) that are insensitive to one-way DC pulse (Class-A) and transient current pulse must be selected. Please note that the loaded earth leakage current will also pass through RCCB or RCD. The device grounding must comply with the local electric code.

## Marning—Installed By Professionals

Untrained personnel may not connect, commission and maintain active harmonic filter.

There are AC capacitors & DC capacitors connected inside this filter. Before performing any maintenance work, please short and ground the three line terminals. The DC capacitor needs 10 mins to discharge after disconnection. Please wait for this duration before touching any live parts or maintaining SVG, even after discharging the AC capacitors, to avoid electrical shock. Never discharge DC capacitors through short circuit.

# 1.3 Disposing

When disposing, pay attention to the following factors:

The capacitors may explode when they are burnt.

Poisonous gas may be generated when the plastic parts like front covers are burnt.

Disposing method: Please dispose the Drive as industrial waste.

# 2. APF technical information

# 2.1 working principles

1. External current transformer(CT)could detect real-time load current .

2. Internal DSP calculates and analyzes the reactive power content of the system.

3. Control PWM to send signal to IGBT to generate reactive power compensation current for power factor compensation.

## 2.2 Electrical Features& Specifications

| Item             |                            | Description   |
|------------------|----------------------------|---|
|                  | Harmonic<br>Filter         | Setting filtering from 2-51 times(under only harmonic filtering function)<br>While choose priority, the harmonic filtering is 2-13 <sup>th</sup>  |
| Main<br>Function | Auto/Priorit<br>y function | The user can also set the priority function, including H+Q/<br>Q+H/Q+H+B/H+Q+B (Q power factor, H harmonic filtering, B,<br>unblance )ref:Tab.4-1 |
|                  | Application                | Hotel,Car park, Car charger station,Car 4S store,IDC,<br>hospital,Railway,water treatment and other non-liner load                                |
|                  | Rated<br>voltage           | 380/400Vac  |
|                  | Wiring                     | 3P4W  |
|                  | Frequency                  | 50±2Hz  |
|                  | Capacity                   | 20~100A(According to SVG type)  |
| Flastrias        | Module<br>Consumpti<br>on  | < 2kW   |
| Electrical       | Efficiency                 | Up to 97.5%   |
|                  | switching<br>frequency     | 20kHz   |
|                  | Response                   | Fast response time < 50µs   |
|                  | time                       | Total response time < 5ms   |
|                  | CT ratio                   | 150:5~6000:5  |
|                  | Parallel                   | Max.5 (customization acceptable)  |
| Terminals        | Communic<br>ation          | RS485   |

| Item       |                              | Description  |
|------------|------------------------------|--|
|            | Operating<br>environmen<br>t | In-door, free from moisture, dust, corrodent or flammable gases, oil mist, vapor, water leakage or salt water. |
|            | <mark>Altitude</mark>        | <1000m (customized acceptable)   |
|            | Work                         | -20℃~+50℃( derating is required from 40℃ to 50℃, increase  |
| Environmen | temperatur                   | every 1°C above 40°C, derating 2%, highest temperature   |
| t          | е                            | allowed: 50°C )  |
|            | Humidity                     | Less than 95%RH, no condensing   |
|            | Storage                      |  |
|            | temperatur                   | -20℃~+70℃  |
|            | е                            |  |
|            | Vibration                    | Less than 5.9m/s2 (0.6g)   |
|            | Protection<br>degree         | IP20   |
| Enclosure  | Colour                       | 7035 grey (customization acceptable)   |
|            | Size                         | According to APF type(refer: APF Dimensions)   |
|            | Cooling                      | Fan cooling  |

Tab. 2-1 Specifications

## 2.3 APF Dimensions

Rack mounted type dimensions is shown in figure 2-1.



Fig.2-1 Dimensions of rack mounted type Wall mounted type dimensions is shown in figure 2-2.



Fig.2-2 Dimensions of wall mounted type NOTE: APF is not matched with screws. Recommend you use M8x11 exploration screws.

|      |         | Rack m | nounted |      | Wall mounted |     |      |      |
|------|---------|--------|---------|------|--------------|-----|------|------|
| (mm) | 35A/50A | 75A    | 100A    | 150A | 35A/50A      | 75A | 100A | 150A |
| Α    | 437     | 480    | 480     | 550  | 400          | 440 | 440  | 510  |
| В    | 420     | 460    | 460     | 532  | 240          | 360 | 360  | 360  |
| С    | 400     | 440    | 440     | 510  | /            | /   | /    | /    |
| D    | 205     | 232    | 232     | 250  | 205          | 232 | 232  | 250  |
| E    | 88      | 88     | 88      | 88   | 545          | 610 | 610  | 610  |
| F    | 58      | 72     | 72      | 81   | 80           | 40  | 40   | 75   |
| G    | 563     | 652    | 652     | 660  | 573          | 636 | 636  | 648  |
| Н    | 497     | 576    | 576     | 585  | 497          | 576 | 576  | 585  |
| К    | 40      | 40     | 40      | 40   | /            | /   | /    | /    |

Tab. 2-2 SVG Dimensions

## 2.4 APF terminals

Power connectors (A, B, C, N, N) and control connectors in APF are shown as Fig. 2-3.Control connectors include CT input port,485port and UI port.

#### Note:

The AC supply to APF power connectors must be installed with suitable protection against overload and short circuits. Failure to observe this requirement will cause risk of fire or damage to other equipment.



| rs |
|----|
|    |

| Mark  | Definition              |
|-------|-------------------------|
| A/B/C | 3-phase AC connectors   |
| N     | 3P4W Neutral connectors |
| PE    | Protective earth        |

Telecommunication connectors are shown as Fig2-4. 485 1 is connected with back platform.485 1 is connected with back platform.485 II is connected with another APF/SVG module in parallel. UI is connected with HMI to transfer data. CT port is connected with external CT input signal. The detail is in the below table 2-4.

|   |     | U  | I  |     | 48 | 5 I | 485 II |    |   |
|---|-----|----|----|-----|----|-----|--------|----|---|
|   | 12∛ | Тх | Rx | GND | Å1 | B1  | A2     | B2 |   |
|   | 1   | 2  | 3  | 4   | 5  | 6   | 7      | 8  |   |
| € |     |    |    |     |    |     |        |    | Ð |

|   | CT |    |    |    |    |    |   |
|---|----|----|----|----|----|----|---|
|   | A1 | A2 | B1 | B2 | C1 | C2 |   |
|   | 1  | 2  | 3  | 4  | 5  | 6  |   |
| ŧ |    |    |    |    |    |    | € |

| name           | Mark | Definition   |  |  |  |
|----------------|------|--|--|--|--|
|                | A1   | Connect to S1 of phase A CT (Pin1)                                   |  |  |  |
| Current        | A2   | Connect to S2 of phase A CT(Pin2)                                    |  |  |  |
| transform      | B1   | Connect to S1 of phase B CT (Pin3)                                   |  |  |  |
|                | B2   | Connect to S2 of phase B CT (Pin4)                                   |  |  |  |
| Ci             | C1   | Connect to S1 of phase C CT (Pin5)                                   |  |  |  |
|                | C2   | Connect to S2 of phase C CT (Pin6)                                   |  |  |  |
| 485 I A1<br>B1 | A1   | Module&back platform RS485+signal(Pin5)                              |  |  |  |
|                | B1   | Module&back platform RS485-signal(Pin6)                              |  |  |  |
| <b>485</b> TI  | A2   | Module connecting in parallel RS485+signal(Pin7)                     |  |  |  |
| 405 11         | B2   | Module connecting in parallel RS485-signal(Pin8)                     |  |  |  |
|                | 12\/ | Module connecting to central HMI power supply positive               |  |  |  |
|                | 12 V | pole(Pin1)   |  |  |  |
|                | Тx   | Backup(Pin2)   |  |  |  |
| 01             | Rx   | Backup(Pin3)   |  |  |  |
|                | GND  | Module connecting to central HMI power supply negative<br>pole(Pin4) |  |  |  |

# 3.Installation and electrical distribution

# 3.1 Mechanical (the size is for 150A module as example)

Rack type APFM is fixed in the two sides of cabinet.refer to 3-1 Wall mounted type APFM is fixed in the wall or cabinet refer to 3-2

Dwg 3-1 Rack type APFM (the size is for 150A module as example)



Wall mounted type APFM 3-2 (the size is for 150A module as example)



Expandable screw installation size (recommended M8)

# 3.2 Electrical Installation

SVG/APFM can be installed individually (one-set) or in parallel(max.5 pieces modules).

Installation of one-set type is included in this guide. For multi-set installation, it is different.

## 3.2.1 Electrical Installation for one-set type

For installation of one-set type, please refer to Fig.3-3. CT connection is detailed in chapter 3.3. Please do remember the direction of CT is in accord with that shown in Fig.3-3. CTs are place between power supply and load, and P1 of CT is facing to load side and P2 of CT is facing to supply side. S1 and S2 of each CT should be connected according to Tab. 3-3.

#### NOTE:

Make sure the direction and connection of CT are in accord with Fig.3-3, specially the direction, otherwise the harmonic would be enlarged.



Fig.3-3Quick start commissioning of APF

## 3.2.2 Electrical Installation for multi-set installation

Maximum five modules can be connected in parallel. The power wires connect like one-set type. CT sub-cable is connected in series. If communication with your platform is required, the A1 and B1 of the 485 I need to be connected in parallel and connected to your platform; if there is a centralized HMI, the 12V and GND in the UI terminal of the module 1 are connected with the centralized HMI V, G, and the A2 and B2 in the 485 II of the module 1 are connected in parallel with the centralized HMI A and B. The wiring is shown in Figure 3-4.



3-4(CT connection phase A as example)



3-5 CT sub-cable series connection

## 3.2.3 CT installation



Before SVG /SVG start, please check CT installation is correct. We choose the CT ratio according to 1.2to1.5 times load current. For example: load current is 2000A, we choose CT 2500:5.

There are open type and close type CT. Open type is easy to install and accuracy is 0.5 or above. Close type CT must be installed while the load is off power and accuracy is 0.2 or above. CT each phase 2nd wiring cable is single core of above 2.5mm<sup>2</sup>copper shielded twisted pair.

## 3.2.3.1 (Recommended) CT fixed in load side

APFM CTs are placed between power supply and load. One set (3pieces) CT is fixed in phase A, B, C, like the below picture 3-6(only shown phase A)



3-6 CT installed in load side

While CT is fixed in load side, meanwhile, there are capacitor compensation (capacitor bank) between power grid and load. We have two CT connection way like picture ,3-7, 3-8. In the picture 3-8, we need

two sets(6 pieces)of CT to connect in shunt between two sets of CT. ( not recommended).



3-7 CT installed in load side, capacitor bank exists



3-8 CT installed in load side, capacitor bank exists ( capacitor bank is between load and SVG /SVG )

#### 3.2.3.2 CT is fixed in power grid

One set (3pieces)CT is fixed in phase A,B,C like picture 3-9



3-9 CT fixed in power grid (phase A as example)

While CT is fixed in power grid side, meanwhile, there are capacitor compensation (capacitor bank) between power grid and load. We have two CT connection way like picture , 3-10、3-11. In the picture 3-11, we need two sets (6 pieces) of CT to connect in shunt between two sets of CT. (not recommended).





3-11 CT installed in power grid side, capacitor bank exists The CT installed in power grid side is only for one-set type .If multi-set modules CT is installed in power grid, please contact us.

## 4 Operation of APF

This chapter introduces power ON/OFF steps and user interfaces of APF.

## 4.1 Power ON/OFF of APF

### 4.1.1 Power ON steps

It's applicable to the power-on operation when SVG is in power-off state.

- 1. Fix the power and control cables correctly.
- 2. Close the breaker between SVG and power supply.

## 4.1.2 Power OFF steps

There are two kinds of power-off modes, first is to disconnect the breaker between APF and power supply. In this mode, the APF would be thoroughly powered off and then may carry out maintenance and setup work. Another one is to press the stop button on HMI panel. In this mode, SVG only stop compensating, but the power terminals are still live, so it's not allowed to carry out maintenance or setup work.

#### NOTE:

Please wait for at least 10 mins before touching any live parts or maintaining APF

## 4.1.3 Manual/auto operation

While APFM is power on, we touch screen "on" to realize APFM work. And its status is "run".

We touch"auto" to realize auto work. Suggest manual operation in the first operation and set" auto" after usage.

## 4.2 Operation of HMI panel

APF module categorizes two typs of HMI screen. 7 inch LCD panel is installed in the cabinet to control whole cabinet SVG, 4.3 inch LCD panel is installed in the module which only control the module.

## 4.2.1 7 inch APFM HMI

As user interface of APFM cabinet solution which user can display grid , load and output information, device working status, set parameters etc.

The screen can be divided into 3 areas. On the top, it is data, fault, set, on/off. Main data is displayed in area 2(in the middle) including data. Buttons in area 3 display device working status, date, time etc. (in the bottom).Please refer to 4.2

|     | Data    | а          | Fau | lt |   | Set. | on | /off    |    |   |    |   |
|-----|---------|------------|-----|----|---|------|----|---------|----|---|----|---|
|     | data    |            | A   | I  | В | с    |    | data    |    | A | В  | с |
| 6   | Urms(v) |            |     |    |   |      | 5  | Irms(A) |    |   |    |   |
| rid | THDu(%  | )          |     |    |   |      | ad | THDi(%) |    |   |    |   |
| Sic | Irms(A) |            |     |    |   |      | Si | cosφ    |    |   |    |   |
| e   | THDi(%) |            |     |    |   |      | de |         |    |   |    |   |
|     | cosφ    |            |     |    |   |      |    |         |    |   |    |   |
|     | data    |            | #1  |    | ł | #2   | #3 |         | #4 |   | #5 | Σ |
| De  |         | А          |     |    |   |      |    |         |    |   |    |   |
| VIC | lout(A) | В          |     |    |   |      |    |         |    |   |    |   |
| es  |         | С          |     |    |   |      |    |         |    |   |    |   |
| Ide | Bus VDC | Bus VDC(V) |     |    |   |      |    |         |    |   |    |   |
|     | Tsystem | (°C)       |     |    |   |      |    |         |    |   |    |   |

The screen details refer to another attached.

| Page       |                     | Ρ       | arameters                          | Remark  | Att            |
|------------|---------------------|---------|------------------------------------|---|----------------|
|            | Power grid<br>/load |         | voltage、current value              | A/B/C value(V)  | read           |
|            |                     |         | voltage、current<br>distortion rate | A/B/Cdistortion rate<br>(%)   | read           |
| data       |                     |         | PF                                 | A/B/C power factor  | read           |
| data       |                     |         | Compensation current               | Output current ( A )  | read           |
|            | devic               | e       | Bus voltage                        | DC bus bar voltage (V)  | read           |
|            |                     |         | IGBT temperature                   | IGBT temp. ( $^{\circ}\!\!\!\!\!^{\circ}\!\!\!\!^{\circ}\!\!\!\!^{\circ}$ ) | read           |
|            | hardware            |         | hardware                           | Hardware fault  | read           |
|            | system              |         | system                             | System fault  | read           |
| fault      | software            |         | software                           | Software fault  | read           |
|            |                     |         | Power grid order                   | Phase A/B/C disorder  | read           |
|            | other               | Sub-DSP |                                    | DSP abnormal  | read           |
|            |                     |         | EEPROM                             | Inner chip abnormal   | read           |
|            | Fault record        |         |                                    | Record fault<br>type,data&time  | Write&<br>read |
| Swit<br>ch |                     |         | on                                 | touch on,wait<br>30seconds  | button         |
| on/of      |                     |         | off                                | touch off   | button         |
| f          |                     |         | reset                              | reset   | button         |

note : central HMI setting is only under "pending"status. The set parameters is valid after switching off the device again. Central HMI screen is selectable part.

## 4.2.1.1 Central HMI screen wiring

While HMI is wiring with module as following drawing, the wire should be 4 core shielded copper core stranded wire.



## 4-3 inch APF HMI

 $4.2.2 \mbox{ As user interface, the user can set parameters or read grid , load and output information etc.$ 

Typical page of LCD is shown in Fig.4-1. It can be divided into 3 areas. Main parameters of grid and SVG itself are displayed in area 2(in the middle). Buttons in area 3 are for switching to other pages (in the bottom). The screen details refers to another attached.





## 4.2.2.1 Parameters in LCD screen

All parameters below for single module displayed in LCD are listed in Tab.4-1.

| Page |                | Parameter      | Definition                                | attribution |
|------|----------------|----------------|---|-------------|
| home | status         |                | Ready, Run, Fault                         | read        |
|      | Login          |                | password is insert and check other data   | button      |
|      |                | voltage        | Valid value                               | read        |
|      |                | current        | Valid value                               | read        |
|      | Powe<br>r grid | THDi           | THDi                                      | read        |
|      |                | COS            | Power factor                              | read        |
| data |                | list           | Phase harmonics and harmonic content list | button      |
| uala |                | current        | Valid value                               | read        |
|      |                | THDi           | THDi                                      | read        |
|      | data           | COS            | Power factor                              | read        |
|      |                | chart          | Phase harmonics and harmonic content list | button      |
|      | Unit           | Output current | APFM phase current                        | read        |

| Page | Parameter            |                   | Definition                                 | attribution |
|------|----------------------|-------------------|--|-------------|
|      | data Bus bar voltage |                   | APFM Bus bar voltage                       | read        |
|      |                      | Sys.temp.         | APFM IGBT temperature                      | read        |
|      |                      | contact           | APFM contact status                        | read        |
|      |                      | version           | APFM hardware version                      | read        |
|      | 1P                   | CT ratio          | Set external CT ratio parameter            | Write&read  |
| set  |                      | CT direction      | CT(0-P2 face power grid,0-P1power<br>grid) | Write&read  |
|      |                      | CT position       | CT(0-load side,1-power grid side)          | Write&read  |
|      |                      | Parallel capacity | Parallel capacity(A)                       | Write&read  |

|     | 1P               | 485 I-ID.   | Module and back platform485 address        | Write&read |  |  |
|-----|------------------|---|--|------------|--|--|
|     |                  | 485 II-ID   | Module parallel address ( 1.2.3 •••• )     | Write&read |  |  |
|     |                  | Start mode  | Set auto work                              | Write&read |  |  |
|     |                  | *Auto   | Auto compensation                          | Write&read |  |  |
|     | Str              |   |  |            |  |  |
|     | atig             | *Priority   | <mark>Q+H/H+Q/Q+H+B/H+Q+B</mark>           | Write&read |  |  |
|     | <mark>У</mark>   | H+Q+B: Harmonic filtering first ,Power factor secondary ,unbalance stablizing |  |            |  |  |
|     |                  | last.   |  |            |  |  |
| set | Har<br>mo<br>nic | Harmonic  | Select(2-13)                               | Write&read |  |  |
|     |                  | *power factor   | Target power factor(0~1)                   | Write&read |  |  |
|     | <mark>s</mark>   | *unbalance<br>compensation  | unbalance set                              | Write&read |  |  |
|     |                  | Back home   | No touch (30times)auto back home           | Write&read |  |  |
|     | 4P               | Password protection   | password ( 123456 )                        | Write&read |  |  |
|     | וד               | Password change   | Password change(forget password:<br>333222 | Write&read |  |  |

|       |                  | Factory password                   | Only for factory   | Write&read |
|-------|------------------|------------------------------------|--|------------|
|       |                  | time/date                          | Set time/date  | Write&read |
|       |                  | A/B/C hardware<br>overcurrent      | A/B/C output over limit  | read       |
|       | har              | Bus bar overvoltage                | Over limit   | read       |
|       | dw               | 24V power supply                   | Abnormal output  | read       |
|       | are              | ±15V power supply                  | Abnormal output  | read       |
|       |                  | fan                                | Not work   | read       |
|       |                  | wiring                             | Short circuit/open circuit   | read       |
|       | Sof<br>twa<br>re | A/B/C over voltage                 | Power grid voltage over max.input voltage                                  | read       |
| fault |                  | A/B/C under voltage                | Power grid voltage less than<br>min.input voltage                          | read       |
|       |                  | A/B/C phase over<br>current        | A/B/C output current over software<br>overcurrent value                    | read       |
|       |                  | Bus bar under/over voltage         | Power grid voltage less/over SVG min./max. Input voltage                   | read       |
|       |                  | Bus bar imbalance                  | Power grid A/B/C disorder  | read       |
|       |                  | Power gird<br>under/over frequency | Power grid voltage frequency<br>less/over SVG min./max. Input<br>frequency | read       |
|       |                  | IGBT temperature                   | APFM IGBT over temperature value   | read       |

#### Note:



# 5 Customization&software update

## 5.1 Customization

## 5.1.1Function

- Base on special application, the customer may need customization requirement, please advise while query or ordering. The following functions have used in some projects.
- 1 Power factor/ harmonic filtering /three phase unbalance Priority One module can work as three modules.
- 2 SVG+1...to 13<sup>th</sup> harmonics filtering

In electrical vehicle charger project, it need inductive reactive power compensation and low harmonic filtering.

3 It can set working time and set the compensation capacity

We can set the device work in the night or day, moreover, we can choose some percentage work as harmonic filtering and the rest capacity work as reactive power compensation.

Furthermore, we can also make ODM.

#### 5.1.2Appearance

We accept OEM business. Usually, we put logo and sales contact into software. We need your clear JPG pictures.

## 5.2 Software

We will develop our software to improve the device performance or changeable demand. Only if you purchase our device, we will provide lifelong remote software update.

# 6 Trouble shooting

Device failures can be divided as follows:

1.Failure caused by user's wrong operation: If CT cable is connected reversely, phase sequence of power lie is reverse or reference setting is wrong, observe whether this kind of failure can be found during startup commissioning. If the compensation effect is poor but there is no warning information, please contact our product engineer.

2.If warning or problem information is displayed in LCD, please contact our product engineer directly.

3.If no response after electrification, please contact our product engineer directly.

# Appendix 1 Accessories introduction

|                             | 35A/   | 50A/       | 75A/100A            | 150A        |  |  |
|-----------------------------|--|------------|---------------------|-------------|--|--|
| ΑΡΕΜ/ΑΡΕΜ                   | 20kVA<br>R   | 35<br>kVAR | 50 kVAR /75<br>kVAR | 100<br>kVAR |  |  |
| Cable of phase<br>A/B/C mm2 | 16   | 25         | 35                  | 50          |  |  |
| Cable of phase<br>N mm2     | 25   | 35         | 50                  | 70          |  |  |
| PE cable mm2                | 16   | 16         | 16                  | 16          |  |  |
| Power terminal screw        | M6   | M8         | M8                  | M8          |  |  |
| PE terminal<br>screw        | M6   | M6         | M6                  | M6          |  |  |
| Rated current of Breaker    | 50A  | 80A        | 160A                | 200A        |  |  |
| CT cable                    | Below 15m: RVVSP 2*2.5 mm2; 15m-30m:<br>RVVSP 2*4 mm2;   |            |                     |             |  |  |
|                             | above 30m: contact Consnant  |            |                     |             |  |  |
| Range of CT<br>ratio        | 150/5~6000/5   |            |                     |             |  |  |
| Remark                      | If there is requirement for cable temperature, the specification of cable needs to be expanded |            |                     |             |  |  |