# SmartGen

MAKING CONTROL SMARTER

# HPM6/HPM6D

# POWER MANAGEMENT CONTROLLER

# USER MANUAL



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**Table 1 – Version History**

| Date | Version | Contents |
|---|---|---|
| 2021-11-26 | 1.0 | Original release. |
| 2022-09-19 | 1.1 | 1. Modify the error in typical application diagram; 2. Update company logo. |
| 2022-11-22 | 1.2 | Modify the product model as "HMP6/HPM6D". |
|  |  |  |

This manual is suitable for HPM6/HPM6D power management controller only.

**Table 2 – Notation Clarification**

| Sign | Instruction |
|---|---|
| ⚠ NOTE | Highlights an essential element of a procedure to ensure correctness. |
| ⚠ CAUTION! | Indicates a procedure or practice, which, if not strictly observed, could result in damage or destruction of equipment. |
| ☢ WARNING! | Indicates a procedure or practice, which could result in injury to personnel or loss of life if not followed correctly. |
| X | Indicates the controller without this function. |
| √ | Indicates the controller with this function. |

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## 1. OVERVIEW

HPM6/HPM6D power management controller is a special power management system for marine applications. The system carries out genset control, protection, power detection functions. The system is a true multi-master system whose power management function is realized by calculating all generator control units. One of the control units is internally defined as the "command unit". This unit is the one where start priority and other power management-related functions are calculated.

HPM6 can realize up to 20 gensets automatic synchronization and load sharing. Should the command unit fail, the power management calculations will automatically be transferred to the next available control unit. Each control unit is connected via network bus, which has device level ring redundancy function.

## 2. MODEL CONFIGURATION

According to the functions, it is divided into HPM6-DG diesel genset power management controller and HPM6-SG genset power management controller. All controllers share one set of hardware (master control module + display module).

## 3. PERFORMANCE AND CHARACTERISTICS

HPM6 power management controller adopts split-type design, which is composed of display module HPM6D and master control module HPM6.
— 4.3-inch LCD, 480x272 resolution with backlight, Chinese, English and other languages display interface;
— Suitable for 3-phase 4-wire, 3-phase 3-wire, 2-phase 3-wire and single phase systems with frequency 50/60Hz;
— PLC function enables user to define control logic;
— User-defined system SLD function;
— 3-level password protection, two password permissions can customize user configuration items, i.e. configuration items that user can modify can be customized;
— 3 accumulated data, two user accumulated data (user A and user B), user can clear accumulated data. 3 accumulated data are simultaneously and synchronously calculated, but user A and user B data can be cleared at any time;
— Parameter setting: parameters can be modified, most of them can be configured from front panel of the controller and all of them can be configured using PC via USB, RS485 or RJ45 ports;
— Alarm log, which cannot be lost even in case of power outage, maximum 500 pieces can be recorded;
— Event log, which cannot be lost even in case of power outage, maximum 500 pieces can be recorded;
— User-defined protocol content function;
— User-defined bus data function, can read other genset controller data from one controller;
— Harmonic analysis and generator voltage, current waveform display function;
— Monitor data curve at real time;

— Black box function, record data before and after alarm, do data analysis and find problem via PC software;

— Master control module can record USB, open USB record via PC software can do data analysis;

— Display module can open USB, save configuration files.

## 4. FUNCTION DESCRIPTION

### 4.1 HPM6-DG FUNCTION DESCRIPTION

#### 4.1.1 FUNCTION

- Support up to 16 master diesel gensets
- Load distribution (load sharing, fixed power output) between diesel gensets
- 4 heavy consumer inquiry for each controller
- Safe mode (reserve an additional unit running)
- Reserved power (reserve appropriate power for bus running)
- Drop power (run at the set percentage of rated power)
- Start/stop control
- Synchronous close
- Soft loading/unloading
- Engine speed adjusting control: relay output, analog voltage output, analog current output
- Genset voltage adjusting control: relay output, analog voltage output, analog current output

#### 4.1.2 PROTECTION

- Over current, 6-level
- Reverse power, 2-level
- Over power, 2-level
- Over voltage, 3-level
- Under voltage, 3-level
- Over frequency, 3-level
- Under frequency, 3-level
- Unbalanced voltage, 2-level
- Unbalanced current, 2-level
- ROCOF, 2-level
- Vector shift, 2-level
- Loss of excitation, 2-level
- Power factor low, 2-level
- Voltage single and total harmonics, 2-level
- Current single and total harmonics, 2-level
- Earth fault, 2-level
- Unbalanced active power distribution, 2-level
- Unbalanced reactive power distribution, 2-level
- Loss of phase and reverse phase sequence
- Close/open failure
- Digital inputs

#### 4.1.3 DISPLAY PANEL

- Genset start/stop key
- Auto/semi-auto mode transfer key

● Breaker close/open key

● Top priority key

● ACK alarm key

● Status, alarm and information text messages

### 4.1.4    POWER MANAGEMENT

● Blackout handling

● Load-dependent start/stop

● Auto start mode selection

    ► Linear start

    ► Duty time start

● Auto scheduled start mode selection

    ► Active power percentage

    ► Left active power

    ► Apparent power percentage

    ► Left apparent power

● NEL priority trip (3-way for single unit)

● Light consumer active, genset will not stop when load is lower than stop load

● Reserved running gensets, minimum load running gensets on the bus

● Safety stop, safety trip

● Limited on-grid gensets

● Bus breaking handling

● Shore power handling

## 4.2  HPM6-SG FUNCTION DESCRIPTION

### 4.2.1    OPERATION

● Support up to 4 shaft gensets

● Load distribution (load sharing, fixed power output) between shaft gensets and diesel gensets

● 4 heavy consumer inquiry for each controller

● Drop power (run at the set percentage of rated power)

● Start/stop control

● Synchronous close

● Soft loading/unloading

● SG/DG load transfer

● Engine speed adjusting control: relay output, analog voltage output, analog current output

● Genset voltage adjusting control: relay output, analog voltage output, analog current output

### 4.2.2    PROTECTION

● Over current, 6-level

● Reverse power, 2-level

● Over power, 2-level

● Over voltage, 3-level

● Under voltage, 3-level

● Over frequency, 3-level

- Under frequency, 3-level
- Unbalanced voltage, 2-level
- Unbalanced current, 2-level
- ROCOF, 2-level
- Vector shift, 2-level
- Loss of excitation, 2-level
- Power factor low, 2-level
- Voltage single and total harmonics, 2-level
- Current single and total harmonics, 2-level
- Earth fault, 2-level
- Unbalanced active power distribution, 2-level
- Unbalanced reactive power distribution, 2-level
- Loss of phase and reverse phase sequence
- Close/open failure
- Digital inputs
- DG insufficient capacity
- SG insufficient capacity
- SG and DG paralleled number over
- SG and DG grid-connection timeout

### 4.2.3    DISPLAY PANEL

- SG genset start/stop key
- Auto/semi-auto mode transfer key
- Breaker close/open key
- Top priority key
- ACK alarm key
- Status, alarm and information text messages

### 4.2.4    POWER MANAGEMENT

- Blackout handling
- Load-dependent start/stop
- Work mode selection
    - ► Load takeover mode
    - ► Fixed power mode
    - ► Load sharing mode
- NEL priority trip (3-way for single unit)
- Reserved power
- Safety stop, safety trip
- Limited on-grid gensets
- Bus breaking handling
- Shore power handling

## 5. SPECIFICATION

**Table 3 – Specification Parameters**

| Item | Content |
|---|---|
| Working Voltage | Range: DC8V - DC35V continuous power supply, DC reverse connection protection<br>Resolution: 0.1V<br>Accuracy: 1% |
| Overall Consumption | Display: <4W (standby: ≤2.5W)<br>Master control: <8W (standby: ≤5W) |
| AC Voltage | Phase Voltage<br>Range: AC15V - AC520V (ph-N)<br>Resolution: 0.1V<br>Accuracy: 0.5%<br><br>Line Voltage<br>Range: AC30V - AC900V (ph-ph)<br>Resolution: 0.1V<br>Accuracy: 0.5% |
| AC Frequency | Range: 5Hz - 75Hz<br>Resolution: 0.01Hz<br>Accuracy: 0.1Hz |
| AC Current | Rated: 5A<br>Range: 0A - 15A<br>Resolution: 0.1A<br>Accuracy: 0.5% |
| Analog Inputs | Resistance Input<br>Range: (0 - 6000)Ω<br>Resolution: 0.1<br>Accuracy: 1Ω (below 300Ω)<br><br>Voltage Input<br>Range: (0 - 5)V<br>Resolution: 0.001V<br>Accuracy: 0.5%<br><br>Current Input<br>Range: (0 - 20)mA<br>Resolution: 0.001mA<br>Accuracy: 0.5% |
| Analog Outputs | Current Output<br>Range: (-20 - 20)mA<br>Resolution: 0.001mA<br>Accuracy: 0.5% |
| Digital Output Port 1-2 | 8A   DC30V Volt-free (relay output) |

| Item | Content |
|---|---|
| Digital Output Port 3-4 | 8A    DC30V Active (relay output) |
| Digital Output Port 5 | 8A    DC30V Volt-free (relay output) |
| Digital Output Port 6-7 | 7A    DC30V Volt-free (relay output) |
| Digital Output Port 8-20 | 1A    DC30V DC (transistor output) |
| Digital Input Port 1-20 | Low on threshold voltage 4.6V, max. input voltage 60V |
| RS485 Port | Isolated, half-duplex, 9600bps, max. communication distance 1000m |
| Ethernet | Self-adaption, 10/100Mbit |
| MSC CAN Port | Isolated, max. communication distance 250m, use Belden 9841 cable or equivalence |
| CE-EMC Certificate | EN 55032, EN 55024 |
| Vibration | 5Hz~8Hz: displacement=±7.5mm<br>8Hz~500Hz: a=±2g<br>IEC 60068-2-6 |
| Shock | 50g, 11ms, half-sine, three consecutive shocks are applied in each of the three mutually perpendicular directions, i.e., a total of 18 times.<br>IEC 60068-2-27 |
| Bump | 25g, 16ms, half-sine<br>IEC 60255-21-2 |
| Safety Requirements | According to EN 61010-1 installation category (over voltage category) III, 300V, pollution class 2, altitude 3000m |
| Case Dimensions | HPM6D: 220mm x 130mm x 52mm<br>HPM6: 250mm x 165mm x 83mm |
| Panel Cutout | HPM6D: 201mm x 111mm, embedded panel installation<br>HPM6: aperture φ5.5 x 4, hole distance 237.5mm x 152.5mm, screw fixed installation |
| Working Temperature | (-25~+70)°C |
| Work Humidity | (20~93)%RH |
| Storage Temperature | (-30~+80)°C |
| Protection Level | HPM6D display module: front panel IP65, back panel IP20 when waterproof rubber ring is added between controller and control panel.<br>HPM6 master control module: IP20 |
| Insulation Intensity | Apply AC2.2kV voltage between high voltage terminal and low voltage terminal, leakage current is less than 3mA within 1min. |
| Product Standard | GB/T 2820.4-2009 Reciprocating internal combustion engine driven alternating current generating sets - Part 4: Control gear and switchgear<br>GB/T 10250-2007 Electrical and electronic installations in ships – Electromagnetic compatibility<br>GD 22-2015 Guidelines for type approval test of electric and electronic products<br>E-14-2015 Generator protection gear, power station automatic control gear<br>Rules for classification of sea-going steel ships 2015, Volume 4, Part 7: |

| Item | Content |
|------|---------|
|  | Automatic system |
|  | Rules for classification of sea-going steel ships 2015, Volume 4, Part 4: Electric device, chapter 2, section 5 System protection |
| Weight | HPM6D display module 0.57kg; |
|  | HPM6 master control module 1.31kg. |

## 6. OPERATION

## 6.1 PANEL DISPLAY

HPM6D display module TFT LCD is 4.3 inches with 480x272 resolutions, as follows:



**Fig.1 – HPM6D Display Panel**

**Table 4 – Alarm Indicator Introduction**

| Alarm Type | Indicator Color | Indicator Status |
|---|---|---|
| Indication Alarm | Green | Slowly flash (once per second) |
| Warning Alarm | Yellow | Slowly flash (once per second) |
| Block Alarm | Yellow | Slowly flash (once per second) |
| Safety Trip Alarm | Red | Fast flash (twice per second) |
| Safety Trip and Stop Alarm | Red | Fast flash (twice per second) |
| Trip Alarm | Red | Fast flash (twice per second) |
| Trip and Stop Alarm | Red | Fast flash (twice per second) |

**NOTE1:** Alarm Indicator (red, green, yellow): flashes when alarm is not acknowledged, always illuminates when alarm is acknowledged but not disappear, extinguishes when the alarm is disappeared;

**NOTE2:** Power Indicator (green): green light always illuminates when the power is normal;

**NOTE3:** Running Indicator (red and green, yellow represents green and red lights are illuminated simultaneously):

    Green light always illuminates: genset is normally running;

    Red light always illuminates: ready to start signal abnormal or genset in start inhibit status;

    Yellow light always illuminates: genset normal running, but standby engine starts signal abnormal or genset in start inhibit status;

    Light off: genset standby and normal running;

**NOTE4:** Self-check Indicator (green): green light illuminates when self-check is normal;

**NOTE5:** Gen Normal Indicator (green): it always illuminates when generating is normal, flashes when generating is abnormal, extinguishes when there is no generating;

**NOTE6:** Bus Normal Indicator (green): it always illuminates when bus is normal, extinguishes when bus is abnormal or bus voltage blackout;

**NOTE7:** Top Priority Indicator (green): When the top priority is enabled, press current controller "Top Priority Key", system will sort all gensets priority and set the current genset as the first (priority value is smallest), controller indicator always illuminates (on-grid genset in non-auto mode is prior to genset in auto mode), otherwise it will extinguish. When the top priority is disabled, press current controller "Top Priority Key", indicator illuminates, representing current genset is master,

controller priority shows -1 simultaneously, press the key again, indicator extinguishes and priority shows normally. When the top priority key more than two gensets is pressed, indicators will illuminate simultaneously, representing they are all in master status, priority refers to number, smaller the number, higher the priority.

**Table 5 – Switch Status Indicator Introduction**

| Alarm Type | Alarm Indicator Status |
|---|---|
| Opened | All lights between gen indicator and bus indicator (except for gen c/o indicator) illuminate according to gen and bus status. |
| Closed | All lights between gen indicator and bus indicator always illuminate. |
| Synchronous Closing | All lights between gen indicator and bus indicator cycle illuminate from left to right. |
| Soft-loading | All lights between gen indicator and bus indicator cycle illuminate from left to right. |
| Soft Unloading Opening | All lights between gen indicator and bus indicator cycle illuminate from right to left. |
| Close Failure | All lights between gen indicator and bus indicator flash. |
| Open Failure | All lights between gen indicator and bus indicator flash. |
| Close Feedback Failure | All lights between gen indicator and bus indicator always illuminate, but gen c/o indicator flashes. |
| Open Feedback Failure | All lights between gen indicator and bus indicator always illuminate, but gen c/o indicator flashes. |
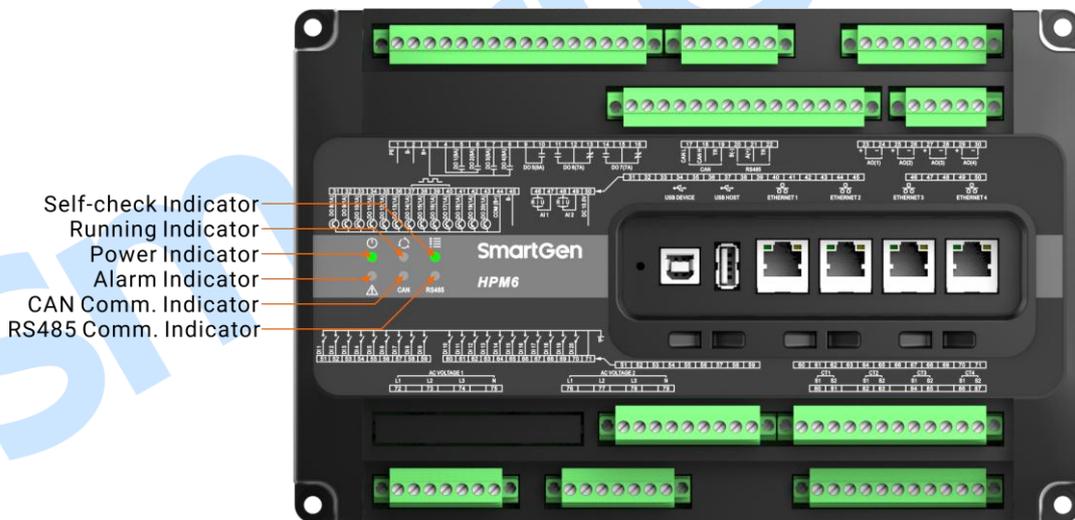


**Fig.2 – HPM6 Master Control Panel**

**NOTE1:** Power Indicator (red, green, yellow): green light always illuminates when power is normal, yellow light always illuminates when power is abnormal;

**NOTE2:** Running Indicator (red and green, yellow represents green and red light simultaneously): refer to display module indicator description;

**NOTE3:** Self-check Indicator (green): green light illuminates when self-checking is normal;

**NOTE4:** Alarm Indicator (red, green, yellow): refer to display module indicator description;

**NOTE5:** CAN Communication Indicator (green): flashes in communication, extinguishes in other periods;

**NOTE6:** RS485 Communication Indicator (green): flashes in communication, extinguishes in other periods.

## 6.2 KEY FUNCTION DESCRIPTION

**Table 6 – Key Description**

| Icon | Key | Description |
|------|-----|-------------|
| **O** | Stop | Open and stop the parallel running genset in Semi-auto mode. Lamp test (press at least 3s). |
| **I** | Start | Start the standby genset in Semi-auto mode. |
| | Semi-auto | Press this key and controller enters **Semi-auto** mode. |
| | Auto | Press this key and controller enters **Auto** mode. |
| | Top Priority | Place current genset at the highest priority by pressing the key. Start current genset first under corresponding running mode. Details refer to top priority indicator description. |
| (ACK) | ACK | Press it to fast switch to alarm interface, press it in alarm interface to acknowledge all alarms, alarm indicator changes from flash to flat. |
| | Close | Control breaker synchronous close in **Semi-auto** mode. |
| | Open | Control breaker unloading open in **Semi-auto** mode. |
| | Up/Increase | 1. Screen scroll; <br> 2. Up cursor and increase value in setting menu. |
| | Down/Decrease | 1. Screen scroll; <br> 2. Down cursor and decrease value in setting menu. |
| | Left | 1. Page scroll; <br> 2. Left move cursor in setting menu. |
| | Right | 1. Page scroll; <br> 2. Right move cursor in setting menu. |
| Enter | Set/Confirm | 1. Press it more than 3s and enter parameter setting menu; <br> 2. In setting menu, confirm the set value; <br> 3. Alarm interface can acknowledge and unlock alarms. |
| | Exit | 1. Return to first interface; <br> 2. Return to previous menu in setting menu. |

⚠**NOTE:** Press any key in the main interface can mute sound.

### 6.3 PARAMETERS SETTING

Press [Enter] key for more than 3s to enter into user menu.

★ Parameter setting

After entering the correct password, you can enter parameter settings interface.

Password can be divided into 3 levels: one highest level (engineer, default is 00318) and two user-defined levels (technician, default is 00317; operator, default is 00316). After entering highest level password, all configuration items can be set; after entering user-defined level password, users can only configure parameters within the permission field.

Parameter setting includes the following contents:

★ Module setting

★ Bus setting

★ Generator setting

★ Generator load setting

★ Timers setting

★ Analog inputs setting

★ Digital inputs setting

★ Digital outputs setting

★ Analog outputs setting

★ Breaker setting

★ Synchronization setting

★ Synchronous calibration

★ SLD setting (only configure via upper computer)

★ Engine setting

★ 1# DIN16 setting

★ 2# DIN16 setting

★ 1# DOUT16 setting

★ 2# DOUT16 setting

**Example:**

| Return | >Start delay | Interface 1: |
|---|---|---|
| Module setting | >Stop delay | Use △ ▽ to change setting contents, |
| Bus setting | >Start output time | [Enter] to enter settings (interface 2), ⤺ to exit |
| Generator setting | >Stop output time | settings menu. |
| Generator load setting | >Wait for start time | |
| **Timers setting >** | >Wait for stop time | |
| Analog inputs setting | >Load stable time | |
| Digital inputs setting | >Transient fault delay | |
| Digital outputs setting | >Alarm start delay | |
| Analog outputs setting | >Trigger start delay | |
| Breaker setting | >Alarm stop delay | |

| Return | >Start delay | Interface 2: |
|---|---|---|
| Module setting | >Stop delay | Use ▲ ▼ to change setting contents, |
| Bus setting | >Start output time | [Enter] to enter settings (interface 3), ↩ to |
| Generator setting | >Stop output time | return to previous menu. (interface 1) |
| Generator load setting | >Wait for start time | |
| **Timers setting        >** | >Wait for stop time | |
| Analog inputs setting | >Load stable time | |
| Digital inputs setting | >Transient fault delay | |
| Digital outputs setting | >Alarm start delay | |
| Analog outputs setting | >Trigger start delay | |
| Breaker setting | >Alarm stop delay | |

| Return | >Start delay | Interface 3: |
|---|---|---|
| Module setting | **>Stop delay** | Use ▲ ▼ to change setting contents, |
| Bus setting | >Start output time | [Enter] to confirm settings (interface 4), ↩ to |
| Generator setting | >Stop output time | return to previous menu. (interface 1). |
| Generator load setting | >Wait for start time | |
| **Timers setting        >** | >Wait for stop time | |
| Analog inputs setting | >Load stable time | |
| Digital inputs setting | >Transient fault delay | |
| Digital outputs setting | >Alarm start delay | |
| Analog outputs setting | >Trigger start delay | |
| Breaker setting | >Alarm stop delay | |

| >Start delay | | Interface 4: |
|---|---|---|
| **>Stop delay** | **00005** | Press [Enter] to enter settings (interface 5), ↩ |
| >Start output time | | to return to previous menu. (interface 3). |
| >Stop output time | | |
| >Wait for start time | | |
| >Wait for stop time | | |
| >Load stable time | | |
| >Transient fault delay | | |
| >Alarm start delay | | |
| >Trigger start delay | | |
| >Alarm stop delay | | |

| | | |
|---|---|---|
| >Start delay | | Interface 5: |
| **>Stop delay** | **00005** | Press ◀ ▶ to change cursor position, ▲ ▼ are used for changing cursor value, Enter ↵ to confirm setting and the setting will be stored in internal memory automatically; ↩ to exit setting. |
| >Start output time | | |
| >Stop output time | | |
| >Wait for start time | | |
| >Wait for stop time | | |
| >Load stable time | | |
| >Transient fault delay | | |
| >Alarm start delay | | |
| >Trigger start delay | | |
| >Alarm stop delay | | |

## 7. DG SYSTEM MODE DESCRIPTION

## 7.1 SYSTEM MODE

### 7.1.1 MANUAL MODE

When manual mode signal is active, the system will enter manual mode. In this mode, HPM6 controller can only monitor data and issue alarms but cannot control switch or genset. In addition, GOV and AVR do not work but the manual GOV IN, manual GOV OUT, manual AVR IN and manual AVR OUT do work in this mode.

### 7.1.2 SEMI-AUTO MODE

Semi-auto mode is activated by pressing 🖐 key; Semi-auto means that the unit will not initiate any sequences automatically. It will only initiate sequences if external signal is given and alarm protection function is always active.

The external signal may be given in three ways:
1. Using display panel keys
2. Using digital inputs
3. Using Modbus command

In semi-auto mode, all available diesel gensets start/stop/synchronizing closed/unloaded open can be controlled by front panel keys.

The system monitors that if gensets are overloaded. Should that be the case, the Non Essential Load (NEL) trip will activate to maintain power supply to bus.

If a heavy consumer is requested, the system will calculate the power needed. If the available power is insufficient, the heavy consumer connection will not be allowed.

**Semi-auto Start:**

a) Start command will be initiated by HPM6 after pressing 🔲 key. The system enters into "Start Output Delay" while the start relay will activate;

b) When "Start Output Delay" is over, "Wait for Start Delay" will be initiated. "Fail to Start" block alarm will be initiated if measured generator voltage and frequency do not reach the set value after start wait delay is over;

c) "Load Stable Delay" will be initiated when crank disconnect conditions are reached during start wait delay process. "Frequency/Voltage Fault" block alarm and shutdown will be initiated if generator voltage and frequency do not reach the set value after the "Load Stable Delay" has expired. It enters into "Normal Running" status if the on-load requirement has been achieved;

d) If the switch is not closed during the normal running status and the voltage/frequency has not satisfied the on-load requirement suddenly, "Transient Fault Delay" will be initiated. "Frequency/Voltage Fault" block alarm and shutdown will be initiated if the on-load requirement has not been achieved after the delay has expired. It enters into "Normal Running" status if the on-load requirement has been achieved during delay period;

e) Under normal running status, genset will close and synchronize automatically after pressing the

 key; In case of single unit running, it will close breaker directly;

f) In case of multi-set operation, the genset will share load automatically;

g) If there is trip or shutdown alarm occurs, then the system will trip or stop and the corresponding alarm information will be displayed on the LCD.

**Semi-auto Stop:**

a) In breaker close status, press  key, in case of multi-set operation, first of all, the system will transfer load and open breaker; in case of single unit running and semi-auto intelligent open is enabled, it cannot open, otherwise it will open directly;

b) In breaker open status, press  key, system will enter into "Stop Output Delay" while the stop relay will activate;

c) After "Stop Output Delay" is over, system will enter into "Wait for Stop" delay. If genset voltage and frequency signals disappear during the delay, controller will judge that the genset stops and in standby state; otherwise, if genset voltage and frequency signals still can be detected after the delay expired, controller will judge that the genset fails to stop;

d) After genset fails to stop, if voltage and frequency signals are disappeared, controller will judge that the genset stops completely and in standby state.

### 7.1.3 AUTO MODE

Auto mode is activated by pressing  key.

All available diesel gensets are controlled by the power management system and are started and stopped according to the start priority and the actual bus load. Should a running generator develop the trip alarm, the system will start the next generator in line and synchronize its breaker before taking the failing generator out of service. At the same time, the system detects whether gensets are overloaded. Should that be the case, the Non Essential Load (NEL) trip will activate to maintain power supply to bus.

**Auto Start Rules:**

a) If the system detects that there is no voltage signal on bus, then corresponding gensets are started according to the start priority;

b) After load increasing, the system will start the next genset in line if the power is insufficient;

c) If a heavy consumer is requested, the system will calculate the power needed and automatically start corresponding gensets to satisfy the requirement when power is insufficient;

d) If there are trip and shutdown fault alarms occur, the corresponding units are automatically started to meet the load requirements;

e) Linear start mode: if priority is disabled, priority changes will not affect loading genset, it will work in next genset scheduling (current power is over than start power); if enabled and priority changes, higher priority level standby genset will start;

f) Duty time start mode: gensets will start according to the duty-hour.

**Auto Start Sequence:**

a) Genset enters into "Start Delay" as soon as "Auto Start" is active;

b) After the "Start Delay" has expired, the system enters into "Start Output Delay" while the start relay will activate;

c) When start delay is over, "Wait for Start Delay" will be initiated. "Fail to Start" block alarm will be initiated if measured generator voltage and frequency do not reach the set value after start wait delay is over;

d) If crank disconnect conditions are satisfied in "Wait for Start Delay", "Load Stable Delay" will be initiated. "Frequency/Voltage Fault" block alarm and shutdown will be initiated if generator voltage and frequency do not reach the set value after the "Load Stable Delay" has expired. It enters into "Normal Running" status if the on-load requirement has been achieved;

e) After controller entering into normal running state, and meanwhile on-load requirement has been achieved (generator normal light will illuminate), genset will close and synchronize automatically;

f) In case of multi-set operation after closing, genset will share load automatically;

g) If there is trip alarm or shutdown alarm occurs, then the system will trip or shutdown and the alarm information will be displayed on the LCD.

**Auto Stop Rules:**

a) In multiple gensets running system, if the system detects that the load power has fallen below the stop power, the controller will transfer load according to the start mode rules firstly and then open breaker and shutdown;

b) If there is trip alarm or shutdown alarm occurs, the fault genset will open breaker and stop;

c) If there is safety trip alarm or safety shutdown alarm occurs, the fault genset will take off load and open breaker to stop after new genset start up and on-load requirement of the bus is satisfied;

d) Linear start mode: if priority is enabled and priority changes, after genset with higher priority takes load, genset with lower priority will take off load and stop; if disabled, priority changes will not affect loading genset, it will work in next genset scheduling (total load power is lower than stop power);

e) Duty time start mode: gensets will stop according to the duty-hour.

**Auto Stop Sequence:**

a) When stop input is activated in auto mode, system enters into "Stop Delay" state;

b) After "Stop Delay" is expired, in case of multi-set operation, genset will open breaker after transferring the load;

c) After the switch is opened, the system enters into "Stop Output Delay" while the stop relay will activate;

d) After "Stop Output Delay" expired, system enters into "Wait for Stop Delay", If genset voltage and frequency signals disappear during the delay, controller will judge that the genset stops and in standby state; otherwise, if genset voltage and frequency signals still can be detected after the delay expired, controller will judge that the genset fails to stop;

e) After genset fails to stop, if voltage and frequency signals are disappeared, controller will judge that

the genset stops completely and enters into standby state.

**Table 7 – System Modes Description**

| Mode | Start/Stop Method | Close/Open | GOV/AVR | Alarm Protection | Description |
|------|-------------------|------------|---------|------------------|-------------|
| Manual | Exterior (not via controller) | Exterior (not via controller) | Exterior (not via controller) | Auto | Also called switchboard mode, mainly for monitoring and protection. |
| Semi-auto | Exterior (by controller) | Exterior (by controller) | Auto | Auto | Used for semi-auto power station. |
| Auto | Auto | Auto | Auto | Auto | Used for full-auto power station. |

## 7.2 START MODE DESCRIPTION

**Table 8 – Start Mode Description**

| Start Mode | Start Method | Stop Method | Auto Mode | Semi-auto Mode | Manual Mode |
|------------|--------------|-------------|-----------|----------------|-------------|
| Linear Start Mode | Start the gensets according to the set priority. The genset with higher priority will start first. The smaller the number, the higher the priority. | Stop the gensets according to the priority, genset with lower priority will stop first.<br>E.g. If start sequence is 1-2-3, then the stop sequence of 3-2-1. | √ | X | X |
| Duty Time Start Mode | The gensets which has the shortest running hours will start first. After start time reaches set duty time, the next genset which has the shortest running hours will start. | The gensets which has the longest running hours will stop first. | √ | X | X |

## 7.3 SCHEDULED MODE DESCRIPTION

**Table 9 – Scheduled Mode Description**

| Mode | Start Method | Stop Method | Auto | Semi-auto | Manual |
|------|-------------|-------------|------|-----------|--------|
| Active Power PCT | When start according to "Start Max. Load PCT", if load active power ÷ bus total active power ≥ start max. load PCT, it will schedule other gensets to start. | When stop according to "Stop Min. Load PCT", if current load active power ÷ (bus total active power - rated active power of genset to be shutdown) < stop max. load PCT, it will schedule this genset to stop. | √ | X | X |
| Left Active Power | When start according to "Left Start Active Power", if current bus total left active power ≤ start active power, it will schedule other gensets to start. | When stop according to "Left Stop Active Power", if (current bus total left active power - rated active power of genset to be shutdown) < left stop active power, it will schedule this genset to stop. | √ | X | X |
| Apparent Power PCT | When start according to "Start Max. Load PCT", if load apparent power ÷ bus total apparent power ≥ start max. load PCT, it will schedule other gensets to start. | When stop according to "Stop Min. Load PCT", if current load apparent power ÷ (bus total apparent power - rated apparent power of genset to be shutdown) < stop max. load PCT, it will schedule this genset to stop. | √ | X | X |
| Left Apparent Power | When start according to "Left Start Apparent Power", if current bus total left apparent power ≤ left start apparent power, it will schedule other gensets to start. | When stop according to "Left Stop Apparent Power", if (current bus total left apparent power - rated apparent power of genset to be shutdown) < left stop apparent power, it will schedule this genset to stop. | √ | X | X |

## 8.  SG SYSTEM MODE DESCRIPTION

### 8.1 SG SYSTEM MODE

#### 8.1.1    MANUAL MODE

When manual mode signal is active, the system will work through manual mode. In this mode, HPM6 controller can only monitor data and alarm information but cannot control switch or genset. In addition, GOV and AVR do not work but the manual GOV IN, manual GOV OUT, manual AVR IN and manual AVR OUT do work in this mode.

#### 8.1.2    SEMI-AUTO MODE

Semi-auto mode is activated by pressing 🖐 key; Semi-auto means that the unit will not initiate any sequences automatically. It will only initiate sequences if external signal is given and alarm protection function is always active.

The external signal may be given in three ways:

1. Using display panel keys
2. Using digital inputs
3. Using Modbus command

In semi-auto mode, all available gensets start/stop/synchronizing closed/unloaded open can be controlled by front panel keys.

The system detects whether gensets are overloaded. Should that be the case, the Non Essential Load (NEL) trip will activate to maintain power supply to bus.

If a heavy consumer is requested, the system will calculate the power needed. If the available power is insufficient, the heavy consumer connection will not be allowed.

**Semi-auto Start:**

a) Press 【 I 】 key, the controller firstly judges the feedback state of the shaft solenoid valve closing (if configured). If the state is not detected, the shaft solenoid valve closing outputs (if configured) and will wait for the feedback state to be effective;

b) After the feedback signal of shaft solenoid valve closing is detected, HPM6 initiates a start command and the system enters the "Start Output Delay", during which the engine start relay outputs;

c) When "Start Output Delay" is over, "Wait for Start Delay" will be initiated. "Fail to Start" block alarm will be initiated if the measured generator voltage and frequency do not reach the set value after the delay has expired;

d) When this delay is over, "Load Stable Delay" will be initiated. "Frequency/Voltage Fault" block alarm and shutdown will be initiated if generator voltage and frequency do not reach the set value after the "Load Stable Delay" has expired. It will enter into "Normal Running" status if the on-load requirement has been achieved;

e) If the switch is not closed during the normal running status and the voltage/frequency has not satisfied the on-load requirement suddenly, "Transient Fault Delay" will be initiated. "Frequency/Voltage Fault" block alarm and shutdown will be initiated if the on-load requirement has

not been achieved after the "Transient Fault Delay" has expired. It enters into "Normal Running" status if the on-load requirement has been achieved during delay period;

f) When the shaft genset is in normal running status, it will close and synchronize automatically after pressing ▭ key;

g) It will judge whether the SG power can receive all the DG power when closing in load takeover mode. If not, the controller will initiate an alarm and stop the closing operation. If it meets the requirements, the DG will open and stop after all the loads are received by the SG (DG is effective in auto mode); In the fixed power mode, the controller synchronously closes and operates at fixed power and grid connection with DG;

h) If there is trip or shutdown alarm occurs, then the system will trip or stop and the corresponding alarm information will be displayed on the LCD.

**Semi-auto Stop:**

a) Press ▭ key in close status or input port of DG with load is effective, the system will dispatch the DG starting (DG is effective in auto mode), judging whether DG power receives all the SG power, if not, controller will initiate an alarm and stop operations, if it meets the requirements, SG soft unloads and opens;

b) After breaker opened or in breaker open status, press ⭕ key, system will enter into "Stop Output Delay" while the stop relay will activate;

c) After "Stop Output Delay" is over, system will enter into "Wait for Stop" delay. If genset voltage and frequency signals disappear during the delay, controller will judge that the genset stops and in standby state; otherwise, if genset voltage and frequency signals still can be detected after the delay expired, controller will judge that the genset fails to stop;

d) After genset fails to stop, if voltage and frequency signals are disappeared, controller will judge that the genset stops completely and enters into standby state.

### 8.1.3 AUTO MODE

Auto mode is activated by pressing ⟲ key (or by auto mode switch).

The start/stop, opening/closing sequence of auto mode is the same as the semi-auto mode, except for start/stop, opening/closing keys on the panel are inactive and can only be operated through the input port in auto mode.

When DG is loaded, SG will start and close automatically when the input of SG is effective with load, and DG will automatically unload and stop;

When SG is loaded, DG will start and close automaticlly when the input of DG is effective with load, and SG will automaticlly unload and stop;

In fixed power mode, SG will automatically start and connect to the grid with DG when the input of SG is effective with load;

In load sharing mode, SG will automatically start and connect to the grid with DG when the input of SG is effective with load.

## 8.2 WORKING MODE DESCRIPTION

**Table 10 – Working Mode Description**

| Working Mode | Description | Auto Mode | Semi-auto Mode | Manual Mode |
|---|---|---|---|---|
| Load Takeover Mode | After SG closing, all loads will be transferred to SG side, DG opens and stops; When SG opening, all loads will be transferred to DG side, SG opens and stops. | √ | √ | X |
| Fixed Power Mode | After SG closing, SG shares with parts of loads, DG shares the rest of power; When SG opening, all load will be transferred to DG side, SG opens and stops. | √ | √ | X |
| Load Sharing Mode | After SG closing, loads will be shared by SG and DG; When SG opening, all loads will be transferred to DG side, SG opens and stops. | √ | √ | X |

**NOTE:** When in SG mode, outputs of GOV and AVR should be set as "none" if SG can not achieve speed governing.

## 9. PROTECTION

Generator protection, bus protection, current protection, power protection and switch protection can be provided by HPM6. Each kind of protection can configure alarm types and ranges.

**Table 11 – Controller Alarm Types**

| Alarm Type/Action | Buzzer | Display | Start | Close | Unload | Trip | Stop |
|---|---|---|---|---|---|---|---|
| Block | √ | √ | X | X | X | X | X |
| Warning | √ | √ | √ | √ | X | X | X |
| Safety Trip | √ | √ | √ | X | √ | √ | √ |
| Safety Trip and Stop | √ | √ | X | X | √ | √ | X |
| Trip | √ | √ | √ | X | X | √ | X |
| Trip and Stop | √ | √ | X | X | X | √ | √ |
| Indication | X | √ | √ | √ | X | X | X |

**Table 12 – Alarm Active Ranges**

| Active Range | Description |
|---|---|
| Always Active | All statuses detect alarm. |
| Inactive | Alarm is inactive. |
| Before Gen Close | It detects alarm when genset is not closed. |
| After Gen Close | It detects alarm after genset is closed with load. |
| Gen Close on Bus | It detects alarm when genset closes with load (bus is available). |
| No Gen Close on Bus | It detects alarm when genset not close with load (bus is unavailable). |
| Gen Normal | It detects alarm when generator is normal. |
| Other Gens Close | It detects alarm after other gensets except for bus close with load. |
| Start Delay | It detects alarm after genset start delay time. |
| After Gen Close Delay | It detects alarm after gen close delay. |
| Before Gen Close Delay | It detects alarm after gen open delay. |
| Gen Load Normal | It detects alarm after genset takes load and soft loading. |
| Gen Close Delay on Bus | It detects alarm after genset closes delay with load on bus (bus is available). |
| No Gen Close Delay on Bus | It detects alarm after no gen close delay with load (bus is unavailable). |
| Gen Normal Delay | It detects alarm after gen normal delay. |
| Other Gens Close Delay | It detects alarm after other gensets except for bus close delay with load. |
| Gen Load Normal Delay | It detects alarm after genset takes load ad soft loading delay. |

If alarm self-locked function is enabled, when the alarm condition is not satisfied and acknowledged, this alarm can be removed after unlocking. If this function is disabled, alarm information will be automatically removed after alarm condition is not satisfied and acknowledged.

If alarm automatic acknowledging function is disabled, when the alarm condition is not satisfied, this alarm can be removed after acknowledging. If this function is enabled, alarm information will be automatically removed after alarm condition is not satisfied.

Users can remove the alarm by "Alarm Reset" auxiliary input port.
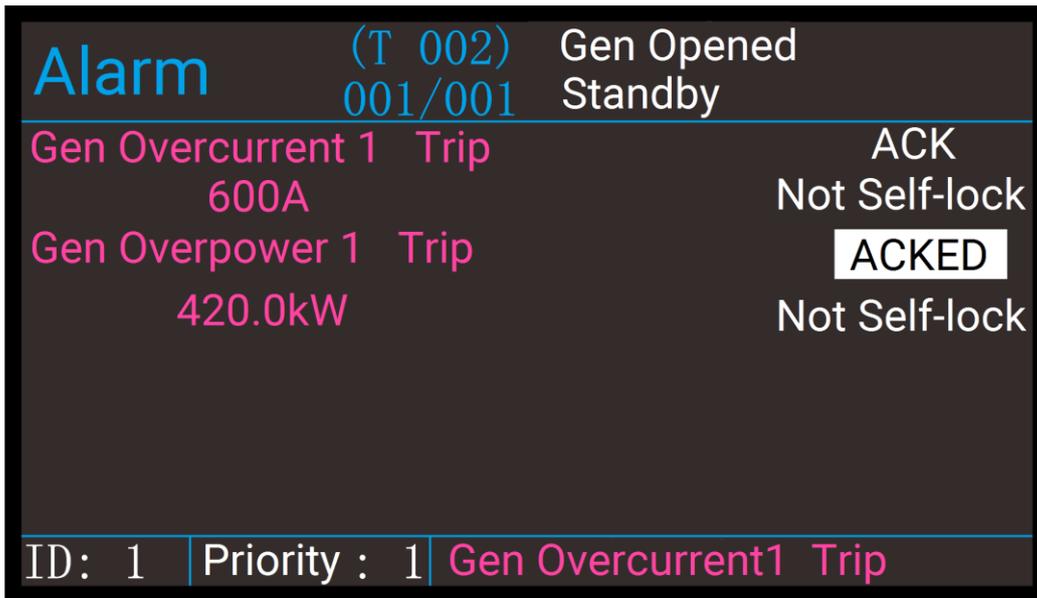


**Fig.3 – Alarm Display Diagram**

Press ▲▼ to select the alarm you are going to reply, and press [Enter] to acknowledge the alarm.

**Table 13 – HPM6 Alarms List**

| No. | Types | Description | Alarm Type |
|-----|-------|-------------|------------|
| Bus Protection | | | |
| 1 | Overvolt 1 | When bus voltage has exceeded the set value 1, it will initiate a warning alarm. | **Warn**<br>Always active |
| 2 | Overvolt 2 | When bus voltage has exceeded the set value 2, it will initiate a trip alarm. | **Trip**<br>Always active |
| 3 | Overvolt 3 | When bus voltage has exceeded the set value 3, it will initiate an alarm. | Disabled |
| 4 | Undervolt 1 | When bus voltage has fallen below than the set value 1, it will initiate a warning alarm. | **Warn**<br>It is active after gen has closed on bus. |
| 5 | Undervolt 2 | When bus voltage has fallen below than the set value 2, it will initiate a trip alarm. | **Trip**<br>It is active after gen has closed on bus. |
| 6 | Undervolt 3 | When bus voltage has fallen below than the set value 3, it will initiate an alarm. | Disabled |
| 7 | Overfreq 1 | When bus frequency has exceeded the set value 1, it will initiate a warning alarm. | **Warn**<br>Always active |
| 8 | Overfreq 2 | When bus frequency has exceeded the set value 2, it will initiate a trip alarm. | **Trip**<br>Always active |
| 9 | Overfreq 3 | When bus frequency has exceeded the set value 3, it will initiate an alarm. | Disabled |

| No. | Types | Description | Alarm Type |
|---|---|---|---|
| 10 | Underfreq 1 | When bus frequency has fallen below than the set value 1, it will initiate a warning alarm. | **Warn** It is active after gen has closed on bus. |
| 11 | Underfreq 2 | When bus frequency has fallen below than the set value 2, it will initiate a trip alarm. | **Trip** It is active gen has closed on bus. |
| 12 | Underfreq 3 | When bus frequency has fallen below than the set value 3, it will initiate an alarm. | Disabled |
| 13 | ROCOF | Alarm when rate of change of frequency is greater than the set value. | Disabled |
| 14 | Vector Shift | Alarm when the change of phase angle is greater than the set value. | Disabled |
| 15 | Loss of Phase | Alarm when bus losses of phase. | **Warn** It is active after gen is normal. |
| 16 | Reverse Phase Sequence | Alarm when bus has reverse phase sequence. | **Warn** It is active after gen is normal. |
| 17 | Input Fault | Alarm when other gensets on bus close and controller detects that there is no voltage sampling signal when it is about to close. | **Block** It is active after synchronous close. |
| Generator Protection | | | |
| 1 | Overvolt 1 | When genset voltage has exceeded the set value 1, it will initiate a warning alarm. | **Warn** Always active |
| 2 | Overvolt 2 | When genset voltage has exceeded the set value 2, it will initiate a trip alarm. | **Trip** Always active |
| 3 | Overvolt 3 | When genset voltage has exceeded the set value 3, it will initiate an alarm. | Disabled |
| 4 | Undervolt 1 | When genset voltage has fallen below than the set value 1, it will initiate a warning alarm. | **Warn** It is active after gen has closed. |
| 5 | Undervolt 2 | When genset voltage has fallen below than the set value 2, it will initiate a trip alarm. | **Trip** It is active after gen has closed. |
| 6 | Undervolt 3 | When genset voltage has fallen below than the set value 3, it will initiate an alarm. | Disabled |
| 7 | Overfreq 1 | When genset frequency has exceeded the set value 1, it will initiate a warning alarm. | **Warn** Always active |
| 8 | Overfreq 2 | When genset frequency has exceeded the set value 2, it will initiate a trip alarm. | **Trip** Always active |
| 9 | Overfreq 3 | When genset frequency has exceeded the set value 3, it will initiate an alarm. | Disabled |

| No. | Types | Description | Alarm Type |
|---|---|---|---|
| 10 | Underfreq 1 | When genset frequency has fallen below than the set value 1, it will initiate a warning alarm. | **Warn** <br> It is active after gen has closed. |
| 11 | Underfreq 2 | When genset frequency has fallen below than the set value 2, it will initiate a trip alarm. | **Trip** <br> It is active after gen has closed. |
| 12 | Underfreq 3 | When genset frequency has fallen below than the set value 3, it will initiate an alarm. | Disabled |
| 13 | Reverse Phase Sequence | When controller detects the reverse phase sequence, it will initiate a warning alarm. | **Warn** <br> It is active after gen is normal. |
| 14 | Loss of Phase | When controller detects loss of phase, it will initiate a warning alarm. | **Warn** <br> It is active after gen is normal. |
| 15 | Generator ROCOF 1 | Alarm when rate of change of frequency is greater than set value. | Disabled |
| 16 | Generator ROCOF 2 | | Disabled |
| 17 | Vector Shift 1 | Alarm when vector shift is greater than set value. | Disabled |
| 18 | Vector Shift 2 | | Disabled |
| 19 | Unbalanced Voltage 1 | Alarm when unbalanced voltage is greater than set value. Unbalanced voltage refers to the difference value between maximum voltage and average voltage. | **Warn** <br> It is active after gen has closed. |
| 20 | Unbalanced Voltage 2 | | Disabled |
| 21 | Voltage THD 1 | Alarm when controller detects voltage total harmonic distortion value is greater than set value. | Disabled |
| 22 | Voltage THD 2 | | Disabled |
| 23 | Voltage SHD 1 | Alarm when controller detects voltage single harmonic distortion value is greater than set value. | Disabled |
| 24 | Voltage SHD 2 | | Disabled |
| 25 | Loss of Excitation 1 | Alarm when controller detects the absolute value of genset negative reactive power is greater than the set value. | **Warn** <br> Always active |
| 26 | Loss of Excitation 2 | | Disabled |
| 27 | Low Power Factor 1 | Alarm when controller detects genset power factor is lower than set vale. | **Warn** <br> It is active after gen has closed. |
| 28 | Low Power Factor 2 | | Disabled |
| 29 | Freq./Volt Fault | Frequency/voltage alarm will be initiated when controller starts and can't meet load conditions after load stable delay. | **Block** <br> It is active after starting. |
| Engine Protection | | | |

| No. | Types | Description | Alarm Type |
|---|---|---|---|
| 1 | Start Failure | Alarm when genset not reach load condition after starting and start wait delay is over. | **Block**<br>It is active after starting. |
| 2 | Stop Failure | Alarm when it detects generator signal after stop wait delay is over. | **Warn**<br>It is active after stop wait delay. |
| 3 | Sync. Failure | When controller not detect synchronous signal during set time, it will initiate a warning alarm. | **Warn**<br>It is active in synchronization. |
| 4 | Engine Fault | When controller detects engine fault input is active, it will initiate a warning alarm. | **Block**<br>Always active. |
| 5 | No Running Feedback Fault | When running feedback function is enabled, if controller detects that voltage and frequency meet crank disconnect conditions after starting, but running feedback input is inactive, running feedback fault alarm will be initiated. | **Warn**<br>It is active after starting. |
| 6 | External Start | In semi-auto mode, when controller detects generator signal, alarm signal will be initiated;<br>In manual mode, alarm signal will be initiated after external start and close with load. | **Indication**<br>It is active at standby. |
| 7 | External Stop | In manual mode, controller will send alarm signal in external stop. | **Indication**<br>It is active at stop. |
| 8 | Freq. Error | Alarm signal will be initiated when generator and bus frequency are greater than 8Hz in synchronous close. | **Warn**<br>It is active in synchronous close. |
| 9 | Emergency Stop | Controller will send alarm signal when emergency stop input port is active. | **Trip and Stop**<br>Always active. |
| Current Protection | | | |
| 1 | Over Current 1 | When controller detects the generator current has exceeded the set value 1, it will initiate a warning alarm. | **Warn**<br>Always active. |
| 2 | Over Current 2 | When controller detects the generator current has exceeded the set value 2, it will initiate a trip alarm. | **Trip**<br>Always active. |
| 3 | Over Current 3 | When controller detects the generator current has exceeded the set value 3, it will initiate a trip alarm. | **Trip**<br>Always active. |
| 4 | Over Current 4 | When controller detects the generator current has exceeded the set value 4, it will initiate a trip alarm. | **Trip**<br>Always active. |
| 5 | Over Current 5 | When controller detects the generator current has exceeded the set value 5, it will initiate a trip alarm. | Disabled |
| 6 | Over Current 6 | When controller detects the generator current has | Disabled |

| No. | Types | Description | Alarm Type |
|---|---|---|---|
| | | exceeded the set value 6, it will initiate a trip alarm. | |
| 7 | Unbalanced Current 1 | When the controller detects that unbalanced current has exceeded the set value, it will initiate a warning alarm. Unbalanced current refers to the difference value between max. current and average current. | **Warn** It is active after gen has closed. |
| 8 | Unbalanced Current 2 | | Disabled |
| 9 | Current THD 1 | Alarm when controller detects current total harmonic distortion value is greater than set value. | Disabled |
| 10 | Current THD 2 | | Disabled |
| 11 | Current SHD 1 | Alarm when controller detects current single harmonic distortion value is greater than set value. | Disabled |
| 12 | Current SHD 2 | | Disabled |
| 13 | Earth Fault 1 | Alarm when controller detects earth current is greater than set value. | Disabled |
| 14 | Earth Fault 2 | | Disabled |
| 15 | External Overcurrent Short | Alarm when external overcurrent input port is active. | **Trip** Always active. |
| Power Protection | | | |
| 1 | Reverse Power 1 | When controller detects the reverse power value (power is negative) has fallen below than the set value 1, it will initiate a trip alarm. | **Warn** Always active. |
| 2 | Reverse Power 2 | When controller detects the reverse power value (power is negative) has fallen below than the set value 2, it will initiate a trip alarm. | **Trip** Always active. |
| 3 | Over Power 1 | When controller detects the power value (power is positive) has exceeded the set value 1, it will initiate a warning alarm. | **Warn** Always active. |
| 4 | Over Power 2 | When controller detects the power value (power is positive) has exceeded the set value 2, it will initiate a trip alarm. | **Trip** Always active. |
| 5 | Non Essential Load 1 Trip | When controller detects the power value (power is positive) has exceeded the *Non Essential Load 1 Trip* set value, it will trip and initiate alarm. | **Warn** (Non Essential Load 1 Trip) It is active after the Non Essential Load switch 1 has closed. |
| 6 | Non Essential Load 2 Trip | When controller detects the power value (power is positive) has exceeded the *Non Essential Load 2 Trip* set value, it will trip and initiate alarm. | **Warn** (Non Essential Load 2 Trip) It is active after the Non Essential Load switch 2 has closed. |
| 7 | Non Essential Load 3 Trip | When controller detects the power value (power is positive) has exceeded the *Non Essential Load 3 Trip* set value, it will trip and initiate alarm. | **Warn** (Non Essential Load 3 Trip) It is active after the Non |

| No. | Types | Description | Alarm Type |
|---|---|---|---|
| | | | Essential Load switch 3 has closed. |
| 8 | Gen Insufficient Capacity | When controller detects all normal gensets are on grid and the remaining power cannot request power, it will initiate a warning alarm. | **Warn** Always active. |
| 9 | Unbalanced Distribution of Active Power 1 | When the controller detects the unbalanced distribution of active power percentage is greater than the set value, the unbalanced active power distribution outputs and alarms. | **Warn** It is active after gen has closed. |
| 10 | Unbalanced Distribution of Active Power 2 | | Disabled |
| 11 | Unbalanced Distribution of Reactive Power 1 | When the controller detects the unbalanced distribution of reactive power percentage is greater than the set value, the unbalanced reactive power distribution outputs and alarms. | **Warn** It is active after gen has closed. |
| 12 | Unbalanced Distribution of Reactive Power 2 | | Disabled |
| 13 | SG & DG Parallel No. Out of Limit | When the controller detects that the number of DG on grid exceeds the limit when SG synchronizes, SG & DG parallel number exceeds the limit and alarms. | **Warn** It is active when it is SG mode. |
| 14 | SG Insufficient Capacity | When the controller detects that SG capacity is unable to receive the total loads, SG capacity is insufficient to output and an alarm is given. | **Warn** It is active when it is SG mode. |
| 15 | DG Insufficient Capacity | When the controller detects that SG capacity is unable to receive the total loads, DG & DG parallel number exceeds the limit and alarms. | **Warn** It is active when it is SG mode. |
| 16 | SG & DG Grid-connection Timeout | When the controller detects timeout of SG & DG grid-connection, it outputs and alarms. | **Warn** Always active. |
| 17 | SG Solenoid Valve Fault | Alarm when controller detects SG solenoid valve has faults. | **Block** It is active when it is SG mode. |
| 18 | HC1 Feedback Failure | When heavy consumer is acknowledged, HC feedback running signal is not received in set time, controller will send alarm signal. | **Warn** After heavy consumer is acknowledged. |
| 19 | HC2 Feedback Failure | | **Warn** After heavy consumer is acknowledged. |
| 20 | HC3 Feedback Failure | | **Warn** After heavy consumer is |

| No. | Types | Description | Alarm Type |
|---|---|---|---|
| | | | acknowledged. |
| 21 | HC4 Feedback Failure | | **Warn**<br>After heavy consumer is acknowledged. |
| 22 | HC1 Request Failure | When heavy request is active, if bus left available power can't meet HC demand, controller will send alarm signal. | **Warn**<br>After heavy consumer is active. |
| 23 | HC2 Request Failure | | **Warn**<br>After heavy consumer is active. |
| 24 | HC3 Request Failure | | **Warn**<br>After heavy consumer is active. |
| 25 | HC4 Request Failure | | **Warn**<br>After heavy consumer is active. |
| Switch Protection | | | |
| 1 | Fail to Close | When controller detects that there is no *Close* signal after the Close delay has expired, and no other close signals (current, power), it will initiate a block alarm. | **Block**<br>It is active after gen has closed. |
| 2 | Fail to Open | When controller detects that there is no *Open* signal after the Open delay has expired, and no other open signals (current, power), it will initiate a block alarm. | **Block**<br>It is active after gen has opened. |
| 3 | Close Fault | When controller detects that there is no *Close* signal after the Close delay has expired, but detects other close signals (current, power), it will initiate a warning alarm. | **Warn**<br>Always active. |
| 4 | Open Fault | When controller detects that there is no *Open* signal after the Open delay has expired, but detects other open signals (current, power), it will initiate a warning alarm. | **Warn**<br>Always active. |
| 5 | Unload Failure | When controller detects unload failure in set time, it will initiate a warning alarm. | **Warn**<br>It is active in unloading. |
| 6 | Bustie Switch 0 Fault | The bustie switch fault signal of ring bus. When controller detects fault signal (signal is inconsistent), it will initiate an alarm. | Disabled |
| 7 | Bustie Switch 1 Fault | When controller detects bustie switch fault signal (signal is inconsistent), it will initiate an alarm. | **Warn**<br>Always active. |
| 8 | Bustie Switch 2 Fault | | Disabled |
| 9 | Bustie Switch 3 | | Disabled |

| No. | Types | Description | Alarm Type |
|---|---|---|---|
| | Fault | | |
| 10 | Bustie Switch 4 Fault | | Disabled |
| 11 | Bustie Switch 5 Fault | | Disabled |
| 12 | Bustie Series Switch 0 Fault | | Disabled |
| 13 | Bustie Series Switch 1 Fault | | Disabled |
| 14 | Bustie Series Switch 2 Fault | Series switch refers to middle switch of bus section has two or more isolating switches. When controller detects bustie series switch fault signal (signal is inconsistent), it will initiate an alarm. | Disabled |
| 15 | Bustie Series Switch 3 Fault | | Disabled |
| 16 | Bustie Series Switch 4 Fault | | Disabled |
| 17 | Bustie Series Switch 5 Fault | | Disabled |
| 18 | Shore Switch 1 Fault | | **Warn** Always active. |
| 19 | Shore Switch 2 Fault | | Disabled |
| 20 | Shore Switch 3 Fault | When controller detects shore switch fault signal (signal is inconsistent), it will initiate an alarm. | Disabled |
| 21 | Shore Switch 4 Fault | | Disabled |
| 22 | Shore Switch 5 Fault | | Disabled |
| 23 | Abnormal Trip of Main Switch | When controller detects the input is active, it will initiate a trip alarm. | **Trip** It is active after gen has closed. |
| 24 | External Open of Main Switch | When controller is grid-connected with load in non-manual mode, gen close input port is inactive and power and current are both 0, it will initiate a trip alarm. | **Trip** It is active after gen has closed. |
| 25 | Bus Break Fault | When bus break function is enabled, if other controllers on the bus have bus break input, and current bus break input port is inactive, it will initiate a warning alarm. | **Warn** It is active after bus break is enabled. |
| 26 | SG Solenoid Valve Fault | When SG mode is enabled and SG solenoid valve closed input is configured, if SG valve close status and controller valve close/open status are inconsistent, it will initiate a warning alarm. | **Warn** It is active after SG mode is enabled and SG solenoid valve close |

| No. | Types | Description | Alarm Type |
|---|---|---|---|
| | | | input is configured. |
| 27 | Volt Asynchrony | When voltage asynchrony is detected after synchronous close, controller will initiate a trip alarm. | **Trip** It is active after gen has closed. |
| 28 | Freq. Asynchrony | When frequency asynchrony is detected after synchronous close, controller will initiate a trip alarm. | **Trip** It is active after gen has closed. |
| 29 | Phase Asynchrony | When phase asynchrony is detected after synchronous close, controller will initiate a trip alarm. | **Trip** It is active after gen has closed. |
| Module Protection | | | |
| 1 | Over Volt 1 | When controller detects the power supply voltage has exceeded the set value, it will initiate a warning alarm. | **Warn** Always active. |
| 2 | Over Volt 2 | | Disabled |
| 3 | Under Volt 1 | When controller detects the power supply voltage has fallen below the set value, it will initiate a warning alarm. | **Warn** Always active. |
| 4 | Under Volt 2 | | Disabled |
| 5 | Input Port 1~20 Alarm | When digital input port action selects "Alarm", controller sends corresponding alarm signal when the alarm is active. | Disabled |
| 6 | AI1 Open | When controller detects analog input ports are open, it will initiate an alarm. | **Not Used** Always active. |
| 7 | AI2 Open | | **Not Used** Always active. |
| 8 | AI1 Upper Limit 1 Alarm | When analog input port is configured as temperature sensor, temperature value is higher than the upper limit or below the lower limit, controller will initiate an alarm. | **Not Used** Always active. |
| 9 | AI1 Upper Limit 2 Alarm | | **Not Used** Always active. |
| 10 | AI1 Lower Limit 1 Alarm | | **Not Used** Always active. |
| 11 | AI1 Lower Limit 2 Alarm | | **Not Used** Always active. |
| 12 | AI2 Upper Limit 1 Alarm | | **Not Used** Always active. |
| 13 | AI2 Upper Limit 2 Alarm | | **Not Used** Always active. |
| 14 | AI2 Lower Limit 1 Alarm | | **Not Used** Always active. |
| 15 | AI2 Lower Limit 2 Alarm | | **Not Used** Always active. |
| 16 | AI1 Fault | When analog input fault is detected, controller will initiate an alarm. | Disabled |
| 17 | AI2 Fault | | Disabled |

| No. | Types | Description | Alarm Type |
|---|---|---|---|
| 18 | MSC Too Few Sets | When the controller detects fewer modules on the MSC link than the minimum number configured in the unit, it will initiate a warning alarm. There are 2 possible reasons: a) Communication line between the controllers disconnects, which interrupts communication. <br> b) Other parallel gensets controllers have not been powered on. | **Warn** <br> Always active. |
| 19 | ID Address Error | When repetitive ID on network bus is detected, controller will initiate a warning alarm. | **Warn** <br> Always active. |
| 20 | Switch Error | When switch fault signal is detected, controller will initiate a warning alarm. | **Warn** <br> Always active. |
| 21 | IP Address Error | When repetitive IP on network bus is detected, controller will initiate a warning alarm. | **Warn** <br> Always active. |
| 22 | SLD Config. Error | When single line drawing configuration is wrong, controller will initiate a warning alarm. | **Warn** <br> Always active. |
| 23 | Ring Disconnect | When network bus ring is disconnected, controller will initiate a warning alarm. | **Warn** <br> Always active. |
| 24 | 1#DIN16 Input Port 1-16 | When digital input port action selects "Alarm", controller sends corresponding alarm signal when the alarm is active. | **Not Used** <br> Always active. |
| 25 | 2#DIN16 Input Port 1-16 | When digital input port action selects "Alarm", controller sends corresponding alarm signal when the alarm is active. | **Not Used** <br> Always active. |
| 26 | PLC Function 1-16 | When PLC result is function and action selects "Alarm", controller sends corresponding alarm signal when the condition is active. | **Not Used** <br> Active after PLC configuration. |
| 27 | 1#DIN16 Comm. Failure | When the controller detects DIN1 module communication failure, it will initiate an alarm. | Disabled |
| 28 | 2#DIN16 Comm. Failure | When the controller detects DIN2 module communication failure, it will initiate an alarm. | Disabled |
| 29 | 1#DOUT16 Comm. Failure | When the controller detects DOUT1 module communication failure, it will initiate an alarm. | Disabled |
| 30 | 2#DOUT16 Comm. Failure | When the controller detects DOUT2 module communication failure, it will initiate an alarm. | Disabled |
| 31 | Local Controller Comm. Failure | When HPM6 controller detects communication failure with local controller, it will initiate an alarm. | Disabled |
| 32 | 1#HMP300 Comm. Failure | When the controller detects communication failure with HMP300 module, it will initiate an alarm. | Disabled |
| 33 | 2#HMP300 Comm. Failure | | Disabled |

## 10. HARDWARE STRUCTURE

### 10.1 STRUCTURE DESCRIPTION

HPM6 is composed of display module HPM6D and master control module HPM6. Its terminals are standard configuration. Users only can expand 16-way digital input module, 16-way digital output module via CANBUS port to realize expansion.

**Table 14 – HPM6D Terminals**

| Slot | Terminal | Remarks |
|------|----------|---------|
| TS #1 | | Communication port. |
| TS #2 | 1-9 | RS485 communication, relay output, power port. |

**Table 15 – HPM6 Terminals**

| Slot | Terminal | Remarks |
|------|----------|---------|
| TS #1 | 1-16 | Power port; reply output port |
| TS #2 | 17-22 | CANBUS and RS485 communication port |
| TS #3 | 23-30 | Analog output port |
| TS #4 | 31-45 | Triode output port |
| TS #5 | 46-50 | Analog input port |
| TS #6 | 51-59 | Digital input port |
| TS #7 | 60-71 | Digital input port |
| TS #8 | 72-75 | Bus voltage input |
| TS #9 | 76-79 | Gen voltage input |
| TS #10 | 80-87 | Gen current input and earth current input |
| | | Communication port |

### 10.2 HPM6D MODULE

### 10.2.1 TERMINAL DESCRIPTION



**Fig.4 – HPM6D Terminal Drawing**

**10.2.2    TS #1 COMMUNICATION PORT**

**Table 16 – TS #1 Communication Port**

| Terminal | Function | Cable Size | Parameter | Remarks |
|---|---|---|---|---|
| | USB DEVICE | | USB communication port | USB-TYPE B port, connect PC software. |
| | USB HOST | | USB port | USB-TYPE B port, connect USB read and write configuration files. |
| | ETHERNET 1 | SF/UTP CAT5e | ETHERNET port 1 | RJ45 port, connect master control module, PC software. |
| | ETHERNET 2 | SF/UTP CAT5e | ETHERNET port 2 | |

**10.2.3    TS #2 RS485 COMMUNICATION, RELAY OUTPUT, POWER PORT**

**Table 17 – TS #2 RS485 Communication, Relay Output, Power Port**

| Terminal | Function | Cable Size | Description | Remark |
|---|---|---|---|---|
| 1 | B(-) | 0.5mm$^2$ | RS485 communication port | Default baud rate 9600bps, no parity, 2-bit stop bit; Standard MODBUS protocol. |
| 2 | A(+) | 0.5mm$^2$ | | |
| 3 | TR | 0.5mm$^2$ | Pin-out terminal of 120Ω terminal matching resistor inside the controller RS485 communication port | TR and A(+) terminal short connected, which means 120Ω resistor inside controller A(+) and B(-) has been connected, there is no need for external 120Ω resistor. |
| 4 | DIGI.OUTPUT_NC | 1.5mm$^2$ | Digital output port | AC250V/8A, it is recommended to connect DC 30V/8A due to insufficient safety requirements. |
| 5 | DIGI.OUTPUT _COM | 1.5mm$^2$ | | |
| 6 | DIGI.OUTPUT _NO | 1.5mm$^2$ | | |
| 7 | B+ | 2.5mm$^2$ | DC(8~35)V | Controller power input. |
| 8 | B- | 2.5mm$^2$ | | |
| 9 | PE | 2.5mm$^2$ | Ground connection | |

## 10.3 HPM6 MODULE

### 10.3.1 TERMINAL DESCRIPTION
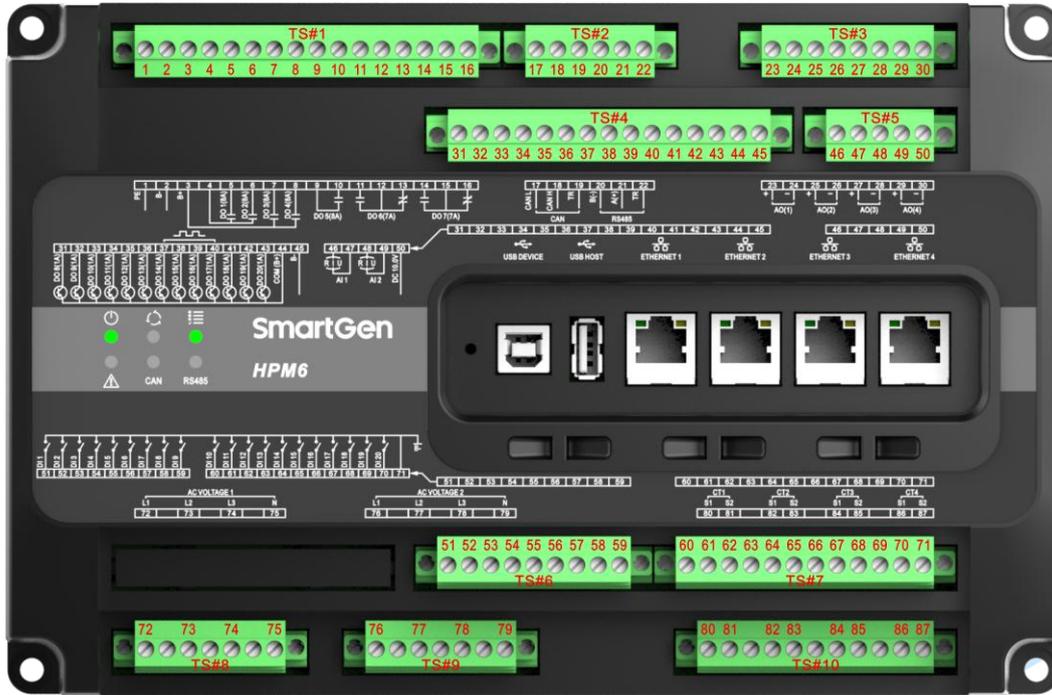


**Fig.5 – HPM6 Terminal Drawing**

### 10.3.2 TS #1 POWER AND RELAY OUTPUT PORT

**Table 18 – TS #1 Power and Relay Output Port**

| Terminal | Function | Cable Size | Description | Remark |
|---|---|---|---|---|
| 1 | PE | 2.5mm$^2$ | Ground connection | |
| 2 | B- | 2.5mm$^2$ | DC(8~35)V | Controller power input |
| 3 | B+ | 2.5mm$^2$ | | |
| 4 | COM1 | 1.5mm$^2$ | port 5~6 COM | |
| 5 | DO1 | 1.5mm$^2$ | Digital output port 1 (engine start) | DC30V/8A |
| 6 | DO2 | 1.5mm$^2$ | Digital output port 2 (engine stop) | DC30V/8A |
| 7 | DO3 | 1.5mm$^2$ | Digital output port 3 (speed raise) | DC30V/8A |
| 8 | DO4 | 1.5mm$^2$ | Digital output port 3 (speed drop) | DC30V/8A |
| 9 | DO5 | 1.5mm$^2$ | Digital output port 5 (audible alarm output) | DC30V/8A |
| 10 | | | | |
| 11 | DO6_NO | 1.5mm$^2$ | Digital output port 6 (close output) | DC30V/7A |
| 12 | DO6 _COM | 1.5mm$^2$ | | |
| 13 | DO6 _NC | 1.5mm$^2$ | | |
| 14 | DO7 _NO | 1.5mm$^2$ | Digital output port 6 (open output) | DC30V/7A |
| 15 | DO7 _COM | 1.5mm$^2$ | | |
| 16 | DO7 _NC | 1.5mm$^2$ | | |

⚠**NOTE:** If battery is used as power, power must directly connect the battery, but not starting power or charging generator to ensure HPM6 stable supply.

### 10.3.3 TS #2 CANBUS AND RS485 COMMUNICATION PORT

**Table 19 – TS #2 CANBUS and RS485 Communication Port**

| Terminal | Function | Cable Size | Description | Remark |
|----------|----------|------------|-------------|--------|
| 17 | CANL | 0.5mm$^2$ | CANBUS communication port | Communication port of expansion module; It is used for expanding digital input module, digital output module or power acquisition module. |
| 18 | CANH | 0.5mm$^2$ | | |
| 19 | TR | 0.5mm$^2$ | Pin-out terminal of 120Ω terminal matching resistor inside the controller CANBUS communication port | TR and CANH terminal short connected, which means 120Ω resistor inside controller CANH and CANL has been connected, there is no need for external 120Ω resistor. |
| 20 | B(-) | 0.5mm$^2$ | RS485 communication port | Default baud rate 9600bps, no parity, 2-bit stop bit; Standard MODBUS-RTU protocol. |
| 21 | A(+) | 0.5mm$^2$ | | |
| 22 | TR | 0.5mm$^2$ | Pin-out terminal of 120Ω terminal matching resistor inside the controller RS485 communication port | TR and A(+) terminal short connected, which means 120Ω resistor inside controller A(+) and B(-) has been connected, there is no need for external 120Ω resistor. |

### 10.3.4 TS #3 ANALOG OUTPUT PORT

**Table 20 – TS #3 Analog Output Port**

| Terminal | Function | | Cable Size | Description | Remark |
|----------|----------|---|------------|-------------|--------|
| 23 | + | AOUT1 (GOV) | 1.0mm$^2$ | Output -20mA~20mA | Can be configured as GOV, AVR, transmitter output. |
| 24 | - | | | | |
| 25 | + | AOUT2 (AVR) | 1.0mm$^2$ | | |
| 26 | - | | | | |
| 27 | + | AOUT3 | 1.0mm$^2$ | | |
| 28 | - | | | | |
| 29 | + | AOUT4 | 1.0mm$^2$ | | |
| 30 | - | | | | |

**10.3.5 TS #4 TRIODE OUTPUT PORT**

**Table 21 – TS #4 Triode Output Port**

| Terminal | Function | Cable Size | Description | Remark |
|---|---|---|---|---|
| 31 | DO8 | 1.0mm² | Digital output port 8 | Digital output ports 8-20 are triode outputs, which require terminal 44 to connect B+ voltage, then output from terminal 31 to 43. The rated on-load current is 1A. |
| 32 | DO9 | 1.0mm² | Digital output port 9 | |
| 33 | DO10 | 1.0mm² | Digital output port 10 | |
| 34 | DO11 | 1.0mm² | Digital output port 11 | |
| 35 | DO12 | 1.0mm² | Digital output port 12 | |
| 36 | DO13 | 1.0mm² | Digital output port 13 | |
| 37 | DO14 | 1.0mm² | Digital output port 14 | |
| 38 | DO15 | 1.0mm² | Digital output port 15 | |
| 39 | DO16 | 1.0mm² | Digital output port 16 | |
| 40 | DO17 | 1.0mm² | Digital output port 17 | |
| 41 | DO18 | 1.0mm² | Digital output port 18 | |
| 42 | DO19 | 1.0mm² | Digital output port 19 | |
| 43 | DO20 | 1.0mm² | Digital output port 20 | |
| 44 | COM(B+) | 2.5mm² | Digital output port 8-20 COM | Connect B+ |
| 45 | B- | 1.5mm² | B- | Connect B- |

**10.3.6 TS #5 ANALOG INPUT PORT**

**Table 22 – TS #5 Analog Input Port**

| Terminal | Function | Cable Size | Description | Remark |
|---|---|---|---|---|
| 46 | AI1 | 1.0mm² | AI1 can configure input as resistance type ((0-1000)Ω), current type ((0-20)mA), voltage type ((0-10)V). | Signal + terminal |
| 47 | B- | 1.0mm² | | Signal - terminal |
| 48 | AI2 | 1.0mm² | AI2 can configure input as resistance type ((0-1000)Ω), current type ((0-20)mA), voltage type ((0-10)V). | Signal + terminal |
| 49 | B- | 1.0mm² | | Signal - terminal |
| 50 | DC10.0V | 1.0mm² | Provides 10V power for voltage type input of AI1/AI2. | Max output current 30mA |

### 10.3.7    TS #6, TS #7 DIGITAL INPUT PORT

**Table 23 – TS #6, TS #7 Digital Input Port**

| Terminal | Function | Cable Size | Description | Remark |
|---|---|---|---|---|
| 51 | DI1 | 1.0mm$^2$ | Digital Input 1 (close feedback input) | |
| 52 | DI2 | 1.0mm$^2$ | Digital Input 2 (manual mode input) | |
| 53 | DI3 | 1.0mm$^2$ | Digital Input 3 (auto mode input) | |
| 54 | DI4 | 1.0mm$^2$ | Digital Input 4 (semi-auto mode input) | |
| 55 | DI5 | 1.0mm$^2$ | Digital Input 5 (HC inquiry 1) | |
| 56 | DI6 | 1.0mm$^2$ | Digital Input 6 (HC feedback 1) | |
| 57 | DI7 | 1.0mm$^2$ | Digital Input 7 | |
| 58 | DI8 | 1.0mm$^2$ | Digital Input 8 | Terminal 71 (B-) connected active. |
| 59 | DI9 | 1.0mm$^2$ | Digital Input 9 | |
| 60 | DI10 | 1.0mm$^2$ | Digital Input 10 | |
| 61 | DI11 | 1.0mm$^2$ | Digital Input 11 | |
| 62 | DI12 | 1.0mm$^2$ | Digital Input 12 | |
| 63 | DI13 | 1.0mm$^2$ | Digital Input 13 | |
| 64 | DI14 | 1.0mm$^2$ | Digital Input 14 | |
| 65 | DI15 | 1.0mm$^2$ | Digital Input 15 | |
| 66 | DI16 | 1.0mm$^2$ | Digital Input 16 | |
| 67 | DI17 | 1.0mm$^2$ | Digital Input 17 | |
| 68 | DI18 | 1.0mm$^2$ | Digital Input 18 | |
| 69 | DI19 | 1.0mm$^2$ | Digital Input 19 | |
| 70 | DI20 | 1.0mm$^2$ | Digital Input 20 | |
| 71 | B- | 1.5mm$^2$ | Digital Input 1-20 COM B- | |

### 10.3.8 TS #8, TS #9, TS #10 GEN/BUS VOLTAGE, GEN/EARTH CURRENT INPUT PORT

**Table 24 – TS #8, TS #9, TS #10 Gen/Bus Voltage, Gen/Earth Current Input Port**

| Terminal | Function | Cable Size | Description | Remark |
|---|---|---|---|---|
| 72 | L1 (Bus) | 1.5mm$^2$ | (Bus) A phase voltage input | |
| 73 | L2 (Bus) | 1.5mm$^2$ | (Bus) B phase voltage input | |
| 74 | L3 (Bus) | 1.5mm$^2$ | (Bus) C phase voltage input | |
| 75 | N (Bus) | 1.5mm$^2$ | (Bus) N phase voltage input | |
| 76 | L1 (Gen) | 1.5mm$^2$ | (Gen) A phase voltage input | |
| 77 | L2 (Gen) | 1.5mm$^2$ | (Gen) B phase voltage input | |
| 78 | L3 (Gen) | 1.5mm$^2$ | (Gen) C phase voltage input | |
| 79 | N (Gen) | 1.5mm$^2$ | (Gen) N phase voltage input | |
| 80 | S1 (CT1) | 2.5mm$^2$ | Gen A phase current | Rated input 5A |
| 81 | S2 (CT1) | 2.5mm$^2$ | | |
| 82 | S1 (CT2) | 2.5mm$^2$ | Gen B phase current | Rated input 5A |
| 83 | S2 (CT2) | 2.5mm$^2$ | | |
| 84 | S1 (CT3) | 2.5mm$^2$ | Gen C phase current | Rated input 5A |
| 85 | S2 (CT3) | 2.5mm$^2$ | | |
| 86 | S1 (CT4) | 2.5mm$^2$ | Earth current | Rated input 5A |
| 87 | S2 (CT4) | 2.5mm$^2$ | | |

### 10.3.9 COMMUNICATION PORT

**Table 25 – Communication Port**

| Terminal | Function | Cable Size | Parameter | Remark |
|---|---|---|---|---|
| | USB DEVICE | | USB comm. port | USB-TYPE B port, connect PC software. |
| | USB HOST | | USB port | USB-TYPE A port, connect USB to record historical data. |
| | ETHERNET 1 | SF/UTP CAT5e | ETHERNET port 1 | RJ45 port, connect master control module, PC software, display module or other monitoring platforms. |
| | ETHERNET 2 | SF/UTP CAT5e | ETHERNET port 2 | |
| | ETHERNET 3 | SF/UTP CAT5e | ETHERNET port 3 | |
| | ETHERNET 4 | SF/UTP CAT5e | ETHERNET port 4 | |

## 10.4 WIRE CONNECTION

### 10.4.1 TYPICAL APPLICATION DIAGRAM
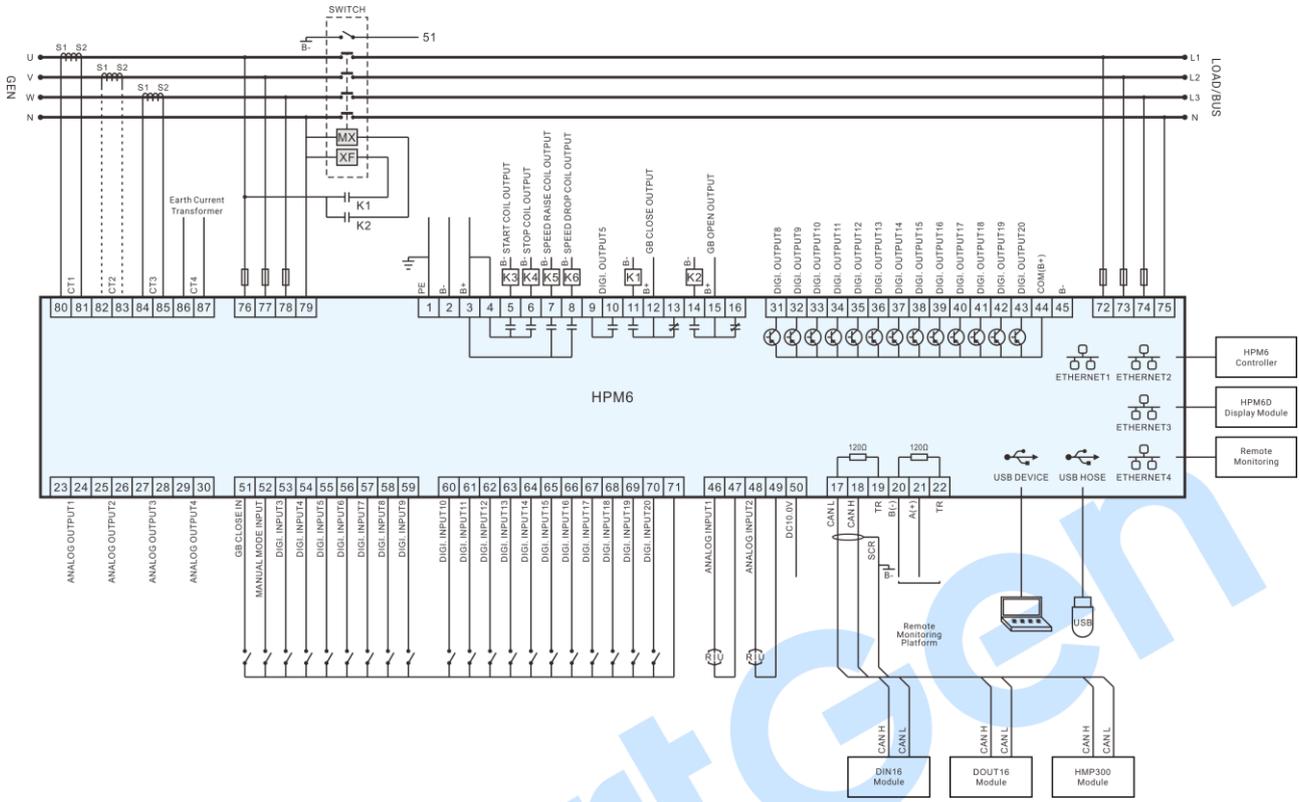


**Fig.6 – HPM6 Typical Application Diagram**

**⚠NOTE:** Current transformet CT2 can be disconnected in 3P3W (Enable gen load configuration "three-phase three-wire two-meter method").

### 10.4.2 AC WIRE CONNECTION (3 PHASE 4 WIRE)
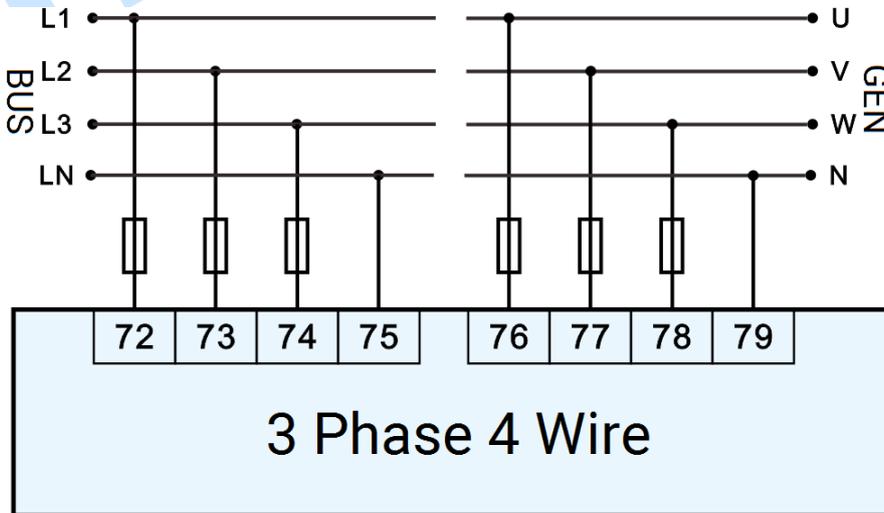


**Fig.7 – 3 Phase 4 Wire Connection Diagram**

### 10.4.3 AC WIRE CONNECTION (SINGLE PHASE)
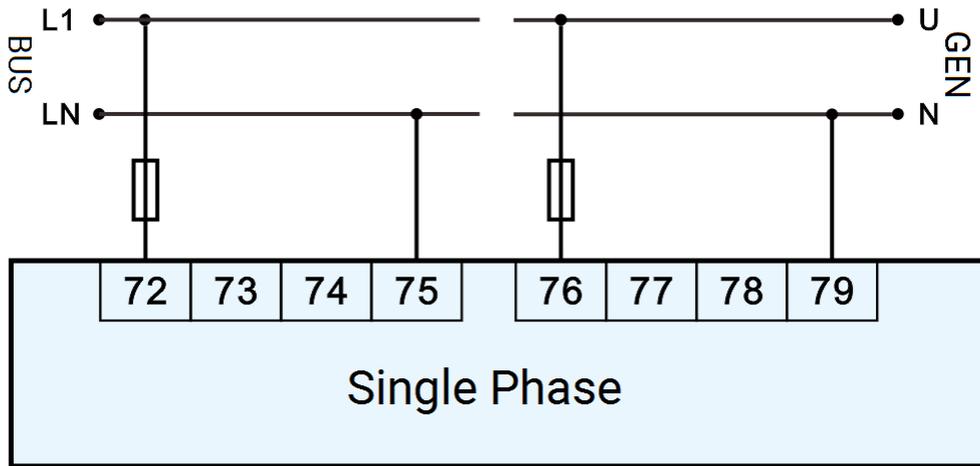


**Fig.8 – Single Phase Connection Diagram**

### 10.4.4 AC WIRE CONNECTION (2 PHASE 3 WIRE)
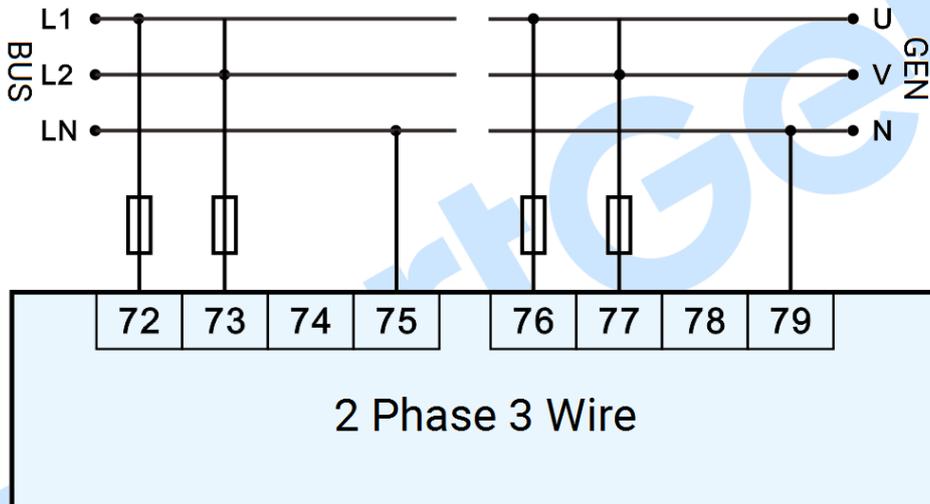


**Fig.9 – 2 Phase 3 Wire Connection Diagram**

**10.4.5  ANALOG INPUT PORT**

HPM6 AI1 and AI2 ports support (0~1k)Ω resistance input, (0~20)mA current input and (0~10)V voltage input function. Controller supplies 10V power for voltage input equipment. These two input ports can be connected to signal to adjust frequency and voltage. For example, AI1 is set as voltage type fixed active power input, AI2 is voltage type fixed reactive power input, it is shown as below:

**Table 26 – Analog Frequency/Voltage Adjusting Function Description**

| Function | Description | External Set-point Trigger Bar | Input Voltage |
|---|---|---|---|
| AI1 | External frequency adjust | Single unit running or generator breaker is opened. | (0-10)V DC |
| | External active power adjust | Constant power output is required for HPM6 paralleled with shore power/shaft generator/bus. | (0-10)V DC |
| AI2 | External voltage adjust | Single unit running or generator breaker is opened. | (0-10)V DC |
| | External reactive power adjust | Constant power output is required for HPM6 paralleled with shore power/shaft generator/bus. | (0-10)V DC |

0~10V input wire connection:
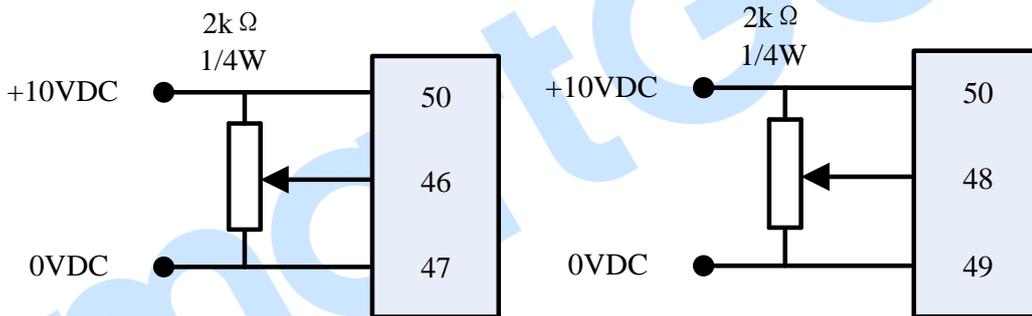


**Fig.10 – 0~10V Input Wire Connection Diagram**

**10.4.6  MSC NETWORK COMMUNICATION PORT**

Data sharing and communication of HPM6 all modules are implemented via network port. Detailed connection way is as following:
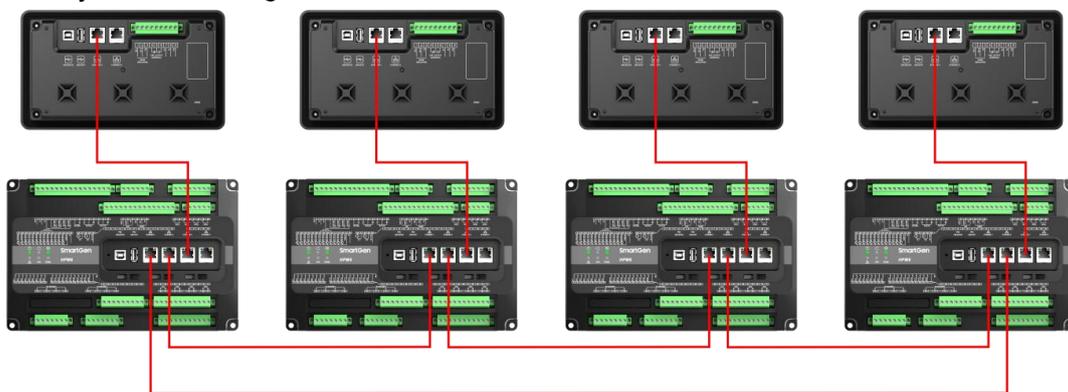


**Fig.11 – HPM6 Communication Connection Diagram 1**
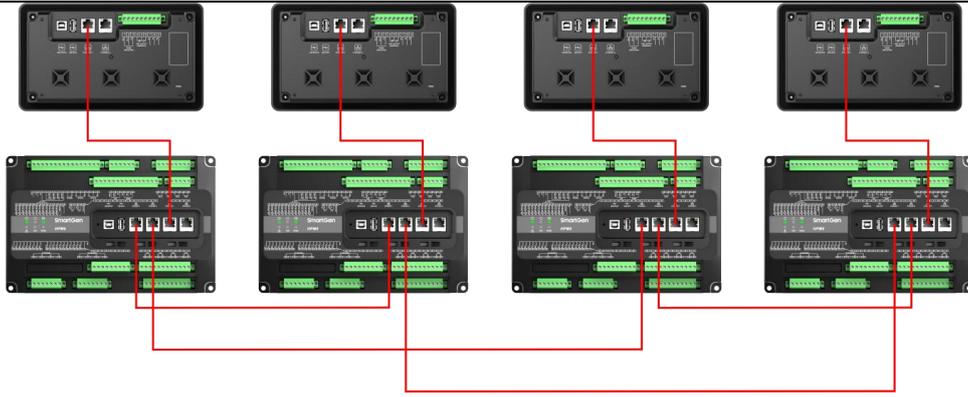
**Fig.12 – HPM6 Communication Connection Diagram 2**

## 10.4.7 MSC APPLICATION DIAGRAM
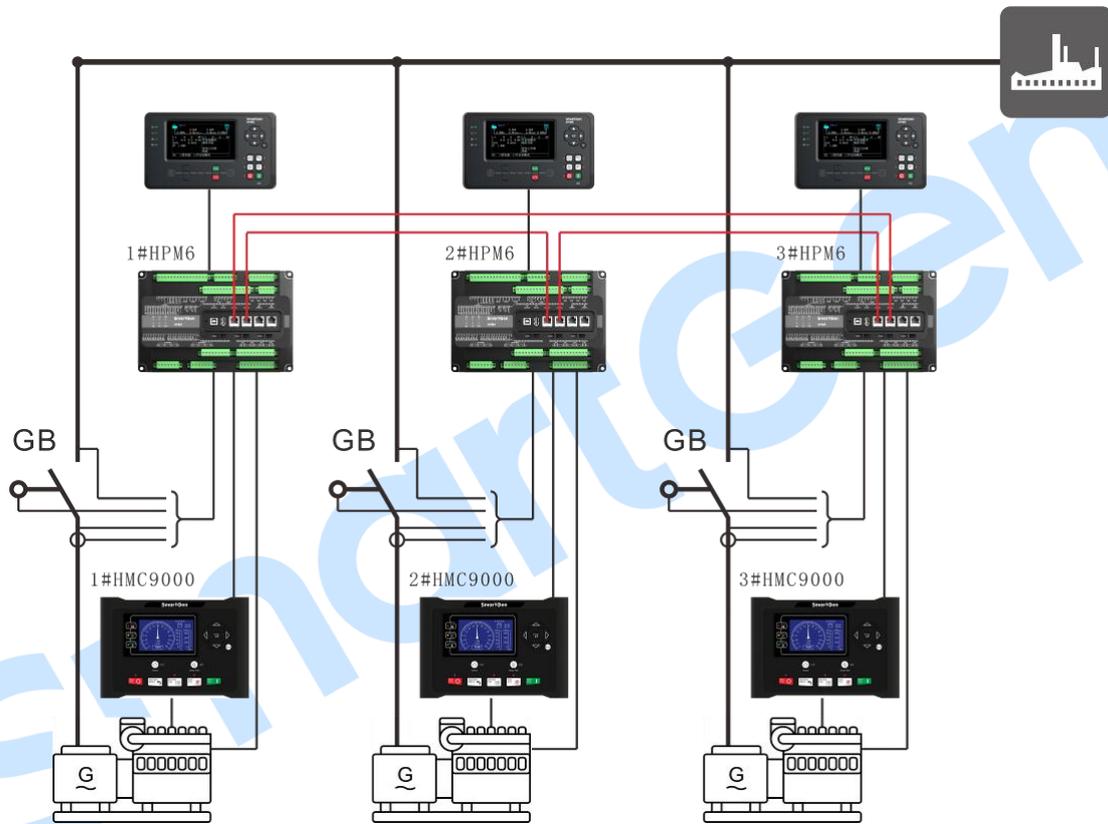


**Fig.13 – MSC Application Diagram**
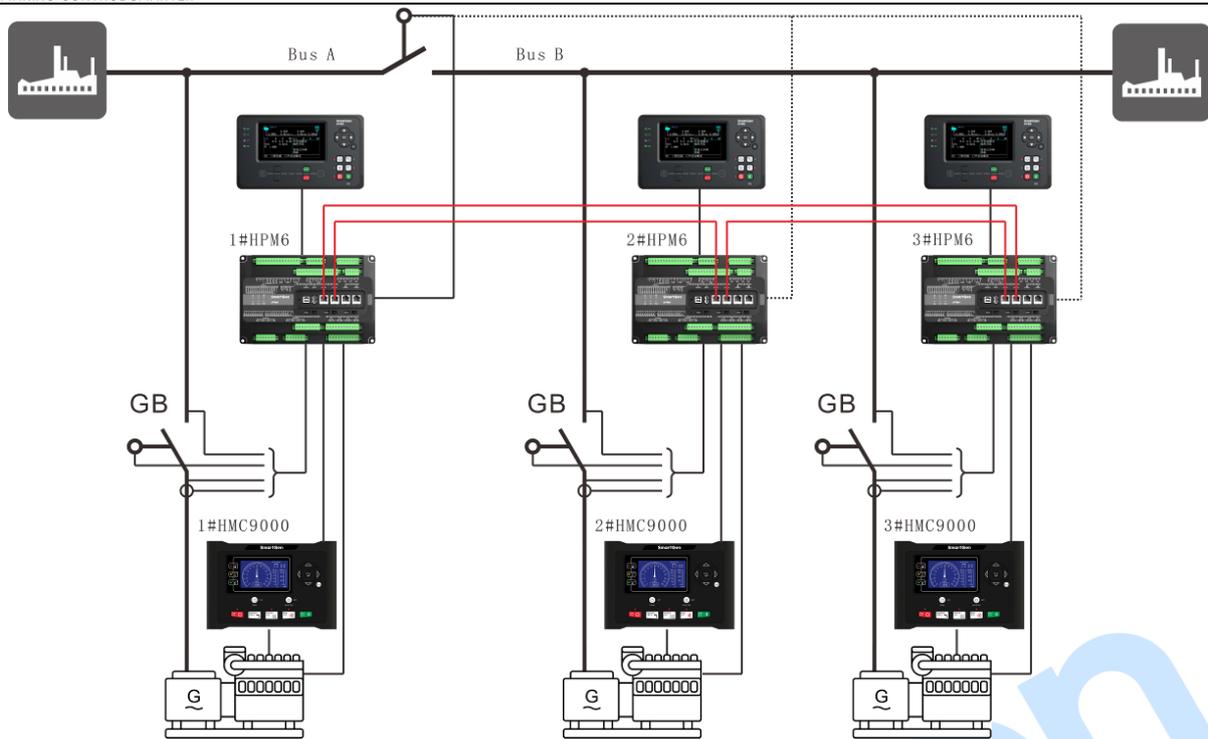
**Fig.14 – MSC Application Diagram of Two Bus with Bustie Switch**

⚠**NOTE:** Switch feedback signal of bustie switch/disconnector can be connected to any one master control module. It is recommended to connect all master control modules to bustie switch feedback signal.

## 11. POWER MANAGEMENT AND WORKFLOW CHART

### 11.1 ILLUSTRATION

There are two kinds of power management mode: Equal load sharing and fixed power output.

### 11.2 EQUAL LOAD SHARING

Equal load sharing is active both in auto mode and semi-auto mode. In both cases, load sharing is carried out via network bus.

There are two kinds of equal load sharing ways: active load sharing and reactive load sharing.

a) Active load sharing: the real-time equal load sharing of active power of each unit on bus can be adjusted via GOV or relay output.

b) Reactive load sharing: the real-time equal load sharing of reactive power of each unit on bus can be adjusted via AVR or relay output.

### 11.3 FIXED POWER OUTPUT

Each unit can be selected as running with fixed power. This can be done via digital input or parameter setting.

The unit works in fixed power mode will automatically be set in SEMI-AUTO. Only one generator per independent bus can run in this mode.

Active power output value and reactive power output value can be set, in addition, power factor also can be set.

When the generator main switch is closed, the generator power will be increased to the fixed power set-point.

The following figure shows the fixed power DG & SG on-load diagram in SG mode:
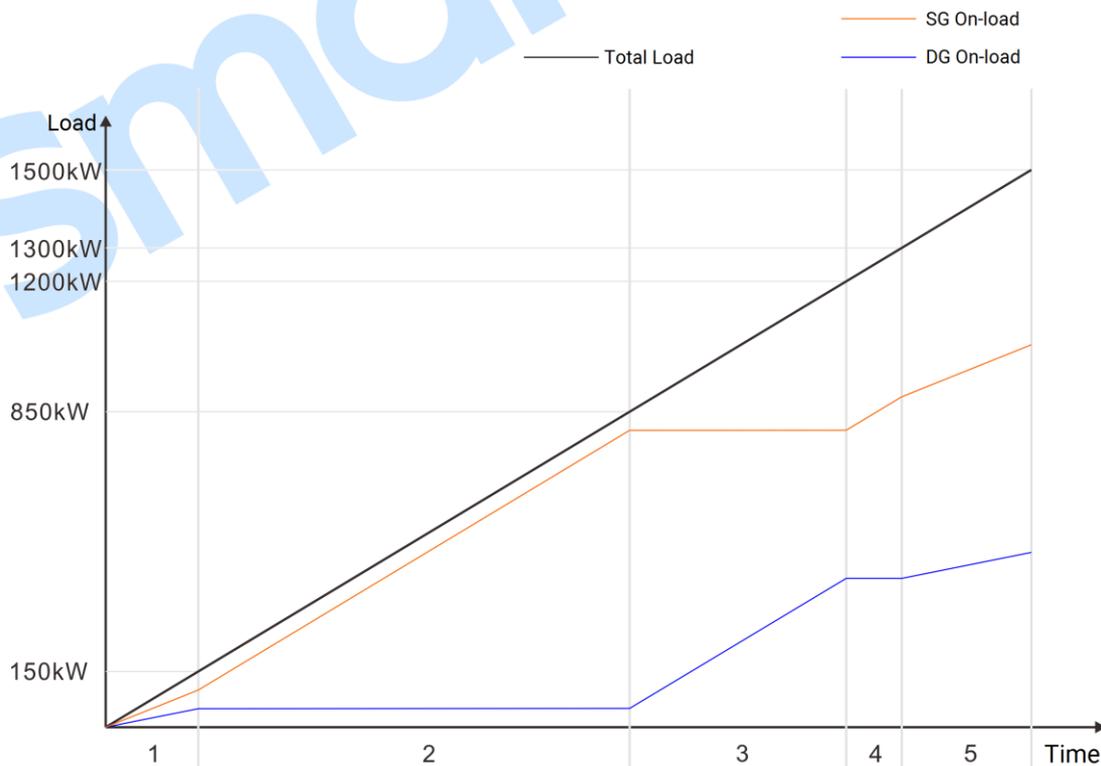


**Fig.15 – SG Fixed Power Load Distribution Diagram**

Suppose SG rated power is 1000kW, DG rated power is 500kW, the fixed min on-load percentage is 10%, the fixed max on-load percentage is 90% and the fixed output power percentage is 80%. According to the change of the total load, DG and SG on-load are as shown in the 5 parts of figure above:

The first part: (0-150)kW, SG and DG share the power;

The second part: (150-850)kW, DG on-load is 50kW(10%), the rest is loaded with SG;

The third part: (850-1200)kW, SG on-load is 800kW(80%), the rest is loaded with DG;

The fourth part: (1200-1300)kW, DG on-load is 400kW(80%), the rest is loaded with SG;

The fifth part: (1300-1500)kW, SG on-load is 900kW(90%)+sharing excess power (total load-1300kW), DG on-load is 400kW(90%)+sharing excess power (total power-1300kW).

**NOTE:** If the fixed min on-load percentage is set to 0, DG will start with load only when SG on-load exceeds the fixed power percentage.

## 11.4　SYNCHRONIZATION

HPM6 controller enables dynamic and static synchronizations. It is defaulted to adopt dynamic synchronization because of its fast speed to close breakers. It is with 0.1Hz slip frequency, synchronization can be finished in 10s and ramp on load immediately once generator closed.

During dynamic synchronization, the unit which is going to be synchronized is running at a different speed to generator on the bus, and the speed difference between them is named as slip frequency. Generally, the synchronizing unit is running at a positive slip frequency which means it is relatively faster than bus generator, so that the generator reverse power is avoided after synchronizing.

The aim of synchronization is reducing the phase angle between two systems (refer to 3-phase systems of generator and bus).

Voltage difference, frequency difference and angle difference should be set during dynamic synchronization. The breaker is going to be closed if all of them meet the requirement between generator and bus.

Static synchronization means that genset ready to synchronize runs in same or extremely similar speed with bus genset, adjusts phase synchronization by phase synchronizer, and sends breaker close signal. It is not recommended to use relay control in static synchronization because it can't precisely adjust due to its slow response. In static synchronization, breaker response time has no higher requirements because of very small or non-existent frequency difference.

## 11.5　HEAVY CONSUMER INQUIRY

### 11.5.1　ILLUSTRATION

Each HPM6 controller can handle up to four Heavy Consumers (HC).

Response priority for the same controller is HC1>HC2>HC3>HC4 if HC ID and priority are both set as 128; while for the different controllers, controller's ID determines HC response priority, which means first response to HC request from controller with small ID number.

If HC ID and priority are not 128, HC response depends on ID and priority, which means first response with small priority, first response with small ID number if the priority is same.

If HC ID number is same and not equal to 128, this heavy consumer has redundancy, which means HC signal can be connected to multiple ports. It is active when one HC request feedback is active. When HC power meets the requirement, it outputs HC permission and response signals.

When a heavy consumer is requested to the power station, system will reserve the required power on the bus, until sufficient predicted available power is present at the bus.

### 11.5.2　HEAVY CONSUMER REQUEST

Heavy load equipment should send a heavy consumer request before starting up. Each HC request signal can set the corresponding inquiry power value and rated power value. HC signal is divided into continuous signal and pulse signal. If bus still has no sufficient left available power for HC response when HC request failure time is over, controller will send HC request failure alarm. If the inquiry signal is pulse signal, this heavy consumer inquiry is over after request failure alarm is acknowledged.

### 11.5.3　HEAVY CONSUMER RESPONSE

If a heavy consumer is requested, the system calculates the power needed according to the requested value of heavy consumer power. If the request is not satisfied, the controller will start the corresponding standby units, if satisfied and the heavy consumer stability delays, then the response signal will be initiated, heavy consumer response output delay ends, if the heavy consumer feedback inactive system is only heavy consumer includes its rated power, and the controller does not reserve any power after the heavy consumer feedback is active.

Example (three 100kW gensets):

1) There is 60kW redundancy on bus which is composed by two 100kW parallel running gensets with 140kW load, then the heavy consumer request 1 is active (request power is 70kW);
2) An additional genset should be started if the power needed is insufficient;
3) There is 160kW redundancy on bus after genset starting and in parallel, then the response signal will be initiated.

### 11.5.4　HEAVY CONSUMER PERMISSION

If a heavy consumer is requested, the system calculates the power needed according to the requested value of heavy consumer power. If the request is not satisfied, the controller will start the corresponding standby units, if satisfied and the heavy consumer stability delays, then the heavy consumer permission signal will be initiated and the signal is variable. If the current bus power is not enough, the heavy consumer permission signal will not output.

### 11.5.5　HEAVY CONSUMER FEEDBACK

The feedback can be divided into digital signal and analog signal according to the type of heavy consumer (fixed power and variable power), analog signal can be collected by analog input or HMP300 communication input. Heavy consumer feedback signal is sent to the controller after the requested heavy consumer starts normally. If it is a fixed power one, the system will not reserve any power for the heavy consumer after the controller receives the digital feedback signal. If it is a variable power one, when the controller receives an analog feedback signal ≥2% of the rated power of heavy consumer, it is considered that the heavy consumer has been started, and the system reserves the remaining power of the rated power of heavy consumer (rated power of heavy consumer - current power of heavy consumer).

After heavy consumer is acknowledged, if HC feedback failure time is over, controller still not receive the HC feedback signal, it will send HC feedback failure alarm

Digital feedback is shown in the figure below:

HC Inquiry Power 300kW
HC Rated Power   150kW

HC Inquiry Input
Continuous Signal

········ Bus Left Power

300kW

Bus Reserved
Power for HC

150kW

0kW

Sufficient Reserved Power

HC Stable Delay

HC ACK Output

HC Permission Output

Digital Feedback

**Fig.16 – Fixed Heavy Consumer Sequence Diagram 1**

HC Inquiry Power 300kW
HC Rated Power   150kW

HC Inquiry Input
Pulse Signal

········ Bus Left Power

300kW

Bus Reserved
Power for HC

150kW

0kW

Sufficient Reserved Power

HC Stable Delay

HC ACK Output

HC Permission Output

Digital Feedback

**Fig.17 – Fixed Heavy Consumer Sequence Diagram 2**

Illustration for the fixed heavy consumer sequence diagram:

a)  The HC1 request power is 300kW, HC1 rated power is 150kW;

b)  The bus reserves 300kW for HC1;

c)  The bus has enough redundant power and starts after heavy consumer stability delay;

d)  After the heavy consumer stability delay, the controller starts to output HC response signal;

e)  During or after the output delay of heavy consumer response, the bus has different processing states for HC1 heavy consumer according to the different states of heavy consumer feedback and request signals;

f)  If the heavy consumer feedback is active, the bus will no longer reserve any power for HC1;

g)  If the heavy consumer feedback is inactive, the bus will only reserve the rated power for HC1 when heavy consumer request is active;

h)  If the heavy consumer feedback is inactive, the bus will not reserve any power for HC1 when heavy consumer request is inactive.

Analog feedback is shown in the figure below:
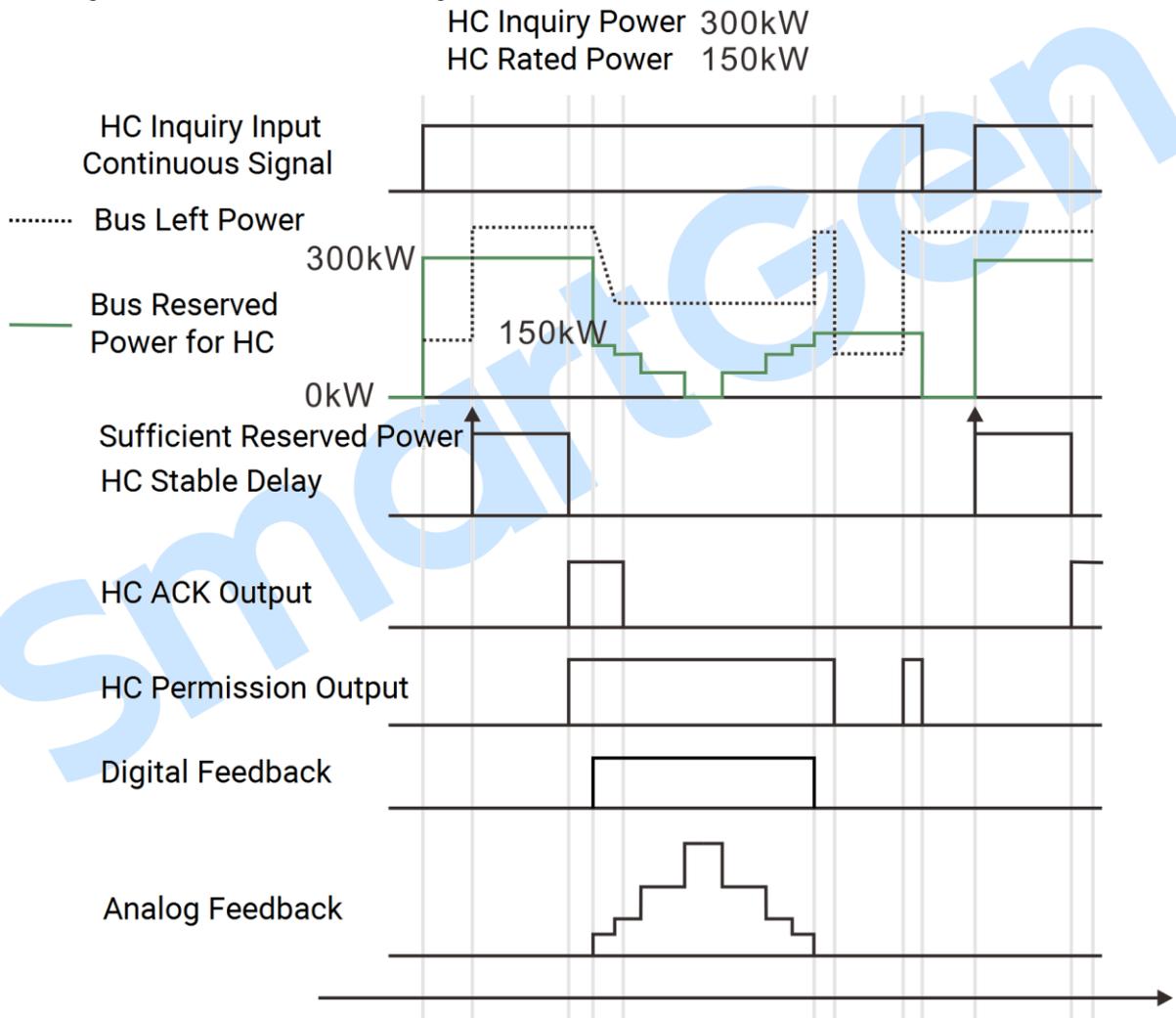


**Fig.18 – Analog Heavy Consumer Sequence Diagram 1**
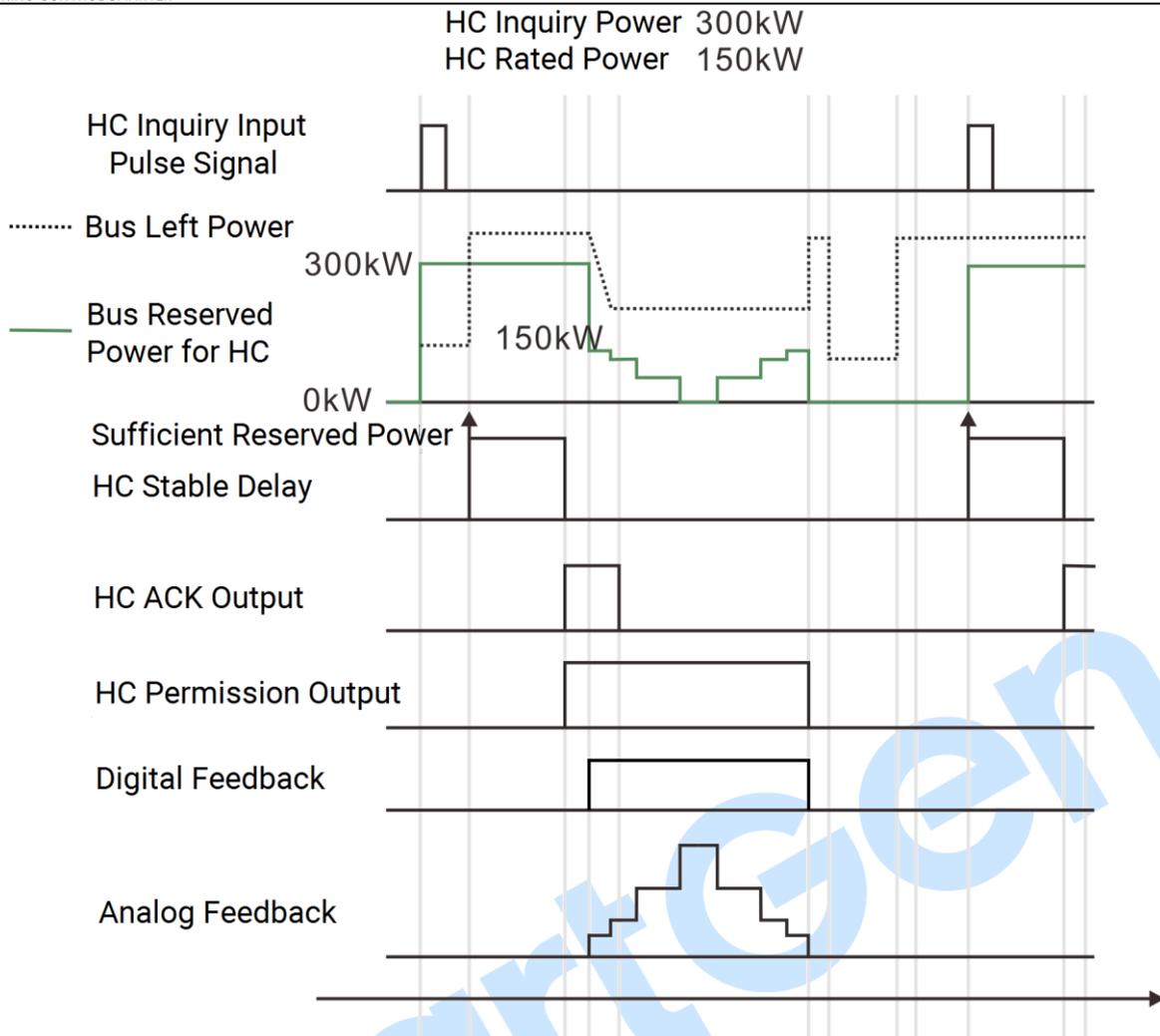
**Fig.19 – Analog Heavy Consumer Sequence Diagram 2**

## 11.6    NON ESSENTIAL LOAD (NEL) TRIP

When controller detects generator over power, over current, it can trip some non-essential loads to realize self-protection. There are 3 NELs trip, the priority is NEL1>2>3 (NEL1 trips first). If the active power or current has exceeded the set value, the corresponding NEL will trip after the trip delay, and the warning alarm will be initiated. NEL trip can be reused after alarm response only.

## 11.7 WORKFLOW CHART

### 11.7.1 START
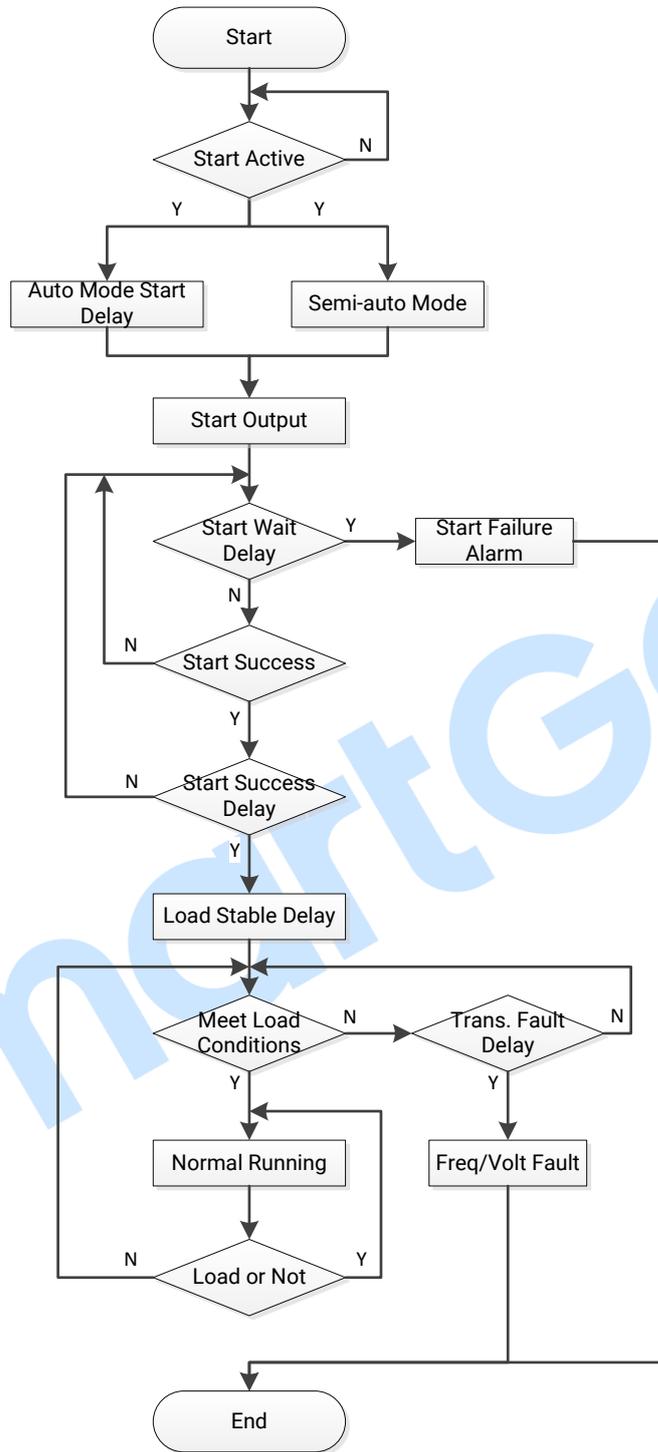


**Fig.20 – System Start Workflow Chart**

**11.7.2 STOP**
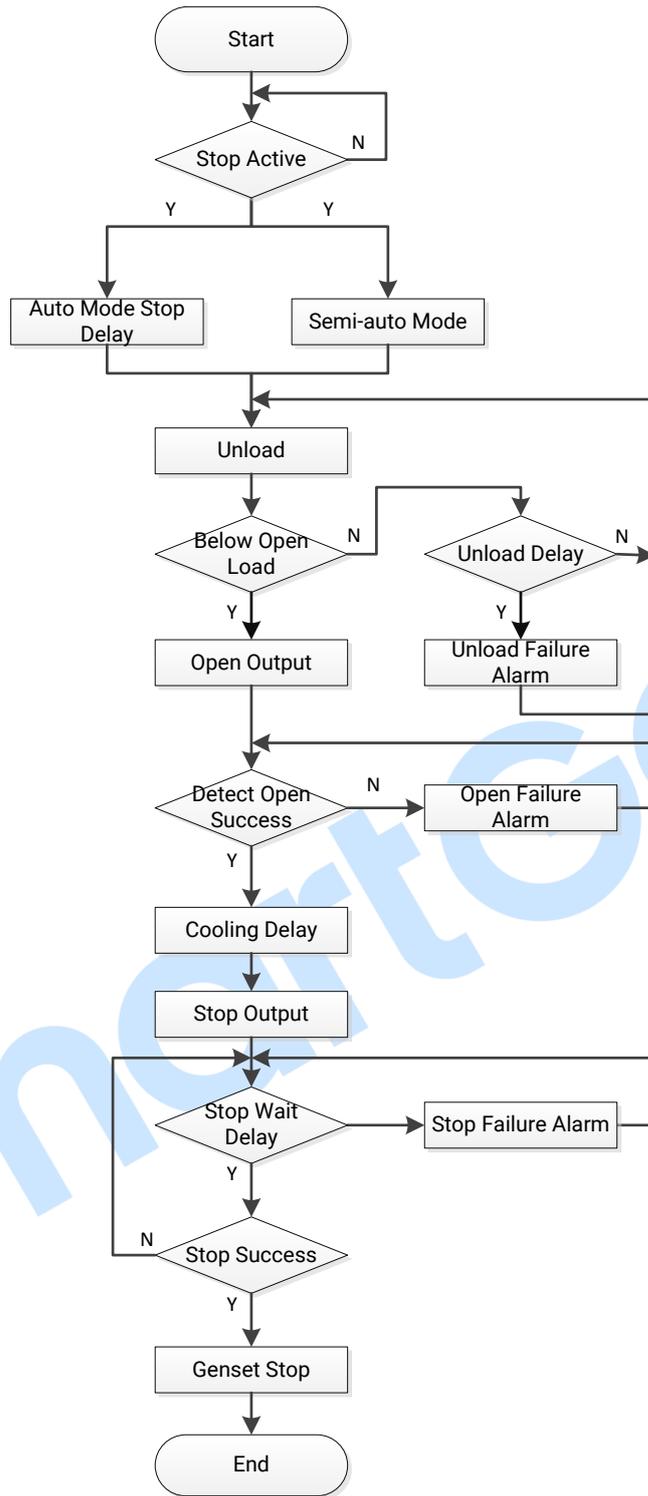


**Fig.21 – System Stop Workflow Chart**

### 11.7.3 CLOSE BREAKER
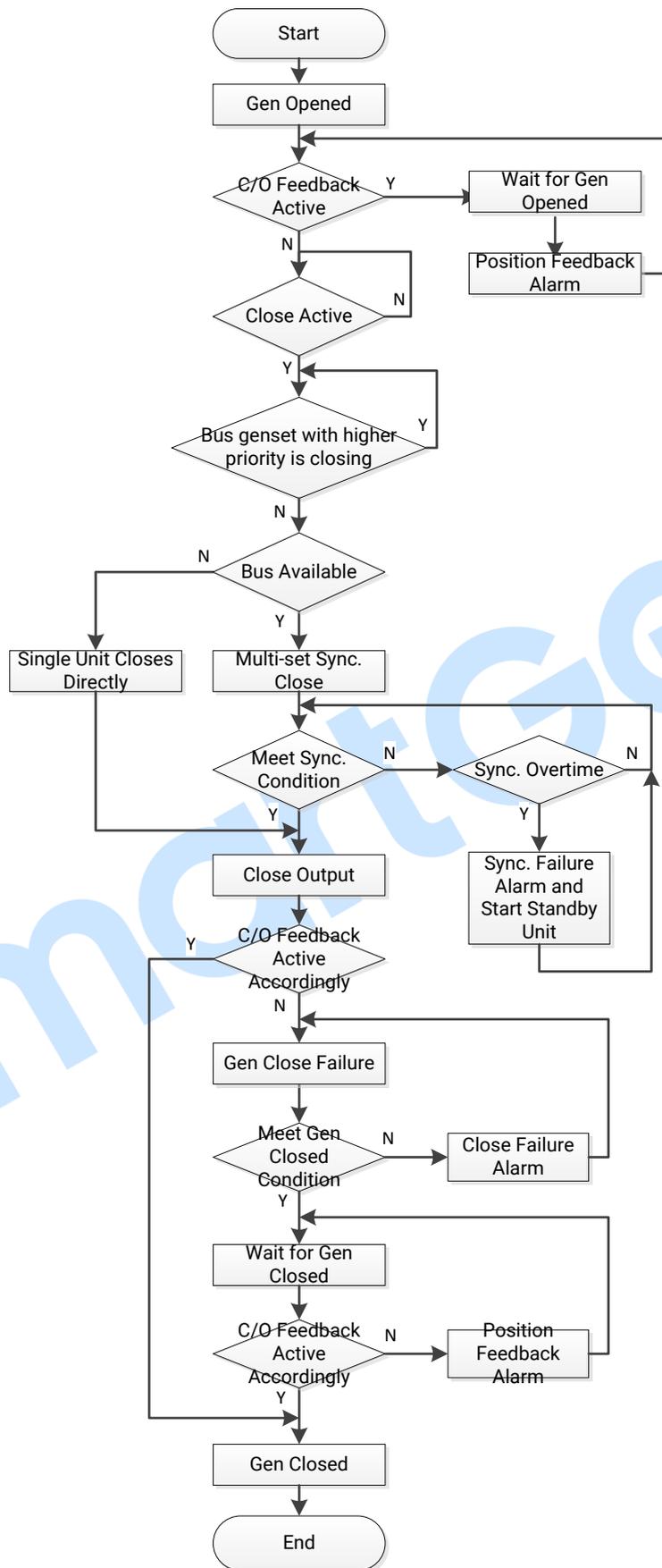


**Fig.22 – System Breaker Close Workflow Chart**

### 11.7.4    OPEN BREAKER
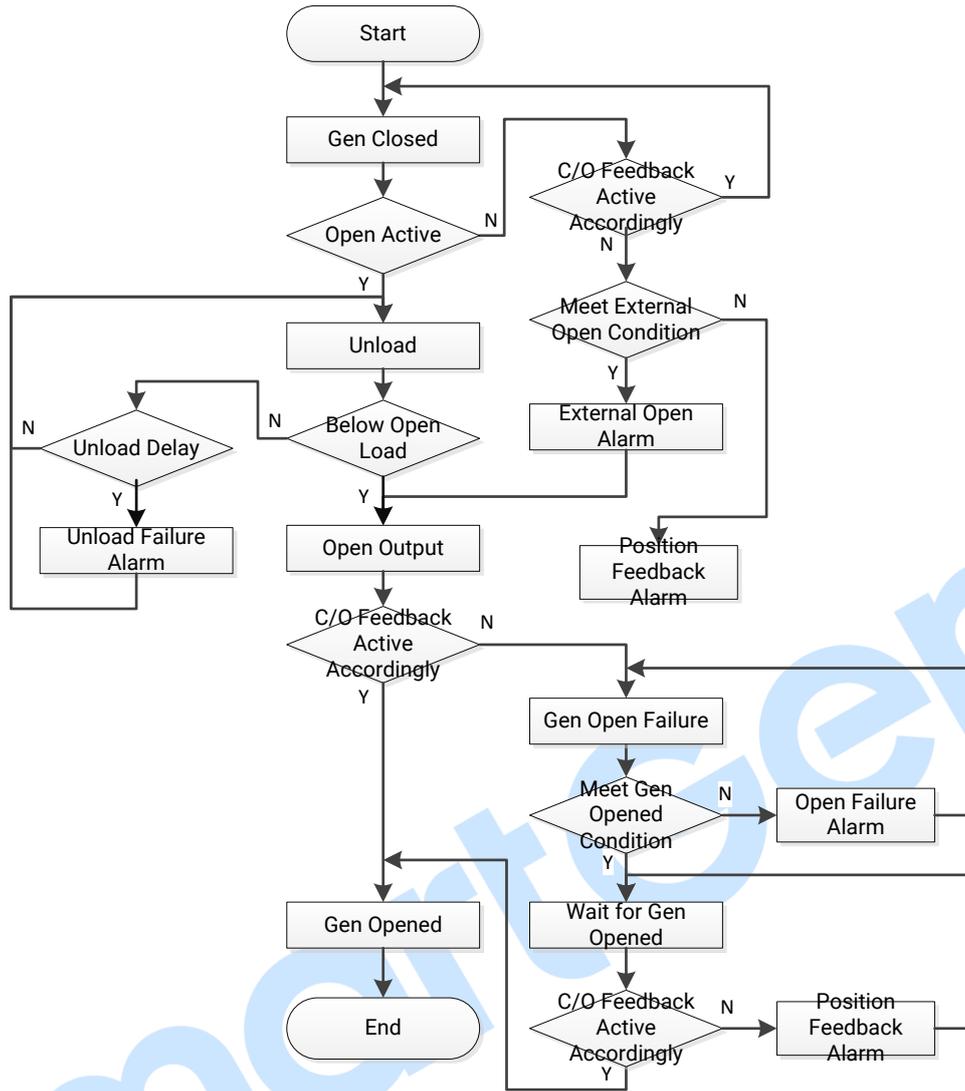


**Fig.23 – System Breaker Open Workflow Chart**

## 11.7.5 HEAVY CONSUMER
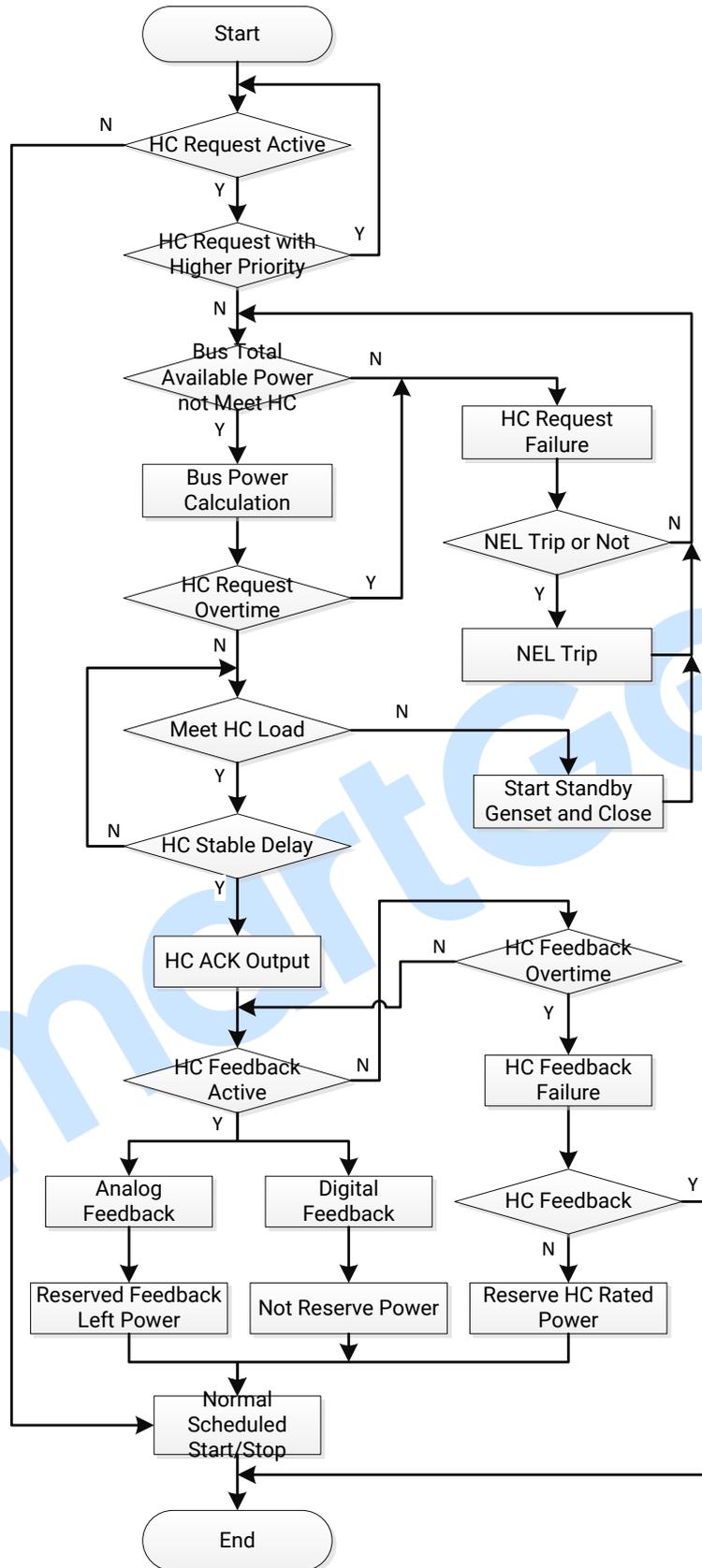


**Fig.24 – Heavy Consumer Workflow Chart**

### 11.7.6 LIGHT CONSUMER
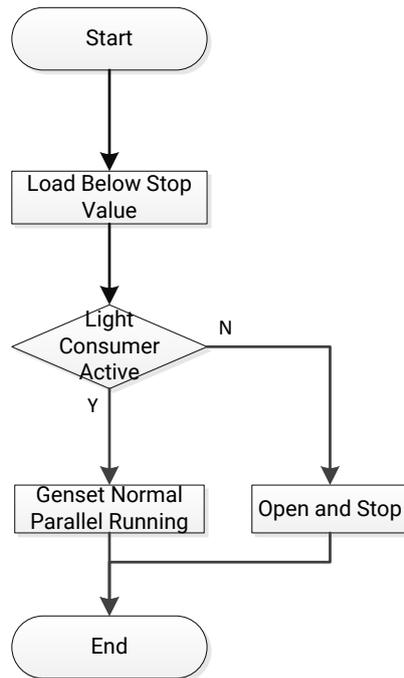


**Fig.25 – Light Consumer Workflow Chart**

## 12. PARAMETER SETTINGS

### 12.1 ILLUSTRATION

This part contains all controller parameters, in which partial parameters only can be configured by upper computer.

### 12.2 MODULE SETTING

**Table 27 – Module Parameter Settings**

| No. | Item | Range | Default | Description |
|---|---|---|---|---|
| Module Setting | | | | |
| 1 | Controller Type | (0-1) | 0 | 0: DG Mode<br>1: SG Mode |
| 2 | Power On Mode | (0-2) | 0 | 0: Semi-auto Mode; 1: Auto Mode; 2: Manual Mode. |
| 3 | Language | (0-2) | 0 | 0: Simplified Chinese; 1: English; 2: Others. |
| 4 | Password | (0-65535) | 00318 | It is used for entering parameter setting. |
| 5 | Engine Fault Action | (0-6) | 0: Block | Alarm action type when engine fault input port is active. |
| 6 | SG Mode | (0-2) | 0 | 0: Load Takeover Mode<br>1: Fixed Power Mode<br>2: Load Sharing Mode |
| 7 | Self-check Abnormal Action | (0-2) | 1: Force to Manual Mode | If controller self-check is abnormal, corresponding actions will be initiated.<br>0: No Action<br>1: Force to Manual Mode<br>2: Force to Semi-auto Mode |
| 8 | Safe Alarm Action | (0-1) | 0: Disable | If it is enabled, in semi-auto mode, safety trip and safety trip and stop alarms will execute corresponding actions.<br>If it is disabled, in semi-auto mode, there are only safety trip and safety trip and stop alarms without action. |
| 9 | Safe Mode with Load | (0-1) | 1: Enable | Load or not after genset starts in safe mode. |
| 10 | Start Enable during Stopping | (0-1) | 0 | 0: Disabled |
| 11 | USB Enable | (0-1) | 0 | 0: Disabled |
| 12 | USB Data Record | (0.1-3600.0)s | 1.0 | Interval time of USB data record in |

| No. | Item | | Range | Default | Description |
|---|---|---|---|---|---|
| | Interval | | | | genset running. |
| 13 | Alarm Data Analysis Record Interval | | (0.0-60.0)s | 0.1 | Interval time of alarm data analysis record. |
| 14 | Self-check Abnormal Selection | | | 0x0b1f | Bit0: Controller Power<br>Bit1: Total Modules Few<br>Bit2: MSC Bus Loss<br>Bit3: MSC Bus Abnormal<br>Bit4: Genset Status<br>Bit5: Reserved<br>Bit6: Reserved<br>Bit7: Reserved<br>Bit8: DIN16 Communication<br>Bit9: DOUT16 Communication<br>Bit10: Reserved<br>Bit11: HMP300 Communication<br>Bit12: Reserved<br>Bit13: Reserved<br>Bit14: Reserved<br>Bit15: Reserved |
| 15 | RS485 Comm. | Baud Rate | (0-3) | 2 | 0: 2400bps<br>1: 4800bps<br>2: 9600bps<br>3: 19200bps |
| 16 | | Stop Bit | (0-1) | 0 | 0: 2-bit<br>1: 1-bit |
| 17 | | Address | (1-254) | 1 | Controller communication address for remote monitoring. |
| 18 | CAN Comm. Rate | | (0-2) | 1 | 0: 500kbps<br>1: 250kbps<br>2: 125kbps |
| 19 | Power Rated Voltage | | (10.0-50.0)V | 24.0 | Standard value for judging power over voltage and under voltage. |
| 20 | Over Volt 1 | Action | (0-1) | 1: Enable | Set value is the percentage of power rated voltage, return value and delay value can be set. |
| 21 | | Auto ACK | (0-1) | 0: Disable | |
| 22 | | Alarm Self-lock | (0-1) | 0: Disable | |
| 23 | | Threshold | (0-200.0)% | 120.0 | |
| 24 | | Return Value | (0-200.0)% | 115.0 | |
| 25 | | Delay Value | (0.1-3600.0)s | 60.0 | |
| 26 | | Alarm Type | (0-6) | 1: Warning | |
| 27 | | Active Range | (0-20) | 0: Always Active | |

| No. | Item | | Range | Default | Description |
|---|---|---|---|---|---|
| 28 | Over Volt 2 | Action | (0-1) | 0: Disable | |
| 29 | | Auto ACK | (0-1) | 0: Disable | |
| 30 | | Alarm Self-lock | (0-1) | 0: Disable | |
| 31 | | Threshold | (0-200.0)% | 120.0 | |
| 32 | | Return Value | (0-200.0)% | 115.0 | |
| 33 | | Delay Value | (0.1-3600.0)s | 60.0 | |
| 34 | | Alarm Type | (0-6) | 1: Warning | |
| 35 | | Active Range | (0-20) | 0: Always Active | |
| 36 | Under Volt 1 | Action | (0-1) | 1: Enable | |
| 37 | | Auto ACK | (0-1) | 0: Disable | |
| 38 | | Alarm Self-lock | (0-1) | 0: Disable | |
| 39 | | Threshold | (0-200.0)% | 85.0 | |
| 40 | | Return Value | (0-200.0)% | 90.0 | |
| 41 | | Delay Value | (0.1-3600.0)s | 60.0 | |
| 42 | | Alarm Type | (0-6) | 1: Warning | |
| 43 | | Active Range | (0-20) | 0: Always Active | |
| 44 | Under Volt 2 | Action | (0-1) | 0: Disable | |
| 45 | | Auto ACK | (0-1) | 0: Disable | |
| 46 | | Alarm Self-lock | (0-1) | 0: Disable | |
| 47 | | Threshold | (0-200.0)% | 85.0 | |
| 48 | | Return Value | (0-200.0)% | 90.0 | |
| 49 | | Delay Value | (0.1-3600.0)s | 60.0 | |
| 50 | | Alarm Type | (0-6) | 1: Warning | |
| 51 | | Active Range | (0-20) | 0: Always | |
| 52 | 1#DIN 16 | Action | (0-1) | 0: Disable | When HPM6 input ports are insufficient, expand external input module 1 is used, if still not enough, input module 2 is used. |
| 53 | | Auto ACK | (0-1) | 0: Disable | |
| 54 | | Alarm Self-lock | (0-1) | 0: Disable | |
| 55 | | Delay Value | (0.1-3600.0)s | 5.0 | |
| 56 | | Alarm Type | (0-6) | 1: Warning | |
| 57 | 2#DIN 16 | Action | (0-1) | 0: Disable | |
| 58 | | Auto ACK | (0-1) | 0: Disable | |
| 59 | | Alarm Self-lock | (0-1) | 0: Disable | |
| 60 | | Delay Value | (0.1-3600.0)s | 5.0 | |
| 61 | | Alarm Type | (0-6) | 1: Warning | |
| 62 | 1#DO | Action | (0-1) | 0: Disable | When HPM6 output ports are |

| No. | Item | | Range | Default | Description |
|---|---|---|---|---|---|
| 63 | UT16 | Auto ACK | (0-1) | 0: Disable | insufficient, expand external output module 1 is used, if still not enough, output module 2 is used. |
| 64 | | Alarm Self-lock | (0-1) | 0: Disable | |
| 65 | | Delay Value | (0.1-3600.0)s | 5.0 | |
| 66 | | Alarm Type | (0-6) | 1: Warning | |
| 67 | 2#DO UT16 | Action | (0-1) | 0: Disable | |
| 68 | | Auto ACK | (0-1) | 0: Disable | |
| 69 | | Alarm Self-lock | (0-1) | 0: Disable | |
| 70 | | Delay Value | (0.1-3600.0)s | 5.0 | |
| 71 | | Alarm Type | (0-6) | 1: Warning | |
| 72 | 1#HMP300 | Action | (0-1) | 0: Disable | When HMP300 is selected to get power signal by HPM6 HC feedback type, HMP300 can be enabled. |
| 73 | | Auto ACK | (0-1) | 0: Disable | |
| 74 | | Alarm Self-lock | (0-1) | 0: Disable | |
| 75 | | Delay Value | (0.1-3600.0)s | 5.0 | |
| 76 | | Alarm Type | (0-6) | 1: Warning | |
| 77 | 2#HMP300 | Action | (0-1) | 0: Disable | |
| 78 | | Auto ACK | (0-1) | 0: Disable | |
| 79 | | Alarm Self-lock | (0-1) | 0: Disable | |
| 80 | | Delay Value | (0.1-3600.0)s | 5.0 | |
| 81 | | Alarm Type | (0-6) | 1: Warning | |
| 82 | Network Enable | | (0-1) | 1: Enable | |
| 83 | IP Address | | (0-255) | 192.168.0.144 | |
| 84 | Subnet Mask | | (0-255) | 255.255.255.0 | |
| 85 | Default Gateway | | (0-255) | 192.168.0.1 | |
| 86 | DNS Address | | (0-255) | 192.168.0.1 | |
| 87 | MAC Address | | (0-255) | | MAC of each controller is different. |
| 88 | Ring Disc. Alarm | Action | (0-1) | 1: Enable | It is enabled when ring has redundancy. |
| 89 | | Auto ACK | (0-1) | 0: Disable | |
| 90 | | Alarm Self-lock | (0-1) | 0: Disable | |

## 12.3    BUS SETTING

**Table 28 – Bus Parameter Settings**

| No. | Items | | Range | Default | Description |
|---|---|---|---|---|---|
| Bus Setting | | | | | |
| 1 | Rated Voltage | | (30-30000)V | 400 | Standard for checking bus over/under voltage. (It is primary voltage when using voltage transformer; it is line voltage when AC system is 3P3W while it is phase voltage when using other AC system). |
| 2 | Rated Frequency | | (10.0-75.0)Hz | 50.0 | Standard for checking bus over/under frequency. |
| 3 | Volt. Trans.(PT) | Action | (0-1) 0: Disable 1: Enable | 0: Disable | Users can set the primary voltage and secondary voltage of the voltage transformer. |
| 4 | | PT Primary | (30-30000)V | 100 | |
| 5 | | PT Secondary | (30-1000)V | 100 | |
| 6 | ROCOF | Action | (0-1) | 0: Disable | When controller detects bus frequency change rate is greater than set value, it will initiate alarm signal and alarm information will be displayed on LCD. |
| 7 | | Auto ACK | (0-1) | 0: Disable | |
| 8 | | Alarm Self-lock | (0-1) | 0: Disable | |
| 9 | | Threshold | (0-10.00)Hz/s | 0.20 | |
| 10 | | Return Value | (0-10.00)Hz/s | 0.15 | |
| 11 | | Delay Value | (0.1-3600.00) s | 0.1 | |
| 12 | | Alarm Type | (0-6) | 1: Warning | |
| 13 | | Active Range | (0-20) | 6: Gen Normal | |
| 14 | Vector Shift | Action | (0-1) | 0: Disable | When controller detects bus voltage vector shift value is greater than set value, it will initiate alarm signal and alarm information will be displayed on LCD. |
| 15 | | Auto ACK | (0-1) | 0: Disable | |
| 16 | | Alarm Self-lock | (0-1) | 0: Disable | |
| 17 | | Threshold | (0-60.0)° | 6.0 | |
| 18 | | Return Value | (0-60.0)° | 5.0 | |
| 19 | | Delay Value | (0.1-3600.00)s | 0.1 | |
| 20 | | Alarm Type | (0-6) | 1: Warning | |
| 21 | | Active Range | (0-20) | 6: Gen Normal | |
| 22 | Over Voltage 1 Set | Action | (0-1) 0: Disable | 1: Enable | Setting value is bus rated voltage's percentage, and both return value and |

| No. | Items | | Range | Default | Description |
|---|---|---|---|---|---|
| | | | 1: Enable | | delay value can be set. |
| 23 | | Auto ACK | (0-1)<br>0: Disable<br>1: Enable | 0: Disable | |
| 24 | | Alarm Self-lock | (0-1)<br>0: Disable<br>1: Enable | 0: Disable | |
| 25 | | Threshold | (0-200.0)% | 110.0 | |
| 26 | | Return Value | (0-200.0)% | 109.0 | |
| 27 | | Delay Value | (0.1-3600.0)s | 5.0 | |
| 28 | | Alarm Type | (0-6)<br>0: Block<br>1: Warning<br>2: Trip<br>3: Trip and Stop<br>4: Safety Trip<br>5: Safety Trip and Stop<br>6: Indication | 1: Warning | |
| 29 | | Active Range | (0-20)<br>0: Always Active<br>1: Inactive<br>2: Before Gen Close<br>3: After Gen Close<br>4: Gen Close on Bus<br>5: No Gen Close on Bus<br>6: Gen Normal<br>7: Other Gens Close<br>8: Start Delay<br>9: After Gen Close Delay<br>10: Before Gen Close Delay<br>11: Gen Load Normal<br>12: Gen Close Delay on Bus | 0: Always Active | |

| No. | Items | | Range | Default | Description |
|---|---|---|---|---|---|
| | | | 13: No Gen Close Delay on Bus<br>14: Gen Normal Delay<br>15: Other Gens Close Delay<br>16: Gen Load Normal Delay<br>17-20: Reserved | | |
| 30 | Over Voltage 2 Set | Action | (0-1) | 1: Enable | |
| 31 | | Auto ACK | (0-1) | 0: Disable | |
| 32 | | Alarm Self-lock | (0-1) | 0: Disable | |
| 33 | | Threshold | (0-200.0)% | 120.0 | |
| 34 | | Return Value | (0-200.0)% | 119.0 | |
| 35 | | Delay Value | (0.1-3600.0)s | 3.0 | |
| 36 | | Alarm Type | (0-6) | 2: Trip | |
| 37 | | Active Range | (0-20) | 0: Always Active | |
| 38 | Over Voltage 3 Set | Action | (0-1) | 0: Disable | |
| 39 | | Auto ACK | (0-1) | 0: Disable | |
| 40 | | Alarm Self-lock | (0-1) | 0: Disable | |
| 41 | | Threshold | (0-200.0)% | 130.0 | |
| 42 | | Return value | (0-200.0)% | 129.0 | |
| 43 | | Delay Value | (0.1-3600.0)s | 1.0 | |
| 44 | | Alarm Type | (0-6) | 2: Trip | |
| 45 | | Active Range | (0-20) | 0: Always Active | |
| 46 | Under Voltage 1 Set | Action | (0-1) | 1: Enable | |
| 47 | | Auto ACK | (0-1) | 0: Disable | |
| 48 | | Alarm Self-lock | (0-1) | 0: Disable | |
| 49 | | Threshold | (0-200.0)% | 95.0 | |
| 50 | | Return Value | (0-200.0)% | 96.0 | |
| 51 | | Delay Value | (0.1-3600.0)s | 5.0 | |
| 52 | | Alarm Type | (0-6) | 1: Warning | |
| 53 | | Active Range | (0-20) | 4: Gen Close on Bus | |

| No. | Items | | Range | Default | Description |
|---|---|---|---|---|---|
| 54 | Under Voltage 2 Set | Action | (0-1) | 1: Enable | |
| 55 | | Auto ACK | (0-1) | 0: Disable | |
| 56 | | Alarm Self-lock | (0-1) | 0: Disable | |
| 57 | | Threshold | (0-200.0)% | 80.0 | |
| 58 | | Return Value | (0-200.0)% | 81.0 | |
| 59 | | Delay Value | (0.1-3600.0)s | 3.0 | |
| 60 | | Alarm Type | (0-6) | 2: Trip | |
| 61 | | Active Range | (0-20) | 4: Gen Close on Bus | |
| 62 | Under Voltage 3 Set | Action | (0-1) | 0: Disable | |
| 63 | | Auto ACK | (0-1) | 0: Disable | |
| 64 | | Alarm Self-lock | (0-1) | 0: Disable | |
| 65 | | Threshold | (0-200.0)% | 70.0 | |
| 66 | | Return Value | (0-200.0)% | 71.0 | |
| 67 | | Delay Value | (0.1-3600.0)s | 2.0 | |
| 68 | | Alarm Type | (0-6) | 2: Trip | |
| 69 | | Active Range | (0-20) | 4: Gen Close on Bus | |
| 70 | Over Frequency 1 Set | Action | (0-1) | 1: Enable | Setting value is bus rated frequency's percentage, return value and delay value can be set according to actual situations. |
| 71 | | Auto ACK | (0-1) | 0: Disable | |
| 72 | | Alarm Self-lock | (0-1) | 0: Disable | |
| 73 | | Threshold | (0-200.0)% | 105.0 | |
| 74 | | Return Value | (0-200.0)% | 104.0 | |
| 75 | | Delay Value | (0.1-3600.0)s | 5.0 | |
| 76 | | Alarm Type | (0-6) | 1: Warning | |
| 77 | | Active Range | (0-20) | 0: Always Active | |
| 78 | Over Frequency 2 Set | Action | (0-1) | 1: Enable | |
| 79 | | Auto ACK | (0-1) | 0: Disable | |
| 80 | | Alarm Self-lock | (0-1) | 0: Disable | |
| 81 | | Threshold | (0-200.0)% | 110.0 | |
| 82 | | Return Value | (0-200.0)% | 109.0 | |

| No. | Items | | Range | Default | Description |
|-----|-------|---|-------|---------|-------------|
| 83 | | Delay Value | (0.1-3600.0)s | 8.0 | |
| 84 | | Alarm Type | (0-6) | 2: Trip | |
| 85 | | Active Range | (0-20) | 0: Always Active | |
| 86 | | Action | (0-1) | 0: Disable | |
| 87 | | Auto ACK | (0-1) | 0: Disable | |
| 88 | | Alarm Self-lock | (0-1) | 0: Disable | |
| 89 | Over Frequency 3 Set | Threshold | (0-200.0)% | 120.0 | |
| 90 | | Return Value | (0-200.0)% | 119.0 | |
| 91 | | Delay Value | (0.1-3600.0)s | 6.0 | |
| 92 | | Alarm Type | (0-6) | 2: Trip | |
| 93 | | Active Range | (0-20) | 0: Always Active | |
| 94 | | Action | (0-1) | 1: Enable | |
| 95 | | Auto ACK | (0-1) | 0: Disable | |
| 96 | | Alarm Self-lock | (0-1) | 0: Disable | |
| 97 | Under Frequency 1 Set | Threshold | (0-200.0)% | 96.0 | |
| 98 | | Return Value | (0-200.0)% | 97.0 | |
| 99 | | Delay Value | (0.1-3600.0)s | 5.0 | |
| 100 | | Alarm Type | (0-6) | 1: Warning | |
| 101 | | Active Range | (0-20) | 4: Gen Close on Bus | |
| 102 | | Action | (0-1) | 1: Enable | |
| 103 | | Auto ACK | (0-1) | 0: Disable | |
| 104 | | Alarm Self-lock | (0-1) | 0: Disable | |
| 105 | Under Frequency 2 Set | Threshold | (0-200.0)% | 93.0 | |
| 106 | | Return Value | (0-200.0)% | 94.0 | |
| 107 | | Delay Value | (0.1-3600.0)s | 10.0 | |
| 108 | | Alarm Type | (0-6) | 2: Trip | |
| 109 | | Active Range | (0-20) | 4: Gen Close on Bus | |
| 110 | Under Frequency 3 Set | Action | (0-1) | 0: Disable | |
| 111 | | Auto ACK | (0-1) | 0: Disable | |
| 112 | | Alarm | (0-1) | 0: Disable | |

| No. | Items | | Range | Default | Description |
|---|---|---|---|---|---|
| | | Self-lock | | | |
| 113 | | Threshold | (0-200.0)% | 92.0 | |
| 114 | | Set Value | (0-200.0)% | 93.0 | |
| 115 | | Delay | (0.1-3600.0)s | 8.0 | |
| 116 | | Alarm Type | (0-6) | 2: Trip | |
| 117 | | Active Range | (0-20) | 4: Gen Close on Bus | |

## 12.4　　GENERATOR SETTING

**Table 29 – Generator Parameter Settings**

| No. | Items | Range | Default | Description |
|---|---|---|---|---|
| Generator Setting | | | | |
| 1 | AC System | (0-3) | 0: 3P3W | 0: 3 phase, 4 wire (3P4W);<br>1: 3 phase, 3 wire (3P3W);<br>2: 2 phase, 3 wire (2P3W);<br>3: Single phase, 2 wire (1P2W). |
| 2 | Rated Voltage | (30-30000)V | 400 | To offer standards for detecting of generator's over/under voltage. (It is primary voltage when using voltage transformer; it is line voltage when AC system is 3P3W while it is phase voltage when using other AC system). |
| 3 | Min. Loading Voltage | (0-200.0)% | 95.0 | Setting value is percentage of generator rated voltage. Detect when controller prepares loading. When generator voltage is between min loading voltage and max loading voltage, it will enter into normally running. |
| 4 | Max. Loading Voltage | (0-200.0)% | 105.0 | |
| 5 | Crank Disconnect Volt | (0-200.0)% | 80.0 | To offer standards for detecting crank disconnect voltage is satisfied or not. |
| 6 | Rated Frequency | (10.0-75.0)Hz | 50.0 | To offer standards for detecting over/under/load frequency. |
| 7 | Min. Loading Frequency | (0-200.0)% | 94.0 | Setting value is percentage of generator rated frequency. Detect when controller prepares loading. When generator frequency is between min loading frequency and max loading frequency, it will enter |
| 8 | Max. Loading Frequency | (0-200.0)% | 101.0 | |

| No. | Items | | Range | Default | Description |
|-----|-------|--|-------|---------|-------------|
| | | | | | into normal running. |
| 9 | Crank Disconnect Freq | | (0-200.0)% | 85 | To offer standards for detecting crank disconnect frequency is satisfied or not. |
| 10 | Phase Sequence Select | | (0-1) | 0 | 0: L1-L2-L3<br>1: L1-L3-L2 |
| 11 | Harmonic Display | | (0-1) | 0: Disable | 0: Disable;　　1: Enable |
| 12 | Volt. Trans.(PT) | Action | (0-1)<br>0: Disable<br>1: Enable | 0: Disable | Primary/secondary voltage of voltage transformer can be set. |
| 13 | | PT Primary | (30-30000)V | 100 | |
| 14 | | PT Secondary | (30-1000)V | 100 | |
| 15 | Loss of Phase Set | Action | (0-1) | 1: Enable | |
| 16 | | Auto ACK | (0-1) | 0: Disable | |
| 17 | | Alarm Self-lock | (0-1) | 0: Disable | |
| 18 | | Delay Value | (0.1-3600.0)s | 5.0 | |
| 19 | | Alarm Type | (0-6) | 1: Warning | |
| 20 | | Active Range | (0-20) | 6: Gen Normal | |
| 21 | Reverse Phase Sequence | Action | (0-1) | 1: Enable | |
| 22 | | Auto ACK | (0-1) | 0: Disable | |
| 23 | | Alarm Self-lock | (0-1) | 0: Disable | |
| 24 | | Delay Value | (0.1-3600.0)s | 5.0 | |
| 25 | | Alarm Type | (0-6) | 1: Warning | |
| 26 | | Active Range | (0-20) | 6: Gen Normal | |
| 27 | VECTOR SHIFT 1 | Action | (0-1) | 0: Disable | When controller detects gen vector shift is greater than set value, it will initiate alarm signal and alarm information will be displayed on LCD. |
| 28 | | Auto ACK | (0-1) | 0: Disable | |
| 29 | | Alarm Self-lock | (0-1) | 0: Disable | |
| 30 | | Threshold | (0-60.0)° | 6.0 | |
| 31 | | Return Value | (0-60.0)° | 5.0 | |
| 32 | | Delay Value | (0.1-3600.0)s | 0.1 | |
| 33 | | Alarm Type | (0-6) | 1: Warning | |
| 34 | | Active Range | (0-20) | 6: Gen Normal | |
| 35 | VECTOR SHIFT 2 | Action | (0-1) | 0: Disable | |
| 36 | | Auto ACK | (0-1) | 0: Disable | |

| No. | Items | | Range | Default | Description |
|---|---|---|---|---|---|
| 37 | | Alarm Self-lock | (0-1) | 0: Disable | |
| 38 | | Threshold | (0-60.0)° | 6.0 | |
| 39 | | Return Value | (0-60.0)° | 5.0 | |
| 40 | | Delay Value | (0.1-3600.0)s | 0.1 | |
| 41 | | Alarm Type | (0-6) | 1: Warning | |
| 42 | | Active Range | (0-20) | 6: Gen Normal | |
| 43 | Voltage THD 1 Set | Action | (0-1) | 0: Disable | When controller detects voltage total harmonic distortion percentage is greater than set value, it will initiate alarm signal and alarm information will be displayed on LCD. |
| 44 | | Auto ACK | (0-1) | 0: Disable | |
| 45 | | Alarm Self-lock | (0-1) | 0: Disable | |
| 46 | | Threshold | (0-200.0)% | 10.0 | |
| 47 | | Return Value | (0-200.0)% | 5.0 | |
| 48 | | Delay Value | (0.1-3600.0)s | 5.0 | |
| 49 | | Alarm Type | (0-6) | 1: Warning | |
| 50 | | Active Range | (0-20) | 6: Gen Normal | |
| 51 | Voltage THD 2 Set | Action | (0-1) | 0: Disable | |
| 52 | | Auto ACK | (0-1) | 0: Disable | |
| 53 | | Alarm Self-lock | (0-1) | 0: Disable | |
| 54 | | Threshold | (0-200.0)% | 10.0 | |
| 55 | | Return Value | (0-200.0)% | 5.0 | |
| 56 | | Delay Value | (0.1-3600.0)s | 5.0 | |
| 57 | | Alarm Type | (0-6) | 1: Warning | |
| 58 | | Active Range | (0-20) | 6: Gen Normal | |
| 59 | Voltage SHD 1 Set | Action | (0-1) | 0: Disable | When controller detects voltage any one harmonic distortion percentage is greater than set value, it will initiate alarm signal and alarm information will be displayed on LCD. |
| 60 | | Auto ACK | (0-1) | 0: Disable | |
| 61 | | Alarm Self-lock | (0-1) | 0: Disable | |
| 62 | | Threshold | (0-200.0)% | 10.0 | |
| 63 | | Return Value | (0-200.0)% | 5.0 | |
| 64 | | Delay Value | (0.1-3600.0)s | 5.0 | |
| 65 | | Alarm Type | (0-6) | 1: Warning | |
| 66 | | Active Range | (0-20) | 6: Gen Normal | |

| No. | Items | | Range | Default | Description |
|---|---|---|---|---|---|
| 67 | Voltage SHD 2 Set | Action | (0-1) | 0: Disable | |
| 68 | | Auto ACK | (0-1) | 0: Disable | |
| 69 | | Alarm Self-lock | (0-1) | 0: Disable | |
| 70 | | Threshold | (0-200.0)% | 10.0 | |
| 71 | | Return Value | (0-200.0)% | 5.0 | |
| 72 | | Delay Value | (0.1-3600.0)s | 5.0 | |
| 73 | | Alarm Type | (0-6) | 1: Warning | |
| 74 | | Active Range | (0-20) | 6: Gen Normal | |
| 75 | Over Voltage 1 Set | Action | (0-1)<br>0: Disable<br>1: Enable | 1: Enable | |
| 76 | | Auto ACK | (0-1)<br>0: Disable<br>1: Enable | 0: Disable | |
| 77 | | Alarm Self-lock | (0-1)<br>0: Disable<br>1: Enable | 0: Disable | |
| 78 | | Threshold | (0-200.0)% | 105.0 | |
| 79 | | Return Value | (0-200.0)% | 104.0 | |
| 80 | | Delay Value | (0.1-3600.0)s | 5.0 | |
| 81 | | Alarm Type | (0-6)<br>0: Block<br>1: Warning<br>2: Trip<br>3: Trip and Stop<br>4: Safety Trip<br>5: Safety Trip and Stop<br>6: Indication | 1: Warning | Setting value is percentage of generator rated voltage. Delay value and return value can be set. |
| 82 | | Active Range | (0-20)<br>0: Always Active<br>1: Inactive<br>2: Before Gen Close<br>3: After Gen Close<br>4: Gen Close on Bus<br>5: No Gen Close on Bus | 0: Always Active | |

| No. | Items | | Range | Default | Description |
|---|---|---|---|---|---|
| | | | 6: Gen Normal<br>7: Other Gens Close<br>8: Start Delay<br>9: After Gen Close Delay<br>10: Before Gen Close Delay<br>11: Gen Load Normal<br>12: Gen Close Delay on Bus<br>13: No Gen Close Delay on Bus<br>14: Gen Normal Delay<br>15: Other Gens Close Delay<br>16: Gen Load Normal Delay<br>17-20: Reserved | | |
| 83 | Over Voltage 2 Set | Action | (0-1) | 1: Enable | |
| 84 | | Auto ACK | (0-1) | 0: Disable | |
| 85 | | Alarm Self-lock | (0-1) | 0: Disable | |
| 86 | | Threshold | (0-200.0)% | 115.0 | |
| 87 | | Return Value | (0-200.0)% | 114.0 | |
| 88 | | Delay Value | (0.1-3600.0)s | 1.0 | |
| 89 | | Alarm Type | (0-6) | 2: Trip | |
| 90 | | Active Range | (0-20) | 0: Always Active | |
| 91 | Over Voltage 3 Set | Action | (0-1) | 0: Disable | |
| 92 | | Auto ACK | (0-1) | 0: Disable | |
| 93 | | Alarm Self-lock | (0-1) | 0: Disable | |
| 94 | | Threshold | (0-200.0)% | 120.0 | |
| 95 | | Return Value | (0-200.0)% | 119.0 | |
| 96 | | Delay Value | (0.1-3600.0)s | 1.0 | |
| 97 | | Alarm Type | (0-6) | 2: Trip | |
| 98 | | Active | (0-20) | 0: Always | |

| No. | Items | | Range | Default | Description |
|---|---|---|---|---|---|
| | | Range | | Active | |
| 99 | Under Voltage 1 Set | Action | (0-1) | 1: Enable | |
| 100 | | Auto ACK | (0-1) | 0: Disable | |
| 101 | | Alarm Self-lock | (0-1) | 0: Disable | |
| 102 | | Threshold | (0-200.0)% | 95.0 | |
| 103 | | Return Value | (0-200.0)% | 96.0 | |
| 104 | | Delay Value | (0.1-3600.0)s | 5.0 | |
| 105 | | Alarm Type | (0-6) | 1: Warning | |
| 106 | | Active Range | (0-20) | 3: After Gen Close | |
| 107 | Under Voltage 2 Set | Action | (0-1) | 1: Enable | |
| 108 | | Auto ACK | (0-1) | 0: Disable | |
| 109 | | Alarm Self-lock | (0-1) | 0: Disable | |
| 110 | | Threshold | (0-200.0)% | 80.0 | |
| 111 | | Set Value | (0-200.0)% | 81.0 | |
| 112 | | Delay | (0.1-3600.0)s | 3.0 | |
| 113 | | Alarm Type | (0-6) | 2: Trip | |
| 114 | | Active Range | (0-20) | 3: After Gen Close | |
| 115 | Under Voltage 3 Set | Action | (0-1) | 0: Disable | |
| 116 | | Auto ACK | (0-1) | 0: Disable | |
| 117 | | Alarm Self-lock | (0-1) | 0: Disable | |
| 118 | | Threshold | (0-200.0)% | 70.0 | |
| 119 | | Set Value | (0-200.0)% | 71.0 | |
| 120 | | Delay | (0.1-3600.0)s | 1.0 | |
| 121 | | Alarm Type | (0-6) | 2: Trip | |
| 122 | | Active Range | (0-20) | 3: After Gen Close | |
| 123 | Voltage Imbalance 1 Set | Action | (0-1) | 1: Enable | When controller detects voltage imbalance percentage is greater than set value, it will initiate alarm signal and alarm information will be displayed on LCD. |
| 124 | | Auto ACK | (0-1) | 0: Disable | |
| 125 | | Alarm Self-lock | (0-1) | 0: Disable | |
| 126 | | Threshold | (0-200.0)% | 10.0 | |
| 127 | | Set Value | (0-200.0)% | 5.0 | |
| 128 | | Delay | (0.1-3600.0)s | 5.0 | |
| 129 | | Alarm Type | (0-6) | 1: Warning | |
| 130 | | Active Range | (0-20) | 3: After Gen Close | |

| No. | Items | | Range | Default | Description |
|---|---|---|---|---|---|
| 131 | Voltage Imbalance 2 Set | Action | (0-1) | 0: Disable | |
| 132 | | Auto ACK | (0-1) | 0: Disable | |
| 133 | | Alarm Self-lock | (0-1) | 0: Disable | |
| 134 | | Threshold | (0-200.0)% | 10.0 | |
| 135 | | Set Value | (0-200.0)% | 5.0 | |
| 136 | | Delay | (0.1-3600.0)s | 5.0 | |
| 137 | | Alarm Type | (0-6) | 1: Warning | |
| 138 | | Active Range | (0-20) | 3: After Gen Close | |
| 139 | Over Frequency 1 Set | Action | (0-1) | 1: Enable | |
| 140 | | Auto ACK | (0-1) | 0: Disable | |
| 141 | | Alarm Self-lock | (0-1) | 0: Disable | |
| 142 | | Threshold | (0-200.0)% | 105.0 | |
| 143 | | Return Value | (0-200.0)% | 104.0 | |
| 144 | | Delay Value | (0.1-3600.0)s | 5.0 | |
| 145 | | Alarm Type | (0-6) | 1: Warning | |
| 146 | | Active Range | (0-20) | 0: Always Active | |
| 147 | Over Frequency 2 Set | Action | (0-1) | 1: Enable | Setting value is percentage of generator rated frequency. Delay value and return value can be set according to actual situation. |
| 148 | | Auto ACK | (0-1) | 0: Disable | |
| 149 | | Alarm Self-lock | (0-1) | 0: Disable | |
| 150 | | Threshold | (0-200.0)% | 107.0 | |
| 151 | | Return Value | (0-200.0)% | 106.0 | |
| 152 | | Delay Value | (0.1-3600.0)s | 3.0 | |
| 153 | | Alarm Type | (0-6) | 2: Trip | |
| 154 | | Active Range | (0-20) | 0: Always Active | |
| 155 | Over Frequency 3 Set | Action | (0-1) | 0: Disable | |
| 156 | | Auto ACK | (0-1) | 0: Disable | |
| 157 | | Alarm Self-lock | (0-1) | 0: Disable | |
| 158 | | Threshold | (0-200.0)% | 110.0 | |
| 159 | | Return Value | (0-200.0)% | 109.0 | |
| 160 | | Delay Value | (0.1-3600.0)s | 1.0 | |
| 161 | | Alarm Type | (0-6) | 2: Trip | |
| 162 | | Active | (0-20) | 0: Always | |

| No. | Items | | Range | Default | Description |
|-----|-------|---|-------|---------|-------------|
| | | Range | | Active | |
| 163 | | Action | (0-1) | 1: Enable | |
| 164 | | Auto ACK | (0-1) | 0: Disable | |
| 165 | | Alarm Self-lock | (0-1) | 0: Disable | |
| 166 | Under Frequency 1 Set | Threshold | (0-200.0)% | 95.0 | |
| 167 | | Return Value | (0-200.0)% | 96.0 | |
| 168 | | Delay Value | (0.1-3600.0)s | 5.0 | |
| 169 | | Alarm Type | (0-6) | 1: Warning | |
| 170 | | Active Range | (0-20) | 3: After Gen Close | |
| 171 | | Action | (0-1) | 1: Enable | |
| 172 | | Auto ACK | (0-1) | 0: Disable | |
| 173 | | Alarm Self-lock | (0-1) | 0: Disable | |
| 174 | Under Frequency 2 Set | Threshold | (0-200.0)% | 93.0 | |
| 175 | | Return Value | (0-200.0)% | 94.0 | |
| 176 | | Delay Value | (0.1-3600.0)s | 3.0 | |
| 177 | | Alarm Type | (0-6) | 2: Trip | |
| 178 | | Active Range | (0-20) | 3: After Gen Close | |
| 179 | | Action | (0-1) | 0: Disable | |
| 180 | | Auto ACK | (0-1) | 0: Disable | |
| 181 | | Alarm Self-lock | (0-1) | 0: Disable | |
| 182 | Under Frequency 3 Set | Threshold | (0-200.0)% | 90.0 | |
| 183 | | Return Value | (0-200.0)% | 91.0 | |
| 184 | | Delay Value | (0.1-3600.0)s | 1.0 | |
| 185 | | Alarm Type | (0-6) | 2: Trip | |
| 186 | | Active Range | (0-20) | 3: After Gen Close | |
| 187 | | Action | (0-1) | 0: Disable | When controller detects that ROCOF is greater than the set value, it will send alarm signal and the alarm information will be displayed on the LCD. |
| 188 | | Auto ACK | (0-1) | 0: Disable | |
| 189 | ROCOF 1 | Alarm Self-lock | (0-1) | 0: Disable | |
| 190 | | Threshold | (0-10.00)Hz/s | 0.20 | |
| 191 | | Return Value | (0-10.00)Hz/s | 0.19 | |
| 192 | | Delay Value | (0.1-3600.0)s | 0.1 | |

| No. | Items | | Range | Default | Description |
|-----|-------|---|-------|---------|-------------|
| 193 | | Alarm Type | (0-6) | 1: Warning | |
| 194 | | Active Range | (0-20) | 6: Gen Normal | |
| 195 | | Action | (0-1) | 0: Disable | |
| 196 | | Auto ACK | (0-1) | 0: Disable | |
| 197 | | Alarm Self-lock | (0-1) | 0: Disable | |
| 198 | ROCOF 2 | Threshold | (0-10.00)Hz/s | 0.20 | |
| 199 | | Return Value | (0-10.00)Hz/s | 0.19 | |
| 200 | | Delay Value | (0.1-3600.0)s | 0.1 | |
| 201 | | Alarm Type | (0-6) | 1: Warning | |
| 202 | | Active Range | (0-20) | 6: Gen Normal | |

## 12.5 GENERATOR LOAD SETTING

**Table 30 – Generator Load Settings**

| No. | Items | | Range | Default | Description |
|---|---|---|---|---|---|
| Load Setting | | | | | |
| 1. | CT Ratio | | (5-6000)/5 | 500/5 | The ratio of external CT. |
| 2. | Full Load Rating | | (5-6000)A | 500 | Generator's rated current. |
| 3. | Rated Active Power | | (5-20000)kW | 276 | Generator's rated active power. |
| 4. | Rated Reactive Power | | (5-20000)kvar | 210 | Generator's rated reactive power. |
| 5. | Earth Current Trans. Ratio | | (5-6000)/5 | 500 | The ratio of external earth current transformer. |
| 6. | Load Slope | | (0.1-100.0)%/s | 3.0 | Genset load percentage in unit time. |
| 7. | Load Slope Delay Point | | (0.1-40.0)% | 10.0 | Load point for genset loading rest. |
| 8. | Load Slope Delay Value | | (0-30)s | 0 | Load disconnect time for genset loading rest. |
| 9. | Drop Power set | | (0-100)% | 70 | When the input port is active, it is the set value of genset drop power. |
| 10. | Unload Slope | | (0.1-100.0)%/s | 3.0 | Genset unload percentage in unit time. |
| 11. | Unload Slope Delay Point | | (0.1-40.0)% | 10.0 | Unload disconnect point for genset unloading rest. |
| 12. | Unload Slope Delay Value | | (0-30)s | 0 | Unload disconnect time for genset unloading rest. |
| 13. | Load Start Offset Point | | (0-100.0)% | 5.0 | Start offset point of soft loading after closing. |
| 14. | Unload Start Offset Point | | (0-100.0)% | 5.0 | Start offset point of soft unloading before opening. |
| 15. | 3P3W Two-meter Method | | (0-1) | 0 | When it is enabled, B phase current is not connected. |
| 16. | Unload Failure Open | Action | (0-1) | 1: Enable | Action whether to open when unloading failure. |
| 17. | | Threshold | (0-100.0)% | 10.0 | Open after reaching this value when unloading failure. |
| 18. | | Delay | (0-3600)s | 180 | Judging delay when unloading failure. |
| 19. | Earth Fault 1 Alarm Set | Action | (0-1) | 0: Disable | When controller detects earth current is greater than set value, it will issue alarm signal |
| 20. | | Auto ACK | (0-1) | 0: Disable | |
| 21. | | Alarm Self-lock | (0-1) | 0: Disable | |

| No. | Items | | Range | Default | Description |
|-----|-------|------|-------|---------|-------------|
| 22. | | Threshold | (0-200.0)% | 20.0 | and alarm information will be displayed on LCD. |
| 23. | | Return Value | (0-200.0)% | 19.0 | |
| 24. | | Delay Value | (0.1-3600.0)s | 10.0 | |
| 25. | | Alarm Type | (0-6) | 1: Warning | |
| 26. | | Active Range | (0-20) | 0: Always Active | |
| 27. | Earth Fault 2 Alarm Set | Action | (0-1) | 0: Disable | |
| 28. | | Auto ACK | (0-1) | 0: Disable | |
| 29. | | Alarm Self-lock | (0-1) | 0: Disable | |
| 30. | | Threshold | (0-200.0)% | 20.0 | |
| 31. | | Return Value | (0-200.0)% | 19.0 | |
| 32. | | Delay Value | (0.1-3600.0)s | 10.0 | |
| 33. | | Alarm Type | (0-6) | 1: Warning | |
| 34. | | Active Range | (0-20) | 0: Always Active | |
| 35. | Current THD 1 Set | Action | (0-1) | 0: Disable | When controller detects current total harmonic distortion is greater than set value, it will initiate alarm signal and alarm information will be displayed on LCD. |
| 36. | | Auto ACK | (0-1) | 0: Disable | |
| 37. | | Alarm Self-lock | (0-1) | 0: Disable | |
| 38. | | Threshold | (0-200.0)% | 10.0 | |
| 39. | | Return Value | (0-200.0)% | 5.0 | |
| 40. | | Delay Value | (0.1-3600.0)s | 5.0 | |
| 41. | | Alarm Type | (0-6) | 1: Warning | |
| 42. | | Active Range | (0-20) | 3: After Gen Close | |
| 43. | Current THD 2 Set | Action | (0-1) | 0: Disable | |
| 44. | | Auto ACK | (0-1) | 0: Disable | |
| 45. | | Alarm Self-lock | (0-1) | 0: Disable | |
| 46. | | Threshold | (0-200.0)% | 10.0 | |
| 47. | | Return Value | (0-200.0)% | 5.0 | |
| 48. | | Delay Value | (0.1-3600.0)s | 5.0 | |
| 49. | | Alarm Type | (0-6) | 1: Warning | |
| 50. | | Active Range | (0-20) | 3: After Gen Close | |
| 51. | Current SHD 1 Set | Action | (0-1) | 0: Disable | When controller detects any one harmonic distortion is greater than set value, it will initiate alarm signal and alarm information will be displayed on LCD. |
| 52. | | Auto ACK | (0-1) | 0: Disable | |
| 53. | | Alarm Self-lock | (0-1) | 0: Disable | |
| 54. | | Threshold | (0-200.0)% | 10.0 | |
| 55. | | Return Value | (0-200.0)% | 5.0 | |
| 56. | | Delay Value | (0.1-3600.0)s | 5.0 | |
| 57. | | Alarm Type | (0-6) | 1: Warning | |
| 58. | | Active Range | (0-20) | 3: After Gen Close | |

| No. | Items | | Range | Default | Description |
|---|---|---|---|---|---|
| 59. | Current SHD 2 Set | Action | (0-1) | 0: Disable | |
| 60. | | Auto ACK | (0-1) | 0: Disable | |
| 61. | | Alarm Self-lock | (0-1) | 0: Disable | |
| 62. | | Threshold | (0-200.0)% | 10.0 | |
| 63. | | Return Value | (0-200.0)% | 5.0 | |
| 64. | | Delay Value | (0.1-3600.0)s | 5.0 | |
| 65. | | Alarm Type | (0-6) | 1: Warning | |
| 66. | | Active Range | (0-20) | 3: After Gen Close | |
| 67. | Gen Current 1 Set | Action | (0-1) | 1: Enable | |
| 68. | | Auto ACK | (0-1) | 0: Disable | |
| 69. | | Alarm Self-lock | (0-1) | 0: Disable | |
| 70. | | Threshold | (0-200.0)% | 100.0 | |
| 71. | | Return Value | (0-200.0)% | 99.0 | |
| 72. | | Delay Value | (0.1-3600.0)s | 20.0 | |
| 73. | | Alarm Type | (0-6)<br>0: Block<br>1: Warning<br>2: Trip<br>3: Trip and Stop<br>4: Safety Trip<br>5: Safety Trip and Stop<br>6: Indication | 1: Warning | Set value is percentage of gen rated full-load current, return value and delay value can be set according to actual situation. |
| 74. | | Active Range | (0-20)<br>0: Always Active<br>1: Inactive<br>2: Before Gen Close<br>3: After Gen Close<br>4: Gen Close on Bus<br>5: No Gen Close on Bus<br>6: Gen Normal<br>7: Other Gens Close<br>8: Start Delay<br>9: After Gen Close Delay<br>10: Before Gen Close Delay | 0: Always Active | |

| No. | Items | | Range | Default | Description |
|---|---|---|---|---|---|
| | | | 11: Gen Load Normal 12: Gen Close Delay on Bus 13: No Gen Close Delay on Bus 14: Gen Normal Delay 15: Other Gens Close Delay 16: Gen Load Normal Delay 17-20: Reserved | | |
| 75. | Gen Current 2 Set | Action | (0-1) | 1: Enable | |
| 76. | | Auto ACK | (0-1) | 0: Disable | |
| 77. | | Alarm Self-lock | (0-1) | 0: Disable | |
| 78. | | Threshold | (0-200.0)% | 110.0 | |
| 79. | | Return Value | (0-200.0)% | 109.0 | |
| 80. | | Delay Value | (0.1-3600.0)s | 60.0 | |
| 81. | | Alarm Type | (0-6) | 2: Trip | |
| 82. | | Active Range | (0-20) | 0: Always Active | |
| 83. | Gen Current 3 Set | Action | (0-1) | 1: Enable | |
| 84. | | Auto ACK | (0-1) | 0: Disable | |
| 85. | | Alarm Self-lock | (0-1) | 0: Disable | |
| 86. | | Threshold | (0-200.0)% | 130.0 | |
| 87. | | Return Value | (0-200.0)% | 129.0 | |
| 88. | | Delay Value | (0.1-3600.0)s | 30.0 | |
| 89. | | Alarm Type | (0-6) | 2: Trip | |
| 90. | | Active Range | (0-20) | 0: Always Active | |
| 91. | Gen Current 4 Set | Action | (0-1) | 1: Enable | |
| 92. | | Auto ACK | (0-1) | 0: Disable | |
| 93. | | Alarm Self-lock | (0-1) | 0: Disable | |
| 94. | | Threshold | (0-200.0)% | 150.0 | |
| 95. | | Return Value | (0-200.0)% | 149.0 | |
| 96. | | Delay Value | (0.1-3600.0)s | 10.0 | |
| 97. | | Alarm Type | (0-6) | 2: Trip | |
| 98. | | Active Range | (0-20) | 0: Always Active | |
| 99. | Gen Current | Action | (0-1) | 0: Disable | Inverse time overcurrent. The |

| No. | Items | | Range | Default | Description |
|---|---|---|---|---|---|
| 100. | 5 Set | Auto ACK | (0-1) | 0: Disable | larger the over current, the less |
| 101. | | Alarm Self-lock | (0-1) | 0: Disable | the time. The formulation is: |
| 102. | | Threshold | (0-200.0)% | 120.0 | $T=t/((IA/IT)-1)^2$ |
| 103. | | Return Value | (0-200.0)% | 119.0 | T: Overload current delay value |
| 104. | | Delay Value | (0.1-36.0)s | 12.0 | (s) |
| 105. | | Alarm Type | (0-6) | 1: Warning | t: Timing multiplier rate |
| 106. | | Active Range | (0-20) | 0: Always Active | IA: Current load max current (L1/L2/L3) |
| 107. | Gen Current 6 Set | Action | (0-1) | 0: Disable | IT: Overload current set value |
| 108. | | Auto ACK | (0-1) | 0: Disable | For example: |
| 109. | | Alarm Self-lock | (0-1) | 0: Disable | t=36.0 |
| 110. | | Threshold | (0-200.0)% | 140.0 | IA=550A |
| 111. | | Return Value | (0-200.0)% | 139.0 | IT=500A |
| 112. | | Delay Value | (0.1-36.0)s | 36.0 | Then T=3600s (1h) |
| 113. | | Alarm Type | (0-6) | 2: Trip | |
| 114. | | Active Range | (0-20) | 0: Always Active | |
| 115. | Unbalanced Current 1 Set | Action | (0-1) | 1: Enable | |
| 116. | | Auto ACK | (0-1) | 0: Disable | |
| 117. | | Alarm Self-lock | (0-1) | 0: Disable | |
| 118. | | Threshold | (0-200.0)% | 20.0 | |
| 119. | | Return Value | (0-200.0)% | 19.0 | |
| 120. | | Delay Value | (0.1-3600.0)s | 5.0 | 3P3W Two-meter method enable |
| 121. | | Alarm Type | (0-6) | 1: Warning | When controller detects |
| 122. | | Active Range | (0-20) | 3: After Gen Close | unbalanced current is greater |
| 123. | Unbalanced Current 2 Set | Action | (0-1) | 0: Disable | than set value, it will initiate |
| 124. | | Auto ACK | (0-1) | 0: Disable | alarm signal and alarm |
| 125. | | Alarm Self-lock | (0-1) | 0: Disable | information will be displayed |
| 126. | | Threshold | (0-200.0)% | 20.0 | on LCD. |
| 127. | | Return Value | (0-200.0)% | 19.0 | |
| 128. | | Delay Value | (0.1-3600.0)s | 5.0 | |
| 129. | | Alarm Type | (0-6) | 1: Warning | |
| 130. | | Active Range | (0-20) | 3: After Gen Close | |
| 131. | Over Power 1 Set | Action | (0-1) | 1: Enable | |
| 132. | | Auto ACK | (0-1) | 0: Disable | When controller detects power |
| 133. | | Alarm Self-lock | (0-1) | 0: Disable | value is greater than set value, |
| 134. | | Threshold | (0-200.0)% | 120.0 | it will initiate alarm signal and |
| 135. | | Return Value | (0-200.0)% | 119.0 | alarm information will be |
| 136. | | Delay Value | (0.1-3600.0)s | 10.0 | displayed on LCD. |
| 137. | | Alarm Type | (0-6) | 1: Warning | |

| No. | Items | | Range | Default | Description |
|---|---|---|---|---|---|
| 138. | | Active Range | (0-20) | 0: Always Active | |
| 139. | Over Power 2 Set | Action | (0-1) | 1: Enable | |
| 140. | | Auto ACK | (0-1) | 0: Disable | |
| 141. | | Alarm Self-lock | (0-1) | 0: Disable | |
| 142. | | Threshold | (0-200.0)% | 130.0 | |
| 143. | | Return Value | (0-200.0)% | 129.0 | |
| 144. | | Delay Value | (0.1-3600.0)s | 5.0 | |
| 145. | | Alarm Type | (0-6) | 2: Trip | |
| 146. | | Active Range | (0-20) | 0: Always Active | |
| 147. | Reverse Power 1 Set | Action | (0-1) | 1: Enable | When controller detects reverse power value is greater than set value, it will initiate alarm signal and alarm information will be displayed on LCD. |
| 148. | | Auto ACK | (0-1) | 0: Disable | |
| 149. | | Alarm Self-lock | (0-1) | 0: Disable | |
| 150. | | Threshold | (0-200.0)% | 8.0 | |
| 151. | | Return Value | (0-200.0)% | 7.0 | |
| 152. | | Delay Value | (0.1-3600.0)s | 5.0 | |
| 153. | | Alarm Type | (0-6) | 1: Warning | |
| 154. | | Active Range | (0-20) | 0: Always Active | |
| 155. | Reverse Power 2 Set | Action | (0-1) | 1: Enable | |
| 156. | | Auto ACK | (0-1) | 0: Disable | |
| 157. | | Alarm Self-lock | (0-1) | 0: Disable | |
| 158. | | Threshold | (0-200.0)% | 15.0 | |
| 159. | | Return Value | (0-200.0)% | 14.0 | |
| 160. | | Delay Value | (0.1-3600.0)s | 2.0 | |
| 161. | | Alarm Type | (0-6) | 2: Trip | |
| 162. | | Active Range | (0-20) | 0: Always Active | |
| 163. | Low Power Factor 1 Alarm Set | Action | (0-1) | 1: Enable | When controller detects power factor is lower than set value, it will initiate alarm signal and alarm information will be displayed on LCD. |
| 164. | | Auto ACK | (0-1) | 0: Disable | |
| 165. | | Alarm Self-lock | (0-1) | 0: Disable | |
| 166. | | Threshold | (0-200.0)% | 0.70 | |
| 167. | | Return Value | (0-200.0)% | 0.75 | |
| 168. | | Delay Value | (0.1-3600.0)s | 5.0 | |
| 169. | | Alarm Type | (0-6) | 1: Warning | |
| 170. | | Active Range | (0-20) | 16: Gen Load Normal Delay | |
| 171. | Low Power Factor 2 Alarm Set | Action | (0-1) | 0: Disable | |
| 172. | | Auto ACK | (0-1) | 0: Disable | |
| 173. | | Alarm Self-lock | (0-1) | 0: Disable | |
| 174. | | Threshold | (0-200.0)% | 0.70 | |

| No. | Items | | Range | Default | Description |
|---|---|---|---|---|---|
| 175. | | Return Value | (0-200.0)% | 0.75 | |
| 176. | | Delay Value | (0.1-3600.0)s | 5.0 | |
| 177. | | Alarm Type | (0-6) | 1: Warning | |
| 178. | | Active Range | (0-20) | 16: Gen Load Normal Delay | |
| 179. | | Action | (0-1) | 1: Enable | When controller detects the absolute value of reactive power is greater than set value, it will initiate alarm signal and alarm information will be displayed on LCD. |
| 180. | | Auto ACK | (0-1) | 0: Disable | |
| 181. | | Alarm Self-lock | (0-1) | 0: Disable | |
| 182. | Loss of Excitation 1 Alarm Set | Threshold | (0-200.0)% | 20.0 | |
| 183. | | Return Value | (0-200.0)% | 19.0 | |
| 184. | | Delay Value | (0.1-3600.0)s | 10.0 | |
| 185. | | Alarm Type | (0-6) | 1: Warning | |
| 186. | | Active Range | (0-20) | 0: Always Active | |
| 187. | | Action | (0-1) | 0: Disable | |
| 188. | | Auto ACK | (0-1) | 0: Disable | |
| 189. | | Alarm Self-lock | (0-1) | 0: Disable | |
| 190. | Loss of Excitation 2 Alarm Set | Threshold | (0-200.0)% | 20.0 | |
| 191. | | Return Value | (0-200.0)% | 19.0 | |
| 192. | | Delay Value | (0.1-3600.0)s | 10.0 | |
| 193. | | Alarm Type | (0-6) | 1: Warning | |
| 194. | | Active Range | (0-20) | 0: Always Active | |
| 195. | | Action | (0-1) | 1: Enable | Action for active distribution percentage is greater that set value. |
| 196. | | Auto ACK | (0-1) | 0: Disable | |
| 197. | | Alarm Self-lock | (0-1) | 0: Disable | |
| 198. | Active Distribution Imbalance 1 | Threshold | (0-200.0)% | 20.0 | |
| 199. | | Return Value | (0-200.0)% | 18.0 | |
| 200. | | Delay Value | (0.1-3600.0)s | 60.0 | |
| 201. | | Alarm Type | (0-6) | 1: Warning | |
| 202. | | Active Range | (0-20) | 3: After Gen Close | |
| 203. | | Action | (0-1) 0: Disable 1: Enable | 0: Disable | |
| 204. | | Auto ACK | (0-1) | 0: Disable | |
| 205. | Active Distribution Imbalance 2 | Alarm Self-lock | (0-1) | 0: Disable | |
| 206. | | Threshold | (0-200.0)% | 20.0 | |
| 207. | | Return Value | (0-200.0)% | 18.0 | |
| 208. | | Delay Value | (0.1-3600.0)s | 60.0 | |
| 209. | | Alarm Type | (0-6) | 1: Warning | |
| 210. | | Active Range | (0-20) | 3: After Gen | |

| No. | Items | | | Range | Default | Description |
|---|---|---|---|---|---|---|
| | | | | | Close | |
| 211. | Reactive Distribution Imbalance 1 | Action | | (0-1) | 1: Enable | Action for reactive distribution percentage is greater that set value. |
| 212. | | Auto ACK | | (0-1) | 0: Disable | |
| 213. | | Alarm Self-lock | | (0-1) | 0: Disable | |
| 214. | | Threshold | | (0-200.0)% | 20.0 | |
| 215. | | Return Value | | (0-200.0)% | 18.0 | |
| 216. | | Delay Value | | (0.1-3600.0)s | 60.0 | |
| 217. | | Alarm Type | | (0-6) | 1: Warning | |
| 218. | | Active Range | | (0-20) | 3: After Gen Close | |
| 219. | Reactive Distribution Imbalance 2 | Action | | (0-1) | 0: Disable | |
| 220. | | Auto ACK | | (0-1) | 0: Disable | |
| 221. | | Alarm Self-lock | | (0-1) | 0: Disable | |
| 222. | | Threshold | | (0-200.0)% | 20.0 | |
| 223. | | Return Value | | (0-200.0)% | 18.0 | |
| 224. | | Delay Value | | (0.1-3600.0)s | 60.0 | |
| 225. | | Alarm Type | | (0-6) | 1: Warning | |
| 226. | | Active Range | | (0-20) | 3: After Gen Close | |
| 227. | | Auto ACK | | (0-1) | 0: Disable | |
| 228. | | Alarm Self-lock | | (0-1) | 0: Disable | |
| 229. | | Alarm Type | | (0-6) | 1: Warning | |
| 230. | | Active Range | | (0-20) | 0: Always Active | |
| 231. | NEL 1 Trip | Power Trip | Action | (0-1) | 1: Enable | When any bus genset power is greater than set value, external non-essential load 1 will trip. |
| 232. | | | Threshold | (0-200.0)% | 100.0 | |
| 233. | | | Return Value | (0-200.0)% | 99.0 | |
| 234. | | | Delay Value | (0.1-3600.0)s | 5.0 | |
| 235. | | Current Trip | Action | (0-1) | 0: Disable | When any bus genset current is greater than set value, external non-essential load 1 will trip. |
| 236. | | | Threshold | (0-200.0)% | 100.0 | |
| 237. | | | Return Value | (0-200.0)% | 99.0 | |
| 238. | | | Delay Value | (0.1-999.9)s | 5.0 | |
| 239. | | Chinese Character String | | | 非重要负载1 | Character string only can be set via upper computer. |
| 240. | | English Character String | | | NEL1 | |
| 241. | NEL2 Trip | Auto ACK | | (0-1) | 0: Disable | |
| 242. | | Alarm Self-lock | | (0-1) | 0: Disable | |

| No. | Items | | | Range | Default | Description |
|---|---|---|---|---|---|---|
| 243. | | Alarm Type | | (0-6) | 1: Warning | |
| 244. | | Active Range | | (0-20) | 0: Always Active | |
| 245. | | Power Trip | Action | (0-1) | 1: Enable | When any bus genset current is greater than set value, external non-essential load 2 will trip. |
| 246. | | | Threshold | (0-200.0)% | 100.0 | |
| 247. | | | Return Value | (0-200.0)% | 99.0 | |
| 248. | | | Delay Value | (0.1-3600.0)s | 8.0 | |
| 249. | | Current Trip | Action | (0-1) | 0: Disable | When any bus genset current is greater than set value, external non-essential load 2 will trip. |
| 250. | | | Threshold | (0-200.0)% | 100.0 | |
| 251. | | | Return Value | (0-200.0)% | 99.0 | |
| 252. | | | Delay Value | (0.1-3600.0)s | 8.0 | |
| 253. | | Chinese Character String | | | 非重要负载 2 | Character string only can be set via upper computer. |
| 254. | | English Character String | | | NEL2 | |
| 255. | | Auto ACK | | (0-1) | 0: Disable | |
| 256. | | Alarm Self-lock | | (0-1) | 0: Disable | |
| 257. | | Alarm Type | | (0-6) | 1: Warning | |
| 258. | | Active Range | | (0-20) | 0: Always Active | |
| 259. | NEL 3 Trip | Power Trip | Action | (0-1) | 1: Enable | When any bus genset current is greater than set value, external non-essential load 3 will trip. |
| 260. | | | Threshold | (0-200.0)% | 100.0 | |
| 261. | | | Return Value | (0-200.0)% | 99.0 | |
| 262. | | | Delay Value | (0.1-3600.0)s | 10.0 | |
| 263. | | Current Trip | Action | (0-1) | 0: Disable | When any bus genset current is greater than set value, external non-essential load 3 will trip. |
| 264. | | | Threshold | (0-200.0)% | 100.0 | |
| 265. | | | Return Value | (0-200.0)% | 99.0 | |
| 266. | | | Delay Value | (0.1-3600.0)s | 10.0 | |
| 267. | | Chinese Character String | | | 非重要负载 3 | Character string only can be set via upper computer. |
| 268. | | English Character String | | | NEL3 | |
| 269. | Heavy Consumer 1 | Feedback Type | | (0-4) | 0 | 0 Digital Input Feedback<br>1 AI1 Input Feedback |

| No. | Items | | Range | Default | Description |
|---|---|---|---|---|---|
| | | | | | 2 AI2 Input Feedback |
| | | | | | 3 HMP300-1 Comm. Feedback |
| | | | | | 4 HMP300-2 Comm. Feedback |
| 270. | | Inquiry Signal | (0-1) | 0 | 0 Continuous Signal; 1 Trigger Signal |
| 271. | | ID | (0-128) | 128 | Heavy consumer ID number. |
| 272. | | Priority | (0-128) | 128 | HC priority. The smaller the number, the higher the priority. If the priority is same, HC with small ID number, the priority is high. |
| 273. | | Rated Power | (0-60000)kW | 60 | HC rated power. |
| 274. | | Inquiry Power | (0-60000)kW | 90 | The percentage of rated power relative to heavy consumer. |
| 275. | | Stable Time | (0-3600)s | 5 | Bus stable time before HC running. |
| 276. | | ACK Time | (0-3600)s | 5 | Output ACK signal time after meeting HC demand. It is continuous output when set as 0. |
| 277. | | Feedback Failure Time | (0-3600)s | 5 | Feedback signal detection time after HC ACK. It doesn't detect feedback failure when set as 0. |
| 278. | | Request Failure Time | (0-3600)s | 120 | Time between receiving HC inquiry signal and HC ACK. Controller will initiate alarm signal when time is over. It doesn't detect request failure when set as 0. |
| 279. | | Request Failure Action | (0-2) | 0 | 0 Alarm<br>1 Trip NEL<br>2 Alarm and Trip NEL |
| 280. | | Chinese Character String | | 重载1 | Character string only can be set via upper computer. |
| 281. | | English Character String | | HC1 | |
| 282. | Heavy Consumer 2 | Feedback Type | (0-4) | 0 | 0 Digital Input Feedback<br>1 AI1 Input Feedback<br>2 AI2 Input Feedback<br>3 HMP300-1 Comm. Feedback |

| No. | Items | | Range | Default | Description |
|---|---|---|---|---|---|
| | | | | | 4 HMP300-2 Comm. Feedback |
| 283. | | Inquiry Signal | (0-1) | 0 | 0 Continuous Signal; 1 Trigger Signal |
| 284. | | ID | (0-128) | 128 | Heavy consumer ID number. |
| 285. | | Priority | (0-128) | 128 | HC priority. The smaller the number, the higher the priority. If the priority is same, HC with small ID number, the priority is high. |
| 286. | | Rated Power | (0-60000)kW | 60 | HC rated power. |
| 287. | | Inquiry Power | (0-60000)kW | 90 | The percentage of rated power relative to heavy consumer. |
| 288. | | Stable Time | (0-3600)s | 5 | Bus stable time before HC running. |
| 289. | | ACK Time | (0-3600)s | 5 | Output ACK signal time after meeting HC demand. It is continuous output when set as 0. |
| 290. | | Feedback Failure Time | (0-3600)s | 5 | Feedback signal detection time after HC ACK. It doesn't detect feedback failure when set as 0. |
| 291. | | Request Failure Time | (0-3600)s | 120 | Time between receiving HC inquiry signal and HC ACK. Controller will initiate alarm signal when time is over. It doesn't detect request failure when set as 0. |
| 292. | | Request Failure Action | (0-2) | 0 | 0 Alarm 1 Trip NEL 2 Alarm and Trip NEL |
| 293. | | Chinese Character String | | 重载 2 | Character string only can be set via upper computer. |
| 294. | | English Character String | | HC2 | |
| 295. | Heavy Consumer 3 | Feedback Type | (0-4) | 0 | 0 Digital Input Feedback 1 AI1 Input Feedback 2 AI2 Input Feedback 3 HMP300-1 Comm. Feedback 4 HMP300-2 Comm. Feedback |
| 296. | | Inquiry Signal | (0-1) | 0 | 0 Continuous Signal; 1 Trigger |

| No. | Items | | Range | Default | Description |
|---|---|---|---|---|---|
| | | | | | Signal |
| 297. | | ID | (0-128) | 128 | Heavy consumer ID number. |
| 298. | | Priority | (0-128) | 128 | HC priority. The smaller the number, the higher the priority. If the priority is same, HC with small ID number, the priority is high. |
| 299. | | Rated Power | (0-60000)kW | 60 | HC rated power. |
| 300. | | Inquiry Power | (0-60000)kW | 90 | The percentage of rated power relative to heavy consumer. |
| 301. | | Stable Time | (0-3600)s | 5 | Bus stable time before HC running. |
| 302. | | ACK Time | (0-3600)s | 5 | Output ACK signal time after meeting HC demand. It is continuous output when set as 0. |
| 303. | | Feedback Failure Time | (0-3600)s | 5 | Feedback signal detection time after HC ACK. It doesn't detect feedback failure when set as 0. |
| 304. | | Request Failure Time | (0-3600)s | 120 | Time between receiving HC inquiry signal and HC ACK. Controller will initiate alarm signal when time is over. It doesn't detect request failure when set as 0. |
| 305. | | Request Failure Action | (0-2) | 0 | 0 Alarm 1 Trip NEL 2 Alarm and Trip NEL |
| 306. | | Chinese Character String | | 重载 3 | Character string only can be set via upper computer. |
| 307. | | English Character String | | HC3 | |
| 308. | Heavy Consumer 4 | Feedback Type | (0-4) | 0 | 0 Digital Input Feedback 1 AI1 Input Feedback 2 AI2 Input Feedback 3 HMP300-1 Comm. Feedback 4 HMP300-2 Comm. Feedback |
| 309. | | Inquiry Signal | (0-1) | 0 | 0 Continuous Signal; 1 Trigger Signal |
| 310. | | ID | (0-128) | 128 | Heavy consumer ID number. |

| No. | Items | | Range | Default | Description |
|---|---|---|---|---|---|
| 311. | | Priority | (0-128) | 128 | HC priority. The smaller the number, the higher the priority. If the priority is same, HC with small ID number, the priority is high. |
| 312. | | Rated Power | (0-60000)kW | 60 | HC rated power. |
| 313. | | Inquiry Power | (0-60000)kW | 90 | The percentage of rated power relative to heavy consumer. |
| 314. | | Stable Time | (0-3600)s | 5 | Bus stable time before HC running. |
| 315. | | ACK Time | (0-3600)s | 5 | Output ACK signal time after meeting HC demand. It is continuous output when set as 0. |
| 316. | | Feedback Failure Time | (0-3600)s | 5 | Feedback signal detection time after HC ACK. It doesn't detect feedback failure when set as 0. |
| 317. | | Request Failure Time | (0-3600)s | 120 | Time between receiving HC inquiry signal and HC ACK. Controller will initiate alarm signal when time is over. It doesn't detect request failure when set as 0. |
| 318. | | Request Failure Action | (0-2) | 0 | 0 Alarm<br>1 Trip NEL<br>2 Alarm and Trip NEL |
| 319. | | Chinese Character String | | 重载 4 | Character string only can be set via upper computer. |
| 320. | | English Character String | | HC4 | |

**12.6    TIMER SETTING**

**Table 31 – Timer Settings**

| No. | Items | Range | Default | Description |
|---|---|---|---|---|
| Timer Setting | | | | |
| 1 | Start Delay | (0-3600)s | 5 | Time from start signal is active to genset start. |
| 2 | Stop Delay | (0-3600)s | 30 | Time from start signal is deactivated to genset stop. |
| 3 | Start Output Delay | (0-3600)s | 8 | Start relay output time. When it is 0, means output constantly. |
| 4 | Stop Output Delay | (0-3600)s | 5 | Stop relay output time. When it is 0, means output constantly. |
| 5 | Start Wait Delay | (0-3600)s | 120 | Time from start signal is active to on-load requirement is satisfied. If the requirement doesn't be satisfied but delay time is up, then the warning alarm will be initiated. |
| 6 | Stop Wait Delay | (0-3600)s | 20 | After the "Wait For Stop" delay, the genset is stopped successfully if the voltage and frequency are 0; while the warning alarm will be initiated if they are not 0. |
| 7 | Load Stable Delay | (0-3600)s | 5 | When genset starts success and on-load stable delay is beginning. |
| 8 | Transient Fault Delay | (0-100.0)s | 2.0 | After the on-load stable delay, If the voltage and frequency requirements are not satisfied after the transient fault delay has expired, then the "Freq/Volt Fault" alarm will be initiated. |
| 9 | Alarm Start Delay | (0-3600)s | 1 | Start delay caused by trip or shutdown alarm. |
| 10 | Trigger Start Delay | (0-3600)s | 1 | Start delay caused by human triggered (e.g. manual transfer priority, heavy consumer request and etc.) |
| 11 | Alarm Stop Delay | (0-3600)s | 1 | Stop delay caused by the trip or shutdown alarms. |
| 12 | Trigger Stop Delay | (0-3600)s | 1 | Stop delay caused by human triggered (e.g. manual transfer priority, heavy consumer request and etc.) |

| No. | Items | | Range | Default | Description |
|---|---|---|---|---|---|
| 13 | Cooling Delay | | (0-3600)s | 0 | High speed cooling time before stop output. |
| 14 | Gen Insufficient Delay | | (0-3600.0)s | 1.5 | When current genset power can't meet load demand, alarm will be initiated after delay. |
| 15 | Crank Success Delay | | (0-3600.0)s | 2.0 | It is considered that crank success after conditions are met and delay continues in crank rest, then it enters stable load after crank rest is over. |
| 16 | Fast Start Delay | | (0-3600)s | 2 | Time from auto fast start conditions are active to start output rest. |
| 17 | Fast Stop Delay | | (0-3600)s | 2 | Time from auto fast stop conditions are active to stop output rest. |
| 18 | SG-DG Max. Grid-connection Time | | (0-3600.0)s | 60.0 | The max grid-connection time of SG and DG, alarm will be initiated when the time is over. |

## 12.7 ANALOG INPUT PORTS SETTING

**Table 32 – Analog Input Ports Setting**

| No. | Items | | Range | Default | Description |
|---|---|---|---|---|---|
| Analog Input Ports Setting | | | | | |
| Analog Input Port 1 | | | | | |
| 1 | Function | | (0-4) | 0 | 0: Not Used<br>1: Fixed Active Power Input<br>2: Fixed Reactive Power Input<br>3: HC Feedback Input<br>4: Temperature Sensor |
| 2 | Type | | (0-2) | 0 | 0: Resistance Type<br>1: Current Type<br>2: Voltage Type |
| 3 | Input Min. Value | | (0.0-1000.0)Ω/mA/V | 0.0 | Unit is changed according to type. |
| 4 | Input Max Value | | (0.0-1000.0)Ω/mA/V | 600.0 | |
| 5 | HC Feedback Range | | (0-60000)kW | 100 | |
| 6 | Open Action | | (0-6) | 1 | |
| 7 | Curve Type | | (0-15) | 0 | |
| 8 | Upper Limit 1 | Action | (0-1) | 0: Disable | |
| 9 | | Auto ACK | (0-1) | 0: Disable | |
| 10 | | Alarm Self-lock | (0-1) | 0: Disable | |
| 11 | | Threshold | (0.0-1000.0)°C | 100.0 | |
| 12 | | Return Value | (0.0-1000.0)°C | 90.0 | |
| 13 | | Delay Value | (0.1-3600.0)s | 5.0 | |

| No. | Items | | Range | Default | Description |
|---|---|---|---|---|---|
| 14 | | Alarm Type | (0-6) | 1 | |
| 15 | | Active Range | (0-20) | 0: Always Active | |
| 16 | | Action | (0-1) | 0: Disable | |
| 17 | | Auto ACK | (0-1) | 0: Disable | |
| 18 | | Alarm Self-lock | (0-1) | 0: Disable | |
| 19 | Upper Limit 2 | Threshold | (0.0-1000.0)°C | 90.0 | |
| 20 | | Return Value | (0.0-1000.0)°C | 80.0 | |
| 21 | | Delay Value | (0.1-3600.0)s | 5.0 | |
| 22 | | Alarm Type | (0-6) | 1 | |
| 23 | | Active Range | (0-20) | 0: Always Active | |
| 24 | | Action | (0-1) | 0: Disable | |
| 25 | | Auto ACK | (0-1) | 0: Disable | |
| 26 | | Alarm Self-lock | (0-1) | 0: Disable | |
| 27 | Lower Limit 1 | Threshold | (0.0-1000.0)°C | 10.0 | |
| 28 | | Return Value | (0.0-1000.0)°C | 20.0 | |
| 29 | | Delay Value | (0.1-3600.0)s | 5.0 | |
| 30 | | Alarm Type | (0-6) | 1 | |
| 31 | | Active Range | (0-20) | 0: Always Active | |
| 32 | | Action | (0-1) | 0: Disable | |
| 33 | | Auto ACK | (0-1) | 0: Disable | |
| 34 | | Alarm Self-lock | (0-1) | 0: Disable | |
| 35 | Lower Limit 2 | Threshold | (0.0-1000.0)°C | 20.0 | |
| 36 | | Return Value | (0.0-1000.0)°C | 30.0 | |
| 37 | | Delay Value | (0.1-3600.0)s | 5.0 | |
| 38 | | Alarm Type | (0-6) | 1 | |
| 39 | | Active Range | (0-20) | 0: Always Active | |
| 40 | 1st Point X (Resistance) | | (0-6000) | 0 | |
| 41 | 2nd Point X (Resistance) | | (0-6000) | 21 | |
| 42 | 3rd Point X (Resistance) | | (0-6000) | 28 | |
| 43 | 4th Point X (Resistance) | | (0-6000) | 39 | |
| 44 | 5th Point X (Resistance) | | (0-6000) | 56 | User-defined curve. |
| 45 | 6th Point X (Resistance) | | (0-6000) | 116 | |
| 46 | 7th Point X (Resistance) | | (0-6000) | 258 | |
| 47 | 8th Point X (Resistance) | | (0-6000) | 300 | |
| 48 | 1st Point Y (Value) | | (0-10000) | 140 | |

**SmartGen**
MAKING CONTROL SMARTER

| No. | Items | | Range | Default | Description |
|---|---|---|---|---|---|
| 49 | 2nd Point Y (Value) | | (0-10000) | 110 | |
| 50 | 3rd Point Y (Value) | | (0-10000) | 100 | |
| 51 | 4th Point Y (Value) | | (0-10000) | 90 | |
| 52 | 5th Point Y (Value) | | (0-10000) | 80 | |
| 53 | 6th Point Y (Value) | | (0-10000) | 60 | |
| 54 | 7th Point Y (Value) | | (0-10000) | 40 | |
| 55 | 8th Point Y (Value) | | (0-10000) | 20 | |
| Analog Input Port 2 | | | | | |
| 56 | Function | | (0-4) | 0 | 0: Not Used<br>1: Fixed Active Power Input<br>2: Fixed Reactive Power Input<br>3: HC Feedback Input<br>4: Temperature Sensor |
| 57 | Type | | (0-2) | 0 | 0: Resistance Type<br>1: Current Type<br>2: Voltage Type |
| 58 | Input Min. Value | | (0.0-1000.0)Ω/mA/V | 0.0 | Unit is changed according to type. |
| 59 | Input Max Value | | (0.0-1000.0)Ω/mA/V | 600.0 | |
| 60 | HC Feedback Range | | (0-60000)kW | 100 | |
| 61 | Open Action | | (0-6) | 1 | |
| 62 | Curve Type | | (0-15) | 0 | |
| 63 | Upper Limit 1 | Action | (0-1) | 0: Disable | |
| 64 | | Auto ACK | (0-1) | 0: Disable | |
| 65 | | Alarm Self-lock | (0-1) | 0: Disable | |
| 66 | | Threshold | (0.0-1000.0)°C | 100.0 | |
| 67 | | Return Value | (0.0-1000.0)°C | 90.0 | |
| 68 | | Delay Value | (0.1-3600.0)s | 5.0 | |
| 69 | | Alarm Type | (0-6) | 1 | |
| 70 | | Active Range | (0-20) | 0: Always Active | |
| 71 | Upper Limit 2 | Action | (0-1) | 0: Disable | |
| 72 | | Auto ACK | (0-1) | 0: Disable | |
| 73 | | Alarm Self-lock | (0-1) | 0: Disable | |
| 74 | | Threshold | (0.0-1000.0)°C | 90.0 | |
| 75 | | Return Value | (0.0-1000.0)°C | 80.0 | |
| 76 | | Delay Value | (0.1-3600.0)s | 5.0 | |
| 77 | | Alarm Type | (0-6) | 1 | |
| 78 | | Active Range | (0-20) | 0: Always Active | |
| 79 | Lower | Action | (0-1) | 0: Disable | |

| No. | Items | | Range | Default | Description |
|---|---|---|---|---|---|
| 80 | Limit 1 | Auto ACK | (0-1) | 0: Disable | |
| 81 | | Alarm Self-lock | (0-1) | 0: Disable | |
| 82 | | Threshold | (0.0-1000.0)°C | 10.0 | |
| 83 | | Return Value | (0.0-1000.0)°C | 20.0 | |
| 84 | | Delay Value | (0.1-3600.0)s | 5.0 | |
| 85 | | Alarm Type | (0-6) | 1 | |
| 86 | | Active Range | (0-20) | 0: Always Active | |
| 87 | | Action | (0-1) | 0: Disable | |
| 88 | | Auto ACK | (0-1) | 0: Disable | |
| 89 | | Alarm Self-lock | (0-1) | 0: Disable | |
| 90 | Lower Limit 2 | Threshold | (0.0-1000.0)°C | 20.0 | |
| 91 | | Return Value | (0.0-1000.0)°C | 30.0 | |
| 92 | | Delay Value | (0.1-3600.0)s | 5.0 | |
| 93 | | Alarm Type | (0-6) | 1 | |
| 94 | | Active Range | (0-20) | 0: Always Active | |
| 95 | 1st Point X (Resistance) | | (0-6000) | 0 | |
| 96 | 2nd Point X (Resistance) | | (0-6000) | 21 | |
| 97 | 3rd Point X (Resistance) | | (0-6000) | 28 | |
| 98 | 4th Point X (Resistance) | | (0-6000) | 39 | |
| 99 | 5th Point X (Resistance) | | (0-6000) | 56 | |
| 100 | 6th Point X (Resistance) | | (0-6000) | 116 | |
| 101 | 7th Point X (Resistance) | | (0-6000) | 258 | |
| 102 | 8th Point X (Resistance) | | (0-6000) | 300 | User-defined curve. |
| 103 | 1st Point Y (Value) | | (0-10000) | 140 | |
| 104 | 2nd Point Y (Value) | | (0-10000) | 110 | |
| 105 | 3rd Point Y (Value) | | (0-10000) | 100 | |
| 106 | 4th Point Y (Value) | | (0-10000) | 90 | |
| 107 | 5th Point Y (Value) | | (0-10000) | 80 | |
| 108 | 6th Point Y (Value) | | (0-10000) | 60 | |
| 109 | 7th Point Y (Value) | | (0-10000) | 40 | |
| 110 | 8th Point Y (Value) | | (0-10000) | 20 | |

## 12.8 DIGITAL INPUT PORTS SETTING

HPM6 input ports are low level active, response time is over 300ms.

**Table 33 – Input Ports Settings**

| No. | Items | Range | Default | Description |
|---|---|---|---|---|
| Input Ports | | | | |
| Digital Input Port 1 | | | | |
| 111 | Contents Setting | (0-150) | 02 | Close input. |
| 112 | Active Type | (0-1) | 0 | 0: Close Activate 1: Open Activate |
| Digital Input Port 2 | | | | |
| 113 | Contents Setting | (0-150) | 25 | Manual mode input. |
| 114 | Active Type | (0-1) | 0 | 0: Close Activate 1: Open Activate |
| Digital Input Port 3 | | | | |
| 115 | Contents Setting | (0-150) | 28 | Semi-auto mode input. |
| 116 | Active Type | (0-1) | 0 | 0: Close Activate 1: Open Activate |
| Digital Input Port 4 | | | | |
| 117 | Contents Setting | (0-150) | 29 | Auto mode input. |
| 118 | Active Type | (0-1) | 0 | 0: Close Activate 1: Open Activate |
| Digital Input Port 5 | | | | |
| 119 | Contents Setting | (0-150) | 08 | HC Inquiry 1. |
| 120 | Active Type | (0-1) | 0 | 0: Close Activate 1: Open Activate |
| Digital Input Port 6 | | | | |
| 121 | Contents Setting | (0-150) | 09 | HC feedback 1. |
| 122 | Active Type | (0-1) | 0 | 0: Close Activate 1: Open Activate |
| Digital Input Port 7 | | | | |
| 123 | Contents Setting | (0-150) | 0 | Not used. |
| 124 | Active Type | (0-1) | 0 | 0: Close Activate 1: Open Activate |
| Digital Input Port 8 | | | | |
| 125 | Contents Setting | (0-150) | 0 | Not used. |
| 126 | Active Type | (0-1) | 0 | 0: Close Activate 1: Open Activate |
| Digital Input Port 9 | | | | |
| 127 | Contents Setting | (0-150) | 0 | Not used. |
| 128 | Active Type | (0-1) | 0 | 0: Close Activate 1: Open Activate |
| Digital Input Port 10 | | | | |
| 129 | Contents Setting | (0-150) | 0 | Not used. |
| 130 | Active Type | (0-1) | 0 | 0: Close Activate 1: Open Activate |
| Digital Input Port 11 | | | | |
| 131 | Contents Setting | (0-150) | 0 | Not used. |
| 132 | Active Type | (0-1) | 0 | 0: Close Activate 1: Open Activate |
| Digital Input Port 12 | | | | |
| 133 | Contents Setting | (0-150) | 0 | Not used. |
| 134 | Active Type | (0-1) | 0 | 0: Close Activate 1: Open Activate |

| No. | Items | Range | Default | Description |
|---|---|---|---|---|
| Digital Input Port 13 | | | | |
| 1 | Contents Setting | (0-150) | 0 | Not used. |
| 2 | Active Type | (0-1) | 0 | 0: Close Activate 1: Open Activate |
| Digital Input Port 14 | | | | |
| 1 | Contents Setting | (0-150) | 0 | Not used. |
| 2 | Active Type | (0-1) | 0 | 0: Close Activate 1: Open Activate |
| Digital Input Port 15 | | | | |
| 1 | Contents Setting | (0-150) | 0 | Not used. |
| 2 | Active Type | (0-1) | 0 | 0: Close Activate 1: Open Activate |
| Digital Input Port 16 | | | | |
| 1 | Contents Setting | (0-150) | 0 | Not used. |
| 2 | Active Type | (0-1) | 0 | 0: Close Activate 1: Open Activate |
| Digital Input Port 17 | | | | |
| 1 | Contents Setting | (0-150) | 0 | Not used. |
| 2 | Active Type | (0-1) | 0 | 0: Close Activate 1: Open Activate |
| Digital Input Port 18 | | | | |
| 1 | Contents Setting | (0-150) | 0 | Not used. |
| 2 | Active Type | (0-1) | 0 | 0: Close Activate 1: Open Activate |
| Digital Input Port 19 | | | | |
| 1 | Contents Setting | (0-150) | 0 | Not used. |
| 2 | Active Type | (0-1) | 0 | 0: Close Activate 1: Open Activate |
| Digital Input Port 20 | | | | |
| 1 | Contents Setting | (0-150) | 0 | Not used. |
| 2 | Active Type | (0-1) | 0 | 0: Close Activate 1: Open Activate |

**Table 34 – Input Ports Function**

| No. | Name | Description | Auto Mode | Semi-auto Mode | Manual Mode |
|---|---|---|---|---|---|
| 0. | Not Used | Invalid | X | X | X |
| 1. | User Defined | User-defined actions when input port is active:<br>0: Block<br>1: Warning<br>2: Trip<br>3: Trip and Stop<br>4: Safety Trip<br>5: Safety Trip and Stop<br>6: Indication<br>User-defined active conditions of input port:<br>0: Always Active<br>1: Inactive | √ | √ | √ |

| No. | Name | Description | Auto Mode | Semi-auto Mode | Manual Mode |
|---|---|---|---|---|---|
| | | 2: Before Gen Close<br>3: After Gen Close<br>4: Gen Close on Bus<br>5: No Gen Close on Bus<br>6: Gen Normal<br>7: Other Gens Close<br>8: Start Delay<br>9: After Gen Close Delay<br>10: Before Gen Close Delay<br>11: Gen Load Normal<br>12: Gen Close Delay on Bus<br>13: No Gen Close Delay on Bus<br>14: Gen Normal Delay<br>15: Other Gens Close Delay<br>16: Gen Load Normal Delay<br>17: Reserved<br>18: Reserved<br>19: Reserved<br>20: Reserved<br>Input ports names can be downloaded into controller after defined using PC software. | | | |
| 2. | Close Input | Switch close feedback signal input, used for indicating switch close/open status.<br>If this signal no corresponding response in c/o, controller will initiate feedback fault alarm.<br>There must be one and only one input port to select this function, otherwise controller will initiate feedback fault alarm. | √ | √ | √ |
| 3. | Open Input | Switch open feedback signal input, opposite the close feedback signal.<br>After it is configured for input port, switch status must be indicated with close input and open input. If two signals are not matched or signal is not correct in c/o, controller will initiate feedback fault alarm. | √ | √ | √ |
| 4. | Speed Raise | Speed raise relay is active when the input is active. | X | X | √ |
| 5. | Speed Drop | Speed drop relay is active when the input is active. | X | X | √ |
| 6. | Volt Raise | Voltage raise relay is active when the input is active. | X | X | √ |

| No. | Name | Description | Auto Mode | Semi-auto Mode | Manual Mode |
|---|---|---|---|---|---|
| 7. | Volt Drop | Voltage drop relay is active when the input is active. | X | X | √ |
| 8. | HC 1 Inquiry | Heavy consumer 1 inquiry. Acknowledge signal is initiated if the requirements are satisfied. If not satisfied, standby gensets will be started to meet with the requirement. | √ | √ | X |
| 9. | HC 1 Feedback | After breaker closing, feedback signal is sent to controller to ensure the HC1 has loaded. | √ | √ | X |
| 10. | HC 2 Inquiry | Heavy consumer 2 inquiry. Acknowledge signal is initiated if the requirements are satisfied. If not satisfied, standby gensets will be started to meet with the requirement. | √ | √ | X |
| 11. | HC 2 Feedback | After breaker closing, feedback signal is sent to controller to ensure the HC2 has loaded. | √ | √ | X |
| 12. | HC 3 Inquiry | Heavy consumer 3 inquiry. Acknowledge signal is initiated if the requirements are satisfied. If not satisfied, standby gensets will be started to meet with the requirement. | √ | √ | X |
| 13. | HC 3 Feedback | After breaker closing, feedback signal is sent to controller to ensure the HC3 has loaded. | √ | √ | X |
| 14. | HC 4 Inquiry | Heavy consumer 4 inquiry. Acknowledge signal is initiated if the requirements are satisfied. If not satisfied, standby gensets will be started to meet with the requirement. | √ | √ | X |
| 15. | HC 4 Feedback | After breaker closing, feedback signal is sent to controller to ensure the HC4 has loaded. | √ | √ | X |
| 16. | Engine Fault | Engine fault feedback input. | √ | √ | X |
| 17. | Alarm Inhibit | All alarms are inhibited after input is active. | √ | √ | √ |
| 18. | Alarm Mute | Mute the panel buzzer and audible alarm not output. | √ | √ | √ |
| 19. | Alarm Reset | Reset alarms. | √ | √ | √ |
| 20. | Alarm ACK | Acknowledge all alarms. | √ | √ | √ |
| 21. | Alarm Unlock | Unlock all self-locked alarms. | √ | √ | √ |
| 22. | Lamp Test | Test all the LED lights. | √ | √ | √ |

| No. | Name | Description | Auto Mode | Semi-auto Mode | Manual Mode |
|---|---|---|---|---|---|
| 23. | Light Consumer | The controller doesn't open breaker even if the system load has fallen below the set value. | √ | √ | X |
| 24. | Fixed Power IN | Fixed power output, when the "Fixed Power Input" is active, the active power and the reactive power can be adjusted via fixed power setting parameter, or when the external adjust input is active, the active power and the reactive power can be adjusted via external SPEED IN port and VOLT IN port. | √ | √ | X |
| 25. | Manual Mode | Manual mode is carried out when the input is active. | √ | X | X |
| 26. | Linear Start | Linear start mode is carried out when the input is active. | √ | X | X |
| 27. | Duty Time Start | Duty time start mode is carried out when the input is active. | √ | X | X |
| 28. | Auto Mode | Auto mode is carried out when the input is active. | √ | √ | √ |
| 29. | Semi-auto Mode | Semi-auto mode is carried out when the input is active. | √ | √ | √ |
| 30. | Remote Closing | Synchronous closing process will be carried out when the input is active. | X | √ | X |
| 31. | Remote Opening | Opening process will be carried out when the input is active. | X | √ | X |
| 32. | Remote Start | The genset will start automatically when the input is active. | X | √ | X |
| 33. | Remote Stop | The genset will stop after unload open when the input is active. | X | √ | X |
| 34. | Safe Mode | An additional genset will be started even if the power request is satisfied when the input is active. | √ | X | X |
| 35. | Standby Engine | Connect the output signal when the preparation work is done. If the function is selected, the engine will be started when the input is active. | √ | √ | X |
| 36. | Remote Mode | If it is configured, system is in remote control status when the input is active, remote control (start, close, open, stop) function is active. When the input is inactive, remote control (start, close, open, stop) function is inactive. | X | √ | X |

| No. | Name | Description | Auto Mode | Semi-auto Mode | Manual Mode |
|---|---|---|---|---|---|
| 37. | External Active Adjust | Simulate adjust frequency/active power input is active when the input port is active. Controller automatically adjust frequency/active power according to configuration when the input port is inactive. | X | √ | √ |
| 38. | Start Inhibit | Semi-auto start and auto start are inhibited. | √ | √ | X |
| 39. | External Overcurrent Short Circuit | External over current short circuit trip signal. | √ | √ | X |
| 40. | Override Input | Genset is inhibited to trip or shutdown except for over frequency and over current. | √ | √ | X |
| 41. | Emergency Trip and Stop | Trip and stop immediately. | √ | √ | X |
| 42. | Top Priority | Configure the priority of controller as the highest level. | √ | √ | X |
| 43. | 2nd Start Input | If it fails to start, after this input is active, it will issue start signal again. | √ | √ | X |
| 44. | Manual Mode | When input is active, all gensets on the bus become manual mode. | √ | √ | √ |
| 45. | Semi-auto Mode | When input is active, all gensets on the bus become semi-auto mode. | √ | √ | √ |
| 46. | Auto Mode | When input is active, all gensets on the bus becomes auto mode. | √ | √ | √ |
| 47. | Light Consumer | When input is active, all gensets on the bus are active for light consumer. | √ | X | X |
| 48. | Safe Mode Input | When input is active, all gensets on the bus become safe mode. | √ | X | X |
| 49. | Semi-auto/Auto Transfer Input | When input is active, auto mode is active; When input is inactive, semi-auto mode is active. | √ | √ | √ |
| 50. | Genset On-load Input Inhibit | When input is active, genset close is inhibited. | √ | √ | X |
| 51. | Non-auto Mode HC Permission | When input is active, in manual mode/semi-auto mode, if genset capacity meets heavy consumer request power, it will also output heavy consumer response, heavy consumer permission signal. | √ | √ | √ |
| 52. | Limited On-grid No. | When input is active, limit genset on grid number based on configuration (max. on-grid number). | √ | √ | X |

| No. | Name | Description | Auto Mode | Semi-auto Mode | Manual Mode |
|---|---|---|---|---|---|
| 53. | Engine Running Feedback | Engine running feedback active signal. | √ | √ | X |
| 54. | Shore Power Supply Input | This input is active when shore power is closed. | √ | √ | √ |
| 55. | Bustie Switch 1 Break Input | When input port is active, divide a phase of bus based on current bus genset configuration; only the unit scheduled on this bus is active. | √ | √ | X |
| 56. | Capacity Insufficient Reduce Load Input | When heavy consumer is requesting, if all normal gensets are on grid and still cannot meet requested power, and this input is active, it will make NEL trip. | √ | √ | √ |
| 57. | Abnormal Trip of Main Switch | When the input port is active, the controller issues trip alarms. | √ | √ | √ |
| 58. | Numbers of Running Units Reserved | When the input port is active, the units with load running on grid >= numbers of running units reserved. | √ | √ | √ |
| 59. | Forced Manual Mode | Controller is forced to enter manual mode when the input port is active. Its priority is higher than system mode. | √ | √ | √ |
| 60. | Inhibit Blackout | Block is inhibited when the input port is active. | √ | √ | X |
| 61. | Forced Auto Mode | Controller is forced to enter auto mode when the input port is active. Its priority is higher than system mode. | √ | √ | X |
| 62. | Reserved | Reserved | | | |
| 63. | SG Enabled | If module is not set as SG mode, the controller will work in SG mode when input port is active. | √ | √ | X |
| 64. | SG/DG Transferring | When input port is active, DG starts to take load, otherwise, SG starts to take load. | √ | √ | X |
| 65. | SG Solenoid Valve Closing Feedback | When the controller works in SG mode and input port is active, SG is allowed to start. Otherwise, SG is not allowed to start. | √ | √ | X |
| 66. | Drop Power Input | When input port is active, the controller will limit the max. output power of the genset according to the set drop value. | √ | √ | X |
| 67. | SG On-load Input | When input port is active, SG starts to take load and select load distribution according to load mode. | √ | √ | X |
| 68. | DG On-load Input | When input port is active, DG starts to take load and select load distribution according | √ | √ | X |

| No. | Name | Description | Auto Mode | Semi-auto Mode | Manual Mode |
|---|---|---|---|---|---|
| | | to load mode. | | | |
| 69. | DG Inactive Input | When input port is active, all DG are disconnected and the load is transferred to the other power supply units. | √ | √ | X |
| 70. | Bus Outage Closing Input | When input port is active, DG controller detects that the bus is outage then allows DG switch to close. | √ | √ | X |
| 71. | Bustie Switch 0 Close Feedback | Bustie switch 0 is ring bustie switch, i.e. if there are N buses, it is the contact switch between bus 1 and bus N. Power management system considers that ring bus switch is closed when the input port is active. | √ | √ | X |
| 72. | Bustie Switch 1 Close Feedback | Bustie switch close feedback input between bus 1 and bus 2. | √ | √ | X |
| 73. | Bustie Switch 2 Close Feedback | Bustie switch close feedback input between bus 2 and bus 3. | √ | √ | X |
| 74. | Bustie Switch 3 Close Feedback | Bustie switch close feedback input between bus 3 and bus 4. | √ | √ | X |
| 75. | Bustie Switch 4 Close Feedback | Bustie switch close feedback input between bus 4 and bus 5. | √ | √ | X |
| 76. | Bustie Switch 5 Close Feedback | Bustie switch close feedback input between bus 5 and bus 6. | √ | √ | X |
| 77. | Bustie Switch 0 Open Feedback | Bustie switch 0 is ring bustie switch, ring bus switch open feedback input. | √ | √ | X |
| 78. | Bustie Switch 1 Open Feedback | Bustie switch open feedback input between bus 1 and bus 2. | √ | √ | X |
| 79. | Bustie Switch 2 Open Feedback | Bustie switch open feedback input between bus 2 and bus 3. | | | |
| 80. | Bustie Switch 3 Open Feedback | Bustie switch open feedback input between bus 3 and bus 4. | √ | √ | X |
| 81. | Bustie Switch 4 Open Feedback | Bustie switch open feedback input between bus 4 and bus 5. | √ | √ | X |
| 82. | Bustie Switch 5 Open Feedback | Bustie switch open feedback input between bus 5 and bus 6. | √ | √ | X |
| 83. | BTB0 Series Switch Close | It is close feedback input of series switch of ring bustie switch. Series switch means | √ | √ | X |

| No. | Name | Description | Auto Mode | Semi-auto Mode | Manual Mode |
|---|---|---|---|---|---|
| | Feedback | that if there are N buses, other series switches besides bus contact switch between bus 1 and bus N. | | | |
| 84. | BTB1 Series Switch Close Feedback | Bustie series switch close feedback input between bus 1 and bus 2. | √ | √ | X |
| 85. | BTB2 Series Switch Close Feedback | Bustie series switch close feedback input between bus 2 and bus 3. | √ | √ | X |
| 86. | BTB3 Series Switch Close Feedback | Bustie series switch close feedback input between bus 3 and bus 4. | √ | √ | X |
| 87. | BTB4 Series Switch Close Feedback | Bustie series switch close feedback input between bus 4 and bus 5. | √ | √ | X |
| 88. | BTB5 Series Switch Close Feedback | Bustie series switch close feedback input between bus 1 and bus 6. | √ | √ | X |
| 89. | Reserved Power 1 Input | Power management system reserves response set power for bus when the input port is active. | √ | X | X |
| 90. | Reserved Power 2 Input | | √ | X | X |
| 91. | Reserved Power 3 Input | | √ | X | X |
| 92. | GB Storage Feedback | It means genset mains switch energy storage is finished, power management system can initiate close operation when the input port is active. | √ | √ | X |
| 93. | Single Pulse Speed Raise Input | In manual mode, when the input port is closed once, the minimum pulse value is output from speed control output port. | X | X | √ |
| 94. | Single Pulse Speed Drop Input | | X | X | √ |
| 95. | Single Pulse Voltage Raise Input | In manual mode, when the input port is closed once, the minimum pulse value is output from voltage control output port. | X | X | √ |
| 96. | Single Pulse Voltage Drop Input | | X | X | √ |
| 97. | Shore Switch 0 Close | Shore switch close feedback input. | √ | √ | X |

| No. | Name | Description | Auto Mode | Semi-auto Mode | Manual Mode |
|---|---|---|---|---|---|
| | Feedback Input | | | | |
| 98. | Shore Switch 1 Close Feedback Input | | √ | √ | X |
| 99. | Shore Switch 2 Close Feedback Input | | √ | √ | X |
| 100. | Shore Switch 3 Close Feedback Input | | √ | √ | X |
| 101. | External Reactive Adjust | Simulate adjust voltage/reactive power input is active when the input port is active. Controller automatically adjust voltage/reactive power according to configuration when the input port is inactive. | √ | √ | X |
| 102~150 | Reserved | Reserved | | | |

## 12.9 DIGITAL OUTPUT PORTS SETTING

**Table 35 – Output Ports Setting**

| No. | Items | Range | Default | Description |
|---|---|---|---|---|
| Digital Output Ports | | | | |
| Digital Output Port 1 | | | | |
| 1 | Contents Setting | Alarm/Function (0-255) | Function 007 | Crank output. |
| 2 | Active Type | (0-1) | 0 | 0: Normally Open 1: Normally Close |
| Digital Output Port 2 | | | | |
| 3 | Contents Setting | Alarm/Function (0-255) | Function 008 | Stop output. |
| 4 | Active Type | (0-1) | 0 | 0: Normally Open 1: Normally Close |
| Digital Output Port 3 | | | | |
| 5 | Contents Setting | Alarm/Function (0-255) | Function 001 | Speed raise output. |
| 6 | Active Type | (0-1) | 0 | 0: Normally Open 1: Normally Close |
| Digital Output Port 4 | | | | |
| 7 | Contents Setting | Alarm/Function (0-255) | Function 002 | Speed drop output. |
| 8 | Active Type | (0-1) | 0 | 0: Normally Open 1: Normally Close |
| Digital Output Port 5 | | | | |
| 9 | Contents Setting | Alarm/Function (0-255) | Function 062 | HC1 ACK output. |

| No. | Items | Range | Default | Description |
|---|---|---|---|---|
| 10 | Active Type | (0-1) | 0 | 0: Normally Open 1: Normally Close |
| Digital Output Port 6 | | | | |
| 11 | Contents Setting | Alarm/Function (0-255) | Function 005 | Close output. |
| 12 | Active Type | (0-1) | 0 | 0: Normally Open 1: Normally Close |
| Digital Output Port 7 | | | | |
| 13 | Contents Setting | Alarm/Function (0-255) | Fixed 006 | Open output. |
| 14 | Active Type | (0-1) | 0 | 0: Normally Open 1: Normally Close |
| Digital Output Port 8 | | | | |
| 15 | Contents Setting | Alarm/Function (0-255) | Function 000 | Not used. |
| 16 | Active Type | (0-1) | 0 | 0: Normally Open 1: Normally Close |
| Digital Output Port 9 | | | | |
| 17 | Contents Setting | Alarm/Function (0-255) | Function 000 | Not used. |
| 18 | Active Type | (0-1) | 0 | 0: Normally Open 1: Normally Close |
| Digital Output Port 10 | | | | |
| 19 | Contents Setting | Alarm/Function (0-255) | Function 000 | Not used. |
| 20 | Active Type | (0-1) | 0 | 0: Normally Open 1: Normally Close |
| Digital Output Port 11 | | | | |
| 21 | Contents Setting | Alarm/Function (0-255) | Function 000 | Not used. |
| 22 | Active Type | (0-1) | 0 | 0: Normally Open 1: Normally Close |
| Digital Output Port 12 | | | | |
| 23 | Contents Setting | Alarm/Function (0-255) | Function 000 | Not used. |
| 24 | Active Type | (0-1) | 0 | 0: Normally Open 1: Normally Close |
| Digital Output Port 13 | | | | |
| 25 | Contents Setting | Alarm/Function (0-255) | Function 000 | Not used. |
| 26 | Active Type | (0-1) | 0 | 0: Normally Open 1: Normally Close |
| Digital Output Port 14 | | | | |
| 27 | Contents Setting | Alarm/Function (0-255) | Function 000 | Not used. |
| 28 | Active Type | (0-1) | 0 | 0: Normally Open 1: Normally Close |
| Digital Output Port 15 | | | | |
| 29 | Contents Setting | Alarm/Function (0-255) | Function 000 | Not used. |
| 30 | Active Type | (0-1) | 0 | 0: Normally Open 1: Normally Close |
| Digital Output Port 16 | | | | |

| No. | Items | Range | Default | Description |
|-----|-------|-------|---------|-------------|
| 31 | Contents Setting | Alarm/Function (0-255) | Function 000 | Not used. |
| 32 | Active Type | (0-1) | 0 | 0: Normally Open 1: Normally Close |
| Digital Output Port 17 | | | | |
| 33 | Contents Setting | Alarm/Function (0-255) | Function 000 | Not used. |
| 34 | Active Type | (0-1) | 0 | 0: Normally Open 1: Normally Close |
| Digital Output Port 18 | | | | |
| 35 | Contents Setting | Alarm/Function (0-255) | Function 000 | Not used. |
| 36 | Active Type | (0-1) | 0 | 0: Normally Open 1: Normally Close |
| Digital Output Port 19 | | | | |
| 37 | Contents Setting | Alarm/Function (0-255) | Function 000 | Not used. |
| 38 | Active Type | (0-1) | 0 | 0: Normally Open 1: Normally Close |
| Digital Output Port 20 | | | | |
| 39 | Contents Setting | Alarm/Function (0-255) | Function 000 | Not used. |
| 40 | Active Type | (0-1) | 0 | 0: Normally Open 1: Normally Close |
| Defined Combination Output 1 | | | | |
| 1 | S1 Active Type | (0-1)0 | 0 | |
| 2 | S1 Set | Alarm/Function (0-255) | Alarm 000 | |
| 3 | S2 Active Type | (0-1)0 | 0 | |
| 4 | S2 Set | Alarm/Function (0-255) | Alarm 000 | |
| 5 | S3 Active Type | (0-1)0 | 0 | |
| 6 | S3 Set | Alarm/Function (0-255) | Alarm 000 | Active type: |
| 7 | S4 Active Type | (0-1)0 | 0 | 0 Close for inactive |
| 8 | S4 Set | Alarm/Function (0-255) | Alarm 000 | 1 Close for active |
| 9 | S5 Active Type | (0-1)0 | 0 | Digital output port set function list. |
| 10 | S5 Set | Alarm/Function (0-255) | Alarm 000 | |
| 11 | Delay Active Time | (0.0-60.0)s | 0 | |
| 12 | Delay Inactive Time | (0.0-60.0)s | 0 | |
| 13 | Active Time | (0.0-60.0)s | 0 | |
| Defined Combination Output 2-10 | | | | |
| 1 | S1 Active Type | (0-1)0 | 0 | Active type: |
| 2 | S1 Set | Alarm/Function (0-255) | Alarm 000 | 0 Close for inactive<br>1 Close for active |

| No. | Items | Range | Default | Description |
|---|---|---|---|---|
| 3 | S2 Active Type | (0-1)0 | 0 | Digital output port set function list. |
| 4 | S2 Set | Alarm/Function (0-255) | Alarm 000 | |
| 5 | S3 Active Type | (0-1)0 | 0 | |
| 6 | S3 Set | Alarm/Function (0-255) | Alarm 000 | |
| 7 | S4 Active Type | (0-1)0 | 0 | |
| 8 | S4 Set | Alarm/Function (0-255) | Alarm 000 | |
| 9 | S5 Active Type | (0-1)0 | 0 | |
| 10 | S5 Set | Alarm/Function (0-255) | Alarm 000 | |
| 11 | Delay Active Time | (0.0-60.0)s | 0 | |
| 12 | Delay Inactive Time | (0.0-60.0)s | 0 | |
| 13 | Active Time | (0.0-60.0)s | 0 | |
| Defined Period Output 1 | | | | |
| 1 | S1 Active Period | (0-0x7ff) | 0 | Active type: 0 Close for inactive 1 Close for active Digital output port set function list. |
| 2 | S1 Delay Active Time | (0.0-3600.0)s | 0 | |
| 3 | S1 Active Time | (0.0-3600.0)s | 0 | |
| 4 | S2 Active Type | (0-1)0 | 0 | |
| 5 | S2 Set | Alarm/Function (0-255) | Alarm 000 | |
| Defined Period Output 2-10 | | | | |
| 1 | S1 Active Period | (0-0x7ff) | 0 | Active type: 0 Close for inactive 1 Close for active Digital output port set function list. |
| 2 | S1 Delay Active Time | (0.0-3600.0)s | 0 | |
| 3 | S1 Active Time | (0.0-3600.0)s | 0 | |
| 4 | S2 Active Type | (0-1)0 | 0 | |
| 5 | S2 Set | Alarm/Function (0-255) | Alarm 000 | |

**Table 36 – Output Ports Function**

| No. | Name | Description | Remark |
|---|---|---|---|
| 0. | Not Used | This port is invalid. | |
| 1. | Speed Raise | Active when the generator is raising speed. | |
| 2. | Speed Drop | Active when the generator is dropping speed. | |
| 3. | Volt Raise | Active when the generator is raising voltage. | |
| 4. | Volt Drop | Active when the generator is dropping voltage. | |
| 5. | Close Gen | Active when the close generator requirements are reached. | |
| 6. | Open Gen | Active when the open generator requirements are reached. | |
| 7. | Crank Output | Active when unit starts. | |
| 8. | Stop Output | Active when stopping. | |
| 9. | Remote Control | System can control its status via communication. | |
| 10. | Generator OK | Active when the rated voltage and rated frequency are reached. | |
| 11. | Common Alarm | Active when genset alarm occurs. | |
| 12. | Common Indication Alarm | Active when genset indication alarm occurs. | |
| 13. | Common Warning Alarm | Active when genset warning alarm occurs. | |
| 14. | Common Block Alarm | Active when genset block alarm occurs. | |
| 15. | Common Safety Trip Alarm | Active when genset safety trip alarm occurs. | |
| 16. | Common Safety Trip and Stop Alarm | Active when genset safety trip and stop alarm occurs. | |
| 17. | Common Trip Alarm | Active when genset trips alarm occurs. | |
| 18. | Common Trip and Stop Alarm | Active when genset trip and stop alarm occurs. | |
| 19. | Input 1 Active | Active when input port 1 is active. | |
| 20. | Input 2 Active | Active when input port 2 is active. | |
| 21. | Input 3 Active | Active when input port 3 is active. | |
| 22. | Input 4 Active | Active when input port 4 is active. | |
| 23. | Input 5 Active | Active when input port 5 is active. | |
| 24. | Input 6 Active | Active when input port 6 is active. | |
| 25. | Input 7 Active | Active when input port 7 is active. | |
| 26. | Input 8 Active | Active when input port 8 is active. | |
| 27. | Input 9 Active | Active when input port 9 is active. | |
| 28. | Input 10 Active | Active when input port 10 is active. | |
| 29. | Input 11 Active | Active when input port 11 is active. | |
| 30. | Input 12 Active | Active when input port 12 is active. | |
| 31. | Input 13 Active | Active when input port 13 is active. | |
| 32. | Input 14 Active | Active when input port 14 is active. | |

| No. | Name | Description | Remark |
|---|---|---|---|
| 33. | Input 15 Active | Active when input port 15 is active. | |
| 34. | Input 16 Active | Active when input port 16 is active. | |
| 35. | Input 17 Active | Active when input port 17 is active. | |
| 36. | Input 18 Active | Active when input port 18 is active. | |
| 37. | Input 19 Active | Active when input port 19 is active. | |
| 38. | Input 20 Active | Active when input port 20 is active. | |
| 39. | Reserved | Reserved | |
| 40. | Reserved | Reserved | |
| 41. | Defined Period Output 1 | Set output according to defined period. | |
| 42. | Defined Period Output 2 | | |
| 43. | Defined Period Output 3 | | |
| 44. | Defined Period Output 4 | | |
| 45. | Defined Period Output 5 | | |
| 46. | Defined Period Output 6 | | |
| 47. | Defined Period Output 7 | | |
| 48. | Defined Period Output 8 | | |
| 49. | Defined Period Output 9 | | |
| 50. | Defined Period Output 10 | | |
| 51. | Defined Combination Output 1 | Set output according to defined combination. | |
| 52. | Defined Combination Output 2 | | |
| 53. | Defined Combination Output 3 | | |
| 54. | Defined Combination Output 4 | | |
| 55. | Defined Combination Output 5 | | |
| 56. | Defined Combination Output 6 | | |
| 57. | Defined Combination Output 7 | | |
| 58. | Defined Combination Output 8 | | |
| 59. | Defined Combination Output 9 | | |
| 60. | Defined Combination Output 10 | | |
| 61. | Gen Load Indication | Active when gen takes load. | |
| 62. | HC1 ACK | Active when bus left available power can meet heavy consumer 1 inquiry power. | |
| 63. | HC2 ACK | Active when bus left available power can meet | |

| No. | Name | Description | Remark |
|---|---|---|---|
| | | heavy consumer 2 inquiry power. | |
| 64. | HC3 ACK | Active when bus left available power can meet heavy consumer 3 inquiry power. | |
| 65. | HC4 ACK | Active when bus left available power can meet heavy consumer 4 inquiry power. | |
| 66. | Start Failure | Active when start failure alarm occurs. | |
| 67. | Manual Mode | Active in Manual mode. | |
| 68. | Semi-auto Mode | Active in Semi-auto mode. | |
| 69. | Auto Mode | Active in Auto mode. | |
| 70. | Light Consumer | Active when light consumer outputs. | |
| 71. | NEL 1 Trip | Active when non-essential load 1 trip occurs. | |
| 72. | NEL 2 Trip | Active when non-essential load 2 trip occurs. | |
| 73. | NEL 3 Trip | Active when non-essential load 3 trip occurs. | |
| 74. | Engine Fault | Active when engine fault signal outputs. | |
| 75. | Start Success | Active when the generator voltage and frequency have reached the requirement. | |
| 76. | Synchronizing | Active when genset is synchronizing. | |
| 77. | Reserved | | |
| 78. | Pre-close Output | Storage output of genset main switch. | |
| 79. | Reserved | | |
| 80. | Reserved | | |
| 81. | PLC Flag 1 | PLC logic flag outputs. | |
| 82. | PLC Flag 2 | | |
| 83. | PLC Flag 3 | | |
| 84. | PLC Flag 4 | | |
| 85. | PLC Flag 5 | | |
| 86. | PLC Flag 6 | | |
| 87. | PLC Flag 7 | | |
| 88. | PLC Flag 8 | | |
| 89. | PLC Flag 9 | | |
| 90. | PLC Flag 10 | | |
| 91. | PLC Flag 11 | | |
| 92. | PLC Flag 12 | | |
| 93. | PLC Flag 13 | | |
| 94. | PLC Flag 14 | | |
| 95. | PLC Flag 15 | | |
| 96. | PLC Flag 16 | | |
| 97. | PLC Flag 17 | | |
| 98. | PLC Flag 18 | | |
| 99. | PLC Flag 19 | | |
| 100. | PLC Flag 20 | | |
| 101. | Bu Voltage Abnormal | | |

| No. | Name | Description | Remark |
|---|---|---|---|
| 102. | Bus Frequency Abnormal | | |
| 103. | Bus Voltage/Frequency Abnormal | | |
| 104. | Lamp Alarm | When common alarm or common block occurs, it outputs cyclically every 1 second; it keeps outputting after acknowledge; if common trip and stop alarm occurs, it outputs cyclically every 0.5 second; it keeps outputting after acknowledge. | |
| 105. | Audible Alarm | Output at common alarms, close to output after acknowledge. | |
| 106. | Unload Failure | | |
| 107. | Unload Output | | |
| 108. | Gen Insufficient Capacity | When controller detects all normal gensets are on grid, and remaining power cannot request power, it outputs. | |
| 109. | HC1 Permission | When HC requests, and bus power is met, it outputs; when power is not met, it doesn't output. If HC feedback signal is active, it continues to output. | |
| 110. | HC2 Permission | | |
| 111. | HC3 Permission | | |
| 112. | HC4 Permission | | |
| 113. | Unbalanced Distribution of Active Power | Outputs when active power percentage and target active power percentage is greater than the set value. | |
| 114. | Unbalanced Distribution of Reactive Power | Outputs when reactive power percentage and target reactive power percentage is greater than the set value. | |
| 115. | Unbalanced Distribution of Load | Outputs when either unbalanced active distribution or reactive distribution is active. | |
| 116. | Self-check Normal Output | Output when self-check conditions are met according to setting. | |
| 117. | Reserved | | |
| 118. | Reserved | | |
| 119. | Reserved | | |
| 120. | Reserved | | |
| 121. | SG Solenoid Valve Closing | SG solenoid valve closes and outputs. | |
| 122. | SG Solenoid Valve Opening | SG solenoid valve opens and outputs. | |
| 123. | SG Insufficient Capacity | When the controller operates in SG mode and load receiving mode, if SG on-load is active, but SG capacity is insufficient to receive the full load, it outputs. | |
| 124. | DG Insufficient Capacity | When the controller operates in SG mode and | |

| No. | Name | Description | Remark |
|-----|------|-------------|--------|
| | | load receiving mode, if DG on-load is active, but DG capacity is insufficient to receive the full load, it outputs. | |
| 125. | SG & DG Parallel No. Exceeds Limit | When SG and DG are on-grid at the same time or to be synchronized, the DG switch number exceeds the set value, it outputs. | |
| 126. | Bus Freq. Change Abnormal | Output when the bus frequency change rate exceeds the set value and the delay value. | |
| 127. | Gen. Freq. Change Abnormal | Generating frequency change rate exceeds the set value and the delay value. | |
| 128. | Blackout | The controller outputs when it detects that the whole ship is black out. | |
| 129. | NEL 1 Pre-tripping | Output when controller detects power, current is greater than NEL trip set value and in delay. | |
| 130. | NEL 2 Pre-tripping | | |
| 131. | NEL 3 Pre-tripping | | |
| 132. | 1# DIN16 IN1 Active | Outputs when DIN16-1 module input is active. | |
| 133. | 1# DIN16 IN2 Active | | |
| 134. | 1# DIN16 IN3 Active | | |
| 135. | 1# DIN16 IN4 Active | | |
| 136. | 1# DIN16 IN5 Active | | |
| 137. | 1# DIN16 IN6 Active | | |
| 138. | 1# DIN16 IN7 Active | | |
| 139. | 1# DIN16 IN8 Active | | |
| 140. | 1# DIN16 IN9 Active | | |
| 141. | 1# DIN16 IN10 Active | | |
| 142. | 1# DIN16 IN11 Active | | |
| 143. | 1# DIN16 IN12 Active | | |
| 144. | 1# DIN16 IN13 Active | | |
| 145. | 1# DIN16 IN14 Active | | |
| 146. | 1# DIN16 IN15 Active | | |
| 147. | 1# DIN16 IN16 Active | | |
| 148. | 2# DIN16 IN1 Active | Outputs when DIN16-2 module input is active. | |
| 149. | 2# DIN16 IN2 Active | | |
| 150. | 2# DIN16 IN3 Active | | |
| 151. | 2# DIN16 IN4 Active | | |
| 152. | 2# DIN16 IN5 Active | | |
| 153. | 2# DIN16 IN6 Active | | |
| 154. | 2# DIN16 IN7 Active | | |
| 155. | 2# DIN16 IN8 Active | | |
| 156. | 2# DIN16 IN9 Active | | |
| 157. | 2# DIN16 IN10 Active | | |
| 158. | 2# DIN16 IN11 Active | | |

| No. | Name | Description | Remark |
|-----|------|-------------|--------|
| 159. | 2# DIN16 IN12 Active | | |
| 160. | 2# DIN16 IN13 Active | | |
| 161. | 2# DIN16 IN14 Active | | |
| 162. | 2# DIN16 IN15 Active | | |
| 163. | 2# DIN16 IN16 Active | | |
| 164-255 | Reserved | | |

**Table 37 – Output Ports Alarms**

| No. | Name | Description | Remark |
|-----|------|-------------|--------|
| 0 | Bus Over Voltage 1 | | |
| 1 | Bus Over Voltage 2 | | |
| 2 | Bus Over Voltage 3 | | |
| 3 | Bus Under Voltage 1 | | |
| 4 | Bus Under Voltage 2 | | |
| 5 | Bus Under Voltage 3 | | |
| 6 | Bus Over Frequency 1 | | |
| 7 | Bus Over Frequency 2 | | |
| 8 | Bus Over Frequency 3 | | |
| 9 | Bus Under Frequency 1 | | |
| 10 | Bus Under Frequency 2 | | |
| 11 | Bus Under Frequency 3 | | |
| 12 | Bus ROCOF | | |
| 13 | Bus Vector Shift | | |
| 14 | Bus Loss of Phase | | |
| 15 | Bus Reverse Phase Sequence | Refer to alarm protection function description. | |
| 16 | Gen Over Voltage 1 | | |
| 17 | Gen Over Voltage 2 | | |
| 18 | Gen Over Voltage 3 | | |
| 19 | Gen Under Voltage 1 | | |
| 20 | Gen Under Voltage 2 | | |
| 21 | Gen Under Voltage 3 | | |
| 22 | Gen Over Frequency 1 | | |
| 23 | Gen Over Frequency 2 | | |
| 24 | Gen Over Frequency 3 | | |
| 25 | Gen Under Frequency 1 | | |
| 26 | Gen Under Frequency 2 | | |
| 27 | Gen Under Frequency 3 | | |
| 28 | Gen Over Current 1 | | |
| 29 | Gen Over Current 2 | | |
| 30 | Gen Over Current 3 | | |
| 31 | Gen Over Current 4 | | |
| 32 | Gen Over Current 5 | | |

| No. | Name | Description | Remark |
|-----|------|-------------|--------|
| 33 | Gen Over Current 6 | | |
| 34 | Gen ROCOF 1 | | |
| 35 | Gen ROCOF 2 | | |
| 36 | Gen Reverse Power 1 | | |
| 37 | Gen Reverse Power 2 | | |
| 38 | Gen Over Power 1 | | |
| 39 | Gen Over Power 2 | | |
| 40 | Gen Voltage Imbalance 1 | | |
| 41 | Gen Voltage Imbalance 2 | | |
| 42 | Gen Current Imbalance 1 | | |
| 43 | Gen Current Imbalance 2 | | |
| 44 | Earth Fault 1 | | |
| 45 | Earth Fault 2 | | |
| 46 | Gen Loss of Excitation 1 | | |
| 47 | Gen Loss of Excitation 2 | | |
| 48 | Voltage THD 1 | | |
| 49 | Voltage THD 2 | | |
| 50 | Low Power Factor 1 | | |
| 51 | Low Power Factor 2 | | |
| 52 | NEL 1 Trip | | |
| 53 | NEL 2 Trip | | |
| 54 | NEL 3 Trip | | |
| 55 | Power Over Voltage 1 | | |
| 56 | Power Over Voltage 2 | | |
| 57 | Power Under Voltage 1 | | |
| 58 | Power Under Voltage 2 | | |
| 59 | Unbalanced Active Distribution 1 | | |
| 60 | Unbalanced Active Distribution 2 | | |
| 61 | Unbalanced Reactive Distribution 1 | | |
| 62 | Unbalanced Reactive Distribution 2 | | |
| 63 | Gen Insufficient Capacity | | |
| 64 | Gen Loss of Phase | | |
| 65 | Gen Reverse Phase Sequence | | |
| 66 | Crank Failure | | |
| 67 | No Running Feedback Fault | | |
| 68 | Stop Failure | | |
| 69 | Engine Fault | | |
| 70 | Frequency/Voltage Fault | | |
| 71 | Frequency Error | | |
| 72 | External Start | | |
| 73 | External Stop | | |
| 74 | External Overcurrent Short | | |

| No. | Name | Description | Remark |
|---|---|---|---|
| 75 | Emergency Stop | | |
| 76 | Reserved | | |
| 77 | Few Bus Module | | |
| 78 | ID Address Error | | |
| 79 | Bus Input Fault | | |
| 80 | Abnormal Trip of Main Switch | | |
| 81 | External Open of Main Switch | | |
| 82 | Close Failure | | |
| 83 | Open Failure | | |
| 84 | Close Feedback Failure | | |
| 85 | Open Feedback Failure | | |
| 86 | Sync. Failure | | |
| 87 | Unload Failure | | |
| 88 | Bustie Switch 0 Feedback Fault | | |
| 89 | Bustie Switch 1 Feedback Fault | | |
| 90 | Bustie Switch 2 Feedback Fault | | |
| 91 | Bustie Switch 3 Feedback Fault | | |
| 92 | Bustie Switch 4 Feedback Fault | | |
| 93 | Bustie Switch 5 Feedback Fault | | |
| 94 | Bustie Switch 6 Feedback Fault | | |
| 95 | Reserved | | |
| 96 | Input Port 1 | | |
| 97 | Input Port 2 | | |
| 98 | Input Port 3 | | |
| 99 | Input Port 4 | | |
| 100 | Input Port 5 | | |
| 101 | Input Port 6 | | |
| 102 | Input Port 7 | | |
| 103 | Input Port 8 | | |
| 104 | Input Port 9 | | |
| 105 | Input Port 10 | | |
| 106 | Input Port 11 | | |
| 107 | Input Port 12 | | |
| 108 | Input Port 13 | | |
| 109 | Input Port 14 | | |
| 110 | Input Port 15 | | |
| 111 | Input Port 16 | | |
| 112 | Input Port 17 | | |
| 113 | Input Port 18 | | |
| 114 | Input Port 19 | | |
| 115 | Input Port 20 | | |
| 116 | Reserved | | |

| No. | Name | Description | Remark |
|---|---|---|---|
| 117 | Reserved | | |
| 118 | AI1 Open | | |
| 119 | AI2 Open | | |
| 120 | AI1 Upper Limit 1 Alarm | | |
| 121 | AI1 Upper Limit 2 Alarm | | |
| 122 | AI1 Lower Limit 1 Alarm | | |
| 123 | AI1 Lower Limit 2 Alarm | | |
| 124 | AI2 Upper Limit 1 Alarm | | |
| 125 | AI2 Upper Limit 2 Alarm | | |
| 126 | AI2 Lower Limit 1 Alarm | | |
| 127 | AI2 Lower Limit 2 Alarm | | |
| 128 | 1#DIN16 IN1 | | |
| 129 | 1#DIN16 IN2 | | |
| 130 | 1#DIN16 IN3 | | |
| 131 | 1#DIN16 IN4 | | |
| 132 | 1#DIN16 IN5 | | |
| 133 | 1#DIN16 IN6 | | |
| 134 | 1#DIN16 IN7 | | |
| 135 | 1#DIN16 IN8 | | |
| 136 | 1#DIN16 IN9 | | |
| 137 | 1#DIN16 IN10 | | |
| 138 | 1#DIN16 IN11 | | |
| 139 | 1#DIN16 IN12 | | |
| 140 | 1#DIN16 IN13 | | |
| 141 | 1#DIN16 IN14 | | |
| 142 | 1#DIN16 IN15 | | |
| 143 | 1#DIN16 IN16 | | |
| 144 | 2#DIN16 IN1 | | |
| 145 | 2#DIN16 IN2 | | |
| 146 | 2#DIN16 IN3 | | |
| 147 | 2#DIN16 IN4 | | |
| 148 | 2#DIN16 IN5 | | |
| 149 | 2#DIN16 IN6 | | |
| 150 | 2#DIN16 IN7 | | |
| 151 | 2#DIN16 IN8 | | |
| 152 | 2#DIN16 IN9 | | |
| 153 | 2#DIN16 IN10 | | |
| 154 | 2#DIN16 IN11 | | |
| 155 | 2#DIN16 IN12 | | |
| 156 | 2#DIN16 IN13 | | |
| 157 | 2#DIN16 IN14 | | |
| 158 | 2#DIN16 IN15 | | |

| No. | Name | Description | Remark |
|---|---|---|---|
| 159 | 2#DIN16 IN16 | | |
| 160 | 1#DIN16 Comm. Failure | | |
| 161 | 2#DIN16 Comm. Failure | | |
| 162 | 1#DOUT16 Comm. Failure | | |
| 163 | 2#DOUT16 Comm. Failure | | |
| 164 | Reserved | | |
| 165 | Reserved | | |
| 166 | Local Controller Comm. Failure | | |
| 167 | 1#HMP300 Comm. Failure | | |
| 168 | 2#HMP300 Comm. Failure | | |
| 169 | Reserved | | |
| 170 | Reserved | | |
| 171 | Reserved | | |
| 172 | PLC Function 1 | | |
| 173 | PLC Function 2 | | |
| 174 | PLC Function 3 | | |
| 175 | PLC Function 4 | | |
| 176 | PLC Function 5 | | |
| 177 | PLC Function 6 | | |
| 178 | PLC Function 7 | | |
| 179 | PLC Function 8 | | |
| 180 | PLC Function 9 | | |
| 181 | PLC Function 10 | | |
| 182 | PLC Function 11 | | |
| 183 | PLC Function 12 | | |
| 184 | PLC Function 13 | | |
| 185 | PLC Function 14 | | |
| 186 | PLC Function 15 | | |
| 187 | PLC Function 16 | | |
| 188 | PLC Function 17 | | |
| 189 | PLC Function 18 | | |
| 190 | PLC Function 19 | | |
| 191 | PLC Function 20 | | |
| 192 | SG&DG Parallel　No. Exceeds | | |
| 193 | SG Insufficient Capacity | | |
| 194 | DG Insufficient Capacity | | |
| 195 | SG&DG Grid-connection Timeout | | |
| 196 | SG Solenoid Valve Fault | | |
| 197 | Reserved | | |
| 198 | Reserved | | |
| 199 | Reserved | | |
| 200 | Reserved | | |

| No. | Name | Description | Remark |
|---|---|---|---|
| 201 | Reserved | | |
| 202 | Reserved | | |
| 203 | Reserved | | |
| 204 | Reserved | | |
| 205 | Reserved | | |
| 206 | Reserved | | |
| 207 | Reserved | | |
| 208 | Voltage Asynchrony | | |
| 209 | Frequency Asynchrony | | |
| 210 | Phase Asynchrony | | |
| 211 | AI1 Fault | | |
| 212 | AI2 Fault | | |
| 213 | Bustie Series Switch 0 Feedback Fault | | |
| 214 | Bustie Series Switch 1 Feedback Fault | | |
| 215 | Bustie Series Switch 2 Feedback Fault | | |
| 216 | Bustie Series Switch 3 Feedback Fault | | |
| 217 | Bustie Series Switch 4 Feedback Fault | | |
| 218 | Bustie Series Switch 5 Feedback Fault | | |
| 219 | HC1 Feedback Failure | | |
| 220 | HC2 Feedback Failure | | |
| 221 | HC3 Feedback Failure | | |
| 222 | HC4 Feedback Failure | | |
| 223 | Shore Switch Feedback Failure | | |
| 224 | HC1 Request Failure | | |
| 225 | HC2 Request Failure | | |
| 226 | HC3 Request Failure | | |
| 227 | HC4 Request Failure | | |
| 228 | Switch Error | | |
| 229 | IP Address Error | | |
| 230 | Reserved | | |
| 231 | SLD Configuration Error | | |
| 232 | Shore Switch 0 Feedback Fault | | |
| 233 | Shore Switch 1 Feedback Fault | | |
| 234 | Shore Switch 2 Feedback Fault | | |
| 235 | Shore Switch 3 Feedback Fault | | |
| 236 | Ring Disconnect | | |

| No. | Name | Description | Remark |
|-----|------|-------------|--------|
| 237 | DG Inactive IN Fault | | |
| 238 | Bus Unavailable Close IN Fault | | |
| 239 | Reserved | | |
| 240 | Current THD 1 | | |
| 241 | Current THD 2 | | |
| 242 | Voltage SHD 1 | | |
| 243 | Voltage SHD 2 | | |
| 244 | Current SHD 1 | | |
| 245 | Current SHD 2 | | |
| 246 | Gen Vector Shift 1 | | |
| 247 | Gen Vector Shift 2 | | |
| 248 | Reserved | | |
| 249 | Reserved | | |
| 250 | Reserved | | |
| 251 | Reserved | | |
| 252 | Reserved | | |
| 253 | Reserved | | |
| 254 | Reserved | | |
| 255 | Reserved | | |

## 12.10 ANALOG OUTPUT PORTS SETTING

**Table 38 – Analog Output Ports Setting**

| No. | Item | | Range | Default | Description |
|-----|------|---|-------|---------|-------------|
| Analog Output Ports | | | | | |
| Analog Output Port 1 | | | | | |
| 1 | Function | | (0-4) | 1 | 0: Not used<br>1: GOV<br>2: AVR<br>3: Transmitter |
| 2 | Output Type | | (0-0) | 0 | 0: Current |
| 3 | Transmitter Config. | Config | (0-20) | 0 | Refer to Transmitter Configuration Functions. |
| 4 | | OUT Min. | (-20.0-20.0)mA | 4 | Transmitter configuration min value corresponds to output min value, max value corresponds to output max value. |
| 5 | | OUT Max. | (-20.0-20.0)mA | 20 | |
| 6 | | Config Min. | (-1000-32000) | 0 | |
| 7 | | Config Max. | (-1000-32000) | 500 | |
| Analog Output Port 2 | | | | | |
| 8 | Function | | (0-4) | 2 | 0: Not used |

| No. | Item | | Range | Default | Description |
|---|---|---|---|---|---|
| | | | | | 1: GOV |
| | | | | | 2: AVR |
| | | | | | 3: Transmitter |
| 9 | Output Type | | (0-0) | 0 | 0: Current |
| 10 | | Config | (0-20) | 0 | Refer to Transmitter Configuration Functions. |
| 11 | | OUT Min. | (-20.0-20.0)mA | 4 | |
| 12 | Transmitter Config. | OUT Max. | (-20.0-20.0)mA | 20 | Transmitter configuration min value corresponds to output min value, max value corresponds to output max value. |
| 13 | | Config Min. | (-1000-32000) | 0 | |
| 14 | | Config Max. | (-1000-32000) | 500 | |
| Analog Output Port 3 | | | | | |
| 15 | Function | | (0-4) | 0 | 0: Not used<br>1: GOV<br>2: AVR<br>3: Transmitter |
| 16 | Output Type | | (0-0) | 0 | 0: Current |
| 17 | | Config | (0-20) | 0 | Refer to Transmitter Configuration Functions. |
| 18 | | OUT Min. | (-20.0-20.0)mA | 4 | |
| 19 | Transmitter Config. | OUT Max. | (-20.0-20.0)mA | 20 | Transmitter configuration min value corresponds to output min value, max value corresponds to output max value. |
| 20 | | Config Min. | (-1000-32000) | 0 | |
| 21 | | Config Max. | (-1000-32000) | 500 | |
| Analog Output Port 4 | | | | | |
| 22 | Function | | (0-4) | 0 | 0: Not used<br>1: GOV<br>2: AVR<br>3: Transmitter |
| 23 | Output Type | | (0-0) | 0 | 0: Current |
| 24 | | Config | (0-20) | 0 | Refer to Transmitter Configuration Functions. |
| 25 | Transmitter Config. | OUT Min. | (-20.0-20.0)mA | 4 | Transmitter configuration min value corresponds to output min value, max value corresponds to output max value. |
| 26 | | OUT Max. | (-20.0-20.0)mA | 20 | |

| No. | Item | | Range | Default | Description |
|-----|------|---|-------|---------|-------------|
| 27 | | Config Min. | (-1000-32000) | 0 | |
| 28 | | Config Max. | (-1000-32000) | 500 | |

**Table 39 – Transmitter Configuration Functions**

| No. | Name | Description |
|-----|------|-------------|
| 0 | Not Used | Transmitter function is not used. |
| 1 | Bus Voltage | |
| 2 | Bus Frequency | |
| 3 | Bus Active Power | |
| 4 | Bus Reactive Power | |
| 5 | Bus Apparent Power | |
| 6 | Reserved | |
| 7 | Gen Voltage | |
| 8 | Gen Frequency | |
| 9 | Gen Active Power | |
| 10 | Gen Reactive Power | |
| 11 | Gen Apparent Power | |
| 12 | Gen Power Factor | |
| 13 | Gen A Phase Current | |
| 14 | Gen B Phase Current | |
| 15 | Gen C Phase Current | |
| 16 | Gen Max. Current | |
| 17 | Bus Left Power | |
| 18 | Gen Left Power | |
| 19 | Reserved | |
| 20 | PLC Variant X1 | |
| 21 | PLC Variant X2 | |
| 22 | PLC Variant X3 | |
| 23 | PLC Variant X4 | |
| 24 | PLC Variant X5 | |
| 25 | PLC Variant X6 | |
| 26 | Reserved | |
| 27 | Reserved | |
| 28 | Reserved | |
| 29 | Reserved | |
| 30 | Reserved | |

## 12.11 GB SETTING

**Table 40 – GB Settings**

| No. | Item | | Range | Default | Description |
|---|---|---|---|---|---|
| GB Setting | | | | | |
| 1 | Close Delay | | (0-20.0)s | 3.0 | Close pulse width, it is continuous output when set to 0. |
| 2 | Open Delay | | (0-20.0)s | 3.0 | Open pulse width, it is continuous output when set to 0. |
| 3 | Action Time | | (0-2000)ms | 100 | Time for switch receives close signal to contact closes. |
| 4 | Storage Time | | (0-3000)ms | 100 | Coil storage time before actions. |
| 5 | Semi-auto Intelligent Open | | (0-1) | 1 | 0: Disable; 1: Enable. When it is enabled, in semi-auto mode, it intelligently judges whether to open. |
| 6 | Failure Setting | Enable | (0-1) | 1: Enable | There is no corresponding signal for close/open feedback input port in switch close/open, and the alarm action for no corresponding signal inputs for other feedback signals (like current). |
| 7 | | Auto ACK | (0-1) | 0: Disable | |
| 8 | | Alarm Self-lock | (0-1) | 1: Enable | |
| 9 | | Action | (0-6) | 0: Block | |
| 10 | Feedback Fault Setting | Enable | (0-1) | 1: Enable | Action in close/open feedback and switch real status are inconsistent. |
| 11 | | Auto ACK | (0-1) | 0: Disable | |
| 12 | | Alarm Self-lock | (0-1) | 0: Disable | |
| 13 | | Action | (0-6) | 1: Warning | |
| 14 | Solenoid Valve Close Time | | (0-20.0)s | 5.0 | Close pulse width, it is continuous output when set to 0. |
| 15 | Solenoid Valve Open Time | | (0-20.0)s | 5.0 | Open pulse width, it is continuous output when set to 0. |

⚠**NOTE:** If close feedback input port can't be detected when close command is sent and after close delay, controller will initiate close failure alarm. If there are other close signals (like there is current) besides close input por, controller will initiate close feedback fault. If open feedback input port can't be detected when open command is sent and after open delay, controller will initiate open failure alarm. If there are other open signals (like no current) besides close input por, controller will initiate open feedback fault.

## 12.12 SYNCHRONIZATION SETTING

**Table 41 – Synchronization Settings**

| No. | Item | | Range | Default | Description |
|---|---|---|---|---|---|
| Synchronization Setting | | | | | |
| 1 | GOV Output | | (0-2) | 1 | 0: Internal relay; 1: Internal analog; 2: None. |
| 2 | GOV Reverse Output Enable | | (0-1) | 0 | 0: Disable; 1: Enable. |
| 3 | GOV Loading Action | | (0-2) | 1 | 0: None; 1: Adjust rated frequency; 2: Adjust center point. |
| 4 | AVR Output | | (0-2) | 1 | 0: Internal relay; 1: Internal analog; 2: None. |
| 5 | AVR Reverse Output Enable | | (0-1) | 0 | 0: Disable; 1: Enable. |
| 6 | AVR Loading Action | | (0-2) | 1 | 0: None; 1: Adjust rated voltage; 2: Adjust center point. |
| 7 | Load (P) Feedback Coefficient | | (0-100)% | 50 | The proportion of load frequency adjustment PID coefficient in whole load active adjustment coefficient. |
| 8 | Load (Q) Feedback Coefficient | | (0-100)% | 50 | The proportion of load voltage adjustment PID coefficient in whole load reactive adjustment coefficient. |
| 9 | Active Adjust. Limit | | (0-50.0)% | 30.0 | The max adjustment deviation of current power from the target power value. |
| 10 | Reactive Adjust. Limit | | (0-50.0)% | 30.0 | |
| 11 | Active Distribution Weight | | (0.0-200.0)% | 100.0 | The weight of power distribution. For example, when the active distribution weight is 50%, the current genset shares load according to 50% of rated power. |
| 12 | Reactive Distribution Weight | | (0.0-200.0)% | 100.0 | |
| 13 | Freq. Droop | Enable | (0-1) | 0 | When it is enabled, target frequency adjusts according to active load. |
| 14 | | No-load | (0.0-200.0)% | 101.0 | |
| 15 | | Full-load | (0.0-200.0)% | 100.0 | |
| 16 | Volt Droop | Enable | (0-1) | 0 | When it is enabled, target voltage adjusts according to reactive load. |
| 17 | | No-load | (0.0-200.0)% | 101.0 | |
| 18 | | Full-load | (0.0-200.0)% | 100.0 | |
| 19 | Dead Bus Voltage | | (1.0-20.0)% | 10.0 | Bus is unavailable when bus voltage is below the dead bus voltage. |
| 20 | Sync. Voltage Difference | | (1.0-10.0)% | 5.0 | Voltage synchronization is considered when voltage difference percentage of gen and bus is lower than sync voltage difference. |
| 21 | Sync. Positive Freq. Difference | | (0-2.00)Hz | 0.20 | Frequency synchronization is considered when frequency difference of gen and bus is lower than sync positive frequency difference and greater than sync. negative frequency |
| 22 | Sync. Negative Freq. Difference | | (0-2.00)Hz | 0.10 | |

| No. | Item | Range | Default | Description |
|---|---|---|---|---|
| | | | | difference. |
| 23 | Sync. Phase Difference | (0-20)° | 10 | Phase synchronization is considered when the initial phase difference of gen and bus is lower than sync phase difference. |
| 24 | Phase Compensation | (0-360.0)° | 0.0 | Phase difference compensation of gen and bus sampling. |
| 25 | Sync. Failure Time | (5.0-300.0)s | 60.0 | When synchronization signal is not detected within set sync. failure time, corresponding alarm will be initiated according to action type. |
| 26 | Sync. Failure Action | (0-6) | 1 | 0: Block; 1: Warning; 2: Trip; 3: Trip and Stop; 4: Safety Trip; 5: Safety Trip and Stop; 6: Indication. |
| 27 | Start Options | (0-2) | 0 | 0: Linear Start; 1: Duty Time Start. |
| 28 | Active Output Mode | (0-2) | 0 | 0 Share Power Output<br>1 Fixed Power Output<br>2 Analog Control Output |
| 29 | Reactive Output Mode | (0-2) | 0 | 0 Share Power Output<br>1 Fixed Power Output<br>2 Analog Control Output |
| 30 | Reserved Running Gensets | (1-16) | 1 | The minimum load running gensets on the bus. |
| 31 | Max On-grid Gensets | (0-16) | 16 | The maximum scheduling on-grid gensets on the current bus. |
| 32 | Priority Active | (0-1) | 0 | If it is disabled, power management function will not change bus genset start/stop status due to priority change. It will only be active when bus needs to schedule other gensets to start. |
| 33 | Top Priority | (0-1) | 1 | When it is enabled, press top priority key, the current genset will have the highest priority, other gensets will sort again;<br>When it is disabled, only the current genset has the highest priority, other genset priority has no change. |
| 34 | System Mode | (0-1) | 0 | If it is enabled, all bus gensets controllers mode will be changed by switching mode (key or input port). |
| 35 | Duty Start Run | (0.1-100.0)h | 5.0 | When it is duty time start, genset with smallest running time will start first, the next genset with less running time will start when start time reaches set duty time.<br>The running time here refers to the |

| No. | Item | Range | Default | Description |
|---|---|---|---|---|
| | | | | accumulated running time of user A. |
| 36 | Bus Blackout Starts | (0-16) | 0 | Started gensets in bus blackout. |
| 37 | Bus Blackout Start Running Time | (0-3600)s | 600 | Continuous running time of started gensets in bus blackout. |
| 38 | Short Close Times | (0-1) | 0 | Again close times when short trip is detected. |
| 39 | Bus Blackout Mode | (0-2) | 0 | 0 No Change<br>1 Semi-auto Mode<br>2 Auto Mode |
| 40 | Inhibit Blackout | (0-1) | 0 | 0: Disable; 1: Enable.<br>When it is enabled in auto mode, only one genset on the bus takes load, other general trip and stop alarm open except for overspeed, overfrequency, emergency trip and stop, overcurrent is inhibited. Fault genset can open after other normal gensets starting with load.<br>In manual mode, when only one genset on the bus takes load, general trip, stop alarm open and stop and manual open and stop are inhibited. |
| 41 | Continuous Supply | (0-1) | 0 | 0: Disable; 1: Enable.<br>When it is enabled in auto mode, loading genset on the bus has trip and stop alarm, the genset can disconnect after other standby gensets start and close.<br>If voltage/frequency trip or stop alarm occurs, the fault genset will open firdt after other normal gensets normally run and meet load conditions, then normal gensets will close. |
| 42 | Scheduling Start Mode | (0-3) | 0 | 0: Active Power Percentage; 1: Left Active Power; 2: Apparent Power Percentage; 3: Left Apparent Power. |
| 43 | Max. Start Load Percentage | (0-100)% | 80 | Bus load percentage for scheduling other gensets to start. |
| 44 | Min. Stop Load Percentage | (0-100)% | 60 | Bus load percentage for scheduling other gensets to stop. |
| 45 | Left Start Power | (0-20000)kW | 50 | Bus left power for scheduling other gensets to start. |
| 46 | Left Stop Power | (0-20000)kW | 80 | Bus left power for scheduling other gensets to stop. |

| No. | Item | Range | Default | Description |
|---|---|---|---|---|
| 47 | Fast Start/stop | (0-1) | 0 | |
| 48 | Max Load PCT of Fast Start | (0-100)% | 90 | Bus load percentage for scheduling other gensets to start. |
| 49 | Min Load PCT of Fast Stop | (0-100)% | 30 | Bus load percentage for scheduling other gensets to stop.。 |
| 50 | Left Fast Start Power | (0-20000)kW | 30 | Bus left power for scheduling other gensets to start. |
| 51 | Left Fast Stop Power | (0-20000)kW | 100 | Bus left power for scheduling other gensets to stop. |

## 12.13 SYNCHRONOUS CALIBRATION

**Table 42 – Synchronous Calibration List**

| No. | Item | | Range | Default | Description |
|---|---|---|---|---|---|
| Synchronous Calibration | | | | | |
| 1 | Multi-set Comm. No. | | (1-16) | 2 | Genset numbers on the network bus. |
| 2 | Comm. Alarm Action | | (0-6) | 1 | Communication alarm action when the module on the network bus is less than set multi-set communication numbers. |
| 3 | Module ID | | (0-15) | 1 | ID in the communication network. The ID should be unique throughout the whole communication network. |
| 4 | Priority | | (0-15) | 1 | The smaller of the number, the higher of the priority. |
| 5 | GOV SW1 | | (0-20.00) | 0 | Default central current is 0mA. |
| 6 | GOV SW2 | | (0-20.00) | 2.00 | Default current range is (-3.0~+3.0)mA. |
| 7 | AVR SW1 | | (0-20.00) | 0 | Default central current is 0mA. |
| 8 | AVR SW2 | | (0-20.00) | 2.00 | Default current range is (-3.0~+3.0)mA. |
| Frequency Sync | | | | | |
| 9 | Frequency Difference | | (0-1.00)Hz | 0.10 | Adjusting generator frequency to make it greater than the difference value of bus frequency, that is the sliding frequency difference of dynamic sync. |
| 10 | Analog Control | Gain | (0-2000)% | 20 | The internal analog is adjusted to control the engine speed before parallel connection. |
| 11 | | Stability | (0-2000)% | 20 | |
| 12 | | Change | (0-2000)% | 0 | |
| 13 | Relay Control | Period | (100-10000)ms | 2000 | The internal relay is adjusted to control the engine speed before |
| 14 | | Min Adjust | (10-1600)ms | 100 | |

| No. | Item | | Range | Default | Description |
|---|---|---|---|---|---|
| | | Pulse | | | parallel connection. |
| 15 | | Gain | (0-30000)% | 10 | |
| 16 | | Dead Band | (0-10.0)% | 1.0 | |
| Voltage Sync | | | | | |
| 17 | Analog Control | Gain | (0-2000)% | 20 | The internal analog is adjusted to control the generator voltage before parallel connection. |
| 18 | | Stability | (0-2000)% | 20 | |
| 19 | | Change | (0-2000)% | 0 | |
| 20 | Relay Control | Period | (100-10000)ms | 2000 | The internal relay is adjusted to control the generator voltage before parallel connection. |
| 21 | | Min Adjust Pulse | (10-1600)ms | 100 | |
| 22 | | Gain | (0-30000)% | 10 | |
| 23 | | Dead Band | (0-10.0)% | 1.0 | |
| Phase Sync | | | | | |
| 24 | Phase Stable Time | | (0-20.0)s | 2.0 | It will close after phase synchronization and delay set value in static synchronization. |
| 25 | Analog Control | Gain | (0-2000)% | 20 | The internal analog is adjusted to control the generator phase before parallel connection. |
| 26 | | Stability | (0-2000)% | 20 | |
| 27 | | Change | (0-2000)% | 0 | |
| 28 | Relay Control | Period | (100-10000)ms | 2000 | The internal relay is adjusted to control the generator phase before parallel connection. |
| 29 | | Min Adjust Pulse | (10-1600)ms | 100 | |
| 30 | | Gain | (0-30000)% | 10 | |
| 31 | | Dead Band | (0-10.0)% | 1.0 | |
| Active Power Control | | | | | |
| 32 | Voltage Control | Gain | (0-2000)% | 20 | The internal analog voltage is adjusted to control active power after parallel connection. |
| 33 | | Stability | (0-2000)% | 20 | |
| 34 | | Change | (0-2000)% | 0 | |
| 35 | Relay Control | Period | (100-10000)ms | 2000 | The internal relay is adjusted to control active power after parallel connection. |
| 36 | | Min, Adjust Pulse | (10-1600)ms | 100 | |
| 37 | | Gain | (0-30000)% | 10 | |
| 38 | | Dead Band | (0-10.0)% | 1.0 | |
| Reactive Power Control | | | | | |
| 39 | Voltage Control | Gain | (0-2000)% | 20 | The internal analog voltage is adjusted to control reactive power after parallel connection. |
| 40 | | Stability | (0-2000)% | 20 | |
| 41 | | Change | (0-2000)% | 0 | |
| 42 | Relay Control | Period | (100-10000)ms | 2000 | The internal relay is adjusted to control reactive power after parallel connection. |
| 43 | | Min. Adjust Pulse | (10-1600)ms | 100 | |
| 44 | | Gain | (0-30000)% | 10 | |
| 45 | | Dead Band | (0-10.0)% | 1.0 | |

| No. | Item | Range | Default | Description |
|---|---|---|---|---|
| 46 | Min. Load Percentage | (0-100.0)% | 10.0 | The active power percentage of the unit from soft unloaded to the opening. |
| 47 | Fixed Active Power% | (0-100.0)% | 30.0 | The percentage of active power output in fixed power mode. |
| 48 | Fixed Reactive Power Mode | (0-1) | 0 | 0: Power Percentage;  1: Power Factor |
| 49 | Fixed Reactive Power% | (0-100.0)% | 8.0 | The percentage of reactive power output in fixed power mode. |
| 50 | Fixed Power Factor | (0-100.0)% | 8.0 | The genset power factor in fixed power mode. |
| Fixed Active Power | | | | |
| 51 | Output Min. Value | (0-100)% | 5 | When the active load percentage of any one on-grid genset is lower than set min. value and continues min delay time, fixed power genset outputs in active power. |
| 52 | Output Min. Value Delay | (0-3600.0)s | 0.5 | |
| 53 | Output Max. Value | (0-100)% | 95 | When the active load percentage of any one on-grid genset is greater than set max. value and continues max delay time, fixed power genset outputs in active power. |
| 54 | Output Max. Value Delay | (0-3600.0)s | 0.5 | |
| Fixed Reactive Power | | | | |
| 55 | Output Min. Value | (0-100)% | 5 | When the reactive load percentage of any one on-grid genset is lower than set min. value and continues min delay time, fixed power genset outputs in reactive power. |
| 56 | Output Min. Value Delay | (0-3600.0)s | 0.5 | |
| 57 | Output Max. Value | (0-100)% | 95 | When the reactive load percentage of any one on-grid genset is greater than set max. value and continues max delay time, fixed power genset outputs in reactive power. |
| 58 | Output Max. Value Delay | (0-3600.0)s | 0.5 | |
| SG Fixed Power Mode | | | | |
| 59 | DG Min. On-load% | (0-100.0)% | 0.0 | When the controller works in both SG mode and fixed power mode, if the total load is lower than the active power of SG fixed output, DG takes the set value and the remaining power is carried by SG. If this value is 0, when the total power is lower than the fixed active power output of SG, DG does not |

| No. | Item | Range | Default | Description |
|---|---|---|---|---|
| | | | | start with load. |
| 60 | SG Max. On-load% | (0-100.0)% | 100.0 | When the controller works in both SG mode and fixed power mode, if the total load is greater than the SG and DG fixed active power percentage, DG will be loaded to the fixed active power percentage, the remaining power will be loaded by SG as much as possible and the maximum load will be the setting value. If the total load is even greater, it will be balanced by SG and DG. |
| 61 | Max. Load% of SG Receiving | (0-100.0)% | 100.0 | When the controller works in both SG mode and load-receiving mode, if SG on-load mode is effective, the load must be lower than receiving rated power percentage (the setting value) before SG is closing. |
| 62 | DG Stop% When SG Receiving | (0-100.0)% | 50.0 | When the controller works in both SG mode and load-receiving mode, if SG on-load is effective, when SG on-load is greater than the setting value of the total load, DG will start unloading and stopping and DG will stop soft loading. |
| 63 | Max. No. of SG & DG Sync. | (1-16) | 16 | When SG is synchronized, the current limit number of on-grid DG is higher than the setting value, closing and grid connection of SG is not allowed. |
| 64 | Analog Control Inactive Action | (0-2) | 0 | 1: Previous Power Output; 2: Fixed Power Value Output; 2: Share Power Output. |

## 12.14 ENGINE SETTING

**Table 43 – Engine Parameter Settings**

| No. | Item | | Range | Default | Description |
|---|---|---|---|---|---|
| Engine Setting | | | | | |
| 1 | Controller Type | | (0-7) | 0 | 0: None;<br>1: HMC6000S;<br>2: HMC6000E;<br>3: HMC6000A;<br>4: HMC6000ED;<br>5: HMC6000EG;<br>6: HMC9000S;<br>7: HMC9000A. |
| 2 | Engine Controller | Action | (0-1) | 0: Disable | Communication failure setting of engine controller. |
| 3 | | Auto ACK | (0-1) | 0: Disable | |
| 4 | | Alarm Self-lock | (0-1) | 0: Disable | |
| 5 | | Delay Value | (0.1-3600.0)s | 3.0 | |
| 6 | | Alarm Type | (0-6) | 1: Warning | |
| 7 | | Active Range | (0-20) | 0: Always Active | |

## 12.15 DISPLAY SETTING

**Table 44 – Display Parameter Settings**

| No. | Item | | Range | Default | Description |
|---|---|---|---|---|---|
| Local Setting | | | | | |
| 1 | Comm. Address | | (1-254) | 0 | RS485 communication address of display module. |
| 2 | Backlight Time | | (1-3600)s | 300 | When display module is not used for a long time, LCD backlight brightness should be adjusted to less. |
| 3 | Brightness | | (1-10) | 10 | 10-level can be adjusted. |
| 4 | Start Interface | | (0-1) | 1: Enable | |
| 5 | Start Interface Display Time | | (1-3600)s | 3 | |
| 6 | Start Image | | | | Only can be set in upper computer. |
| 7 | RS485 Comm. | Baud Rate | (0-3) | 2 | 0: 2400bps<br>1: 4800bps<br>2: 9600bps<br>3: 19200bps |
| 8 | | Stop Bit | (0-1) | 0 | 0: 2-bit |

| No. | Item | | Range | Default | Description |
|---|---|---|---|---|---|
| | | | | | 1: 1-bit |
| 10 | Network | | (0-1) | 1: Enable | |
| 11 | IP Address | | (0-255) | 192.168.0.188 | |
| 12 | Subnet Mask | | (0-255) | 255.255.255.0 | |
| 13 | Default Gateway | | (0-255) | 192.168.0.1 | |
| 14 | DNS Address | | (0-255) | 192.168.0.1 | |
| 15 | MAC Address | | (0-255) | | Each controller has different MAC. |
| 16 | Output Port Content | | Alarm/Function (0-255) | Alarm 000 | Not used |
| 17 | Output Port Output Type | | (0-1) | 0 | 0: Normally Open; 1: Normally Close. |

## 12.16    USER-DEFINED PROTOCOL FORM SETTING

This only can be set by upper computer.

To facilitate user remote monitoring and reduce system communication bus pressure, address 3500-3999 is added to user-defined data mapping field. By configuring data address via upper computer, user can read data of user-defined sequence via address 3500-3999.

**Table 45 – User-defined Protocol Form**

| Address | Item | Description | Bytes |
|---|---|---|---|
| 3500 | User-defined | | 2Bytes |
| 3501 | User-defined | | 2Bytes |
| 3502 | User-defined | | 2Bytes |
| 3503 | User-defined | | 2Bytes |
| 3504 | User-defined | | 2Bytes |
| 3505 | User-defined | | 2Bytes |
| 3506 | User-defined | | 2Bytes |
| 3507 | User-defined | | 2Bytes |
| 3508 | User-defined | | 2Bytes |
| 3509 | User-defined | | 2Bytes |
| 3510 | User-defined | | 2Bytes |
| 3511 | User-defined | | 2Bytes |
| 3512 | User-defined | | 2Bytes |
| 3513 | User-defined | | 2Bytes |
| 3514 | User-defined | | 2Bytes |
| 3515 | User-defined | | 2Bytes |
| 3516 | User-defined | | 2Bytes |
| 3517 | User-defined | | 2Bytes |
| 3518 | User-defined | | 2Bytes |
| 3519 | User-defined | | 2Bytes |
| 3520 | User-defined | | 2Bytes |
| 3521 | User-defined | | 2Bytes |

| Address | Item | Description | Bytes |
|---|---|---|---|
| 3522-3999 | User-defined | | 2*N |

### 12.17 DIN16 SETTING

HPM6 can expand with two DIN16 modules (input expansion module), which has the same input functions with HPM6.

**Table 46 – DIN16 Parameter Settings**

| No. | Items | Range | Default | Description |
|---|---|---|---|---|
| Input Port 1 | | | | |
| 1. | Contents Setting | (0-150) | 0 | Not Used. |
| 2. | Active Type | (0-1) | 0 | 0: Close Activate; 1: Open Activate. |
| Input Port 2 | | | | |
| 3. | Contents Setting | (0-150) | 0 | Not Used. |
| 4. | Active Type | (0-1) | 0 | 0: Close Activate;1: Open Activate. |
| Input Port 3 | | | | |
| 5. | Contents Setting | (0-150) | 0 | Not Used. |
| 6. | Active Type | (0-1) | 0 | 0: Close Activate;1: Open Activate. |
| Input Port 4 | | | | |
| 7. | Contents Setting | (0-150) | 0 | Not Used. |
| 8. | Active Type | (0-1) | 0 | 0: Close Activate;1: Open Activate. |
| Input Port 5 | | | | |
| 9. | Contents Setting | (0-150) | 0 | Not Used. |
| 10. | Active Type | (0-1) | 0 | 0: Close Activate;1: Open Activate. |
| Input Port 6 | | | | |
| 11. | Contents Setting | (0-150) | 0 | Not Used. |
| 12. | Active Type | (0-1) | 0 | 0: Close Activate;1: Open Activate. |
| Input Port 7 | | | | |
| 13. | Contents Setting | (0-150) | 0 | Not Used. |
| 14. | Active Type | (0-1) | 0 | 0: Close Activate;1: Open Activate. |
| Input Port 8 | | | | |
| 15. | Contents Setting | (0-150) | 0 | Not Used. |
| 16. | Active Type | (0-1) | 0 | 0: Close Activate;1: Open Activate. |
| Input Port 9 | | | | |
| 17. | Contents Setting | (0-150) | 0 | Not Used. |

| No. | Items | Range | Default | Description |
|---|---|---|---|---|
| 18. | Active Type | (0-1) | 0 | 0: Close Activate;1: Open Activate. |
| Input Port 10 | | | | |
| 19. | Contents Setting | (0-150) | 0 | Not Used. |
| 20. | Active Type | (0-1) | 0 | 0: Close Activate;1: Open Activate. |
| Input Port 11 | | | | |
| 21. | Contents Setting | (0-150) | 0 | Not Used. |
| 22. | Active Type | (0-1) | 0 | 0: Close Activate;1: Open Activate. |
| Input Port 12 | | | | |
| 23. | Contents Setting | (0-150) | 0 | Not Used. |
| 24. | Active Type | (0-1) | 0 | 0: Close Activate;1: Open Activate. |
| Input Port 13 | | | | |
| 25. | Contents Setting | (0-150) | 0 | Not Used. |
| 26. | Active Type | (0-1) | 0 | 0: Close Activate;1: Open Activate. |
| Input Port 14 | | | | |
| 27. | Contents Setting | (0-150) | 0 | Not Used. |
| 28. | Active Type | (0-1) | 0 | 0: Close Activate;1: Open Activate. |
| Input Port 15 | | | | |
| 29. | Contents Setting | (0-150) | 0 | Not Used. |
| 30. | Active Type | (0-1) | 0 | 0: Close Activate;1: Open Activate. |
| Input Port 16 | | | | |
| 31. | Contents Setting | (0-150) | 0 | Not Used. |
| 32. | Active Type | (0-1) | 0 | 0: Close Activate;1: Open Activate. |

⚠**NOTE:** Input port functions please refer to Input Port Function setting.

## 12.18 DOUT16 SETTING

HPM6 can expand with two DOUT16 modules (output expansion module), which has the same output functions with HPM6.

**Table 47 – DOUT16 Parameter Settings**

| No. | Items | Parameter Range | Default | Description |
|-----|-------|-----------------|---------|-------------|
| Output Port 1 | | | | |
| 1. | Contents Setting | Alarm/Function (0-255) | Alarm 000 | Not Used. |
| 2. | Active Type | (0-1) | 0 | 0: Normally Open 1: Normally Close |
| Output Port 2 | | | | |
| 3. | Contents Setting | Alarm/Function (0-255) | Alarm 000 | Not Used. |
| 4. | Active Type | (0-1) | 0 | 0: Normally Open 1: Normally Close |
| Output Port 3 | | | | |
| 5. | Contents Setting | Alarm/Function (0-255) | Alarm 000 | Not Used. |
| 6. | Active Type | (0-1) | 0 | 0: Normally Open 1: Normally Close |
| Output Port 4 | | | | |
| 7. | Contents Setting | Alarm/Function (0-255) | Alarm 000 | Not Used. |
| 8. | Active Type | (0-1) | 0 | 0: Normally Open 1: Normally Close |
| Output Port 5 | | | | |
| 9. | Contents Setting | Alarm/Function (0-255) | Alarm 000 | Not Used. |
| 10. | Active Type | (0-1) | 0 | 0: Normally Open 1: Normally Close |
| Output Port 6 | | | | |
| 11. | Contents Setting | Alarm/Function (0-255) | Alarm 000 | Not Used. |
| 12. | Active Type | (0-1) | 0 | 0: Normally Open 1: Normally Close |
| Output Port 7 | | | | |
| 13. | Contents Setting | Alarm/Function (0-255) | Alarm 000 | Not Used. |
| 14. | Active Type | (0-1) | 0 | 0: Normally Open 1: Normally Close |
| Output Port 8 | | | | |

| No. | Items | Parameter Range | Default | Description |
|---|---|---|---|---|
| 15. | Contents Setting | Alarm/Function (0-255) | Alarm 000 | Not Used. |
| 16. | Active Type | (0-1) | 0 | 0: Normally Open 1: Normally Close |
| Output Port 9 | | | | |
| 17. | Contents Setting | Alarm/Function (0-255) | Alarm 000 | Not Used. |
| 18. | Active Type | (0-1) | 0 | 0: Normally Open 1: Normally Close |
| Output Port 10 | | | | |
| 19. | Contents Setting | Alarm/Function (0-255) | Alarm 000 | Not Used. |
| 20. | Active Type | (0-1) | 0 | 0: Normally Open 1: Normally Close |
| Output Port 11 | | | | |
| 21. | Contents Setting | Alarm/Function (0-255) | Alarm 000 | Not Used. |
| 22. | Active Type | (0-1) | 0 | 0: Normally Open 1: Normally Close |
| Output Port 12 | | | | |
| 23. | Contents Setting | Alarm/Function (0-255) | Alarm 000 | Not Used. |
| 24. | Active Type | (0-1) | 0 | 0: Normally Open 1: Normally Close |
| Output Port 13 | | | | |
| 25. | Contents Setting | Alarm/Function (0-255) | Alarm 000 | Not Used. |
| 26. | Active Type | (0-1) | 0 | 0: Normally Open 1: Normally Close |
| Output Port 14 | | | | |
| 27. | Contents Setting | Alarm/Function (0-255) | Alarm 000 | Not Used. |
| 28. | Active Type | (0-1) | 0 | 0: Normally Open 1: Normally Close |
| Output Port 15 | | | | |
| 29. | Contents Setting | Alarm/Function (0-255) | Alarm 000 | Not Used. |
| 30. | Active Type | (0-1) | 0 | 0: Normally Open 1: Normally Close |
| Output Port 16 | | | | |
| 31. | Contents Setting | Alarm/Function (0-255) | Alarm 000 | Not Used. |

| No. | Items | Parameter Range | Default | Description |
|-----|-------|-----------------|---------|-------------|
| 32. | Active Type | (0-1) | 0 | 0: Normally Open 1: Normally Close |

⚠**NOTE:** Output port functions please refer to Output Port Function list in 11.8.

### 12.19 USER-DEFINED PROTOCAL SETTING

This item can only be set by the upper computer.

In order to coordinate with address 3500-3999 to obtain user-defined data, user-defined bus data can be configured via upper computer and controller can share all ID genset defined data (100) via network bus. Then users can read each ID genset data via address 3500-3999 to configure user-defined data address.

**Table 48 – User-defined Protocol**

| Address | Item | Description | Bytes |
|---------|------|-------------|-------|
| 0 | User-defined | | 2Bytes |
| 1 | User-defined | | 2Bytes |
| 2 | User-defined | | 2Bytes |
| 3 | User-defined | | 2Bytes |
| 4 | User-defined | | 2Bytes |
| 5 | User-defined | | 2Bytes |
| 6 | User-defined | | 2Bytes |
| 7 | User-defined | | 2Bytes |
| 8 | User-defined | | 2Bytes |
| 9 | User-defined | | 2Bytes |
| 10 | User-defined | | 2Bytes |
| 11 | User-defined | | 2Bytes |
| 12 | User-defined | | 2Bytes |
| 13 | User-defined | | 2Bytes |
| 14 | User-defined | | 2Bytes |
| 15 | User-defined | | 2Bytes |
| 16 | User-defined | | 2Bytes |
| 17 | User-defined | | 2Bytes |
| 18 | User-defined | | 2Bytes |
| 19 | User-defined | | 2Bytes |
| 20 | User-defined | | 2Bytes |
| 21 | User-defined | | 2Bytes |
| 22-99 | User-defined | | 2*N |

### 13. COMMISSIONING

#### 13.1 STEP 1: SINGLE UNIT DEBUGGING

a) Check the parameter configuration of the controller;

b) Check the genset connections and MSC CAN connection lines between the units. (E.g. if 3 generators are correctly connected, main screen will display Module Number: 3).

c) Start the genset in semi-auto mode, check if generator data is normal;

d) Start the genset in semi-auto mode, check if switch opens and closes normally;

e) Start the genset in semi-auto mode, after closing the breaker, check if generator frequency can be adjusted to the rated frequency (e.g. set the rated frequency as 52Hz/48Hz);

f) Start the genset in semi-auto mode, after closing the breaker, check if generator voltage can be adjusted to the rated voltage (e.g. set the rated voltage as 440V/360V);

g) Start the genset in semi-auto mode, after closing the breaker, check if power factor, active power and reactive power are normal; if abnormal, check generator voltage and current phase sequence, current transformer incoming line direction, current transformer secondary current dotted terminal.

#### 13.2 STEP 2: SEMI-AUTO PARALLEL OPERATION OFF-LOAD

a) Semi-auto close parallel sets, check whether units synchronization is balanced and breaker close impulse current is too high; if that, adjust synchronization control parameters appropriately;

b) During parallel operation off load, check if there is no high circumfluence on HPM6 current screen;

c) During parallel operation off load, check if the output of active and reactive power is equal to zero; if it is not, then check if there is power oscillation; if there is, adjust the gain and stability values of engine, or adjust engine GOV or generator AVR gain and stability potentiometer to avoid active and reactive power oscillation; output close to 0; if relay adjusts speed/voltage, the droop function of speed adjusting panel and voltage adjusting panel should be opened and make droop characteristics be consistent.

#### 13.3 STEP 3: SEMI-AUTO PARALLEL OPERATION ON-LOAD

a) Semi-auto close parallel sets, perform on-load test and check if active and reactive power is evenly distributed between all the gensets;

b) Semi-auto close parallel sets, perform soft on-load test to see if there is high overshoot or power oscillation during this period; if there is, adjust load slope properly;

c) Semi-auto close parallel sets, perform soft off-load test to see if genset breaker opens after reaching minimum set value (%);

d) Semi-auto close parallel sets, perform impact load test and damp load test to check if there is power oscillation.

#### 13.4 STEP 4: AUTOMATIC PARALLEL OPERATION

When the controller is in auto status, if there is no power on bus, it will carry out automatic parallel, start and stop operation.

a) Start the genset which has the highest priority or shortest running time according to the start mode;

b) The genset which has the second highest priority or second shortest running time will start if the load has exceeded the set value or the HC request value has exceeded the set value;

c)  After the genset has started up, synchronization, parallel and share load process will begin;

d)  The genset will stop according to the preset sequence if the load has fallen below the set value (light load input deactivates.)

## 14.  INSTALLATION

Controller is split type design; HPM6D display module is panel mounted and it is fixed by 4 clips when installed while HPM6 master control module is fixed by M5×4 screw. The controller's overall dimensions and cutout dimensions are as following:
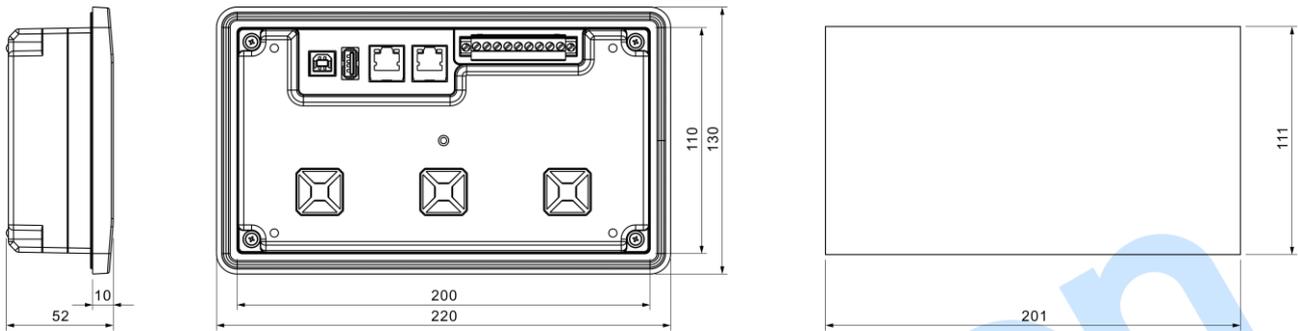


**Fig.26 – HPM6D Display Module Installation Dimensions (Unit: mm)**
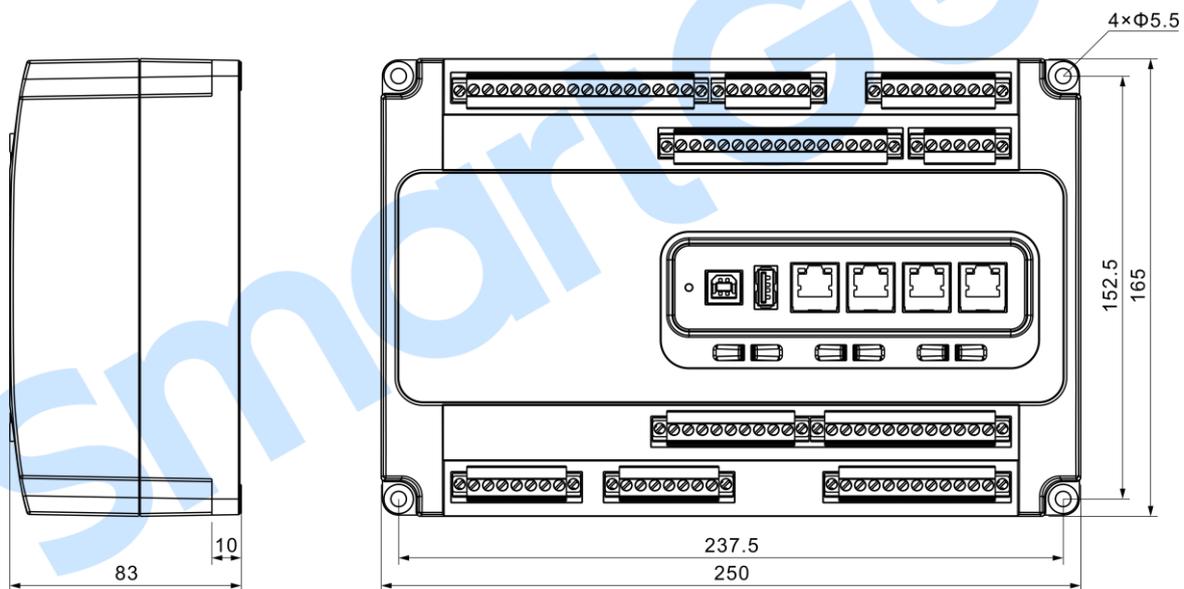


**Fig.27 – HPM6 Master Control Module Installation Dimensions (Unit: mm)**

### 1)  Battery Voltage Input

⚠**NOTE:** HPM6 controller can suit for widely range of battery voltage (8~35) VDC. The wire's diameter must be over 1.5mm$^2$ and which is connected to B+ and B- of controller power.

### 2)  Output and Expand Relays

⚠**NOTE:** Outputs of controller are divided into passive output and active output. If need to expand the relays, please add freewheel diode to both ends of expand relay's coils (when coils of relay have DC current) in order to prevent disturbance to controller or others equipment.

## 3)  AC Input

⚠**NOTE:** Current input of controller must be connected to outside current transformer. And the current transformer's secondary side current must be 5A. At the same time, the phases of current transformer and input voltage must be correct. Otherwise, the current of collecting and active power maybe not correct.

☠**WARNING!** When there is load current, transformer's secondary side is prohibited to open circuit.

## 4)  Withstand Voltage Test

⚠**CAUTION!** When controller has been installed in control panel, if need the high voltage test, please disconnect controller's all terminal connections, in order to prevent high voltage into controller and damage it.

## 15. FAULT FINDING

**Table 49 – Fault Finding**

| Symptoms | Possible Solutions |
|---|---|
| Controller no response with power | Check power supply; <br> Check controller connection wirings; <br> Check DC fuse. |
| Controller GOV/AVR relay no response | Check whether GOV, AVR output is selected as internal relay output. |
| Controller GOV, AVR output error | Check setting of central point SW1 and range SW2; <br> Check whether GOV, AVR output is selected as internal analog output. |
| Impact current too large in sync closing | Detect controller voltage sampling line or adjust synchronization parameters; <br> Debug every unit based on the commissioning process. |
| Grid connected load of more than two units | Adjust load control parameters; <br> Debug every unit based on the commissioning process. |
| Paralleling units cannot raise/drop power, or just can little raise/drop power | When the internal relay speed control, check whether the potentiometer is stuck or in limit, whether the speed control pulse width is too small at rated speed; <br> When the internal analog speed control, SW1, SW2 set error, or adjust the speed control unit, EMC parameters. |
| Trip in running | Check related switch and its connections according to the information on LCD. |
| Genset is running while switch is not operating | Check if the output signal of the controller is matched with switch signal; <br> Check the connections between switch and controllers. |
| MSC modules too few | Check whether MSC module number is correct; <br> Detect if the MSC LINK communication is normal. |
| RS485 comm. abnormal | Check connections; <br> Check setting of COM port is correct or not; <br> Check RS485's connections of A and B is reverse connected or not; <br> Check whether communication port of PC is normal. |
| Network monitoring comm. | Check connections; <br> Check whether network IP, MAC address is correct. |

_____