

Manual

GM8020/GM8021
Genset controller

TH101133ER1

The Interpretation of the symbol

**WARNING:**

A WARNING indicates a potentially hazardous situation which, if not avoided, could result in death, or equipment damage.

**NOTE:**

Provide the user's help is very useful information and tips or alert the operator to the correct operation.

History

No.	Rev.	Date	Editor	Validation	Changes
1	TH101133ER1	2018.7	L	C	NEW
2					



WARNING:

Read this entire manual pertaining to the work to be performed before installing, operating, or servicing this controller. Practice all plant and safety instructions and precautions. Failure to follow instructions can cause personal injury and/or property damage.

The engine or other type of prime mover should be equipped with an overspeed shutdown device to protect against runaway or damage to the prime mover with possible personal injury, loss of life, or property damage.

The overspeed shutdown device must be totally independent of the prime mover control system. An over temperature or low pressure shutdown device may also be needed for safety, as appropriate.



CAUTION:

To prevent damage to a controller that uses an alternator or battery-charging device, make sure the power cable of charge or charger and controllers is turned off before disconnecting the battery from the system.



CAUTION:

Controllers contain static-sensitive parts. Observe the following precautions to prevent damage to these parts.

Do not disassemble the rear back of controller and touch the components or conductors on a printed circuit board.



CAUTION:

The controller comes with the factory settings. As the factory settings may not fully meet the actual user needs, the generator settings must be checked before.

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1 Description

GM8020/GM8021 is a new generation of generator set intelligent controller, using a new form structure, refine and improve the performance of the controller, so that the product fully meet of generator users or professional assembly plants of different types of generator sets , including oil and gas generator sets to open automatic stop control and protection needs.

Features:

- True RMS measure of voltage and current.
- The backlight function of the LCD allows the user to clearly see the operating parameters even in the dark.
- The controller has two operating modes: automatic/manual, and the two operating modes are selected by the buttons on the panel.
- The controller displays the control status, operating status and related measurement data of the generator set through the LCD on the panel.
- USB communication port, communicate with PC, can read and set the operating parameters of the controller
- It is very easy and convenient to connect, move, repair and replace the equipment through the pin terminal connection.

Model Comparison:

Model	GM8020	GM8021
Number of digital inputs	2	3
Number of control relay output	4	4
Analog sensor count	2	—
CAN communication port	—	●
Speed sensor measurement	●	—

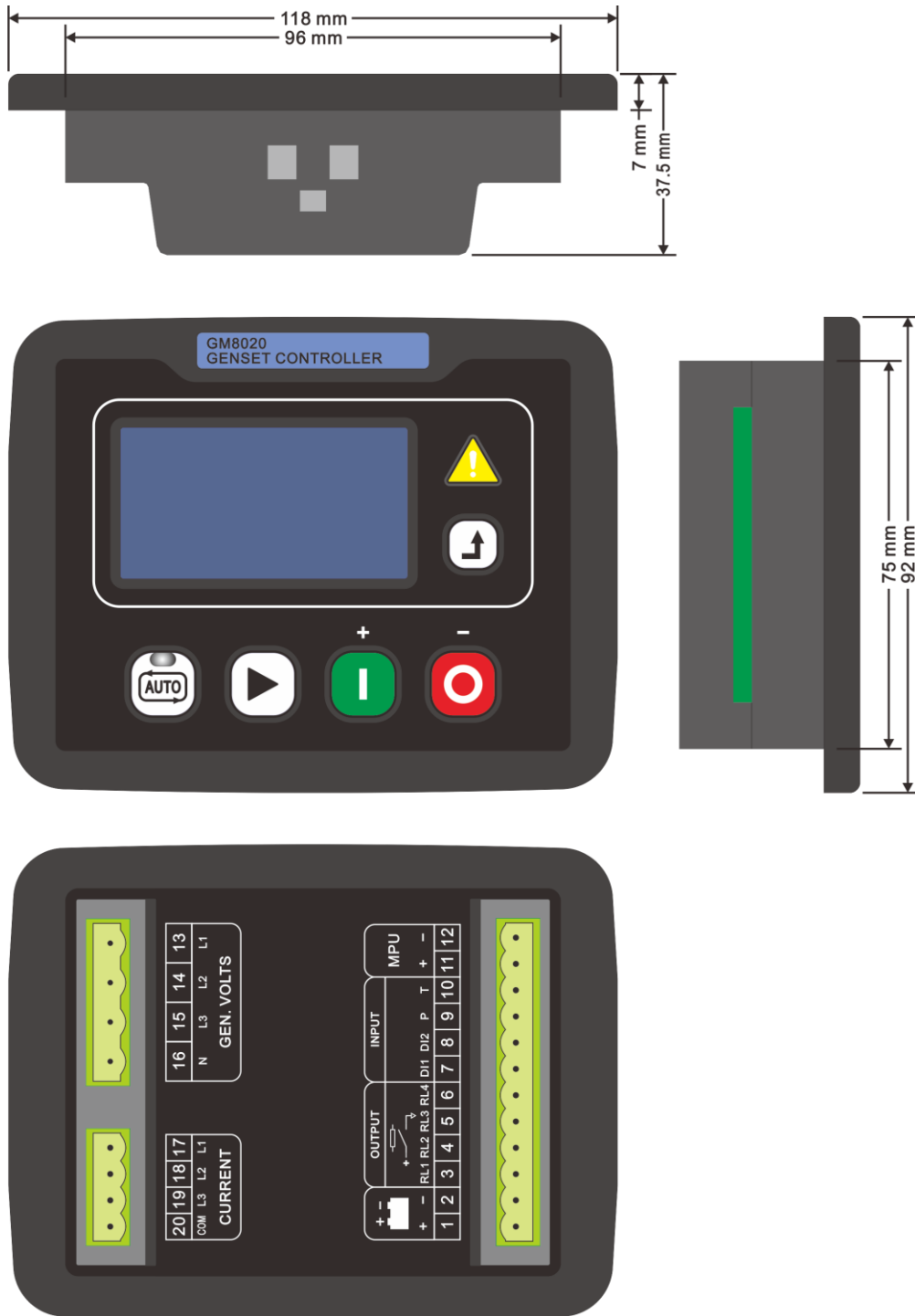
“—” : without “●” : Standard configuration

2 The Outline Dimension Drawings and Controller Wiring

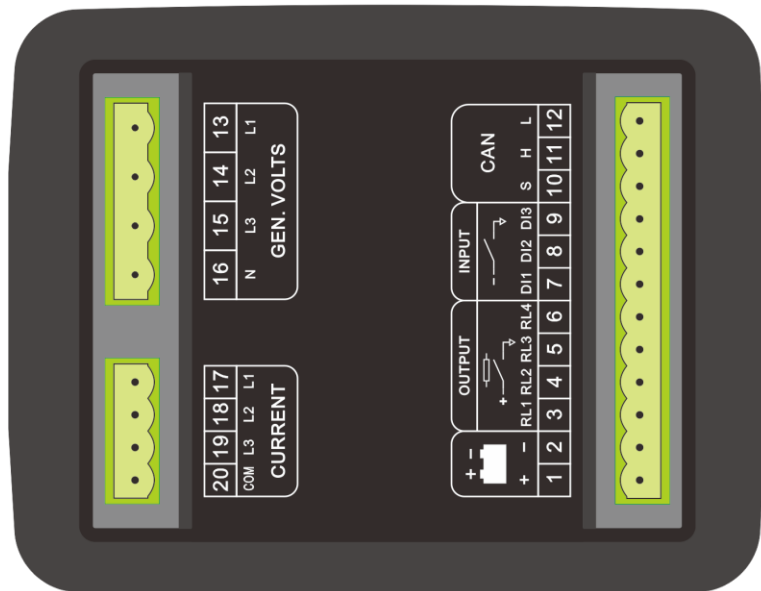
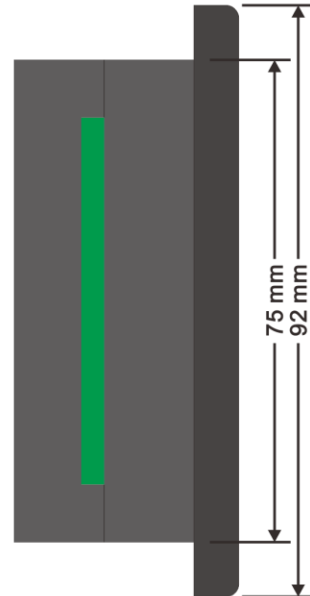
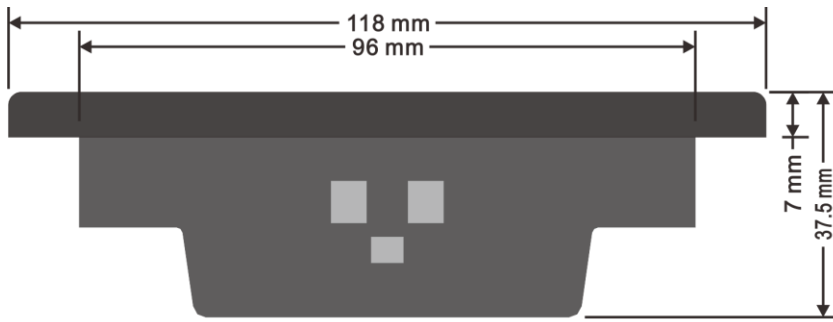
2.1 Following Details:

Module Dimensions	W118mm×H92mm
Panel Cutout	W98mm×H77mm
Thickness	D37.5mm

GM8020



GM8021



2.2 Terminal Connections:

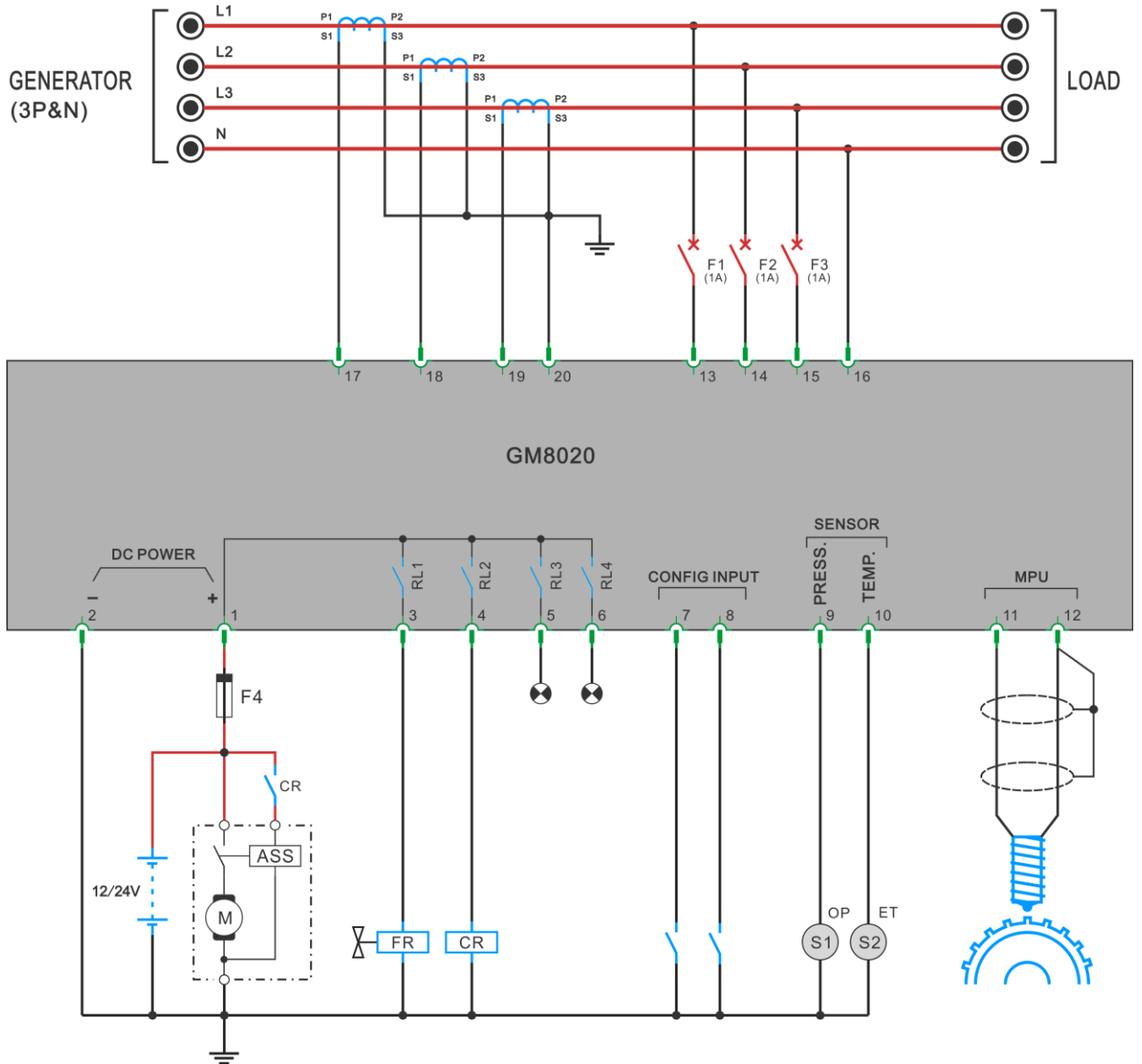
GM8020

Terminal	Function	Signal	Connection
1	Battery supply (+B)	12V/24V (8-35Vdc continuous)	2.5mm ²
2	Battery supply (-B)		2.5mm ²
3	Relay output 1	N.O. contact, 3A/30Vdc, defined (1)	1mm ²
4	Relay output 2	N.O. contact, 3A/30Vdc, defined (2)	1mm ²
5	Relay output 3	N.O. contact, 3A/30Vdc, defined (3)	1mm ²
6	Relay output 4	N.O. contact, 3A/30Vdc, defined (4)	1mm ²
7	D-Input 1	Defined (1)	1mm ²
8	D-Input 2	Defined (2)	1mm ²
9	LOP detection	Resistive pressure sensor (<1K Ω)	2.5mm ²
10	HET detection	Resistive temperature sensor (<1K Ω)	2.5mm ²
11	Magnetic pick-up signal {+}	1-70Vac	Two-core shielded cable
12	Magnetic pick-up signal {-}		
13	GEN. VL1-N input	0-346Vac	1mm ²
14	GEN. VL2-N input	0-346Vac	1mm ²
15	GEN. VL3-N input	0-346Vac	1mm ²
16	GEN. Neutral		1mm ²
17	I1 Gen current input (S1)	0-5A	2.5mm ²
18	I2 Gen current input (S1)	0-5A	2.5mm ²
19	I3 Gen current input (S1)	0-5A	2.5mm ²
20	Comm. port for current inputs (S2)		2.5mm ²

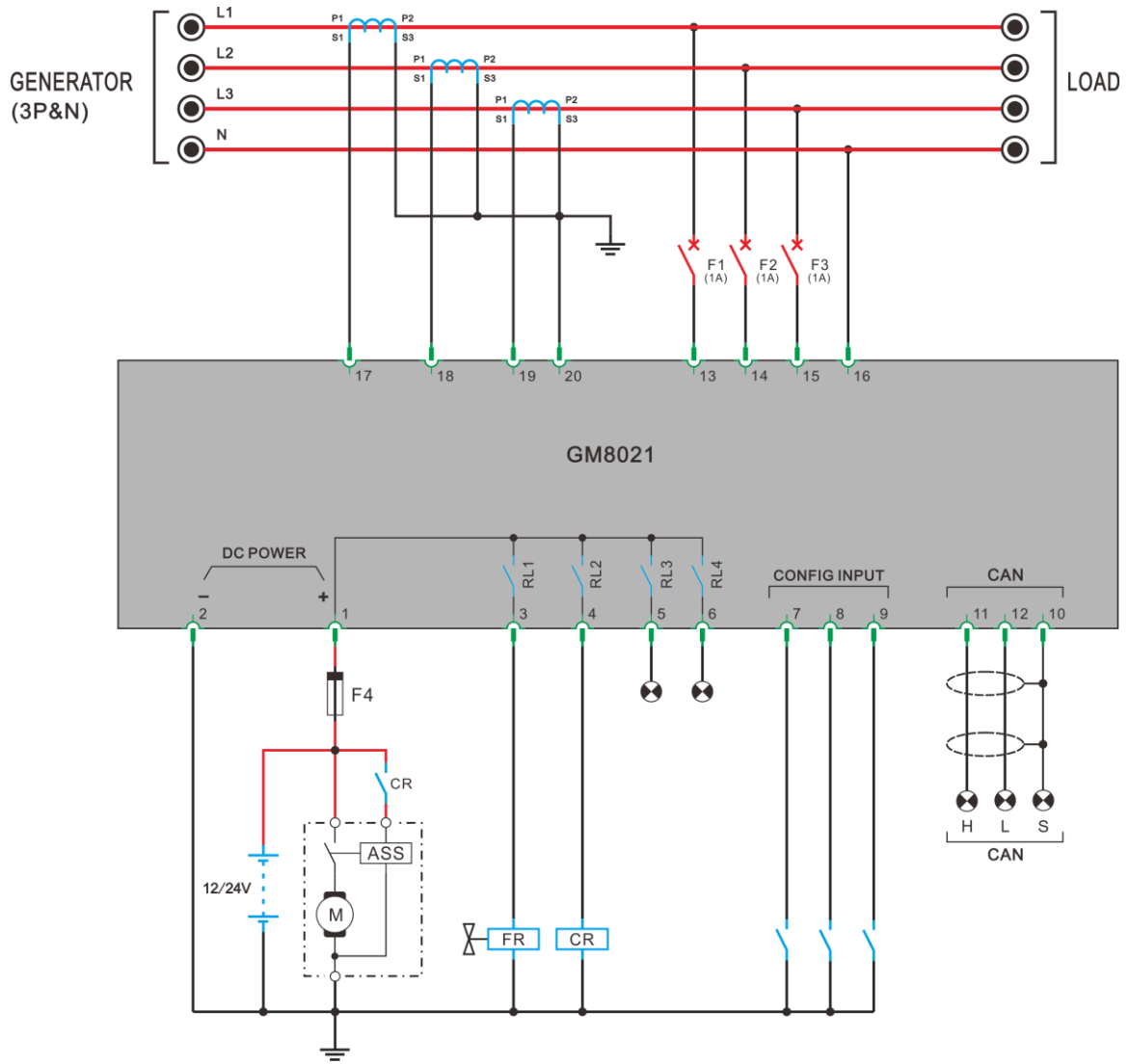
GM8021

Terminal	Function	Signal	Connection
1	Battery supply (+B)	12V/24V (8-35Vdc continuous)	2.5mm ²
2	Battery supply (-B)		2.5mm ²
3	Relay output 1	N.O. contact, 3A/30Vdc, defined (1)	1mm ²
4	Relay output 2	N.O. contact, 3A/30Vdc, defined (2)	1mm ²
5	Relay output 3	N.O. contact, 3A/30Vdc, defined (3)	1mm ²
6	Relay output 4	N.O. contact, 3A/30Vdc, defined (4)	1mm ²
7	D-Input 1	Defined (1)	1mm ²
8	D-Input 2	Defined (2)	1mm ²
9	D-Input 3	Defined (3)	1mm ²
10	S	ECU CAN communication port	Two-core shielded cable
11	H		
12	L		
13	GEN. VL1-N input	0-346Vac	1mm ²
14	GEN. VL2-N input	0-346Vac	1mm ²
15	GEN. VL3-N input	0-346Vac	1mm ²
16	GEN. Neutral		1mm ²
17	I1 Gen current input (S1)	0-5A	2.5mm ²
18	I2 Gen current input (S1)	0-5A	2.5mm ²
19	I3 Gen current input (S1)	0-5A	2.5mm ²
20	Comm. port for current inputs (S2)		2.5mm ²

2.3 Typical Wiring Diagram:
GM8020



GM8021








3 Panel Operation

The operation panel consists of 3 sections: LCD display indicating measurement parameters, LED indicator for common failure, and push buttons for Genset and selection of control modes.

LCD with 132x64pixels can display multi-line data in the same time. LCD also has a backlight so that the operator can clearly read information day or night. After pressing any button the backlight will automatically turn off after a preset time.

The LCD display and its control push buttons provide a friendly operational interface for the operator to easily control the Genset, read information and parameter setting.


Control buttons and LEDs

Function Description	Tag
<p>Scroll Button Scroll menu for parameters display Enter into or exit parameters setting by pressing and holding this button for 2sec.</p>	
<p>AUTO Mode Button This button controller operation mode, press this button repeatedly, can choose automatic mode and nonautomatic mode, when the LED indicator light on this button, the controller running in automatic mode. LCD display controller selected mode of operation.</p>	
<p>START Button/ "+" Value Increase The push button is used for manually start the Genset. When controller is running in MANUAL mode, press this button to start the generator. When in parameters setting mode, this button is used to increase value or scroll up menu.</p>	
<p>STOP / RESET Button / "-" Value Decrease The push button is used for manually stop the Genset. When controller is running in MANUAL mode, press this button to stop the generator. If failure occurs, press this button, the shutdown alarm lockout can be cleared. No matter what mode the controller is running, the "Stop" button is valid. In the "automatic" or other mode of operation, press and hold this button for 2sec to stop the generator, the controller automatically from other modes to manual mode. When executing the program in a shutdown of the generator set, press the button again, immediate shutdown and the cessation of associated control output. When in parameters setting mode, this button is used to decrease value or scroll down menu.</p>	
<p>Shutdown Alarm (FAILURE) LED The LED will illuminate when pre-alarm occurs. The LED will illuminate permanently when shutdown alarm occurs.</p>	

4 Control and Operation Instruction

The controller has a variety of control mode, the operator panel can be set to automatic mode and the non-automatic mode. Non-automatic mode there are two kinds of situations, such as no definable switch is set to "activate the test mode", for the manual operation mode; if a definable switch is set to "Enable Test Mode" and effective, then is test operation mode.

4.1 Operation Mode Setting:

Description	Action
Press the "AUTO" button, the LED is illuminated, the controller is running in "AUTO" mode. Press the "AUTO mode" button again, the LED is off, the controller is running in non-automatic operation mode.	



Note:

Controller keeps the states for the previous mode when changing the operation mode, then implements the control procedure of the next mode according to the present states.



Note:

If a defined panel lock switch input will not change the operating mode of the controller.

4.2 AUTO Control Sequence

The controller is running in "AUTO" mode.

Generator Auto Start Sequence:

Generator in the standby mode, only in the following situations occur, generator start-up program began:

- Definable input port for the remote control load a definition.
- Definable input port for the remote control no-load a definition.

The Start delay timer is activated, when it times out, the Preheat relay output is energised (if preheat function selected), the timer starts. When it times out, the fuel relay output is energised, and operates the fuel solenoid of the engine. After 300ms delay, the start relay output is energised, the start motor engages and begins to crank. When the engine speed reaches the crank cutout RPM, the start relay output is de-energised and the safety-on delay starts. When the safety-on times out, if the controller detects that the parameters of the Genset such as voltage, frequency, oil pressure, coolant temperature are normal, and no other failure is detected this indicates the Genset has successfully started and running normally. The LCD displays the Genset Measurement Parameters.

If you have selected idle function, the idle relay will be closed at the same time as the start relay is closed, the idle timer will begin counting down after successful crank, when it times out, the idle relay opens, other procedure is the same as above.



Note:

- When the engine is running at idle period, the controller does not detect the failure of low-voltage, low-frequency, low-speed and charging failure.
- When no one input port as defined as remote start, the "remote start" signal is not as boot judgment condition.



NOTE:

The start motor will power off while cranking if there are one of the following conditions occur:

- The generator's frequency reaches the preset value (configurable cranking cutout value);
- The AC engine speed reaches **crank cutout value**;
- Generator's voltage reaches the **crank cutout value** (optional);
- Cutout P-delay time's up (optional);
- Cranking time's up.

The controller can not implement crank procedure in one of the following conditions:

- A. The generator's frequency reaches the preset value (configurable cranking cutout value);
- B. The AC engine speed reaches **crank cutout value**;
- C. Generator's voltage reaches the **crank cutout value** (optional);
- D. Oil pressure switch is opened or oil pressure is higher than **crank cutout value** (optional).

**CAUTION:**

- If the control system does not use the speed sensor, that is, the engine cut off the signal from the generator frequency, must ensure that the generator in the process of turning, the output voltage is greater than the controller measure the voltage to avoid damage to the motor.

Repeat Start: During the crank period, if the engine can not ignite and controller will not output start signal during crank rest. Once crank rest timer times out the start relay energises once again and will attempt to start engine again. The above procedure will be repeated until engine successfully ignites or reaches the preset number of crank attempt.

If any shutdown alarm occurs during operation, controller will stop the control output immediately, and the Genset only can be restarted after clearing the failure and reset.

Start Failure: When the procedure above repeats again and again and reaches the preset number of crank attempt, the crank relay output is then de-energised. The failure LED illuminates and the LCD displays fail to start.

**CAUTION:**

- If fail to start occurs, operator must check the whole Genset system to find out failure reason, only after clearing the failure can press "reset button to relieve fault lock out status, and restart the genet.

Power supply process:

When the generator running, the generator voltage and frequency reaches to the the generation load voltage and power generation with load frequency, power generation delay timer is started, time's up, the GCB relay closure outputs, the transfer switch power generation side switch is closed, power supply.

Generator unloading and shutdown process

Under the following conditions, the controller sends the generator uninstall command:

- Loading remote signal of definable input port is invalid.

In GOB, cooling delay began to countdown , when it times out, the controller fuel relay action, immediately disconnect the fuel solenoid ,into standby generator.

Stop Failure: When cool down times out, the fuel relay action and the timer for stop delay begins. If the controller detects that the voltage of the generator is greater than the cutout values, or the speed is greater than the RPM, or the oil pressure switch is off, or the oil pressure is greater than the crank cutout oil pressure, the failure LED illuminates and the LCD displays **Fail to stop**.

**NOTE:**

- After stop failure occurs and the generator can not be started unless it is removed and reset .

4.3 MAN control Sequence

The controller is running in “MANUAL” mode.

Generator starting sequence:

Pressing “START” button the fuel relay action, and open the fuel solenoid of engine. After 300ms delay, the start relay closed output, the start motor engages and begins to crank, When the engine speed reaches the crank cutout RPM, the controller output is de-energised and the safety-on delay starts. When the safety-on times out, if the controller detects that the parameters of the genset such as voltage, frequency, oil pressure, coolant temperature are normal, and no other failure is detected this indicates the Genset has successfully started and running normally. The LCD displays the Genset Measurement Parameters.

Generator opening and stopping sequence:

Press “STOP” button, GCB relay opens, the generator is unload, the cool down timer starts, disconnect when it times out , the fuel relay action, disconnect the fuel solenoid immediately, generator stops and goes to standby status.

If press “STOP” button again during cool down period, generator stops immediately without cool down time.

4.4 Start and stop sequence of engine whose fuel solenoid is N.O.type:

There are two kinds of fuel solenoids for an engine, one is N.C. type, the valve of this solenoid is closed when the engine is in standby and it can be opened by switching on power; another is N.O. type, the valve of this solenoid is opened when engine is in standby and it can be closed by switching on power. All control sequences above are for N.C. type.

Start control sequence for N.O. type:

During the starting sequence the fuel relay of controller will not energise, fuel solenoid is no power, fuel solenoid open by the fuel solenoid to no-activate.

Stop control sequence for N.O. type:

During the stop sequence, the fuel relay energises, fuel solenoid is on power, the fuel solenoid action, the solenoid closed and the engine begins to stop. After a delay (same as Stop delay) fuel relay disconnect, disconnecting the supply from the fuel solenoid.

Other control sequences are same as engine whose fuel solenoid is N. C. type.

4.5 Idle function:

For **idle** function set one of the configurable outputs as **idle**.
Refer to the flow chart for start and stop for idle control flows.



NOTE:

- Controller will not detect under voltage, under frequency, under speed, and charge failure during idle period.

4.6 Preheat function:

For preheat function, one of the configurable outputs as **Preheat**, the controller has 5 type selectable preheat control modes as below:

Mode 1 — during preheat time, preheat relay closure output.

Mode 2 — during preheat time, preheat relay closure output until the successful ignition.

Mode 3 — during preheat time, preheat relay closure output until safety-on delay times out.

Mode 4 — one of the configurable inputs is defined as **Preheat**, preheat relay closure output when this configurable input is active, and disconnect when configurable input is inactive.

Mode 5 — the temperature measurement value from the T-sensor port is used as the preheat control signal. When the temperature measured by the controller is lower than the preheated Preheat ON value, the preheat relay closes the output until the temperature reaches the Preheat OFF value, the preheat relay is disconnected.

For preheat mode 1 to 3, please refer to the flow chart for start and stop for **Preheat** control flows.

For preheat mode 4 to 5, preheat function is active immediately when the controller is switched on power.

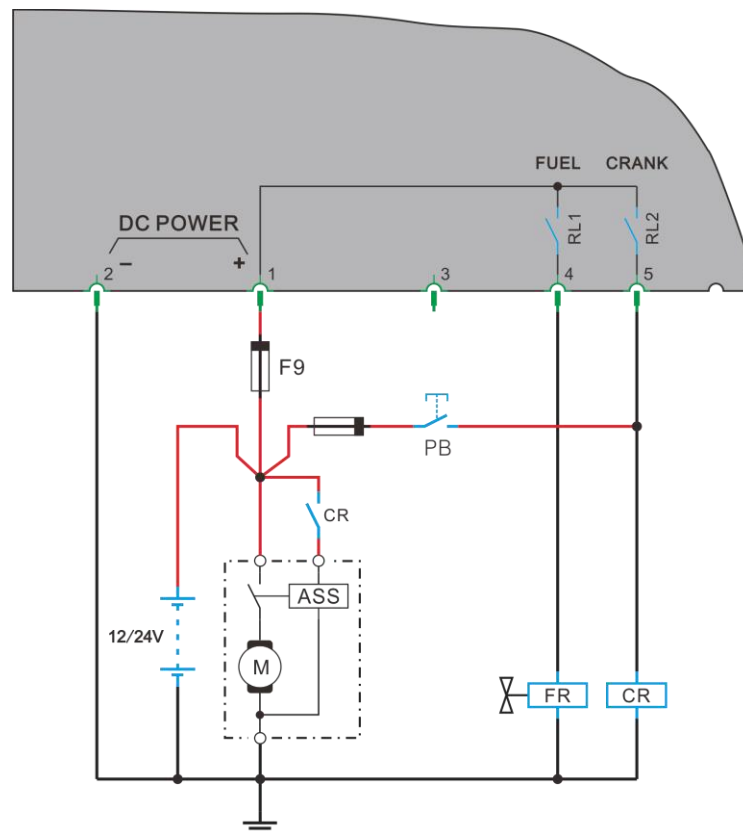
During crank period, the preheat relay output will not energise in any of above modes.

4.7 The function of forcing start:

Reason to add this function to the controller is that when the engine under abnormal conditions, e.g. the battery voltage is too low or ambient temperature is too low, or generator only outputs voltage at a high speed when magnetic pick-up is not used, the Genset cannot be started successfully when it implements the build-up cranking process of controller. There are 2 methods to solve these conditions in the controller:

Method 1: In manual mode, press the "Start" button, the controller crank relay closes output, the maximum closing time does not exceed the preset crank time. To extend the crank time, press the "Start" button continuously without changing the relevant parameters, depending on the duration of the hold button. After successfully crank, the safety monitoring delay time starts, and the procedure and protection is followed.

Method 2: In manual mode, set the parameter "EX. Crank permit" to "1" and add a switch PB to the control circuit as shown below. When the speed is up to 150RPM, the engine crank, if the speed sensor is not used, the generator voltage $\geq 20\text{VAC}$, the controller function is triggered, the throttle relay output, when the speed reaches the crank cutout RPM, the safety monitoring delay timer Start, after the procedures and protection is normal. If in the safety monitoring time, the engine speed is lower than 150RPM, the controller reset, re-enter the standby state.



CAUTION:

- We normally don't recommend using the method 2
- Pay attention to the installation of PB switch to avoid cranking when the Genset is running.

5 Measure and Display Data

Gen V_{Ph-N} **L1-N L2-N L3-N**

Gen V_{Ph-Ph} **L1-L2 L2-L3 L3-L1**

Gen frequency **Hz** (L1)

Gen 3 phases current **I1 I2 I3**

Gen 3 phases apparent power **KVA AL1 AL2 AL3 ΣA**

Gen 3 phases active power **KW PL1 PL2 PL3 ΣP**

Gen 3 phases reactive power **KVAr QL1 QL2 QL3 ΣQ**

Gen 3 phases power factor **PFL1 PFL2 PFL3 PF (AV)**

Engine speed **RPM** (signal derived from magnetic pick-up or generator Hz or ECU)

Engine oil pressure **Bar / PSI** (signal from engine LOP sensor or ECU)

Engine coolant temperature **°C/°F** (signal from engine HET sensor or ECU)

Battery voltage **Vdc**

Genset Running hour **Hour**

6 Pre-alarm and Shutdown Alarm

Controller to configure different levels of alarm, according to actual application requirements for each limit beyond the protection function is triggered and control procedures to be configured, different grade configuration table is as follows:

Alarm level	Screen display	"Warning" LED flash Sound sirens	Power generation load switch GCB disconnect	"Fault" LED illuminate Close generators
A1 Silence Warning	Y	N	N	N
	Warning: This warning is not to interrupt the operation of equipment, do not issue public alarm, the screen displays a warning content, except relay action is defined as trigger a warning, without any other control behavior. Related events recorded in the event log.			
A2 Voice and light Warning	Y	Y	N	N
	Warning: This warning is not to interrupt the operation of equipment, Public Warning "LED lights lit and sound the alarm, the screen displays a warning content, except is defined trigger a warning relay action, without any other control behavior. Related events recorded in the event log.			
A3 Unload Warning	Y	Y	Soft Uninstall	N
	Warning: Public "Warning "LED illuminate and sound the alarm, the controller performs the uninstall program, the screen displays a warning content and trigger a defined warning relay action generator without stopping the machine. Related events recorded in the event log.			
B1 Unload Shutdown	Y	Y	Soft Uninstall	Cooling timing
	Shutdown failure: public "fault" LED illuminate and sound the alarm rang, the controller performs the uninstall program, opening, the generator cooling down, the screen displays the content of the fault and the program process information. Related events recorded in the event log. Troubleshooting, fault reset, and can be re-operations unit.			
B2 Cooling Shutdown	Y	Y	Immediately	Cooling timing
	Shutdown failure: public "fault" LED illuminate and sound the alarm, real-time sub-gate generator cooling down, the screen displays the fault content and program process information. Related events recorded in the event log. Troubleshooting, fault reset, and can be re-operations unit.			
B3 Immediately Shutdown	Y	Y	Immediately	Immediately
	Shutdown failure: public "fault" LED illuminate and sound the alarm, real-time sub-gate, immediate shutdown generator, the screen displays the fault content. Related events recorded in the event log. Troubleshooting, fault reset, and can be re-operations unit.			
Control	N	N	N	N
	Control: only as a control condition to trigger related control command.			



Note:

- Warning is a non-serious fault state, temporarily do not constitute a hazard to the generator system, but to remind the operator not to meet the requirements of the situation and timely solution to ensure continuous operation of the system. When the warning occurs, the warning indicator immediately, the fault is not locked, the unit does not stop, once the failure to remove the warning automatic release.
- Genset shutdown after the shutdown failure, fault status locked when the fault is cleared, and then press the reset button, fault lock before lifting.

7 Parameters Setting

7.1 SYSTEM

NO.	Items	Setting Range	Preset
1.0	Quit		
1.1	Language		
1.2	Password	0000 to 9999	
1.3	Pressure unit	0Bar/1PSI	0
1.4	Temperature unit	0°C/1°F	0
1.5	Comm. address	1 to 247	1
1.6	Startup mode	0 Man/1 Auto/ 2 Last	0
1.7	CT ratio	5:5 to 30000:5	1000:5
1.8	PT ratio	1.0:1 to 100.0:1	1.0:1
1.9	Rated voltage	45 to 30000VAC	230
1.10	Rated current	1 to 30000A	1000
1.11	Rated active power	1 to 16000KW	500
1.12	Voltage type	1 to 5 / not used	1
1.13	Display contrast	1 to 9%	5
1.14	Auto scroll time	1 to 60s / not used	not used
1.15	Starting alarm	0 N/1 Y	0
1.16	CB close pulse	1 to 60s/0 Continuous	Continuous
1.17	Reset to MAN	0 N/1 Y	0
1.18	Default settings		
1.19	Firmware Update		

Menu descriptions:

Language

- Used to select the Language which is displayed on the LCD。

Password

- There are 3 levels of password (CL0/CL1/CL2) for different users.
- CL0 for the operator, who can read parameters, start and stop controller. The default setting is no password.
- CL1 for the technician, who has the authority of CL0 and can modify all parameters, the default setting is "1111".
- CL2 for factory, who have the authority of CL1 and Firmware update, the default setting as "2222".
- All passwords are automatically inactive 60 seconds after exiting menu.

Pressure unit

- Used to define oil pressure unit which is displayed on the LCD. "0" stand for Bar, "1" stand for PSI.
- Transfer formula: $P[\text{psi}] = P[\text{bar}] * 14.503$.

Temperature unit

- Used to define temperature unit which is displayed on the LCD. "0" stand for °C, "1" stand for °F.
- Transfer formula: $T[°F]=(T[°C]*1.8)+32$.

Comm. address

- Used to configure ID address for MODBUS.
- Each controller on the same MODBUS has a unique communication address.

Startup mode

- Used to configure the Startup mode of controller when it is powered up.
- When parameter is configured as "0", the controller will be in Manual mode when it is powered up.
- When parameter is configured as "1", the controller will be in Automatic mode when it is powered up.
- When parameter is configured as "2", the controller will be in the mode which is the same as last time when it is powered up.

CT Ratio

- The current is derived from CT on generator or load. Secondary current on CT is fixed at 5A.
- Used to calculate for GEN or load: A, KVA, KW, KVA_r, PF, KWh, KVA_rh.
- Used to set the limit trigger: overcurrent, overload , etc.

PT Ratio

- Definition Gen and Mains Voltage PT ratio of the primary and secondary.
- Used to calculate for GEN: V, HZ, KVA, KW, KVA_r, PF, KWh, KVA_rh.
- Used to set the limit trigger:: high / low voltage, overload ,etc.

Rated voltage

- For the definition of the power generation and mains rated voltage.
- As a reference value for high / low voltage.

Rated current

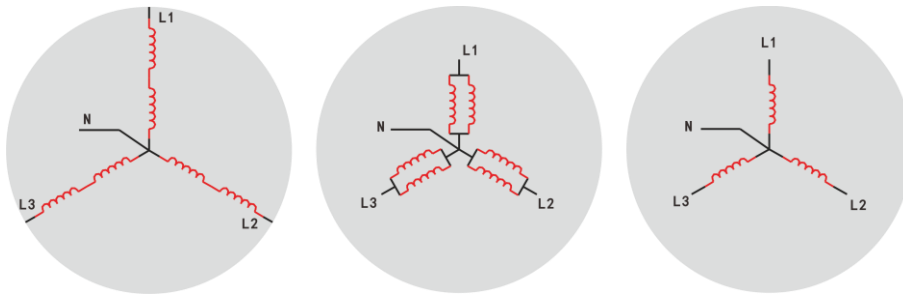
- Used to define the generator and mains rated current.
- As a reference value for overcurrent limit.

Rated active power

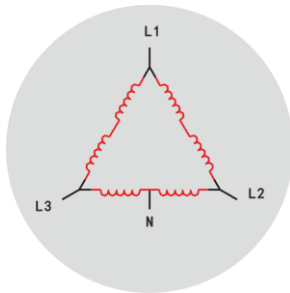
- Definition generator rated active power.
- As the reference value of the active power value judgment.

Voltage type

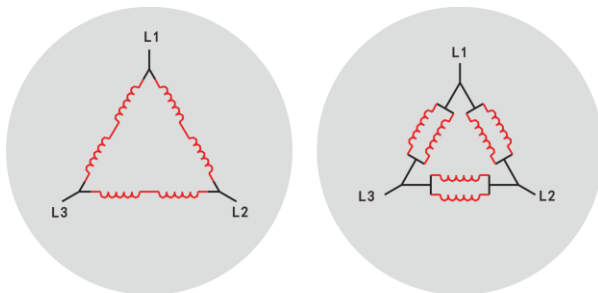
- There are 5 voltage types: "Y"3P4W, "Δ"3P4W, 3P3W, 2P3W, 1P2W.
- "Y"3P4W (Star three-phase four-wire)



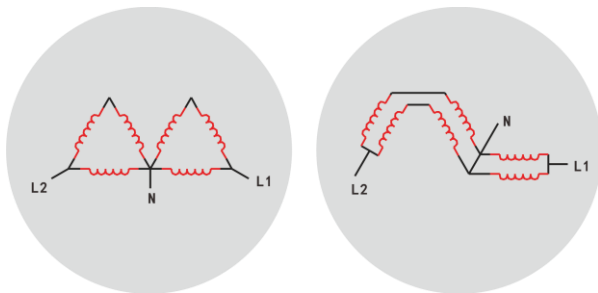
- “Δ”3P4W (Angle three-phase four-wire)



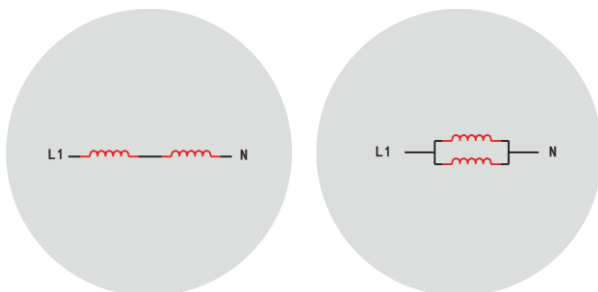
- 3P3W (Three-phase three-wire)



- 2P3W (Two-phase three-wire)



- 1P2W (One-phase two-wire)




- When the parameter is set to " not use", the controller does not measure, not show the generation of electrical data.

Display contrast

- Used to adjust the controller LCD display contrast.

Auto scroll time

- Use to setting the interval of LCD screen display scroll page, any button will start auto scroll page after 30 seconds.
- When the parameter is set to " not use" Press "" Manually scroll.

Starting alarm

- When the parameter is set to "0", the controller will not audible alarm before the generator set start.
- When the parameter is set to "1" in the automatic operation mode, to start the generator set during the start-up delay and the warm-up, an audible alarm.

CB close pulse

- When the parameter is set to "continuous", the closing relay of the controller will continuously output ,unless controller failure or tripping command.
- When the parameter is set to "value", after the controller sends a close command , closing relay closure outputs, the timer starts, when the accumulated reaches to set the pulse time, closing relay disconnect.

Reset to MAN

- When the parameter is set to "1", the controller shutdown fault, fault condition lock. When the fault is cleared, press the reset button on the panel, however the controller before in any control mode are automatically switched to manual operation mode.
- When the parameter is set to "0", the controller shutdown fault, fault condition lock. When the fault is cleared, press the reset button on the panel, the controller keep before control mode.

**Warning:**

When the "reset to manual mode" parameter is set to "0" before is in automatic operation mode, press the fault reset key, in the case of other generators open condition is satisfied, generator sets may be started in no warning.

Default settings

- Parameters returned to the factory default.

Firmware Update

- Used for the controller is set to online programming mode, after enter the 30 seconds will automatically exit if the upgrade not proceed.
- Must enter CL2 (Factory) permission password is "2222".
- Before electrify, press and hold the stop button (or scroll page) can quickly enter the mode.
- After the upgrade you need to restart the controller.

7.2 GENERATOR

NO.	Parameter	Setting range	Preset
2.0	Quit		
2.1	GEN V-monitor type	0 ph-ph/1 ph-n	1
2.2	GEN-V under 1		
	Function	0 N/1 Y	1
	Limit	20 to 200%	90%
	Delay	0 to 999s	5s
	Delay by	0 to 3	3
	ALM. class	0 to 6	2
2.3	GEN-V under 2		
	Function	0 N/1 Y	0
	Limit	20 to 200%	85%
	Delay	0 to 999s	5s
	Delay by	0 to 3	3
	ALM. class	0 to 6	3
2.4	GEN-V over 1		
	Function	0 N/1 Y	1
	Limit	20 to 200%	115%
	Delay	0 to 999s	5s
	Delay by	0 to 3	3
	ALM. class	0 to 6	2
2.5	GEN-V over 2		
	Function	0 N/1 Y	1
	Limit	20 to 200%	120%
	Delay	0 to 999s	5s
	Delay by	0 to 3	3
	ALM. class	0 to 6	3
2.6	GEN-Hz under 1		
	Function	0 N/1 Y	1
	Limit	10.0 to 500.0Hz	48.0Hz
	Delay	0 to 999s	5s
	Delay by	0 to 3	3
	ALM. class	0 to 6	2
2.7	GEN-Hz under 2		
	Function	0 N/1 Y	0
	Limit	10.0 to 500.0Hz	45.0Hz
	Delay	0 to 999s	5s
	Delay by	0 to 3	3
	ALM. class	0 to 6	3
2.8	GEN-Hz over 1		
	Function	0 N/1 Y	1
	Limit	10.0 to 500.0Hz	55.0Hz
	Delay	0 to 999s	5s
	Delay by	0 to 3	3
	ALM. class	0 to 6	2

2.9	GEN-Hz over 2		
	Function	0 N/1 Y	1
	Limit	10.0 to 500.0Hz	57.0Hz
	Delay	0 to 999s	5s
	Delay by	0 to 3	3
	ALM. class	0 to 6	3
2.10	GEN-I over 1		
	Function	0 N/1 Y	1
	Limit	50 to 300%	110%
	Delay	0 to 999s	5s
	Delay by	0 to 3	3
	ALM. class	0 to 6	2
2.11	GEN-I over 2		
	Function	0 N/1 Y	1
	Limit	50 to 300%	115%
	Delay	0 to 999s	5s
	Delay by	0 to 3	3
	ALM. class	0 to 6	3
2.12	GEN-KW over 1		
	Function	0 N/1 Y	1
	Limit	20 to 200%	110%
	Delay	0 to 999s	5s
	Delay by	0 to 3	3
	ALM. class	0 to 6	2
2.13	GEN-KW over 2		
	Function	0 N/1 Y	1
	Limit	20 to 200%	120%
	Delay	0 to 999s	5s
	Delay by	0 to 3	3
	ALM. class	0 to 6	3
2.14	Phase rotation		
	Function	0 N/1 Y	1
	Phase rotation	CW(+)/CCW(-)	CW
	Delay	0 to 999s	5s
	Delay by	0 to 3	3
	ALM. class	0 to 6	3
2.15	GCB close		
	Function	0 N/1 Y	0
	Delay	0 to 999s	5s
	ALM. class	0 to 6	2
2.16	GCB open		
	Function	0 N/1 Y	0
	Delay	0 to 999s	5s
	ALM. class	0 to 6	2
2.17	GEN. loading Volt	20 to 200%	90%
2.18	GEN. loading Hz	10.0 to 100.0Hz	48.0Hz
2.19	GEN. on delay	0 to 9999s	5s
2.20	Test mode	0 unload /1 Load	0
2.21	Soft unload time	1 to 9999s	1s

Menu descriptions:**GEN V-monitor type**

- Use to select a controller in **ph - ph** voltage or **ph - n** voltage as monitoring object.
- In different voltage input type, select "phase - phase" or "phase - zero" , monitoring voltage is different, specifically in the following table:

Parameter Voltage type	Ph - ph	Ph - N
“Y” 3P4W	$V_{L1-L2}, V_{L2-L3}, V_{L3-L1}$	$V_{L1-N}, V_{L2-N}, V_{L3-N}$
“△” 3P4W	$V_{L1-L2}, V_{L2-L3}, V_{L3-L1}$	$V_{L1-N}, V_{L2-N}, V_{L3-N}$
3P3W	$V_{L1-L2}, V_{L2-L3}, V_{L3-L1}$	
2P3W	V_{L1-L2}	V_{L1-N}, V_{L2-N}
1P2W		V_{L1-N}

GEN-V under 1&2

- Controller provides two levels of low-voltage limit monitoring for users to choose for warning, fault shutdown and control. If you select 1/2/3 alarm level, when the protection function triggered , LCD screen displays "! W: GEN-V under 1" or "! W: GEN-V under 2"; if select 4/5/6 alarm level , when protection function triggered, LCD screen displays "! A: GEN-V under 1" or "! A: GEN-V under 2 ".

Function	Select "Y", the monitoring function is active; Select "N", the monitoring function is invalid.
Limit	Used to define low-voltage protection threshold. When the generated voltage reaches or falls below this threshold, lasts time longer than the delay time, the define operation of alarm levels are triggered.
Delay	If the generation low voltage exceeds the value of the delay time set, the define operation of alarm levels are triggered; if low voltage higher than the voltage limit in the delay before termination, the delay time is set to zero.
Delay by	Defined time range of effective monitoring function: Set (0): always effective; Set (1): starting from crank, monitoring effectively at the same time Set (2): from safety supervision delay time over, start effective Set (3): after running ,start effectively
ALM. class	Used to define the protection is triggered, and what is the controller will do. Details refer to the alarm level configuration table.

GEN-V over 1&2

- Controller provides two levels of high-voltage limit monitoring for users to choose for warning, fault shutdown and control. If you select 1/2/3 alarm level when the protection function triggered, LCD screen displays "!W:GEN-V over 1" or "!W:GEN-V over 2"; if select 4/5/6 alarm level when protection function triggered, LCD screen display "!A:GEN-V over 1" or "!A:GEN-V over 2".

Function	Select "Y", the monitoring function is active; Select "N", the monitoring function is invalid.
Limit	Used to define high voltage protection threshold. When the generated voltage reaches or is higher than this threshold, lasts time longer than the delay time, the define operation of alarm levels are triggered.
Delay	If the generation high voltage exceeds the value of the delay time set, the define operation of alarm levels are triggered; if high voltage is below the voltage limit in the delay before termination, the delay time is set to zero.
Delay by	Defined time range of effective monitoring function: Set (0): always effective; Set (1): starting from crank, monitoring effectively at the same time; Set (2): from safety supervision delay time over, start effective; Set (3): after running ,start effectively.
ALM. class	Used to define the protection is triggered, and what is the controller will do. Details refer to the alarm level configuration table.

GEN-Hz under 1&2

- Controller provides two levels of low-frequency limit monitoring for users to choose for warning, fault shutdown and control. If you select 1/2/3 alarm level when the protection function triggered, LCD screen displays "!W:GEN-Hz under 1" or "!W:GEN-Hz under 2"; if select 4/5/6 alarm level when protection function triggered, LCD screen display "!A:GEN-Hz under 1" or "!A:GEN-Hz under 2".

Function	Select "Y", the monitoring function is active; Select "N", the monitoring function is invalid.
Limit	Used to define low frequency protection threshold. When the generated frequency reaches or falls below this threshold, lasts time longer than the delay time, the define operation of alarm levels are triggered. This parameter set compatible with 400 hz intermediate frequency system, 50/60 hz system reference range are set.
Delay	If the generation low frequency exceeds the value of the delay time set, the define operation of alarm levels are triggered; if low frequency higher than the frequency limit in the delay before termination, the delay time is set to zero.
Delay by	Defined time range of effective monitoring function: Set (0): always effective; Set (1): starting from crank, monitoring effectively at the same time; Set (2): from safety supervision delay time over, start effective; Set (3): after running ,start effectively.
ALM. class	Used to define the protection is triggered, and what is the controller will do. Details refer to the alarm level configuration table.

GEN-Hz over 1&2

- Controller provides two levels of high-frequency limit monitoring for users to choose for warning, fault shutdown and control. If you select 1/2/3 alarm level when the protection function triggered, LCD screen displays "!W:GEN-Hz over 1" or "!W:GEN-Hz over 2"; if select 4/5/6 alarm level when protection function triggered, LCD screen display"!A:GEN-Hz over 1"or"!A:GEN-Hz over 2"..

Function	Select "Y", the monitoring function is active; Select "N", the monitoring function is invalid.
Limit	Used to define high frequency protection threshold. When the generated frequency reaches or is higher than this threshold, lasts time longer than the delay time, the define operation of alarm levels are triggered. This parameter set compatible with 400 hz intermediate frequency system, 50/60 hz system reference range are set.
Delay	If the generation high frequency exceeds the value of the delay time set, the define operation of alarm levels are triggered; if high frequency is below the frequency limit in the delay before termination, the delay time is set to zero.
Delay by	Defined time range of effective monitoring function: Set (0): always effective; Set (1): starting from crank, monitoring effectively at the same time; Set (2): from safety supervision delay time over, start effective; Set (3): after running ,start effectively.
ALM. class	Used to define the protection is triggered, and what is the controller will do. Details refer to the alarm level configuration table.

GEN-I over 1&2

- Controller provides two levels of overcurrent limit monitoring for users to choose for warning, fault shutdown and control. If you select 1/2/3 alarm level when the protection function triggered, LCD screen displays "!W:GEN-I over 1" or "!W:GEN-I over 2"; if select 4/5/6 alarm level when protection function triggered , LCD screen displays"!A:GEN-I over 1" or"!A:GEN-I over 2".

Function	Select "Y", the monitoring function is active; Select "N", the monitoring function is invalid.
Limit	Used to define overcurrent protection threshold. When the generated current reaches or is higher than this threshold, lasts time longer than the delay time, the define operation of alarm levels are triggered.
Delay	If the generation overcurrent exceeds the value of the delay time set, the define operation of alarm levels are triggered; if overcurrent is below the current limit in the delay before termination, the delay time is set to zero.
Delay by	Defined time range of effective monitoring function: Set (0): always effective; Set (1): starting from crank, monitoring effectively at the same time; Set (2): from safety supervision delay time over, start effective; Set (3): after running ,start effectively.
ALM. class	Used to define the protection is triggered, and what is the controller will do. Details refer to the alarm level configuration table.

GEN-KW over 1&2

- Controller provides two levels of overload monitoring for users to choose for warning, fault shutdown and control. If you select 1/2/3 alarm level when the protection function triggered, LCD screen displays "!W:GEN-KW over 1" or "!W:GEN-KW over 2"; if select 4/5/6 alarm level when protection function triggered, LCD screen displays "!A:GEN-KW over 1" or "!A:GEN-KW over 2".

Function	Select "Y", the monitoring function is active; Select "N", the monitoring function is invalid.
Limit	Used to define overload protection threshold. When the generated power reaches or is higher than this threshold, lasts time longer than the delay time, the define operation of alarm levels are triggered.
Delay	If the generation overload exceeds the value of the delay time set, the define operation of alarm levels are triggered; if overload is below the current limit in the delay before termination, the delay time is set to zero.
Delay by	Defined time range of effective monitoring function: Set (0): always effective; Set (1): starting from crank, monitoring effectively at the same time; Set (2): from safety supervision delay time over, start effective; Set (3): after running ,start effectively.
ALM. class	Used to define the protection is triggered, and what is the controller will do. Details refer to the alarm level configuration table.

Phase rotation

- Voltage phase sequence according to clockwise and counterclockwise directions at different division, clockwise as "L1-L2-L3", to "CW" indicates; counterclockwise direction as "L1-L3-L2", to "CCW" indicates. The controller detects the voltage phase sequence measurement, if the control is set clockwise phase sequence and measured counterclockwise, or control settings and measured counterclockwise to clockwise, the protection function is triggered, LCD screen displays " failure: phase sequence mismatch ".

Function	Select "Y", the monitoring function is active; Select "N", the monitoring function is invalid.
Phase rotation	"0 CW" clockwise, the voltage sequence direction is "L1-L2-L3"; "1 CCW" counterclockwise, the voltage sequence direction is "L1-L3-L2".
Delay	If the phase sequence does not match the set definition value and exceeds the set delay time value, the action defined by the alarm level is triggered
Delay by	Defined time range of effective monitoring function: Set (0): always effective; Set (1): starting from crank, monitoring effectively at the same time; Set (2): from safety supervision delay time over, start effective; Set (3): after running ,start effectively.
ALM. class	Used to define the protection is triggered, and what is the controller will do. Details refer to the alarm level configuration table.

GCB close

- Controller can closing monito the GEN load switch for warning, fault shutdown and control. If you choose to 1/2/3 alarm level when the protection function triggered, LCD screen displays "!W:GCB close"; If you choose to 4/5/6 alarm level when protection function, LCD screen displays"!A:GCB close".

Function	Select "Y", the monitoring function is active; Select "N", the monitoring function is invalid.
Delay	When generator sended the GEN closing command, the delay timer starts to timing when the timer ends, the GEN load switch has not been closed or keep in the state of GEN closing switch command, the switch off, and the define operation of alarm levels are triggered.
ALM. class	Used to define the protection is triggered, and what is the controller will do. Details refer to the alarm level configuration table.

GCB open

- Controller can load switch of the power generation sub-gate monitoring, for users to choose for warning downtime and control. If you choose to 1/2/3 alarm level protection function triggered LCD screen displays "!W:GCB open"; such as select 4/5/6 alarm levels trigger protection function, the LCD screen displays "!A:GCB open".

Function	Select "Y", the monitoring function is active; Select "N", the monitoring function is invalid.
Delay	When generator sended the GEN opening command, the delay timer starts to timing when the timer ends, the GEN load switch has not been opened or keep in the state of GEN opening switch command, the switch close, and the define operation of alarm levels are triggered.
ALM. class	Used to define the protection is triggered, and what is the controller will do. Details refer to the alarm level configuration table.



Note:

To make the monitoring function of the GEN closing and opening effectively, must satisfy at the same time :

- One of the relay is defined as " GEN closing / opening";
- One of D-input is defined as " GEN closing auxiliary contacts.

GEN. loading Volt

- Used to define the voltage threshold of GEN can closing power supply.

GEN. loading Hz

- Used to define the frequency threshold of GEN can closing power supply.

GEN. on delay

- Used to set the delay time of the GEN auto closing power supply from load conditions are satisfy.

Test mode

- Use for controller in the test mode, select the control function.
- When the parameter is set to "0", the controller is running in test mode, generator running, the transfer switch not convert, mains continue to supply, and the generator unload running; When the parameter is set to "1", the control runs in test mode, generator running, the transfer switch conversion, and power supply.

Soft unload time

- When the trigger alarm level is "3" shutdown fault, soft unload time start to timing ,and after the timing, GCB load switch opening.

7.3 ENGINE

No.	Parameter	Setting range	Preset
3.0	Quit		
3.1	Engine type	1 Diesel /2 ECU/3 Gas	1
3.2	ECU type	1 to 20	4
3.3	Engine rated speed	99 to 9999RPM	1500
3.4	MPU input	0 N/1 Y	0
3.5	Fly wheel teeth	5 to 300	120
3.6	Set pickup now		
3.7	Pair of poles	1 to 20	2
3.8	Fuel mode	0 N.C/1 N.O	0
3.9	Start delay	0 to 999s	10s
3.10	Crank attempts	1 to 10	3
3.11	Critical C-attempt	1 to 20 times	6 times
3.12	Crank time	1 to 99s	5s
3.13	Crank time add	1 to 99s / not used	not used
3.14	Crank pause time	1 to 300s	15s
3.15	Ignition speed	1 to 9999 RPM	200RPM
3.16	Ignition start DLY	0 to 999s	5s
3.17	Gas valve on DLY	0 to 999s	5s
3.18	Crank cutout RPM	1 to 9999 RPM	300RPM
3.19	Crank cutout volt	1 to 100% / not used	85%
3.20	Crank cutout Oil-P	0.1 to 150.0Bar/PSI / not used	2.2 Bar
3.21	Crank cutout P-DLY	1 to 60s / not used	not used
3.22	Idle time	1 to 9999s / not used	not used
3.23	Pre-heat mode	1 to 6	1
3.24	Pre-heat time	1 to 9999s / not used	3s
3.25	Safety-on delay	0 to 600s	10s
3.26	Cool down mode	0 Full speed /1 Idle	1
3.27	Cool down time	0 to 9999s	300s
3.28	Stop time	0 to 60s	20s
3.29	EX. Crank permit	0 N/1 Y	0
3.30	Pickup signal		
	Function	0 N/1 Y	1
	Delay	0 to 999s	1s
	Delay by	0 to 3	1
	ALM. class	0 to6	2
3.31	Overspeed level1		
	Function	0 N/1 Y	1
	Limit	1 to 9999 RPM	1600 RPM
	Delay	0 to 999s	1s
	Delay by	0 to 3	1
	ALM. class	0 to 6	2
3.32	Overspeed level2		
	Function	0 N/1 Y	1
	Limit	1 to 9999 RPM	1710 RPM
	Delay	0 to 999s	0s
	Delay by	0 to 3	1
	ALM. class	0 to 6	6

3.33	Underspeed level1		
	Function	0 N/1 Y	1
	Limit	1 to 9999 RPM	1440RPM
	Delay	0 to 999s	5s
	Delay by	0 to 3	3
	ALM. class	0 to 6	2
3.34	Underspeed level2		
	Function	0 N/1 Y	0
	Limit	1 to 9999 RPM	1350 RPM
	Delay	0 to 999s	5s
	Delay by	0 to 3	3
	ALM. class	0 to 6	3
3.35	Start failure		
	Function	0 N/1 Y	1
	ALM. class	0 to 6	6
3.36	Stop failure		
	Function	0 N/1 Y	1
	ALM. class	0 to 6	3
3.37	Batt. Overvolt		
	Function	0 N/1 Y	1
	Limit	1.0 to 40.0 V	35.0 V
	Delay	0 to 999s	1s
	Delay by	0 to 3	0
	ALM. class	0 to 6	2
3.38	Batt. Undervolt		
	Function	0 N/1 Y	1
	Limit	1.0 to 40.0 V	8.0 V
	Delay	0 to 999s	1s
	Delay by	0 to 3	0
	ALM. class	0 to 6	2
3.39	Maintenance		
	Function	0 N/1 Y	0
	Limit	0 to 9999 Hours	1000
	ALM. class	0 to 6	2
3.40	ECU Data fail		
	Function	0 N/1 Y	1
	Delay	0 to 999s	30s
	Delay by	0 to 3	3
	ALM. class	0 to 6	2
3.41	ECU Warning		
	Function	0 N/1 Y	1
	Delay	0 to 999s	5s
	Delay by	0 to 3	3
	ALM. class	0 to 6	2
3.42	ECU Shutdown		
	Function	0 N/1 Y	1
	Delay	0 to 999s	5s
	Delay by	0 to 3	3
	ALM. class	0 to 6	6

3.43	Water in fuel		
	Function	0 N/1 Y	0
	Delay	0 to 999s	30s
	Delay by	0 to 3	3
	ALM. class	0 to 6	2

Menu description:**Engine type**

- Used to select the controller controls the object type of engine.
- When the parameter is set to "1", is a traditional diesel engine;
- When the parameter is set to "2", is used ECU of the engine; (要使用 ECU 功能还需相应硬件支持, 只适用于 **GM8021**) 缺此翻译
- When the parameter is set to "3", is a conventional gas engine.
- When the control object is ECU engine, the controller will be activated "ECU warning", "ECU fault shutdown", " ECU data failure" and "oil inlet water" protection function at the same time.
- Diesel engine:

Starting sequence:

Start-up delay start to time, time out, if preset preheating function, preheat relay closure outputs, warm-up time start to time, time out, throttle relay operation, the engine fuel solenoid valve opens, after delay 300 ms, crank relay closure outputs and start crank, when the engine operating speed reach crank cutting speed, crank stop, and the engine running.

If in cranking time timing period, the engine is not firing, crank stop, crank intermittent time begins and after the end of the timing, try to start the engine again. The boot sequence has been repeated until engine successfully ignition. When the number of starts reaches preset crank attempts, the controller will stop start control output, LCD display "failed to start".

Shutdown sequence:

After GCB Tripping, cooling time begin to time, time out, throttle relay action, the fuel solenoid valve is closed, engine stop. At the end of the engine downtime timing engine failed to stop, LCD displays "shutdown failed".

- Gas engine:

Starting sequence:

The beginning of the start-up delay timing, time out, crank relay action, crank beginning, crank time and ignition delay time timer start at the same time, before the end of ignition start timing delay, the engine speed reaches or higher than the set ignition speed, ignition relay action, firing, the end of Gas valve open delay time open the gas valve when the engine operating speed reach the crank cutout RPM, crank stop, engine is running.

If after the end of ignition start timing delay, the engine speed has not reached the ignition speed, or crank time timing over, the engine still not ignition running, crank stop, crank rest timing start, try again to start engine after the end of the timing. The start sequence has been repeated until engine successfully ignition. When the number of starts reached the crank attempt of preset , controller will stop start control output, LCD displays "failed to start".

Shutdown sequence:

After GCB opening, cooling time starts timing, time out, the gas valve is closed, engine stopped, at the end of shutdown failed delay timing ignition stop..

At the end of shutdown failed delay timing, engine not stop, LCD displays "shutdown failed".

**Note:**

- normal shutdown procedure, you want to stop the ignition control output must be the engine shutdown. If the engine not shutdown after the end of shutdown fails delay timing, the engine has not been stopped, the ignition output will not stop.

- Use to ECU engine, open and stop the process is controlled by the ECU, the controller can control the ECU power switch, and ECU open stop signal.

ECU type

- Used to define J1939 interface functions of controller and ECU type;
- The controller has built-in several common ECU type:

Code	Description
1	Cummins GCS / (MODBUS) information
2	Cummins CM570 / Cummins QSX15 information
3	Cummins CM2150
4	VOLVO EMS2
5	Iveco
6	MTU
7	Scanis EMS S6

Engine rated speed

- Used to define the rated speed of engine running.

MPU input

- Used to define the controller whether using the speed sensor
- When the parameter is set to "1", the controller uses the speed sensor as the engine speed measurement signal source; When the parameter is set to "0", the controller of the engine speed measurement value from the frequency signal of the generator , the conversion was calculated.
- Speed (RPM) and frequency conversion formula: $\text{speed (RPM)} = (\text{Hz} * 60) / \text{pole-pairs}$. Example: the measurement frequency of the generator is 50Hz, when the pole-pairs is set to 2, the speed (RPM) = $(50 * 60) / 2 = 1500$ (RPM).

Fly wheel teeth

- Used to define the engine per revolution of pulses / flywheel teeth.

Set pickup now

- If user not know the engine per revolution pulse / flywheel teeth, by measuring the frequency of power frequency and speed sensor, to calculate, obtained the number of flywheel teeth.
- flywheel teeth and power frequency conversion formula: flywheel teeth = (f1 * pole-pairs) / f2, {f1 speed sensor frequency, f2 generating frequency}.
- Operating procedures:
 - "Speed sensor input "parameter is set to" 0. "
 - Open the generator, enter "set sensor frequency" setup menu press to confirm and enter the correct CL2 authorized password, press OK, automatically modify the parameters of "flywheel teeth" of the menu.
 - "Speed sensor input "parameter is set to" 1 ", complete the relevant settings of speed sensor.

**Note:**

- This function is only used for debugging process of controllers and generators.

Pair of poles

- Used to define the generator exciter poles.
- Controller speed measurement value from the frequency signal of the generator, for the measurement operation of speed.

Fuel mode

- Used to define the type of fuel (details refer to section 4.4).
- N.C. type means the fuel channel is closed when fuel can not be used: N.O. type means the fuel channel is opened when fuel can not be used.

Start delay

- Used to define the time from satisfy conditions of the generator enable to the executing engine enable procedure.
- This time is opened in the following conditions are valid:
 - automatic operating mode, the remote signal is active.
 - test mode is active.
- When the start delay timer working, LCD screen displays the time course.

Crank attempts

- The controller can repeatedly attempt to start the engine; the setting value is equal to the maximum crank times.

Critical C-attempt

- When the critical mode is activated, controller can be repeated attempts to crank the engine, this value is equal to the maximum crank times.

Crank time

- Use to configure the time of duration of engine crank command issued.
- This parameter is used in diesel engines, start to timing and the crank command issued at the same time; used on the gas engine, start to timing and the gas valve open command issued at the same time.

Crank time add

- Used to adjust the time permit of the repeat cranking.
- The second time of crank time is equal to the first crank time plus the extra time. For example: “crank time” set at 5s, “Crank time add” set at 3s, then since the second crank, the maximum crank time permit is 8s.

**Caution:**

- The maximum crank time permit can not exceed the range of the equipment safety

Crank pause time

- The time between last crank and next crank.
- The time will be began in crank stop output, until the end of the time to re-issue the crank command.

Ignition speed

- Used to define can be issue the minimum engine speed of Ignition command .
- This parameter is valid only in the application of gas engine.

Ignition start DLY

- Used to define the lag time of ignition output.
- This parameter is only valid only on the application of the gas engine, crank command output and start to timing at the same time.

Gas valve on DLY

- Used to define the lag time of gas valve open command issued.
- This parameter is only valid only on the application of the gas engine from the ignition command issued and start to timing at the same time..

Crank cutout RPM

- The crank cutout speed.

Crank cutout volt

- The crank disconnect voltage.
- Expressed by percentage, use “Rated ph-voltage” as factor.

Crank cutout Oil-P

- The crank cutout engine oil pressure, signal is from LOP-sensor.
- When parameter is configured as “not used”, this function is inactive.

Crank cutout P-DLY

- Used to configure the period from engine LOP-switch opened or oil pressure reaches oil Pressure Crank cutout value to crank disconnection.
- When parameter is configured as “not used”, this function is inactive, also both being the condition of judging stop failure and can not implement crank process are inactive.

Idle time

- The duration of engine idle running.
- When controller in manual control mode, press the start button, the idle time timer starts to timing; when test control mode is valid, start delay timer end, idle time timer is beginning; when controller in the automatic control mode, the end of the start-up delay timer, idle time timer is started. Is defined within the idle time of idle output relay closed output ,time out, the relay restore the disconnected state.
- When parameter is configured as “not used”, idle function is inactive.

Pre-heat mode

- Used to configure the mode of preheat.
- There are 5 pre-heat modes for selection, please read the description of preheat function for details.

Pre-heat time

- The preheat duration before engine crank. When it is working, LCD screen displays time course.
- When parameter is configured as “not used”, pre-heat function is inactive.

Safety-on delay

- Used to define the time from engine crank ignition successfully to Genset stable running.
- The controller shielded low-speed, low voltage, low frequency, low oil pressure protection in the security monitoring delay time.

**CAUTION:**

- Some of the protection are disabled during safety-on delay, so the safety-on delay should be set carefully and properly, this is very important, otherwise it may cause engine damage.

Cool down mode

- Used to define the mode of cool down.
- When parameter is configured as “0”, the engine will run at rated speed during cooling down. When parameter is configured as “1”, the engine will run in idle during cooling down.

Cool down time

- The no-load run time allowed before the engine is stopped.
- It is necessary to set cool down time, it can make the engine stop at a lower temperature after a long time running with load..

Stop time

- The maximum time permit for the engine stop.
- When the controller executes the stop command, that is, the fuel control relay is disconnected (the control relay closed output when the fuel is N.O). After the time out if the controller detects that the generator voltage is greater than the crank cutout voltage, or speed greater than the crank cutout speed, or oil pressure switch disconnected, or oil pressure is greater than the crank cutout oil pressure, then the shutdown failure.
- In N.O fuel control, after the engine downtime time out, the fuel control relay disconnect output.

EX. Crank permit

- Used to configure permit external crank to trigger the the normal controller monitoring, control and protection alarm function.
- Refer to 4.7 for details.

Pickup signal

- When using the speed sensor, the controller can through speed signal monitoring, to determine the speed sensor whether there is. When the sensor signal is lost, if select 1/2/3 alarm level when protection function triggered, LCD displays "!W:Pickup signal"; if select 4/5/6 alarm level when protection function triggered, LCD display "!A:Pickup signal".

Function	Select "Y", the monitoring function is active; Select "N", the monitoring function is invalid.
Delay	If the speed signal loss time of duration longer than the delay time value set, the define operation of alarm levels are triggered; if the speed signal loss recovery before the time delay termination, the delay time is set to zero.
Delay by	Defined time range of effective monitoring function: Set (0): always effective; Set (1): starting from crank, monitoring effectively at the same time; Set (2): from safety supervision delay time over, start effective; Set (3): after running ,start effectively.
ALM. class	Used to define the protection is triggered, and what is the controller will do. Details refer to the alarm level configuration table.

Overspeed level1&2

- Controller provides two levels of speed monitoring for users to choose for warning, fault shutdown and control. If you select 1/2/3 alarm level when the protection function triggered, LCD displays "!W:Overspeed level1" or "!W:Overspeed level2"; If you select 4/5/6 alarm level when protection function triggered, LCD displays"!A:Overspeed level1 "or" !A:Overspeed level2".

Function	Select "Y", the monitoring function is active; Select "N", the monitoring function is invalid.
Limit	Used to define the overspeed protection threshold. when the engine speed is at or above this threshold, time of duration over than delay time, the define operation of alarm levels are triggered.
Delay	If the overspeed time of duration over than the set time delay value, the define operation of alarm levels are triggered; if overspeed under the overspeed limit before delay stop, the delay time is set to zero.
Delay by	Defined time range of effective monitoring function: Set (0): always effective; Set (1): starting from crank, monitoring effectively at the same time; Set (2): from safety supervision delay time over, start effective; Set (3): after running ,start effectively.
ALM. class	Used to define the protection is triggered, and what is the controller will do. Details refer to the alarm level configuration table.

Underspeed level1&2

- Controller provides two levels of low-speed monitoring for users to choose for warning, fault shutdown and control. If you select 1/2/3 alarm level when the protection function triggered, LCD displays "!W:Underspeed level1" or "!W:Underspeed level2"; If you select 4/5/6 alarm level when protection function triggered, LCD display"!A:Underspeed level1 "or" !A:Underspeed level2 ".

Function	Select "Y", the monitoring function is active; Select "N", the monitoring function is invalid.
Limit	Used to define the low-speed protection threshold. when the engine speed is at or under this threshold, time of duration over than delay time, the define operation of alarm levels are triggered.
Delay	If the low-speed time of duration over than the set time delay value, the define operation of alarm levels are triggered; if low-speed under the low-speed limit before delay stop, the delay time is set to zero.
Delay by	Defined time range of effective monitoring function: Set (0): always effective; Set (1): starting from crank, monitoring effectively at the same time; Set (2): from safety supervision delay time over, start effective; Set (3): after running ,start effectively.
ALM. class	Used to define the protection is triggered, and what is the controller will do. Details refer to the alarm level configuration table.

Start failure

- If the engine number of start reaches a pre-set number of starts is still not running, which happened Startup Failure. If you select 1/2/3 alarm level when protection function triggered, LCD display "!W:Start failure"; if select 4/5/6 alarm level protection function triggered when LCD displays "!A:Start failure".

Function	Select "Y", the monitoring function is active; Select "N", the monitoring function is invalid.
ALM. class	Used to define the protection is triggered, and what is the controller will do. Details refer to the alarm level configuration table.

Stop failure

- When the controller executes the stop command, that is, the fuel control relay is disconnected (the control relay closed output when the fuel is N.O). After the time out if the controller detects that the generator voltage is greater than the crank cutout voltage, or speed greater than the crank cutout speed, or oil pressure switch disconnected, or oil pressure is greater than the crank cutout oil pressure, then the shutdown failure. If you select 1/2/3 alarm level when protection function triggered, LCD display "!W:Stop failure"; if select 4/5/6 alarm level when protection function triggered, LCD displays "!A:Stop failure".

Function	Select "Y", the monitoring function is active. Select "N", the monitoring function is invalid.
ALM. class	Used to define the protection is triggered, and what is the controller will do. Details refer to the alarm level configuration table.

Batt. overvolt

- The controller detects the battery voltage, and provide a high limit protection for users to choose for warning, fault shutdown and control. If you select 1/2/3 alarm level when the protection function triggered, LCD displays "!W:Batt.Overvolt"; If select 4/5/6 alarm level when protection function triggered, LCD displays "!A:Batt.Overvolt".

Function	Select "Y", the monitoring function is active; Select "N", the monitoring function is invalid.
Limit	Used to define the high voltage protection threshold. when the battery voltage is at or over this threshold, time of duration over than delay time, the define operation of alarm levels are triggered.
Delay	If the high voltage time of duration over than the set time delay value, the define operation of alarm levels are triggered; if battery voltage under the high voltage limit before delay stop, the delay time is set to zero.
Delay by	Defined time range of effective monitoring function: Set (0): always effective; Set (1): starting from crank, monitoring effectively at the same time.; Set (2): from safety supervision delay time over, start effective. Set (3): after running ,start effectively.
ALM. class	Used to define the protection is triggered, and what is the controller will do. Details refer to the alarm level configuration table.

Batt. undervolt

- The controller detects the battery voltage to provide a low-limit value of the protection, for the user to select for warning, downtime and control. If you select 1/2/3 alarm level when protection function triggered, LCD display "!W:Batt.Undervolt", If you select 4/5/6 alarm level when protection function triggered, LCD displays" !A:Batt.Undervolt"..

Function	Select "Y", the monitoring function is active; Select "N", the monitoring function is invalid.
Limit	Used to define the low voltage protection threshold. when the battery voltage is at or under this threshold, time of duration over than delay time, the define operation of alarm levels are triggered.
Delay	If the low voltage time of duration over than the set time delay value, the define operation of alarm levels are triggered; if battery voltage over than the low voltage limit before delay stop, the delay time is set to zero..
Delay by	Defined time range of effective monitoring function: Set (0): always effective; Set (1): starting from crank, monitoring effectively at the same time; Set (2): from safety supervision delay time over, start effective; Set (3): after running ,start effectively..
ALM. class	Used to define the protection is triggered, and what is the controller will do. Details refer to the alarm level configuration table.

Maintenance

- The controller can be provided on the running time of the generator to be accumulated, and the default parameters with this comparison, there is provided a protection unit maintenance time limit for the user to select for warning, downtime and control. If you select 1/2/3 alarm level when protection function triggered, LCD displays "!W: maintenance"; if select 4/5/6 alarm level protection function triggered, LCD display" !A: maintenance".

Function	Select "Y", the monitoring function is active. Select "N", the monitoring function is invalid.
Limit	Use to definition of the threshold value of the maintenance time. When this parameter is set to the effective and start to accumulate the running time of the generator at the same time, when the cumulative time greater than this setting value, the define operation of alarm levels are triggered.
ALM. class	Used to define the protection is triggered, and what is the controller will do. Details refer to the alarm level configuration table.

ECU Data fail

- Controller and the the ECU communication on the engine, the delay time controller to accept less than the normal data from the ECU, to trigger an alarm action. If you select 1/2/3 alarm level when protection function triggered, LCD display "!W: ECU data failure"; if select 4/5/6 alarm level when protection function triggered, LCD display "!A: ECU data failure".

Function	Select "Y", the monitoring function is active. Select "N", the monitoring function is invalid.
Delay	If the duration of the normal data from the ECU is not exceeded for the set delay time value, the action defined by the alarm level is triggered; if the received data is restored before the delay expires, the delay time is set to zero.
Delay by	Defined time range of effective monitoring function.: Set (0): always effective.; Set (1): starting from crank, monitoring effectively at the same time. Set (2): from safety supervision delay time over, start effective. Set (3): after running ,start effectively.
ALM. class	Used to define the protection is triggered, and what is the controller will do. Details refer to the alarm level configuration table.

**Note:**

- When the engine shutdown, ECU closed, which means that is normal conditions, ECU no communication, but will not trigger fault protection.
- This protection function effective when only choose the engine type "ECU".

ECU Warning

- When the engine ECU shutdown, this is a warning level of fault, the engine continues to run, engine manufacturers sometimes called the "yellow alert". After receiving this signal, the controller can trigger an alarm action. If you select 1/2/3 alarm level when protection function triggered, LCD displays ""!W:: ECU warning"; if select 4/5/6 alarm level when protection function triggered, LCD display "!A: ECU warning.

Function	Select "Y", the monitoring function is active. Select "N", the monitoring function is invalid.
Delay	If the "yellow light alarm" from the ECU is received for longer than the set delay time value, the action defined by the alarm level is triggered; if the data returns to normal before the delay expires, the delay time is set to zero.
Delay by	Defined time range of effective monitoring function. Set (0): always effective; Set (1): starting from crank, monitoring effectively at the same time. Set (2): from safety supervision delay time over, start effective. Set (3): after running ,start effectively.
ALM. class	Used to define the protection is triggered, and what is the controller will do. Details refer to the alarm level configuration table.

**Note:**

- ECU warning to the ECU itself is only a warning level of fault, the engine continues to run. If the controller uses this signal to trigger 4/5/6 alarm level, the control of the controller can turn off the engine.
- This protection function effective when only choose the engine type "ECU".

ECU Shutdown

- When the engine ECU shutdown failure, the engine shutdown, engine manufacturers, sometimes called "red light alarm. After receiving this signal, the controller can trigger an alarm action. If you select 1/2/3 alarm level when protection function triggered, LCD displays "!W: ECU shutdown fault; if select 4/5/6 alarm levels when protection function triggered, LCD display "!A: ECU shutdown fault ".

Function	Select "Y", the monitoring function is active.; Select "N", the monitoring function is invalid..
Delay	If the "red light alarm" from the ECU is received for longer than the set delay time value, the action defined by the alarm level is triggered; if the data returns to normal before the delay expires, the delay time is set to zero.
Delay by	Defined time range of effective monitoring function: Set (0): always effective. Set (1): starting from crank, monitoring effectively at the same time; Set (2): from safety supervision delay time over, start effective; Set (3): after running ,start effectively.
ALM. class	Used to define the protection is triggered, and what is the controller will do. Details refer to the alarm level configuration table.

Water in fuel

- When the controller receives a signal from the ECU of oil influent, can trigger an alarm ation. If you select 1/2/3 alarm level when protection function triggered, LCD displays "!W: water in fuel "; if select 4/5/6 alarm levels when protection function is triggered, LCD displays" !A: water in fuel.

Function	Select "Y", the monitoring function is active; Select "N", the monitoring function is invalid.
Delay	If the "water in fuel" signal from the ECU is received for longer than the set delay time value, the action defined by the alarm level is triggered; if the data returns to normal before the delay expires, the delay time is set to zero.
Delay by	Defined time range of effective monitoring function. Set (0): always effective. Set (1): starting from crank, monitoring effectively at the same time.; Set (2): from safety supervision delay time over, start effective; Set (3): after running ,start effectively.
ALM. class	Used to define the protection is triggered, and what is the controller will do. Details refer to the alarm level configuration table.



Note:

- Controller received "water in fuel" of ECU signal, may also receive "ECU warning" or "ECU shutdown fault" signal at the same time.
- This protection function effective when only choose the engine type "ECU".

7.4 Analog INPUT

No.	Parameter	Setting range	Preset
4.0	Quit		
4.1	P-sensor type	1 to 16 //not used	4
4.2	Oil-P low level1		
	Function	0 N/1 Y	1
	Limit	0.0 to 150.0 Bar/PSI	1.4Bar
	Delay	0 to 999s	1s
	Delay by	0 to 3	3
	ALM. class	0 to 6	2
4.3	Oil-P low level2		
	Function	0 N/1 Y	1
	Limit	0.0 to 150.0 Bar/PSI	1.1Bar
	Delay	0 to 999s	0s
	Delay by	0 to 3	3
	ALM. class	0 to 6	6
4.4	T-sensor type	1 to 16 /not used	3
4.5	High temp. level1		
	Function	0 N/1 Y	1
	Limit	50 to 320°C/°F	92°C
	Delay	0 to 999s	1s
	Delay by	0 to 3	3
	ALM. class	0 to 6	2
4.6	High temp. level2		
	Function	0 N/1 Y	1
	Limit	50 to 320°C/°F	100°C
	Delay	0 to 999s	0 s
	Delay by	0 to 3	3
	ALM. class	0 to 6	6
4.7	Heater on level	-20 to 320°C/°F	50°C
4.8	Heater off level	-20 to 320°C/°F	60°C
4.9	Cooler on level	-20 to 320°C/°F	80°C
4.10	Cooler off level	-20 to 320°C/°F	70°C

Menu descriptions:**P-sensor type**

- Used to define the type of pressure sensor.
- The controller built-in a variety of pressure sensor types to choose,as follow:

Code	Mode	Note
0	Not used	
1	Close for LOP	Closed (low) is valid
2	Open for LOP	Open (high) is valid
3	VDO 5 bar	
4	VDO 10 bar	
5	Datcon 7 bar	
6	Murphy 7 bar	
7	Pre-set 1	
8	Pre-set 2	
9	Pre-set 3	
10	Pre-set 4	
11	Configurable 1	
12	Configurable 2	
13	Configurable 3	
14	0-5V	Through the select panel "configurable sensor values" - Oil Pressure Sensor 1: Fixed point 1 measurement value is minimum; fixed point 2 measurement value is maximum
15	4-20mA	

**CAUTION:**

- The P-sensor is used to measure the pressure, the measured pressure value for the engine low oil pressure protection function, the measurement accuracy related to the controller of the normal control and protection function is valid or not, so the correct choice of pressure sensor type or configurable sensor parameters is very important. Otherwise, it may cause damage to the engine.

- The parameters appendix of LOP sensor::

VDO 5 bar:

P(Bar)	0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5
P(PSI)	0	7.3	14.5	21.8	29.0	36.3	43.5	50.8	58.0	65.3	72.5
R(Ω)	11	29	47	65	82	100	117	134	151	167	184

VDO 10 bar:

P(Bar)	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0
P(PSI)	0	14.5	29.0	43.5	58.0	72.5	87.0	101.5	116.0	130.5	145.0
R(Ω)	10	31	52	71	90	106	124	140	155	170	184

Datcon 7 bar:

P(Bar)	0.0	0.7	1.4	2.1	2.8	3.4	4.1	4.8	5.5	6.2	6.9
P(PSI)	0	10.0	20.0	30.0	40.0	50.0	60.0	70.0	80.0	90.0	100.0
R(Ω)	240	200	165	135	115	95	78	63	48	35	25

Murphy 7 bar:

P(Bar)	0.0	0.7	1.4	2.1	2.8	3.4	4.1	4.8	5.5	6.2	6.9
P(PSI)	0	10.0	20.0	30.0	40.0	50.0	60.0	70.0	80.0	90.0	100.0
R(Ω)	240	205	171	143	123	103	88	74	60	47	33

Pre-set 1:

P(Bar)	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0
P(PSI)	0	14.5	29.0	43.5	58.0	72.5	87.0	101.5	116.0	130.5	145.0
R(Ω)	15	31	49	66	85	101	117	132	149	164	178

Pre-set 2:

P(Bar)	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0
P(PSI)	0	14.5	29.0	43.5	58.0	72.5	87.0	101.5	116.0	130.5	145.0
R(Ω)	30	41	65	88	110	115	145	150	172	185	190

Pre-set 3:

P(Bar)	0	1.7	3.4	5.2	6.9	8.6	10.3				
P(PSI)	0	25	50	75	100	125	150				
R(Ω)	21	36	52	72	84	100	120				

Pre-set 4:

P(Bar)	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0		
P(PSI)	14.5	29.0	43.5	58.0	72.5	87.0	101.5	116.0	130.5		
R(Ω)	195	155	127	107	88	72	61	54	48		

**NOTE:**

- “Configurable” means user can input the data manually according to the sensor parameter. Configurable 1 only can be set through the software; configurable 2 or 3 can be done through the push buttons on the front panel or software.
- When configuring, please input the “resistance- measured value” from small to big one by one.

Oil-P low level 1&2

- Controller provides two levels of low oil pressure limit monitoring for users to choose for warning, fault shutdown and control. If you select 1/2/3 alarm level when protection function triggered, LCD displays " !W: Oil-P low level 1" or " !W: Oil-P low level 2"; if select 4/5/6 alarm levels, when protection function is triggered, LCD displays " !A: Oil-P low level 1" or " !A: Oil-P low level 2".

Function	Select "Y", the monitoring function is active; Select "N", the monitoring function is invalid.
Limit	Used to define the engine oil pressure protection threshold. when the engine oil pressure is at or under this threshold, time of duration over than delay time, the define operation of alarm levels are triggered.
Delay	If the low oil pressure time of duration over than the set time delay value, the define operation of alarm levels are triggered; if the low oil pressure under than the low speed limit before delay stop, the delay time is set to zero.
Delay by	Defined time range of effective monitoring function: Set (0): always effective; Set (1): starting from crank, monitoring effectively at the same time; Set (2): from safety supervision delay time over, start effective; Set (3): after running ,start effectively.
ALM. class	Used to define the protection is triggered, and what is the controller will do. Details refer to the alarm level configuration table.

T-sensor type

- Used to define the type of T-sensor ..
- The controller built-in a variety of T-sensor types to choose,as follow:

Code	Mode	Note
0	Not used	
1	Close for HET switch	Closed (low) is valid
2	Open for HET switch	Disconnect (high) is valid
3	VDO 120°C	
4	VDO 150°C	
5	Datcon	
6	Murphy	
7	Pt100	
8	Pre-set 1	
9	Pre-set 2	
10	Pre-set 3	
11	Pre-set 4	
12	Configurable 1	
13	Configurable 2	
14	Configurable 3	
15	0-5V	Through the select panel "configurable sensor values" – TEMP. Sensor 1:
16	4-20mA	Fixed point 1 measurement value is minimum; fixed point 2 measurement value is maximum

**CAUTION:**

- The T-sensor is used to measure the temperature, the measured temperature value for the engine high temperature protection function, the measurement accuracy related to the controller of the normal control and protection function is valid or not, so the correct choice of temperature sensor type or custom sensor parameters are very important. Otherwise, it may cause damage to the engine

- The parameters appendix of HEP sensor:

VDO 120°C:

T(°C)	40	50	60	70	80	90	100	110	120	130	140
T(°F)	104	122	140	158	176	194	212	230	248	266	284
R(Ω)	291	197	134	97	70	51	38	29	22	18	15

VDO 150°C:

T(°C)	50	60	70	80	90	100	110	120	130	140	150
T(°F)	122	140	158	176	194	212	230	248	266	284	302
R(Ω)	322	221	155	112	93	62	47	37	29	23	19

Datcon:

T(°C)	40	50	60	70	80	90	100	110	120	130	140
T(°F)	104	122	140	158	176	194	212	230	248	266	284
R(Ω)	900	600	400	278	200	141	104	74	50	27	4

Murphy:

T(°C)	40	50	60	70	80	90	100	110	120	130	140
T(°F)	104	122	140	158	176	194	212	230	248	266	284
R(Ω)	1029	680	460	321	227	164	120	89	74	52	40

PT100:

T(°C)	-100	-50	0	20	40	60	80	100	150	200	300
T(°F)	-148	-58	32	68	104	140	176	212	302	392	572
R(Ω)	60	81	100	108	116	123	131	139	157	176	212

Pre-set 1:

T(°C)	20	30	40	50	60	70	80	90	100	110	120
T(°F)	68	86	104	122	140	158	176	194	212	230	248
R(Ω)	900	600	420	282	152	113	86	62	48	40	30

Pre-set 2:

T(°C)	30	50	60	70	80	90	100	110	120		
T(°F)	86	122	140	158	176	194	212	230	248		
R(Ω)	980	400	265	180	125	90	65	50	38		

Pre-set 3:

T(°C)	20	30	40	50	60	70	80	90	100	110	120
T(°F)	68	86	104	122	140	158	176	194	212	230	248
R(Ω)	805	540	380	260	175	118	83	58	42	30	21

Pre-set 4:

T(°C)	28	35	40	50	60	70	80	90	95	98	
T(°F)	82	95	104	122	140	158	176	194	203	208	
R(Ω)	579	404	342	250	179	136	103	77	67	63	

**NOTE:**

- “Configurable” means user can input the data manually according to the sensor curve. Configurable 1 only can be set through the software; configurable 2 or 3 can be done through the push buttons on the front panel or software.
- When configuring, please input the “resistance-value” from small to big one by one..

High temp. level 1&2

- Controller provides two levels of high-temperature limit monitoring for users to choose for warning, fault shutdown and control. If you select 1/2/3 alarm level when protection function triggered, LCD displays "!W:High temp. level1 " or " !W:High temp. level2"; if select 4/5/6 alarm level when protection function triggered, LCD display " !A:High temp. level1 "or" !A:High temp. level2 ".

Function	Select "Y", the monitoring function is active; Select "N", the monitoring function is invalid.
Limit	Used to define high temp protection threshold. when the engine temperature is at or higher than this threshold, time of duration over than delay time, the define operation of alarm levels are triggered.
Delay	If the high temp time of duration over than the set time delay value, the define operation of alarm levels are triggered; if the high temperature under than this limit before delay stop, the delay time is set to zero..
Delay by	Defined time range of effective monitoring function: Set (0): always effective; Set (1): starting from crank, monitoring effectively at the same time; Set (2): from safety supervision delay time over, start effective; Set (3): after running ,start effectively.
ALM. class	Used to define the protection is triggered, and what is the controller will do. Details refer to the alarm level configuration table.

Heater on level

- This parameter is used to set the controller to select the preheat mode 5 is defined as a " preheat " relay action of the temperature low- limit, and set " preheat control" relay action of the temperature low limit.
- To This parameter is valid, the temperature sensor type can not be set to " not use" and "switch".

Heater off level

- This parameter is used to set the controller to select the preheat mode 5 is defined as a " preheat " relay stop action of the high-temperature limit, and set " preheat control" relay stop action of the high-temperature limit.
- To This parameter is valid, the temperature sensor type can not be set to "not use" and "switch".

Cooler on level

- This parameter is used to set is defined as a "cooling control" relay action of high temperature limit.
- To This parameter is valid, the temperature sensor type can not be set to " not use" and "switch".

Cooler off level

- This parameter is used to set is defined as a "cooling control" relay stop action of low temperature limit.
- To This parameter is valid, the temperature sensor type can not be set to " not use" and "switch".

7.5 Discrete IN/OUT

No.	Parameter	Setting range	Preset
5.0	Quit		
5.1	D-Input 1 Config		
	Function	0 to 30	6
	Logic	0Closed/1Open	0
	Delay	0 to 999s	1s
	Delay by	0 to 3	0
	ALM. class	0 to 6	6
5.2	D-Input 2 Config		
	Function	0 to 30	2
	Logic	0Closed/1Open	0
	Delay	0 to 999s	1s
	Delay by	0 to 3	0
	ALM. class	0 to 6	6
5.3	D-Input 3 Config		
	Function	0 to 30	3
	Logic	0Closed/1Open	0
	Delay	0 to 999s	1s
	Delay by	0 to 3	0
	ALM. class	0 to 6	6
5.4	Relay 1 Config		
	Function	0 to 120	2
	Logic	0N.O/1N.C	0
5.5	Relay 2 Config		
	Function	0 to 120	1
	Logic	0N.O/1N.C	0
5.6	Relay 3 Config		
	Function	0 to 120	0
	Logic	0N.O/1N.C	0
5.7	Relay 4 Config		
	Function	0 to 120	0
	Logic	0N.O/1N.C	0

Menu descriptions:**D-Input * Config**

- Used to define the D-input function.

Function	Defined the function of discrete input, controller built-in a variety of functions for user to choose, as follows "definable D-input function menu.
logic	Select "0", the discrete input is active in close (low level); Select "1", the discrete input is active in open circuit.
Delay	If the discrete input is valid duration time over than the set delay time value, the define operation of alarm levels are triggered; if the discrete input change to invalid before delay stop, the delay time is set to zero.
Delay by	Defined time range of effective monitoring function: Set (0): always effective; Set (1): from turning, monitoring and effective; Set (2): from the end of the delay time of the safety supervision, began to be effective; Set (3): from running after.
ALM. class	Used to define the protection is triggered, the controller action. Details see the alarm level table.

**NOTE:**

- Only in the function is set to "1", that is, when the discrete input function user-defined parameters of the delay, start point and alarm level is set to be effective.

- Configure D-input menu is as follows:

code	Function	Note
0	Not used	
1	User configured	When you select this function, the user can use the discrete input user- configured menu to configuration this function of discrete.
2	Oil pressure switch	Select this function of discrete input port external one mounted pressure switch which is on the engine, and through this limit action switch to trigger the engine low oil pressure protection. Controller allows the oil pressure switch as low oil pressure protection and with reference to the measurement of pressure sensor as the engine low oil pressure protection exist at the same time. Triggered by low oil pressure alarm level, Users according to the defined function of the alarm level 2 configuration tables to choose.
3	Temp. high switch	Select this function of discrete input port external one mounted temperature switch which is on the engine, and through this limit action switch to trigger the engine high temperature protection. Controller allows the temperature switch as high temperature protection and with reference to the measurement of temperature sensor as the engine high temperature protection exist at the same time. Triggered by high temperature alarm level, Users according to the defined function of the alarm level 2 configuration tables to choose.
4	Emergency stop	Select this function of discrete input port external an emergency stop switch, when this input valid, the controller close all control output, trigger the alarm level "6", the engine shutdown immediate.

5	Remote off load	This input is active, the generator start-up, power generation does not issue a closing command after normal operation, has been unload operation until the input signal becomes invalid. This signal is only use in remote start with load for automatic operation mode is invalid.
6	Remote with load	This input is active, the generator starting, after normal operation, power generation issue a closing command, and has been maintained until the input signal becomes invalid. This signal is only effective in automatic operation mode.
7	Reserve	
8	GEN closed aux.	Select this function of discrete input port connected to the GCB auxiliary contacts of power generation load switch, for monitoring the status of the closing or opening of the GCB.
9	Low fuel switch	Select this function of discrete input port connected to the fuel tank of the engine oil level switch for monitoring the fuel tank low oil level.
10	Lamp test	Select this function discrete input signal is active, the indicator light on the controller operation panel all illuminate.
11	Reserve	
12	Reserve	
13	Air-flap Closed	Select this function of discrete input port connected to the auxiliary contacts on the engine ventilation door, and through the limit actions of switch to determine the ventilation door working conditions.
14	Pre-heat switch	Select this function of discrete input port connected to the temperature switch which is mounted on the engine preheater, and through the limit action of switch to stop preheat relay output. Only for the Preheat mode 4.
15	Critical mode	In critical mode, all the shutdown fault change to warning, that is when the unit in shutdown fault, only alarm not to shutdown. LCD display critical mode.
16	Alarm mute	When selecting this digital input signal of function is active, the alarm buzzer of controller will stop sound, one is defined as "sound alarm" relay output will be closed. The functionality of input signal is equivalent to the the "mute" button on the controller panel.
17	Alarm reset	Select this function discrete input signal is active, the controller shutdown fault lock will unlock.
18	Reserve	
19	Reserve	
20	Panel lock	When selecting this digital input signal of function is active, you can not modify the operating parameters on the operation panel of the controller, can not select the operating mode of the controller. LCD display panel lock information.
21	Activate AUTO mode	When selecting this digital input signal of function is active, the controller change to auto operation mode, which provides users with a remote button to select auto operation mode. This operating mode selection function is not affected by panel lock.

22	Activate MAN mode	When selecting this digital input signal of function is active, the controller change to manual operation mode, which provides users with a remote button to select manual operation mode. This operating mode selection function is not affected by panel lock.
23	Activate TEST mode	When selecting this digital input signal of function is active, the controller change to test operation mode, which provides users with a remote button to select test operation mode. This operating mode selection function is not affected by panel lock.
24	Stop button	Select this function, the discrete input signal function is equivalent to control panel "stop" button, it provides users with a remote stop buttons.
25	Start button	Select this function, the discrete input signal function is equivalent to control panel "start" button, it provides users with a remote start buttons.
26	Inhibit Genset	When selecting this digital input signal of function is active, the controller can not issue a closing signal in any mode.
27	Low water level	When selecting this digital input signal of function is active, the controller has a low water level alarm, the corresponding alarm levels and delay settings are valid.
28	Gas leakage1	When selecting this digital input signal of function is active, the controller has gas leak alarm 1, the corresponding alarm levels and delay settings are valid.
29	Gas leakage2	When selecting this digital input signal of function is active, the controller has gas leak alarm 2, the corresponding alarm levels and delay settings are valid.
30	Fire	When selecting this digital input signal of function is active, the controller has fire alarm, the corresponding alarm levels and delay settings are valid.

Relay * Config

- Use to configure the relay function selection.

Function	Define the role of the relay output, controller built-in a variety of functions for the user to choose, as follows " configure relay output menu".
Logic	Select " 0", the monitoring function is active; Select " 1", the monitoring function is invalid.

- Configure relay output function table:

code	Function	Note
0	Not used	
1	Crank	Select this function of the output relay is used to control the engine starter motor, when need the engine crank, its running, stop in crank cutout conditions are satisfy.
2	Fuel	Select this function of the output relay is used to control the diesel engine throttle electromagnet, when need to start the engine, its running, stop in crank cutout conditions are satisfy.
3	Gas valve	Select this function of the output relay is used to control the gas engine fuel valve closed or open, when need to start the engine, its running, stop in crank cutout conditions are satisfy.
4	Ignition	Select this function of the output relay is used to control the gas engine ignition system provides power or signal, when to achieve ignition conditions, its running, stop running in ignition stop delay timing over.
5	Shutdown alarm	Select this function of the output relay running when occurrence of one or more of shutdown fault, after fault clearance and press the fault reset, then its stop.
6	Warning	Select this function of the output relay running when occurrence of one or more of warning, after fault clearance, its stop.
7	Idle	Select this function, the output relay action, in controller internal idle time timing period, stop working in the end of timing.
8	Preheat output	Select the function, the output relay action, please refer to the description of preheating function.
9	Reserve	
10	Reserve	
11	Reserve	
12	Genset running	Select this function of the output relays action when the generator is normal running, that is the engine speed, oil pressure, temperature, etc., and the electrical parameters of the generator have reached the limits of the normal setting.
13	Auto mode	output relay action, when controller running in the auto operation mode.
14	Test mode	output relay action, when controller running in the test operation mode.
15	Man mode	output relay action, when controller running in the manual operation mode.

16	Maintenance due	Select this function of output relay, the accumulation time of engine reaches the time limit value of maintenance parameter set, its action, and stopping action in the re-set maintenance time or press the reset button.
17	Reserve	
18	GCB fail to close	Output relay action, after the generator closing failure occurred.
19	Fail to start	The crank attempts of engine reaches the setting have been not successful ignition, the output relay action.
20	Fail to stop	The engine is still running after the end of the downtime timing set, the output relay action.
21	Reserve	
22	Generator close/open	The output relay is used to control the power generation load switch GCB closing and opening action, when the controller commands power generation supply, its action, and not need the power generation supply, its stop working.
23	Audible alarm	When you need on the basis of the controller built-in alarm buzzer add a warning sound, the output relay action be equal to built-in alarm buzzer.
24	Cooling down	output relay action, in timing of the cooling time.
25	ECU data fail	At the end of the safety monitoring time timing has not receive the data from engine ECU, choose this function of the output relay action.
26	ECU warning	The output relay operation of select this function when receive the warning signal from ECU
27	ECU alarm	The output relay operation of select this function when receive the fault signal from ECU
28	Reserve	
29	Battery over volt	when the controller detects that the battery voltage is higher than the set value, its action.
30	Battery under volt	When the controller detects that the battery voltage is lower than the set value, its action.
31	Under speed level1	When the engine speed is lower than the setting of under speed level 1 while delay confirm, its action.
32	Under speed level 2	When the engine speed is lower than the setting of under speed level 2 while delay confirm, its action.
33	Over speed level1	When the engine speed is higher than the setting of overspeed level 1 while delay confirm, its action.
34	Over speed level2	When the engine speed is higher than the setting of over speed level 2 while delay confirm, its action.
35	Oil pressure low level1	When the engine oil pressure lower than the setting of low oil level 1 while delay confirm, its action..
36	Oil pressure low level2	When the engine oil pressure lower than the setting of low oil level 2 while delay confirm, its action..
37	High temperature level1	When the cooling temperature of engine is higher than the setting of high temperature level 1 while delay confirm, its action.
38	High temperature level 2	When the cooling temperature of engine is higher than the setting of high temperature level 2 while delay confirm, its action.
39	Reserve	
40	Reserve	
41	GEN-V under1	When the generator voltage is lower than the setting of the power generation of low voltage level 1 while delay confirm, its action.

42	GEN-V under2	When the generator voltage is lower than the setting of the power generation of low voltage level 2 while delay confirm, its action.
43	GEN-V over1	When the generator voltage is higher than the setting of power generation of high-voltage level 1 while delay confirm, its action.
44	GEN-V over2	When the generator voltage is higher than the setting of power generation of high-voltage level 2 while delay confirm, its action.
45	GEN-Hz under1	When the generator frequency is lower than the setting of power generation of low-frequency level 1 while delay confirm, its action.
46	GEN-Hz under2	When the generator frequency is lower than the setting of power generation of low-frequency level 2 while delay confirm, its action.
47	GEN-Hz over1	When the generator frequency is higher than the setting of power generation of high-frequency level 1 while delay confirm, its action.
48	GEN-Hz over2	When the generator frequency is higher than the setting of power generation of high-frequency level 2 while delay confirm, its action.
49	GEN-I over1	When the generator current is higher than the setting of overcurrent level 1 while delay confirm, its action.
50	GEN-I over2	When the generator current is higher than the setting of overcurrent level 2 while delay confirm, its action.
51	GEN-KW over1	When the active load of engine is higher than the setting of power generation overload level 1 while delay confirm, its action.
52	GEN-KW over2	When the active load of engine is higher than the setting of power generation overload level 2 while delay confirm, its action.
53	Idle 1	Select this function of output relay, for 1 second after the end of the idle time in the controller,
54	Idle 2	Select this function of output relay, for 1 second after the start of the cooling time in the controller,
55	Reserve	
56	Reserve	
57	Reserve	
58	Reserve	
59	Reserve	
60	Reserve	
61	Oil-P sensor open	Select this function of the output relays action after the controller detect oil pressure sensor . The triggered alarm level is defined by the low oil pressure alarm level 2.
62	Loss of pickup	When select the speed sensor as the engine speed control signal, in crank command is issued, undetectable speed sensor signal, the function of the output relay action.
63	Reserve	
64	Blinds control	Select this function of output relay at the beginning of the start time delay, its action, and stop after the engine stops running.This output is connected to the electric shutter of engine cooling air duct, control the blinds open and close.

65	Cooler control	Select this function of output relay, when the cooling temperature of engine is higher than the lower limit of cooling open level value of setting, its action, and keep until the cooling temperature lower than the high limit of the cooling stop level of setting, its stop.
66	Reserve	
67	Reserve	
68	Heater control	Select this function of output relay, when the cooling temperature of engine is below the lower limit of preheat open level value of setting, its action, and keep until the cooling temperature higher than the high limit of the preheat stop level of setting, its stop
69	Reserve	
70	Reserve	
71	GCB open	This output relay is connected to the shut excitation coil of generate power load switch GCB, when controller command of generate power to outage, stopped working after the switch opening.
72	Reserve	
73	Reserve	
74	Reserve	
75	Reserve	
76	Reserve	
77	Reserve	
78	Reserve	
79	Reserve	
80	Soft unload	When soft unloading time start timing action, stop action at the end of timing.
81	Off load	Its action when the controller is in the opened load
82	Reserve	
83	Reserve	
84	Emergency stop	When this function is active, the generator is emergency stop fuel output.
85	Reserve	
86	Reserve	
87	Reserve	
88	Reserve	
89	Reserve	
90	Reserve	
91	Reserve	
92	Reserve	
93	Reserve	
94	Reserve	
95	Reserve	
96	Reserve	
97	ECU water in fuel	The generator action when detects ECU oil into the water.

98	D-Input 1 alarm	D-input 1 is set to "1 user configured", when a warning or fault input is active.
99	D-Input 2 alarm	D-input 2 is set to "1 user configured", when a warning or fault input is active
100	D-Input 3 alarm	D-input 3 is set to "1 user configured", when a warning or fault input is active
101-120	Reserve	

7.6 DEFINE SENSORS

No.	Parameter	Setting range	Preset
6.0	Quit		
6.1	PRES. Sensor 1		
6.2	TEMP. Sensor 1		

Menu descriptions:

PRES. Sensor 1:

- Corresponds to the “configurable 2” in the “LOP Sensor type”.

TEMP. Sensor 1:

- Corresponds to the “configurable 2” in the “HET Sensor type”.



NOTE:

- “Configurable sensor data” means user can input the data manually according to the sensor curve. When configuring, please input the “resistance - measured value” from small to big one by one as following:

PRES. Sensor 1

Fix Point	1	2	3	4	5	6	7	8	9	10
Resistance	228.6	261.9	285.7	309.5	338.1	366.7	395.2	419.0	447.6	476.2
Measured	0.0	0.5	1	1.5	2	2.5	3	3.5	4	4.5

TEMP. Sensor 1

Fix Point	1	2	3	4	5	6	7	8	9	10
Resistance	7.0	17.0	24.0	30.0	40.0	58.0	80.0	110.0	140.0	210.0
Measured	140	120	110	100	90	80	70	60	50	40

7.7 CALIBRATION MENU

No.	Parameter	Setting range	Preset
7.0	Quit		
7.1	GEN. V1 offset	-9.9% to 9.9%	
7.2	GEN. V2 offset	-9.9% to 9.9%	
7.3	GEN. V3 offset	-9.9% to 9.9%	
7.4	Current I1 offset	-9.9% to 9.9%	
7.5	Current I2 offset	-9.9% to 9.9%	
7.6	Current I3 offset	-9.9% to 9.9%	
7.7	Pressure offset	-9.9% to 9.9%	
7.8	Temperature offset	-9.9% to 9.9%	
7.9	Batt. V offset	-9.9% to 9.9%	

Menu descriptions:

GEN. V1 offset

- Used to modify the measured value of GEN Phase 1 voltage.
- Reference to the Rated ph-voltage.

GEN. V2 offset

- Used to modify the measured value of GEN Phase 2 voltage.
- Reference to the Rated ph-voltage.

GEN. V3 offset

- Used to modify the measured value of GEN Phase 3 voltage.
- Reference to the Rated ph-voltage.

Current I1 offset

- Used to modify the measured value of Phase 1 current.
- Reference to the Rated current.

Current I2 offset

- Used to modify the measured value of Phase 2 current.
- Reference to the Rated current..

Current I3 offset

- Used to modify the measured value of Phase 3 current.
- Reference to the Rated current.

Pressure offset

- Used to modify the measured value of LOP sensor.

Temperature offset

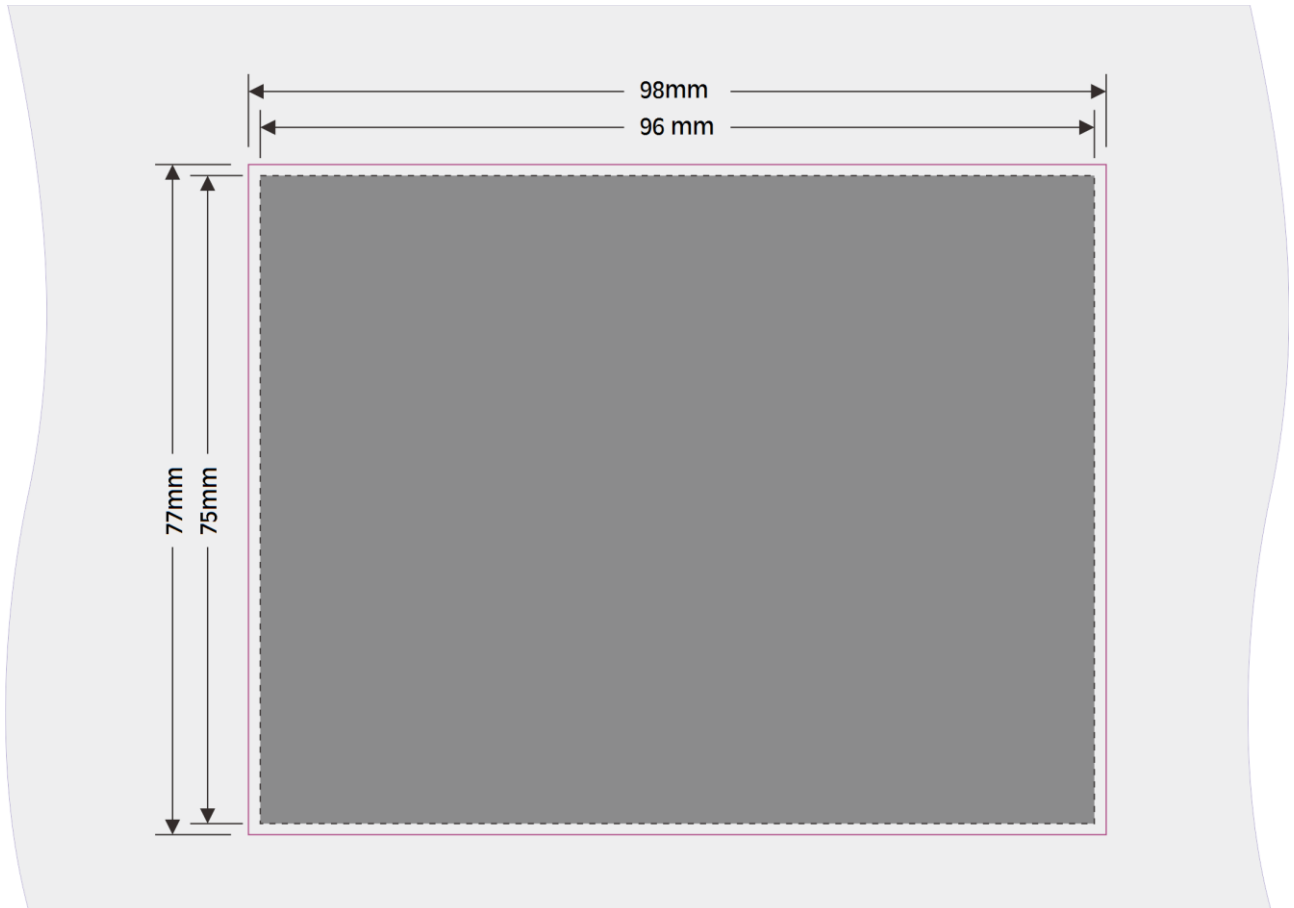
- Used to modify the measured value of HET sensor.

Bat. V offset

- Used to modify the measured value of battery voltage.

8 Installation Guide

8.1 The cutout dimensional drawing installed on panel as follows:



Cutout dimension: 98mm(W) x 77mm (H) . Dashed box dimensions for the controller..

The controller is fixed by 2 special fittings.

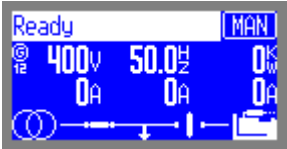
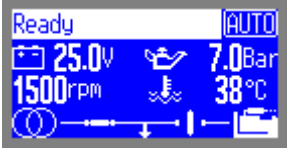

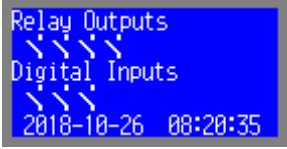
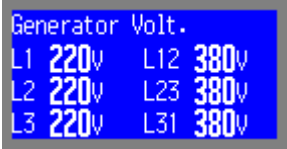
**NOTE:**

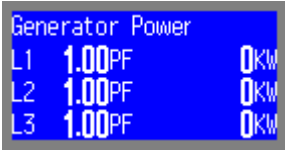
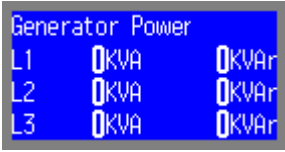
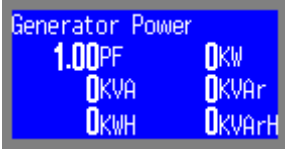
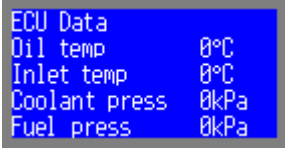
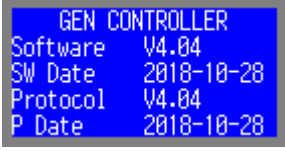
- If the installation of the controller installed directly on the chassis of the generator or other violent vibration of the device, must be installed shock absorber.
- To ensure that the degree of protection of the installation controller is IP65, the required panel mounting hole size must be strictly enforced.

9 LCD displays and Menu System












9.1 LCD displays measuring parameters:

Use a back-light graphic LCD to display data and information. Each LCD screen can display simultaneously plurality of data, uppermost is state information, all the status data nformation displayed by multiple screens. manual press “▶” to scroll for viewing next page, it can be configured as auto scroll as well, automatically switch between display screens at regular intervals (Only five pages display content at the first can auto page turning) , when alarm occurs, the alarm status is displayed on the LCD immediatel.












Frist page	Description
	<ul style="list-style-type: none"> ● Show GEN. L12 line voltage ● Power frequency ● Total active power generation load ● Power load current of each phase
Second page	Description
	<ul style="list-style-type: none"> ● Engine speed ● Battery voltage ● Engine oil pressure, do not use pressure sensors, this project is not displayed ● Engine coolant temperature when the temperature sensor is not used, this project is not displayed
Third page	Description
	<ul style="list-style-type: none"> ● Cumulative running time of the engine ● Cumulative number of engine cranking.
Four page	Description
	<ul style="list-style-type: none"> ● This page shows the state of controller digital inputs and relay outputs.
Five page	Description
	<ul style="list-style-type: none"> ● This page shows the generator phase voltage, line voltage.

Six page	Description
 <p>Generator Power L1 1.00PF 0KW L2 1.00PF 0KW L3 1.00PF 0KW</p>	<ul style="list-style-type: none"> ● This page show the GEN. of the three-phase active power and power factor.
Seven page	Description
 <p>Generator Power L1 0KVA 0KVA L2 0KVA 0KVA L3 0KVA 0KVA</p>	<ul style="list-style-type: none"> ● This page show the GEN. of three-phase power apparent power and reactive power.
Eight page	Description
 <p>Generator Power 1.00PF 0KW 0KVA 0KVA 0KWH 0KVA</p>	<ul style="list-style-type: none"> ● This page shows the total apparent power, total active power, total reactive power and average power factor. ● Power generation and reactive power.
Nine page	Description
 <p>ECU Data Oil temp 0°C Inlet temp 0°C Coolant press 0kPa Fuel press 0kPa</p>	<ul style="list-style-type: none"> ● These parameters from the engine ECU, that the engine type is not set as "ECU", ECU shows automatically hidden. ● Display parameters the ECU necessary support, otherwise it does not show the parameters.
Ten page	Description
 <p>GEN CONTROLLER Software V4.04 SW Date 2018-10-28 Protocol V4.04 P Date 2018-10-28</p>	<ul style="list-style-type: none"> ● This page displays information such as version control













9.2 Setting running parameter

Press and hold “” button 2sec to enter into settings menu, parameter setting modification is incremented or decremented bit by bit, then use “” or “” to scroll page in the same menu list, press “” enter into submenu, go to menu 1.2 “password” to enter password first, or select the required item, press “” enter into modify mode, press “” or “” to modify, the LCD displays 0 0 0 0 when prompted to enter password, then use “” or “” enter password, press “” to confirm after the password is set as 1111, then you can modify parameters. Otherwise it will prompt to key in password again. Press and hold “” for more than 2sec to quit parameter settings mode after finishing configuration.






FOR EXAMPLE: (SETTING CT RATIO AT 500: 5, THEN CT SHOULD BE CONFIGURED AS 500)

Operation	Description
Press and hold “  ” 2sec, enter into parameters setting menu, then LCD displays	[SETTING] 0. QUIT 1. SYSTEM 2. GENERATOR 3. ENGINE
Press “  ” once, press “  ” 6 times again, then press “  ” once, LCD displays:	[CT ratio] 1000: 5
Press “  ” or “  ” prompted enter password (1111), press “  ” button to confirm after entering password.	[CT ratio] Password: 0000
Press “  ” or “  ” to change parameters, change at 500, then LCD displays:	[CT ratio] 500: 5
Press “  ” to confirm, press and hold “  ” 2sec will quit parameter settings menu, then LCD displays:	Ready

FOR EXAMPLE: (SETTING CONTROLLER CRANK ATTEMPT AT 2)

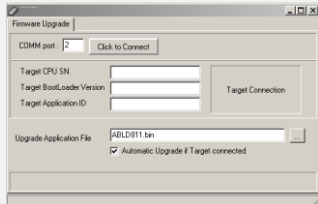






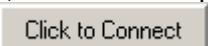
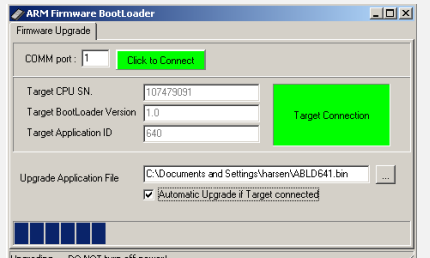
Operation	Description
Press and hold “  ” 2sec, enter into parameters setting menu, then LCD displays	[SETTING] 0. QUIT 1. SYSTEM 2. GENERATOR 3. ENGINE
Press “  ” button 2 times, then press “  ” button, LCD displays:	[ENGINE] 0. QUIT 1. ENGINE TYPE 2. ECU TYPE 3. ENGINE RATED SPEED
Press “  ” 9 times and then press “  ”, LCD displays:	[Crank attempt] 3
Press “  ” or “  ” prompted enter password (1111), press “  ” button to confirm after entering password.	[Crank attempt] Password: 0000
Press “  ” or “  ” to change parameters, change at 2.	[Crank attempt] 2
Press “  ” button to confirm, and then press “  ” 2sec will quit parameter settings menu, LCD displays:	Ready

Example: (the parameters of the controller reverts to the factory default values)

Operation	Description
Press and hold “  ” 2sec, enter into parameters settings menu, then LCD displays	[SETTING] 0. QUIT 1. SYSTEM 2. GENERATOR 3. ENGINE
Press “  ” button and then press “  ” 3times, then LCD displays:	[SYSTEM] 16. CB closed pulse 17. Reset to Man 18. Default settings 19. Firmware Update
Press “  ” button, prompted enter password (1111), press “  ” button to confirm after entering password..	[Default settings] Password: 0000

<p>Press “ <p>[SYSTEM] DONE</p> </p>
--

Example: (CONFIGURE CONTROLLER AS ONLINE PROGRAM MODE)

Operation	Description
<p>Open the programming software "ABLDs.exe" on your computer, such as the right to import the upgrade process, the controller connected to the computer via cable Minu USB, the computer will recognize the serial port software to fill "COMM port", but do not open the serial port, as following methods to enter programming mode; (If cannot identify serial port you need to installation the USB driver in CD)</p>	
<p>Press and hold “” 2sec, enter into parameters settings menu, then LCD displays:</p>	<p>[SETTING] 0. QUIT 1. SYSTEM 2. GENERATOR 3. ENGINE</p>
<p>Press “” button, then press “” 2 times, LCD displays:</p>	<p>[SYSTEM] 16. CB closed pulse 17. Reset to Man 18. Default settings 19. Firmware Update</p>
<p>Press “” button, prompted enter password (2222), press “” button to confirm after entering password.</p>	<p>[Default settings] Password:0000</p>
<p>Press “” to confirm enter the programming mode, then the controller LCD disappears, later click computer software "ABLDs.exe" serial port "  ", then it will automatically upgrade. In this mode it must ensure that the normal power supply, communication line connection will not be interrupted, restart the controller to work after a successful upgrade program.</p>	

10 Technical Specification

10.1 AC voltage:

Type	True RMS
Phase voltage	15 to 346VAC
Line voltage	25 to 600VAC
Max power wastage per line	<0.1W
Accuracy	1%
Display	0 to 600KV

10.2 AC voltage frequency:

Input frequency	3 to 500Hz (voltage \geq 15VAC)
Accuracy	0.1%
Display	0 to 500Hz

10.3 Current (isolated):

Measurement	True RMS
Measuring current	5A
Accuracy	1%
Display	0 to 30000A
Max power wastage per line	<0.01W

10.4 Power supply:

Voltage range	12V/24V (8-35V) continuous
Max. operating current	@12V 100mA, @24V 50mA
Max. standby current	@12V 40mA, @24V 20mA
Cranking drop outs	As before cranking voltage \geq 10V, can be maintained 80 ms at 0V, after the voltage is restored, the controller can work without to install additional auxiliary power.
Accuracy	1%
Display	0 to 40V

10.5 D-input:

Number	3
Max. contact resistance	5K Ω
Max. contact current per line	1mA

10.6 Configurable relay outputs

Quantity	4
Relay	3A/30Vdc

10.7 Analog Inputs

Number	2
Sensor type	Resistance
Resolution	10 bits
Range	0 to1 K Ω
Accuracy	2% When full scale, except for sensor error

10.8 Speed sensor

Voltage range	1 to 70V
Max. frequency	10000Hz
Fly wheel teeth	5 to 300

10.9 Environmental parameters

Operating ambient temperature Standards	-20 to 70°C IEC60068-2-1 和 IEC60068-2-2
Storage ambient temperature Standards	-30 to 80°C IEC60068-2-1 和 IEC60068-2-2
Humidity Standards	40°C, 93%RH, 96 hour IEC60068-2-30
Electro Magnetic compatibility (EMC) Standards	EN 61000-6-4 and EN 61000-6-2
Vibration Standards	EN 60068-2-6
Shock Standards	EN 60068-2-27
Electrical safety Standards	EN 60950-1
Degrees of protection Standards	IP65(front) IP20 (back) BS EN 60529