

Harsen®




Manual

GU3303/GU3304 Genset Controller



HM1081CR1

Clarification of notation in this manual:

 WARNING	WARNING: A WARNING indicates a potentially hazardous situation which, if not avoided, could result in death, serious personal
 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:**

Read this entire manual pertaining to work to be performed before installing, operating, or serving 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 shut down device must be totally independent of the prime mover control system. An over temperature or low pressure shutdown device also be needed for safety, as appropriate.

**CAUTION-BATTERY CHARGING**

To prevent damage to a controller that uses an alternator or battery-charging device, make sure the charging device is turned off before disconnecting the battery from the system.

**CAUTION:**

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

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

During installation process, please pay attention to prevention of static electricity.

**CAUTION:**

Controllers are equipped with factory settings. Because the factory settings may not fully meet the actual needs of the customers, it is necessary to check the settings before starting the generator.

Revision history

No	Version	Date	Revised by	Approved by	Revision content
1	HM1081CR1	2012.11.8	CHEN	P.L	Initially issued

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1. Description

GU3303 is a type of self-starting controller in which operation mode is selected with soft key.
GU3304 is a type of self-starting controller in which operation mode is selected with key switch.

Characteristics:

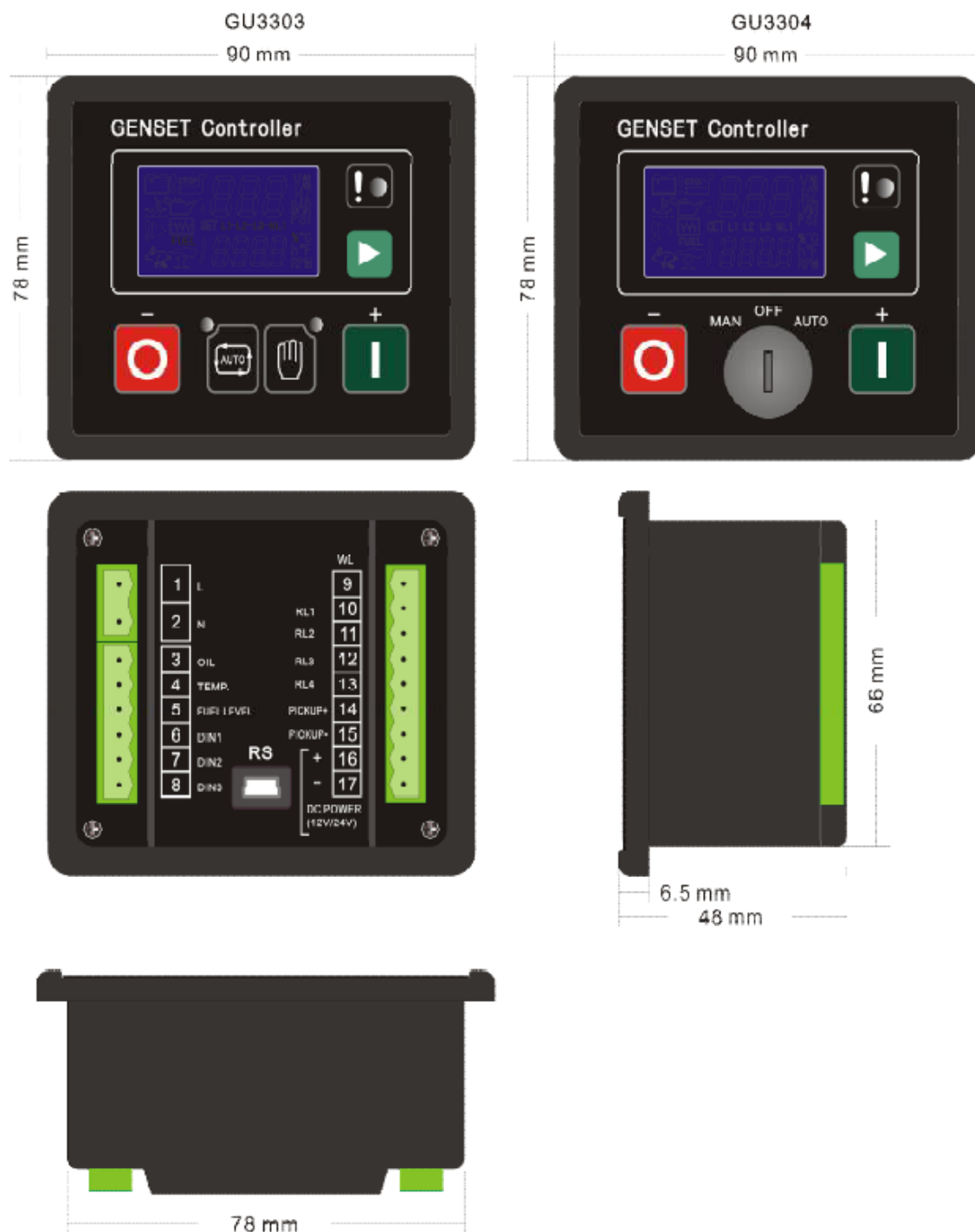
- Voltage is measured through true RMS.
- LCD graph display.
- Unit maintenance time presetting & alert function.
- Equipped with 3 analog variable measurement inputs, also various kinds of built-in sensors for selection and capable of customization of parameters.
- Equipped with 4 definable control relay outputs.
- Equipped with 3-way definable switching value inputs.
- The buttons on controller panel can be used to select control mode, start & stop program operation, display data and revise protective parameters, LED indicator lamp can be used to indicate operation mode of controller and operation status of generator set, LCD can be used to display various measurement parameters and statuses
- Optionally equipped with USB communication port to communicate with PC, which is capable of reading and setting operation parameters of the controllers.
- All connections of controllers are by secure plug and socket, for ease and convenience to connect, move, maintain and replace the device.

This manual is only suitable for GU3303/GU3304 Automatic Generator Controller, the user must carefully read this manual first.

2. Outline Dimension Drawings and Controller Wiring

2.1 Following Details:

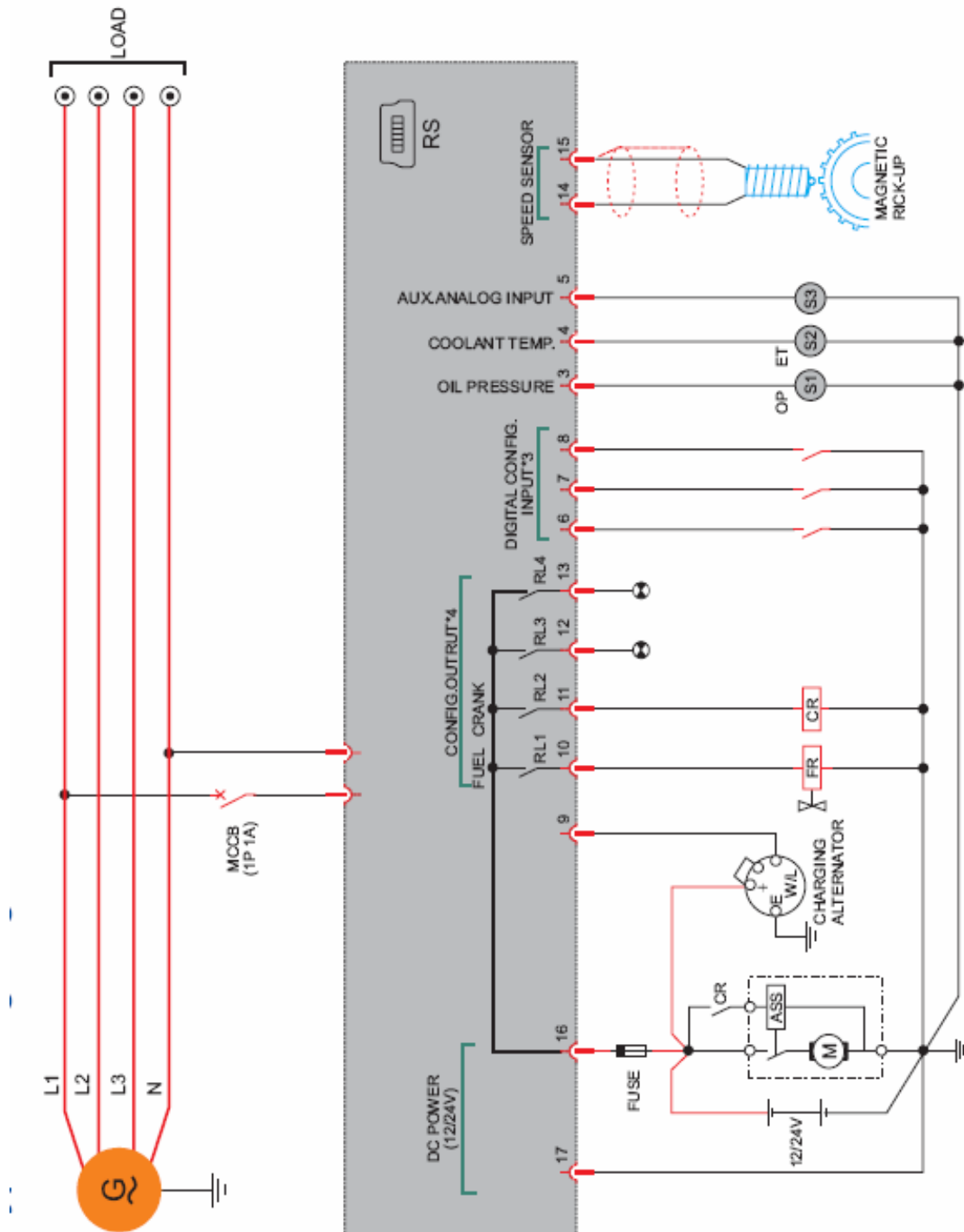
Module dimensions	W90mm×H78mm
Panel cutout	W79mm×H67mm
Thickness	D48mm (disconnected)



2.2 Terminal connections:

Pin №	Function Description	Signal	Dim
1	Generating phase voltage input	0-300Vac	1mm ²
2	Generating neutral		1mm ²
3	Oil pressure detection	Oil pressure sensor(<1kΩ)	2.5 mm ²
4	Temperature detection	Temperature sensor(<1kΩ)	2.5 mm ²
5	Oil level detection	Oil level sensor(<1kΩ)	2.5 mm ²
6	Switching value input 1	Customized	1mm ²
7	Switching value input 2	Customized	1mm ²
8	Switching value input 3	Customized	1mm ²
9	Charge excitation power output	If not used, do not connect to negative	1mm ²
10	Relay output 1	N.O. dry contact, 3A/30Vdc, can be customized(1)	1mm ²
11	Relay output 2	N.O. dry contact, 3A/30Vdc, can be customized(2)	1mm ²
12	Relay output 3	N.O. dry contact, 3A/30Vdc, can be customized(3)	1mm ²
13	Relay output 4	N.O. dry contact, 3A/30Vdc, can be customized(4)	
14	Magnetic sensor signal(+)	1-70Vac	2-core shielded cable
15	Magnetic sensor signal(-)		
16	Battery supply(+)	12V/24V(8~35Vdc continuous)	2.5 mm ²
17	Battery supply(-)		2.5 mm ²

2.3 Typical Wirng Diagram










3. Panel Operation

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

LCD can display two rows of data information simultaneously, LCD has backlight function and this enables the operator to see the information clearly whether during the day or night, the backlight can be automatically turned off a period of time after pushing any key.

LCD display and control buttons provide a friendly operation interface for the operator to conveniently read information and parameter setting.



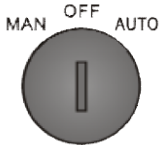
3.1 Control buttons and LEDs

Function Description	Tag
<p>Scroll Button Scroll to continuously display the information/continuously push this button for 2s to enter/exit parameter setting menu.</p>	
<p>AUTO Mode Button/LED The push button is used for selecting “AUTO mode”. When the controller is running in AUTO mode, the LED above the push button illuminated. The activation and deactivation of the “remote start signal input” controls the starting and stopping of the generator (Genset).</p>	
<p>Manual Mode Button/LED The push button is used for selecting “manual mode”. When the controller is running in manual mode, the LED above the push button illuminated. The Start and Stop push buttons control the starting and stopping of the generator (Genset). (This button only exists in GU3303A)</p>	
<p>START/VALUE INCREASE “+” Push Button The push button is used for manually starting of the generator (Genset). When the controller is in Manual mode, press this push button to start the generator. When in parameter setting mode, this push button is used to increase values and move selection downward.</p>	
<p>STOP/RESET/VALUE DECREASE “-” Push Button The push button is used for manually stopping of the generator (Genset). When the controller is in Manual mode, please press & hold this button more than 2sec to stop the generator (Genset). If failure occurs, press this button, the shutdown alarm lockout can be cleared. When in parameter setting mode, this push button is used to decrease values and move selection upward. Whatever mode is the controller operating in, the STOP button is valid, you can push this button continuously for above 2s in “AUTO” or “TEST” mode to stop the generator set, the controller simultaneously transforms from other modes to manual modes automatically.</p>	
<p>Alarm LED The LED lights when alarm or stop failure occurs in the controller.</p>	
<p>Key switch Select operation mode with key through selection switch (This button only exist in GU3303A)</p>	

4. Control and operation guide

The controller has 2 modes: AUTO and MANUAL.

4.1 Operation Mode Setting:

Description	Operation
Press the “AUTO” button, the LED above the button is illuminated, then the controller is running in “AUTO” mode. (This button only exists in GU3303A)	
Press the “MANUAL” button, the LED above the button is illuminated, then the controller is running in “MANUAL” mode. (This button only exists in GU3303A)	
In GU3303A, mode is selected through key switch.	



Note:

Only 1 mode can be selected from above 2 modes.

In case of transformation between the operation modes, the controller first maintains all control states, then executes control program of the new mode accordign to the current situation.

4.2 AUTO Control Sequence:


Controller is running in "AUTO" mode.


When the generator (Genset) is in stand-by state, the start program of the generator **(Genset) starts only in case of the following situation:**


- A configurable Port defined as Remote Start if effective.

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

If idling function is preset, then closure output of the relay defined as idling function is started along with start relay closure output. After cranking is successfully completed, the idling delay timer starts, when it times out, the relay with idling function is disconnected. The procedure is the same as above.

	<p>Note:</p> <p>During idling period of the engine, the controller does not detect failures including low voltage, low frequency, low speed and charge failure, etc.</p>
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	<p>Note:</p> <p>While cranking, engine ignites. The start motor will be de-energized under the following conditions:</p> <ul style="list-style-type: none"> When the frequency of the generator achieves the preset frequency. When the rotation speed of the engine achieves the cranking cutoff speed (optional). When the voltage of the generator achieves the cranking cutoff voltage (optional). When cranking cutoff oil pressure delay is timeout (optional). When cranking is timeout. <p>The controller can not implement cranking procedure under the following situations:</p> <ul style="list-style-type: none"> When the frequency of the generator achieves the preset frequency. When the rotation speed of the engine achieves the cranking cutoff speed. When the voltage of the generator achieves the cranking cutoff voltage (optional). When the oil switch is cutt off or when the oil pressure is higher than the cranking cut off oil pressure (optional).
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	<p>Caution: If the control system does not use speed sensor, i.e., the crank cut out signal comes from the generator frequency, then you should make sure that the generator's voltage is higher than the measureable value of controller while cranking to avoid damage to the start motor.</p>
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Repeated start: During the crank period, if the engine can not ignite and controller will not output start signal during crank rest. Once crank rest timer is time out, the start relay will be energized once again and attempt to start the engine again.

The above procedure will be repeated until engine successfully ignites or reaches the preset number of crank attempt.

However, if any shutdown alarm occurs during crank, controller will stop cranking immediately and only can be restartd after clearing failure and reset.

Start failure : When the above procedure repeats again and again and reaches the preset number of crank attempt, the crank relay output is then deenergized. The failure LED

illuminates and the LCD displays **REPN: 000**.

	<p>Caution: If Fail to Start occurs, operator must check the whole generator (Genset) system to find out failure reason, only after clearing the failure can the operator press "STOP/RESET" button to relieve fault lock out status, and restart the generator (Genset)</p>
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Electricity generation and supply process:

In case that a generator operates normally and .voltage & frequency of the generator separately achieves on-load voltage and on-load frequency, if a relay is defined as generating switching on/off, then the generating & supplying delay timer acts, when it is time out, the generating switching relay sends closure output the generating switch is on and starts electricity generation and supply.


Generator unloading and shutdown sequenet:

The controller sends out unloading command of the generator: the Remote Start configurable switch input is ineffective.

In the electricity brake, the countdown of colling delay timer begins. When it is time out, the fuel relay of the controller acts and immediately cuts off the fuel solenoid valve, then the generator stops and enters stand-by state.

Stop failure: When cool down is time out, the fuel relay acts and the timer for Stop delay begins. When it is time out, if the controller detects that the generator voltage is higher than the cranking cutout voltage or the speed is higher than the cranking cutout speed, or if the oil pressure switch is disconnected, or if the oil pressure is higher than the cranking cutout oil

pressure, then the Fail to stop LED illuminates and the LCD displays **REPN: 009**.

	<p>Note: After stop failure, the generatoer can not start and operate unless the trouble is removed and reset.</p>
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4.3 Manual control sequence:

Controller is in Manual mode.

Generator starting sequence:

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

Forced start function:

Under some special conditions, e.g., too low battery voltage, or too low environmental temperature, or when speed sensor is not used and the generator can output voltage only under high speed, the generator can not successfully carry out cranking or ignition on execution of the built-in cranking program of the controller. In order to cope with such conditions, it is necessary to prolong cranking time. Under the condition that related parameters are not changed, you can press and hold the "start" button, the cranking time depends on button-pressing duration. After successful cranking, the safety-on delay starts. The subsequent procedure and protection is the same as normal.

After the voltage & frequency of the generator separately achieves on-load voltage and on-load frequency, the generating closing relay will not send out closure output.

Generator starting sequence:

While pressing "STOP" button, the generating closing relay separates, the generator has no load, the cooling delay timer starts. When it is time out, the fuel relay of the controller acts and immediately closes the throttle, then the generator stops and enters stand-by state.

Under cooling state, if you press "stop" button, the generator will not undergo cooling delay period and immediately stops.

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

Start control sequence of N.O. type:

During the starting sequence, the fuel relay of controller will not energize, fuel solenoid has no power source, that is to say, the fuel solenoid magnet does not act, the valve opens.

Stop control sequence of N.O. type:

During the stopping sequence, the fuel relay energizes, fuel solenoid is on power and energizes, and the engine begins to stop. After a delay (same as stop delay) fuel relay de-energizes, disconnecting the supply for the fuel solenoid.

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

4.5 Idle function:

For idle function, configure one of the configurable outputs as idle, the controller immediately has idle control function.

As for idle control flow, refer to the start & stop flow chart.

**Note:**

During idling period of the engine, the controller does not detect failures including low voltage, low frequency, low speed and charge failure, etc.

4.6 Preheat function:

For Preheat function, configure one of the configurable outputs as Preheat. The controller has 3 selectable preheat control modes as follows:

Mode 1: during preheat time, preheat relay output is energized.

Mode 2: during preheat time, preheat relay output energizes until the successful ignition.

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

Mode 4: configure one of the configurable input switch value as Preheat, when this switch value is effective, the preheat relay output is energized, when the switch value is ineffective, the preheat relay is disconnected.

As for the control flow of mode 1 to 3, please refer to the start and stop flow chart.

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

5. Measure and Display Data

Generating phase voltage L-N

Generator frequency Hz

Operation speed of generator set RPM (signal derived from speed sensor of the generator, generating frequency)

Oil pressure of the generator Bar/PSI (signal derived from oil pressure sensor of the engine)

Generator temperature °C/°F (signal derived from temperature sensor of the generator)

Fuel oil level% (signal derived from oil level sensor of the oil tank)

Battery voltage Vdc

Operating time of the generator set Hour

6. Parameter settings

6.1 System parameters

№	Parameter		Set range	Presetting
	English	Brevity code		
1.0	Exit	90E		
1.1	Password	PR5	0000~9999	
1.2	Oil pressure unit	PS0	0Bar/1PSI	0
1.3	Temperature unit	ES0	0°C/1°F	0
1.4	Communication address	888	1~247	1
1.5	Start mode	5E0	0manual/1automatic/2final	0
1.6	Voltage transformer transformation ratio	0E0	1.0:1~10.0:1	1.0:1
1.7	Nominal voltage	0E0	45~3000VAC	220
1.8	Auto scroll time	85P	1~60s /0 not used	Not used
1.9	Default settings	8E0		

Comments to the menus:

Password

- It is used to verify identity & grade of the user, there are 3 built-in grades in the controller, whose codes are separately CL0/ CL1/ CL2.
- CL0 is the Operator grade, who is allowed to see the set parameters and start/stop the controller. There is no factory preset value, i.e., it does not need password.
- CL1 is the Technician grade, who is also allowed to revise all set operation parameters apart from the authorities of CL0. The factory preset value is “2213”.
- CL2 is the Factory grade, who has all other authority of functions apart from CL1 (for example, record clearing). The factory preset value is “3132”.
- All Passwords will automatically cease to be in effect 60s after exiting the menu.

Oil pressure unit

- It is the pressure unit used to define the display of LCD for measured oil pressure value, “0” represents Bar, “1” represents PSI.
- Transformation formula: $P[\text{psi}] = P[\text{bar}] * 14.503$

Temperature unit

- It is the pressure unit used to define the display of LCD for measured temperature value, “0” represents °C, “1” represents °F.
- Transformation formula: $(T[°F]) = T[°C] * 1.8 + 32$.

Communication address

- It is used in address setting of the components in MODBUS.
- There is a unique communication address for every controller in the same MODBUS.

Startup mode

- It is used to set up the initial control mode when the controller is connected to the power supply.
- When the parameter is set to “0” and the controller is connected to the power supply, it automatically operates in manual control mode.
- When the parameter is set to “1” and the controller is connected to the power supply, it automatically operates in automatic control mode.
- When the parameter is set to “2” and the controller is connected to the power supply, the control mode of the controller is the same as that before power-down.

**Note:**

THE above parameters only exist in GU3303A.


RT Ratio

- It is used to define transformation ratio between primary side & secondary side of the generating voltage transformer.
- It is used to measure and calculate the electricity generation: V, Hz.
- It is used to set up the limit value trigger: high/low voltage, etc.

Rated voltage

- It is used to define rated voltage in electricity generation.
- It is used as the reference value for high/low voltage limit value judgment.

Auto scroll time

- It is used to set up the scroll interval time in liquid crystal display, automatic scroll starts 30 seconds after pushing any button.
- When the parameter setting is “not used”, then manual scrolling is carried out through the button “”.

Default settings

- It is used to restore the parameters to preset factory settings.

6.2 Generator parameters

№	Parameter		Set range	Presetting
	English	Brevity code		
2.1	Low generating voltage warning threshold		20~200% /0not used	90%
2.2	Low generating voltage fault value		20~200% /0not used	90%
2.3	High generating voltage warning threshold		20~200% /999 not used	115%
2.4	High generating voltage fault value		20~200% /999 not used	120%
2.5	Low generating frequency warning threshold		10.0~100.0Hz /0.0 not used	48.0Hz
2.6	Low generating frequency fault value		10.0~100.0Hz /0.0 not used	47.0Hz
2.7	High generating frequency warning threshold		10.0~100.0Hz /999.9 not used	55.0Hz
2.8	High generating frequency fault value		10.0~100.0Hz /999.9 not used	57.0Hz
2.9	Generator fault confirm time		0~9999s	5s
2.10	Generating on-load voltage		20~200%	90%
2.11	Generating on-load frequency		10.0~100.0Hz	48.0Hz
2.12	Generator supply delay		1~9999s	5s

Comments to the menus:

Low generating voltage warning threshold (Gen-V under preALM)

- It is used to define low generating voltage warning threshold. When the parameter is set to “not used”, low generating voltage warning protection is ineffective.
- This value is represented by percent and uses rated voltage as the benchmark value.
- The controller compares the measured voltage to the set value, when the set voltage is lower than the rated voltage* low generating voltage warning threshold, then it is low generating voltage warning, the LED is lighted, LCD screen displays “”.

Low generating voltage fault value (Gen-V under alarm)

- It is used to define low generating voltage stop fault value. When the parameter is set to “not used”, low generating voltage fault protection is ineffective.
- This value is represented by percent and uses rated voltage as the benchmark value.
- The controller compares the measured voltage to the set value, when the set voltage is lower than the rated voltage* low generating voltage fault value and it continues until the

generator fault confirm time is over , then it is low generating voltage fault, the LED is lighted, LCD screen displays “**8020: 003**”, the generator stops, the fault status is locked until resetting button is pushed.

High generating voltage warning threshold (Gen-V over preALM)

- It is used to define high generating voltage warning threshold. When the parameter is set to “not used”, high generating voltage warning protection is ineffective.
- This value is represented by percent and uses rated voltage as the benchmark value.
- The controller compares the measured voltage to the set value, when the set voltage is higher than the rated voltage* higher generating voltage warning threshold, then it is high generating voltage warning, the LED is lighted, LCD screen displays “**8822: 004**”.

High generating voltage fault value (Gen-V under alarm)

- It is used to define low generating voltage stop fault value. When the parameter is set to “not used”, high generating voltage fault protection is ineffective.
- This value is represented by percent and uses rated voltage as the benchmark value.
- The controller compares the measured voltage to the set value, when the set voltage is higher than the rated voltage* high generating voltage fault value and it continues until the generator fault confirm time is over , then it is high generating voltage fault, the LED is lighted, LCD screen displays “**8020: 004**”, the generator stops, the fault status is locked until resetting button is pushed.

Low generating frequency warning threshold (Gen-Hz under preALM)

- It is used to define low generating frequency warning threshold. When the parameter is set to “not used”, low generating frequency warning protection is ineffective.
- The controller compares the measured frequency to the set value, when the measured frequency is lower than the set frequency, then it is low generating frequency warning, the LED is lighted, LCD screen displays “**8822: 040**”.

Low generating frequency fault value (Gen- Hz under alarm)

- It is used to define low generating frequency fault threshold. When the parameter is set to “not used”, low generating frequency fault protection is ineffective.
- The controller compares the measured frequency to the set value, when the measured frequency is lower than the set frequency, then it is low generating frequency fault, the LED is lighted, LCD screen displays “**8822: 040**”, the generator stops, the fault status is locked until resetting button is pushed.

High generating frequency warning threshold (Gen-Hz over preALM)

- It is used to define high generating frequency warning threshold. When the parameter is set to “not used”, high generating frequency warning protection is ineffective.
- The controller compares the measured frequency to the set value, when the measured frequency is higher than the set frequency, then it is high generating frequency warning, the LED is lighted, LCD screen displays “**8822: 039**”.

High generating frequency fault value (Gen- Hz over alarm)

- It is used to define high generating frequency fault threshold. When the parameter is set to “not used”, high generating frequency fault protection is ineffective.
- The controller compares the measured frequency to the set value, when the measured frequency is higher than the set frequency, then it is high generating frequency fault, the LED is lighted, LCD screen displays “**8000: 039**”, the generator stops, the fault status is locked until resetting button is pushed.

Generator fault confirm time (Gen alarm delay)

- It is used to define effective time for conforming generating voltage & frequency fault.

Generating on-load voltage (Gen. loading volt)

- It is used to define generating voltage threshold of “generating switching on/off” relay action.
- This value is represented by percent and uses rated voltage as the benchmark value.

Generating on-load frequency (Gen. loading Hz)

- It is used to define generating frequency threshold of “generating switching on/off” relay action.
- Generator supply delay (Gen. on delay)
- It is used to define the delay time from the time point at which the generating voltage & frequency separately achieves on-load voltage & on-load frequency to the time point at which “generating switching on/off” relay is energized.

6.3 Engine parameters

№	Parameter		Set range	Presetting
	English	Brevity code		
3.1	Engine rated speed	ESP	99~9999RPM	3000
3.2	MPU input	PNP	0 no /1 yes	0
3.3	Fly wheel teeth	EEB	5~300	120
3.4	SET pickup now	SEB		
3.5	Pair of Poles	PBB	1~4	1
3.6	Fuel mode	PNB	0N.C /1N.O	0
3.7	Start delay	SBP	0~999s	10s
3.8	Crank attempts	CBP	1~10	3
3.9	Critical C-attempts	CBP	1~20 times	6 times
3.10	Crank time	CBP	1~99s	5s
3.11	Crank time add	CBP	1~99s /0 not used	Not used
3.12	Crank reset time	CBP	1~300s	10s
3.13	Crank cutout RPM	CBP	1~9999RPM	300RPM
3.14	Crank cutout volt	CBP	1~100% /999 not used	85%
3.15	Crank cutout ALT-V	CBP	1.0~40.0V /99.9 not used	99.9
3.16	Crank cutout Oil-P	CBP	0.1~150.0Bar /PSI/999.9 not used	999.9
3.17	Crank cutout P-DLY	CBP	1~60s /0 not used	Not used
3.18	Idle time	IBP	1~9999s /0 not used	Not used

3.19	Pre-heat mode		1~4	1
3.20	Pre-heat time		1~9999s /0 not used	3s
3.21	Safety-on delay		1~600s	10s
3.22	Cool down mode		0 full speed /1 idling	1
3.23	Cool down time		0~9999s	60s
3.24	Stop time		1~60s	10s
3.25	SP Under preALM		1~9999RPM /0 not used	2800 RPM
3.26	SP Under alarm		1~9999RPM /0 not used	Not used
3.27	SP Over preALM		1~9999RP/9999 not used	3250 RPM
3.28	SP Over alarm		1~9999RPM /9999 not used	3400 RPM
3.29	Batt. under preALM		1.0~40.0V /0.0 not used	8.0V
3.30	Batt. over preALM		1.0~40.0V /99.9 not used	17.0V
3.31	ALT. low preALM		1.0~40.0V /0.0 not used	8.0V
3.32	Maintenance preALM		1~9999 hour / 0 not used	955
3.33	Maintenance alarm		0 warning/1 stop	0

Comments to the menus:

Engine rated speed

- It is used to define rated rotation speed of the engine.
- It is used as standard reference value for speed control.

MPU input

- It is used to define whether a speed sensor is used.
- When the parameter is set to “1”, the controller uses speed sensor as the signal source for rotation speed measurement of the engine. When the parameter is set to “1”, the controller’s speed measurement comes from frequency signal of the engine and it is converted through calculation.
- Conversion formula between RPM(rotation speed) and frequency: $RPM=(Hz*60)/\text{polar pair number}$. For example, when the measurement frequency of the generator is 50Hz and the polar pair number is 2, $RPM=(50*60)/2=1500(RPM)$.

Fly wheel teeth

- It is used to define pulse number/fly wheel teeth number of every turn of the generator.

SET pickup now

- It is used to determine the fly wheel teeth number through calculation with measured generating frequency and speed sensor frequency when the user does not know pulse number/fly wheel teeth number of every turn of the generator.
- The conversion formula between flywheel teeth number and the generating frequency: $\text{fly wheel teeth number}=(f1*\text{pole pair number})/f2$, (f1 is the speed sensor frequency and f2 is the generating frequency).
- Operation procedure:
- ①Set the parameter “MPU input” to “0”.

- ② Start the generator, wait until the operation becomes steady, then enter the setting menu “Set sensor frequency” and press confirm button, input proper CL2 authorized password and then press confirm button, at this time the menu “Fly wheel teeth” is automatically revised.
- ③ Set the parameter “MPU input” to “1” and thus related setting on speed sensor has been completed.

**Note:**

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

Pair of poles

- It is used to define excitation pole number of the generator.
- When the speed measurement value of the controller comes from frequency signal of the generator, it is used in measurement operation of the rotation speed.

Fuel mode

- It is used to define delivery valve type (as for detailed usage, please refer to 4.6).
- N.C. throttle refers to the condition in which delivery valve passage is closed if the delivery valve is not used, N.O. refers to the condition in which delivery valve passage is open if the delivery valve is not used.

Start delay

- It is used to define time period from the time point at which the generator start condition is satisfied to the time point at which generator start procedure is executed.

Crank attempts

- The controller can attempt to start the generator many times, the maximum number of trial times equals the set value.

Critical C-attempts

- When the Critical mode is activated, the controller can attempt to start the engine many times, the maximum number of cranking equals the set value.

Crank time

- It is used to set up duration time and stop time of cranking command of the engine.
- When this parameter is used in diesel engines, the timer starts at the point when the cranking command is sent, when it is applied in gas engines, the timer starts at the point when the fuel gas valve open command is sent.

Crank time add

- It is used to adjust allowed time for repetitive trial of cranking.
- Time period from second time of cranking trial on equals to the original defined cranking time plus added time, for example, if the “Crank time” is set to 5s, the “Crank time add” is set to 3s, then from the second time of cranking trial on, the maximum allowed crank time is 8s.

**Caution:**

The maximum allowed crank time should not exceed equipment safety range.

Crank reset time

- Time interval between the two times of repetitive crank trials.
- This time interval starts from the time point when crank control stops input and the crank command can be sent only after this time interval ends.

Crank cutout RPM

- The rotation speed that makes the crank command eliminated.

Crank cutout volt

- The generator voltage that makes the crank command eliminated.
- This value is represented by percent and uses “rated phase voltage” as the benchmark value.

Crank cutout ALT-V

- The charger voltage that makes the crank command eliminated, the signal comes from WL terminal of the charger.
- When the parameter setting is “Not used”, this crank cutout condition is ineffective.

Crank cutout Oil-P

- The engine oil pressure that makes the crank command eliminated, the signal comes from the pressure sensor.
- When the parameter setting is “Not used”, this crank cutout condition is ineffective.

Crank cutout P-DLY

- It is used to set up the time period from oil pressure switch cutoff or achievement of oil pressure to “Crank cutout Oil-P” to elimination of crank command.
- When the parameter setting is “Not used”, the oil pressure as crank cutout condition is ineffective, in addition oil pressures as stop failure judgment condition and execution inability condition for crank are simultaneously ineffective.

Idle time

- Duration of idling operation for the engine.
- In manual control mode of the controller, push the start button, the idle time timer starts. When the test control mode is effective, the idle time timer starts. When the controller is in automatic control mode, start delay timer stops and idle time timer starts. During the idle time, the relay defined as idle output is energized, the timer stops and the relay restores to cutout state.
- When the parameter setting is “Not used”, the idle function is ineffective.

Pre-heat mode

- It is used to define preheating control mode.
There are 4 optional preheating modes, you can refer to description of the preheating function for detail.

Pre-heat time

- Preheating duration time before cranking of the engine, when it works, the LCD screen displays the time course.
- When the parameter setting is “Not used”, the preheating function is ineffective.

Safety-on delay

- It is used to define the time period from successful crank ignition to stable operation.
- During the safety-on delay time, the controller masks the protective functions including low speed, low voltage and low oil pressure, etc.

**Caution:**

Considering that part of the protective functions are ineffective during the safety-on delay time, it is critical to set the safety-on delay time. Otherwise, damage of the engine will occur.

Cool down mode

- It is used to define control mode of cooling.
- When the parameter setting is “0”, then the engine operates with rated rotation speed during cooling period, when the parameter setting is “1”, then the engine operates in idling mode during cooling period.

Cool down time

- The allowed idle operation time before the engine stops.
The setting of cool down time is necessary, it can make the engine which has operated for a long time under the loading condition stop at relatively low temperature.

Stop time

- The allowed maximum engine stop time.
- When the controller executes stop command, i.e., the throttle control relay cuts off the output (if throttle is N.O., the control relay is energized), the engine stop timer starts, after the timer stops, if the controller detects that the generator voltage is higher than the “Crank cutout volt”, or if the speed is higher than the “Crank cutout RPM”, then it is “Stop failure”.
- In case of N.O. throttle control, then the throttle control relay cuts off the output after the “engine stop timer” ends.

SP Under preALM

- It is used to set up lower limit warning value of the engine. When the parameter setting is “Not used”, the function is ineffective.
- After the “Safety-on delay” timer ends, if the engine rotation speed is lower than this set value, the warning LED is lighted and the LCD screen displays “**8888**: **888**”.

SP Under alarm

- It is used to set up lower stop failure limit value of the engine. When the parameter setting is “Not used”, the function is ineffective.
- After the “Safety-on delay” timer ends, if the engine rotation speed is lower than this set value, the engine stops, warning LED is lighted and the LCD screen displays “**8888**: **888**”.

SP Over preALM

- It is used to set up upper limit warning value of the engine. When the parameter setting is “Not used”, the function is ineffective.
- After the “Safety-on delay” timer ends, if the engine rotation speed is higher than this set value, the warning LED is lighted and the LCD screen displays “**8888**: **888**”.

SP Over alarm

- It is used to set up upper stop failure limit value of the engine. When the parameter setting is “Not used”, the function is ineffective.
- After the “Safety-on delay” timer ends, if the engine rotation speed is higher than this set value, the engine stops, warning LED is lighted and the LCD screen displays “**8000: 002**”.

Batt. under preALM

- It is used to set up lower limit warning value of power supply (battery voltage). When the parameter setting is “Not used”, the function is ineffective.
- If the battery voltage is lower than this set value, the warning LED is lighted and the LCD screen displays “**8800: 010**”.

Batt. over preALM

- It is used to set up upper limit warning value of power supply (battery voltage). When the parameter setting is “Not used”, the function is ineffective.
- If the battery voltage is higher than this set value, the warning LED is lighted and the LCD screen displays “**8800: 011**”.

ALT. low preALM

- It is used to set up lower limit warning value of engine charger output voltage. When the parameter setting is “Not used”, the function is ineffective.
- The voltage signal comes from the WL terminal of the charger.
- After the “Safety-on delay” timer ends, if the voltage measurement value from WL terminal is lower than this set value, the warning LED is lighted and the LCD screen displays “**8800: 012**”.

Maintenance preALM

- It is used to define the scheduled time for next maintenance request. This parameter sets up the effective time and the controller screen will display maintenance information. When the parameter setting is “Not used”, the function is ineffective.

Maintenance alarm

- It is used to define the action to be executed after the operation time of the engine accumulated by the controller achieves the set value.
- If the parameter setting is “0”, the warning LED is lighted and the LCD screen displays “**8800: 045**”, if the parameter setting is “1”, the engine stops, the warning LED is lighted and the LCD screen displays “**8800: 045**”.

**Note:**

Every time the maintenance time is set, the controller will reset the accumulated time of maintenance engine operation.

6.4 Analog input setting

№	Parameter		Set range	Presetting
	English	Brevity code		
4.1	P-sensor type	<i>PPS</i>	1~15 /0 not used	0
4.2	Oil-P low preALM	<i>PPP</i>	0.1~150.0Bar/PSI /0.0 not used	1.4 Bar
4.3	Oil-P low Alarm	<i>PPB</i>	0.1~150.0Bar/PSI/0.0 not used	1.1 Bar
4.3	T-sensor type	<i>PCT</i>	1~15 /0 not used	3
4.4	Coolant preALM	<i>PCC</i>	50~320°C/°F /9999 not used	92°C
4.5	Coolant Alarm	<i>CCB</i>	50~320°C/°F /9999 not used	100°C
4.6	Fuel sensor type	<i>FPS</i>	1~15 /0 not used	1
4.7	Fuel low preALM	<i>FPP</i>	0~100% /0 not used	70%
4.8	Fuel low Alarm	<i>FBB</i>	0~100% /0 not used	20%

Comments to the menus:

P-sensor type:

- It is used to define type of oil pressure sensor.
- There are many kinds of optional built-in pressure sensor types in the controllers, as shown in the following pressure sensor type table:

Code	Type	Remark
0	Not used	
1	Low oil pressure switch 1	Effective in close (low level) state
2	Low oil pressure switch 2	Effective in cutoff (high level) state
3	VDO 5 bar	
4	VDO 10 bar	
5	Datcon 7 bar	
6	Murphy 7 bar	
7	Definition 1	
8	Definition 2	
9	Definition 3	
10	Definition 4	
11	Customization 1	
12	Customization 2	
13	Customization 3	
14		
15		

- The parameters of the above pressure sensor are as follows:

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

Definition 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

Definition 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

Definition 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

Definition 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:

“Customization” refers to the situation in which user can input data by themselves according to the parameters of the sensor, among them the “customization 1” can only be carried out in application software, “customization 2” and “customization 3” can simultaneously carried out on controller operation interface.

In the customization operation, the sensor data should be arranged in ascending order according to the resistance and input sequentially according to the sequence of “resistance- corresponding value”.

Oil-P low preALM

- It is used to define engine low oil pressure warning threshold. When the engine oil pressure achieves or is lower than this threshold, the warning LED is lighted and the LCD screen displays “**8888: 885**”.


Oil-P low Alarm

- It is used to define engine low oil pressure stop failure threshold. When the engine oil pressure achieves or is lower than this threshold, the warning LED is lighted and the LCD screen displays “**8888: 885**”, the engine stops and the failure state is locked until the reset button is pushed.

T-sensor type

- It is used to define type of the temperature sensor.
- There are many kinds of optional built-in temperature sensor types in the controllers, as shown in the following temperature sensor type table:

Code	Type	Remark
0	Not used	
1	High temperature switch 1	Effective in close (low level) state
2	High temperature switch 2	Effective in cutoff (high level) state
3	VDO 120°C	
4	VDO 150°C	
5	Datcon	
6	Murphy	
7	Pt100	
8	Definition 1	
9	Definition 2	
10	Definition 3	
11	Definition 4	
12	Customization 1	
13	Customization 2	
14	Customization 3	
15		



CAUTION:

The temperature sensor is used in temperature measurement, this measured temperature value is used in engine high temperature protection function, the measurement precision relates to whether the normal control and protection function of the controller is effective, therefore, it is very important to choose temperature sensor type or customize sensor parameters. Otherwise, the engine damage may occur.

- The parameters of the above temperature sensor are as follows:

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

Definition 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

Definition 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

Definition 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

Definition 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:

“Customization” refers to the situation in which user can input data by themselves according to the parameters of the sensor, among them the “customization 1” can only be carried out in application software, “customization 2” and “customization 3” can simultaneously carried out on controller operation interface.

In the customization operation, the sensor data should be arranged in ascending order according to the resistance and input sequentially according to the sequence of “resistance- corresponding value”.

Coolant preALM

- It is used to define engine high water temperature warning threshold. When the engine water temperature achieves or is higher than this threshold, the warning LED is lighted and the LCD screen displays “**8888: 888**”.

Coolant Alarm

- It is used to define engine high water temperature stop failure threshold. When the engine water temperature achieves or is higher than this threshold, the warning LED is lighted and the LCD screen displays “**8888: 888**”, the engine stops and the failure state is locked until the reset button is pushed.

Fuel sensor type

- It is used to define type of the fuel sensor.
- There are many kinds of optional built-in fuel sensor types in the controllers, as shown in the following temperature sensor type table:

Code	Type	Remark
1	Customization 1	The customer uses application software and configure through communication ports.
2	Customization 2	
3	Customization 3	

Fuel low preALM

- It is used to define engine low oil level warning threshold. When the engine fuel oil level achieves or is lower than this threshold, the warning LED is lighted and the LCD screen displays “**8888: 888**”.

Fuel low Alarm

- It is used to define engine low oil level warning threshold. When the engine fuel oil level achieves or is lower than this threshold, the warning LED is lighted and the LCD screen displays “**8888: 888**”, the engine stops and the failure state is locked until the reset button is pushed.

6.5 Switch input & output setting

№	Parameter		Set range		Presetting
	English	Brevity code			
5.1	D-input*function	800	1~20	/0 not used	6
5.2	D-input*logic	800	0 closed	/1 cutoff	0
5.3	D-input*delay	800	0~999s		1s
5.4	D-input2function	802	1~20	/0 not used	3
5.5	D-input2logic	802	0 closed	/1 cutoff	0
5.6	D-input2delay	802	0~999s		1s
5.7	D-input3function	803	1~20	/0 not used	4
5.8	D-input3logic	803	0 closed	/1 cutoff	0
5.9	D-input3delay	803	0~999s		1s
5.10	Relay1 function	200	1~80	/0 not used	2
5.11	Relay1 logic	200	0 N.O./1 N.C.		0
5.12	Relay2 function	202	1~80	/0 not used	1
5.13	Relay2logic	202	0 N.O./1 N.C.		0
5.14	Relay3function	203	1~80	/0 not used	0
5.15	Relay3logic	203	0 N.O./1 N.C.		0
5.16	Relay4function	204	1~80	/0 not used	0
5.17	Relay4logic	204	0 N.O.	/1 N.C.	0

Comments to the menus:

D-input*function:

- It is used to define input function of switching values.
- The function table of the configurable switching values is as follows:

Code	Function	Description
0	Not used	
1	AUX Pre-alarm	If this switching value input signal is selected as effective, the auxiliary LED is lighted.
2	AUX Alarm	If this switching value input signal is selected as effective, the auxiliary LED is lighted and the generator stops.
3	Oil pressure switch	Select this function switching value, the input terminal is connected to a pressure switch installed to the engine, in addition, low oil pressure protection is triggered through value limiting action of the switch, the controller allows the coexistence of low oil pressure protection through oil pressure switch and pressure sensor measurement. As for low oil pressure triggered alarm pressure, the user should select according to the functions defined in the alarm level configuration table.

4	Temp. high switch	Select this function switching value, the input terminal is connected to a temperature switch installed to the engine, in addition, high temperature protection is triggered through value limiting action of the switch, the controller allows the coexistence of high temperature protection through temperature switch and temperature sensor measurement. As for high temperature triggered alarm pressure, the user should select according to the functions defined in the alarm level configuration table.
5	Emergency stop	Select this function switching value, the input terminal is connected to an emergency stop switch, when this input is effective, the controller closes all control outputs and the engine immediately stops.
6	Remote start	When this input is effective, the generator starts. This signal is effective only in automatic operation mode.
7	Low fuel switch	Select this function switching value, the input terminal is connected to the oil level switch on the fuel tank of the engine to monitor low oil level state of the fuel oil tank.
8	Pre-heat temp. switch	Select this function switching value, the input terminal is connected to the temperature switch installed on the preheater of the engine, in addition, it can stop output of the preheat relay through the value limiting action of the switch. This is only used in preheat mode 4.
9	Critical mode	In critical mode, all stop failure turns into warning, i.e., the unit only gives out warning but does not stop the machine. The LCD screen displays "Critical mode" information.
10	Lamp test	If this switching value input signal is selected as effective, all LEDs on the control panel are lighted.
11	Alarm reset	If this switching value input signal is selected as effective, the stop failure lock of the controller is unlocked.
12	Air-flap Closed	Select this function switching value, the input terminal is connected to the auxiliary contacts installed on the engine air flap, in addition, it judges working condition of the air flap through value limiting action of the switch.

D-input*logic:

- It is used to define whether the switch value input is effective in case of N.O. or N.C..
- If "0" is selected, the switch value is effective at time of closing (low level), If "1" is selected, the switch value is effective at time of open circuit.

D-input*delay:

- It is used to select delay in effective duration of switch value input, if the value "effective" of the switch value changes into "ineffective" before ending of the delay, then the delay time is reset.

Relay*function

- It is used in function selection of configurable relay.
- The optional functions are as shown in the following table:

Code	Function	Description
0	Not used	
1	Crank	The output relay choosing this function is used in control of start motor of the engine, it acts in case that crank action of the engine is needed, it stops working at time of crank cutout.
2	Fuel	The output relay choosing this function is used in control of throttle magnet of the diesel engine, it acts in case that engine start is needed, it stops working in case that engine stop is needed.
3	Shutdown alarm	The output relay choosing this function acts when one or several stop failure (failures) occur and it resets and stop acting when the failure is eliminated.
4	Warning	The output relay choosing this function acts when one or several stop warning (warnings) occur and it resets and stop acting when the failure is eliminated.
5	Idle	The output relay choosing this function acts during timing period of the idle timer inside the controller and it stops acting after the timing ends.
6	Preheat output	As for action of the output relay choosing this function, please refer to the description of preheat function.
7	Generator (Genset) running	The output relay choosing this function acts when the generator normally operates, i.e., the speed, oil pressure, temperature and electric parameters of the generator all achieve normal set value limit range.
8	Auto mode	The output relay choosing this function acts when the controller operates in automatic operation mode.
9	Manual mode	The output relay choosing this function acts when the controller operates in manual operation mode.
10	Generator close/open	This output relay is used to control close and open of the generator load switch GCB, it acts when the controller gives out electricity generating supply command and it stops working when electricity generating supply is not needed.
11	Speed raise	The output relay choosing this function acts when operation speed of the engine is lower than the rated rotation speed.
12	Fail to start	If the engine has not successfully ignite after the set crank trial times, then the output relay acts.
13	Fail to stop	If the engine is still running after the set stop timing period, then the output relay acts.
14	Charge failure	The output relay acts after the charging fails.

Relay*logic

- It is used to select whether the relay output is effective in case of N.O. or N.C..
- If “0” is selected, the relay acts in case of effective execution. If “1” is selected, the relay does not act in case of effective execution.

6.6 Calibration menu

№	Parameter		Set range	Presetting
	English	Brevity code		
8.1	Voltage		-9.9%~9.9%	
8.2	Oil pressure		-9.9%~9.9%	
8.3	Temperature		-9.9%~9.9%	
8.4	Battery voltage		-9.9%~9.9%	
8.5	Oil level		-9.9%~9.9%	

Comments to the menus:

Voltage deviation

- It is used to revise measurement display value of voltage.
- This value uses rated voltage as the benchmark value.

Oil pressure deviation

- It is used to revise measurement display value of oil pressure sensor.

Temperature deviation

- It is used to revise measurement display value of temperature sensor.

Battery voltage deviation

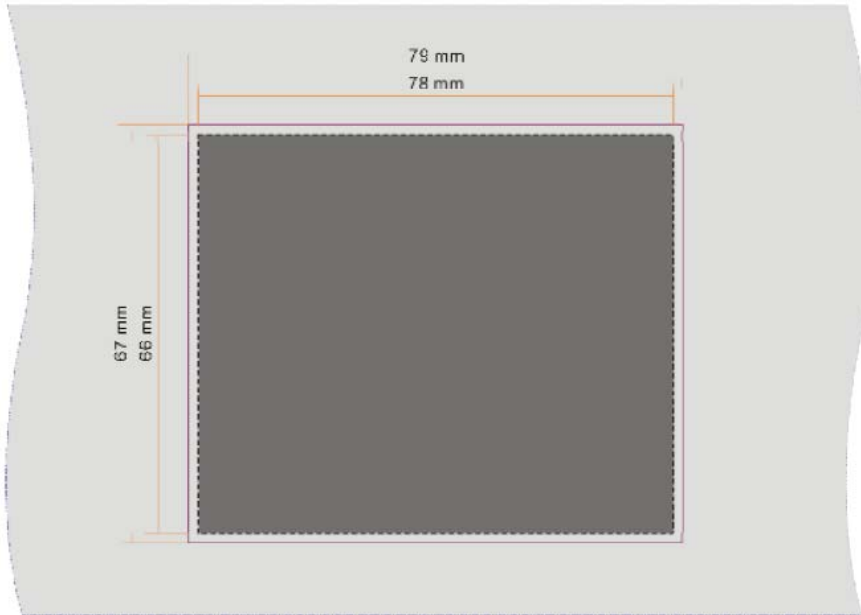
- It is used to revise measurement display value of battery voltage.

Oil level deviation


- It is used to revise measurement display value of oil level.

7. Installation Guide

7.1 The panel installation hole dimension drawing:



Hole dimension: 79mm*67mm(width*height), the dash line frame is the controller dimension. The controller is fixed by six specially customized fasteners.

	<p>Note:</p> <p>If the casing containing the controller is directly installed on generator set body or other equipment with violent vibration, it is necessary to add anti-vibration mounting .</p> <p>In order to assure that the protection grade of the installed controller has achieved IP65, it is necessary to execute the required panel installation hole dimension strictly..</p>
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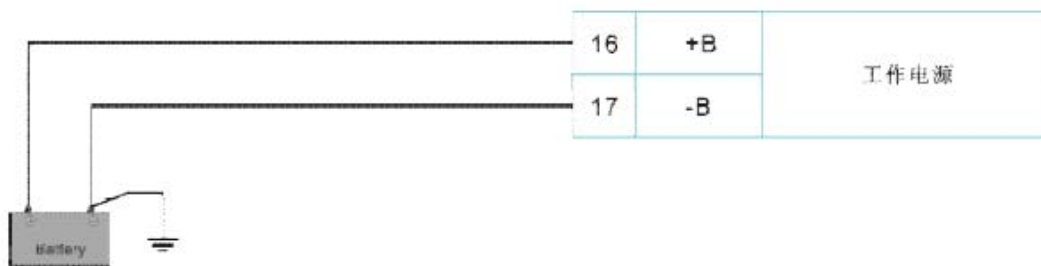
7.2 Electrical connection

As for the control wire connection, please refer to typical connection diagram.

7.2.1 Power supply:

Power specification:

Operating voltage range	8~35Vdc
Maximum operating current	@12V 120mA, @24V 60mA
Crank voltage drop	If voltage before cranking $\geq 10V$, it can maintain at 0V for 80ms, then the voltage is restored to $\geq 5V$, the controller can work normally and it is unnecessary to install other auxiliary power supply.



Note:

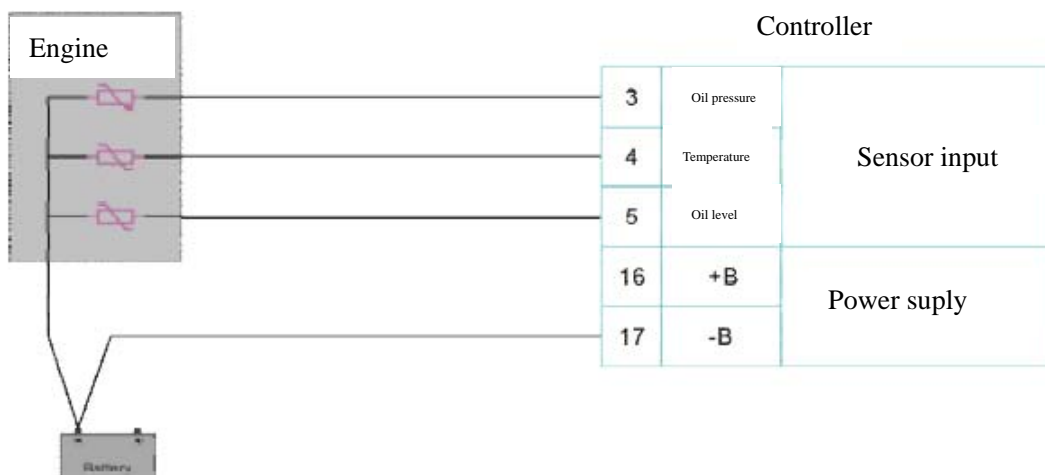
In actual application, the power supply of the controller must be installed with overcurrent protection switch or fuse with capacity $\leq 10A$.

At the moment when the controller is connected to the power supply, a remarkable spontaneous peak current will occur. The value grade of the spontaneous peak value is determined by resistance of the power, therefore, we can't understand the detailed maximum spontaneous peak current, it is necessary to consider spontaneous peak current in selection of overcurrent protection switch or fuse to avoid tripping or open circuit.

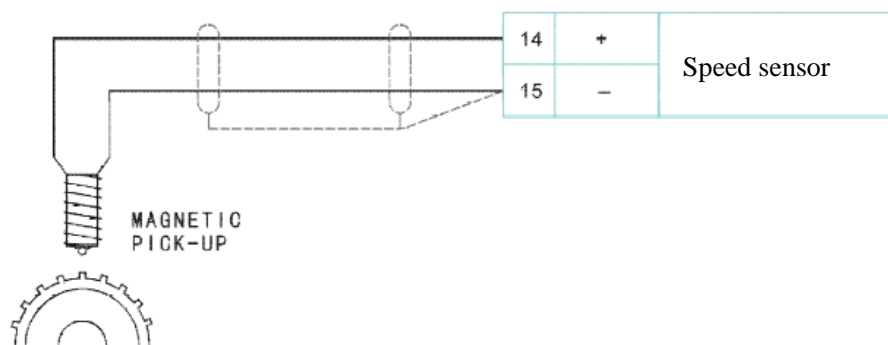
CAUTION:

The negative pole of the power supply must be earthed, good grounding is critical for normal working of the controller. Otherwise, the normal electric measurement or working stability of the controller will be affected.

7.2.2 Installation of oil pressure/temperature/oil level sensor



7.2.3 Installation of speed sensor



Note:

Measurement precision of the speed sensor relates to flywheel teeth number:.

Precision= $\pm(120/\text{flywheel teeth number})$ RPM

It is shown in the above formula that the more the flywheel teeth, the higher the measurement precision of the speed sensor is.



CAUTION:

The controller and sensor should be connected with shielded cable, the shielding net is earthed at one end.

The 15# terminal is connected to the negative pole of the power inside the controller, in application, it is necessary to take caution to avoid ineffectiveness.

8. LCD Display and Menu System

8.1 Setting of operation parameters





Progressive increase or decrease by digit is used in parameter setting, press and hold “▶” on any page for 2s to enter setting menu, at this time you can scroll under the same level of menu by pressing “+” or “-”, you can press “▶” to enter the next level of menu, if you need to revise the parameters, then first enter menu 1.1 “password” to input the authorized password and revise, or select the item to be revised and then press “▶” to enter the revision interface of this menu, next press “+” or “-” to revise. When password input is prompted, 0000 is displayed, at this time, you can press “+” or “-” to position and input the password, set the password to 2213, subsequently press “▶” to confirm and enter, then you can revise the parameter. Otherwise the prompt to input the password will be appear again. After revising the parameters, you can press and hold “▶” for 2s and then you can exit the setting status.

For example, set the rated voltage value, change it from 100 to 220):





Operation	Description
Press and hold “▶” for 2s to enter setting menu, then the LCD displays:	
Press “+” for 5 times, the LCD displays:	
Press “▶” once, press “+” or “-” and the password revision prompt appears, input and revise the password to 2213, press “▶” to confirm and enter.	
After the password becomes proper, press “+” or “-” to change the parameter, at this time it is revised to 220, the LCD displays:	
You can exit by pressing and holding “▶” for above 2s, then the LCD displays:	

For example, set the controller crank trial times to 2:


Operation	Description
Press and hold “▶” for 2s to enter setting menu, then the LCD displays:	

<p>Press “+” for 28 times, the LCD displays:</p>	
<p>Press “▶” once, press “+” or “-” and the password revision prompt appears, input and revise the password to 2213, press “▶” to confirm and enter.</p>	
<p>Press “+” or “-” to change the parameter, at this time it is revised to 2.</p>	
<p>Press “▶” to confirm , then you can exit the setting menu by holding “▶” for above 2s.</p>	

For example, restore the controller parameters to default factory settings:

Operation	Description
<p>Press and hold “▶” for 2s to enter setting menu, then the LCD displays:</p>	
<p>Press “-” for 8 times, the LCD displays:</p>	
<p>Press “▶” once, press “+” or “-” and the password revision prompt appears, input and revise the password to 2213, press “▶” to confirm and enter.</p>	
<p>Press “▶” to restore the default settings, then you can exit the setting menu by holding “▶” for above 2s.</p>	

For example, set up the controller to online programming mode:

Operation	Description
<p>Disconnect the power supply, properly connect to the computer through the communication cable, open the programming software “ABLDs.exe”, as shown in the right figure, open the serial port and introduce the upgrade program, then reconnect the controller power supply to carry out the automatic program upgrade.</p>	

9. Technical parameters**9.1 Measurement of AC voltage:**

Measurement type	True virtue value
Measured phase voltage	15~346 VAC
Measured line voltage	25~600 VAC
Maximum power consumption for every channel	<0.1W
Measured precision	1%
Display	0~600KV

9.2 AC frequency measurement:

Frequency measurement	3~70Hz (voltage≥15VAC)
Frequency measurement precision	0.1%
Display	0~100 Hz

9.3 Current measurement(isolated):

Measurement type	True virtue value
Measured current	5A
Measurement precision	1%
Display	0~30000A
Maximum power consumption for every channel	<0.01W

9.4 Power supply:

Voltage scope	12V/24V (8~35V) continuous
Maximum operating current	@12V 120mA, @24V 60mA
Maximum spare current	@12V 60mA, @24V 30mA
Crank voltage drop	If voltage before cranking $\geq 10V$, it can maintain at 0V for 80ms, then the voltage is restored to $\geq 5V$, the controller can work normally and it is unnecessary to install other auxiliary power supply.
Measurement precision	1%
Display	0~40V

9.5 Switching value input:

Quantity	3
Maximum connection resistance	10K Ω
Maximum connection current of every channel	0.3mA

9.6 Relay output

Quantity	4
Relay	3A/30VDC

9.7 Charging failure input

Voltage scope	0~35VDC
Measurement precision	1%
Maximum output current	@12V 120mA, @24V 240mA
Measurement precision	1%

9.8 Analog input

Quantity	3
Sensor type	Resistance
Resolution	10 bit
Scope	0~1k Ω
Measurement precision	2% full measurement range, except the sensor error

9.9 Speed sensor

Voltage scope	0~70V
Maximum frequency	10000Hz
Fly wheel teeth number	5~300

9.10 Environmental parameters

Operation temperature scope	-20~70 $^{\circ}$ C IEC60068-2-1 and IEC60068-2-2
Storage temperature scope standard	-30~80 $^{\circ}$ C IEC60068-2-1 and IEC60068-2-2
Humidity standard	60 $^{\circ}$ C, 95%RH, 48 hours, IEC60068-2-30
Electromagnetic compatibility standard	EN61000-6-4 and EN61000-6-2
Vibration standard	EN60068-2-6
Impact standard	EN60068-2-27
Electric safety standard	EN60950-1
Protection class standard	IP65(front) IP20(rear) BS EN 60529



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