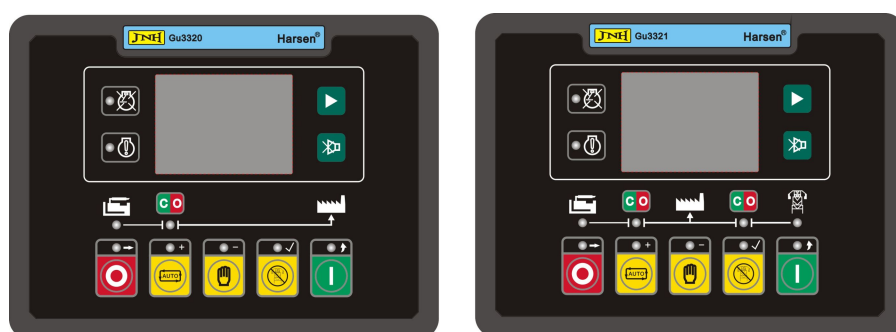


Manual

GU3320 / GU3321 Genset controller



The Interpretation of the Symbol:**WARNING****WARNING:**

A WARNING indicates a potentially hazardous situation which, if not avoided, could result in death, serious personal injury or property damage.

**CAUTION****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****WARNING:**

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

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

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

**CAUTION****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****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****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	HM1080ER1	2012.11.5	Chen	P.L	New
2	HM1080ER2	2013.12.30	Chen	P.L	1、 The CT from 100:5 change to 500:5 in decimal point;

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1 Description

GU3320/GU3321 is 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.

GU3320 is an Auto Start controller.

GU3321 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:

- I The voltage and current using true RMS measuring.
- I Multi-Language menu.
- I 128 x 64 graphic LCD.
- I 3 Analogue inputs configurable with a variety of preset sensors and can also customize your own sensor curves.
- I 6 Configurable relay outputs.
- I 5 Configurable D- inputs.
- I 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.
- I Standard RS485, the other optional RS232 or USB communication port, remote control, or to communicate with the PC, fully realized telesignalling, telemetry, remote control functions.
- I 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.

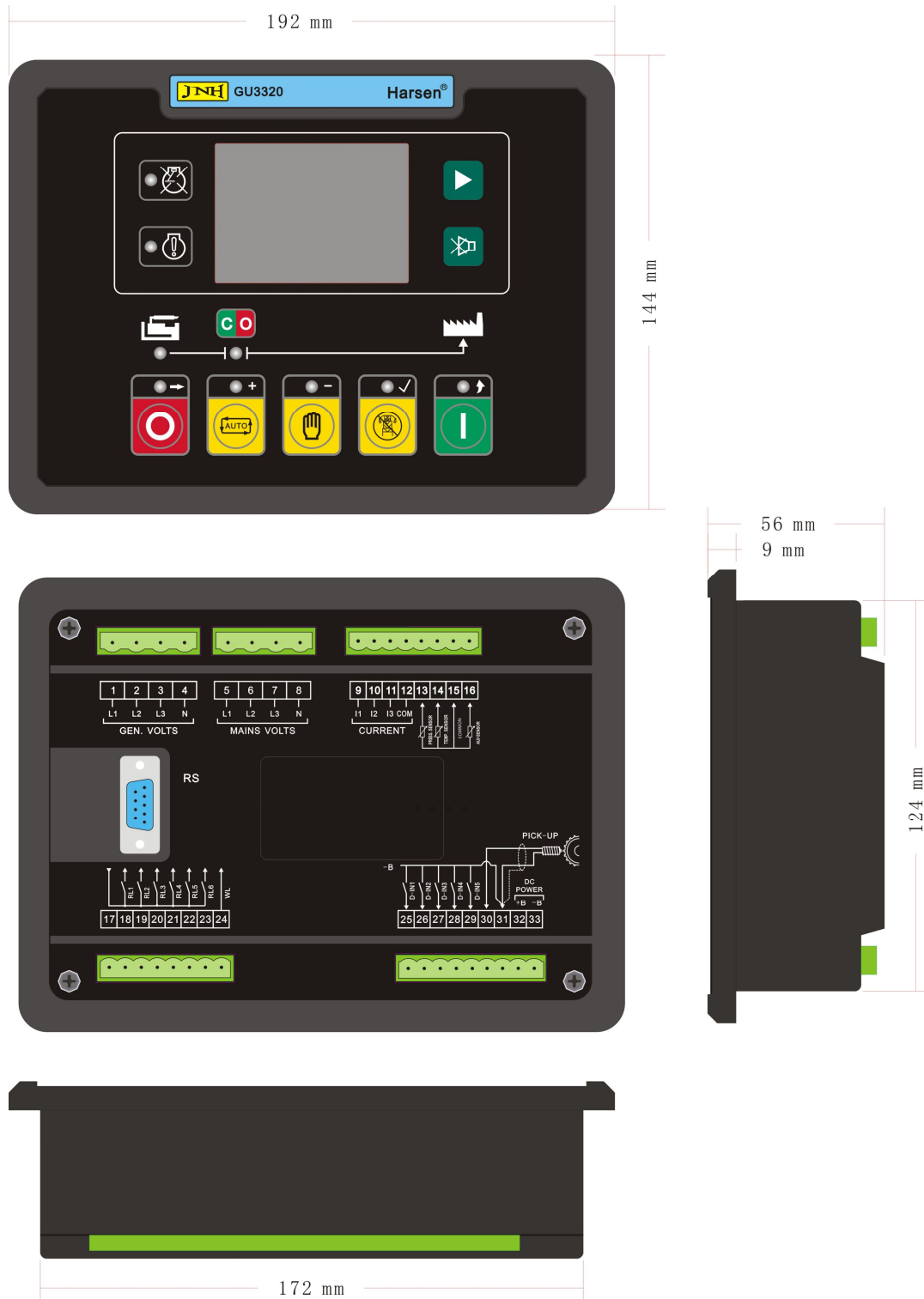
This manual is only suitable for GU3320/ GU3321 Automatic control module, user must carefully read this manual first.

2 The Outline Dimension Drawings and Controller Wiring

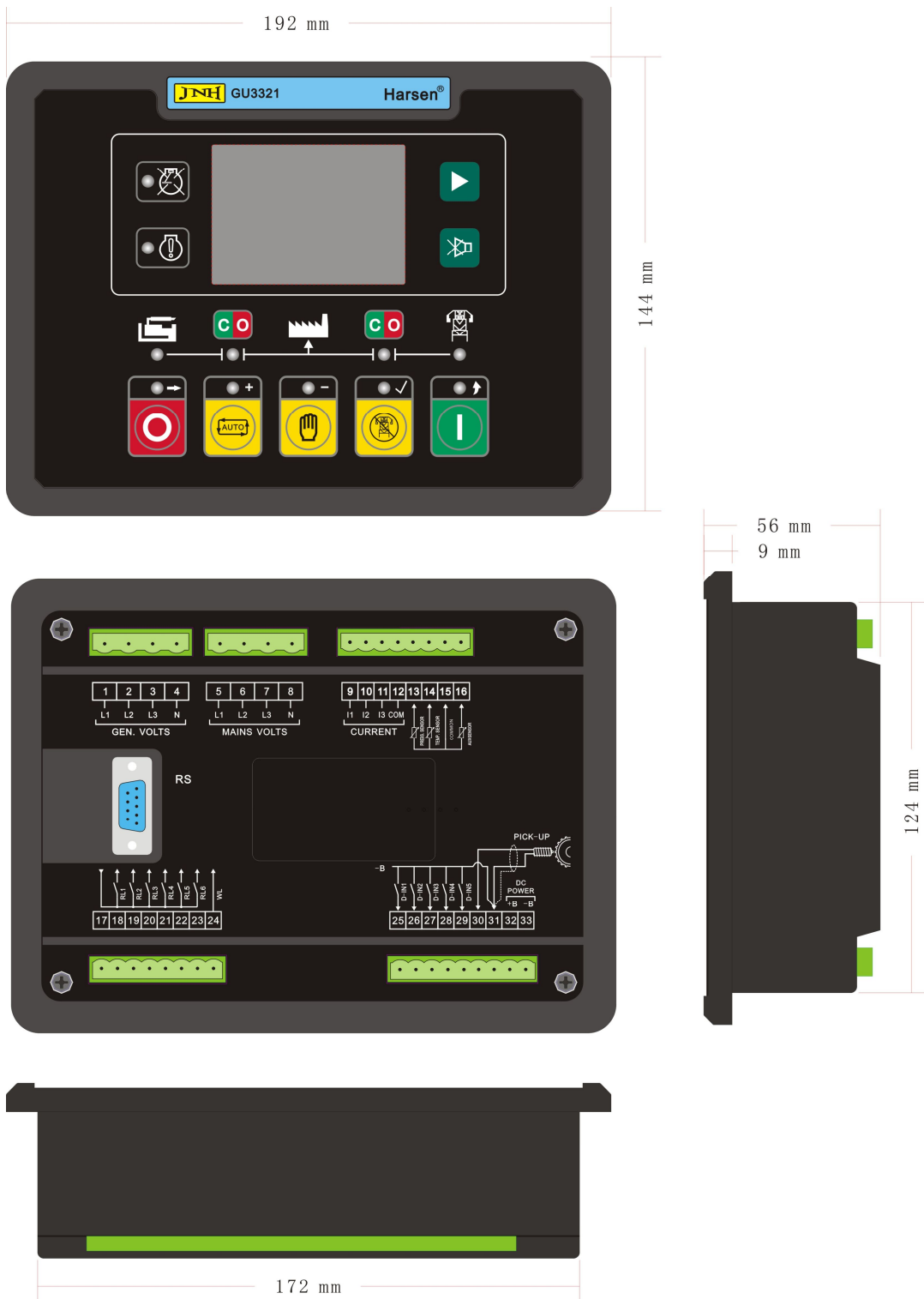
2.1 Following Details:

Module Dimensions	W192mm×H144mm
Panel Cutout	W173mm×H125mm
Thickness	D56mm (without connection)

GU3320 Genset Controller



GU3321 Genset Controller



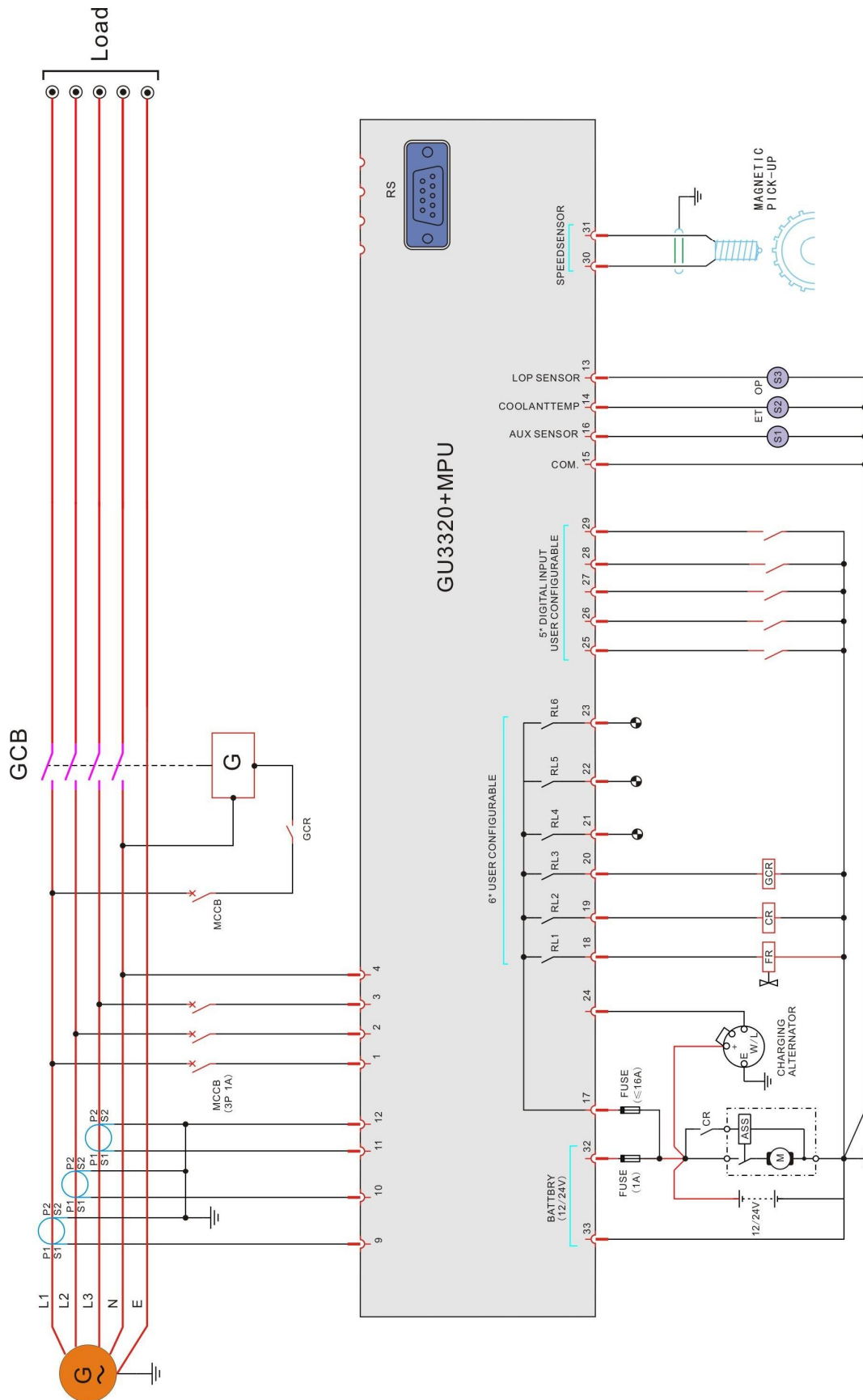
2.2 Terminal Connections:

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

**NOTE:**

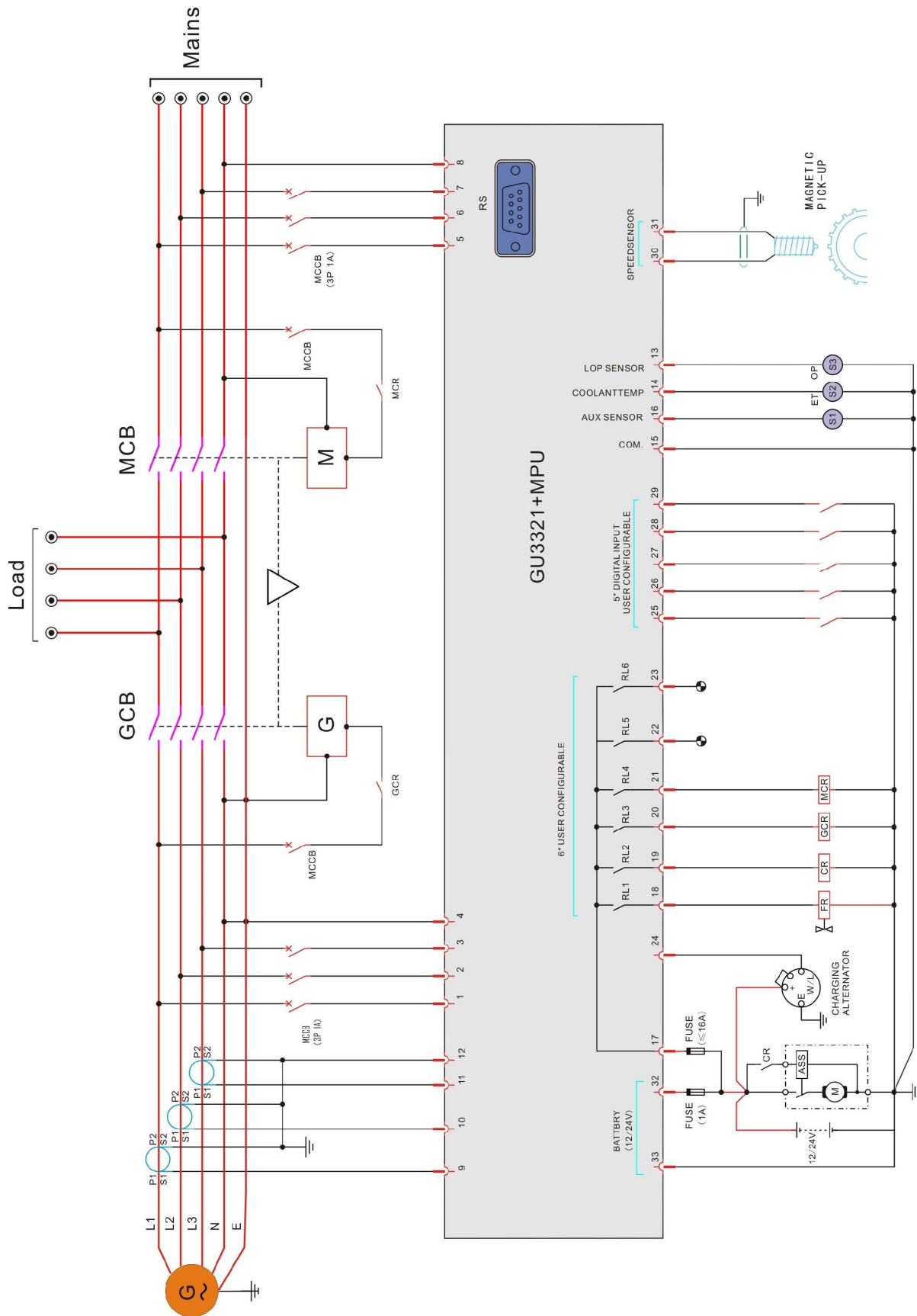
I Only supply for GU3321 port #5, #6, #7, #8.

2.3 GU3320+MPU Typical Wiring Diagram:



3 phase 4 wire

2.4 GU3321+MPU 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.

Control buttons and LED




Function Description	Tag
<p>Scroll Button</p> <p>Scroll menu for parameters display/ enter into or exit parameters setting by pressing and holding this button for 2sec.</p>	
<p>MUTE/ Lamp Test Button</p> <p>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.</p>	
<p>AUTO Mode Button / LED / "+" Value Increase</p> <p>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. When in parameters setting mode, this button is used to increase value / scroll down menu.</p>	
<p>MAN Mode Button / LED / "-" Value Decrease</p> <p>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. When in parameters setting mode, this button is used to decrease value / scroll up menu.</p>	
<p>TEST Mode Button / LED / "✓" Confirm Parameters Configure</p> <p>The push button is used for selecting "test mode". When controller is running in TEST mode, the LED above the push button is illuminated, the controller starts the generator simulating Mains failure and the activation of "remote start signal". When in parameters setting mode, this button is used to enter into submenu / confirm modification.</p>	
<p>START Button / LED / Return</p> <p>The push button is used for manually start the Genset. When controller is running in MANUAL mode, press this button to start the generator. When in parameters setting mode, this button is used to return.</p>	

<p>STOP / RESET Button / “→” Move Setting The Push button is used for manually stops the Genset. If failure occurs, press this button, the shutdown alarm lockout can be cleared. When in parameters setting mode, this button is used to move to next parameters 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” or “TEST” mode and the generator will be shut down after 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.</p>	
<p>C/O Button There are 2 C/O buttons respectively beside the Mains and Gen icons. They are used to close/open the switches of Mains and Gen when controller is running in MANUAL mode. MCB C/O button only supply for GU3321.</p>	
<p>Shutdown Alarm (FAILURE) LED The LED will illuminate permanently when shutdown alarm occurs.</p>	
<p>Pre-alarm (WARNING) LED The LED will illuminate permanently when pre-alarm occurs.</p>	
<p>GEN. Normal LED Gen. normal LED will illuminate after both voltage and frequency of the Gen. reach loading voltage and frequency.</p>	
<p>GCB Closed LED LED will illuminate when GCB/MCB is closed and power supplied by Gen / Mains, LED will flash when GCB / MCB failure occurs.</p>	
<p>MAINS Normal LED (only supply for GU3321) Mains normal LED will illuminate after both voltage and frequency of the Mains reach the preset value range.</p>	
<p>MCB Closed LED (only supply for GU3321) LED will illuminate when MCB is closed and power supplied by Mains, LED will flash when MCB failure occurs..</p>	

4 Control and Operation Instruction

The controller has 3 modes: AUTO, MANUAL and TEST.

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.	
Press and hold the "TEST" button, the LED above the button is illuminated; the controller is running in "TEST" mode.	



NOTE:

- | Only 1 mode can be selected from above 3 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 supply for GU3321) :

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:

- I 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.
- I Do not assume the Mains is not available if Mains normal but LED does not illuminate in plant maintenance.

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:

- I 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 to this port.
- I 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. and the along function of start Genset is also inactive.
- I 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:

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

- I Mains voltage failure, the controller detects the mains voltage or frequency exceeds the set level of extreme value, and delay the confirmation.
- I Mains failure occurs.

(The above two conditions only supply for GU3321)

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

The Start delay timer is activated, when it times out 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 speed**;
- | Generator Voltage reaches the **crank cut off value** (optional);
- | Charger voltage reaches **crank cut off value** (optional);
- | Cutout P-delay 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 speed**;
- | 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****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:**

- I 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 the generator running, the generator voltage and frequency, respectively, after the the generation load voltage and power generation with load frequency, power generation normal light, power generation and distribution delay timer is started, time to time, the generator breaker relay closure outputs transfer switch power generation side switch is closed, the power generation side switch auxiliary contacts are closed, power generation the closing indicator, power generation powered.

**NOTE:**

- I Effective **remote no-load start** input, or **dispatch mode** set to no-load, generator only no-load operation
- I The generator switching command is only achieved after the **safety inspection delay** timer is over.
- I 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 supply for GU3321) :

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:

- I When mains voltage has returned, the mains power supply delay timer is started (**only supply for GU3321**) .
- I **Remote loading start** input 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:**

- I 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, Mains is on load (Only supply for GU3321) :

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 MCB close/open relay will not close automatically.

Press the “C/O” button of Mains to close the Mains switch manually, then Mains is on load, the Mains Aux. Switch’s contact feeds back the signal to a configurable input on our controller, MCB closed LED illuminates. Press the “C/O” button of Mains again to open the Mains switch manually, the Mains is off load, the MCB closed LED is turned off at the same time.

If you press the “C/O” button of Mains when Gen is on load, the GCB close/open relay will be opened first, then Gen is off load, the MCB close/open relay closes later, Mains is on load.



NOTE:

- I When the controller is running in “MANUAL” mode, Mains must be normal, if not the “C/O” button of Mains will be disabled.

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

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

Press the “C/O” button of Gen to close the Gen switch manually, Gen is on load, the Gen Aux. Switch’s contact feeds back the signal to a configurable input on our controller, GCB closed LED illuminates. Press the “C/O” button of Gen again to open the Gen switch manually, Gen is off load, the GCB closed LED is turned off at the same time.

If you press the “C/O” button of Gen when Mains is on load, the MCB close/open relay will be opened first, then Mains is off load, the GCB close/open relay closes later, Gen is on load.



- I When the controller is running in “MANUAL” mode, the Gen must be normal, or the “C/O” button of Gen will be disabled.
- I GCB and MCB close/open relays are electrically interlocked, they can’t be closed at the same time.

Generator stopping sequence:

Press “STOP” button, GCB close/open relay opens, the generator is off load, the cool down timer starts, when it times out , the fuel relay 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 time.

**NOTE:**

- I When the controller is running in "MANUAL" mode, need to manually closing, Mains must be normal, if not the "C/O" button of Mains will be disabled.

4.4 TEST Controll Sequence:

GU3321 is running in "TEST" mode means it simulates Mains failure automatically., After the operation of the controller program is equivalent to the automatic mode when the operating procedures.

GU3320 is running in "TEST" mode, Both cases, when the parameters of the test mode is set to "no-load" is equivalent to a defined custom port for the remote control no-load boot enter a valid; When the the parameter test mode is set to "load", equivalent to a defined enter a valid remote boot load custom port.

When the test mode is active, the start timing of the start-up delay timer, time to time, such as default preheat function, preheat relay closure outputs, warm-up time timer is started, time to time, the throttle relay action, engine fuel solenoid valve opens, the delay of 300 milliseconds, the starter relay closure outputs, engine cranking motor power, start turning, cutting speed, turning when the engine is running speed reaches the the controller stop start output delay timer starts timing of the safety supervision, to counting time, such as the controller detects that the voltage, frequency, oil pressure, water temperature, and other parameters of the generator set is normal, there is no other fault, generator sets start successful, normal operation, the LCD display measurement parameters.

No-load test:

The generator has been no-load operation, the controller maintains the control state until the following actions will occur:

- I Press "STOP" button, Generator stop.
- I switching mode of operation of the controller to the "automatic": controller maintains full control of the state of the test mode, execution of the control program of the automatic mode, the latter according to the prevailing conditions.

Load test:

When the generator is running, the power generation and distribution delay timer is started, time to time:

GU3320 controller's generator closing relay closure outputs, the generation load switch GCB closed, power generation side switch auxiliary contacts are closed, Generation the closing indicator light, power generation.

GU3321 controller's mains closing relay action, power generation close relay closure outputs, the transfer switch power generation side switch GCB closed, power generation side switch auxiliary contacts are closed, the generator breaker indicator light, power generation and distribution. Normal mains voltage, mains voltage normal light.

The controllers maintain power generation and distribution, until the following actions occur:

- I Press "STOP" button, Generator stop
 - I Switching mode of operation of the controller to the "automatic": controller maintains full control of the state of the test mode, execution of the control program of the automatic mode, the latter according to the prevailing conditions.

4.5 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

4.6 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 flows.



NOTE:

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

4.7 Preheat function:

For **Preheat** function, configure one of the configurable outputs as **Preheat**, the controller has 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 the successful ignition.

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

Mode 4 — one of the configurable inputs 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 T-sensor use 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 A-sensor use is defined as **Preheat**, preheat relay output energises when the temperature falls below the **Preheat ON 1** value, and de-energises until the temperature reaches the **Preheat OFF 1** value.

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

For preheat mode 4 to 6, preheat function is active immediately when the controller is switched on power.

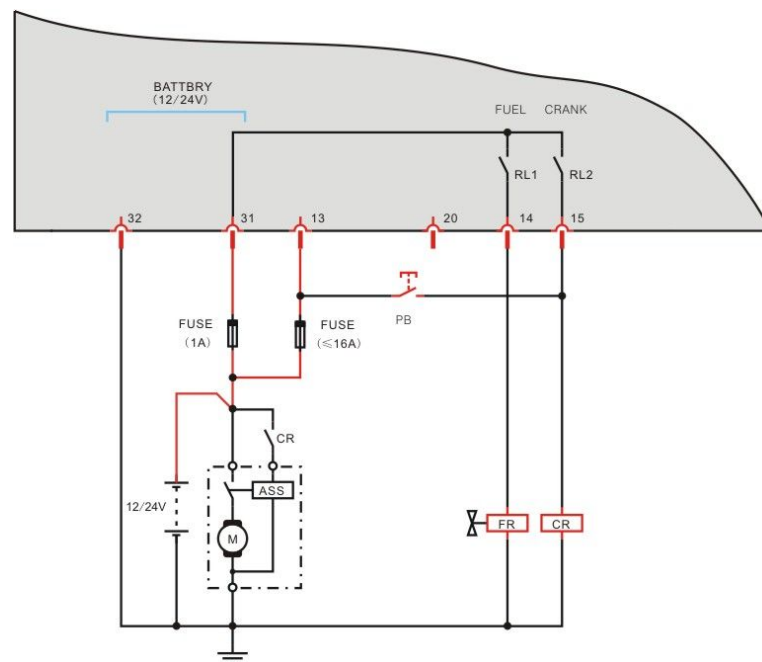
During crank period, the preheat relay output will not energise in any of above modes.

4.8 The function of forcing a start:

Controller to increase this function, it is because of the engine in some special cases, like 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:

- I We normally don't recommend using the second method to solve this condition.
- I 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)

(The above data only supply for GU3321)

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

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

Gen frequency **Hz** (L1)

Gen / Mains 3 phases current **I1 I2 I3**

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

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

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

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

(The above Mains data only supply for GU3321)

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

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

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

AUX. sensor

Battery voltage **Vdc**

Genset Running hour **Hour**

6 Pre-alarm and Shutdown Alarm

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

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

Note:



- I The warning non-serious fault state to defer any generator system which is harmful, just to remind the attention of the operator does not match the requirements of the situation and resolved in a timely manner to ensure the continuous operation of the system. When a warning occurs, the warning indicator light, the fault is not locked unit without stopping the machine once the fault is removed warning automatic discharge.
- I Genset shutdown after the shutdown failure, fault status locked when the fault is cleared, and then press the reset button, fault lock before lifting.

7 Parameters Setting

7.1 SYSTEM

NO.	Items	Setting Range	Preset
1.0	Quit		
1.1	Language		
1.2	Password	0000 to 9999	
1.3	Pressure unit	0Bar/1PSI	0
1.4	Temperature unit	0°C/1°F	0
1.5	Comm. address	1 to 247	1
1.6	Startup mode	0 manual / 1 automatic / 2 finally	0
1.7	CT Ratio	5:5 to 30000:5	1000:5
1.8	PT Ratio	1.0:1 to 100.0:1	1.0:1
1.9	Rated voltage	45 to 30000VAC	220
1.10	Rated current	1 to 30000A	1000
1.11	Rated active power	1 to to 16000KW	500
1.12	Voltage type	1 to 5 / not used	1
1.13	Display contrast	1 to 9%	5
1.14	Display brightness	1 to 9%	5
1.15	Saving brightness	0 to 9%	1
1.16	Auto scroll time	1 to 60S / not used	not used
1.17	Starting alarm	0 N / 1 Y	0
1.18	CB close pulse	0 to 60 seconds /0 continuous	continuous
1.19	Reset to MAN	0 N / 1 Y	0
1.20	Default settings		

Menu descriptions:

Language

I Used to select the Language which is displayed on the LCD.

Password

- I There are 3 levels of password (CL0/CL1/CL2) for different users.
- I CL0 for the operator, who can read parameters, start and stop controller. The default setting is no password.
- I CL1 for the technician, who has the authority of CL0 and can modify all parameters, the default setting is "2213".
- I CL2 for factory, who have the authority of CL1 and on-line update, the default setting as "3132".
- I All passwords are automatically inactive 60 seconds after exiting menu.

Pressure unit

- I Used to define oil pressure unit which is displayed on the LCD. "0" stand for Bar, "1" stand for PSI.
- I Transfer formula: $P[\text{psi}] = P[\text{bar}] * 14.50$.

Temperature unit

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

Comm. address

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

Startup mode

- | Used to configure the 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,
- | As reference value for judging over/under voltage.

Rated current

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

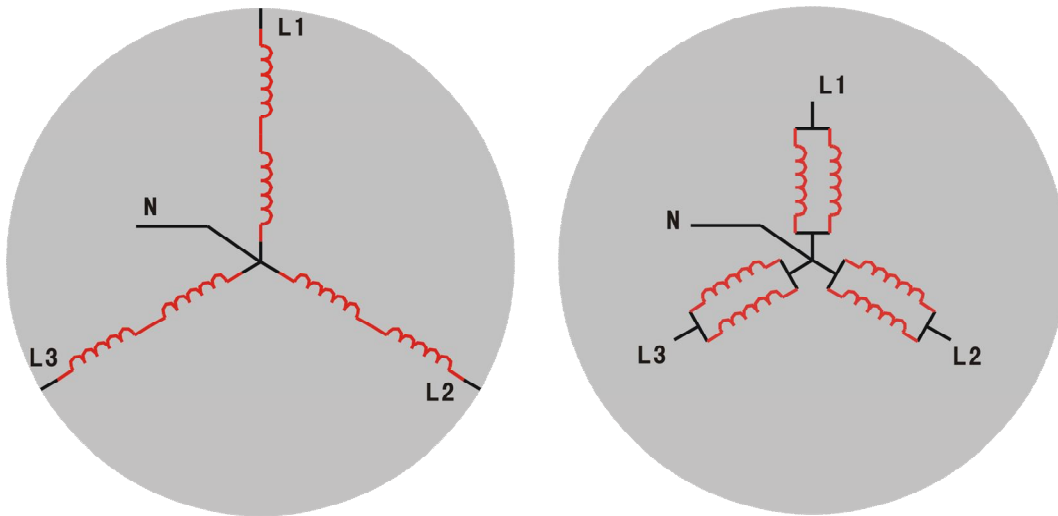
Rated active power

- | definition generator rated active power.
- | As the reference value of the active power value.

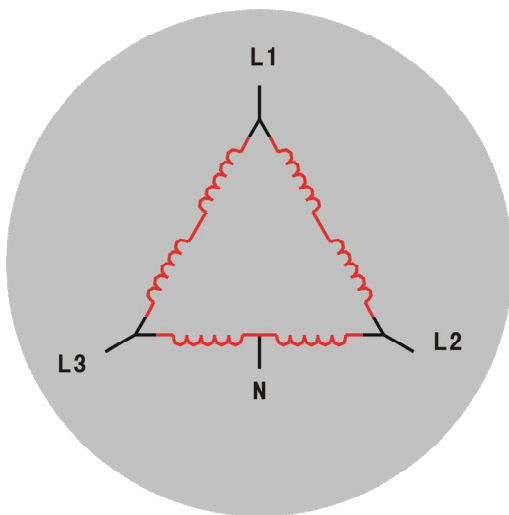
Voltage type

I The voltage and 5 types: “Y”3P4W, “Δ”3P4W, 3P3W, 2P3W, 1P2W.

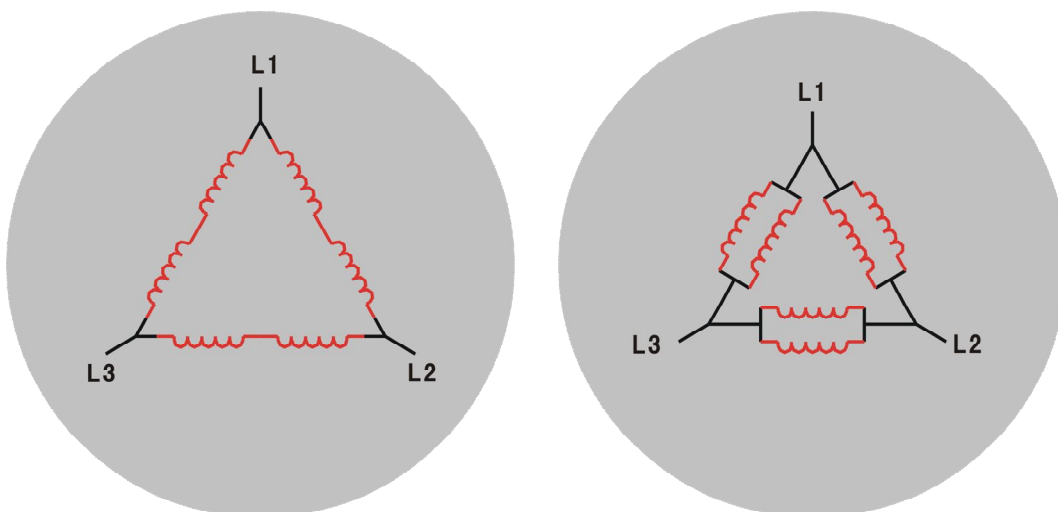
I 1—“Y”3P4W (Star three-phase four-wire) :



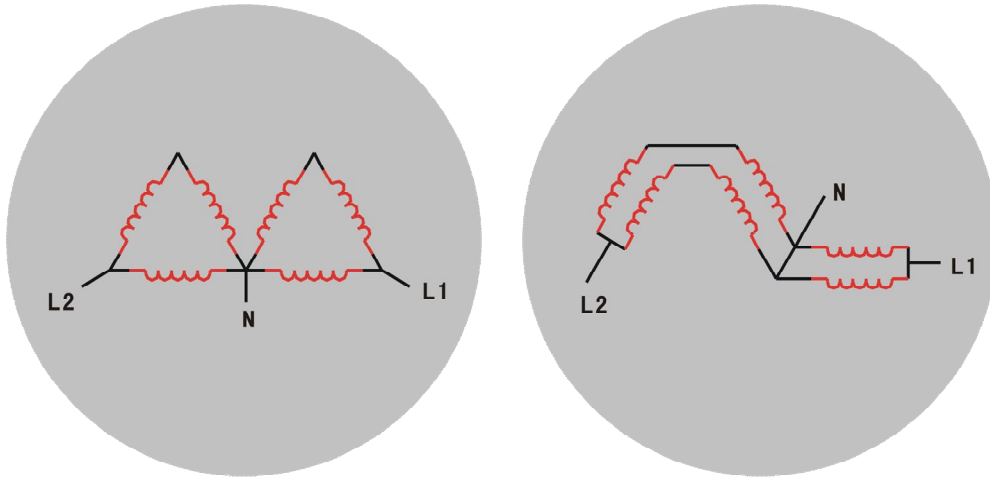
I 2—“Δ”3P4W (Angle-phase four-wire) :



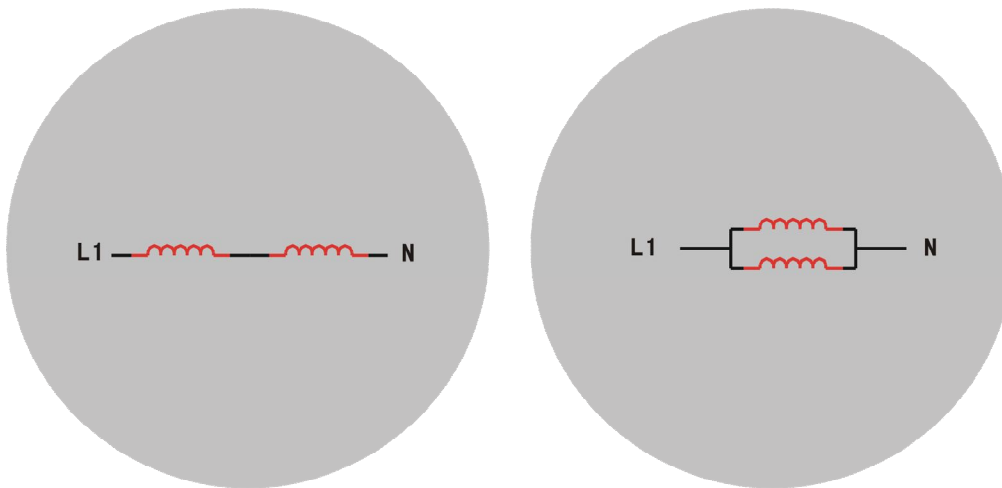
I 3—3P3W (Three-phase three-wire) :



I 4—2P3W (Two-phase three-wire) :



I 5—1P2W (One-phase two-wire) :



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

Display contrast

- I used to adjust the controller LCD display contrast.

Display brightness

- I used to adjust the backlight brightness of the controller's LCD operation panel and generator run.

Saving brightness

- I used to adjust the brightness of the LCD backlight controller when in standby.
- I When the 30 seconds after the end of the operation controller panel buttons, and the generator in the standby mode, LCD backlight automatically goes into sleep brightness display status.

Auto scroll time

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

Starting alarm

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

CB close pulse

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

Reset to MAN

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

**Warning:**

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

Default settings

- I parameters returned to the factory default.

7.2 GENERATOR

NO.	Parameter	Setting range	Preset
2.0	Quit		
2.1	GEN V-monitor type	0 ph-ph/1 ph-n	1
2.2	GEN-V under 1		
	Function	0 N/1 Y	1
	Limit	20 to 200%	90%
	Delay	0 to 999s	5s
	Delay by	0 to 3	3
	ALM. class	0 to 6	2
2.3	GEN-V under 2		
	Function	0 N/1 Y	0
	Limit	20 to 200%	85%
	Delay	0 to 999s	5s
	Delay by	0 to 3	3
	ALM. class	0 to 6	5
2.4	GEN-V over 1		
	Function	0 N/1 Y	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 N/1 Y	0
	Limit	20 to 200%	120%
	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 N/1 Y	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 N/1 Y	0
	Limit	10.0 to 100.0Hz	45.0Hz
	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 N/1 Y	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 N/1 Y	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 N/1 Y	1
	Limit	50 to 300%	110%
	Delay	0 to 999s	5s
	Delay by	0 to 3	3
	ALM. class	0 to 6	2
2.11	GEN-I over 2		
	Function	0 N/1 Y	1
	Limit	50 to 300%	115%
	Delay	0 to 999s	5s
	Delay by	0 to 3	3
	ALM. class	0 to 6	5
2.12	GEN-KW over 1		
	Function	0 N/1 Y	1
	Limit	20 to 200%	110%
	Delay	0 to 999s	5s
	Delay by	0 to 3	3
	ALM. class	0 to 6	2
2.13	GEN-KW over 2		
	Function	0 N/1 Y	1
	Limit	20 to 200%	120%
	Delay	0 to to 999s	5s
	Delay by	0 to 3	3
	ALM. class	0 to 6	5
2.14	GCB close		
	Function	0 N/1 Y	1
	Delay	0 to 999s	5s
	ALM. class	0 to 6	2
2.15	GCB open		
	Function	0 N/1 Y	0
	Delay	0 to 999s	5s
	ALM. class	0 to 6	2
2.16	GEN. loading Volt	20 to 200%	90%
2.17	GEN. loading Hz	10.0 to 100.0Hz	48.0Hz
2.18	GEN. on delay	0 to 9999s	5s
2.19	Test mode	0 No-load /1 Load	0
2.20	Soft unload time	1 to 9999s	5s

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

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

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

GEN-V under 1&2

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

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

GEN-V over 1&2

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

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

GEN-Hz under 1&2

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

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

GEN-Hz over 1&2

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

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

GEN-I over 1&2

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

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

GEN-KW over 1&2

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

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

GCB close

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

Function	Select "1", the monitoring function is active; Select "0", the monitoring function is invalid.
Delay	When generator sended the GEN closing command, the delay timer starts to timing when the timer ends, the GEN load switch has not been closed or keep in the state of GEN closing switch command, the switch off, and the define operation of alarm levels are triggered.
Alarm levels	Used to define the protection is triggered, and what is the controller will do. Details refer to the alarm level configuration table.

GCB open

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

Function	Select "1", the monitoring function is active; Select "0", the monitoring function is invalid.
Delay	When generator send the GEN closing command, the delay timer starts to timing when the timer ends, the GEN load switch has not been closed or keep in the state of GEN closing switch command, the switch close, and the define operation of alarm levels are triggered.
Alarm levels	Used to define the protection is triggered, and what is the controller will do. Details refer to the alarm level configuration table.

**Note:**

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

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

GEN. loading Volt

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

GEN. loading Hz

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

GEN. on delay

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

Test mode

I Use for controller in the test mode, select the control function.

I When the parameter is set to "0", the controller is running in test mode, generator running, the transfer switch not convert, mains continue to supply, and the generator no-load running; When the parameter is set to "1", the control runs in test mode, generator running, the transfer switch conversion, and power supply.

Soft unload time

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

7.3 ENGINE

No.	Parameter	Setting range	Preset
3.0	Quit		
3.1	Engine type	1 Diesel /2 ECU/3 Gas	1
3.2	ECU type	1 to 20	1
3.3	Engine rated speed	99 to 9999RPM	1500
3.4	MPU input	0 N/1 Y	0
3.5	Fly wheel teeth	5 to 300	120
3.6	Set pickup now		
3.7	Pair of poles	1 to 8	2
3.8	Fuel mode	0 N.C/1 N.O	0
3.9	Start delay	0 to 999s	10s
3.10	Crank attempts	1 to 10	3
3.11	Critical C-attempt	1 to 20 times	6s
3.12	Crank time	1 to 99s	5s
3.13	Crank time add	1 to 99s / not used	not used
3.14	Crank reset time	1 to 300s	15s
3.15	Ignition speed	1 to 9999 RPM	200RPM
3.16	Ignition start DLY	0 to 999s	5s
3.17	Gas valve on DLY	1 to 999s	5s
3.18	Crank cutout RPM	1 to 9999 RPM	300RPM
3.19	Crank cutout volt	1 to 100% / not used	85%
3.20	Crank cutout ALT-V	1.0 to 40.0 V / not used	not used
3.21	Crank cutout Oil-P	0.1 to 150.0Bar/PSI / not used	2.2 Bar
3.22	Crank cutout P-DLY	1 to 60s / not used	not used
3.23	Idle time	1 to 9999s / not used	not used
3.24	Pre-heat mode	1 to 6	1
3.25	Pre-heat time	1 to 9999s / not used	3s
3.26	Safety-on delay	0 to 600s	10s
3.27	Cool down mode	0 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 N/1 Y	0
3.31	Charge failure		
	Function	0 N/1 Y	1
	Limit	1.0 to 40.0 V	8.0V
	ALM. class	0 to 6	2
3.32	Pickup signal		
	Function	0 N/1 Y	1
	Delay	0 to 999s	1s
	Delay by	0 to 3	1
	ALM. class	0 to 6	2
3.33	Overspeed level1		
	Function	0 N/1 Y	1
	Limit	1 to 19999 RPM	1600 RPM
	Delay	0 to 999s	1s
	Delay by	0 to 3	1
	ALM. class	0 to 6	2

3.34	Overspeed level2		
	Function	0 N/1 Y	1
	Limit	1 to 19999 RPM	1710 RPM
	Delay	0 to 999s	1s
	Delay by	0 to 3	1
	ALM. class	0 to 6	5
3.35	Underspeed level1		
	Function	0 N/1 Y	1
	Limit	1 to 9999 RPM	1440RPM
	Delay	0 to 999s	5s
	Delay by	0 to 3	3
	ALM. class	0 to 6	2
3.36	Underspeed level2		
	Function	0 N/1 Y	1
	Limit	1 to 9999 RPM	1350 RPM
	Delay	0 to 999s	5s
	Delay by	0 to 3	3
	ALM. class	0 to 6	5
3.37	Start failure		
	Function	0 N/1 Y	1
	ALM. class	0 to 6	6
3.38	Stop failure		
	Function	0 N/1 Y	1
	ALM. class	0 to 6	3
3.39	Batt. Overvolt		
	Function	0 N/1 Y	1
	Limit	1.0 to 99.9 V	35.0 V
	Delay	0 to 999s	1s
	Delay by	0 to 3	0
	ALM. class	1 to 6	2
3.40	Batt. Undervolt		
	Function	0 N/1 Y	1
	Limit	0.0 to 40.0 V	8.0 V
	Delay	0 to 999s	1s
	Delay by	0 to 3	0
	ALM. class	0 to 6	2
3.41	Maintenance		
	Function	0 N/1 Y	0
	Limit	0 to 9999h	1000
	ALM. class	0 to 6	2
3.42	ECU Data fail		
	Function	0 N/1 Y	1
	Delay	0 to 999s	30s
	Delay by	0 to 3	3
	ALM. class	0 to 6	2
3.43	ECU Warning		
	Function	0 N/1 Y	1
	Delay	0 to 999s	5s
	Delay by	0 to 3	3
	ALM. class	0 to 6	2

3.44	ECU Shutdown		
	Function	0 N/1 Y	1
	Delay	0 to 999s	5s
	Delay by	0 to 3	3
	ALM. class	0 to 6	2

Menu description:**Engine type**

- I used to select the controller controls the object type of engine.
- I When the parameter is set to "1", is a traditional diesel engine;
When the parameter is set to "2", is used ECU of the engine (requires hardware support) ;
When the parameter is set to "3", is a conventional gas engine.
- I When the control object is ECU engine, the controller will be activated "ECU warning", "ECU fault shutdown", " ECU data failure" and "oil inlet water" protection function at the same time.
- I diesel engine:

Starting sequence:

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

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

Shutdown sequence:

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

- I gas engine:

Starting sequence:

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

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

Shutdown sequence:

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

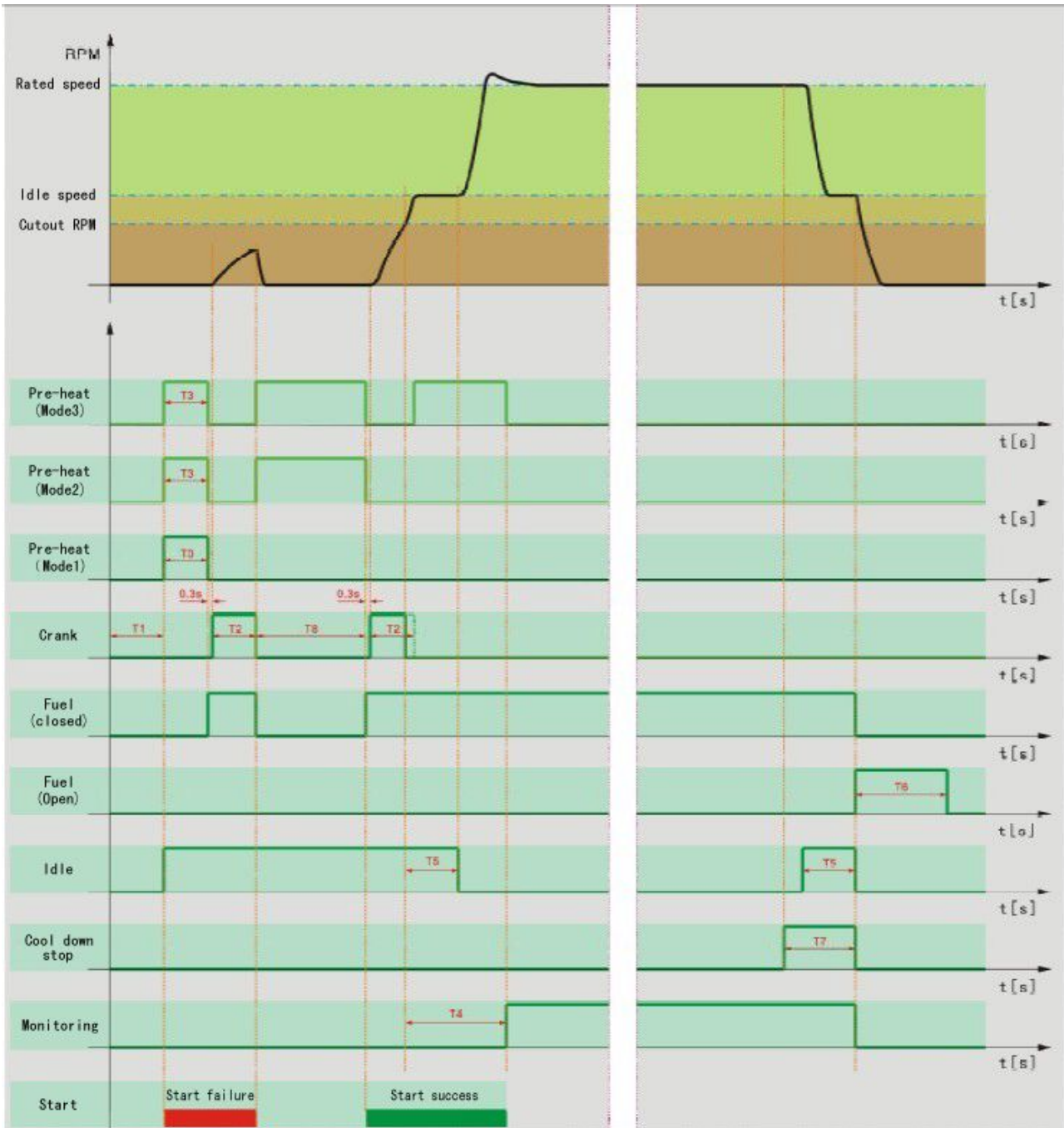
At the end of shutdown failed delay timing, engine not stop, LCD displays "shutdown failed".

**Note:**

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

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

I The diesel engine start stop the flow chart:



T1 – Start delay
 T2 – Cranking time
 T3 – Preheat time

T4 – Safety time
 T5 – Idle time
 T6 – Fail to Stop Delay

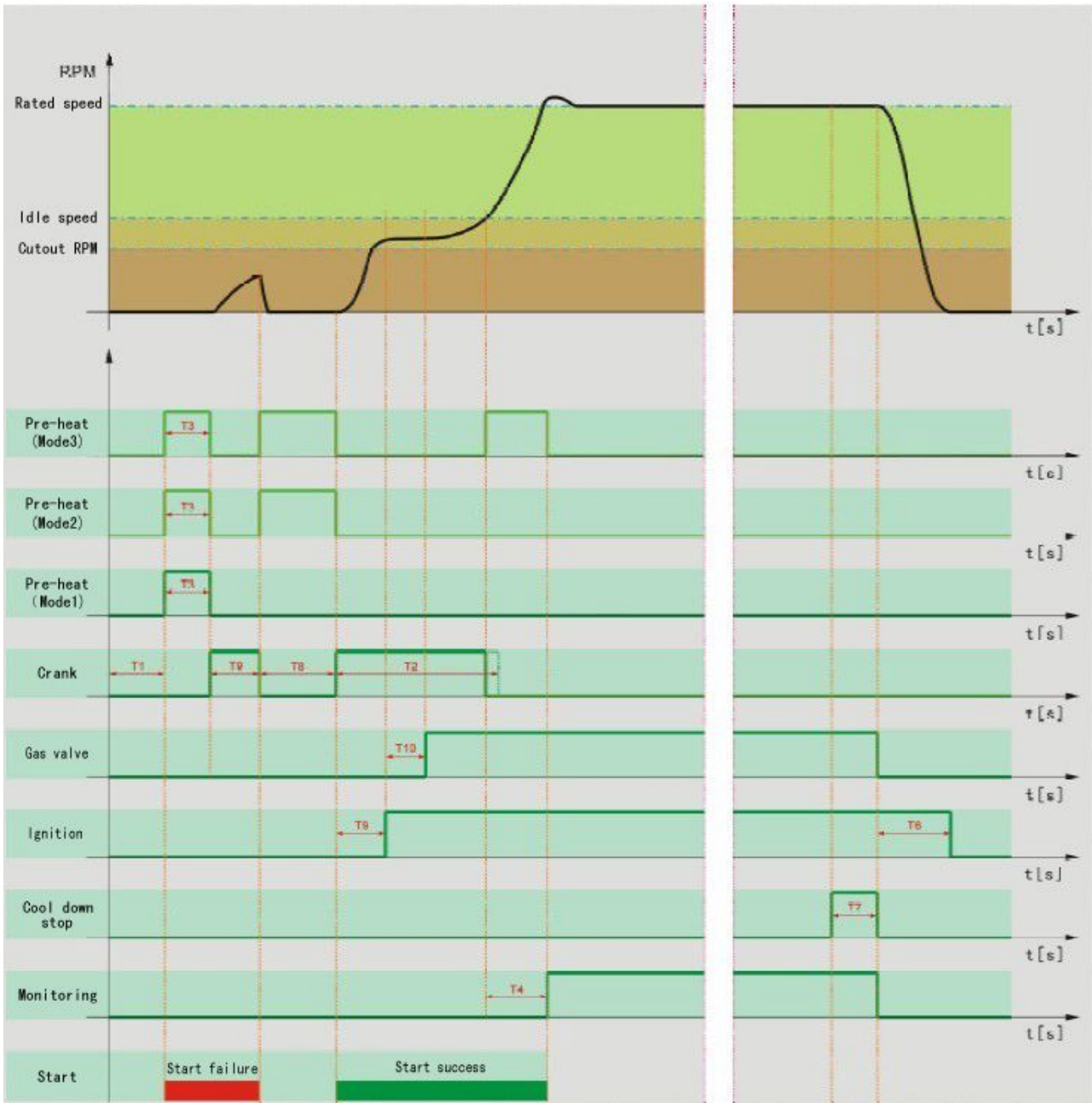
T7 – Cooling time
 T8 – crank rest time



Note:

I When $T4 > T5$, the engine in idle period, low oil pressure protection does not work; When $T4 < T5$, engine in the end of the safety supervision delay idle period, low oil pressure protection can act.

I Gas engine start stop flow chart:



T1 – Start delay
 T2 – crank time
 T3 – Preheat time

T4 – safety time
 T6 – stop time
 T7 – Cooling time

T8 – crank rest time
 T9 – Ignition delay time
 T10 – Gas valve open time

ECU type

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

Code	Description
1	Receiving standard J1939 information
2	Standard J1939 information plus specific VOLVO EMS2 of information
3	Standard J1939 information plus specific the CUMMINS QSX15 information
4	CUMMINS (MODBUS) information

Engine rated speed

- I used to define the rated speed of engine running.
- I as a baseline reference value of speed control.

MPU input

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

Fly wheel teeth

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

Set pickup now

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



Note:

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

Pair of poles

- I used to define the generator exciter poles.
- I controller speed measurement value from the frequency signal of the generator, for the measurement operation of speed.

Fuel mode

- I Use to configure the type of engine fuel supply valve (details refer to section 4.6).
- I N.C. type means the fuel channel when fuel can not be used: N.O. type means the fuel channel is opened when fuel can not be used.

Start delay

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

Crank attempts

- I 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

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

Crank time

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

Crank time add

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



Caution:

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

Crank reset time

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

Ignition speed

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

Ignition start DLY

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

Gas valve on DLY

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

Crank cutout RPM

- I The crank cutout speed.

Crank cutout volt

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

Crank cutout ALT-V

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

Crank cutout Oil-P

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

Crank cutout P-DLY

- I Used to configure the period from engine LOP-switch opened or oil pressure reaches oil Pressure Crank cutout value to crank disconnection.
- I 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

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

Pre-heat mode

- I Used to configure the mode of preheat.
- I There are 7 pre-heat modes for selection, please read the description of preheat function for details.

Pre-heat time

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

Safety-on delay

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



CAUTION:

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

Cool down mode

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

Cool down time

- I The time permit for running without load before engine stop.
- I 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

- I The maximum time permit for the engine stop.
- I 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's voltage exceeds crank cutout voltage, or the speed exceeds crank cutout RPM, or LOP switch is open, or oil pressure exceeds crank cutout oil pressure, then stop failure occurs.
- I If the fuel valve is N.O. type, the fuel relay output is de-energised after Stop delay has expired.

EX. Crank permit

- I used to configure permit external crank to trigger the the normal controller monitoring, control and protection alarm function.
- I Refer to 4.8 for details.

Charge failure

- I controller through the "WL" port detection auxiliary AC charger excitation voltage, to determine the AC charger whether working properly, when the detection voltage is lower than the set limit, charging failure protection function triggered. If you choose to 1/2/3 alarm level when protection function triggered, LCD displays "!W:Charge failure"; if select 4/5/6 alarm level when protection function triggered, LCD display "!W:Charge failure".

Function	Select "1", the monitoring function is active; Select "0", the monitoring function is invalid.
Limit	Use to defined charging failure protection threshold. When detection voltage reaches or falls below this threshold, the duration exceeds over than delay time, the define operation of alarm levels are triggered
Alarm levels	Used to define the protection is triggered, and what is the controller will do. Details refer to the alarm level configuration table.

Pickup signal

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

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

Overspeed level1&2

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

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

Underspeed level1&2

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

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

Start failure

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

Function	Select "1", the monitoring function is active; Select "0", the monitoring function is invalid.
Alarm levels	Used to define the protection is triggered, and what is the controller will do. Details refer to the alarm level configuration table.

Stop failure

- I When the controller to execute the shutdown command, the throttle control relay to disconnect the output (N.O. throttle, control relay output is closed), engine downtime timer is started, after the end of the counting time, if the controller detects to the generator voltage greater than crank cutout voltage, or the speed is greater than crank cutout RPM, or oil pressure switch is open, or oil pressure greater than crank cutout oil pressure, that is shutdown failed. If you choose to 1/2/3 alarm level when protection function triggered, LCD display "!W:Stop failure"; if select 4/5/6 alarm level when protection function triggered, LCD displays "!A:Stop failure".

Function	Select "1", the monitoring function is active; Select "0", the monitoring function is invalid.
Alarm levels	Used to define the protection is triggered, and what is the controller will do. Details refer to the alarm level configuration table.

Batt. overvolt

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

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

Batt. undervolt

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

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

Maintenance

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

Function	Select "1", the monitoring function is active; Select "0", the monitoring function is invalid.
Limit	Use to definition of the threshold value of the maintenance time. When this parameter is set to the effective and start to accumulate the running time of the generator at the same time, when the cumulative time greater than this setting value, the define operation of alarm levels are triggered
Alarm levels	Used to define the protection is triggered, and what is the controller will do. Details refer to the alarm level configuration table.

ECU Data fail

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

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

**Note:**

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

ECU Warning

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

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

**Note:**

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

ECU Shutdown

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

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

7.4 Analog INPUT

No.	Parameter	Setting range	Preset
4.0	Quit		
4.1	P-sensor type	1 to 15 / not used	4
4.2	Oil-P low level1		
	Function	0 N/1 Y	1
	Limit	0.0 to 150.0 Bar / PSI	1.4Bar
	Delay	0 to 999s	1s
	Delay by	0 to 3	3
	ALM. class	0 to 6	2
4.3	Oil-P low level2		
	Function	0 N/1 Y	1
	Limit	0.0 to 150.0 Bar / PSI	1.1Bar
	Delay	0 to 999s	1s
	Delay by	0 to 3	3
	ALM. class	0 to 6	5
4.4	T-sensor type	1 to15 / not used	3
4.5	High temp. level1		
	Function	0 N/1 Y	1
	Limit	50 to 320 °C/°F	92°C
	Delay	0 to 999s	1s
	Delay by	0 to 3	3
	ALM. class	0 to6	2
4.6	High temp. level2		
	Function	0 N/1 Y	1
	Limit	50 to 320 °C/°F	100°C
	Delay	0 to999s	1s
	Delay by	0 to 3	3
	ALM. class	0 to 6	5
4.7	Heater on level	-20 to 320 °C/°F	50°C
4.8	Heater off level	-20 to 320 °C/°F	60°C
4.9	Cooler on level	-20 to 320 °C/°F	80°C
4.10	Cooler off level	-20 to 320 °C/°F	70°C
4.11	AUX sensor use	0 not used /1 oil/2temp.	1
4.12	AUX sensor type	1 to 15	3
4.13	Low fuel level1		
	Function	0 N/1 Y	1
	Limit	0 to 100%	20%
	Delay	0 to 999s	1s
	Delay by	0 to3	3
	ALM. class	0 to 6	2
4.14	Low fuel level 2		
	Function	0 N/1 Y	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	AUX low T level1		
	Function	0 N/1 Y	1
	Limit	-20 to 320 °C/°F	60°C
	Delay	0 to 999s	1s
	Delay by	0 to 3	3
	ALM. class	0 to 6	2
4.18	AUX low T level2		
	Function	0 N/1 Y	1
	Limit	-20 to 320 °C/°F	50°C
	Delay	0 to 999s	1s
	Delay by	0 to 3	3
	ALM. class	0 to 6	2
4.19	AUX high T level1		
	Function	0 N/1 Y	1
	Limit	-20 to 320 °C/°F	90°C
	Delay	0 to 999s	1s
	Delay by	0 to 3	3
	ALM. class	0 to 6	2
4.20	AUX high T level2		
	Function	0 N/1 Y	1
	Limit	-20 to 320 °C/°F	100°C
	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 °C/°F	50°C
4.22	Heater1 off level	-20 to 320 °C/°F	60°C
4.23	Cooler1 on level	-20 to 320 °C/°F	80°C
4.24	Cooler1 off level	-20 to 320 °C/°F	70°C

Menu descriptions:**P-sensor type**

I Used to configure the type of pressure sensor.

I The controller built-in a variety of pressure sensor types to choose,as follow:

Code	Mode	Note
0	not used	
1	Low oil pressure switch1	Closed (low) is valid
2	Low oil pressure switch2	Open (high) is valid
3	VDO 5 bar	
4	VDO 10 bar	
5	Datcon 7 bar	
6	Murphy 7 bar	
7	Pre-set 1	
8	Pre-set 2	
9	Pre-set 3	
10	Pre-set 4	
11	configurable 1	
12	configurable 2	
13	configurable 3	
14		
15		

**CAUTION:**

- I The P-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 sensor. Otherwise it may cause engine damage.

I 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:**

- I "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.
- I When configuring, please input the "resistance- measured value" from small to big one by one.

Oil-P low level 1&2

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

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

T-sensor type

- I Used to configure the type of HET sensor.
- I Optional kinds of built-in HET sensors in the controller:

Code	Mode	Note
0	Not used	
1	High temperature switch 1	Closed (low) is valid
2	High temperature switch 2	Disconnect (high) is valid
3	VDO 120°C	
4	VDO 150°C	
5	Datcon	
6	Murphy	
7	Pt100	
8	Pre-set 1	
9	Pre-set 2	
10	Pre-set 3	
11	Pre-set 4	
12	configurable 1	
13	configurable 2	
14	configurable 3	
15		

**CAUTION :**

I The HET 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 sensor. Otherwise it may cause engine damage.

I The parameters appendix of HEP sensor:

VDO 120°C:

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

VDO 150°C:

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

Datcon:

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

Murphy:

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

PT100:

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

Pre-set 1:

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

Pre-set 2:

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

Pre-set 3:

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

Pre-set 4:

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



NOTE:

- I “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.
- I When configuring, please input the “resistance-value” from small to big one by one.

High temp. level 1&2

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

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

Heater on level

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

Heater off level

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

Cooler on level

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

Cooler off level

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

AUX sensor1 use

- I This parameter is used to set the auxiliary sensor port 1 function.
- I When the parameter is set to "0", this port is not used.
- I When the parameter is set to "1", this port is connected to the oil level sensor to detects the engine fuel oil level.
- I When the parameter is set to "2", this port connected temperature sensor.

AUX sensor1 type

- I used to define the type of the auxiliary sensor 1.
- I When its oil level sensor, the controller built-in below oil level sensor types to choose, such as following the oil level sensor type table:

Code	Type	Remark
0	not use	
1	Low oil level switch 1	Closed (low) is valid
2	Low oil level switch 2	Disconnect (high) is valid
3	configurable 1	
4	configurable 2	

- I When its temperature sensor, the controller built-in a variety of temperature sensor types to choose, refer to the temperature sensor type table.

Low fuel level 1&2

- I When the auxiliary sensor uses parameter is set to "1", this parameter set be effective;
- I controller for the auxiliary oil level sensor provides two levels of low oil level limit monitoring for users to choose for warning, fault shutdown and control. If you choose to 1/2/3 alarm level when protection function triggered, LCD displays "!W:Low fuel level1 " or "!W:Low fuel level2"; if select 4/5/6 alarm levels, when protection function is triggered, LCD displays " !A:Low fuel level1 or " !A:Low fuel level2".

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

Fuel pump ON

- I When the auxiliary sensor 1 uses parameters set to "1", this parameter set be effective.
- I This parameter is used to set is defined as "fuel pump control" relays closed of the fuel level low limit.
- I The controller through oil level sensor detects oil level of engine daily fuel tank, when the oil level is lower than the set value, "pump control" relay closure outputs.

Fuel pump OFF

- I When the auxiliary sensor 1 uses parameters set to "1", this parameter is set to be effective.
- I This parameter is used to set is defined as the high limit of the fuel pump control relays disconnect bit.
- I Daily fuel tank through the oil level sensor detects engine oil level controller, disconnect the output when the oil level is higher than the set value, the pump control relays.

AUX1 low T level 1&2

- I When the auxiliary sensor 1 uses parameters set to "2", this parameter set be effective.
- I Controller to auxiliary 1 temperature sensor provides two levels of the low-temperature limit monitoring for users to choose for warning, fault shutdown and control. If you choose to 1/2/3 alarm level when protection function triggered, LCD displays "!W:AUX1 low T level1" or "!W:AUX1 low T level2"; if select 4/5/6 alarm levels, when protection function is triggered, LCD displays "!A:AUX1 low T level1" or "!A:AUX1 low T level1".

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

AUX1 high T level 1&2

- I When the auxiliary sensor 1 uses parameters set to "2", this parameter set be effective;
- I Controller to auxiliary 1 temperature sensor provides two levels of high-temperature limit monitoring for users to choose for a warning, fault shutdown and control. If you choose to 1/2/3 alarm level when protection function triggered, LCD displays "!W:AUX1 high T level1" or "!W:AUX1 high T level2"; if you choose 4/5/6 alarm level when protection function is triggered, LCD displays !A:AUX1 high T level1" or "!A:AUX1 high T level2".

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

Heater1 on level

- I This parameter is used to set the controller to select the preheat mode 6 is defined as a "warm-up" relay action of the temperature low limit, and set " preheat 1 control" relay action of the temperature low limit.
- I To this parameter effective, the auxiliary sensor 1 type can not be set to " not use" and "switch".

Heater1 off level

- I This parameter is used to set the controller to select the preheat mode 6 is defined as a "warm-up" relay stop action of the temperature high limit, and set " heat 1 control" relay stop action of the temperature high limit.
- I To this parameter is effective, the auxiliary sensor 1 type can not be set to " not use" and "switch".

Cooler1 on level

- I This parameter is used for setting is defined as a "cooling 1 control "relay action of in the temperature high limit.
- I To This parameter is valid, auxiliary temperature sensor types can not be set to " not use" and "switch".

Cooler1 off level

- I This parameter is used to set is defined as a "cooling 1 control" relay to stop the action of temperature low limit.
- I To This parameter is valid, auxiliary temperature sensor types can not be set to " not use" and "switch".

7.5 Discrete IN/OUT

No.	Parameter	Setting 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	D-Input 4 Config		
	Function	0 to 30	4
	Logic	0 Closed /1 Open	0
	Delay	0 to 999s	1s
	Delay by	0 to 3	0
	ALM. class	0 to 6	2
5.5	D-Input 5 Config		
	Function	0 to 30	1
	Logic	0 Closed /1 Open	0
	Delay	0 to 999s	1s
	Delay by	0 to 3	0
	ALM. class	0 to 6	2
5.6	Relay 1 Config		
	Function	0 to 120	2
	Logic	0 N.O /1 N.C	0
5.7	Relay 2 Config		
	Function	0 to 120	1
	Logic	0 N.O /1 N.C	0
5.8	Relay 3 Config		
	Function	0 to 120	0
	Logic	0 N.O /1 N.C	0
5.9	Relay 4 Config		
	Function	0 to 120	0
	Logic	0 N.O /1 N.C	0
5.10	Relay 5 Config		
	Function	0 to 120	0
	Logic	0 N.O /1 N.C	0

5.11	Relay 6 Config		
	Function	0 to 120	0
	Logic	0 N.O /1 N.C	0

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

I used to define the D-input function.

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

**Note:**

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

I definable switch input menu is as follows:

code	Function	Note
0	Not used	
1	User configured	When you select this function, the user can use the the discrete input user-defined menu to configuration this function of discrete.
2	Oil pressure switch	Select this function of discrete input port external one mounted pressure switch which is on the engine, and through this limit action switch to trigger the engine low oil pressure protection. Controller allows the oil pressure switch as low oil pressure protection and with reference to the measurement of pressure sensor as the engine low oil pressure protection exist at the same time. Triggered by low oil pressure alarm level, Users according to the defined function of the alarm level configuration tables to choose.
3	Temp. high switch	Select this function of discrete input port external one mounted temperature switch which is on the engine, and through this limit action switch to trigger the engine high temperature protection. Controller allows the temperature switch as high temperature protection and with reference to the measurement of temperature sensor as the engine high temperature protection exist at the same time. Triggered by high temperature alarm level, Users according to the defined function of the alarm level configuration tables to choose.
4	Emergency stop	Select this function of discrete input port external an emergency stop switch, when this input valid, the controller close all control output, trigger the alarm level "6", the engine shutdown immediate.
5	Remote start off load	This input is active, the generator start-up, power generation does not issue a closing command after normal operation, has been no-load operation until the input signal becomes invalid. This signal is only effective in automatic operation mode. This signal is valid only in the automatic mode of operation.
6	Remote start with load	For GU3320 controllers, this input is active, the generator starting, after normal operation, power generation issue a closing command, and has been maintained until the input signal becomes invalid. For GU3321 controllers, this input is active, the generator start running normal, if the mains normal load, the controller not issue closing command;, if the mains not normal and opening, the controller sends power generation close command. This signal is only effective in automatic operation mode.
7	Mains closed auxiliary	Select this function of discrete input port connected to the MCB auxiliary contacts of mains load switch, for monitoring the status of the closing or opening of the MCB. Only effective GU3321 controller.
8	Generator closed auxiliary	Select this function of discrete input port connected to the GCB auxiliary contacts of mains load switch, for monitoring the status of the closing or opening of the GCB.
9	Low fuel switch	Select this function of discrete input port connected to the fuel tank of the engine oil level switch for monitoring the fuel tank low oil level.
10	Lamp test	Select this function discrete input signal is active, the indicator light on the controller operation panel all illuminate. The function equivalent to the control panel "lamp test" button.

11	Not used	
12	Not used	
13	Air-flap Closed	Select this function of discrete input port connected to the auxiliary contacts on the engine ventilation door, and through the limit actions of switch to determine the ventilation door working conditions.
14	Pre-heat temp. switch	Select this function of discrete input port connected to the temperature switch which is mounted on the engine preheater, and through the limit action of switch to stop preheat relay output. Only for the warm-up mode 4.
15	Critical mode	In critical mode, all the shutdown fault change to warning, that is when the unit in shutdown fault, only alarm not to shutdown. LCD display critical mode.
16	Alarm mute	Select this function discrete input signal is active, the alarm buzzer of controller will stop sound, one is defined as "sound alarm" relay output will be closed. The functionality of input signal is equivalent to the the "anechoic" button on the controller panel.
17	Alarm reset	Select this function discrete input signal is active, the controller shutdown fault lock will unlock.
18	Prohibit return	Select this function discrete input signal is active, Generator for the remote open signal effectively and mains fault while start and load, when mains is restored to normal, the controller will continue to control the generator running and load until the return signal removed , or occurrence of shutdown fault. The LCD displays limited return information. This input is only supply for GU3321 controller.
19	Not used	
20	Panel lock	Select this function discrete input signal is active, you can not modify the operating parameters on the operation panel of the controller, can not select the operating mode of the controller. LCD display panel lock information.
21	Activate AUTO mode	Switch input signal select this function is active, the controller change to auto operation mode, which provides users with a remote button to select auto operation mode. This operating mode selection function is not affected by panel lock.
22	Activate MAN mode	Switch input signal select this function is active, the controller change to manual operation mode, which provides users with a remote button to select manual operation mode. This operating mode selection function is not affected by panel lock.
23	Activate TEST mode	Switch input signal select this function is active, the controller change to test operation mode, which provides users with a remote button to select test operation mode. This operating mode selection function is not affected by panel lock
24	Stop button	Select this function, the discrete input signal function is equivalent to control panel "stop" button, it provides users with a remote stop buttons.
25	Start button	Select this function, the discrete input signal function is equivalent to control panel "start" button, it provides users with a remote start buttons.

Relay * Config

I Use to configure the relay function selection.

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

I Configure relay output function table:

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

16	Maintenance due	Select this function of output relay, the accumulation time of engine reaches the time limit value of maintenance parameter set, it's action, and stopping action in the re-set maintenance time or press the reset button.
17	MCB fail to close	Output relay action, after the mains closing failure occurred. Only supply for GU3321 controller.
18	GCB fail to close	Output relay action, after the generator closing failure occurred.
19	Fail to start	The crank attempts of engine reaches the setting have been not successful ignition, the output relay action.
20	Fail to stop	The engine is still running after the end of the downtime timing set, the output relay action.
21	Mains close/open	The output relay is used to control the mains load switch GCB closing and opening action, when the controller commands mains supply power, its action, and not need the mains supply power, its stop working. Only supply for GU3321 controller.
22	Generator close/open	The output relay is used to control the power generation load switch GCB closing and opening action, when the controller commands power generation supply, its action, and not need the power generation supply, its stop working.
23	Audible alarm	When you need on the basis of the controller built-in alarm buzzer add a warning sound, the output relay action be equal to built-in alarm buzzer.
24	Cooling down	output relay action, in timing of the cooling time.
25	Can data fail	At the end of the safety monitoring time timing has not receive the data from engine ECU, choose this function of the output relay action.
26	Ecu warning	The output relay operation of select this function when receive the warning signal from ECU
27	Ecu alarm	The output relay operation of select this function when receive the fault signal from ECU
28	Charge failure	When charging failure occurs, the output relay action.
29	Battery over volt	when the controller detects that the battery voltage is higher than the set value, its action.
30	Battery under volt	When the controller detects that the battery voltage is lower than the set value, its action.
31	Under speed level1	When the engine speed is lower than the setting of under speed level 1 while delay confirm, its action.
32	Under speed level 2	When the engine speed is lower than the setting of under speed level 2 while delay confirm, its action.
33	Over speed level1	When the engine speed is higher than the setting of overspeed level 1 while delay confirm, its action.
34	Over speed level2	When the engine speed is higher than the setting of over speed level 2 while delay confirm, its action.
35	Oil pressure low level1	When the engine oil pressure lower than the setting of low oil level 1 while delay confirm, its action..
36	Oil pressure low level2	When the engine oil pressure lower than the setting of low oil level 2 while delay confirm, its action..

37	High temperature level1	When the cooling temperature of engine is higher than the setting of high temperature level 1 while delay confirm, its action.
38	High temperature level 2	When the cooling temperature of engine is higher than the setting of high temperature level 2 while delay confirm, its action.
39	Fuel low level1	When the engine fuel level lower than the setting of low oil level 1 while delay confirm, its action.
40	Fuel low level2	When the engine fuel level lower than the setting of low oil level 2 while delay confirm, its action.
41	Generator under volt level1	When the generator voltage is lower than the setting of the power generation of low voltage level 1 while delay confirm, its action.
42	Generator under volt level2	When the generator voltage is lower than the setting of the power generation of low voltage level 2 while delay confirm, its action.
43	Generator over volt level1	When the generator voltage is higher than the setting of power generation of high-voltage level 1 while delay confirm, its action.
44	Generator over volt level2	When the generator voltage is higher than the setting of power generation of high-voltage level 2 while delay confirm, its action.
45	Generator under HZ level1	When the generator frequency is lower than the setting of power generation of low-frequency level 1 while delay confirm, its action.
46	Generator under HZ level2	When the generator frequency is lower than the setting of power generation of low-frequency level 2 while delay confirm, its action.
47	Generator high HZ level1	When the generator frequency is higher than the setting of power generation of high-frequency level 1 while delay confirm, its action.
48	Generator high HZ level2	When the generator frequency is higher than the setting of power generation of high-frequency level 2 while delay confirm, its action.
49	Generator overcurrent level1	When the generator current is higher than the setting of current level 1 while delay confirm, its action.
50	Generator overcurrent level2	When the generator current is higher than the setting of current level 2 while delay confirm, its action.
51	Generator overload level1	When the active load of engine is higher than the setting of power generation overload level 1 while delay confirm, its action.
52	Generator overload level2	When the active load of engine is higher than the setting of power generation overload level 2 while delay confirm, its action.
53	Digital input 1	When the user-defined discrete input 1 is valid, its action
54	Digital input 2	When the user-defined discrete input 2 is valid, its action
55	Digital input 3	When the user-defined discrete input 3 is valid, its action
56	Digital input 4	When the user-defined discrete input 4 is valid, its action
57	Digital input 5	When the user-defined discrete input 5 is valid, its action

58	Not used	
59	Not used	
60	Not used	
61	Oil pressure sensor open	Select this function, the output relays action after the controller detect oil pressure sensor .
62	Loss of pickup signal	When select the speed sensor as the engine speed control signal, in crank command is issued, undetectable speed sensor signal, the function of the output relay action.
63	Scheduled run	Select this function if the output relay is valid in regularly run, its action.
64	Louvre control	Select this function output relay at the beginning of the start time delay, its action, and stop after the engine stops running.This output is connected to the electric shutter of engine cooling air duct, control the blinds open and close.
65	Cooler control	Select this function of output relay, when the cooling temperature of engine is higher than the lower limit of cooling open level value of setting, its action, and keep until the cooling temperature lower than the high limit of the preheat stop level of setting, its stop
66	Cooler1 control	Select this function of output relay, when from auxiliary temperature sensor 1 measuring the temperature is higher than the low limit of cooling 1 open level level value of setting, its action, and keeping until the temperature is lower than the high limit of cooling 1 stop level value of setting, its stop action.
67	Not used	
68	Heater control	Select this function of output relay, when the cooling temperature of engine is below the lower limit of preheat open level value of setting, its action, and keep until the cooling temperature higher than the high limit of the preheat stop level of setting, its stop
69	Heater1 control	Select this function of output relay, when from auxiliary temperature sensor 1 measuring the temperature is lower than the low limit of preheat 1 open level level value of setting, its action, and keeping until the temperature is higher than the high limit of preheat 1 stop level value of setting, its stop action.
70	Not used	
71	GCB open	This output relay is connected to the shut excitation coil of generate power load switch MCB, when controller command of generate power to outage, stopped working after the switch opening.
72	MCB open	This output relay is connected to the shut excitation coil of mains load switch MCB, when controller command of mains to outage, stopped working after the switch opening.
73	Mains under volt alarm	When the mains voltage is lower than the set value while trigger fault, its actions
74	Mains over volt alarm	When the mains voltage is higher than the set value while trigger fault, its actions

75	Mains under HZ alarm	When the mains frequency is lower than the set value while trigger fault, its actions
76	Mains high HZ alarm	When the mains frequency is higher than the set value while trigger fault, its actions
77	Mains alarm	When mains low frequency, high frequency, low voltage and high voltage, any more than the set limit while trigger fault, its actions.
78	Mains overload	When the controller occurs overload mains failure, its actions.
79	Mains overcurrent	When the controller occurs mains overcurrent fault action.
80	Soft unload	When soft unloading time start timing action, stop action at the end of timing
81	off load	Action when the GEN and Mains not closing.

7.6 DEFINE SENSORS

No.	Parameter	Preset	Setting 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:**

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

PRES. Sensor 2:

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

TEMP. Sensor 1:

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

TEMP. Sensor 2:

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

Fuel Level Sensor:

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

**NOTE:**

I “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.	Parameter	Setting range	Preset
7.0	Quit		
7.1	M V-monitor type	0 ph-ph /1 ph-n	1
7.2	M V low alarm	20 to 200% / Not used	90%
7.3	M V low Return	20 to 200% / Not used	95%
7.4	M V High alarm	20 to 200% / Not used	115%
7.5	M V High Return	20 to 200% / Not used	110%
7.6	M Hz low alarm	10.0 to 100.0Hz / Not used	45.0Hz
7.7	M Hz low Return	10.0 to 100.0Hz / Not used	48.5Hz
7.8	M Hz High ALM	10.0 to 100.0Hz / Not used	57.0Hz
7.9	M Hz High Return	10.0 to 100.0Hz / Not used	52.0Hz
7.10	M alarm delay	0 to 9999s	5s
7.11	M on delay	0 to 9999s	5s
7.12	Transfer time	0 to 600s	5s
7.13	MCB close		
	Function	0 N /1 Y	1
	Delay	0 to 999s	5s
	ALM. class	0 to 6	2
7.14	MCB open		
	Function	0 N /1 Y	0
	Delay	0 to 999s	5s
	ALM. class	0 to 6	2
7.15	Current type	0 GEN./1LOAD	0
7.16	Prohibit return	0 N /1 Y	0

**Note:**

I All of the above parameters is only supply for GU3321.

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

- I used to select the controller based on phase - phase voltage or phase - zero voltage as mains voltage monitoring object.
- I In different voltage input type, select "phase - phase" or "phase - zero", voltage monitoring, as following table:

Voltage type \ pam	Ph-Ph	Ph-N
"Y" 3P4W	$V_{L1-L2}, V_{L2-L3}, V_{L3-L1}$	$V_{L1-N}, V_{L2-N}, V_{L3-N}$
" Δ " 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

- I Used to configure Mains low voltage alarm value, the Mains-V high Alarm is inactive when parameter configured as "not used".
- I Expressed by percentage, use "Rated ph-voltage" as the base.
- I controller will measure phase - zero voltage or phase - phase voltage and compared with the set value. When measuring the voltage value is lower than " rated voltage value "*" mains voltage fault value, and has not been higher than "rated voltage value "*" mains voltage return value, duration greater than "mains failure confirm time", that is mains low voltage alarm value;

M V low Return

- I Used to define the Mains low voltage fault recovery value.
- I Expressed by percentage, use "Rated ph-voltage" as the base.
- I controller will measure phase - zero voltage or phase - phase voltage and compared with the set value. When the voltage value of measure is higher than " rated voltage value "*" mains voltage return value, the mains voltage failure to confirm time timing reset, the mains is restored to normal.

M V High alarm

- I Used to configure Mains high voltage alarm value, the Mains-V high Alarm is inactive when parameter configured as "not used".
- I Expressed by percentage, use "Rated ph-voltage" as the base.
- I controller will measure phase - zero voltage or phase - phase voltage and compared with the set value. When measuring the voltage value is higher than " rated voltage value "*" mains voltage fault value, and has not been lower than "rated voltage value "*" mains voltage return value, duration greater than "mains failure confirm time", that is mains high voltage alarm value;

M V High Return

- I Used to define the Mains high voltage fault recovery value.
- I Expressed by percentage, use "Rated ph-voltage" as the base.
- I controller will measure phase - zero voltage or phase - phase voltage and compared with the set value. When the voltage value of measure is lower than " rated voltage value "*" mains voltage return value, the mains voltage failure to confirm time timing reset, the mains is restored to normal.

M HZ low alarm

- I Used to configure Mains low frequency fault value, the Mains-Hz low Alarm is inactive when parameter configured as “not used”.
- I The measure frequency of the controller will compared with the set value, when voltage frequency value of measure is lower than the set value, and always not over than "low frequency of mains return value ", and the duration greater than "mains fault confiem time", that is mains low frequency fault.
- I The parameter setting is compatible with 400 Hz intermediate frequency system, 50/60Hz system reference range for setting.

M Hz low Return

- I Used to define the low frequency of mains fault recovery value.
- I When measuring mains frequency is higher than "mains low frequency return value ", mains low frequency failure to confirm time timing reset, the mains is restored to normal. The parameter setting is compatible with 400 Hz intermediate frequency system, 50/60Hz system reference range for setting.

M Hz High ALM

- I Used to configure Mains high frequency fault value, the Mains-Hz high Alarm is inactive when parameter configured as “not used”.
- I The measure frequency of the controller will compared with the set value, when voltage frequency value of measure is higher than the set value, and always not under than" high frequency of mains return value ", and the duration greater than "mains fault confiem time", that is mains high frequency fault.
- I The parameter setting is compatible with 400 Hz intermediate frequency system, 50/60Hz system reference range for setting.

M Hz High Return

- I Used to define the high frequency of mains fault recovery value.
- I When measuring mains frequencies below " high frequency of mains return value", so that the mains low frequencies failure to confirm time timing reset, the mains is restored to normal. And the parameter setting is compatible with 400 Hz intermediate frequency system, 50/60Hz system reference range for setting.

M alarm delay

- I Used to define the confirmation of mains failure time.

**Note:**

- I When the mains voltage is lower than 10% of the rated voltage, mains failure is confirm immediatly, and not need the time to confirm mains failure.

M on delay

- I used to define the delay time from the mains voltage to mains closing relay closure outputs.

Transfer time

- I Achieve delay some time to transition to the mains side after the mains was recover and GEN opening.

MCB close

- I The controller can monitoring the load switch closing of power generation, for users to choose warning fault shutdown and control. If you choose to 1/2/3 alarm level when protection function triggered, LCD displays "!W:MCB closing"; If you choose to 4/5/6 alarm level when protection function triggered, LCD displays"!A:MCB closing".

Function	Select "1", the monitoring function is active; Select "0", the monitoring function is invalid.
Delay	When the controller sends mains closing command, the delay timer starts timing, in time out, the mains load switch has not closing or in the state of keep mains closing command, switch is opened, the define operation of alarm levels are triggered.
Alarm levels	Used to define the protection is triggered, and what is the controller will do. Details refer to the alarm level configuration table.

MCB open

- I controller can monitoring the load switch tripping of power generation, for users to choose warning fault shutdown and control. If you choose to 1/2/3 alarm level when protection function triggered LCD display "!W:MCB open "; If you choose to 4/5/6 alarm level when protection function triggered, LCD displays " !A:MCB open".

Function	Select "1", the monitoring function is active; Select "0", the monitoring function is invalid.
Delay	When the controller sends mains OPEN command, the delay timer starts timing, in time out, the mains load switch has not tripping or in the state of mains not closing command, switch is closed, the define operation of alarm levels are triggered.
Alarm levels	Used to define the protection is triggered, and what is the controller will do. Details refer to the alarm level configuration table.



Note:

Make the mains closing and opening monitoring functions effectively, it is necessary to satisfy follow condition at the same time:

- I One of relay is defined as "mains closing / opening";
- I One of D-input is defined as "mains closed auxiliary contacts"..

Current type

- I The CT can be mounted on the generator output terminal or the load terminal of transfer switch, this menu for two types of selection.

Prohibit return

- I When the configure value is "0", the controller is in the automatic mode of operation, after mains failure, the generator start running and power supply. When the mains is restored normal, the mains switch closing timer starts timing, when it time out, the power generation opening, Mains closing supply power, and the generator cooling shutdown, in standby.
- I When the set value is "1" , the controller is in the automatic mode of operation, when the mains failure, the generator start running and power supply. When the mains is restored to normal, the generator still keep start running and power supply, the LCD displays: "limit return". Until the following happens:
 - Ø Change "automatic" to "manual" mode, through manually closing make the mains power supply, then change "manual" to "automatic" mode, you can restore the mains supply power state in the automatic mode.
 - Ø power generation supply power, fault shutdown occurs, if the mains is normal, then the mains opening, Mains closing supply power.

7.8 CALIBRATION

No.	Parameter	Setting range	Preset
8.1	GEN. V1 offset	-9.9% to 9.9%	
8.2	GEN. V2 offset	-9.9% to 9.9%	
8.3	GEN. V3 offset	-9.9% to 9.9%	
8.4	Current I1 offset	-9.9% to 9.9%	
8.5	Current I2 offset	-9.9% to 9.9%	
8.6	Current I3 offset	-9.9% to 9.9%	
8.7	MAINS V1 offset	-9.9% to 9.9%	
8.8	MAINS V2 offset	-9.9% to 9.9%	
8.9	MAINS V3 offset	-9.9% to 9.9%	
8.10	Pressure offset	-9.9% to 9.9%	
8.11	Temperature offset	-9.9% to 9.9%	
8.12	Batt. V offset	-9.9% to 9.9%	
8.13	AUX. sensor offset	-9.9% to 9.9%	

Menu descriptions:**GEN. V1 offset**

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

GEN. V2 offset

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

GEN. V3 offset

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

Current I1 offset

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

Current I2 offset

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

Current I3 offset

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

MAINS V1 offset

- I Used to modify the measured value display of Mains Phase 1 voltage.
- I Reference to the Rated ph-voltage.

MAINS V2 offset

- I Used to modify the measured value display of Mains Phase 2 voltage.
- I Reference to the Rated ph-voltage.

MAINS V3 offset

- I Used to modify the measured value display of Mains Phase 3 voltage.
- I Reference to the Rated ph-voltage.

Pressure offset

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

Temperature offset

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

Bat. V offset

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

AUX. sensor1 offset

- I Used to modify the measured value display of auxiliary sensor .

8 Installation Guide

8.1 The cutout dimensional drawing installed on panel as follow:



Cutout dimension: 173mm (W) x 125mm (H). Dashed box dimensions for the controller.

The controller is fixed by 6 special fittings.



NOTE:

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

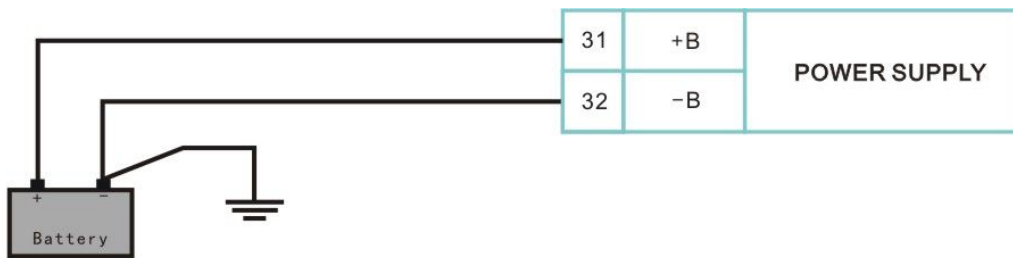
8.2 Wiring

Please refer to the above Typical Wiring Diagram for connection.

8.2.1 Power supply:

Power specification:

DC voltage range	8-35Vdc
Max. operating current	@12V 300 mA, @24V 150mA
Cranking dropouts	0V for 80ms, assuming dc supply was at least 10V before dropout and recovers to 6V, controller can be normally operated dispenses with additional aux. power.



NOTE:

- I A switch or fuse for over current protection between power supply and controller must be mounted, the recommended capacity is 1A.
- I 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 over current protection.

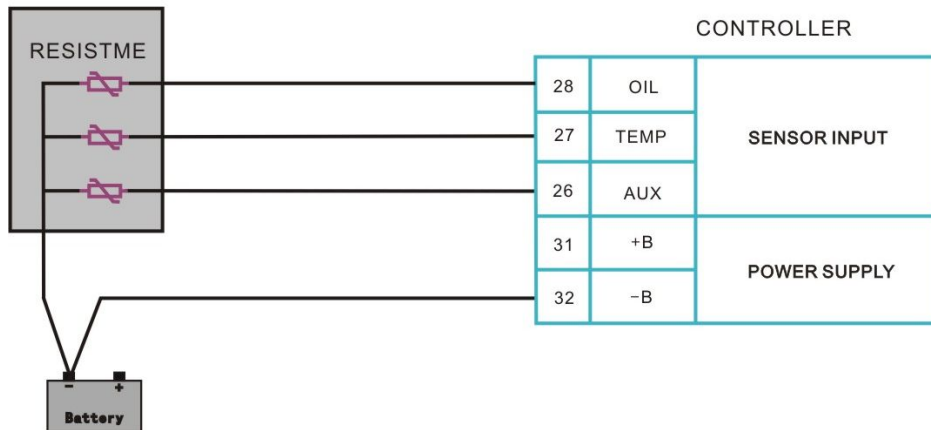



CAUTION

WARNING:

- I 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 LOP sensor, HET sensor, and Auxiliary sensor:



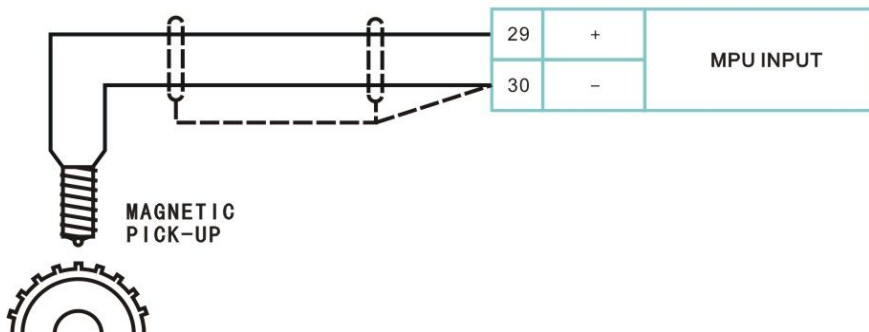



WARNING

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 2.5mm².
- 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.

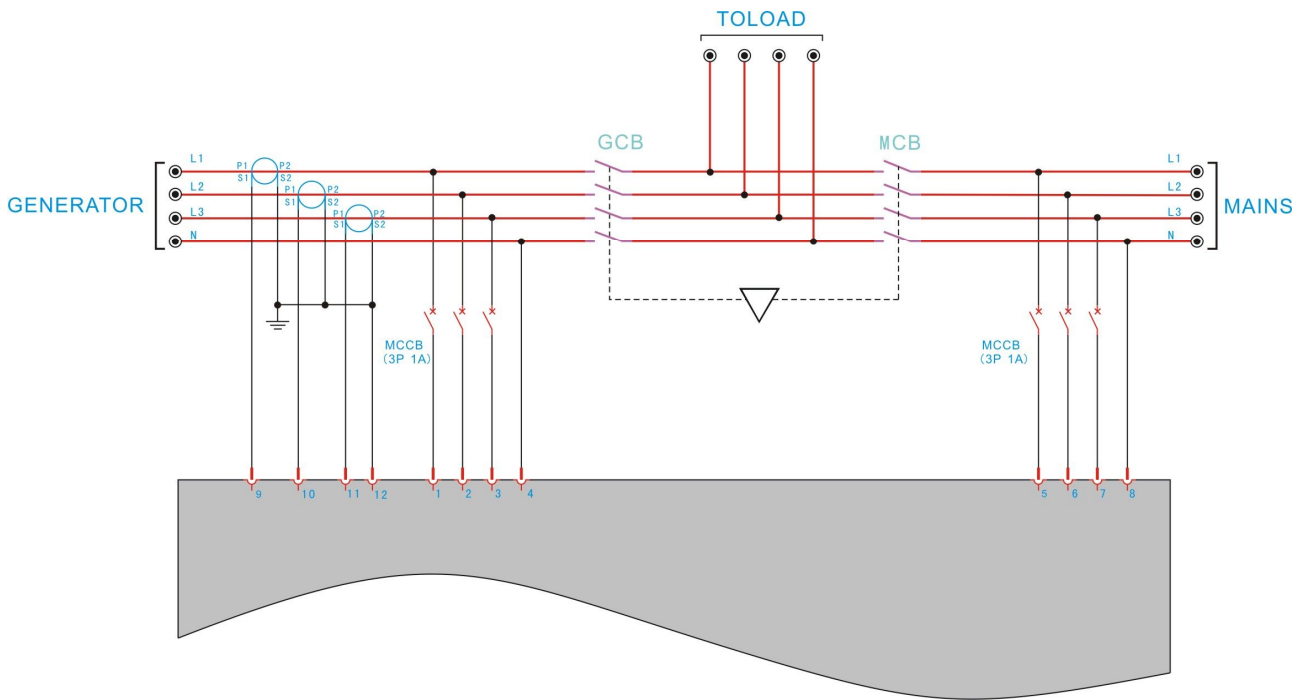


WARNING

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**

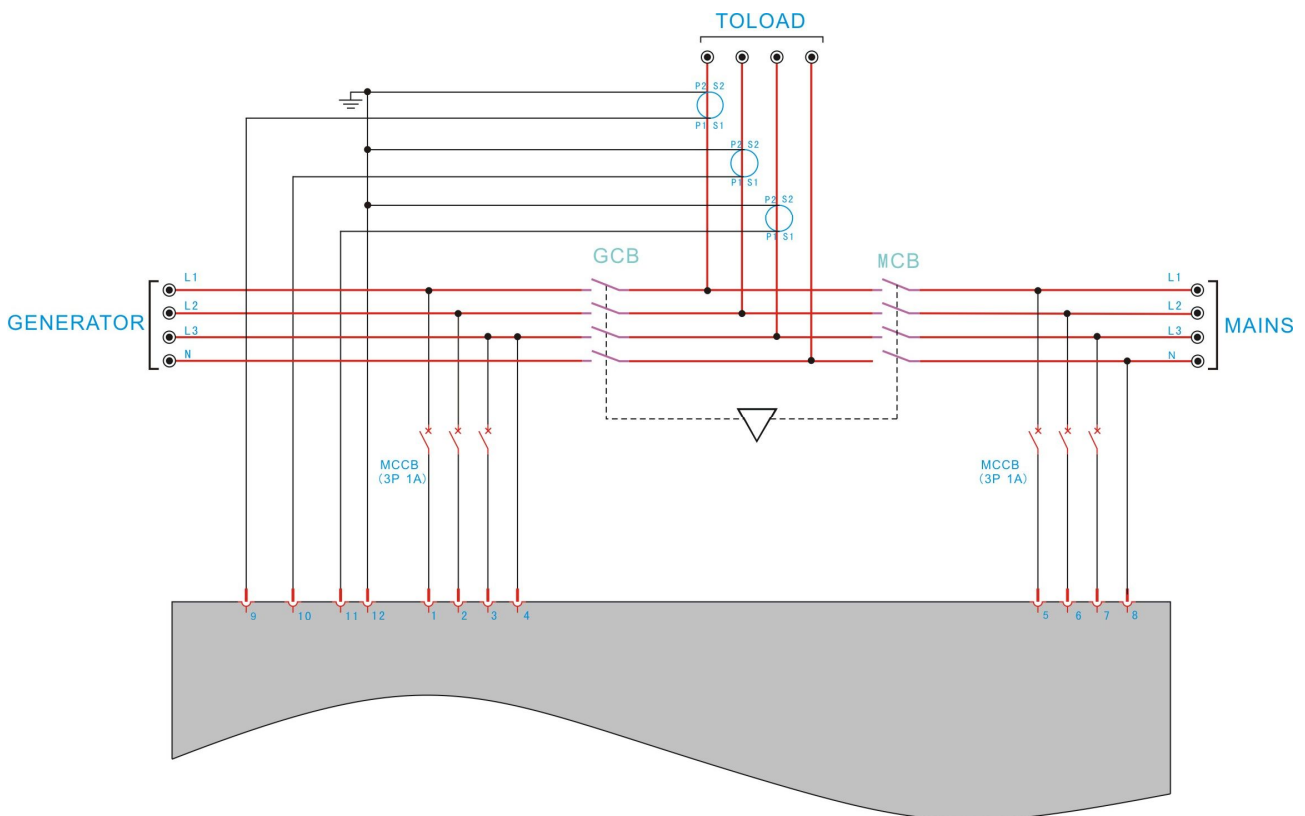


Measure and Display Data	
“Y”3P4W(3 phases 4 wires star)	“Δ”3P4W(3 phases 4 wires angle)
Mains 3 phases V_{Ph-N} L1-N L2-N L3-N Mains 3 phases V_{Ph-P} L1-L2 L2-L3 L3-L1 Mains frequency Hz (L1) Gen 3 phases V_{Ph-N} L1-N L2-N L3-N Gen 3 phases V_{Ph-Ph} L1-L2 L2-L3 L3-L1 Gen frequency Hz (L1) Gen 3 phases current I1 I2 I3 Gen 3 phases apparent power AL1 AL2 AL3 $\sum A$ Gen 3 phases active power PL1 PL2 PL3 $\sum P$ Gen 3 phases reactive power QL1 QL2 QL3 $\sum Q$ Gen 3 phases power factor PFL1 PFL2 PFL3 PF	Mains 3 phases V_{Ph-N} L1-N L2-N L3-N Mains 3 phases V_{Ph-P} 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 $\sum A$ Gen active power $\sum P$ Gen reactive power $\sum Q$ Gen power factor PF

Note:

- | The ports # 5, # 6, # 7, # 8, # and the MCB only supply for GU3321.
- | he electrical measuring display the data only supply forGU3321.

3P4W (3 phases 4 wires), CT measure at Load side



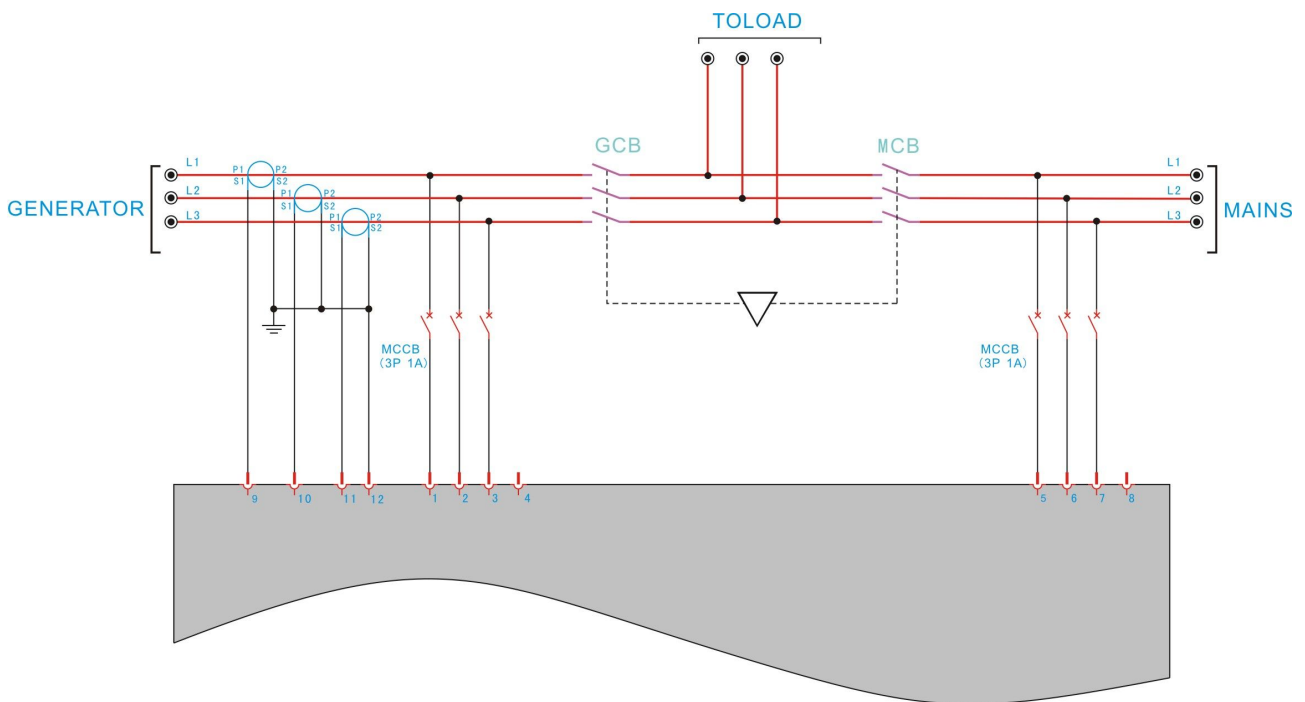
Measure and Display Data	
“Y” 3P4W (3 phases 4 wires star)	“△”3P4W(3 phases 4 wires angle)
Mains 3 phases V_{Ph-N} L1-N L2-N L3-N	Mains 3 phases V_{Ph-N} L1-N L2-N L3-N
Mains 3 phases V_{Ph-Ph} L1-L2 L2-L3 L3-L1	Mains 3 phases V_{Ph-Ph} L1-L2 L2-L3 L3-L1
Mains frequency Hz (L1)	Mains frequency Hz (L1)
Gen 3 phases V_{Ph-N} L1-N L2-N L3-N	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 3 phases V_{Ph-Ph} L1-L2 L2-L3 L3-L1
Gen frequency Hz (L1)	Gen frequency Hz (L1)
Load 3 phases current I1 I2 I3	Load 3 phases current I1 I2 I3
Load 3 phases apparent power AL1 AL2 AL3 ΣA	Load 3 phases apparent power ΣA
Load 3 phases power PL1 PL2 PL3 ΣP	Load 3 phases power ΣP
Load 3 phases reactive power QL1 QL2 QL3 ΣQ	Load 3 phases reactive power ΣQ
Load 3 phases power factor PFL1 PFL2 PFL3	Load 3 phases power factor PF




Note:

I The connection method supply for GU3321.

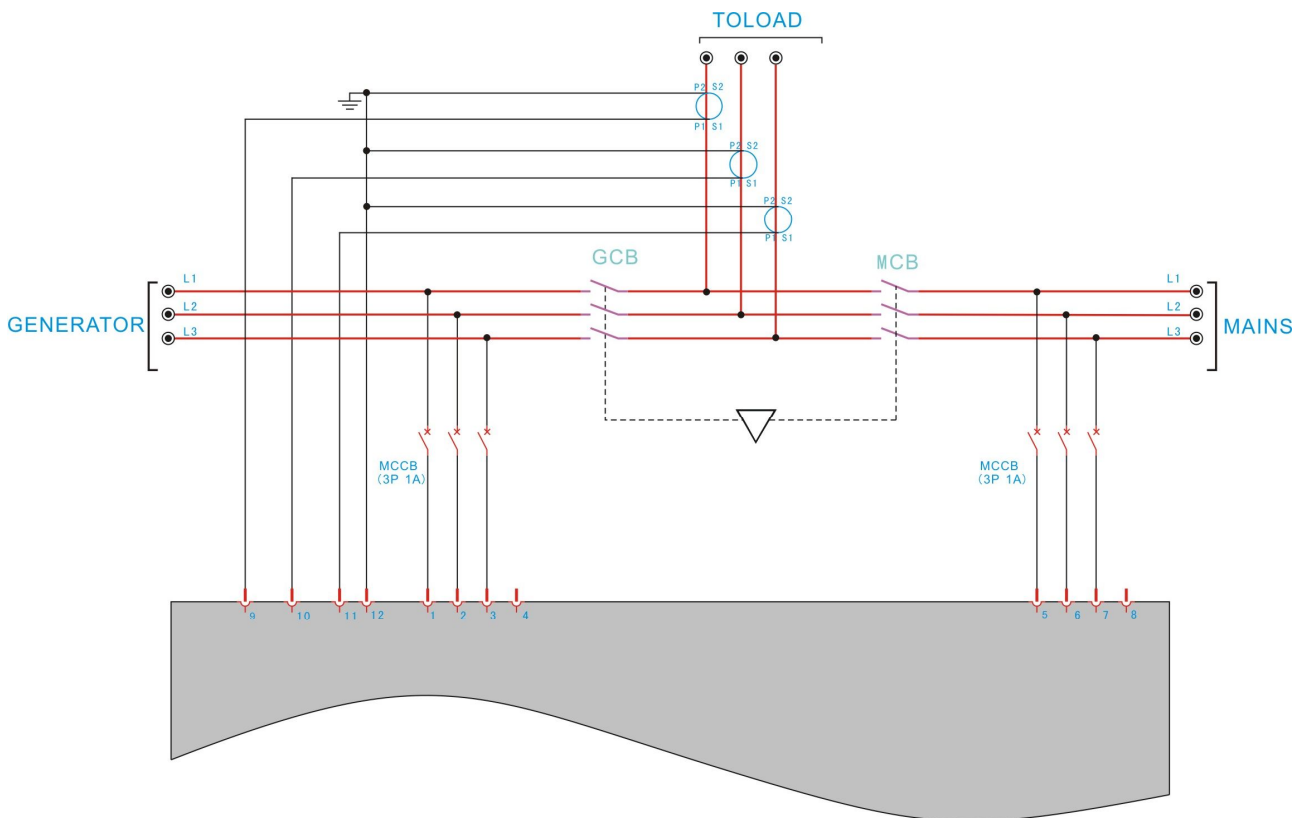
3P3W (3 phases 3 wires), CT measure at Gen side




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 3 phases apparent power ΣA	
Gen active power ΣP	
Gen reactive power ΣQ	
Gen power factor PF	

	<p>Note:</p> <ul style="list-style-type: none"> The ports # 5, # 6, # 7, # 8, # and the MCB only supply for GU3321. The electrical measuring display the data only supply for GU3321.
---	--

3P3W (3 phases 3 wires), CT measure at Load side

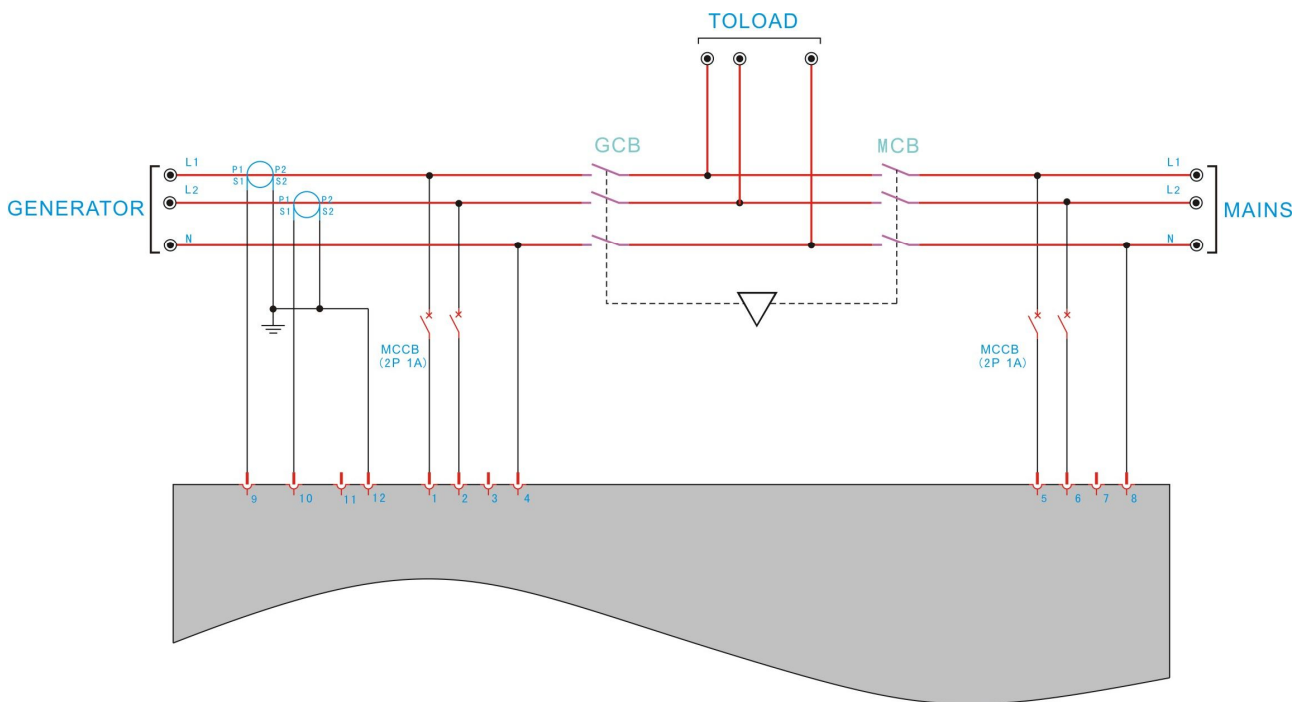


Measure and Display Data	
Mains 3 phases	V_{Ph-Ph} L1-L2 L2-L3 L3-L1
Mains frequency	Hz (L1)
Gen 3 phases	V_{Ph-Ph} L1-L2 L2-L3 L3-L1
Gen frequency	Hz (L1)
Load 3 phases current	I1 I2 I3
Load apparent power	ΣA
Load active power	ΣP
Load reactive power	ΣQ
Load power factor	PF




Note:
I The connection method only supply for GU3321.

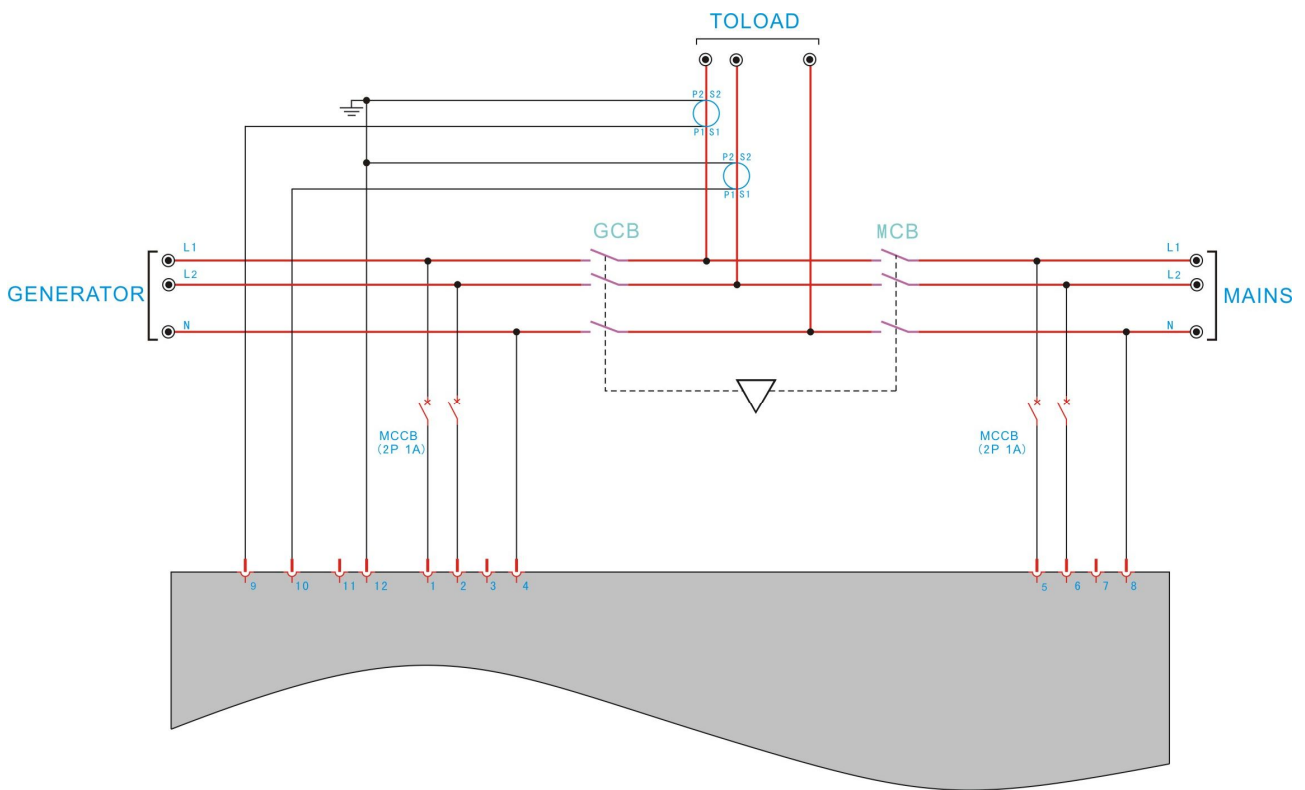
2P3W (2phase 3 wires), CT measure at Gen side




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)
Load	phases current I1 I2
Load	phases apparent power AL1 AL2 ΣA
Load	phases power PL1 PL2 PL3 ΣP
Load	phases reactive power QL1 QL2 ΣQ
Load	phases power factor PFL1 PFL2 PF

	<p>Note:</p> <ul style="list-style-type: none"> The ports # 5, # 6, # 7, # 8, # and the the MCB only supply for GU3321. The Mains measuring display data only supply for GU3321.
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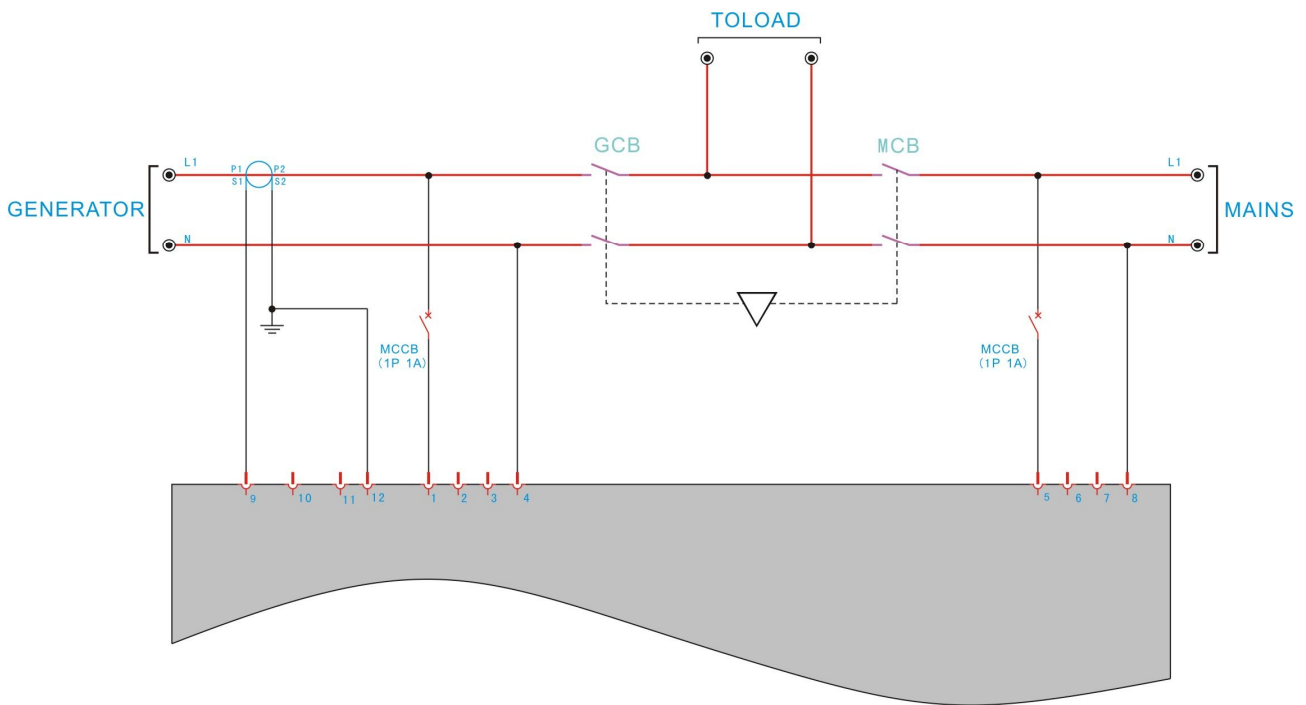
2P3W(2 phase 3 wires), CT measure at Load side




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)
Load current	I1 I2
Load phase apparent power	AL1 AL2 ΣA
Load phase active power	PL1 PL2 ΣP
Load phase reactive power	QL1 QL2 ΣQ
Load power factor	PFL1 PFL2 PF

	<p>Note: I The connection method only supply for GU3321.</p>
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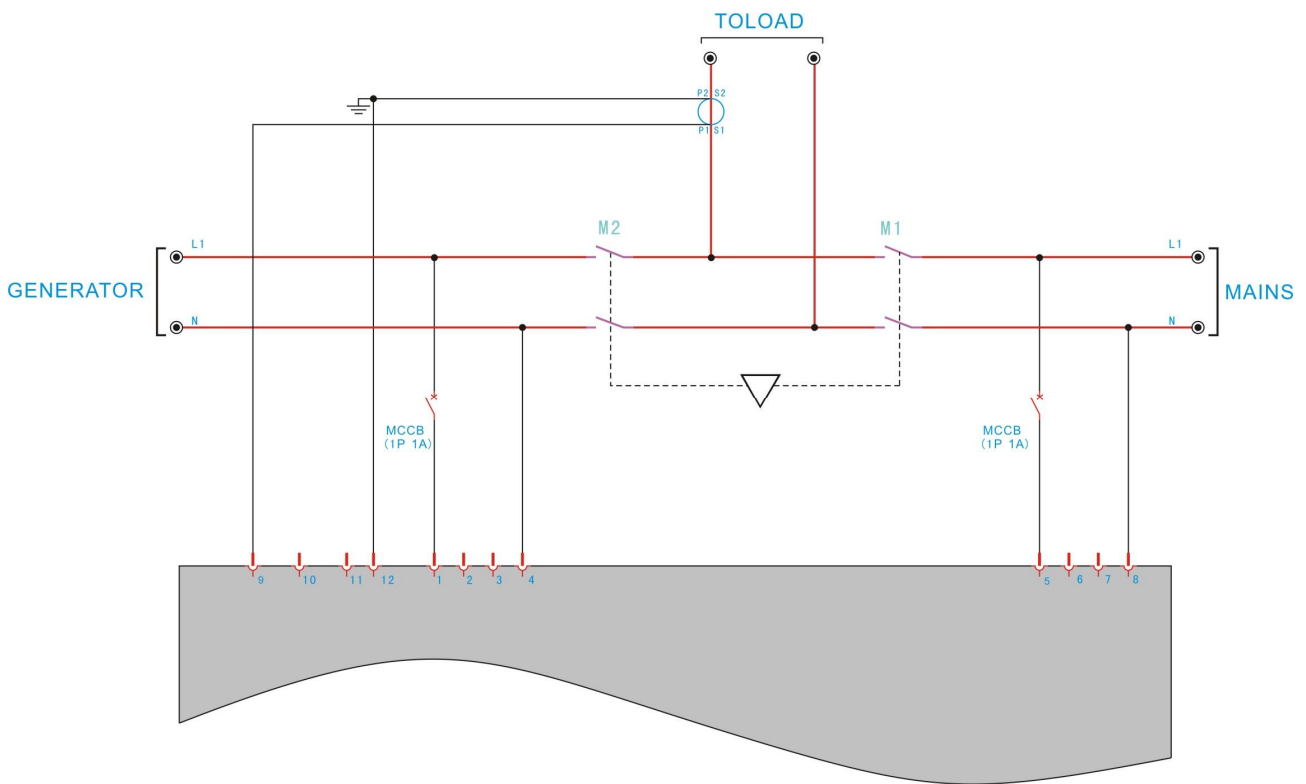
1P2W (single phase 2 wires), CT measure at Gen side




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 apparent power AL1 ΣA
Gen phase power PL1 ΣP
Gen phase reactive power QL1 ΣQ
Gen power factor PFL1 PF

	<p>Note:</p> <ul style="list-style-type: none"> I The ports # 5, # 6, # 7, # 8, # and the the MCB only supply for GU3321. I The Mains measuring display data only supply for GU3321.
---	---

1P2W (single phase 2 wires), 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)
Load current I1
Load phase apparent power AL1 ΣA
Load phase power PL1 ΣP
Load phase reactive power QL1 ΣQ
Load power factor PFL1 PF

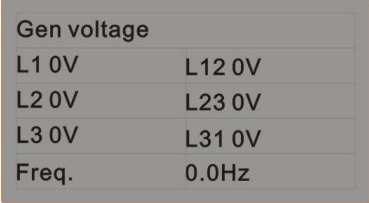
	<p>Note: I The connection method only supply for GU3321.</p>
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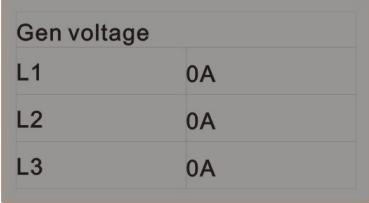
9 LCD displays and Menu System

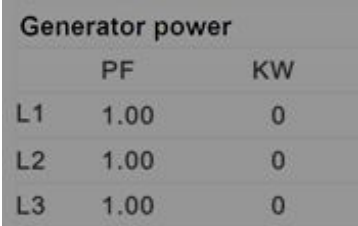
9.1 LCD displays measuring parameters:


Use a back-light 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.

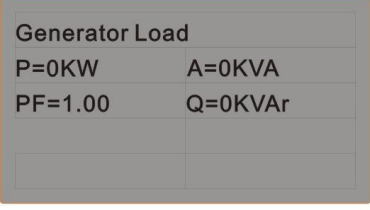
Frist page	Description
	<ul style="list-style-type: none"> U: In addition to the "phase two-wire" shows the phase voltages are line voltage I: power generation phase current average P: total active power generation load F: generation frequency SP: engine speed Bat: battery voltage OP: engine oil pressure, do not use pressure sensors, this project is not displayed. Temp: engine coolant temperature when the temperature sensor is not used, this project does not appear.


Second page	Description
	<ul style="list-style-type: none"> This page shows the generator phase voltage, line voltage and frequency.

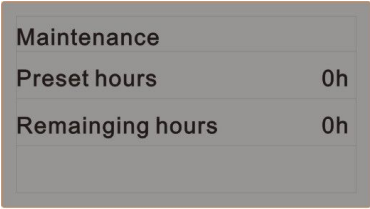
Third page	Description
	<ul style="list-style-type: none"> This page shows the current of each phase of the generator. Power generation in the power supply only display this page.

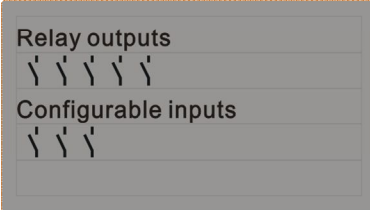
Four page	Description
	<ul style="list-style-type: none"> This page shows each phase of the generator active power and power factor. Active Power unit: "KW" and "MW", the controller automatically adjusted according to the actual measurement display units. power generation in this page is displayed only when the power supply.

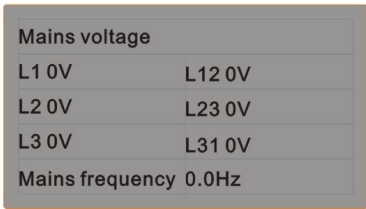
Five page	Description												
 <p>Generator power</p> <table border="1"> <thead> <tr> <th></th> <th>KVA</th> <th>KVAr</th> </tr> </thead> <tbody> <tr> <td>L1</td> <td>0</td> <td>0</td> </tr> <tr> <td>L2</td> <td>0</td> <td>0</td> </tr> <tr> <td>L3</td> <td>0</td> <td>0</td> </tr> </tbody> </table>		KVA	KVAr	L1	0	0	L2	0	0	L3	0	0	<ul style="list-style-type: none"> This page shows each phase of the generator apparent power and reactive power. apparent power unit: "KVA" and "MVA unit of reactive power:" KVAr "and" MVar "controller automatically adjusts the display unit based on the actual measurement. power generation in this page is displayed only when the power supply.
	KVA	KVAr											
L1	0	0											
L2	0	0											
L3	0	0											

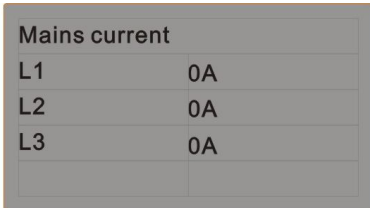
Six page	Description								
 <p>Generator Load</p> <table border="1"> <tbody> <tr> <td>P=0KW</td> <td>A=0KVA</td> </tr> <tr> <td>PF=1.00</td> <td>Q=0KVAr</td> </tr> <tr> <td></td> <td></td> </tr> <tr> <td></td> <td></td> </tr> </tbody> </table>	P=0KW	A=0KVA	PF=1.00	Q=0KVAr					<ul style="list-style-type: none"> this page shows the generator active power, reactive power, total apparent power of each phase the average power factor, active power and reactive power degree. Active Power unit: "KW" and "MW unit reactive power the:" KVAr "and" MVar apparent power unit: "KVA" and "MVA controller automatically adjusts the display based on the actual measurement units.
P=0KW	A=0KVA								
PF=1.00	Q=0KVAr								


Seven page	Description								
 <p>Engine</p> <table border="1"> <tbody> <tr> <td>Fuel level</td> <td>00%</td> </tr> <tr> <td>Running time</td> <td>0h</td> </tr> <tr> <td>Strart times</td> <td>00</td> </tr> <tr> <td></td> <td></td> </tr> </tbody> </table>	Fuel level	00%	Running time	0h	Strart times	00			<ul style="list-style-type: none"> This page shows the auxiliary sensor (oil level) and the auxiliary sensor 2 (temperature) of the measured values. accumulated running time of the engine. The engine cumulative number of crank
Fuel level	00%								
Running time	0h								
Strart times	00								

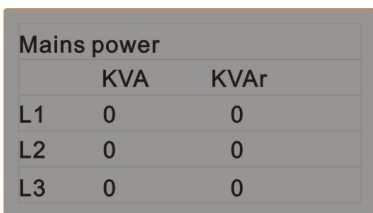
Eight page	Description						
 <p>Maintenance</p> <table border="1"> <tbody> <tr> <td>Preset hours</td> <td>0h</td> </tr> <tr> <td>Remainging hours</td> <td>0h</td> </tr> <tr> <td></td> <td></td> </tr> </tbody> </table>	Preset hours	0h	Remainging hours	0h			<ul style="list-style-type: none"> This page shows the to maintain preset time and remaining hours. When the maintenance monitoring function is set to "No", this page is not displayed.
Preset hours	0h						
Remainging hours	0h						

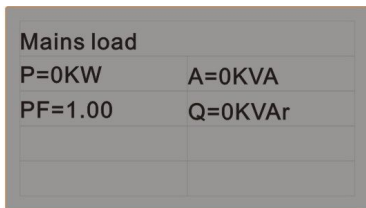
Nine page	Description
 <p>Relay outputs</p> <p>Configurable inputs</p>	<ul style="list-style-type: none"> This page shows the controller switch input and relay output status.

Ten page	Description
	<ul style="list-style-type: none"> This page shows each phase of the mains voltage, line voltage and frequency. display only in GU3321.










Eleven page	Description
	<ul style="list-style-type: none"> This page shows the phase current of the mains. Only GU3321 on the the parameters current input type is set to "load" when mains powered, this page will be displayed.

Twelfth page	Description
	<ul style="list-style-type: none"> This page shows the utility of each phase active power and power factor. Active Power unit: "KW" and "MW", the controller automatically adjusted according to the actual measurement display units. Only GU3321 on the the parameters current input type is set to "load" when mains powered, this page will be displayed.











Thirteen page	Description
	<ul style="list-style-type: none"> This page shows the utility of each phase apparent power and reactive power. apparent power unit: "KVA" and "MVA unit of reactive power:" KVAr "and" MVAr "controller automatically adjusts the display unit based on the actual measurement. Only GU3321 on the the parameters current input type is set to "load" when mains powered, this page will be displayed.

Fourteen page	Description
	<ul style="list-style-type: none"> This page shows the mains active power, reactive power, total apparent power of each phase the average power factor, active power and reactive power degree. Active Power unit: "KW" and "MW unit reactive power the:" KVAr "and" MVAr apparent power unit: "KVA" and "MVA controller automatically adjusts the display based on the actual measurement units.


9.2 Setting running parameter



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, press “” can return to upper menu, go to menu 1.17 “password” to enter password first, or select the required item, press “” enter into modify mode, press “+” or “-”, the LCD displays  when prompted to 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, then you can modify parameters. Otherwise it will prompt to key in password again. Press and hold “” for more than 2sec or press “” 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 once, then press “+” six times, press “  ” button once, then LCD displays:	[CT ratio]
Press “  ” button once	[CT ratio] 1000: 5
Press “+” or “-” button, prompted enter password (2213), press “  ” button to confirm after entering password.	[CT ratio] Password: 
Press “+” or “-” to change parameters, change at 500, then LCD displays:	[CT ratio] 500: 5
Press “  ” to confirm, then press “  ” to return, then LCD displays:	[SETTING] 0. QUIT 1. SYSTEM 2. GENERATOR 3. ENGINE
Press “  ” again or press and hold “  ” 2sec will quit parameter settings menu, then LCD displays:	Ready

FOR EXAMPLE: (SETTING CONTROLLER CRANK ATTEMPT AT 2)

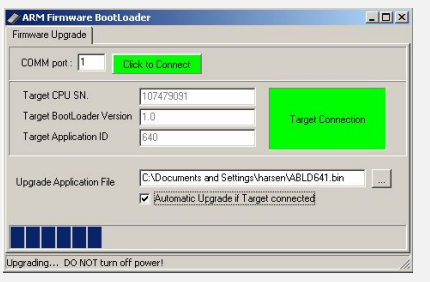
Operation	Description
Press and hold “  ” 2sec, enter into parameters settings menu, then LCD displays:	[SETTING] 0. QUIT 1. SYSTEM 2. GENERATOR 3. ENGINE

<p>Press “+” 2 times and then press “√”, then LCD displays:</p>	<p>[ENGINE] 0. QUIT 1.ENGINE TYPE 2.ECU TYPE 3.ENGINE RUN SPEED</p>
<p>Press “+” 9 times and then press “√”, then LCD displays:</p>	<p>[Crank attempt] 3</p>
<p>Press “+”or“-” button, prompted enter password: 2213, press “→”button to modify the parameter, press “√”to confirm after entering password..</p>	<p>[Crank attempt] Password:0000</p>
<p>Press “+” or “-” to change parameters, change at 2.</p>	<p>[Crank attempt] 2</p>
<p>Press “√” button to confirm, and then press “” or press and hold “” 2sec will quit parameter settings menu.</p>	<p>Ready</p>

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

Operation	Description
Press and hold “▶” 2sec, enter into parameters settings menu, then LCD displays:	<p>[[SETTING]</p> <p>0. QUIT</p> <p>1. SYSTEM</p> <p>2. GENERATOR</p> <p>3. ENGINE</p>
Press “√” button and then press “-”2 times, then LCD displays:	<p>[SYSTEM]</p> <p>18. CB closed pulse</p> <p>19. Reset to Man</p> <p>20. Default settings</p>
Press “+”or“-” button, prompted enter password: 2213, press “→”button to modify the parameter, press “√”to confirm after entering password..	<p>[Default settings]</p> <p>Password:0000</p>
Press “√” button to confirm, and then press “⬆” or press and hold “▶” 2sec will quit parameter settings menu.	<p>[SYSTEM]</p> <p>DONE</p>

Example: (CONFIGURE CONTROLLER AS ONLINE PROGRAM MODE)

Operation	Description
<p>Disconnect the controller’s supply power and connect the controller to the computer by the communication line correctly. And then open the programming software “ABLDs.exe” in the computer. As the picture on the right, open the serial port and import upgrade procedure. Resume the power and then the procedure will upgrade automatically.</p> <p>If the operation failure, you can disconnect the power and try again.</p>	 <p>The screenshot shows the 'ARM Firmware BootLoader' window. It includes fields for 'CDMM port', 'Target CPU SN' (107479091), 'Target BootLoader Version' (1.0), and 'Target Application ID' (640). There is a 'Click to Connect' button and a 'Target Connection' indicator. The 'Upgrade Application File' is set to 'C:\Documents and Settings\Harsen\ABLD641.bin'. A checkbox for 'Automatic Upgrade if Target connected' is checked. A progress bar and the text 'Upgrading... DO NOT turn off power!' are visible at the bottom.</p>

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 600KV

10.2 AC voltage frequency:

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

10.3 Current (isolated):

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

10.4 Power supply: :

Voltage range	12V/24V (8-35V continuous)
Max. operating current	@12V 400mA, @24V 200mA
Max. standby current	@12V 150mA, @24V 75mA
Cranking drop outs	0V for 80ms, assuming dc supply was at least 10V before dropout and recovers to 6V
Accuracy	1%
Display	0 to 40V

10.5 Digital inputs:

Number	5
Max. contact resistance	10K Ω
Max. contact current per line	1mA

10.6 Relay outputs

relay	16A/30Vdc, 2pcs
relay	3A/30Vdc, 4pcs

10.7 Charge failure input:

Voltage range	0 to 35Vdc
Accuracy	1%
Max output current	@12V 200mA , @24V 400mA

10.8 Analog Inputs

Number	3
Sensor type	resistance
Resolution	10 bits
Range	0 to 1K Ω
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°C IEC60068-2-1 and IEC60068-2-2
Storage ambient temperature Standards	-30 to 80°C IEC60068-2-1 and IEC60068-2-2
Humidity Standards	60°C, 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
