# Smartgen®

## HGM72

## Automatic Generator Module

# OPERATING MANUAL
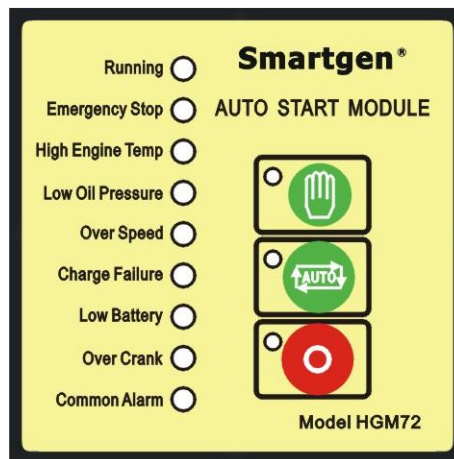


**Smartgen Electronic**

# CONTENT

# 1 SUMMARY

The Module **HGM72** is an **Automatic Engine Control Module**. It selects 3 kinds of working state, can pass panel light touch buttons artificially start/stop genset, also can through remote start signal input automatic starting generator, and can detect fault (low oil pressure, high water temperature, emergency stop alarm, over speed) automatically disconnect fuel relays and stop electromagnet to electric suction close. Panel LED indicator fault state, provide real and effective fault alarm signal.

# 2 FEATURES

◙ The power supply a wide range (8~35) VDC, can adapt different starting battery voltage environment.

◙ With low oil pressure, high water temperature, overspeed, and emergency stop, start failures and so on protection and instructions.

◙ Can provide charging generator excitation function.

◙ With idle speed control and ETS solenoid function.

◙ Speed signal depend on frequency of generator.

◙ Panel LED display various operation and alarm state.

◙ 2 relay fixed output port (fuel output, starting output).

◙ 3 a programmable output port, can set common alarm output, preheat output, idle control, stop output, and other functions.

◙ Provide PC programming port, genset work necessary various delay, output port definition, power threshold can via PC settings, PC only need a USB port.

◙ Built-in watch dog can never be dead halt, ensuring smooth program execution.

◙ Modular configuration design, Flame Retardant ABS plastic shell, inserted type connection terminals, flush type installation, compact structure, easy installation.

# 3 SPECIFICATION

a) **DC supply:** (8~35) V.

b) **Single-phase AC input:** AC (15~300) V (+ 20%) 50Hz/60Hz.

c) **Five relay output(B+, 5A):**

Crank output

Fuel output

Configurable output1

Configurable output2

Configurable output3

d) **3 Digit input port:** connect to (B-) is active.

e) **Power Consumption:** standby mode(12V: 0.3W, 24V: 0.4W)，working (12V: 1W, 24V: 1.1W).

f) **Operating Temperature Range:** (-30~+70) °C.

g) **Dimensions:** 72mm×72mm×52mm.

h) **Panel cutout:** 67mm×67mm.

i) **Weight:** 0.2kg.

# 4  DISPLAY SYMBOL AND OPERATION

### a) PUSH BUTTON

| Symbol | Defined | Description |
|---|---|---|
|  | Manual start button | Push this button, generator will start, and the module comes into manual state. |
|  | Auto state button | Push this button, the module comes into auto state. |
|  | Stop button | Push this button, generator will stop, and the module comes into stop state. |

### b) LED

| Symbol | Defined | Description |
|---|---|---|
| Running | Running led | Lighten when engine start successfully. |
| Emergency | Emergency stop alarm led | Lighten when emergent stop input is active. |
| High Water Temp | High Water Temp alarm led | Lighten when high water temperature alarm is appearing. |
| Low Oil Pressure | Low Oil pressure alarm led | Lighten when the module detects that the engine oil pressure has fallen below the low oil pressure pre-alarm setting level. |
| Over speed | Over speed alarm led | Lighten when the engine speed has risen above the over speed pre alarm setting. |
| Charge Failure | Charge Failure alarm led | Lighten if the module does not detect a voltage from the alarm light terminal on the auxiliary charge |

| | | |
|---|---|---|
| | | alternator. |
| Low Battery | Low Battery alarm led | Lighten if the module detects that the plant DC supply has fallen below the low voltage setting level. |
| Over Crank | Over Crank alarm led | Lighten when over crank alarm is appearing. |
| Common Alarm | Common Alarm led | Lighten when emergency stop, high temperature, low oil pressure, over speed, under speed, charge failure, battery over voltage, battery under voltage, crank failure, stop failure, and no generator is appearing. |

## c) OPERATION

Module has three states: stop state (**OFF**), man state (**MAN**), auto state (**AUTO**).

1) Man Start ( )

When push Man start button ( ), preheat will first output, and start preheat delay, when preheat delay is end, fuel output 1 second, preheat output will stop, and crank output is start. Here engine will start, when crank successfully, crank output stop. Then engine comes into the safe time. When the safe time is end, then engine comes into the idle time. When the safe time is end, then idle output is out and engine will run at full tilt.

2) Auto State ( )

◙ When push ( ) button, the module will enter automatic state. Here if remote start input is active (connect to B-), the engine will start after the delay of start engine. Preheat will first output, and start preheat delay, when preheat delay is end, fuel output 1 second, preheat output will stop, and crank output is start. Here engine will start, when crank successfully, crank output stop. Then engine enter the safe delay. When the safe delay is end, then engine enter the idle delay. When the safe delay is end, then idle relay is close and genset raise high speed.

**Note:** In the process of starting interval delay, fuel output disconnect, starting interval delay after three seconds, preheat and ETS solenoid output, and ETS solenoid stop disconnect after starting interval delay, fuel

output, preheat output before genset start off.

◙ When remote start input is inactive, the engine enter the idle process after the delay of engine stop, idle relay disconnect, fuel relays output after the idle delay, ETS solenoid output, genset will automatically stop, ETS solenoid disconnect when genset stop steady.

3) Stop State (◉)

◙ Push the (◉) button when engine is running, the button beside led will lighten, enter idle process, idle relay disconnect, idle delay ended, fuel disconnect, ETS solenoid output, genset stop, ETS solenoid disconnect when genset stop steady.

◙ When genset fault alarm is appear, push the (◉) button (keep after 1 second loosen) can relieve the alarm. If exceed 1 second, panel all lights will all bright (test lamps function).

◙ When engine is waiting state, push (◉) button 1 second above, ETS solenoid will output and all led will be Lighten. Loosen the stop buttons, ETS solenoid output disconnect instantly, and test lamps function is over.

◙ When engine is waiting state, only emergent stop alarm can be check.

# 5  ALARM

a) Low Oil Pressure: check after the safe delay, the duration of 2 seconds above, the module will alarm and stop engine.

b) High Temperature: check after the safe delay, the duration of 3 seconds above, the module will alarm and stop engine.

c) Over speed: check after the preheat delay, the duration of 1.5 seconds above, the module will alarm and stop engine.

d) Under speed: check when engine run at full tilt, the duration of 15 seconds above, the module will alarm and stop engine.

e) Charge Failure: check when engine run at full tilt, the duration of 3 seconds above, and the module will warn but don't stop engine.

f) Over Crank: when engine crank fail over the times of configure, the module will alarm and stop engine.

g) Stop Failure: when engine is stop fail, the module will warn.

h) No generator: check after the idle delay, when generator frequency for zero and the duration of 5 seconds above, the module will alarm and stop engine.

i) Battery over voltage: The DC supply has risen above the high volts setting level for the duration of the high battery volts 20 seconds.

j) Battery under voltage: The DC supply has low above the under volts setting level for the duration of the low battery volts 20 seconds.

k) Emergency Stop: When emergency stop input, ETS solenoid stop immediately output, and then fuel disconnect, preheat and start signal emit emergency stop alarm signal.

l) Common Alarm: when any alarm or warn is appear, this alarm will active. When the over speed, under speed, high temperature, low oil pressure, emergency stop, no generator, crank failure, stop failure alarm, battery over voltage, battery under voltage, common alarm LED illuminate, and common alarm output.

# 6 PARAMETERS TABLE (ONLY ADJUST VIA PC)

| Num | Parameter | Range | Default | Remark |
|-----|-----------|-------|---------|--------|
| 1 | Start delay | (0-3600)s | 1 | It's the delay from remote start signal is active or mains is failure, to start generator. |
| 2 | Stop delay | (0-3600)s | 5 | It's the delay from remote start signal is inactive or mains is normal, to stop generator. |
| 3 | Number of Crank | (1-9) | 3 | Numbers of crank cycles. |
| 4 | Cranking time | (3-60)s | 5 | This is the maximum amount of time that the module will energize the starter motor for during starting attempts once the starter has engaged. |
| 5 | Crank rest time | (3-60)s | 10 | This is the amount of time the module will wait for between start attempts. This is to allow the starter motor to cool and the starter batteries to recover. |
| 6 | Safe running time | (1-60)s | 10 | This timer dictates how long the module will ignore the Low oil pressure, High Engine Temperature, Under speed, Under volts and any other inputs configured as active from safety on. |

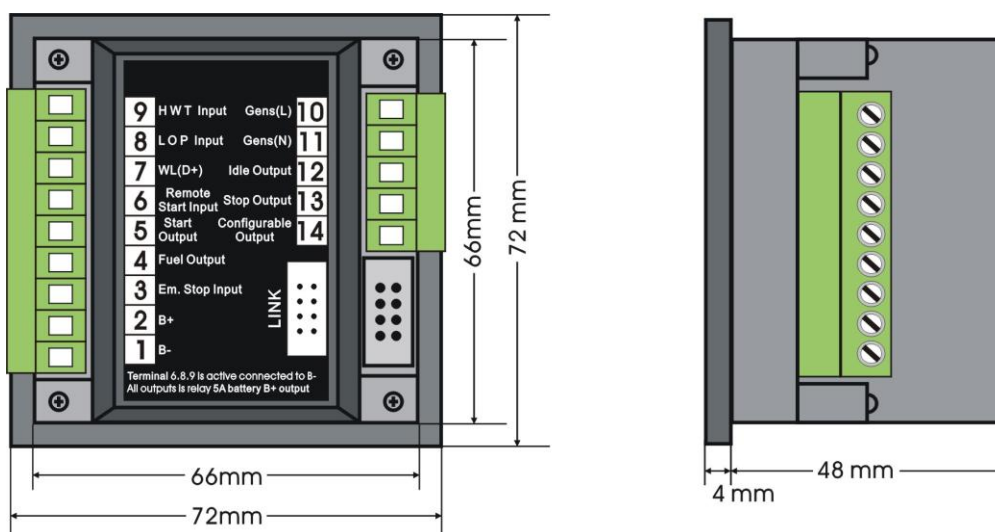| Num | Parameter | Range | Default | Remark |
|-----|-----------|-------|---------|--------|
| 7 | Start idle time | (0-3600)s | 0 | This is the amount of time that the start Idle speed is held active. These allow the engine to hold low speed. |
| 8 | Stop idle time | (0-3600)s | 0 | This is the amount of time that the stop Idle speed is held active. These allow the engine to hold low speed. |
| 9 | ETS solenoid hold | (0-120)s | 30 | This timer is used if the unit is configured to operate an Energize to stop engine. It dictates the duration that the ETS output will remain active after the module has detected the engine has come to rest. If the ETS output is not configured, this timer will still operate, preventing an immediate restart. |
| 10 | Fail to stop delay | (0-120)s | 0 | Once the module has given a shutdown signal to the engine it expects the engine to come to rest. It monitors the Oil pressure and speed sensing sources and if they still indicate engine movement when this timer expires a 'Fail to stop' alarm signal is generated. |
| 11 | Preheat time | (0-300)s | 0 | This timer dictates the duration that the pre-heat output will be active before an attempt is made to start the engine. Once this timer has expired cranking will commence. |
| 12 | Gens over freq | (0-75)Hz | 57 | When generator frequency is over than the point and hold great than 3 seconds, generator over frequency is active. |
| 13 | Gens under freq | (0-59)Hz | 0 | When generator frequency is low than the point, generator low frequency and hold great than 15 seconds is active. |
| 14 | Condition of Crank | (0-1) | 0 | 0: Freq<br>1: Freq+ Oil pressure |

| Num | Parameter | Range | Default | Remark |
|-----|-----------|-------|---------|--------|
| 15 | Freq disconnect | (5-30)Hz | 10 | When generator frequency is large than this point, starter will disconnect. |
| 16 | Battery over volt | (0-35)V | 35.0 | When generator battery voltage is over than the point and hold for 20 seconds, battery over voltage signal is active. It's a warning alarm. |
| 17 | Battery under volt | (0-30)V | 8.0 | When generator battery voltage is less than the point and hold for 20 seconds, battery under voltage signal is active. It's a warning alarm. |
| 18 | Charge failure volt | (0-30)V | 4.0 | During generator is running, when charge alternator WL/D+ voltage is low than this point and remain for 5 seconds, generator will warning alarm. |
| 19 | Configurable output1 | (1-8) | 5 | 1. Common alarm 2. Preheat control 3. Fuel output 4. Crank output 5. Idel control 6. Energized to stop output 7. Over speed alarm output 8. Running 9. Close ATS 10. Open ATS |
| 20 | Configurable output2 | (1-8) | 6 | The same of 19 |
| 21 | Configurable output3 | (1-8) | 1 | The same of 19 |
| 22 | Module address | (1-254) | 1 | Address of module for communication |

# 7  TERMINAL

a) Terminal 1(B-): connect to the cathode of battery.

b) Terminal 2(B+): connect to the anode of battery.

c) Terminal 3(Em. stop input): emergent stop input, connect to (B-) is active.

d) Terminal 4(Fuel Output): Fuel Output, (B+, 5A).

e) Terminal 5(Start Output): Start Output, (B+, 5A).

f) Terminal 6(Remote Start Input): Remote Start Input, connect to (B-) is active.

g) Terminal 7(D+): Connect to the terminal WL (or D+) of charger.

h) Terminal 8(LOP Input): Low oil pressure input, connect to (B-) is active.

i) Terminal 9(HWT. Input): High temperature input, connect to (B-) is active.

j) Terminal 10(L), 11(N): Alternator Input.

k) Terminal 12(Configurable Output1): Configurable output, (B+, 5A).

l) Terminal 13(Configurable Output2): Configurable output, (B+, 5A).

m) Terminal 14(Configurable Output3): Configurable output, (B+, 5A).

n) PC (LINK): Connect to PC by SG72.

## 8  CASE DIMENSIONS (HOLE: 67mm×67mm)



## 9  TYPICAL CONNECTIONS