Harsen®

Manual

GU3310 / GU3311
Genset Controller

HM1077ER1

The Interpretation of the Symbol:

	WARNING: A WARNING indicates a potentially hazardous situation which, if not avoided, could result in death, serious personal injury or property damage.
	CAUTION: A CAUTION indicates a potentially hazardous situation which, if not avoided, could result in damage to equipment or property.
	NOTE: A NOTE provides other helpful information that does not fall under the warning or caution categories.

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 overs peed shutdown device to protect against runaway or damage to the prime mover with possible personal injury, loss of life, or property damage.

The over speed 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 charging device 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 of the controller and touch the components or conductors on the printed circuit board.

In The installation process you must pay attention to prevent electrostatic Damage

CAUTION:
Controller has been set at Harsens standard before delivery. The setting should be checked before starting the generator to confirm it meets the actual application.

History

No.	Rev.	Date	Editor	Validation	Changes
1	HM1077ER1	2013.7.15	Chen	P.L	New

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1 Description

The GU3310 and GU3311 are a new generation on single generating set intelligent controller which is new in shape and structure. It has improved the performance of the controller so that the new product can meet the needs of the user and Generator assembly plants for the different types of Automatic switch control generation and protection needed.

GU3310 is a Auto Start controller.

GU3311 is an Automatic Mains Failure Controller. When running in “AUTO” mode, it detects the Mains. It starts the generator automatically on Mains voltage failure. The Gen is on load; when Mains resumes to normal, it stops the generator after the delay, Mains is on load.

Characteristics:

- The voltage and current using true RMS measuring.
- Multi-Language menu.
- 128 x 64 graphic LCD.
- Unit maintenance time, presets and remind function.
- 3 Analogue inputs configurable with a variety of preset sensors and can also customize your own sensor curves.
- 5 Configurable outputs.
- 3 Configurable inputs.
- Buttons on control panel are used for selecting control modes, starting and stopping the operating procedure, displaying data and modifying the parameters. LED indicators are used for indicating the operation mode of controller and the running status of Genset, and LCD displays each measuring parameter and status.
- The controller can be connected to a PC and can read and set the running parameters of controller.
- Optional Canbus, read and control the parameters for an ECU engine.
- All connections of the controller are by secure plug and socket, for ease and convenience to connect, move, maintain and replace the device. When secured by the screw locks it prevents the plugs from falling out by vibration etc.

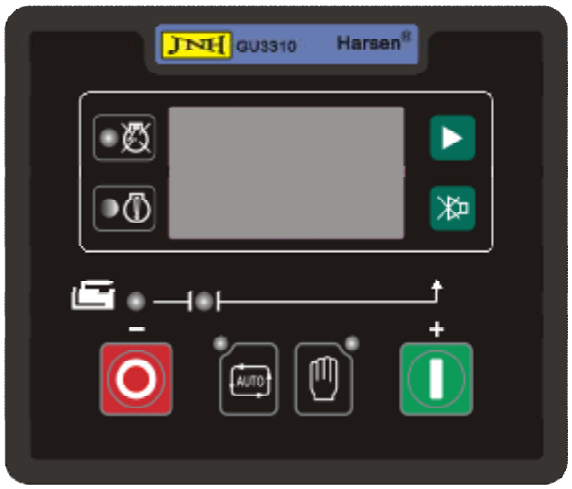
This manual is only suitable for GU3310/GU3311, user must carefully read this manual first.

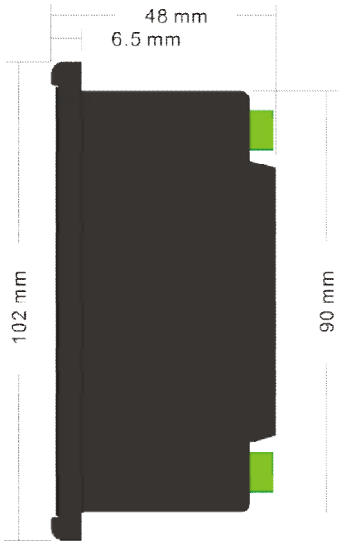
2 The Outline Dimension Drawings and Controller Wiring

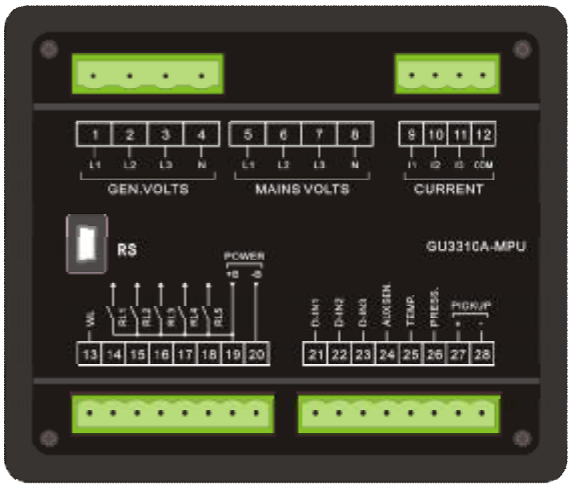
2.1 Following Details:

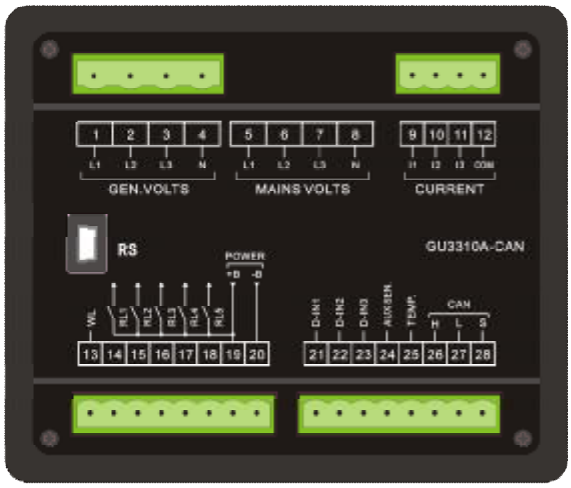
Module Dimensions	W120mm×H102mm
Panel Cutout	W109mm×H91mm
Depth	D48mm（without connection）

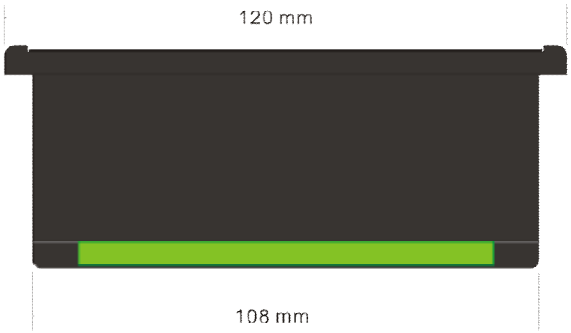
GU3310 controller



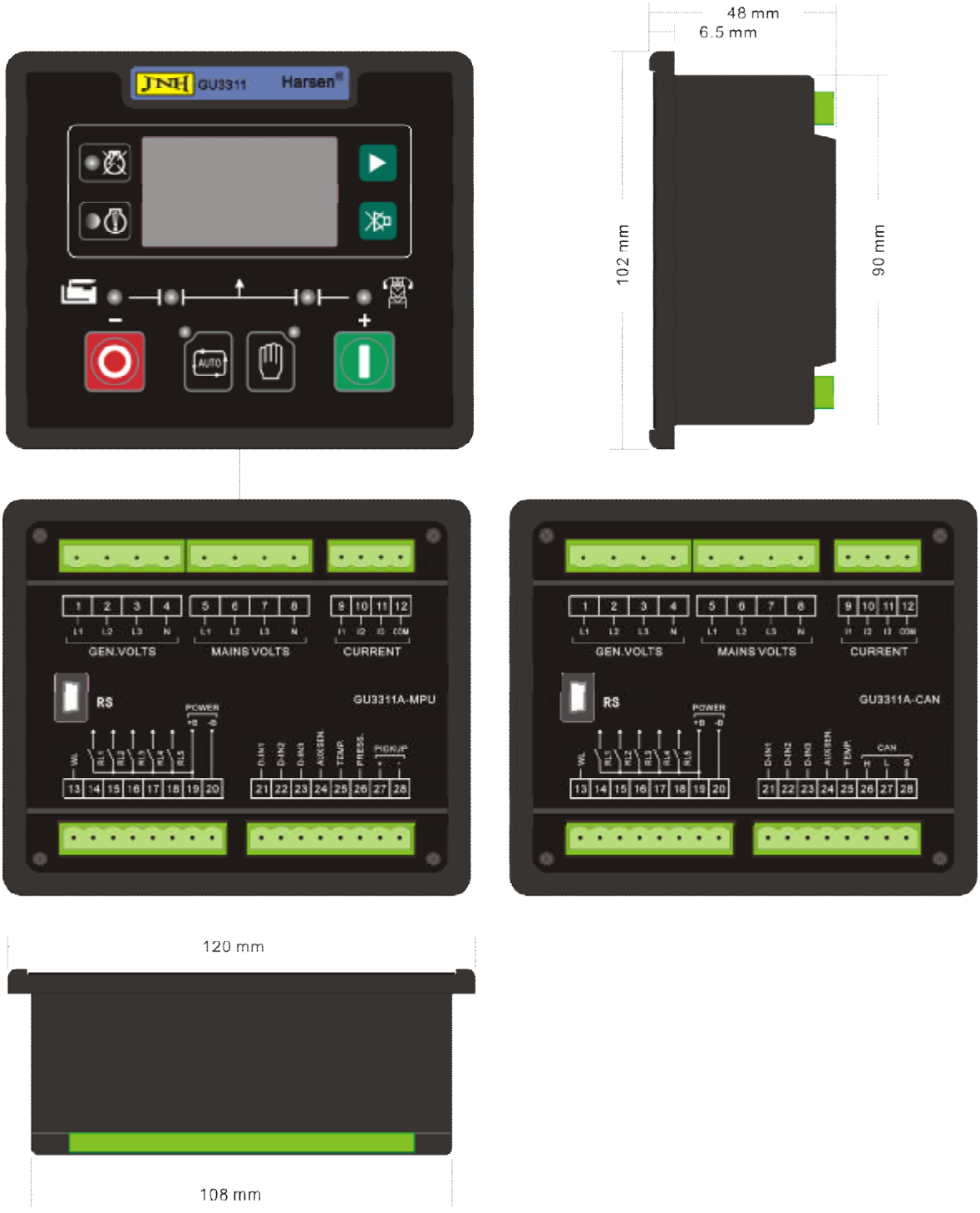








GU3311 controller



2.2 Terminal Connections:

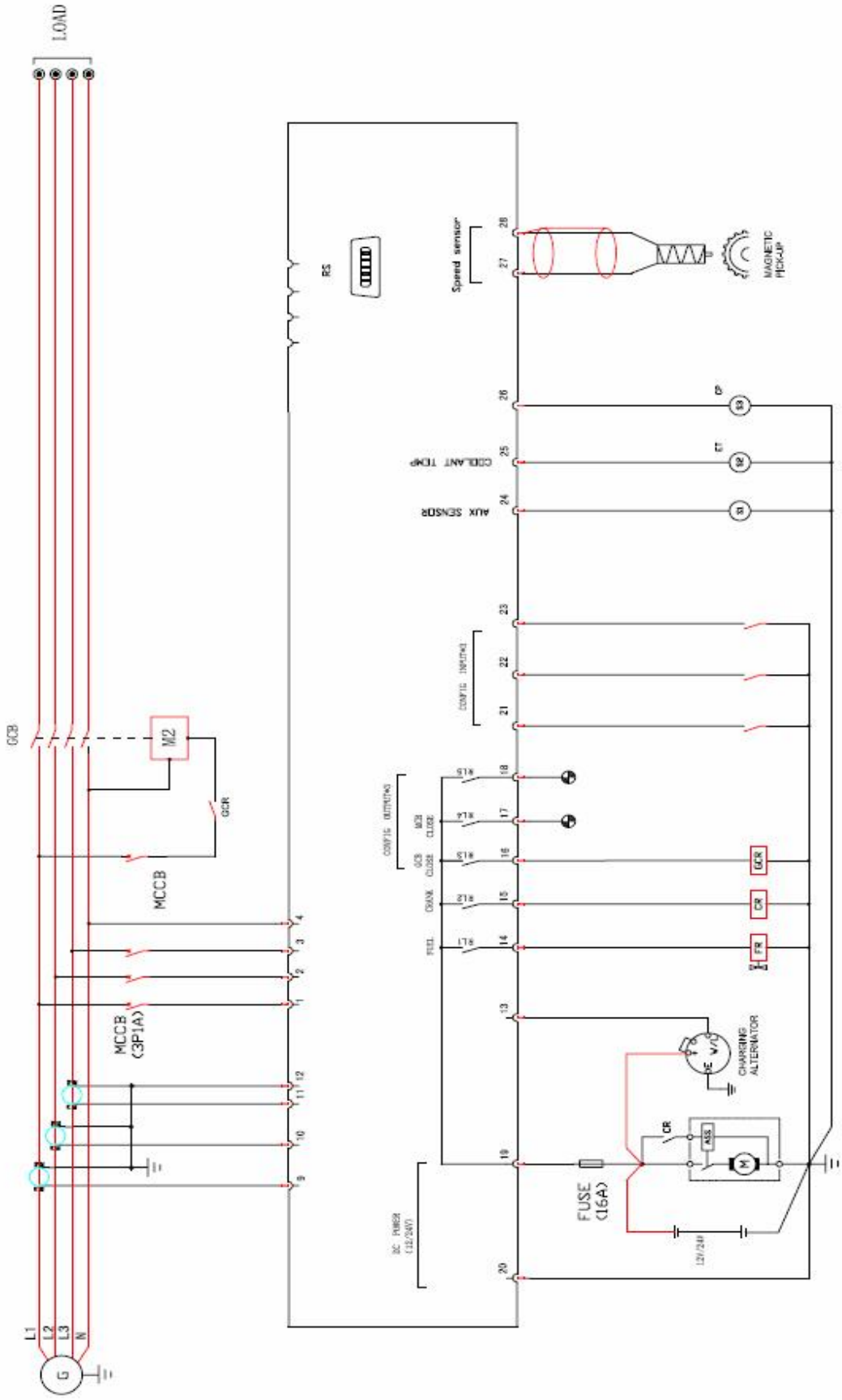
Pin no.	Function Description	Signal	Dim
1	GEN. V_{L1-N} input	0-346Vac	1mm²
2	GEN. V_{L2-N} input	0-346Vac	1mm²
3	GEN. V_{L3-N} input	0-346Vac	1mm²
4	GEN. Neutral		1mm²
5	MAINS V_{L1-N} input	0-346Vac	1mm²
6	MAINS V_{L2-N} input	0-346Vac	1mm²
7	MAINS V_{L3-N} input	0-346Vac	1mm²
8	MAINS Neutral		1mm²
9	I1 Gen current input (S1)	0-5A	2.5mm²
10	I2 Gen current input (S1)	0-5A	2.5mm²
11	I3 Gen current input (S1)	0-5A	2.5mm²
12	Common for current input (S2)	0-5A	2.5mm²
13	charger excitation power output	if not used, do not connect to negative	1mm²
14	Relay output 1	NO. contact, 3A/30Vdc, configurable 1	1mm²
15	Relay output 2	NO. contact, 3A/30Vdc, configurable 2	1mm²
16	Relay output 3	NO. contact, 3A/30Vdc, configurable 3	1mm²
17	Relay output 4	NO. contact, 3A/30Vdc, configurable 4	1mm²
18	Relay output 5	NO. contact, 3A/30Vdc, configurable 5	1mm²
19	Battery supply (+B)	12V/24V (8-35Vdc continuous)	2.5mm²
20	Battery supply (-B)		2.5mm²
21	Configurable Input switch signal 1	low level is active	1mm²
22	Configurable Input switch signal 2	low level is active	1mm²
23	Configurable Input switch signal 3	low level is active	1mm²
24	Auxiliary sensor	Resistance type sensor (<1KΩ)	2.5mm²
25	Temperature detection	Resistance temperature sensor (<1KΩ)	2.5mm²
26	Oil detection	Resistance Pressure sensor (<1KΩ)	2.5mm²
27	Magnetic pick-up signal(+)	1~70Vac	2 core shield
28	Magnetic pick-up signal(-)		

CAN type controller

26	CAN □-H	Electrical isolation	3 core shield
27	CAN □-L		
28	CAN □-S		

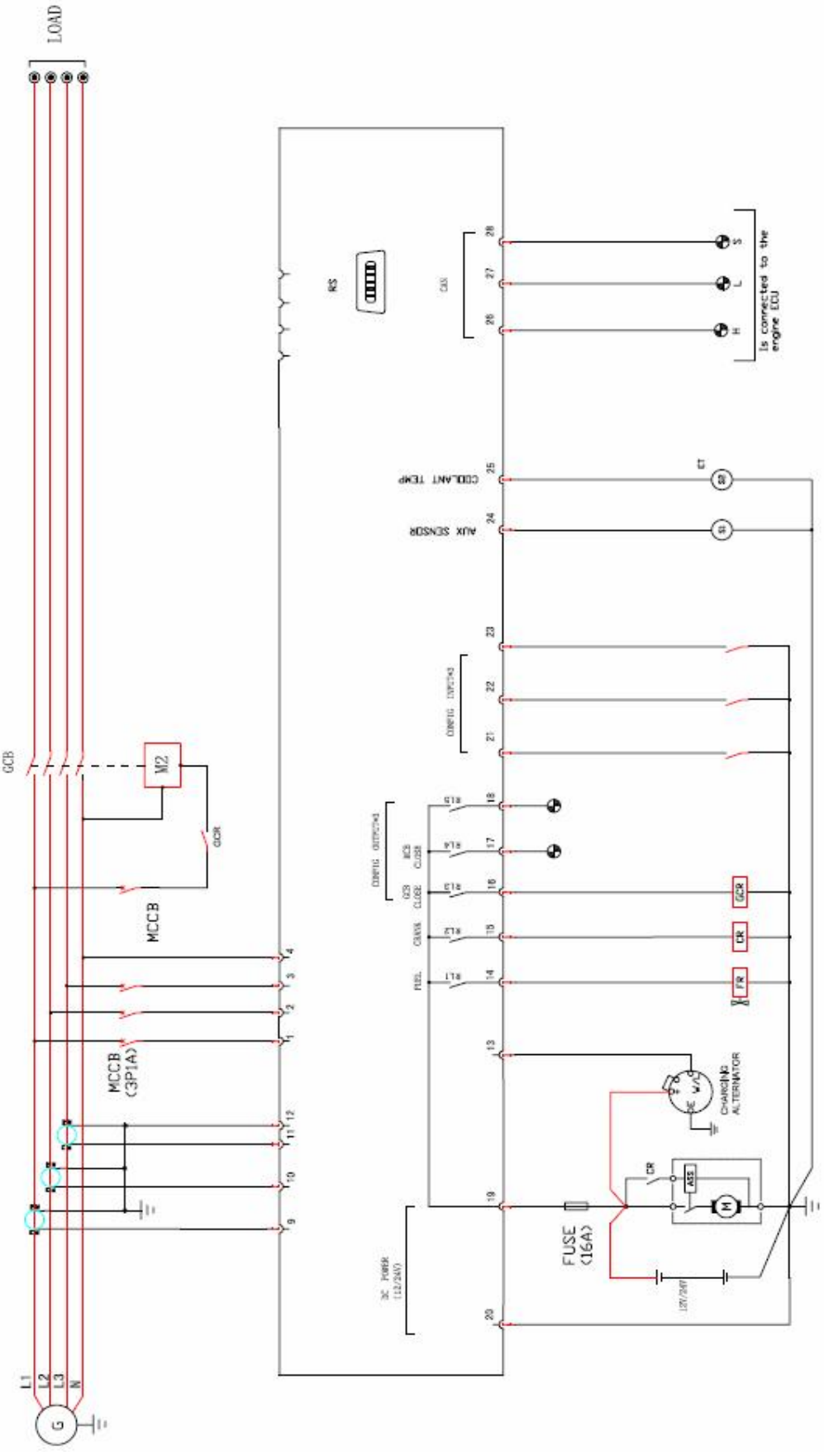
NOTE:
- Only GU3311 has port #5, #6, #7, #8.

2.3 GU3310+MPU Typical Wiring Diagram:



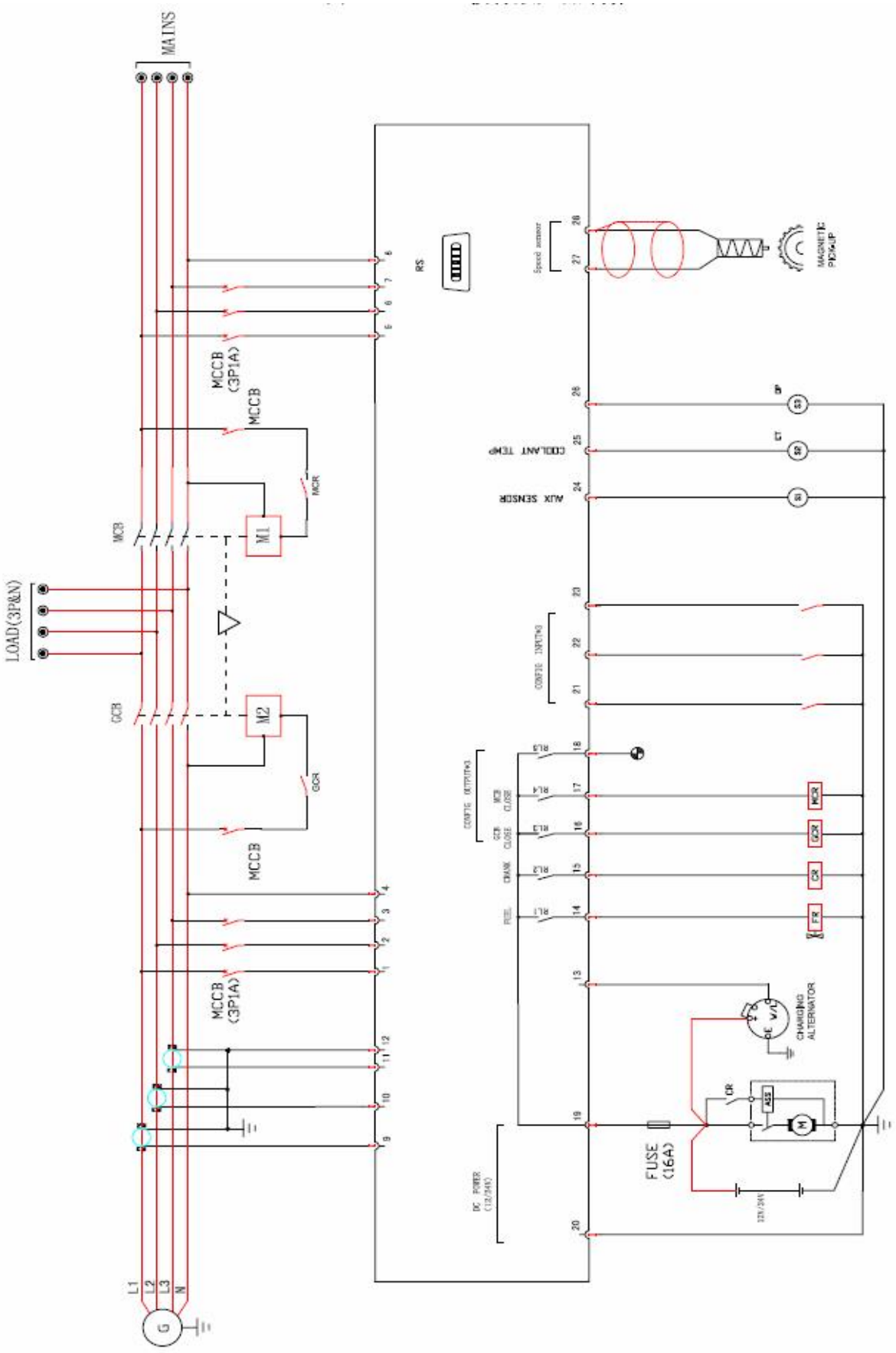
3 phase 4 wire

2.4 GU3310+CAN Typical Wiring Diagram:



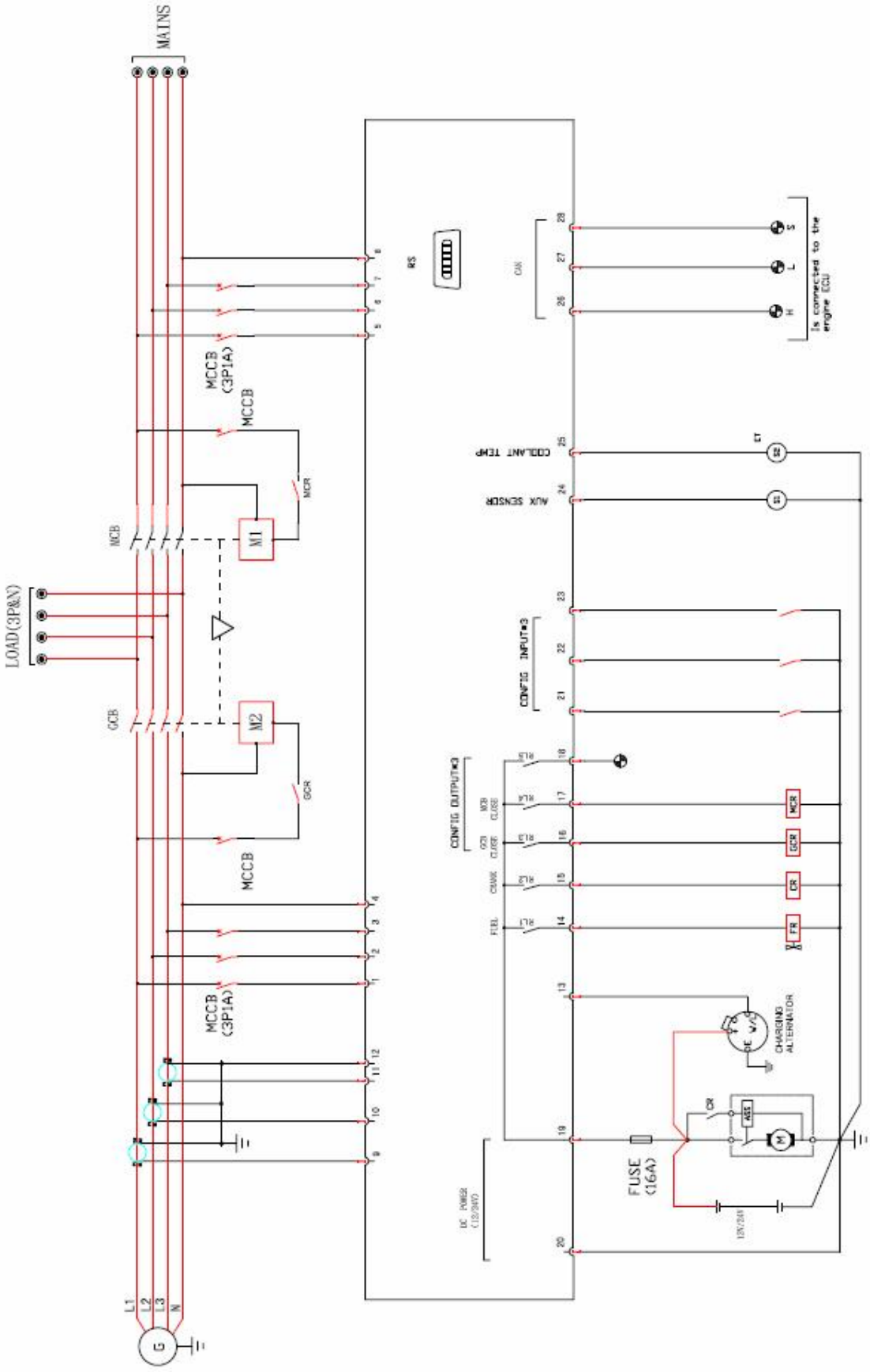
3 phase 4 wire

2.5 GU3311+MPU Typical Wiring Diagram:



3 phase 4 wire

2.6 GU3311+CAN Typical Wiring Diagram:



3 phase 4 wire

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 128*64 pixels 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 user friendly operational interface for the operator to easily control the Genset, read information and parameter setting.

3.1 Control buttons and LED

Function Description	Tag
Scroll Button Scroll menu for parameters display/ enter into or exit parameters setting by pressing and holding this button for 2sec.	
MUTE/ Lamp Test Button When failure occurs, alarm buzzer sounds. Pressing mute button will mute the sound. LCD displays mute icon. Press and hold mute button for 2sec, all LEDs illuminate simultaneously.	
AUTO Mode Button / LED/ The push button is used for selecting “auto mode”. When the controller is running in AUTO mode, the LED above the button is illuminated. The activation and deactivation of the “remote start signal input” and “Mains Failure” controls the starting and stopping of the Genset.	
MAN Mode Button / LED The push button is used for selecting “manual mode”. When the controller is running in MANUAL mode, the LED above the push button is illuminated. The Start and Stop push buttons control the starting of the Genset.	
START Button / “+” Value Increase The push button is used for manually start and stop the Genset. When controller is running in MANUAL mode, press this button to start and stop the generator. When in parameters setting mode, this button is used to increase the value / scroll the menu.	
STOP/ “-” Value Decrease The Push button is used for manually stopping the Genset. No matter what mode the controller is running, press and hold this button for 2sec to stop the generator, the mode of the controller will be default to “MAN” mode automatically from “AUTO” mode and the generator will be shut down after the cool down period, during the cool down period if you press and hold this button for 2sec again, the generator will be shut down immediately. The controller from manual mode to automatic mode. When in parameters setting mode, this button is used to decrease the value / scroll the menu.	
Shutdown Alarm (FAILURE) LED The LED will illuminate permanently when shutdown alarm occurs.	

Pre-alarm (Warning) LED The LED will illuminate permanently when pre-alarm occurs.	
GEN. Normal LED Gen. normal LED will illuminate after both voltage and frequency of the Gen. reach the preset value range.	
GEN. GCB LED LED will illuminate when GCB/MCB is closed and power supplied by Gen/Mains, LED will flash when Gen/Mains failure.	
MAINS Normal LED（Only GU3311 has） Mains normal LED will illuminate after both voltage and frequency of the Mains reach the preset value range.	
MAINS MCB LED（Only GU3311 has） LED will illuminate when the GCB/MCB is closed and power is supplied by Gen/Mains, The LED will flash in the case of Gen/Mains failure.	

4 Control and Operation Instruction

The controller has 2 modes AUTO and MANUAL.

4.1 Operation Mode Setting:

Operation	Description
Press and hold the “AUTO” button, the LED above the button is illuminated; the controller is running in “AUTO” mode.	
Press and hold the “MAN” button, the LED above the button is illuminated; the controller is running in “MAN” mode.	

NOTE:
- Only 1 mode can be selected from above 2 modes.
- 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 digital input has been set as "panel lock" and is activated, This will not change the operation mode of the controller.

4.2 AUTO Control Sequence:

The controller is running in “AUTO” mode.

When Mains is normal, Mains is on load（Only GU3311 has）:

When Mains is normal both voltage and frequency of Mains are within the range of the preset value, the Mains normal LED illuminates, the timer for **Mains Supply Delay** is activated, when it times out the Mains close/open relay closes, the transfer switch switches the load to the Mains, the transfer switch’s Aux. contact feeds back the signal to a configurable input on our controller and the MCB closed LED illuminates.

WARNING:
- When the Mains normal LED is illuminated it means that both voltage and frequency of Mains are within the range of preset values; When the Mains normal LED flashes means either voltage or frequency of the Mains are over the range of preset values; If the Mains normal LED does not illuminate it means that the Mains voltage is lower than 10% of the rated voltage.
- Do not assume the Mains is not available if Mains normal LED does not illuminate, it may be still available but outside set parameters.

Mains Fail to load: If Mains close/open relay is closed the Mains fail to Load timer is activated when it times out if the controller does not receive the Mains switch auxiliary contact feed back signal then Mains fail to Load alarm is activated.

NOTE:

- The Above control procedure assumes that one of configurable inputs has been configured as **Mains Aux.Switch Closed** and connects the ATS switch's N.O. Aux. contact signal to this input.
- If you do not configure an input as **Mains Aux.Switch Closed** when the MCB closed LED illuminates is only an indication that the circuit breaker close/open relay should have been closed， under this condition, the alarm for **Mains fail to load** is inactive.
- If you do not configure a relay as **Mains close/open**, the controller without power supply program, only has Mains parameter detection and display as Mains status display and generator boot request condition.

Generator Auto Start Sequence:

Controller implements following procedure when the Mains fails:

- The controller detecting either the voltage or the frequency of Mains is over the range of preset value and delay confirmed.
- Mains fail to load.

(Only GU3311 has above two conditions)

- One of configurable Input must be defined as remote loading start signal.
- One of configurable Input must be defined as remote no-load start signal.
- The built-in scheduler activation sends a start request.

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 energized and the starter motor engages and begins to crank the engine. When the engine speed reaches the crank disconnect speed the start relay output is de-energised and the safety-on delay time 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 selected idle function, the idle relay will be closed at the same time as the crank relay is closed, the idle timers will begin counting down after successful start up, when it times out, the idle relay open, other procedure is the same as above.

NOTE:

- Controller will not detect under voltage, under frequency, under speed, and charge failure during idle period.
- 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 frequency reaches the preset value;
- The speed reaches **crank cut off value**;
- Generator Voltage reaches the **crank cut off value** (optional);
- Charger voltage reaches **crank cut off value** (optional);
- Oil pressure switch is opened and delay counter time's up (optional);
- Cranking time's up.

Controller can not implement crank procedure in one of following conditions:
- The generator frequency reaches the preset value;
- The speed reaches **crank cut off value**;
- Generator Voltage reaches the **crank cut off value** (optional);
- Oil pressure switch is opened or oil pressure is higher than **crank cut off value** (optional).

CAUTION:
- If magnetic pickup is not used, since the engine cranking cut off signal is sensed from the generator frequency. To avoid damage to the start motor please make sure the output voltage is higher than the controller can measure the voltage value while cranking.

Repeat Crank: During the crank period, if the engine does not fire the start relay output de-energises and crank rest timer begins. 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 it was successful start up or reaches the configured number of crank cycles.

If any shutdown alarm occurs during crank the controller will stop cranking immediately the genset only can be restarted after clearing the failure.

Start Failure: The above procedure will be repeated until it reaches the configured number of crank cycles. The crank relay output is then de-energised and locks out as **Fail to Start.** The failure LED illuminates and the LCD displays Fail to Start.

CAUTION:
- If Fail to Start occurs the operator must check the whole Genset system to find reason for failure, only after clearing the failure can " STOP / RESET" button to reset fault lock out status, and restart the Genset.

Generator Loading Sequence:

When Generator is running normally the Gen normal LED illuminates the timer for Gen power supply-delay is then activated when it time's out Gen close/open relay closes then the transfer switch switches the load to the Generator. The transfer Aux switch contact feeds back a signal to a configurable input on the controller and the GCB closed LED illuminates.

NOTE:
- Effective **remote no-load start** input, or **dispatch mode** set to no-load, generator only no-load operation
- The generator switching command is only achieved after the **safety inspection delay** timer is over.
- If not a switch input port is defined as a Generator closed auxiliary contact, then, the GEN. GCB led is illuminated only expresses the GCB relay output of the controller ..

Mains return and generator shutdown sequence（Only GU3311 has）:

When Mains resumes to normal, Mains normal LED illuminates the **Mains supply delay** timer is activated Gen close/open relay is de-energised after it times out the Mains Close/open relay is energised, transfer switch switches the load to the Main the Aux switch contact feeds back the signal to a configurable input on our controller and the MCB closed LED illuminates.

At the same time as the Mains close/open relay is energised the timer for cooling down delay is activated when it times out the fuel relay de-energises, generator stops and recovers to its standby status.

Generator unloading and stop process

Controller sends the unloading command in following conditions:

- Mains voltage returns to normal, the mains power supply delay timer then starts **(Only GU3311 has**）.
- **Remote loading start** input is invalid.
- The scheduler start request is invalid.

After the Gen points brake and Mains power supply to normal, cooling time delay start the countdown, the controller fuel relay action after timing end, disconnect instantly fuel solenoid valve, generator outage into standby mode.

Stop Failure: When cool down times out, if the controller detects that the voltage and frequency of the generator or oil pressure are greater than the internally set values, the fail to stop delay timer begins. When it times out the failure LED illuminates and the LCD displays “Fail to stop”.

NOTE:

- After stop failure, the controller will not energise the crank relay output if the failure has not been removed and the controller reset.

4.3 MAN control Sequence:

The controller is running in “MANUAL” mode.

Mains is normal（Only GU3311 has）:

When Mains is normal means that both voltage and frequency of Mains are within the range of preset value, the Mains normal LED illuminates, the Mains close/open relay will not close automatically.

Generator starting sequence:

Pressing “START” button the fuel relay output is energised, and operates the fuel solenoid of engine, After 300ms delay, the start relay output is energised, the starter motor engages and begins to crank the engine, When the engine speed reaches the crank disconnect speed, the start relay output is de-energised and the safety-on delay time 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.

After both voltage and frequency of generator respectively reached the normal value, the Gen normal LED illuminates, the Gen close/open relay will not be closed automatically.

Generator stops sequence:

Press “STOP” button, the cool down delay timer starts, when it times out , the fuel relay output is de-energised, then the fuel solenoid opens immediately, generator stops and goes to standby status.

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

4.4 The start and stop Sequence of engine with fuel solenoid is N. O. type (energise to stop):

There are two kind 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 by 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 by power. All control sequence above are for N.C. type.

Start control sequence for N.O. type:

During the starting sequence the fuel output relay of controller will not energise, fuel solenoid is normally open so no signal required for fuel solenoid to activate.

Stop control sequence for N.O. type:

During the controller stop sequence, the fuel relay output energises, the fuel solenoid closes the fuel valve and the engine begins to stop. After a delay (same as fail to stop delay timer) fuel relay de-energises, disconnecting the supply from the fuel solenoid.

Other control sequence same as engine fuel solenoid type is N. C. type (energise to run).

4.5 Idle function:

For **idle** function configure one of the configurable outputs as idle.

Refer to the flow chart for start and stop for idle control levels.

NOTE:

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

4.6 Preheat function:

For **Preheat** function, configure one of the configurable outputs as Preheat, The controller has 6 selectable preheat control modes as below:

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

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

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

Mode 4 — one of the configurable input is defined as Preheat, preheat relay output energises when this configurable input is active, and de-energises when configurable input is inactive.

Mode 5 —the Temperature analog input 2 is defined as **Preheat**, preheat relay output energises when the temperature falls below the **Preheat ON** value, and de-energises until the temperature reaches the **Preheat OFF** value.

Mode 6 —the Auxiliary analog input is defined as **Preheat,** preheat relay output energises when the temperature falls below the **Preheat 1 ON** value, and de-energises until the temperature reaches the **Preheat 1 OFF** value.

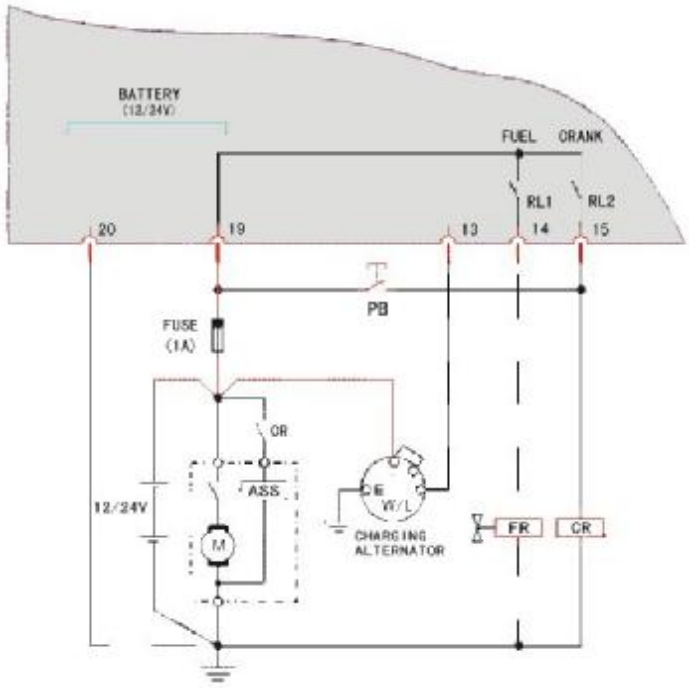
For preheat mode 1 to 3, please refer to the flow chart for start and stop for Preheat control levels.
For preheat mode 4 to 6, preheat function is active immediately when the controller is power up.
During crank attempt the preheat relay output will not energise in any of above modes.

4.7 The function of forcing a start

Reason to add this function to the controller when the genset is under abnormal conditions, i.e whe the battery voltage is too low, or ambient temperature are too low, or generator only outputs voltage at a high speed when magnetic pick-up is not used, therefore 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:

First method: when controller is running in “MANUAL” mode, normally the crank time will not exceed the pre-set value, but you can press “START” button and hold until it has started, the crank time depends on the holding time on the button. Safety-on timer begins after it has successfully started, the other processes and protections are the same as for a normal start.

Second method: when controller is running in “MANUAL” mode, configure the “External crank permit” as “1”, shown as schematic below, a PB switch is externally mounted to control cranking. Close PB switch, engine cranks, when the speed reaches 150RPM or generator voltage output is not less than AC20V if magnetic pickup is not used, then controller functions are triggered, the fuel relay output is energised, safety-on timer begins after the speed reaches crank cutout value, the other processes and protections are the same as normal start. If the speed falls below 150RPM within safety-on time, controller will be reset and return to standby status.



CAUTION	**CAUTION:** l We normally don’t recommend using the second method to solve this condition. l Play attention on the installation of PB switch to avoid cranking when the genset is running.

5 Measure and Display Data

Mains V_{Ph-N} L1-N L2-N L3-N
Mains V_{Ph-Ph} L1-L2 L2-L3 L3-L1
Mains frequency HZ (L1)
（**Only GU3311 has above 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)
Mains/Gen load 3 phases current I1 I2 I3
Mains/Gen active power∑P
Mains/Gen reactive power ∑Q
Mains/Gen power factor PF(AV)
（**Only GU3311 has above mains data**）
Engine speed RPM (signal derived from magnetic pick-up, generator Hz or ECU)
Oil pressure Bar /PSI (signal derived from oil pressure sensor or ECU)
Engine temperature ℃/℉ (signal derived from temperature sensor or ECU)
Auxiliary sensor
Battery voltage Vdc
Genset Running hour Hour

6 Alarm level

The controller configuration has different levels of alarm users can set according to the actual application requirement. Different level configurations are shown in the table below：

Alarm level	Screen display	"Warning" light And audible buzzer	Power load switch GCB off	"Warning" light Generator shutdown
1	**Yes**	**No**	**No**	**No**
	Warning：This warning does not interrupt equipment operation, does not send the public alarm, LCD displays the warning content, Also this triggers a relay action so it can produce a warning external to the unit itself, no other control behavior occurs.			
2	**Yes**	**Yes**	**No**	**No**
	Warning：This warning does not interrupt equipment operation, public "warning" LED light and audible buzzer sounds, LCD displays the warning content, Also this triggers a relay action so it can produce a warning external to the unit itself no other control behavior occurs.			
3	**Yes**	**Yes**	**Soft unloading**	**No**
	Warning：Public "warning" LED light and buzzer sound, the controller performs uninstall program and opens GCB, LCD displays warning content, Also this triggers a relay action so it can produce a warning external to the unit itself, the generator does not stop.			
4	**Yes**	**Yes**	**Soft unloading**	**Cooling time**
	Stop fault：Public "warning" LED light and buzzer Sound, the controller performs uninstall program and opens GCB, the generator stops after cooling down, LCD displays fault contents. Fault can be reset after the confirmation alarm.			
5	**Yes**	**Yes**	**Immediately**	**Cooling time**
	Stop fault：Public "warning" LED light and buzzer Sound, immediately opens GCB, the generator stops after cooling down, LCD display fault contents. Fault can be reset after troubleshooting.			
6	**Yes**	**Yes**	**Immediately**	**Immediately**
	Stop fault：Public "warning" LED light and buzzer Sound, immediately opens GCB, the generator instantly shutdown without cooldown, LCD display fault content. Fault can be reset after the troubleshooting.			
0	**No**	**No**	**No**	**No**
	Control: Only as a control condition, trigger relevant control command.			

NOTE:

- Warning level alarm is a non-serious fault condition and does not constitute a hazard to the Genset if only temporary but the operator must pay attention to the condition and solve it immediately to ensure continuous operation of the machinery. A warning does not lock the system or stop it and will discharge automatically when the fault is cleared.
- With the Shutdown alarm the system will lock the fault must be cleared and the rest button discharged before the Genset will restart

7 Parameters Setting

7.1 SYSTEM:

NO.	Items	Value Range	Preset
1.0	**Quit**		
1.1	**Language**		
1.2	**Password**	0000 to 9999	
1.3	**Pressure unit**	0Bar / 1 PSI	0
1.4	**Temperature unit**	0℃ / 1℉	0
1.5	**Comm. address**	1 to 247	1
1.6	**Startup mode**	0 manual / 1 automatic / 2 finally 0	0
1.7	**CT ratio**	5:5 to 6000:5	1000:5
1.8	**PT ratio**	1.0:1 to 10.0:1	1.0:1
1.9	**Rated voltage**	45 to 3000VAC	220V
1.10	**Rated current**	1 to 6000A	1000A
1.11	**Voltage type**	1 to 5 / Do not use	1
1.12	**Display contrast**	1 to 9%	5
1.13	**Display brightness**	1 to 9%	5
1.14	**Saving brightness**	0 to 9%	1
1.15	**Auto scroll time**	1 to 60S / Do not use	Do not use
1.16	**Starting alarm**	0 no / 1 yes	0
1.17	**CB close pulse**	0 to 60 seconds /0 continuous	0
1.18	**Reset to MAN**	0 no / 1 yes	0
1.19	**Default settings**		

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 have the authority of CL0 and can modify all parameters, the default setting is “2213”.
- CL2 for factory, who have the authority of CL1 and on-line update, the default setting as “3132”.
- 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[psi] =P[bar]*14.503.

Temperature unit

- Used to define temperature unit which is displayed on the LCD. “0” stand for ℃, “1” stand for ℉.
- Transfer formula: T[℉]=(T[℃]*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 begin control 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 load: A，KW，KVAR，PF.
- Used for shutdown alarm: over/under current, etc.

PT ratio

- Definition Gen and Mains Voltage transformer turns ratio of the primary and secondary.
- used to Gen and Mains of Measurement computing: V，HZ，KW，KVAR，PF.
- Used to trigger for setting limits: high / low voltage, etc.

Rated voltage

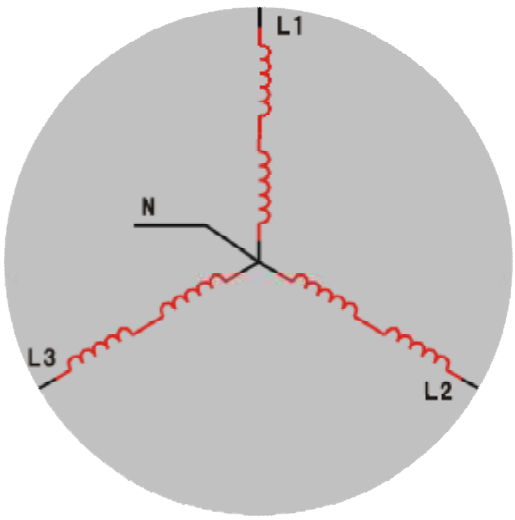
- Used to define the rated voltage (phase to neutral) of Gen and Mains,
- Reference value for judging over/under voltage.

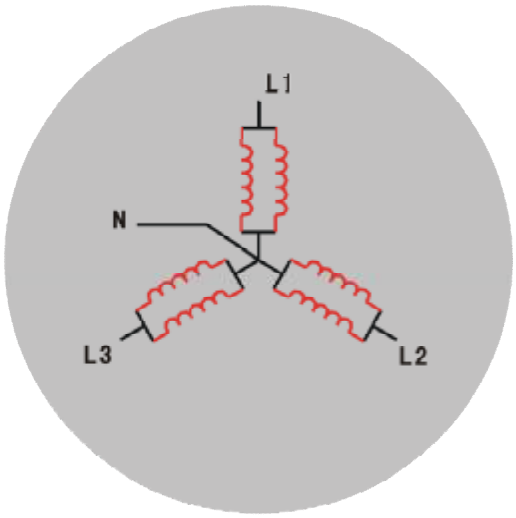
Rated current

- Used to define the rated current of Gen and Mains.
- Reference value for judging over current.

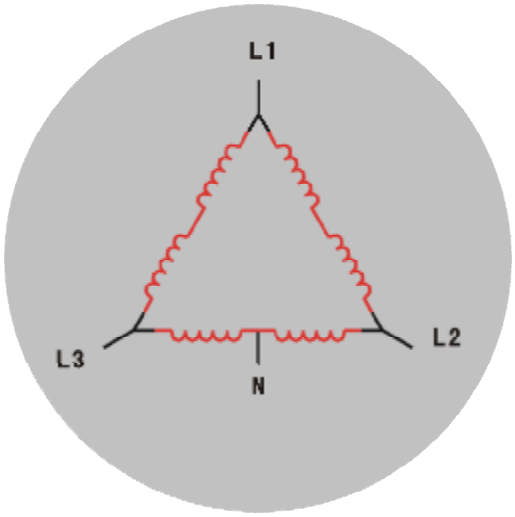
Voltage type

- There are 5 kinds of voltage type: “Y” 3P4W, “△”3P4W, 3P3W, 2P3W, 1P2W.
- 1— “Y” 3P4W (3 phases 4 wires):

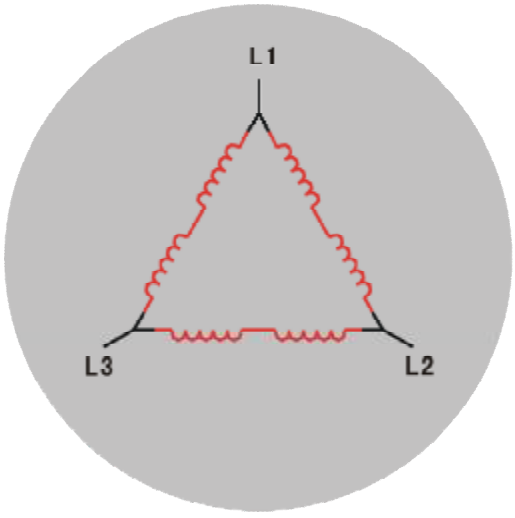


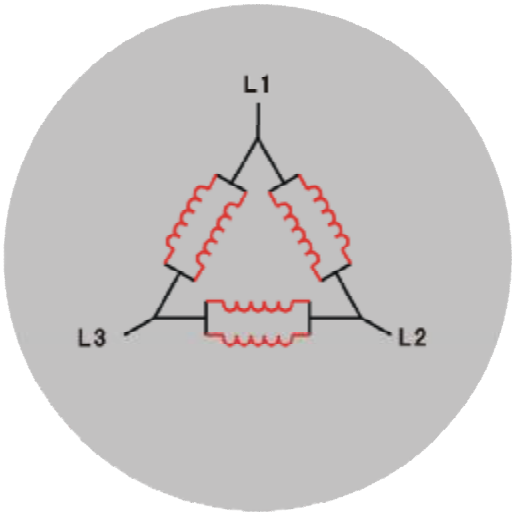


- 2—“△” 3P4W (3 phases 4 wires):

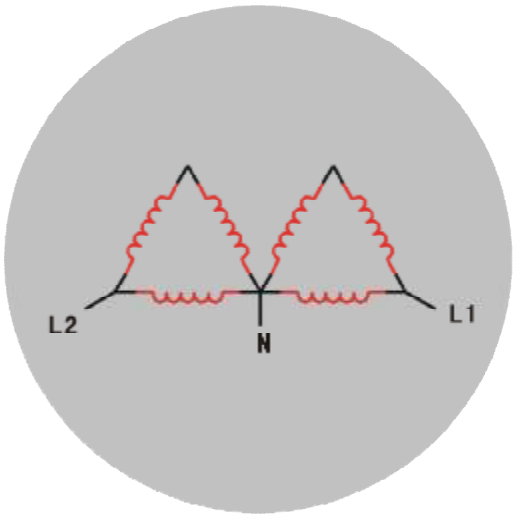


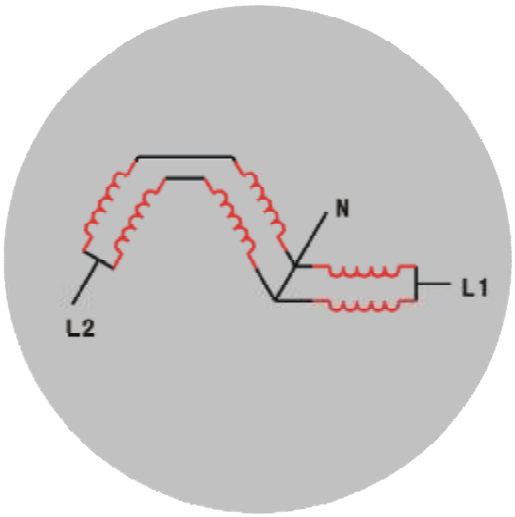
- 3— 3P3W (3 phases 3 wires):



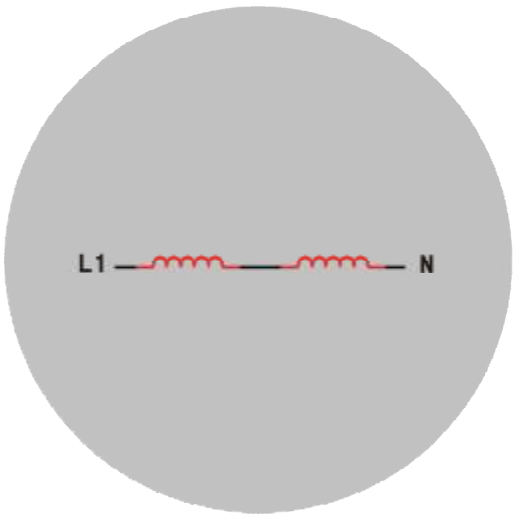


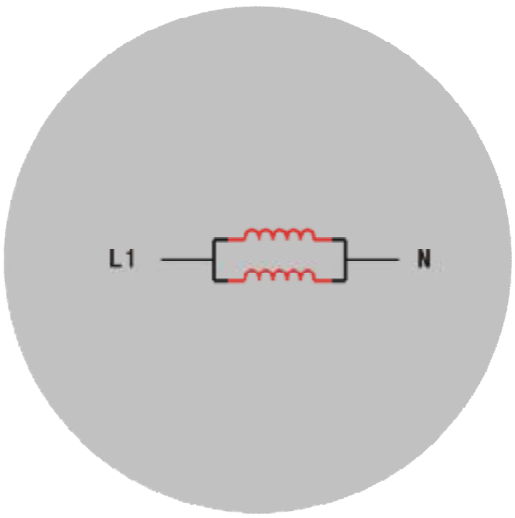
- 4— 2P3W (2 phase 3 wires):





- 5— 1P2W (single phase 2 wires):





- Relevant electrical parameter is invalid when the parameter is set to "do not use", controller does not measure and display the parameters.

Display contrast

- Used to adjust the display contrast of the LCD.

Display brightness

- Used to adjust the backlight brightness with the operation panel and GEN operation of the LCD.

Saving brightness

- Used to adjust the backlight brightness when on standby state of the LCD.
- Start to scroll automatically 30 seconds after not pressing any button.

Auto scroll time

- Used to configure the cycle of page scroll.
- When parameter is configured as “not used”, manually scroll page via“ ”button.

Starting alarm

- When parameter is configured as “0”, the controller didn't make the noise alarm before the generator start.
- When parameter is configured as “1”, the controller star the generator will be made the noise alarm when in startup time delay and the preheating.

CB close pulse

- When parameter is configured as “continuous”, the controller switching relay has been output, unless the controller failure or points brake command.
- When parameter is configured as “numerical”, the relay closed output after the controller sending the switching command. Timer timing, the closing relay off when the accumulated time reaching to a set pulse time.

Reset to MAN

- When parameter is configured as “1”, the controller happen stop fault, fault state lock. Press the reset button when the fault eliminate, the controller will switch to “MAN” mode no matter in any mode before.
- When parameter is configured as “0”, the controller happen stop fault, fault state lock. Press the reset button when the fault eliminate, the controller keeping to the original pattern.

CAUTION:

- When the “Reset to MAN” set to “0”, press the reset button after automatic mode, Generator may not have any warning start when the start conditions meet.

Default settings

- All parameters are resumed to default setting.

7.2 GENERATOR:

NO.	Items	Value Range	Preset
2.0	Quit		
2.1	GEN V-monitor type	0 phase - phase /1 Phase - zero	1
2.2	**GEN-V under 1**		
	Function	0 no / 1 yes	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 no / 1 yes	0
	Limit	20 to 200%	0%
	Delay	0 to 999S	5S
	Delay by	0 to 3	3
	ALM. class	0 to 6	5
2.4	**GEN-V over 1**		
	Function	0 no / 1 yes	0
	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 no / 1 yes	0
	Limit	20 to 200%	999%
	Delay	0 to 999S	5S
	Delay by	0 to 3	3
	ALM. class	0 to 6	5
2.6	**GEN-Hz under 1**		
	Function	0 no / 1 yes	1
	Limit	10.0 to 100.0Hz	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 no/1 yes	0
	Limit	10.0 to 100.0Hz	0.0Hz
	Delay	0 to 999S	5S
	Delay by	0 to 3	3
	ALM. class	0 to 6	5
2.8	**GEN-Hz over 1**		
	Function	0 no/1 yes	1
	Limit	10.0 to 100.0Hz	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 no / 1 yes	0
	Limit	10.0 to 100.0Hz	57.0Hz
	Delay	0 to 999S	5S
	Delay by	0 to 3	3
	ALM**.** class	0 to 6	2
2.10	**GEN-I over 1**		
	Function	0 no / 1 yes	1
	Limit	50 to 300%	200%
	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 no / 1 yes	0
	Limit	50 to 300%	200%
	Delay	0 to 999S	5S
	Delay by	0 to 3	3
	ALM**.** class	0 to 6	5
2.12	**GCB close**		
	Function	0 no / 1 yes	1
	Delay	0 to 999S	5S
	ALM**.** class	0 to 6	2
2.13	**GCB open**		
	Function	0 no / 1 yes	0
	Delay	0 to 999S	5S
	ALM**.** class	0 to 6	2
2.14	GEN. loading Volt	20 to 200%	95%
2.15	GEN. loading Hz	10.0 to 100.0Hz	48.0Hz
2.16	GEN. on delay	0 to 9999S	5S
2.17	Soft unload time	1 to 9999S	5S

Menu descriptions:

GEN V-monitor type

- Used to choose the controller is phase - phase or phase - zero voltage as mains voltage monitoring object.
- Choose the controller is phase - phase or phase – zero in different voltage input type, detection of the different voltage, specific as follows table:

Parameters / Voltage type	Phase – Phase	Phase – Zero
"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 has two level low voltage limit value monitoring for warning, breakdown and control. E.g. to choose 1/2/3 alarm level, when protection function sparks, LCD displays "!W:GEN-V under 1" or "!W:GEN-V under 2", to choose 4/5/6 alarm level, when protection function activates, LCD displays "!A:GEN-V under 1" or "!A:GEN-V under 2".

Monitoring	Select "1", the monitoring function is effective; Select "0", the monitoring function is invalid.
Limit	Used to define the threshold low voltage protection. When the power voltage arrive to or below this threshold, the duration more than delay time, trigger alarm level definition action.
Delay	If the GEN low voltage more than the delay setting time, trigger alarm level defined action; If the low voltage higher than the voltage limit value before the delay termination, delay time return to zero.
Starting point	Monitoring function active time range setting: Set it to be (0): work all the time; Set it to be (1): start with crank; Set it to be (2): start after the safety monitoring delay; Set it to be (3): start when running.
ALM. class	Used to define the trigger protection, the controller what the action happen. Detailed refer to the alarm level configuration table.

GEN-V over 1&2

- Controller has two level high voltage limit value monitoring for warning, breakdown and control. E.g. to choose 1/2/3 alarm level, when protection function sparks, LCD displays “!W:GEN-V over 1” or “!W:GEN-V over 2”, to choose 4/5/6 alarm level, when protection function activates, LCD displays “!A:GEN-V over 1” or “!A:GEN-V over 1”.

Monitoring	Select "1", the monitoring function is effective; Select "0", the monitoring function is invalid.
Limit	Used to define the threshold high voltage protection. When the power voltage arrive to or higher than this threshold, the duration more than delay time, trigger alarm level definition action.
Delay	If the GEN high voltage more than the delay setting time, trigger alarm level defined action; If the high voltage below the voltage limit value before the delay termination, delay time return to zero.
Starting point	Monitoring function active time range setting: Set it to be (0): work all the time; Set it to be (1): start with crank; Set it to be (2): start after the safety monitoring delay; Set it to be (3): start when running.
ALM. class	Used to define the trigger protection, the controller what the action happen. Detailed refer to the alarm level configuration table.

GEN-Hz under 1&2

- Controller has two level low frequency limit value monitoring for warning, breakdown and control. E.g. to choose 1/2/3 alarm level, when protection function sparks, LCD displays “!W:GEN-HZ under 1” or “!W:GEN-HZ under 2”, to choose 4/5/6 alarm level, when protection function activates, LCD displays “!A:GEN-HZ under 1” or “!A:GEN-HZ under 2”.

Monitoring	Select "1", the monitoring function is effective; Select "0", the monitoring function is invalid.
Limit	Used to define the threshold low frequency protection. When the power frequency arrive to or below this threshold, the duration more than delay time, trigger alarm level definition action.
Delay	If the GEN low frequency more than the delay setting time, trigger alarm level defined action; If the low frequency higher than the frequency limit value before the delay termination, delay time return to zero.
Starting point	Monitoring function active time range setting: Set it to be (0): work all the time; Set it to be (1): start with crank; Set it to be (2): start after the safety monitoring delay; Set it to be (3): start when running.
ALM. class	Used to define the trigger protection, the controller what the action happen. Detailed refer to the alarm level configuration table.

GEN-Hz over 1&2

- Controller has two level high frequency limit value monitoring for warning, breakdown and control. E.g. to choose 1/2/3 alarm level, when protection function sparks, LCD displays “!W:GEN-HZ over 1” or “!W:GEN-HZ over 2”, to choose 4/5/6 alarm level, when protection function activates, LCD displays “!A:GEN-HZ over 1” or “!A:GEN-HZ over 2”.

Monitoring	Select "1", the monitoring function is effective; Select "0", the monitoring function is invalid.
Limit	Used to define the threshold high frequency protection. When the power frequency arrive to or higher than this threshold, the duration more than delay time, trigger alarm level definition action.
Delay	If the GEN high frequency more than the delay setting time, trigger alarm level defined action; If the high frequency below the frequency limit value before the delay termination, delay time return to zero.
Starting point	Monitoring function active time range setting: Set it to be (0): work all the time; Set it to be (1): start with crank; Set it to be (2): start after the safety monitoring delay; Set it to be (3): start when running.
ALM. class	Used to define the trigger protection, the controller what the action happen. Detailed refer to the alarm level configuration table.

GEN-I over 1&2

- Controller has two level over current limit value monitoring for warning, breakdown and control. E.g. to choose 1/2/3 alarm level, when protection function sparks, LCD displays “!W:GEN-I over 1” or “!W:GEN-I over 2”, to choose 4/5/6 alarm level, when protection function activates, LCD displays “!A:GEN-I over 1” or “!A:GEN-I over 2”.

Monitoring	Select "1", the monitoring function is effective; Select "0", the monitoring function is invalid.
Limit	Used to define the threshold over current protection. When the power current arrive to or higher than this threshold, the duration more than delay time, trigger alarm level definition action.
Delay	If the GEN over current more than the delay setting time, trigger alarm level defined action; If the current below the current limit value before the delay termination, delay time return to zero.
Starting point	Monitoring function active time range setting: Set it to be (0): work all the time; Set it to be (1): start with crank; Set it to be (2): start after the safety monitoring delay; Set it to be (3): start when running.
ALM. class	Used to define the trigger protection, the controller what the action happen. Detailed refer to the alarm level configuration table.

GCB close

- Controller has to monitoring the Gen switch close, breakdown and control. E.g. to choose 1/2/3 alarm level, when protection function activates, LCD displays “!W:GEB close”, to choose 4/5/6 alarm level, when protection function activates, LCD displays “!A:GEB close”.

Monitoring	Select "1", the monitoring function is effective; Select "0", the monitoring function is invalid.
Delay	Controller sends the power closing order, this delay timer started computing time, Gen switch is not closing or keep closed command in the end of time, switch open, trigger alarm level defined action.
ALM. class	Used to define the trigger protection, the controller what the action happen. Detailed refer to the alarm level configuration table.

GCB open

- Controller has to monitoring the Gen switch open, breakdown and control. E.g. to choose 1/2/3 alarm level, when protection function activates, LCD displays “!W:GEB open”, to choose 4/5/6 alarm level, when protection function activates, LCD displays “!A:GEB open”.

Monitoring	Select "1", the monitoring function is effective; Select "0", the monitoring function is invalid.
Delay	Controller sends the power opening order, this delay timer started computing time, Gen switch is not opening or no closing command in the end of time, switch close, trigger alarm level defined action.
ALM. class	Used to define the trigger protection, the controller what the action happen. Detailed refer to the alarm level configuration table.

NOTE:
If the GCB close and GCB open monitoring function effectively, must satisfy:
- One of the relay is defined as "Gen close/open".
- One of the switch input is defined as "Gen closed auxiliary contacts".

GEN. loading Volt

- Used to configure the voltage trigger value of the GCB close.

GEN. loading Hz

- Used to configure the frequency trigger value of the GCB close.

GEN. on delay

- Used to set from meet the loading condition to Gen automatic closed power supply delay time.

Soft unload time

- When the trigger alarm level "3" stop failure, soft unloading time start to the computing time, after the calculation time, GCB load switch open.

7.3 ENGINE:

NO.	Items	Value Range	Preset
3.0	Quit		
3.1	Engine type	1 diesel /2 ECU/3 gas	1
3.2	ECU type	1 to 20	1
3.3	Engine rated speed	99 to 9999RPM	1500
3.4	MPU input	0 no /1 yes	0
3.5	Fly wheel teeth	5 to 300	120
3.6	Set pickup now		.
3.7	Pair of poles	1 to 8	2
3.8	Fuel mode	0 NC/1 NO	0
3.9	Start delay	0 to 999S	0S
3.10	Crank attempts	1 to 10	3
3.11	Critical C-attempt	1 to 20 time	6 time
3.12	Crank time	1 to 99S	8S
3.13	Crank time add	1 to 99S / Do not use	Do not use
3.14	Crank reset time	1 to 300S	15S
3.15	Ignition speed	1 to 9999 RPM	200RPM
3.16	Ignition speed DLY	1 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% / Do not use	85%
3.20	Crank cutout ALT-V	1.0 to 40.0 V / Do not use	Do not use
3.21	Crank cutout Oil-P	0.1 to150.0Bar/PSI / Do not use	2.2
3.22	Crank cutout P-DLY	1 to 60S / Do not use	Do not use
3.23	Idle time	1 to 9999S / Do not use	Do not use
3.24	Pre-heat mode	1to 6	6
3.25	Pre-heat time	1 to 9999 秒 / Do not use	3S
3.26	Safety-on delay	0 to 600S	10S
3.27	Cool down mode	0 At full speed /1 idle	1
3.28	Cool down time	0 to 9999S	300S
3.29	Stop time	0 to 60S	20S
3.30	EX. Crank permit	0 no/1 yes	0
3.31	**Charge failure**		
	Function	0 no/1 yes	1
	Limit	0.0 to 40.0	8.0V
	ALM. class	0 to 6	2
3.32	**Pickup signal**		
	Function	0 no/1 yes	1
	Delay	0 to 999S	1S
	Delay by	0 to 3	1
	ALM. class	0 to 6	2
3.33	**Overspeed level1**		
	Function	0 no/1 yes	1
	Limit	1 to 19999RPM	1600RPM
	Delay	0 to 999S	1S
	Delay by	0 to 3	1
	ALM. class	0 to 6	2

3.34	**Overspeed level2**		
	Function	0 no/1 yes	1
	Limit	1 to 19999RPM	1710RPM
	Delay	0 to 999S	1S
	Delay by	0 to 3	1
	ALM. class	0 to 6	5
3.35	**Underspeed level1**		
	Function	0 no/1 yes	1
	Limit	0 to 9999 RPM	1440RPM
	Delay	0 to 999 S	5S
	Delay by	0 to 3	3
	ALM. class	0 to 6	2
3.36	**Underspeed level2**		
	Function	0 no/1 yes	1
	Limit	0 to 9999 RPM	0RPM
	Delay	0 to 999 S	5S
	Delay by	0 to 3	3
	ALM. class	0 to 6	5
3.37	**Start failure**		
	Function	0 no/1 yes	1
	ALM.class	0 to 6	6
3.38	**Stop failure**		
	Function	0 no/1 yes	1
	ALM. class	0 to 6	3
3.39	**Batt. Overvolt**		
	Function	0 no /1 yes	1
	Limit	1.0 to 99.9 V	35.0V
	Delay	0 to 999 sec	1 sec
	Delay by	0 to 3	0
	ALM. class	0 to 6	2
3.40	**Batt. Undervolt**		
	Function	0 no /1 yes	1
	Limit	0 to 40.0 V	8.0V
	Delay	0 to 999 sec	1 sec
	Delay by	0 to 3	0
	ALM. class	0 to 6	2
3.41	**Maintenance**		
	Function	0 no /1 yes	0
	Limit	0 to 9999 hours	1000
	ALM. class	0 to 6	2
3.42	**ECU Data fail**		
	Function	0 no /1 yes	1
	Delay	0 to 999 sec	30 sec
	Delay by	0 to 3	3
	ALM. class	0 to 6	2
3.43	**ECU Warning**		
	Function	0 no /1 yes	1
	Delay	0 to 999 sec	5 sec
	Delay by	0 to 3	3
	ALM. class	0 to 6	2

3.44	ECU Shutdown		
	Function	0 no /1 yes	1
	Delay	0 to 999 sec	5 sec
	Delay by	0 to 3	3
	ALM. class	0 to 6	2

Menu descriptions:

Engine type

- Use in selection controller control object engine type.
- If the parameter is set to "1", is a traditional diesel engine. When the parameter is set to "2", is to use the ECU of the engine. When the parameter is set to "3", is a traditional gas engine.
- When the control object is ECU engine, the controller will also activate "ECU warning", "ECU failure", "ECU data fault."
- Diesel engine.

Start order:

Started delay began timing, when timing end, the preheating relay closed output as preset Preheat function. Preheat time began timing, when timing end, fuel relay action and the engine fuel electromagnetic valve open. After delaying 300Ms, crank delay closed output. Crank began, when engine running speed reach the crank cutting speed, the crank stop and the engine run.

Engine no ignition as turning time period, the crank stopped. **Crank intermittent time** to begin, try to start the engine again after the end of time. Above the boot sequence repeated until the engine was successfully ignited. When you start the crank reaches the preset number, the controller will stop start control outputs and the LCD liquid crystal display "failed to start".

Stop order:

Cooling time began after **GCB** opening. When timing end, fuel relay action, the engine fuel electromagnetic valve close and engine stop. After the end of the downtime in the engine timing, engine fails to stop. LCD liquid crystal display, "**stop failed**".

- Gas engine:

Start order:

Started delay began timing, when timing end, crank relay action. Crank begin, both **crank time** and **ignition delay time** are begin timing. Before the end of **ignition delay time**, engine speed reached or higher than set of **ignition speed**, **ignition relay** electrical action. Ignition began, gas valve will open after the end of **gas valve open delay timing**. When engine running speed reach the crank cutting speed, the crank stop and the engine run.

After the end of **ignition delay time**, engine speed is not reached **ignition speed**, or after the end of **crank time**, engine still not running ignition, the crank stopped. **Crank intermittent time** to begin, try to start the engine again after the end of time. Above the boot sequence repeated until the engine was successfully ignited. When you start the crank reaches the preset number, the controller will stop start control outputs and the LCD liquid crystal display "**failed to start**".

Stop order:

Cooling time began after **GCB** opening. When timing end, gas valve closed and the engine stopped. Ignition will stop after the engine failed to stop.

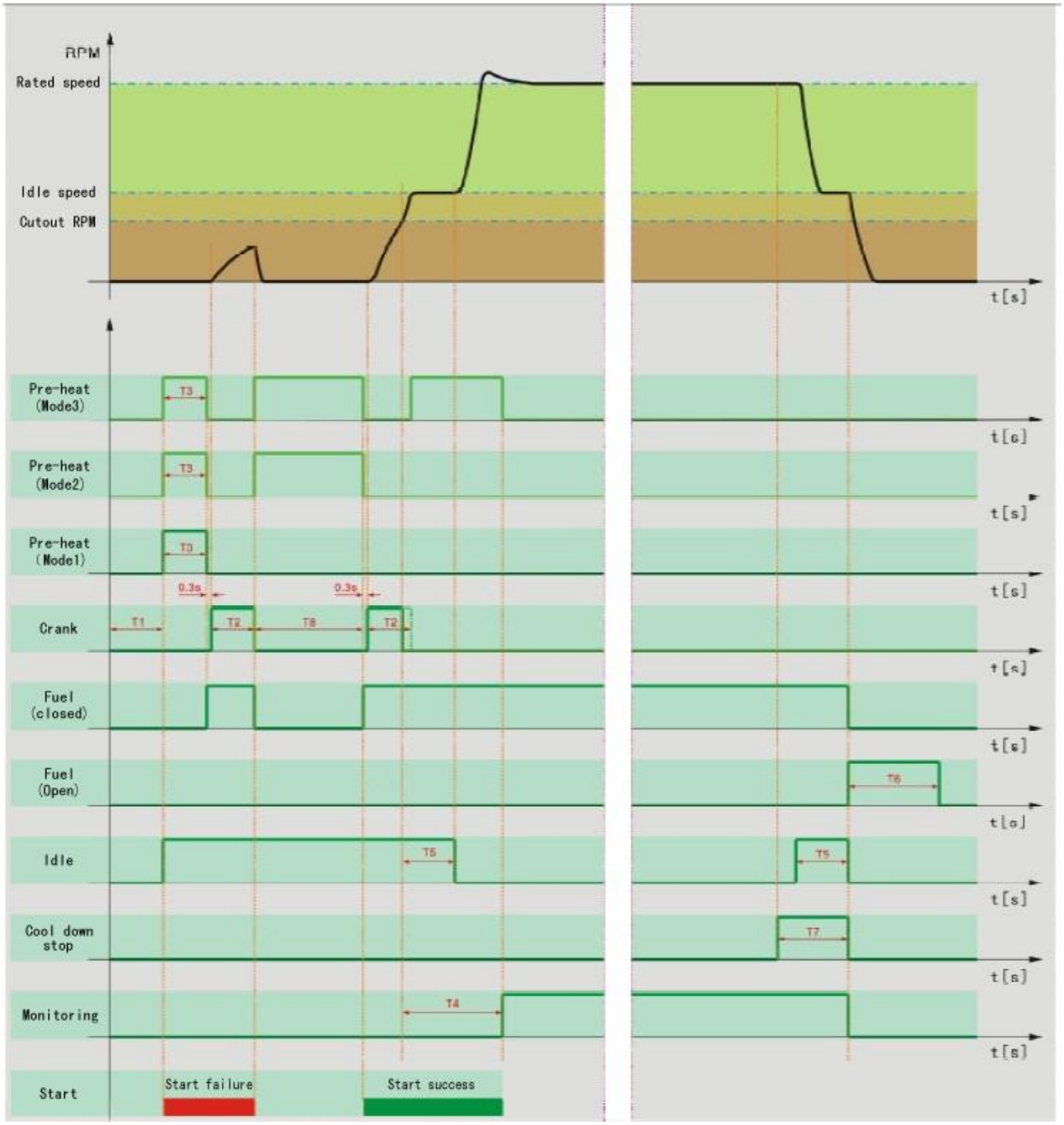
Engine fail to stop after the end of **failed to stop delay**. LCD liquid crystal display "**stop failed**".

NOTE:

- Normal shutdown procedures, to stop the ignition control output must be after the engine shut down. Ignition output does not stop if engine fail to stop after the end of **failed to stop delay**.

- Use the **ECU** engine, start and stop the processes controlled by the **ECU**, the controller can control the power supply switch and on/off signal of **ECU**.

l Diesel engine start and stop flow chart:

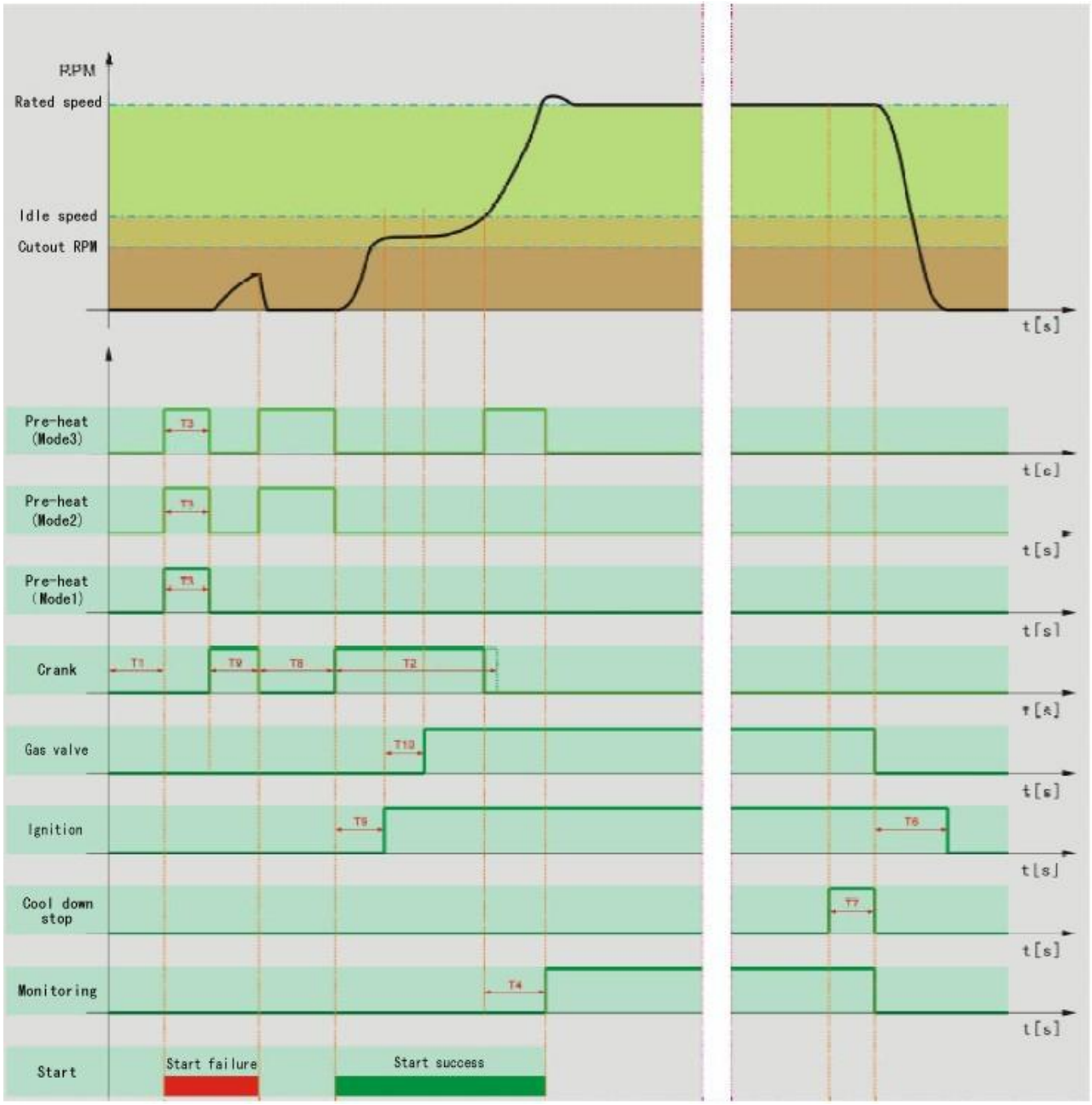


T1—Start delay
T2—Crank time
T3—Preheating time
T4—Safety-on delay
T5—Idle time
T6—Stop failure delay
T7—Cooling time
T8—Crank reset time

NOTE:

l If T4 is longer than T5, oil pressure protection is ignored during T5. If T4 is shorter than T5, oil pressure protection becomes effective after T4.

I Gas engine start and stop flow chart:



T1—Start delay
T2—Crank time
T3—Preheating time
T4—Safety-on delay
T6—Stop failure delay
T7—Cooling time
T8—Crank reset time
T9—Ignition delay
T10—Gas valve on delay

~~Engine~~ ECU type

- Used to define the J1939 interface function and ECU type.
- There are several ECU types have been built in the controller.

Code	Description
1	Receive standard J1939 information
2	Standard J1939 information + specified VOLVO EMS2 information
3	Standard J1939 information + specified CUMMINS QSX15 information
4	CUMMINS(MODBUS) information

Engine rated speed

- Used to configure the genset rated speed.

MPU input

- Used to configure whether magnetic pick-up unit is used or not.
- When parameter is configured as “1”, magnetic pick-up is used for the signal source of the engine speed. When parameter configured as “0”, the magnetic pick-up is not used, the engine speed is calculated from the frequency of the generator.
- RPM = (Hz*60)/ Pair of Poles. For example: the frequency of generator is 50Hz, when Pair of Poles configured as 2, RPM = (50*60)/2 = 1500 (RPM).

Fly wheel teeth

- Used to configure there are how many teeth on the fly wheel.

Set pickup now

- If user does not know the fly wheel teeth, to calculate the fly wheel teeth automatically via the measuring Gen frequency and MPU frequency.
- Fly wheel teeth = (f1* Pair of Poles)/f2, {f1 is MPU frequency，f2 is Gen frequency }.
- Operating procedure:
  - Configure the parameter of “**MPU input**” as “0”.
  - Start the genset, choose “**Set pickup now**” from the menu after the genset running normally, the parameter of “fly wheel teeth” will be automatically calculated at that time.
  - Configure the parameter of “**MPU input**” as “1” to finish the setting.

NOTE:

- This function is only used for the debug of the controller and genset.

Pair of Poles

- Used to configure the poles of excitation winding of the alternator.
- Use to calculate the engine speed with the frequency when without MPU input.

Fuel mode

- Used to configure the type of engine fuel valve (details refer to 4.6).
- N.C. type means the fuel valve is normally closed; N.O. type means the fuel valve is normally opened.

Start delay

- Used to configure the time delay from the meet open generator condition to carry out the engine start program is energised.
- This time in the following condition start is active:
  - Ø Remote open signal is active when in automatic operation mode.
- When the start delay timer is working, LCD display time course.

Crank attempts

- Used to configure how many times the controller repeat to crank the engine; this value is equal to the maximum crank times.

Critical C-attempt

- The controller can be repeated start the engine when activate the emergency mode, the most crank number is equal to the setting value.

Crank time

- Used to set the duration of the engine crank command.
- If this parameter is used on the diesel engine, it starts to time when crank command given out, if used on the gas engine, it starts to time when gas valve open command given out.

Crank time add

- Used to adjust the maximum 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 extra time” 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 rest time

- The time between last crank and next crank.
- Engine only can be cranked again after the crank rest time has expired.

Ignition speed

- Used to define the ignition command engine minimum speed.
- This parameter only on the gas engine is active.

Ignition start DLY

- Used to define the ignition output lag time.
- This parameter only used on the gas engine is active, it starts to time when crank command given out.

Gas valve on DLY:
- Used to define the gas valve open command lag time.
- This parameter only used on the gas engine is active, it starts to time when crank command given out.

Crank cutout RPM
- The crank disconnect speed.

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

Crank cutout ALT-V
- The crank disconnect Charger voltage, signal is from the W/L terminal of charger.
- When parameter is configured as “not used”, this function is inactive.

Crank cutout Oil-P
- The crank disconnect 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 disconnect 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.
- Press the start button when the controller in the manual control mode, idle speed began to computing time, press the start button when the controller in the automatic control mode, idle speed began to computing time. When you choose the idle mode, the configurable relay defined as idle output is energize, the relay recovers to open after the idle time has expired.
- When parameter is configured as “not used”, idle function is inactive.

Pre-heat mode
- Used to configure the mode of preheat.
- There are 6 pre-heat modes for selection, please read the description of preheat function as details.

Pre-heat time
- The preheat duration before engine crank, LCD display the time when it work.
- When parameter is configured as “not used”, pre-heat function is inactive.

Safety-on delay
- Used to configure the period from engine started successfully to Genset stable running.
- The protections of under speed, under voltage, under frequency, low oil pressure are disabled by the controller during safety-on time delay.

CAUTION:
- As some of the protection are disabled during safety-on time delay, so the safety-on delay should be set carefully and properly, this is very important, or it may cause engine damage.

Cool down mode

- Used to configure 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 time permit for running without load before engine stop.
- 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.
- After the fuel relay output is de-energised (fuel relay output is energised for N.O. type fuel valve), fail to stop delay timer begins, when it time’s out if controller detects generator voltage exceeds crank disconnected voltage, or the speed exceeds crank disconnected speed, or oil pressure exceeds crank disconnected oil pressure, then it means **stop failure**.
- If the fuel valve is N.O. type, the fuel relay output is de-energised after stop failure delay has expired.

EX. Crank permit

- Used to configure the permit of external crank.
- Refer to 4.8 for details.

Charge failure

- Controller through the "WL" port detect the auxiliary ac charging machine field contact voltage, in order to judge whether the ac charger is working normal, when the test voltage is lower than set limit, triggering charging failure protection function. E.g. to choose 1/2/3 alarm level, when protection function sparks, LCD displays “!W: Charge failure”, to choose 4/5/6 alarm level, when protection function sparks, LCD displays “!A: Charge failure”.

Function	Select "1", the monitoring function is effective; Select "0", the monitoring function is invalid.
Limit	Used to define charging failure valve. When testing voltage reach to or below this threshold, duration more than delay time, trigger alarm level configuration action.
ALM. class	Used to define the trigger protection, the controller what the action happen. Detailed refer to the alarm level configuration table.

Pickup signal

- Controller can through the speed signal monitoring when using the pickup sensor, used to determine whether there are speed sensor. When confirm the lost sensor signal, E.g. to choose 1/2/3 alarm level, when protection function sparks, LCD displays “!W:Pickup signal”, to choose 4/5/6 alarm level, when protection function sparks, LCD displays “!A:Pickup signal”.

Function	Select "1", the monitoring function is effective; Select "0", the monitoring function is invalid.
Delay	If the lost speed signal time more than the set delay time, trigger alarm level configuration action. If the loss speed signal recovery before the end of delay, delay time return to zero.
Starting point	Monitoring function active time range setting: Set it to be (0): work all the time; Set it to be (1): start with crank; Set it to be (2): start after the safety monitoring delay; Set it to be (3): start when running.
ALM. class	Used to define the trigger protection, the controller what the action happen. Detailed refer to the alarm level configuration table.

Overspeed level 1&2

- Controller has two level overspeed monitoring for warning, breakdown and control. E.g. to choose 1/2/3 alarm level, when protection function sparks, LCD displays “!W:Overspeed level1” or “!W:Overspeed level2”, to choose 4/5/6 alarm level, when protection function sparks, LCD displays “!A:Overspeed level1” or “!A:Overspeed level2”.

Function	Select "1", the monitoring function is effective; Select "0", the monitoring function is invalid.
Limit	Used to define the overspeed protection valve. When the engine speed arrived to or is higher than this threshold, the duration more than delay time, trigger alarm level definition action.
Delay	If the overspeed more than the delay setting time, trigger alarm level defined action; If the overspeed below this limit before the delay termination, delay time return to zero.
Starting point	Monitoring function active time range setting: Set it to be (0): work all the time; Set it to be (1): start with crank; Set it to be (2): start after the safety monitoring delay; Set it to be (3): start when running.
ALM. class	Used to define the trigger protection, the controller what the action happen. Detailed refer to the alarm level configuration table.

Underspeed level 1&2

- Controller has two level underspeed monitoring for warning, breakdown and control. E.g. to choose 1/2/3 alarm level, when protection function sparks, LCD displays “!W:Underspeed level1” or “!W:Underspeed level2”, to choose 4/5/6 alarm level, when protection function sparks, LCD displays “!A:Underspeed level1” or “!A:Underspeed level2”.

Function	Select "1", the monitoring function is effective; Select "0", the monitoring function is invalid.
Limit	Used to define the underspeed protection valve. When the engine speed arrived to or below than this threshold, the duration more than delay time, trigger alarm level definition action.
Delay	If the underspeed more than the delay setting time, trigger alarm level defined action; If the underspeed below this limit before the delay termination, delay time return to zero.
Starting point	Monitoring function active time range setting: Set it to be (0): work all the time; Set it to be (1): start with crank; Set it to be (2): start after the safety monitoring delay; Set it to be (3): start when running.
ALM. class	Used to define the trigger protection, the controller what the action happen. Detailed refer to the alarm level configuration table.

Start failure

- If the engine achieve to presetting start times still can't boot operation, instantly happen to start failure command. E.g. to choose 1/2/3 alarm level, when protection function sparks, LCD displays “!W: Start failure”, to choose 4/5/6 alarm level, when protection function sparks, LCD displays “!A: Start failure”.

Function	Select "1", the monitoring function is effective; Select "0", the monitoring function is invalid.
ALM. class	Used to define the trigger protection, the controller what the action happen. Detailed refer to the alarm level configuration table.

Stop failure

- When the controller perform to stop command, the fuel relay off output (normally open fuel, the control relay closed output), the stop timer is activated, when it times out the controller detection to the generator voltage is greater than the turning cutting voltage, or faster than turning cutting speed, or oil pressure open, or oil pressure is greater than the turning cutting oil, then stop failure happened. E.g. to choose 1/2 alarm level, when protection function sparks, LCD displays “!W:Stop failure”, to choose 4/5/6 alarm level, when protection function sparks, LCD displays “!A:Stop failure”.

Function	Select "1", the monitoring function is effective; Select "0", the monitoring function is invalid.
ALM. class	Used to define the trigger protection, the controller what the action happen. Detailed refer to the alarm level configuration table.

Batt. overvolt

- Controller has a high limit protection of the battery voltage monitoring for warning, breakdown and control. E.g. to choose 1/2/3 alarm level, when protection function sparks, LCD displays “!W: Batt. Overvolt”, to choose 4/5/6 alarm level, when protection function sparks, LCD displays “!A: Batt. Overvolt”.

Function	Select "1", the monitoring function is effective; Select "0", the monitoring function is invalid.
Limit	Used to define the high voltage protection valve. When the battery voltage arrived to or is higher than this threshold, the duration more than delay time, trigger alarm level definition action.
Delay	If the high voltage more than the delay setting time, trigger alarm level defined action; If the high voltage below this limit before the delay termination, delay time return to zero.
Starting point	Monitoring function active time range setting: Set it to be (0): work all the time; Set it to be (1): start with crank; Set it to be (2): start after the safety monitoring delay; Set it to be (3): start when running.
ALM. class	Used to define the trigger protection, the controller what the action happen. Detailed refer to the alarm level configuration table.

Batt. undervolt

- Controller has a low limit protection of the battery voltage monitoring for warning, breakdown and control. E.g. to choose 1/2/3 alarm level, when protection function sparks, LCD displays “!W: Batt. Undervolt”, to choose 4/5/6 alarm level, when protection function sparks, LCD displays “!A: Batt. Undervolt”.

Function	Select "1", the monitoring function is effective; Select "0", the monitoring function is invalid.
Limit	Used to define the low voltage protection valve. When the battery voltage arrived to or below than this threshold, the duration more than delay time, trigger alarm level definition action.
Delay	If the low voltage more than the delay setting time, trigger alarm level defined action; If the low voltage below this limit before the delay termination, delay time return to zero.
Starting point	Monitoring function active time range setting: Set it to be (0): work all the time; Set it to be (1): start with crank; Set it to be (2): start after the safety monitoring delay; Set it to be (3): start when running.
ALM. class	Used to define the trigger protection, the controller what the action happen. Detailed refer to the alarm level configuration table.

Maintenance

- Controller cumulative the generator running time, compares with the default parameters, provide a protection unit maintenance time limit for warning, breakdown and control. E.g. to choose 1/2/3 alarm level, when protection function sparks, LCD displays “Warning: Maintenance”, to choose 4/5/6 alarm level, when protection function sparks, LCD displays “Fault: Maintenance”.

Function	Select "1", the monitoring function is effective; Select "0", the monitoring function is invalid.
Limit	Used to define the low voltage protection valve. When the battery voltage arrived to or below than this threshold, the duration more than delay time, trigger alarm level definition action.
ALM. class	Used to define the trigger protection, the controller what the action happen. Detailed refer to the alarm level configuration table.

ECU Data fail

- Controller and engine ECU communication, the controller can't receive the normal data from ECU in delay time, trigger an alarm command. E.g. to choose 1/2/3 alarm level, when protection function sparks, LCD displays “Warning: ECU Data fail”, to choose 4/5/6 alarm level, when protection function sparks, LCD displays “Fault: ECU Data fail”.

Function	Select "1", the monitoring function is effective; Select "0", the monitoring function is invalid.
Delay	If the low voltage more than the delay setting time, trigger alarm level defined action; If the low voltage is higher than this limit before the delay termination, delay time return to zero.
Starting point	Monitoring function active time range setting: Set it to be (0): work all the time; Set it to be (1): start with crank; Set it to be (2): start after the safety monitoring delay; Set it to be (3): start when running.
ALM. class	Used to define the trigger protection, the controller what the action happen. Detailed refer to the alarm level configuration table.

NOTE:

- When the engine shutdown, ECU closed, means the ECU has not communication in normal situation, but will not trigger fault protection.
- Only the CAN controller has this protection function.

ECU Warning

- When the engine ECU happens to not stop fault, this is a warning level of fault, the engine continues to run, engine manufacturer called "yellow light alarm". Controller can trigger an alarm action when receives this signal. E.g. to choose 1/2/3 alarm level, when protection function sparks, LCD displays “Warning: ECU warning”, to choose 4/5/6 alarm level, when protection function sparks, LCD displays “Fault: ECU warning”.

Function	Select "1", the monitoring function is effective; Select "0", the monitoring function is invalid.
Delay	If the low voltage more than the delay setting time, trigger alarm level defined action; If the low voltage is higher than this limit before the delay termination, delay time return to zero.
Starting point	Monitoring function active time range setting: Set it to be (0): work all the time; Set it to be (1): start with crank; Set it to be (2): start after the safety monitoring delay; Set it to be (3): start when running.
ALM. class	Used to define the trigger protection, the controller what the action happen. Detailed refer to the alarm level configuration table.

NOTE:

- Engine continuous running when the ECU is warning level of fault. If the controller used this signal to trigger 4/5/6 alarm level, the controller can control the engine shut down.
- Only the CAN controller has this protection function.

ECU Shutdown

- When the engine ECU happens to stop fault, the engine shutdown, engine manufacturer called "red light alarm". Controller can trigger an alarm action when receives this signal. E.g. to choose 1/2/3 alarm level, when protection function sparks, LCD displays “Warning: ECU stop fault”, to choose 4/5/6 alarm level, when protection function sparks, LCD displays “Fault: ECU stop fault”.

Function	Select "1", the monitoring function is effective; Select "0", the monitoring function is invalid.
Delay	If the low voltage more than the delay setting time, trigger alarm level defined action; If the low voltage is higher than this limit before the delay termination, delay time return to zero.
Starting point	Monitoring function active time range setting: Set it to be (0): work all the time; Set it to be (1): start with crank; Set it to be (2): start after the safety monitoring delay; Set it to be (3): start when running.
ALM. class	Used to define the trigger protection, the controller what the action happen. Detailed refer to the alarm level configuration table.

7.4 Analog INPUT

NO.	Items	Value Range	Preset
4.0	Quit		
4.1	P-sensor type	1 to 15 / Do not use	4
4.2	**Oil-P low level1**		
	Function	0 no / 1 yes	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	5
4.3	**Oil-P low level2**		
	Function	0 no / 1 yes	1
	Limit	0.0 to 150.0 Bar/PSI	1.1Bar
	Delay	0 to 999S	1S
	Delay by	0 to 3	3
	ALM.class	0 to 6	5
4.4	**T-sensor type**	1 to 15 / Do not use	3
4.5	**High temp. level1**		
	Function	0 no / 1 yes	1
	Limit	50 to 320℃/℉	92℃
	Delay	0 to 999S	1S
	Delay by	0 to 3	3
	ALM.class	0 to 6	2
4.6	**High temp. level2**		
	Function	0 no / 1 yes	1
	Limit	50 to 320℃/℉	100℃
	Delay	0 to 999S	1S
	Delay by	0 to 3	3
	ALM.class	0 to 6	5
4.7	**Heater on level**	-20 to 320℃/℉	50℃
4.8	**Heater off level**	-20 to 320℃/℉	60℃
4.9	**Cooler on level**	-20 to 320℃/℉	80℃
4.10	**Cooler off level**	-20 to 320℃/℉	70℃
4.11	**AUX sensor use**	0 Do not use / 1 Fuel / 2 Temp	1
4.12	**AUX sensor type**	1 to 15 / Do not use	3
4.13	**Low fuel level1**		
	Function	0 no / 1 yes	1
	Limit	0 to 100%	20%
	Delay	0 to 999S	1S
	Delay by	0 to 3	3
	ALM.class	0 to 6	2
4.14	**Low fuel level2**		
	Function	0 no / 1 yes	1
	Limit	0 to 100%	10%
	Delay	0 to 999S	1S
	Delay by	0 to 3	3
	ALM.class	0 to 6	2
4.15	**Fuel pump ON**	0 to 100%	20%
4.16	**Fuel pump OFF**	0 to 100%	70%

4.17	**AUX1 low T level1**		
	Function	0 no / 1 yes	1
	Limit	-20 to 320℃/℉	60℃
	Delay	0 to 999S	1S
	Delay by	0 to 3	3
	ALM.class	0 to 6	2
4.18	**AUX1 low T level2**		
	Function	0 no / 1 yes	1
	Limit	-20 to 320℃/℉	50℃
	Delay	0 to 999S	1S
	Delay by	0 to 3	3
	ALM.class	0 to 6	2
4.19	**AUX1 high T level1**		
	Function	0 no / 1 yes	1
	Limit	-20 to 320℃/℉	90℃
	Delay	0 to 999S	1S
	Delay by	0 to 3	3
	ALM.class	0 to 6	2
4.20	**AUX1 high T level2**		
	Function	0 no / 1 yes	1
	Limit	-20 to 320℃/℉	100℃
	Delay	0 to 999S	1S
	Delay by	0 to 3	3
	ALM.class	0 to 6	2
4.21	**Heater1 on level**	-20 to 320℃/℉	50℃
4.22	**Heater1 off level**	-20 to 320℃/℉	60℃
4.23	**Cooler1 on level**	-20 to 320℃/℉	80℃
4.24	**Cooler1 off level**	-20 to 320℃/℉	70℃

Menu descriptions:

P-sensor type:

- Used to configure the type of LOP-sensor.
- Built-in LOP-sensors in controller, such as the following menu:

Code	Type	Note
0	Do not use	
1	Low oil pressure switch 1	Closed (Low level) effective
2	Low oil pressure switch 2	Open (High level) effective
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		
15		

CAUTION:

- The LOP-sensor is used to measure the oil pressure, its accuracy is very important to the protection of the Genset, so please match the right type of the sensor or configure the right curve of the senor. Otherwise it may cause engine damage.

- 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 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- measured value" from small to big one by one.

Oil-P low level 1&2

- Controller has two level low oil pressure limit value monitoring for warning, breakdown and control. E.g. to choose 1/2/3 alarm level, when protection function sparks, LCD displays "!W:Oil-P low level1" or "!W:Oil-P low level2", to choose 4/5/6 alarm level, when protection function sparks, LCD displays "!A:Oil-P low level1" or "!A:Oil-P low level2".

Function	Select "1", the monitoring function is effective; Select "0", the monitoring function is invalid.
Limit	Used to define the engine oil pressure protection valve. When the engine oil pressure arrive to or below this threshold, the duration more than delay time, trigger alarm level definition action.
Delay	If the low oil pressure more than the delay setting time, trigger alarm level defined action; If the low oil pressure below this limit before the delay termination, delay time return to zero.
Starting point	Monitoring function active time range setting: Set it to be (0): work all the time; Set it to be (1): start with crank; Set it to be (2): start after the safety monitoring delay; Set it to be (3): start when running.
ALM. class	Used to define the trigger protection, the controller what the action happen. Detailed refer to the alarm level configuration table.

T-sensor type:

- Used to configure the type of HET-sensor.
- Built-in Temp-sensors in the controller, such as the following menu:

Code	Type	Note
0	Do not use	
1	High temperature switch 1	Closed (Low level) effective
2	High temperature switch 2	Open (High level) effective
3	VDO 120℃	
4	VDO 150℃	
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		

CAUTION:

- The Temp-sensor is used to measure the coolant temperature, its accuracy is very important to the protection of the Genset, so please match the right type of the sensor or configure the right curve of the senor. Otherwise it may cause engine damage.

- The parameters appendix of Temp-sensor:

VDO 120℃:

T(℃)	40	50	60	70	80	90	100	110	120	130	140
T(℉)	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℃:

T(℃)	50	60	70	80	90	100	110	120	130	140	150
T(℉)	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(℃)	40	50	60	70	80	90	100	110	120	130	140
T(℉)	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(℃)	40	50	60	70	80	90	100	110	120	130	140
T(℉)	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(℃)	-100	-50	0	20	40	60	80	100	150	200	300
T(℉)	-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(℃)	20	30	40	50	60	70	80	90	100	110	120
T(℉)	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(℃)	30	50	60	70	80	90	100	110	120
T(℉)	86	122	140	158	176	194	212	230	248
R(Ω)	980	400	265	180	125	90	65	50	38

Pre-set 3:

T(℃)	20	30	40	50	60	70	80	90	100	110	120
T(℉)	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(℃)	28	35	40	50	60	70	80	90	95	98
T(℉)	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 has two level high temperature limit value monitoring for warning, breakdown and control. E.g. to choose 1/2/3 alarm level, when protection function sparks, LCD displays “!W:High temp. level1” or “!W:High temp. level2”, to choose 4/5/6 alarm level, when protection function sparks, LCD displays “!A:High temp. level1” or “!A:High temp. level2”.

Function	Select "1", the monitoring function is effective; Select "0", the monitoring function is invalid.
Limit	Used to define the engine high temperature protection valve. When the engine temperature arrive to or higher than this threshold, the duration more than delay time, trigger alarm level definition action.
Delay	If the high temperature more than the delay setting time, trigger alarm level defined action; If the high temperature below this limit before the delay termination, delay time return to zero.
Starting point	Monitoring function active time range setting: Set it to be (0): work all the time; Set it to be (1): start with crank; Set it to be (2): start after the safety monitoring delay; Set it to be (3): start when running.
ALM. class	Used to define the trigger protection, the controller what the action happen. Detailed refer to the alarm level configuration table.

Heater on level

- The parameters used to select preheating mode 5 defined as "**preheating**" relay work of low temperature limit, and set "**preheating control**" relay work of low temperature limit.
- The **temperature sensor type** can not set to be "**do not use**" or "**switch**", otherwise the parameters will not achieve.

Heater off level

- The parameters used to select preheating mode 5 defined as "**preheating**" relay stop work of high temperature limit, and set "**preheating control**" relay stop work of high temperature limit.
- The **temperature sensor type** can not set to be "**do not use**" or "**switch**", otherwise the parameters will not achieve.

Cooler on level

- The parameters used to define as "**cooling**" relay work of high temperature limit.
- The **temperature sensor type** can not set to be "**do not use**" or "**switch**", otherwise the parameters will not achieve.

Cooler off level

- The parameters used to define as "**cooling**" relay stop work of low temperature limit.
- The **temperature sensor type** can not set to be "**do not use**" or "**switch**", otherwise the parameters will not achieve.

AUX sensor use

- The parameters used for setting **auxiliary sensor port** function.
- When the parameter is set to "0", this port didn't use.
- When the parameter is set to "1", this port connected to the fuel sensor, detection the engine fuel level.
- When the parameter is set to "2", this port connected to the temperature sensor.

AUX sensor type

- Used to define the auxiliary sensor type.
- When choosing fuel sensor, the controller built-in the following fuel sensor type for user choice.

Code	Type	Note
0	Do not use	
1	Low fuel switch 1	Closed (Low level) effective
2	Low fuel switch 2	Open (High level) effective
3	configurable 1	
4	configurable 2	

- When choosing temperature sensor, the controller built-in the following temperature sensor type for user choice, please refer to the temperature sensor type list.

Low fuel level 1&2

- When the **auxiliary sensor uses** set to "1", this parameter is valid.
- Controller has two level low fuel limit value monitoring for warning, breakdown and control. E.g. to choose 1/2/3 alarm level, when protection function sparks, LCD displays “!W:Low fuel level1” or “!W:Low fuel level2”, to choose 4/5/6 alarm level, when protection function sparks, LCD displays “!A:Low fuel level1” or “!A:Low fuel level1”.

Function	Select "1", the monitoring function is effective; Select "0", the monitoring function is invalid.
Limit	Used to define the engine low fuel protection valve. When the engine fuel arrive to or below this threshold, the duration more than delay time, trigger alarm level definition action.
Delay	If the low fuel more than the delay setting time, trigger alarm level defined action; If the low fuel is higher than this limit before the delay termination, delay time return to zero.
Starting point	Monitoring function active time range setting: Set it to be (0): work all the time; Set it to be (1): start with crank; Set it to be (2): start after the safety monitoring delay; Set it to be (3): start when running.
ALM. class	Used to define the trigger protection, the controller what the action happen. Detailed refer to the alarm level configuration table.

Fuel pump ON

- When the **auxiliary sensor uses** set to "1", this parameter is valid.
- This parameter is used to define "pump control" relay closed of the fuel level low limit
- Controller detects the engine day fuel tank through the fuel sensor, when the fuel is below the setting value, "pump control" relay close.

Fuel pump OFF

- When the **auxiliary sensor uses** set to "1", this parameter is valid.
- This parameter is used to define "pump control" relay closed of the fuel level high limit

- Controller detects the engine day fuel tank through the fuel sensor, when the fuel is higher than the setting value, "pump control" relay close.

AUX1 low T level 1&2

- When the **auxiliary sensor uses** set to "2", this parameter is valid.
- Controller has two level low temperature limit value monitoring for warning, breakdown and control. E.g. to choose 1/2/3 alarm level, when protection function sparks, LCD displays “!W:AUX1 low T level1” or “!W:AUX1 low T level2”, to choose 4/5/6 alarm level, when protection function sparks, LCD displays “!A:AUX1 low T level1” or “!A:AUX1 low T level2”.

Function	Select "1", the monitoring function is effective; Select "0", the monitoring function is invalid.
Limit	Used to define the auxiliary temperature sensor low limit protection valve. When the temperature arrived to or below this threshold, the duration more than delay time, trigger alarm level definition action.
Delay	If the low fuel more than the delay setting time, trigger alarm level defined action; If the temperature is higher than this limit before the delay termination, delay time return to zero.
Starting point	Monitoring function active time range setting: Set it to be (0): work all the time; Set it to be (1): start with crank; Set it to be (2): start after the safety monitoring delay; Set it to be (3): start when running.
ALM. class	Used to define the trigger protection, the controller what the action happen. Detailed refer to the alarm level configuration table.

AUX1 high T level 1&2

- When the **auxiliary sensor uses** set to "2", this parameter is valid.
- Controller has two level high temperature limit value monitoring for warning, breakdown and control. E.g. to choose 1/2/3 alarm level, when protection function sparks, LCD displays “!W:AUX1 high T level1” or “!W:AUX1 high T level1”, to choose 4/5/6 alarm level, when protection function sparks, LCD displays “!A:AUX1 high T level1” or “!A:AUX1 high T level2”.

Function	Select "1", the monitoring function is effective; Select "0", the monitoring function is invalid.
Limit	Used to define the auxiliary temperature sensor high limit protection valve. When the temperature arrived to or is higher than this threshold, the duration more than delay time, trigger alarm level definition action.
Delay	If the high fuel more than the delay setting time, trigger alarm level defined action; If the temperature below this limit before the delay termination, delay time return to zero.
Starting point	Monitoring function active time range setting: Set it to be (0): work all the time; Set it to be (1): start with crank; Set it to be (2): start after the safety monitoring delay; Set it to be (3): start when running.
ALM. class	Used to define the trigger protection, the controller what the action happen. Detailed refer to the alarm level configuration table.

Heater 1 on level

- The parameters used to select preheating mode 6 defined as "**preheating**" relay work of low temperature limit, and set "**preheating 1 control**" relay work of low temperature limit.
- The **auxiliary** sensor type can not set to be "**do not use**" or "**switch**", otherwise the parameters will not achieve.

Heater 1 off level

- The parameters used to select preheating mode 6 defined as "**preheating**" relay stop work of high temperature limit, and set "**preheating 1 control**" relay stop work of high temperature limit.
- The **auxiliary sensor type** can not set to be "**do not use**" or "**switch**", otherwise the parameters will not achieve.

Cooler 1 on level

- The parameters used to define as "**cooling 1**" relay work of high temperature limit.
- The **auxiliary sensor type** can not set to be "**do not use**" or "**switch**", otherwise the parameters will not achieve.

Cooler 1 off level

- The parameters used to define as "**cooling 1**" relay stop work of low temperature limit.
- The **auxiliary sensor type** can not set to be "**do not use**" or "**switch**", otherwise the parameters will not achieve.

7.5 Discrete IN/OUT

NO.	Items	Value Range	Preset
5.1	**D-Input 1 Config**		
	Function	0 to 30	6
	Logic	0 closed / 1 open	0
	Delay	0 to 999S	1S
	Delay by	0 to 3	0
	ALM.class	0 to 6	2
5.2	**D-Input 2 Config**		
	Function	0 to 30	2
	Logic	0 closed / 1 open	0
	Delay	0 to 999S	1S
	Delay by	0 to 3	0
	ALM.class	0 to 6	2
5.3	**D-Input 3 Config**		
	Function	0 to 30	3
	Logic	0 closed / 1 open	0
	Delay	0 to 999S	1S
	Delay by	0 to 3	0
	ALM.class	0 to 6	2
5.4	**Relay 1 Config**		
	Function	0 to 120	2
	Logic	0 open / 1 closed	0
5.5	**Relay 2 Config**		
	Function	0 to 120	1
	Logic	0 open / 1 closed	0
5.6	**Relay 3 Config**		
	Function	0 to 120	0
	Logic	0 open / 1 closed	0
5.7	**Relay 4 Config**		
	Function	0 to 120	0
	Logic	0 open / 1 closed	0
5.8	**Relay 5 Config**		
	Function	0 to 120	0
	Logic	0 open / 1 closed	0

Menu descriptions:

D-Input * Config

- Used to define switch input function.

Function	Define the role of the switch input, controller built-in functions for the user choice, such as the “D-Input Config menu”.
Logic	Select "0", switch input in closed (low level) effective; Select "1", switch input open effective.
Delay	If the switch quantity effective time more than the setting delay time value, trigger defined alarm level; If the switch quantitative change as invalid before the end of the delay, delay time to zero.
Starting point	Monitoring function active time range setting: Set it to be (0): work all the time; Set it to be (1): start with crank; Set it to be (2): start after the safety monitoring delay; Set it to be (3): start when running.
ALM. class	Used to define the trigger protection, the controller what the action happen. Detailed refer to the alarm level configuration table.

Note:

- Only set to "1" in the function, which switch input function when the user defined, time delay, the starting point and alarm level of the project such as parameter setting is valid.

- **Configuration switch input menu:**

Code	Function	Description
0	**Not used**	
1	**User configured**	When choosing this function， The **user can use the switch input to define menu** function configuration.
2	**Oil pressure switch**	Choose this function of the switch input port external a installed on the engine oil pressure switch, through the switch limit action to trigger engine low oil pressure protection. Controller allows oil pressure switch as low oil pressure protection and with pressure sensor measurement as engine low oil pressure protection exist at the same time. Low oil pressure triggered alarm level, user according to the alarm level configuration table defined the function of choice.
3	**Temp. high switch**	Choose this function of the switch input port external a installed on the engine temperature switch, through the switch limit action to trigger engine high temperature protection. Controller allows temperature switch as high temperature protection and temperature sensor measurement as the engine temperature protection there at the same time. High temperature trigger alarm level, user according to the alarm level configuration table defined the function of choice.
4	**Emergency stop**	Choose this function of the switch input port external a emergency stop switch, when this input effective, the controller close all control output, trigger alarm level "**6**", engine immediately stop.

5	**Remote start off load**	The generator starting when this input effective, after running normal the generator don't emit switching command, has been running off load until the input signal change to void. This signal only in **automatic operation mode** effective.
6	**Remote start with load**	For **GU3310** controller, the generator starting when this input effective, after running normal the generator send a switch close command, keep until the input signal change to void. For **GU3310** controller, when this input effective, after running normal, if the mains loading normal, controller does not send the Gen switch close command. If the mains anomaly and the switch open, controller sends the Gen switch close command. This signal only in **automatic operation mode** effective.
7	**Mains closed auxiliary**	Choose this function of the switch input port connected to the mains load switch **MCB** auxiliary contact, used to monitoring the **MCB** close/open state. Only in **GU3311** controller effectively.
8	**Generator closed auxiliary**	Choose this function of the switch input port connected to the Gen load switch **GCB** auxiliary contact, used to monitoring the **GCB** close/open state.
9	**Low fuel switch**	Choose this function of the switch input port connected to the engine fuel tank of fuel level switch, used to monitoring fuel tank low fuel level state.
10	**Lamp test**	Choose this function of the switch input signal effectively, the controller operation panel light full light. This function the same of the control panel "lamp test" button.
11	**Spare**	
12	**Spare**	
13	**Air-flap Closed**	Choose this function of the switch input port connected to install engine throttle auxiliary contact, through the switch limit action to determine the working conditions of damper.
14	**Pre-heat temp. switch**	Choose this function of the switch input port connected to install the engine preheater of the temperature switch, Through the switch limit action to stop the preheating relay output. Only used for preheating mode 4.
15	**Critical mode**	In the critical mode, all stop fault change to warning, the generator happens to stop fault, only alarm don't stop. LCD screen display **critical mode** information.
16	**Alarm mute**	Choose this function of the switch input signal effectively, the controller alarm buzzer sound will stop, defined as "audible alarm" relay output shut down. This input signal is the same of the controller panel "**erase**" button.
17	**Alarm reset**	Choose this function of the switch input signal effectively, the controller remove stop fault locking.
18	**Prohibit return**	Choose this function of the switch input signal effectively, Generator starting and loading when the remote start signal effectively and mains failure, Controller continue to control generator operation and loading when the mains returned to normal, Until the **return signal** to eliminate or stop fault happens. LCD display **limit return** information. Only **GU3311** has this input.
19	**Spare**	

20	**Panel lock**	Choose this function of the switch input signal effectively, can not modified the operation parameters on the operation panel, can not choose the controller's operation mode. LCD display **panel lock** information.
21	**Activate AUTO mode**	Choose this function of the switch input signal effectively, controller instead of **automatic** operation mode, to provide users with a remote choose **automatic** operation mode button. Panel lock can not affect this operating mode function.
22	**Activate MAN mode**	Choose this function of the switch input signal effectively, controller instead of **manual** operation mode, to provide users with a remote choose **manual** operation mode button. Panel lock can not affect this operating mode function.
23	**Spare**	
24	**Stop button**	Choose this function of the switch input signal the same of the control panel "stop" button, it provide users with a remote stop buttons.
25	**Start button**	Choose this function of the switch input signal the same of the control panel "start" button, it provide users with a remote start buttons.

Relay * Config

- Used to define relay output function.

Function	Define relay output action, controller built-in functions for the user choice, such as the “Relay Config menu”.
Logic	Select "0", effective relay action； Select "1", effective relay not action.

- Configuration relay output function menu：

Code	Function	Description
0	**Not used**	
1	**Crank**	Choose this function of the output relay is used to control the engine starting motor, when need the engine disk car action, stop working when meet the crank cutting conditions.
2	**Fuel**	Choose this function of the output relay is used to control the diesel engine fuel electromagnet, if need to start the engine, stop working when need to stop the engine.
3	**Gas valve**	Choose this function of the output relay is used to control gas engine fuel valve close/open, if need to start the engine, stop working when need to stop the engine.
4	**Ignition**	Choose this function of the output relay is used to gas engine ignition system provides power supply or signal, it will be action when reach to ignition conditions, stop working when the **ignition delay time** to stop.
5	**Shutdown alarm**	Choose this function of the output relay, when there are one or more stop failure action, stop working after the fault eliminated and the fault reset.
6	**Warning**	Choose this function of the output relay, when there are one or more stop warming action, stop working after the fault eliminated and the fault reset.
7	**Idle**	Choose this function of the output relay, the controller will be action when in idle speed calculation time, after the end of the time to stop action.
8	**Preheat output**	Choose this function of the output relay action please refer to the preheating function description.
9	**Spare**	
10	**Spare**	
11	**Fuel pump control**	Choose this function of the output relay, When the fuel level below the pump open level low limit value, it will be action, keep until to the fuel level arrive to pump stop level high limit value, it will be stop action.
12	**Genset running**	Choose this function of the output relay, when the generator operation normal, engine speed, oil pressure and temperature arrive to normal parameters set limit range, it will be action.
13	**Auto mode**	Choose this function of the output relay, the controller running in the automatic operation mode action.
14	**Spare**	
15	**Man mode**	Choose this function of the output relay, the controller running in the manual operation mode action.

16	**Spare**	
17	**MCB fail to close**	Choose this function of the output relay, after the mains closed failure fault action. **Only GU3311 controller has**.
18	**GCB fail to close**	Choose this function of the output relay, after the Gen closed failure fault action.
19	**Fail to start**	After the engine turning number set to barring try number of failed to ignition success, the output relay action.
20	**Fail to stop**	After the engine **stop time** end is still running, the output relay action.
21	**Mains close/open**	This output relay used to control the mains load switch of **MCB** close/open, it will be action when the controller commands mains power supply, stop working when do not need to mains power supply. Only **GU3311** controller has.
22	**Generator close/open**	This output relay used to control the Gen load switch of **GCB** close/open, it will be action when the controller commands power supply, stop working when do not need to power supply.
23	**Audible alarm**	When need to add a warning sound in the built-in alarm buzzer basis, this output relay action is the same with built-in alarm buzzer.
24	**Cooling down**	Choose this function of the output relay when in cooling calculation time it will be action.
25	**Can data fail**	When there is not received from the engine **ECU** data after the security monitoring delay time, choose this function of the output relay, it will be action.
26	**ECU warning**	When received from **ECU** warning signal, choose this function the output relay action.
27	**ECU alarm**	When received from **ECU** fault signal, choose this function the output relay action.
28	**Charge failure**	After the **charge failure**, the output relay action.
29	**Battery over volt**	The controller action when detected the battery voltage is higher than the set value.
30	**Battery under volt**	The controller action when detected the battery voltage is lower than the set value.
31	**Under speed level1**	It will be action when the engine speed is lower than **low level 1** value and confirm delay.
32	**Under speed level** 2	It will be action when the engine speed is lower than **low level 2** value and confirm delay.
33	**Over speed level1**	It will be action when the engine speed is higher than **high level 1** value and confirm delay.
34	**Over speed level2**	It will be action when the engine speed is higher than **high level 2** value and confirm delay.
35	**Oil pressure low level1**	It will be action when the engine oil pressure is lower than **oil pressure level 1** value and confirm delay.
36	**Oil pressure low level2**	It will be action when the engine oil pressure is lower than **oil pressure level 2** value and confirm delay.
37	**High temperature level1**	It will be action when the engine cooling temperature is higher than **high temperature level 1** value and confirm delay.
38	**High temperature level** 2	It will be action when the engine cooling temperature is higher than **high temperature level 2** value and confirm delay.

39	**Fuel low level1**	It will be action when the engine fuel level is lower than **low fuel level 1** value and confirm delay.
40	**Fuel low level2**	It will be action when the engine fuel level is lower than **low fuel level 2** value and confirm delay.
41	**Generator under volt level1**	It will be action when the generator voltage is lower than **Gen low voltage level 1** value and confirm delay.
42	**Generator under volt level2**	It will be action when the generator voltage is lower than **Gen low voltage level 2** value and confirm delay.。
43	**Generator over volt level1**	It will be action when the generator voltage is higher than **Gen high voltage level 1** value and confirm delay.
44	**Generator over volt level2**	It will be action when the generator voltage is higher than **Gen high voltage level 2** value and confirm delay.
45	**Generator under HZ level1**	It will be action when the generator frequency is lower than **Gen low frequency level 1** value and confirm delay.
46	**Generator under HZ level2**	It will be action when the generator frequency is lower than **Gen low frequency level 2** value and confirm delay.
47	**Generator high HZ level1**	It will be action when the generator frequency is higher than **Gen high frequency level 1** value and confirm delay.
48	**Generator high HZ level2**	It will be action when the generator frequency is higher than **Gen high frequency level 2** value and confirm delay.
49	**Generator over current level1**	It will be action when the generator current is higher than **Gen overcurrent level 1** value and confirm delay.
50	**Generator over current level2**	It will be action when the generator current is higher than **Gen overcurrent level 2** value and confirm delay.
51	**Spare**	
52	**Spare**	
53	**Digital input 1**	It will be action when the user defined **switch input 1** effective.
54	**Digital input 2**	It will be action when the user defined **switch input 2** effective.
55	**Digital input 3**	It will be action when the user defined **switch input 3** effective.
56	**Spare**	
57	**Spare**	
58	**Spare**	
59	**Spare**	
60	**Spare**	
61	**Oil pressure sensor open**	Choose this function of the output relay when the controller detection to the oil pressure sensor open, it will be action.
62	**Loss of pickup signal**	When choosing the pickup sensor as the engine speed control signal, the controller can't detect the speed sensor signal after the crank command, this function of the output relay will be action.

63	**Scheduled run**	Choose this function of the output relay when on scheduling mode effective, it will be action.
64	**Louvre control**	Choose this function of the output relay at the beginning of startup delay time action, after the engine stopped the operation stop action. This output connected to engine cooling air duct electric shutter, control the shutter open and shut.
65	**Cooler control**	Choose this function of the output relay, it will be action when the engine cooling temperature higher than the low limit **cooling open level value**, and keep until cooling temperature below the high limit **cooling stop level value**, it will stop to work.
66	**Cooler1 control**	Choose this function of the output relay, it will be action when from auxiliary temperature sensor measurement temperature higher than the low limit **cooling 1 open level value**, and keep until the temperature below the high limit **cooling 1 stop level value**, it will stop to work.
67	**Spare**	
68	**Heater control**	Choose this function of the output relay, it will be action when the engine cooling temperature below the low limit **preheating open level value**, and keep until cooling temperature higher than the high limit **preheating stop level value**, it will stop to work.
69	**Heater2 control**	Choose this function of the output relay, it will be action when from auxiliary temperature sensor measurement temperature below the low limit **preheating 1 open level value**, and keep until the temperature higher than the high limit **preheating 1 stop level value**, it will stop to work.
70	**Spare**	
71	**GCB open**	This output relay connected to the Gen load switch of GCB shunt coil, when the controller command the Gen power cut working, after the switch open will stop working.
72	**MCB open**	This output relay connected to the mains load switch of MCB shunt coil, when the controller command the mains power cut working, after the switch open will stop working.
73	**Mains under volt alarm**	When the mains voltage is lower than set value trigger fault movement.
74	**Mains over volt alarm**	When the mains voltage is lower than set value trigger fault movement.
75	**Mains under HZ alarm**	When the mains voltage is lower than set value trigger fault movement.
76	**Mains high HZ alarm**	When the mains voltage is lower than set value trigger fault movement.
77	**Mains alarm**	When the mains low frequency, high frequency, low voltage and high voltage, any more than set limit trigger fault movement.
78	**Spare**	
79	**Mains over current**	When the controller happen mains over-current failure action.
80	**Soft unload**	When soft unloading time meter timing starts action, at the end of the time to stop action.

7.6 DEFINE SENSORS

No.	Item	Preset	Value Range
6.1	PRES. Sensor 1		
6.2	PRES. Sensor 2		
6.3	TEMP. Sensor 1		
6.4	TEMP. Sensor 2		
6.5	Fuel Level Sensor		

Menu Descriptions:

PRES. Sensor 1

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

PRES. Sensor 2

- Corresponds to the “configurable 3” in the “LOP-Sensor type”.

TEMP. Sensor 1

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

TEMP. Sensor 2

- Corresponds to the “configurable 3” in the “HET-Sensor type”.

Fuel Level Sensor

- Corresponds to the “configurable 2” in the “Fuel level sensor selection”.

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.

Fix Point	1	2	3	4	5	6	7	8	9	10
Resistance	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Measured Value	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

7.7 ATS CONTROL

NO.	Items	Value Range	Preset
7.0	Quit		
7.1	M V-monitor type	0 Phase - Phase /1 Phase - Zero	1
7.2	M V low alarm	20 to 200% / Do not use	90%
7.3	M V low Return	20 to 200% / Do not use	95%
7.4	M V High alarm	20 to 200% / Do not use	115%
7.5	M V High Return	20 to 200% / Do not use	110%
7.6	M Hz low alarm	10.0 to 100.0Hz / Do not use	45.0Hz
7.7	M Hz low Return	10.0 to 100.0Hz / Do not use	48.5Hz
7.8	M Hz High ALM	10.0 to 100.0Hz / Do not use	57.0Hz
7.9	M Hz High Return	10.0 to 100.0Hz / Do not use	52.0Hz
7.10	M alarm delay	0 to 9999 sec	5 sec
7.11	M on delay	0 to 9999 sec	5 sec
7.12	MCB close		
	Function	0 no / 1 yes	1
	Delay	0 to 999 sec	5 sec
	ALM. class	0 to 6	2
7.13	MCB open		
	Function	0 no / 1 yes	1
	Delay	0 to 999 sec	5 sec
	ALM. class	0 to 6	2
7.14	Current type	0 GEN / 1Load	0
7.15	Prohibit return	0 no / 1 yes	0

NOTE:

- Only GU3311 has above parameters.

Menu descriptions:

M V-monitor type:

- Used to choose the controller is phase - phase or phase - zero voltage as mains voltage monitoring object.
- Choose the controller is phase - phase or phase – zero in different voltage input type, detection of the different voltage, specific as follows table:

Parameters / Voltage type	Phase – Phase	Phase – Zero
"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}

M V low alarm:

- Used to configure low Mains voltage alarm value, the low Mains voltage alarm is inactive when parameter configured as "not used".
- Expressed by percentage, use "**Rated ph-voltage**" as factor.
- Controller will compare the **"phase-zero"** voltage or **"phase-phase"** voltage with the setting value, when the measured voltage value is lower than the **"rated voltage"** * **"Mains low fault voltage"**, and not higher than the **"rated voltage"** * **"Mains low voltage return value"**, the duration longer than "**Main fault confirming time**", then it is low voltage alarm.

M V low Return:

- Used to configure low Mains voltage alarm value recovery value.
- Expressed by percentage, use "**Rated ph-voltage**" as factor.
- Controller will compare the **"phase-zero"** voltage or **"phase-phase"** voltage with the setting value, when the measured voltage value is higher than the **"rated voltage"** * **"Mains low voltage return voltage"**, Mains low voltage fault reset confirm time, Mains returned to normal.

M V High alarm:

- Used to configure high Mains voltage alarm value, the high Mains voltage alarm is inactive when parameter configured as "not used".
- Expressed by percentage, use "**Rated ph-voltage**" as factor.
- Controller will compare the **"phase-zero"** voltage or **"phase-phase"** voltage with the setting value, when the measured voltage value is higher than the **"rated voltage"** * **"Mains high fault voltage"**, and not lower than the **"rated voltage"** * **"Mains high voltage return value"**, the duration longer than "**Main fault confirming time**", then it is high voltage alarm.

M V High Return:

- Used to configure high Mains voltage alarm value recovery value.
- Expressed by percentage, use "**Rated ph-voltage**" as factor.
- Controller will compare the **"phase-zero"** voltage or **"phase-phase"** voltage with the setting value, when the measured voltage value is lower than the **"rated voltage"** * **"Mains high voltage return voltage"**, Mains high voltage fault reset confirm time, Mains returned to normal.

M Hz low alarm:

- Used to configure low Mains frequency alarm value, the low Mains frequency alarm is inactive when parameter configured as “not used”.
- Controller will compare the measurement frequency with the setting value, when the measure voltage frequency value is lower than the setting value, and not higher than the **"Mains low frequency return value"**, the duration longer than "**Main fault confirming time**", then it is Mains low frequency alarm.

M Hz low Return:

- Used to configure low Mains frequency alarm value recovery value.
- When the measure voltage frequency is higher than the **"Mains low frequency return value"**, Mains low frequency fault reset confirm time,

M Hz High ALM:

- Used to configure high Mains frequency alarm value, the high Mains frequency alarm is inactive when parameter configured as “not used”.
- Controller will compare the measurement frequency with the setting value, when the measure voltage frequency value is higher than the setting value, and not lower than the **"Mains high frequency return value"**, the duration longer than "**Main fault confirming time**", then it is Mains high frequency alarm.

M Hz High Return:

- Used to configure high Mains frequency alarm value recovery value.
- When the measure voltage frequency is lower than the **"Mains high frequency return value"**, Mains high frequency alarm reset confirm time,

M alarm delay:

- Used to configure Mains alarm time is active.

NOTE:

- Confirm mains alarm when the mains voltage is lower than 10% of the rated voltage.

M on delay:

- Used to configure from the mains voltage normal to the mains switch relay closed output delay.

MCB close

- Controller has to monitoring the Mains switch close, breakdown and control. E.g. to choose 1/2/3 alarm level, when protection function sparks, LCD displays “!W:MCB close”, to choose 4/5/6 alarm level, when protection function sparks, LCD displays “!A:MCB close”.

Monitoring	Select "1", the monitoring function is effective; Select "0", the monitoring function is invalid.
Delay	Controller sends the Mains closing order, this delay timer started computing time, Mains switch is not closing or keep closed command in the end of time, switch open, trigger alarm level defined action.
ALM. class	Used to define the trigger protection, the controller what the action happen. Detailed refer to the alarm level configuration table.

MCB open

- Controller has to monitoring the Mains switch open, breakdown and control. E.g. to choose 1/2/3 alarm level, when protection function sparks, LCD displays “!W:MCB open”, to choose 4/5/6 alarm level, when protection function sparks, LCD displays “!A:MCB open”.

Monitoring	Select "1", the monitoring function is effective; Select "0", the monitoring function is invalid.
Delay	Controller sends the power opening order, this delay timer started computing time, Gen switch is not opening or no closing command in the end of time, switch close, trigger alarm level defined action.
ALM. class	Used to define the trigger protection, the controller what the action happen. Detailed refer to the alarm level configuration table.

NOTE:
If the MCB close and MCB open monitoring function effectively, must satisfy:
- One of the relay is defined as "Mains close/open".
- One of the switch input is defined as " Mains closed auxiliary contacts".

Current type:

- Measure the current transformer can be installed in the Gen output end or the load switch end, this menu for two kinds of type choices.

Prohibit return:

- Controller in automatic mode when configured to "0", the generator starting on load after the Mains failure. Mains closed switch time to starts after the Mains returned to normal, when it times out, Gen points brake, Mains switch loading, Generator stop after cooling, in standby state.
- Controller in automatic mode when configured to "1", the generator starting on load after the Mains failure. The generator keep loading when the Mains returned to normal, LCD display: “Prohibit return”. Until the following conditions:
  - "Automatic" change to "Manual" mode, through the manual closed command the Mains loading, "Manual" change to "Automatic" mode again, can restore automatic mode of Mains loading condition.
  - Happen to stop fault when the Gen loading, if the mains normal, the Gen points brake, Mains closed loading.

7.8 MAINTENANCE

NO.	Items	Value Range	Preset
8.1	DATE/TIME	YY-MM-DD HH:MM:SS	
8.2	Scheduler mode	0 without load/ 1 with load	0
8.3	Start time		HH:MM
8.4	Run duration	1 to 1440 minutes	60 minutes
8.5	MON active	0 no/ 1 yes	0
8.6	TUE active	0 no/ 1 yes	0
8.7	WED active	0 no/ 1 yes	0
8.8	THU active	0 no/ 1 yes	0
8.9	FRI active	0 no/ 1 yes	0
8.10	SAT active	0 no/ 1 yes	0
8.11	SUN active	0 no/ 1 yes	0

Menu descriptions:

DATE/ TIME:

- Used to configure the date/ time: YY-MM-DD HH:MM:SS.
- The date displayed on LCD, the pre-alarm(warning) and alarm events with time stamp.

Scheduler mode:

- The function of the controller choice when the controller in the scheduling mode.
- Used to select with load or without load when controller is running in the exercise run schedule.

Start time

- Used to configure the start time when controller is active in exercise run scheduler.

Run duration

- Used to configure the duration when controller is active in exercise run schedule, the scheduler mode will be reset after run duration has expired.

MON active

- The cycle of exercise run scheduler is 1 week. This menu is used to configure the exercise run schedule on Monday active or not.

TUE active

- Used to configure the exercise run schedule on Tuesday active or not.

WED active

- Used to configure the exercise run schedule on Wednesday active or not.

THU active

- Used to configure the exercise run schedule on Thursday active or not.

FRI active

- Used to configure the exercise run schedule on Friday active or not.

SAT active

- Used to configure the exercise run schedule on Saturday active or not.

SUN active

- Used to configure the exercise run schedule on Sunday active or not.

7.9 CALIBRATION

NO.	Items	Value Range	Preset
9.1	GEN. V1 offset	-9.9% to 9.9%	
9.2	GEN. V2 offset	-9.9% to 9.9%	
9.3	GEN. V3 offset	-9.9% to 9.9%	
9.4	Current I1 offset	-9.9% to 9.9%	
9.5	Current I2 offset	-9.9% to 9.9%	
9.6	Current I3 offset	-9.9% to 9.9%	
9.7	MAINS V1 offset	-9.9% to 9.9%	
9.8	MAINS V2 offset	-9.9% to 9.9%	
9.9	MAINS V3 offset	-9.9% to 9.9%	
9.10	Pressure offset	-9.9% to 9.9%	
9.11	Temperature offset	-9.9% to 9.9%	
9.12	Batt. V offset	-9.9% to 9.9%	
9.13	AUX sensor offset	-9.9% to 9.9%	

Menu descriptions:

GEN. V1 offset:

- Used to modify the measured value display of GEN Phase 1 voltage.
- Reference to the rated voltage.

GEN. V2 offset:

- Used to modify the measured value display of GEN Phase 2 voltage.
- Reference to the rated voltage.

GEN. V3 offset:

- Used to modify the measured value display of GEN Phase 3 voltage.
- Reference to the rated voltage.

Current I1 offset:

- Used to modify the measured value display of Phase 1 current I1.
- Reference to the rated current.

Current I2 offset:

- Used to modify the measured value display of Phase 2 current I2.
- Reference to the rated current.

Current I3 offset:

- Used to modify the measured value display of Phase 3 current I3.
- Reference to the rated current.

Mains V1 offset:

- Used to modify the measured value display of Mains Phase 1 voltage.
- Reference to the rated voltage.

Mains V2 offset:

- Used to modify the measured value display of Mains Phase 2 voltage.
- Reference to the rated voltage.

Mains V3 offset:

- Used to modify the measured value display of Mains Phase 3 voltage.
- Reference to the rated voltage.

Pressure offset:

- Used to modify the measured value display of LOP-sensor.

Temperature offset:

- Used to modify the measured value display of HET-sensor.

Batt. V offset:

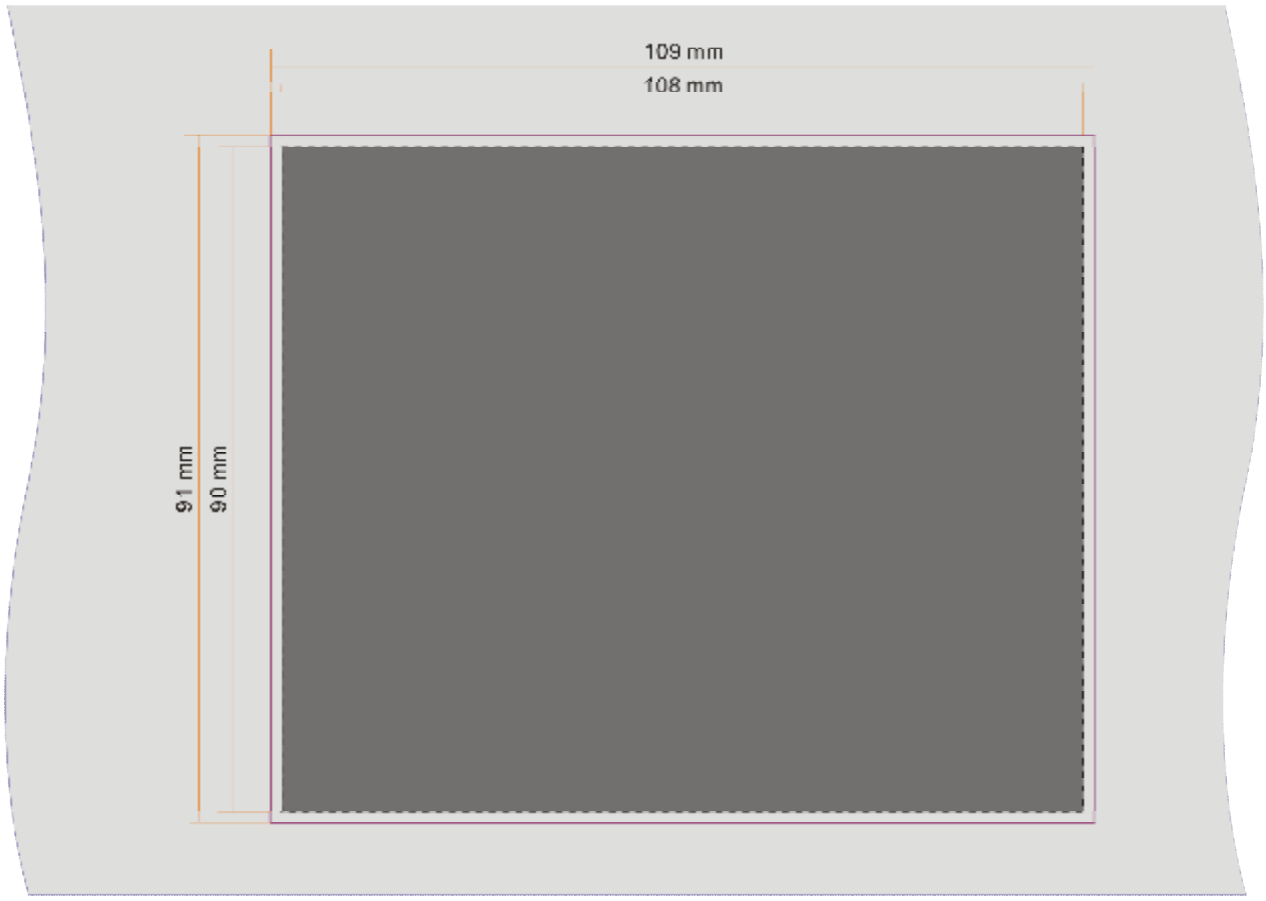
- Used to modify the measured value display of battery voltage.

AUX sensor offset:

- Used to modify the measured value display of AUX. sensor.

8 Installation Guide

8.1 The cutout dimensional drawing installed on panel as above follows:



Cutout dimension: 109mm(W) x 91mm (H). Dashed box dimensions for the controller.

The controller is fixed by 2 special fittings.

Note:

- The shock-proof equipment must be mounted if the enclosure is mounted on Genset or other heavy vibrant device.
- In order to ensure the degrees of protection of the mounted controller meet IP65, the cutout dimension on the panel must be correct.

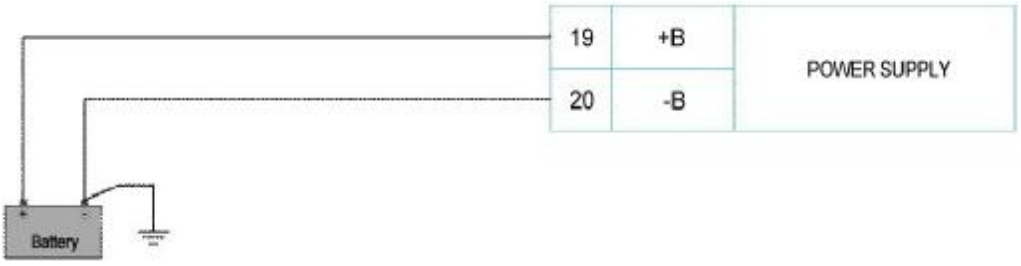
8.2 Wiring

Please refer to the Typical Wiring Diagram for connection.

8.2.1 Power supply:

Power specification

DC voltage range	8~35Vdc continuous
Max. operating current	@12V, 150mA ;@24V, 75mA
Cranking dropouts	0V for 80mS, assuming dc supply was at least 10V before dropout and recovers to 5V



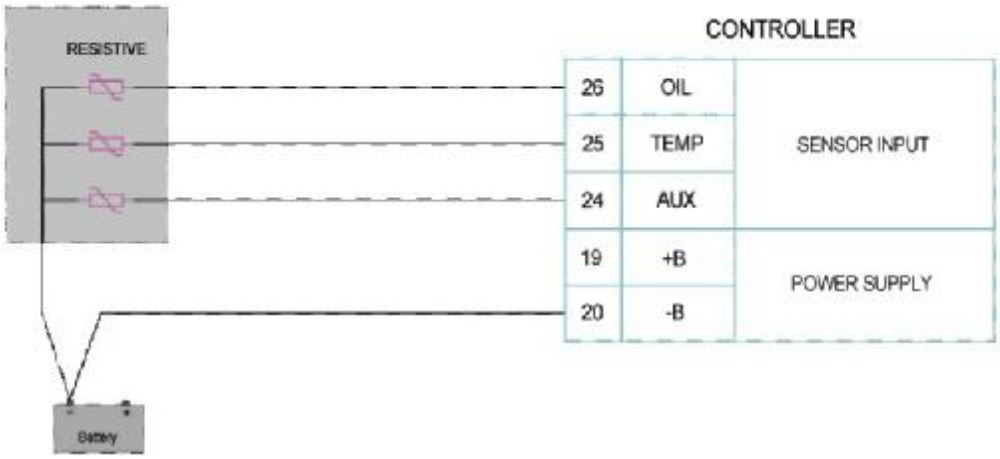
NOTE:

- A switch or fuse for overcurrent protection between power supply and controller must be mounted, the recommended capacity is 1A.
- When powering, the controller will generate significant instantaneous peak current, the maximum instantaneous peak current is relative to the power impedance. You must consider the peak current when choosing a switch or fuse for overcurrent protection.

WARNING:

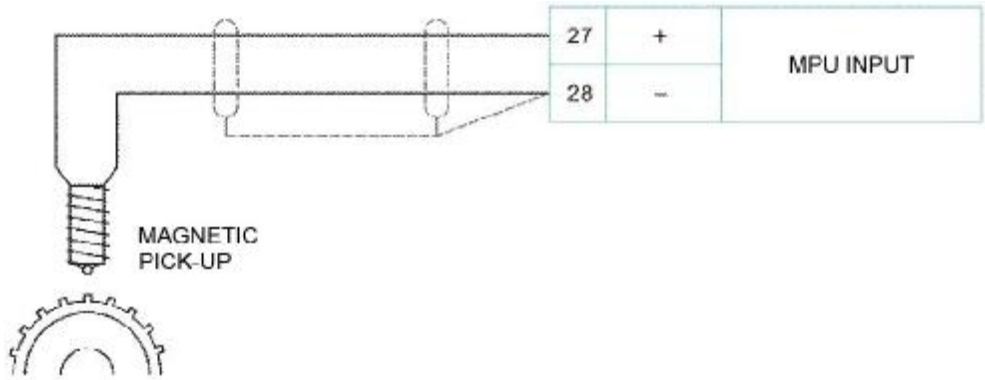
- Make sure the connection between terminal negative of controller and protective earth is good. A good ground is very important for operation of the controller, otherwise it will impact the electrical measurement and even damage the controller.

8.2.2 The installations of OIL-sensor, Temperature-sensor, and Auxiliary sensor:



WARNING	**WARNING:** I For ensuring the accuracy of sensor please reduce the cable resistance between controller and sensor as much as possible, the cable should not be less than 2.5mm^2. I When single pole sensor is used, the sensor shell and engine must be well connected and do not use insulated material on sensor screw thread when installing single pole sensor.

8.2.3 The installation of MPU:

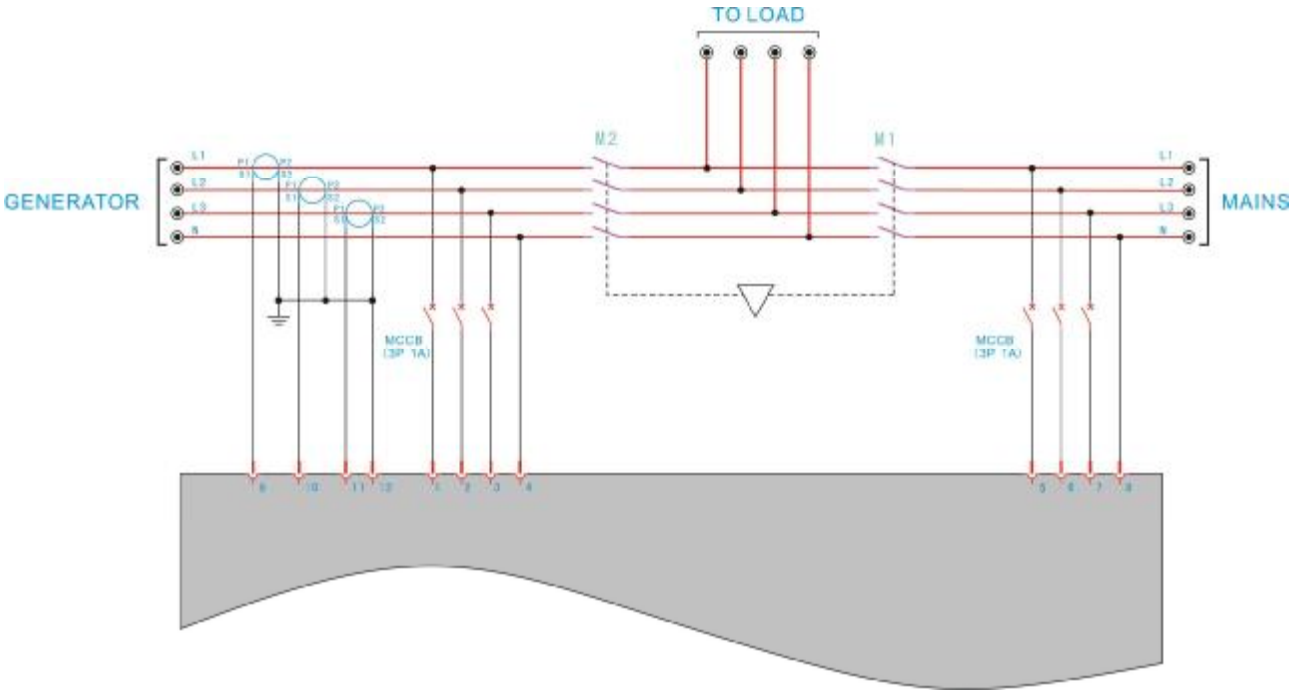


	NOTE: I The measuring accuracy of magnetic pick-up is related to fly wheel teeth: Accuracy=±（120/ fly wheel teeth）RPM. As the above formula, more fly wheel teeth leads to higher measuring accuracy.

WARNING	**WARNING:** I Shield cable must be used for connection between controller and sensor, and the shield should be earthed. I Please play attention that the terminal #28 is connected to negative of the power supply inside the controller.

8.2.4 Typical connection for voltage input and current that corresponding to difference generator winding.

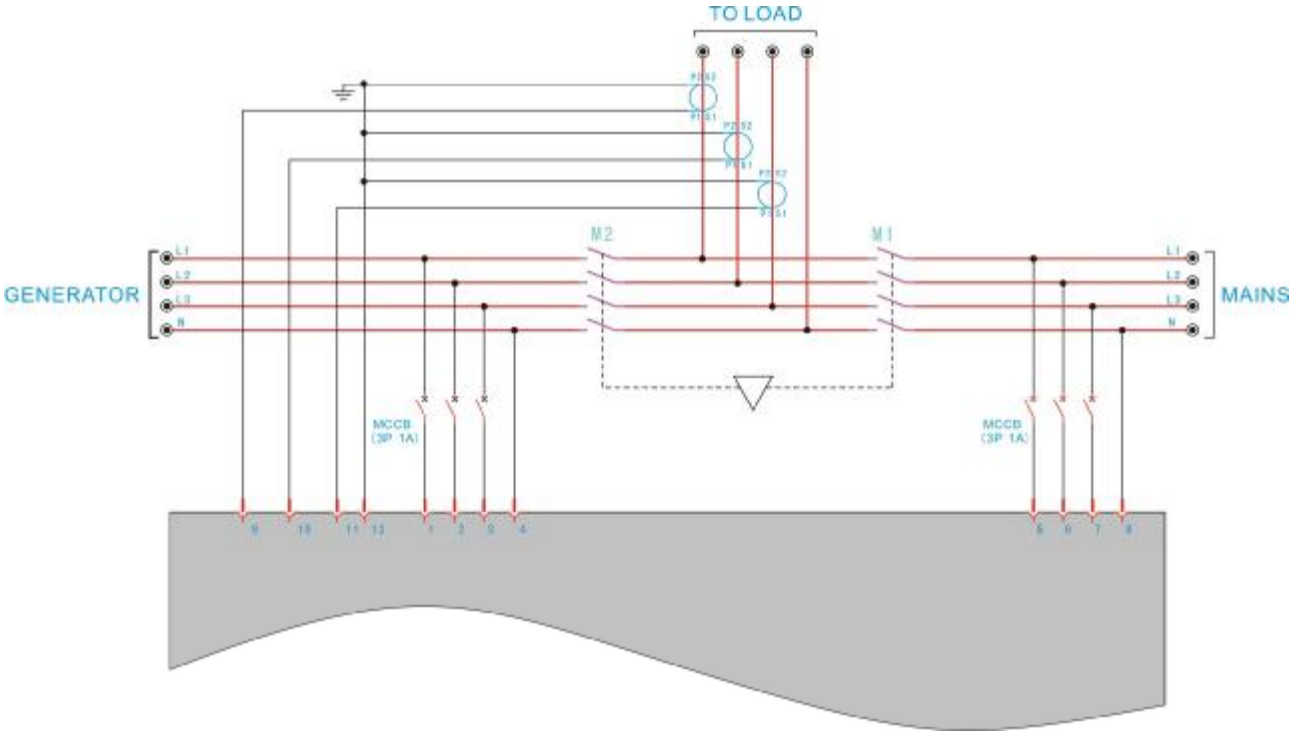
3P4W (3 phase 4 wire), CT measure at Gen side



Measure and Display Data	
"Y" 3P4W (3 phase 4 wire start)	"△" 3P4W (3 phase 4 wire angle)
Mains 3 phases V_{Ph-N} L1-N L2-N L3-N Mains 3 phases V_{Ph-Ph} L1-L2 L2-L3 L3-L1 Mains frequency Hz（L1） Gen 3 phases V_{Ph-N} L1-N L2-N L3-N Gen 3 phases V_{Ph-Ph} L1-L2 L2-L3 L3-L1 Gen frequency Hz（L1） Gen 3 phases current I1 I2 I3 Gen active power ∑P Gen reactive power ∑Q Gen power factor PF	Mains 3 phases V_{Ph-N} L1-N L2-N L3-N Mains 3 phases V_{Ph-Ph} L1-L2 L2-L3 L3-L1 Mains frequency Hz（L1） Gen 3 phases V_{Ph-N} L1-N L2-N L3-N Gen 3 phases V_{Ph-Ph} L1-L2 L2-L3 L3-L1 Gen frequency Hz（L1） Gen 3 phases current I1 I2 I3 Gen active power ∑P Gen reactive power ∑Q Gen power factor PF

NOTE:
- Only GU3311 has port #5, #6, #7, #8 and M1.
- Only GU3311 has Mains measurement display data.

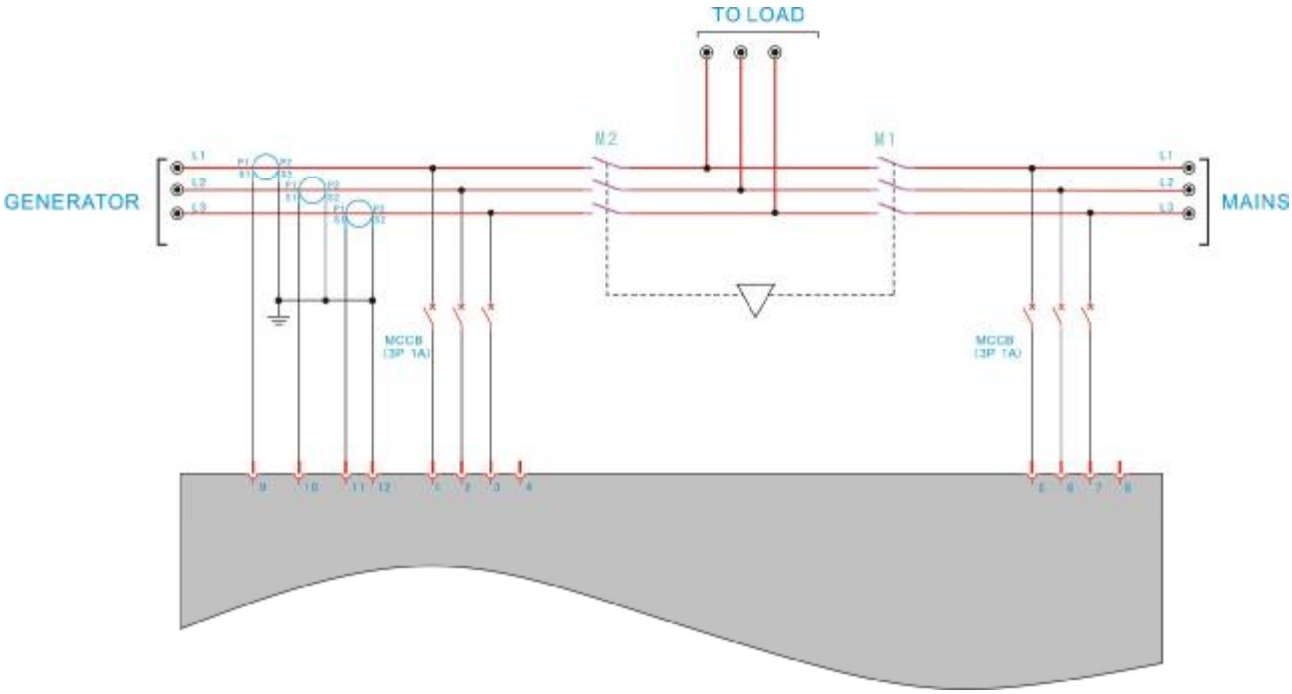
3P4W (3 phase 4 wire), CT measure at Load side



Measure and Display Data	
"Y" 3P4W (3 phase 4 wire start)	"△" 3P4W (3 phase 4 wire angle)
Mains 3 phases V_{Ph-N} L1-N L2-N L3-N Mains 3 phases V_{Ph-Ph} L1-L2 L2-L3 L3-L1 Mains frequency Hz（L1） Gen 3 phases V_{Ph-N} L1-N L2-N L3-N Gen 3 phases V_{Ph-Ph} L1-L2 L2-L3 L3-L1 Gen frequency Hz（L1） Mains/ Gen 3 phases current I1 I2 I3 Mains/ Gen active power ∑P Mains/ Gen reactive power ∑Q Mains/ Gen power factor PF	Mains 3 phases V_{Ph-N} L1-N L2-N L3-N Mains 3 phases V_{Ph-Ph} L1-L2 L2-L3 L3-L1 Mains frequency Hz（L1） Gen 3 phases V_{Ph-N} L1-N L2-N L3-N Gen 3 phases V_{Ph-Ph} L1-L2 L2-L3 L3-L1 Gen frequency Hz（L1） Mains/ Gen 3 phases current I1 I2 I3 Mains/ Gen active power ∑P Mains/ Gen reactive power ∑Q Mains/ Gen power factor PF

NOTE:
- Only GU3311 has above connection mode.

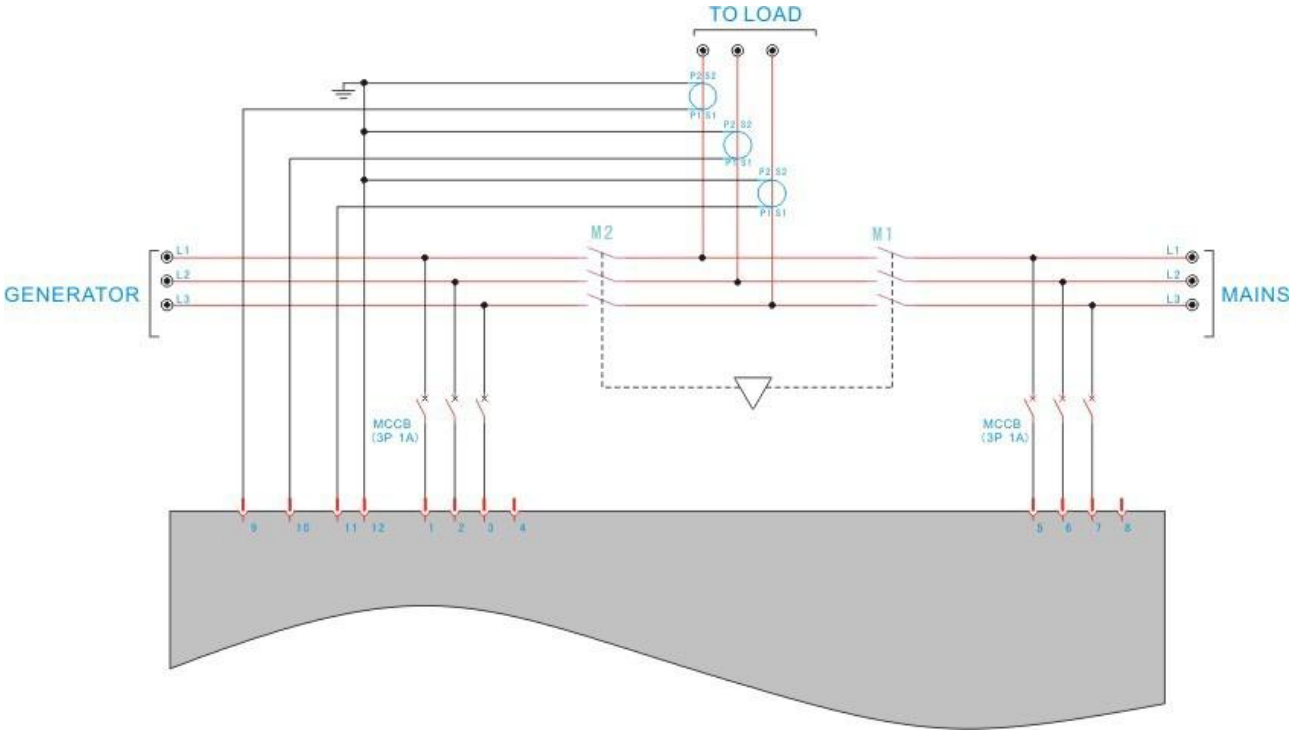
3P3W (3 phase 3 wire), CT measure at Gen side



Measure and Display Data
Mains 3 phases V_{Ph-Ph} L1-L2 L2-L3 L3-L1 Mains frequency Hz（L1） Gen 3 phases V_{Ph-Ph} L1-L2 L2-L3 L3-L1 Gen frequency Hz（L1） Gen 3 phases current I1 I2 I3 Gen active power ∑P Gen reactive power ∑Q Gen power factor PF

NOTE:
- Only GU3311 has port #5, #6, #7, #8 and M1.
- Only GU3311 has Mains measurement display data.

3P3W (3 phase 3 wire), CT measure at Load side

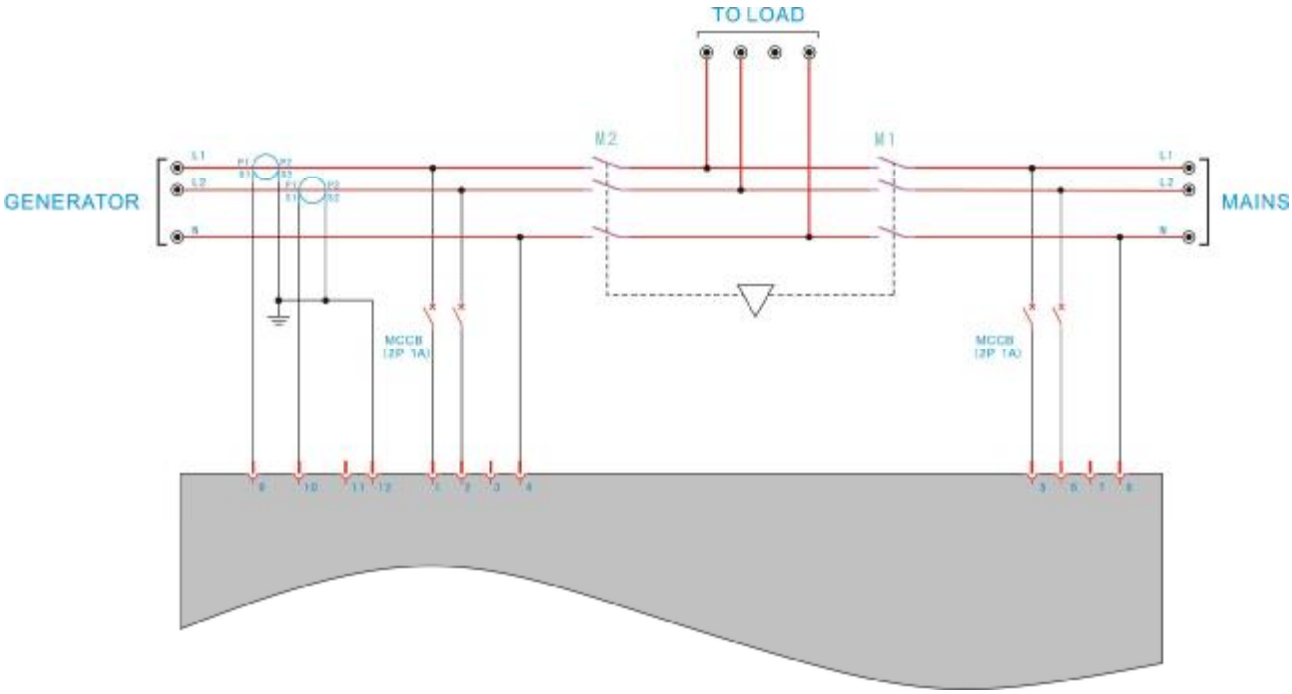


Measure and Display Data
Mains 3 phases V_{Ph-Ph} L1-L2 L2-L3 L3-L1 Mains frequency Hz（L1） Gen 3 phases V_{Ph-Ph} L1-L2 L2-L3 L3-L1 Gen frequency Hz（L1） Mains/ Gen 3 phases current I1 I2 I3 Mains/ Gen active power ∑P Mains/ Gen reactive power ∑Q Mains/ Gen power factor PF

NOTE:

- Only GU3311 has above connection mode.

2P3W (2 phase 3 wire), CT measure at Gen side

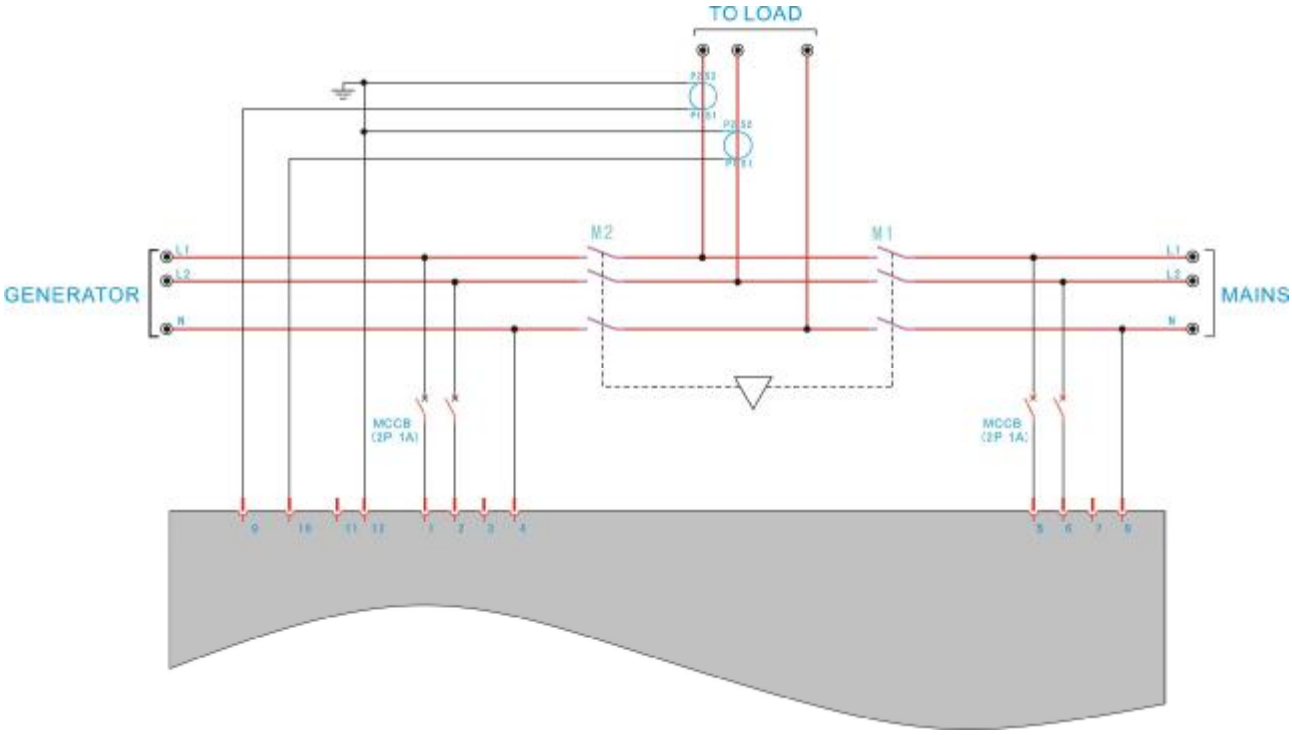


Measure and Display Data
Mains V_{Ph-N} L1-N L2-N Mains V_{Ph-Ph} L1-L2 Mains frequency Hz（L1） Gen V_{Ph-N} L1-N L2-N Gen V_{Ph-Ph} L1-L2 Gen frequency Hz（L1） Gen phases current I1 I2 Gen active power ∑P Gen reactive power ∑Q Gen power factor PF

NOTE:

- Only GU3311 has port #5, #6, #7, #8 and M1.
- Only GU3311 has Mains measurement display data.

2P3W (2 phase 3 wire), CT measure at Load side

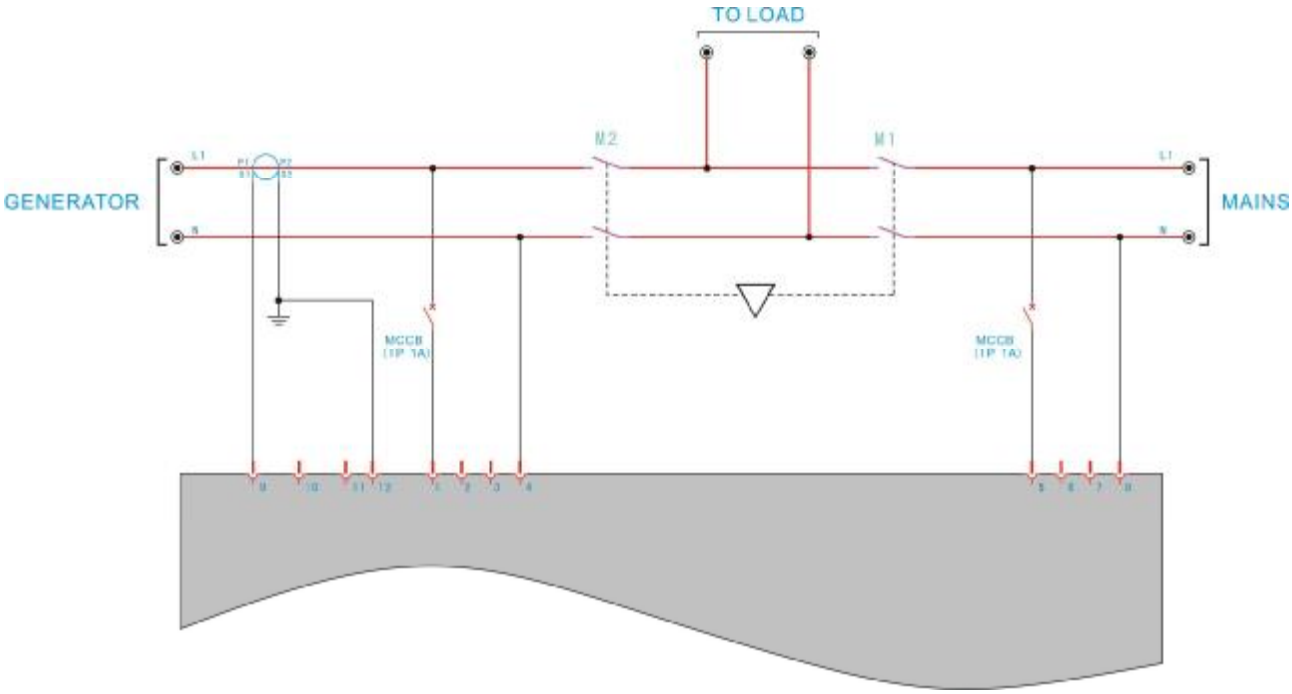


Measure and Display Data
Mains V_{Ph-N} L1-N L2-N Mains V_{Ph-Ph} L1-L2 Mains frequency Hz（L1） Gen V_{Ph-N} L1-N L2-N Gen V_{Ph-Ph} L1-L2 Gen frequency Hz（L1） Mains/ Gen phases current I1 I2 Mains/ Gen active power ∑P Mains/ Gen reactive power ∑Q Mains/ Gen power factor PF

NOTE:

- Only GU3311 has above connection mode.

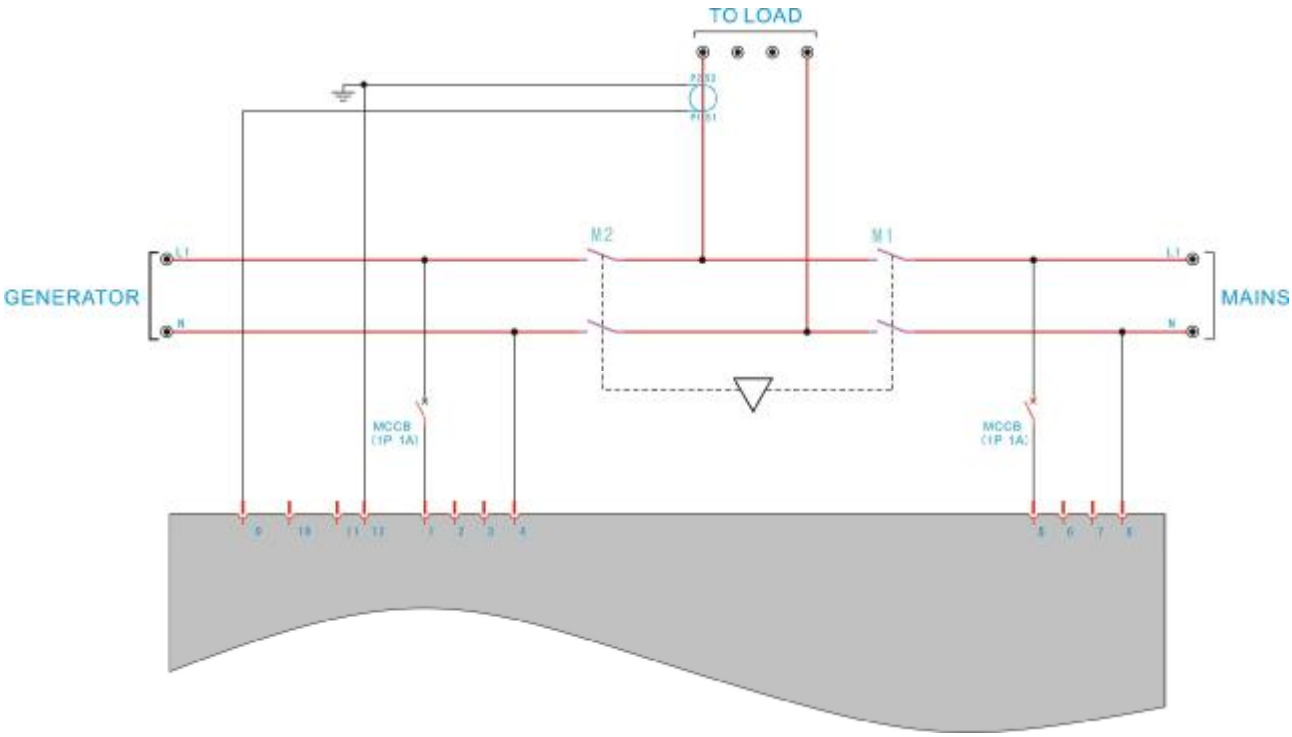
1P2W (single phase 2 wire), CT measure at Gen side



Measure and Display Data
Mains V_{Ph-N} L1-N Mains frequency Hz（L1） Gen V_{Ph-N} L1-N Gen frequency Hz（L1） Gen current I1 Gen phase active power ∑P Gen phase reactive power ∑Q Gen power factor PF

NOTE:
- Only GU3311 has port #5, #6, #7, #8 and M1.
- Only GU3311 has Mains measurement display data.

1P2W (single phase 2 wire), CT measure at Load side



Measure and Display Data
Mains V_{Ph-N} L1-N Mains frequency Hz（L1） Gen V_{Ph-N} L1-N Gen frequency Hz（L1） Mains/ Gen Load current I1 Mains/ Gen active power ∑P Mains/ Gen reactive power ∑Q Mains/ Gen power factor PF

NOTE:

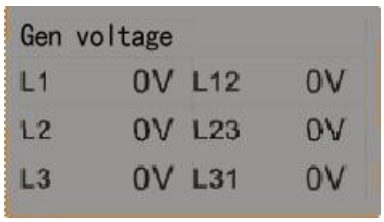
- Only GU3311 has above connection mode.

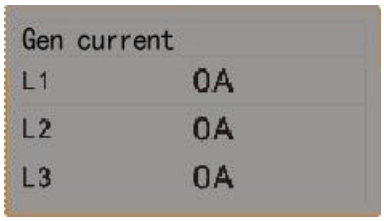
9 LCD displays and Menu System

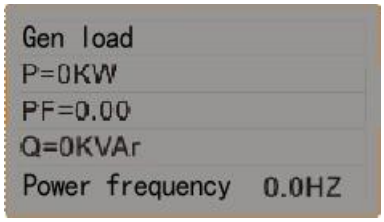
9.1 LCD displays measuring parameters:

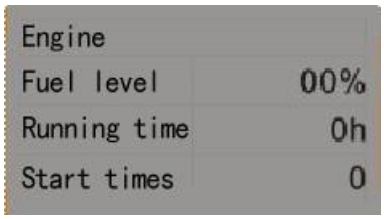
Using a back-lit graphic LCD to display data and information. Each page can display multi-row information simultaneously, the above 4 rows display measuring data, the last row displays status information, press "▶" to scroll for viewing next page, it can be configured as auto scroll as well. When alarm occurs, the alarm status is displayed on the LCD immediately.

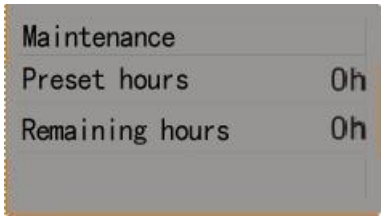
Page 1	Description
	▪ **U:** Line voltage, 1 phase 2 wire: phase voltage. ▪ **I:** Mean value of phase current of Gents. ▪ **P:** Total active power of Gent load. ▪ **F:** Generation frequency. ▪ **SP:** Engine speed. ▪ **Bat:** Battery voltage. ▪ **OP:** Engine oil pressure. it will not display without using pressure sensor. ▪ **Temp:** Engine cooling temperature, it will not display without using temperature sensor.

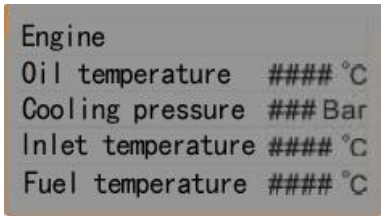
Page 2	Description
	▪ This page displays generator phase voltage, wire voltage.

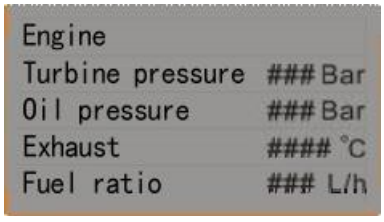
Page 3	Description
	▪ This page displays generator phase current. ▪ This page displays when power supply.

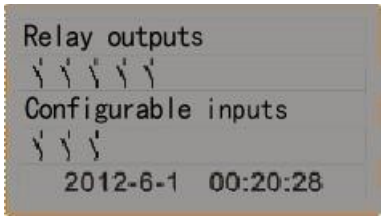
Page 4	Description
	▪ This page displays generator total active power, total reactive power, power factor and generation frequency. ▪ This page displays when power supply.

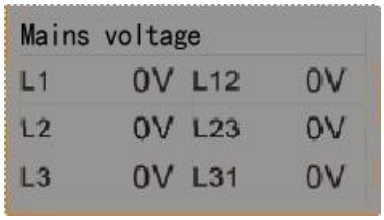
Page 5	Description
	l This page displays auxiliary sensor (fuel level) measured value. l Engine cumulative running time. l Engine accumulative crank times.

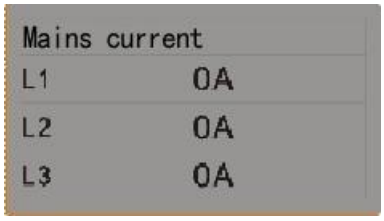
Page 6	Description
	l This page displays maintenance reminder and remaining time. l This page will not display while the maintenance measure function is set to be "No".

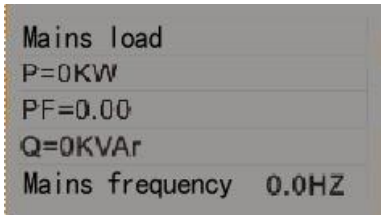
Page 7	Description
	l These parameters are from engine ECU, this page will auto hide when the engine type is not set to be "ECU". l The parameters have to be supported by ECU or they will not be displayed.

Page 8	Description
	l These parameters are from engine ECU, it means they will not be displayed while the engine type is not set to be "ECU". l The parameters have to be supported by ECU or they will not be displayed.

Page 10	Description
	l This page displays controller digital inputs and relay outputs status.

Page 11	Description
	l This page displays Mains phase voltage and wire voltage. l Only GU3311 displays.

Page 12	Description
	l This page displays Mains phase current. l This page only displays when GU3311 need the parameter current input type set to be "on load", and Mains supply.

Page 13	Description
	l This page displays total active power, total reactive power, power factor and power frequency. l This page only displays when GU3311 need the parameter current input type set to be "on load", and Mains supply.

9.2 Setting running parameters

Press and hold "▶" button 2sec to enter into parameter settings menu, 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 "-", the LCD displays 0 0 0 0 when prompted enter password, then use "+" or "-" to modify the first digital value, press "▶" move to modify next digital value, the first digital value will be displayed as "*" after moving to next digital value, press"▶"to confirm after the password is set as 2213. For parameter configuration it uses graduated increase and decrease steps, press and hold increase "+" or decrease "-" push buttons, first single digit changes, then it changes to ten digit changes, then hundred digit changes, press "▶" to confirm after parameters have been changed. 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 "▶" button 1 time, then press "+" 6 times, and then press "▶" button 1 time, LCD displays:	**[CT ratio]** **1000：5**
Press "+" or "-" button, prompted enter password(2213), 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 "▶" button to confirm, press and hold "▶" 2sec will quit parameter settings menu , then LCD displays:	**Ready**

For example: (setting controller crank attempt at 2)

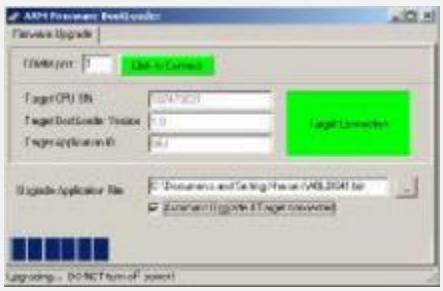
Operation	Description
Press and hold "▶" 2sec, enter into parameters settings menu, then LCD displays:	**[SETTING]** **0. QUIT** **1. SYSTEM** **2. GENERATOR** **3. ENGINE**
Press"+" 2 times and then press "▶", then LCD displays:	**[ENGINE]** **0. QUIT** **1. Engine type** **2. ECU type** **3. Engine rated speed**
Press"+" 9 times and then press "▶", then LCD displays:	**[Crank attempt]** **3**

Press "+" or "-" button, prompted enter password(2213), 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, press and hold "▶" 2sec will quit parameter settings menu , then LCD displays:	**Ready**

FOR EXAMPLE: (THE CONTROLLER PARAMETERS TO REVERT TO THE DEFAULT VALUE)

Operation	Description
Press and hold "▶" 2sec, enter into parameters settings menu, then LCD displays:	**[SETTING]** **0. QUIT** **1. SYSTEM** **2. GENERATOR** **3. ENGINE**
Press "▶" and then press "-" twice, then LCD displays:	**[SYSTEM]** **16. Start alarm** **17. Switch switching pulse** **18. Reset to manual mode** **19. Restore the default value**
Press "▶" button, prompted enter password(2213), press "▶" button to confirm after entering password.	**[Firmware update]** **Password: 0000**
Press "▶" restore the default value, press and hold "▶" 2sec, can quit parameter settings menu.	**[SYSTEM]** **DONE**

FOR EXAMPLE: (SET THE CONTROLLER ON PROGRAM MODE)

Operation	Description
Break off the power supply, then connect the computer with communication cable, run the program software "ABLDs.exe", open the serial interface and import upgrade program as illustrated in figure, switch the power on then the controller will keep to do program upgrade automatically. If the operation failure, you can disconnect the power and try again.	

10 Technical Specification

10.1 AC voltage:

Measurement	True RMS
Phase to Neutral	15 to 346VAC
Phase to Phase	25 to 600VAC
Max power wastage per line	<0.1W
Accuracy	1%
Display	0 to 3000V

10.2 AC voltage frequency:

Input frequency	3 to 70Hz（voltage ≥15VAC）
Accuracy	0.1%
Display	0 to 100Hz

10.3 Current (isolated):

Measurement	True RMS
Measuring current	5A
Accuracy	1%
Display	0 to 6000A
Max power wastage per line	<0.01W

10.4 Working power:

Range	12V/24V （8-35V）continuous
Max. operating current	@12V 150mA, @24V 75mA
Max. standby current	@12V 60mA, @24V 30mA
Cranking drop outs	0V for 80mS, assuming dc supply was at least 10V before dropout and recovers to 5V
Accuracy	1%
Display	0 to 40V

10.5 Configurable digital inputs:

Number	3
Max. contact resistance	10KΩ
Max. contact current per line	1mA

10.6 Configurable relay outputs:

Number	5
Relay	3A/30Vdc

10.7 Charge failure input:

Range	0~35Vdc
Accuracy	1%
Max output current	@12V 400mA , @24V 200mA

10.8 Analog Inputs:

Number	3
Sensor type	resistance
Resolution	10 bits
Range	0 to 1KΩ
Accuracy	2% When full scale, except for sensor error

10.9 Magnetic pickup:

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

10.10 Ambient parameters:

Operating ambient temperature Standards	-20 to 70℃ IEC60068-2-1 and IEC60068-2-2
Storage ambient temperature Standards	-30 to 80℃ IEC60068-2-1 and IEC60068-2-2
Humidity Standards	60℃,95%RH, 48 hours 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

Service Hotline

4008883388

More technical support，
Please browse our website：www.jnhharsen.com