DC100D MK2 GENSET PARALLEL CONTROLLER USER MANUAL

V1.5

Software Version

No.	Version	Date	Note
1	V1.0	2021-01-20	Original release.
2	V1.1	2021-04-15	AVR, GOV and other parameter modification. Increase switch input, number of generator poles, mains detection and other functions.
3	V1.2	2021-08-18	Correction of AUX. input function.
4	V1.3	2021-12-11	Increase the Volt. Trans.(PT) and change the voltage setting range
5	V1.4	2022-03-03	Increase the AUX. input function
6	V1.5	2023-03-15	Increase in "Engine balance hours" "Close times" and "Close interval time"

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Symbol Description

Symbol	Description
 Note	Remind operators to operate correctly, otherwise it may cause the equipment not to work correctly.
 Be care	It is indicated that potential hazards can damage equipment without proper precautions.
 Warning	It is indicated if appropriate preventive measures are not taken, potentially dangerous situations may result in death, serious personal injury or significant property losses.


Warning

1. The installation of this equipment must be carried out by professionals.
2. When installing and operating the controller, please read the entire instruction manual first.
3. Any maintenance and commissioning of the equipment must be familiar with all the equipment.
4. t, safety standards and precautions in advance, otherwise it may cause personal injury or damage to related equipment.
5. The engine must have an overspeed protection device independent of the controller system to avoid casualties or other damage caused by engine out of control.
6. After the installation of the controller is completed, please verify that all protection functions are valid.


Be Care

1. Please keep the good connection of the power supply of the controller. Do not share the connection lines of the positive and negative electrodes of the battery with the floating charger.
2. During the operation of the engine, do not disconnect the battery, otherwise it may cause damage to the controller.

Catalogue

1. Summary

This series controller is designed for manual/auto parallel system generators with similar or different capacity. Additionally,It is suitable for independent constant power output and multiple generators in parallel. It allows automatic start/stop, parallel running, data measurement, alarm protection as well as remote control, remote measurement and remote communication function.

4.3inch colorful LCD screen display with brand new UI design is adapted in this controller that the relative failures can be displayed directly. All the parameters can be displayed by simulated indicators and words. Besides, LCD screen can display various faults in the same time that the gen set will be stopped once it can't work smoothly.

The gen set parallel controller utilizing the GOV (Engine Speed Governor) and AVR (Automatic Voltage Regulator) control function, the controller is able to synchronize and share load automatically; it can be used to parallel with other DC100D MK2 controller. DC100D MK2 controller accurately monitors various working states of the generator set. When the generator set works abnormally, it automatically opens the bus bar and disconnects the bus, shuts down the generator set, and displays the fault status on the LCD. SAE J1939 interface enables the controller to communicate with various ECU (ENGINE CONTROL UNIT) which fitted with J1939 interface.

There are Chinese/English interface options, more language can be set according to user's request. All the parameters can be configured through the front face buttons or use programmable interface by RS485 or USB to adjust via PC. It can be widely applied for all kinds of auto control system of gen sets.

2. Main Features

- ◆ 32bit high performance single chip microcomputer.
- ◆ 4.3inch TFT colorful big screen LCD, Available in 5 languages, user's language set if necessary.
- ◆ Indicator and number display through UI surface.
- ◆ Acrylic material is adapted to protect the screen.
- ◆ Silicone panels;
- ◆ USB Port: parameters can be set even without power through USD port to monitor in real time.
- ◆ With RS485 communication port, can achieve "Three Remote" functions via MODBUS protocol.
- ◆ Standard CAN communication port, built-in J1939 protocol, has matched more than 40 kinds of engines.
- ◆ Various kinds of parameters display.
- ◆ Input/output function, status can be shown directly.
- ◆ More categories of surface setting.
- ◆ Real time clock inside: preset time operate and auto maintenance is available. Gen set working plan can be set as per week or month.
- ◆ Protection countdown function, which can set the maintenance time or date.

- The black box function can save the relevant parameters of the unit when the fault alarm occurs in real time, and it is convenient to find the cause of the fault.
- Totally 8 relay's output, among which 6 relay output can be self-configurable, each relay can be set as max 50 functions, besides, there are 3 groups as non-contact terminals.
- With 7 switches input, up to 40 functions optional.
- 5 sensor simulation input connectors, 2 input types configurable and various kinds of units can be set.
- Battery charging control function, which can protect the battery according to battery voltage status.
- Sensor can be self-defined by front face button or PC software.
- Adapt to 3P4W,1P2W,2P3W(120V/240V,50/60HZ).
- Collects and shows 3-phase voltage, current, power parameter and frequency of Bus bar.
- For Bus, controller has loss of phase and phase sequence wrong detection functions; For generator, controller has over voltage, under voltage, over frequency, under frequency, over current, over power, reverse power, loss of phase, phase sequence wrong detection functions.
- Synchronization parameters：Voltage Difference Between Bus bar, Frequency Difference Between Bus bar, Phase Difference Between Bus bar, multiple running modes in auto state: with load running, off load running, demand parallel running.
- Ramp on and ramp off function.
- Various of crank conditions (RPM, Frequency, Oil Pressure) can be chosen.
- Control Protection: Auto Start/Stop of gen set, load transfer (ATS control) and perfect failure display and protection.
- Standard water-proof rubber gasket. The waterproof can reach IP65.
- Module design: All the connections are adapted with European connectors so that installation, connection, repair and replacement can be more easily.

3. Parameters Display

- Engine RPM
- Engine oil pressure
- Engine water temperature
- Engine fuel level
- Engine battery voltage
- Charging voltage
- Generator 3 Phase voltage L-N
- Generator 3 Phase voltage L-L
- Generator phase
- Generator 3 phase current A
- Generator Frequency Hz
- Generator Power Factor COS φ
- Generator active power KW
- Generator apparent power KVA

- Generator reactive power Kvar
- Bus frequency
- Bus Phase voltage L-N
- Bus Phase voltage L-L
- ATS action closing quantity
- Bus Phase
- GOV
- AVR
- Total Crank times
- Current running time
- Total running time
- Current load rate %
- Average loading rate %
- Current consumption KWH
- Total consumption KWH
- Maintenance notice
- 7 switches input status display
- Output status display of 8 relays
- Cumulative running time A (user)
- Accumulated electric energy A (user)

4. Protection

- Over speed
- Under speed
- Low oil pressure
- High water temperature
- Low oil level
- External emergency alarm
- Low coolant level switch warning
- RPM Lost
- Sensor Open
- Over Frequency
- Under Frequency
- Over voltage
- Under voltage
- Over current
- Over power
- Reverse Power
- Loss of Phase
- Phase Sequence Wrong
- Gen load failure
- Gen unload failure
- Gen load disconnect
- Maintenance expire
- ECU alarm failure

- ECU communication Failure
- MSC too few sets
- Louver opening exception
- Emergency Stop
- Crank failure
- Stop Failure
- Charging Failure
- Sync failed
- MSC failed to open

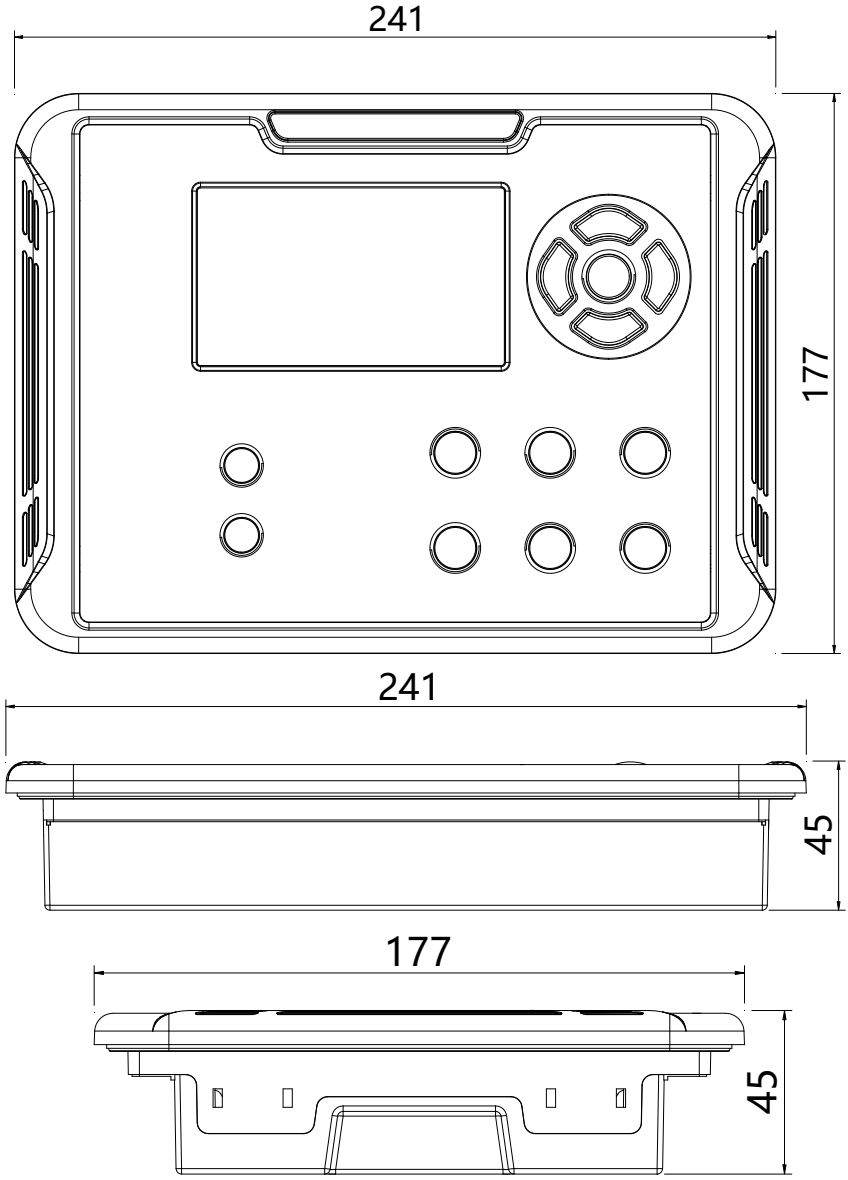
5. Parameters

Options	Parameters
Working voltage	DC9V----36V Continuous
Power consumption	Standby：24V：MAX 2W
	Working：24V：MAX 5W
AC Voltage Input	1P2W 30VAC-360VAC (ph-N)
	2P3W 30VAC-360VAC (ph-N)
	3P4W 30VAC-360VAC (ph-N)
Rotate speed sensor Frequency	1-10000Hz
MAX Accumulating Time	9999999.9Hours（Min Store time:6min）
Fuel Relay Output	Max 16Amp DC+VE Supply voltage
Start Relay Output	Max 16Amp DC+VE Supply voltage
AUX. OUTPUT 1	Max 5Amp DC+VE Supply voltage
AUX. OUTPUT 2	Max 5Amp DC+VE Supply voltage
AUX. OUTPUT 3	Max 5Amp DC+VE Supply voltage
AUX. OUTPUT 4	250V/5 AMP Non-contact normally Open/Closed output
AUX. OUTPUT 5	250V/16 AMP Non-contact normally Open/Closed output
AUX. OUTPUT 6	250V/16 AMP Non-contact normally Open output
Excitation output	DC+VE supply voltage
AUX. Input	Available if connecting with Battery -
Working condition	-30-70℃
Storage condition	-40-85℃
Protection Level	IP65：when waterproof rubber gasket is added between controller and its panel
Insulation strength	Apply AC 2.2kV voltage between high voltage terminal and low voltage terminal; The leakage current is not more than 3mA within 1min.

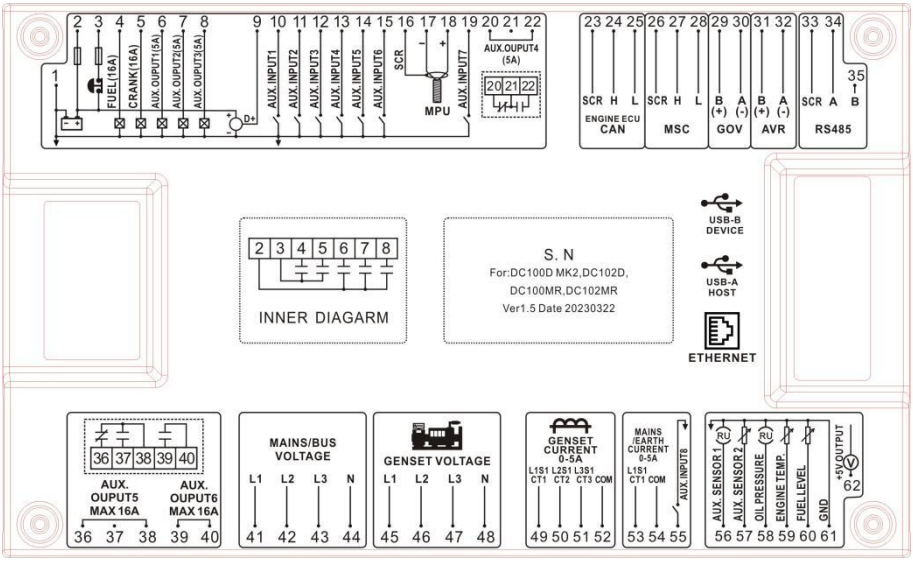
Overall dimension	241mm*177mm*45mm
Panel cutout	220mm*160mm
Weight	1Kg

6. Overall Dimension and Wiring Diagram

◆ Overall Dimension:



◆ Descriptions of terminal connection

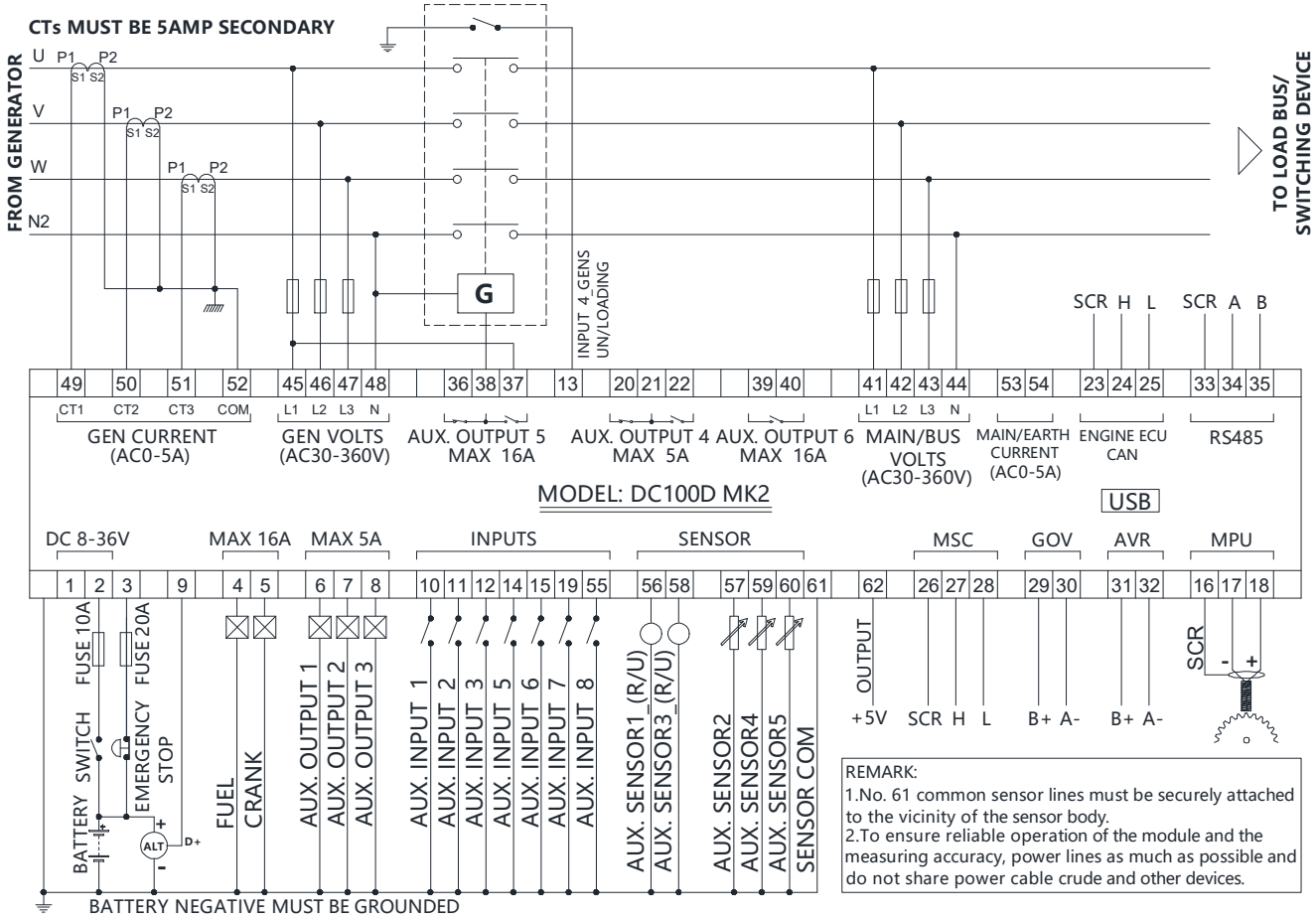


No.	Function	Description	Cable cross sectional area
1	Battery Negative Input B-	Controller power supply input B-.	2.5mm^2
2	Battery Negative Input B+	Controller power supply input B+.	2.5mm^2
3	Emergency Stop Input	B+ voltage input is active, and connected to emergency stop normal closed button.	2.5mm2
4	Fuel Output	Active output, Max 16Amp	1.5mm2
5	Crank Output	Active output, Max 16Amp.	1.5mm2
6	Aux. Output 1	Active output, Max 5Amp.	1.5mm2
7	Aux. Output 2	Active output, Max 5Amp.	1.5mm2
8	Aux. Output 3	Active output, Max 5Amp.	1.5mm2
9	Charging excitation output	DC+VE supply voltage.	1.0mm2
10	Aux. Input 1	The grounding is valid according to the function selection switch input.	1.0mm2
11	Aux. Input 2		1.0mm2
12	Aux. Input 3		1.0mm2
13	Aux. Input 4		1.0mm2

14	Aux. Input 5			1.0mm2
15	Aux. Input 6			1.0mm2
16	Common GND		Connect the battery negative or outer casing.	1.5mm2
17	Speed sensor -		Use a shielded wire to connect the speed sensor.	1.0mm2
18	Speed sensor +			1.0mm2
19	Aux. Input 7		The grounding is valid according to the function selection switch input.	1.0mm2
20	Aux. Output 4	Normally Close	Non-contact normally opened/closed output Max 5Amp, Max 5Amp.	1.5mm2
21		COM		1.5mm2
22		Normally Open		1.5mm2
23	ECU CAN_SCR		Impedance-120Ω shielding wire is recommended, its single-end connect with ground.	1.0mm2
24	ECU CAN_H			1.0mm2
25	ECU CAN_L			1.0mm2
26	MSC CAN_SCR		Impedance-120Ω shielding wire is recommended, its single-end connect with ground.	1.0mm2
27	MSC CAN_H			1.0mm2
28	MSC CAN_L			1.0mm2
29	GOV B+		Shielding line is recommended. Shielding layer connect to earth at GOV end.	1.0mm2
30	GOV A-			1.0mm2
31	AVR B+		Shielding line is recommended. Shielding layer connect to earth at AVR end.	1.0mm2
32	AVR A-			1.0mm2
33	RS485 SCR		A 120 Ω shielded wire and good grounding are recommended.	1.0mm2
34	RS485 A			1.0mm2
35	RS485 B			1.0mm2
36	Aux. Output 5	Normally Close	Non-contact normally opened/closed output Max 16Amp.	1.5mm2
37		Normally Open		1.5mm2
38		COM		1.5mm2

39	Aux. Output 6	Normally Open	Non-contact normally opened output Max 16Amp	1.5mm2
40		COM		1.5mm2
41	Bus bar Voltage L1		Connected to the bus bar L1 phase.	1.0mm2
42	Bus bar Voltage L2		Connected to the bus bar L2 phase.	1.0mm2
43	Bus bar Voltage L3		Connected to the bus bar L3 phase.	1.0mm2
44	Bus bar Voltage N		Connected to the bus bar N phase.	1.0mm2
45	Generator Voltage L1		Connected to the power generation output L1 phase.	1.0mm2
46	Generator Voltage L2		Connected to the power generation output L2 phase.	1.0mm2
47	Generator Voltage L3		Connected to the power generation output L3 phase.	1.0mm2
48	Generator Voltage N		Connected to the power generation output N phase.	1.0mm2
49	Load CT Secondary L1		Current Transformer Secondary Rated 5A.	1.5mm2
50	Load CT Secondary L2			1.5mm2
51	Load CT Secondary L3			1.5mm2
52	Load CT Secondary ICOM		Connect to the common GND instead of the neutral line N.	1.5mm2
53	Reserved			
54	Reserved			
55	Reserved			
56	Aux. Sensor 1		Sensor input types can be configured as: disabled, oil pressure sensor, water temperature sensor, oil level sensor. Aux. Sensor 1/3 compatible with voltage and resistance.	1.0mm2
57	Aux. Sensor 2			1.0mm2
58	Aux. Sensor 3_OP			1.0mm2
59	Aux. Sensor 4_WT			1.0mm2
60	Aux. Sensor 5_FL			1.0mm2
61	Sensor common GND		Connect the battery negative or outer.	1.5mm2
62	5V B+		5V power output, max 50mA	1.0mm2

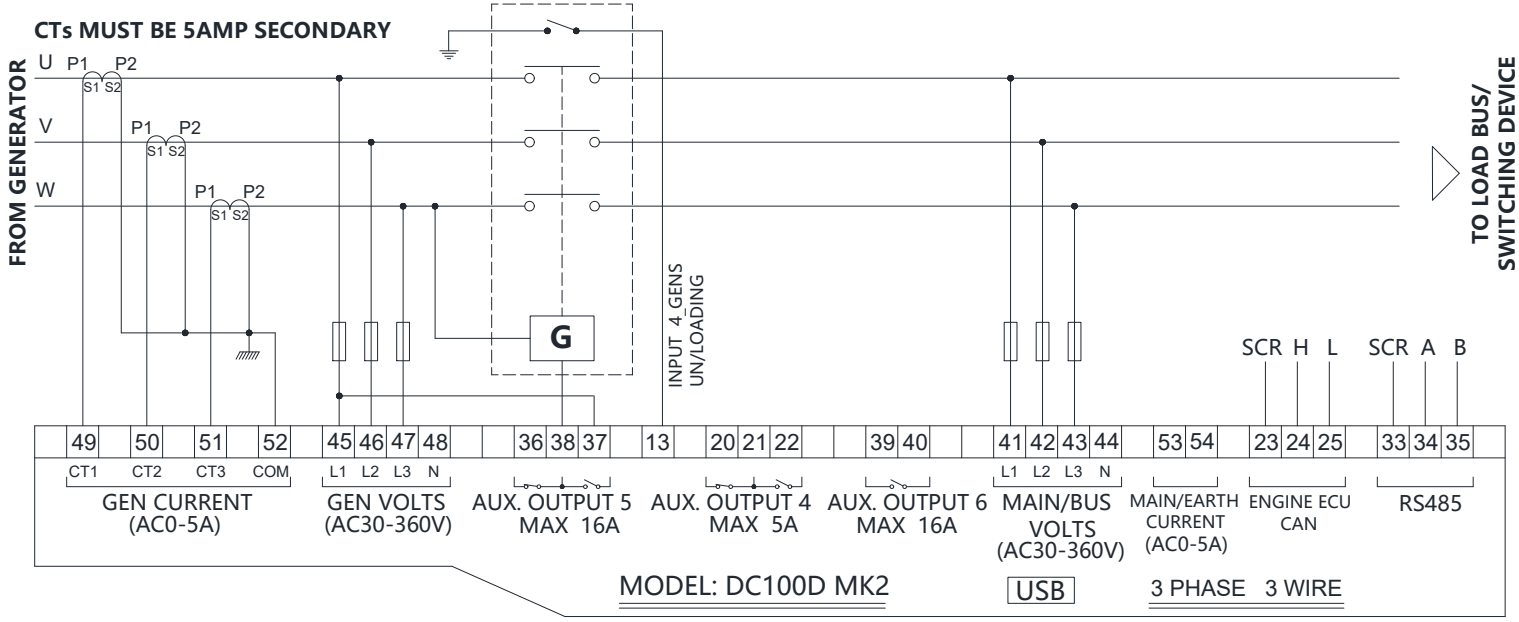
◆ DC100D MK2 3-phase 4-wire Typical Wiring Diagram



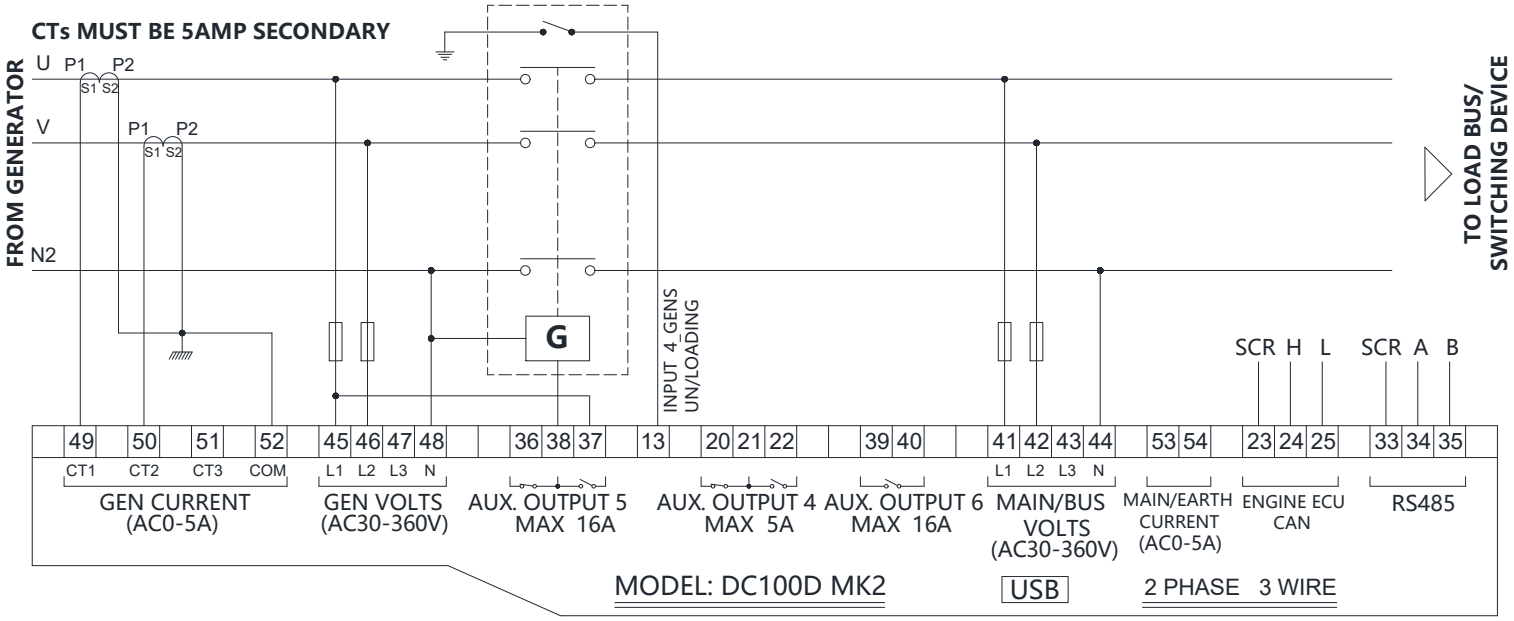
Note: Please don't move battery during running status or it may cause the controller broken!

WARNING: When generator is on-load, C. T. secondary must not be open circuit, Otherwise, the high voltage generated will pose a danger to personal safety.

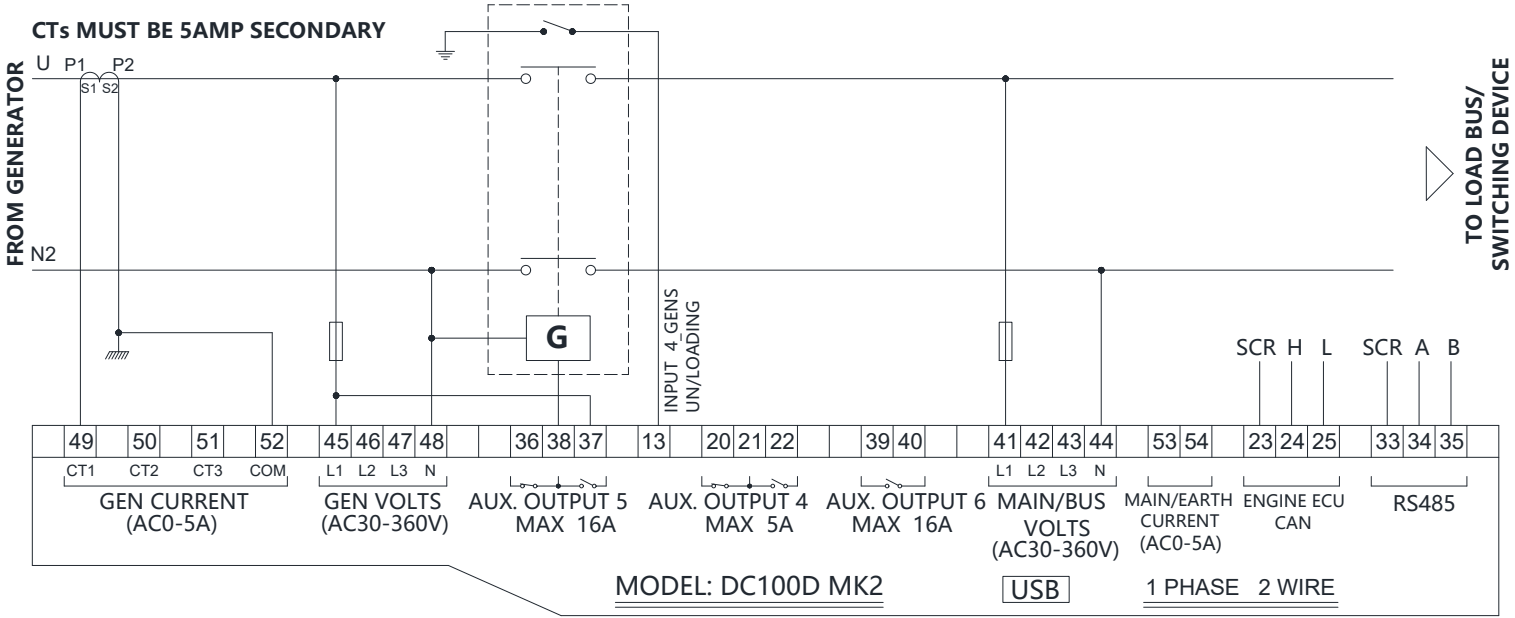
◆ **DC100D MK2 3-phase 3-wire Typical Wiring Diagram**



◆ **DC100D MK2 2-phase 3-wire Typical Wiring Diagram**



◆ DC100D MK2 1-phase 2-wire Typical Wiring Diagram



7. Installation instruction

◆ The controller is fixed by four special fixing members and screws, and the screws of the metal fasteners cannot be too tight.

◆ Panel Cutout: W220mm*H160mm.

Note: If the controller is installed directly in the gen set shell or other fluctuated equipment, the rubber pad must be installed.

◆Battery Voltage Input

DC100D MK2 controller is suitable for 8-36V DC battery voltage. Battery negative must be reliably connected to the enclosure of the engine. The controller power supply B+ and B- must be connected to battery positive and negative, and the wire size must not be less than 2.5mm^2.

NOTE:

In case of floating charger connect charger output to battery positive and negative directly, then, connect battery positive and negative poles to controller positive and negative power supply.

◆Output and relay expansion

Note: All outputs of the controller are relay contacts. The maximum current capacity is described in the "Parameters" in this manual. Please use it in the relay current capacity. If an extended relay is needed, add a continuous current diode (when the extended relay coil is DC) or a resistance-capacitance loop (when the extended relay coil is AC) to both ends of the coil to prevent interference with the controller or other equipment.

◆ AC current input

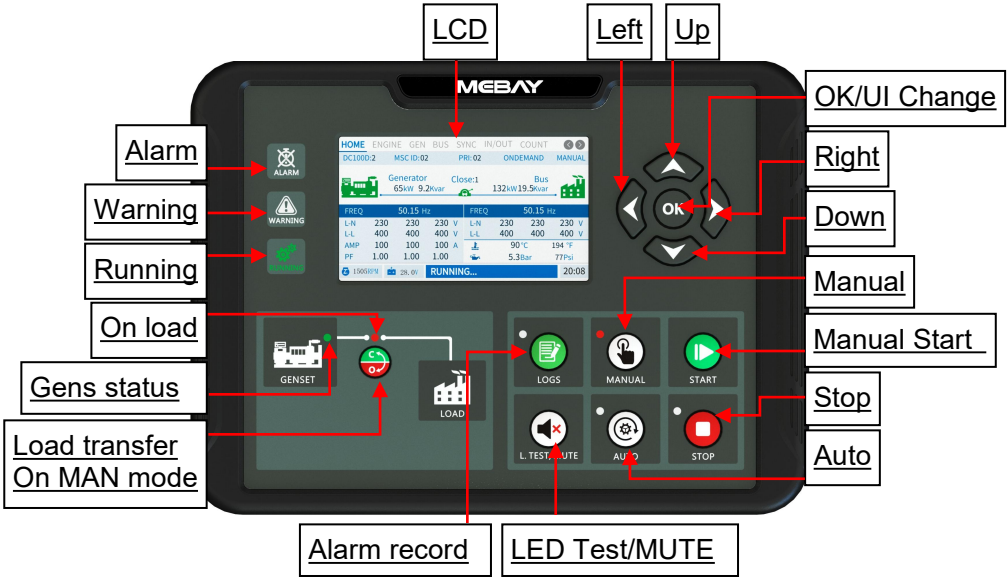
Current transformer with rated secondary current 5A must be externally connected to the controller current input.

WARNING: When generator is on-load, C. T. secondary must not be open circuit, Otherwise, the high voltage generated will pose a danger to personal safety.

◆Withstanding voltage test

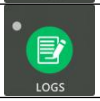
If withstanding voltage test is conducted after the controller has already been installed onto the control panel, please unplug all controller terminal connections in order to prevent high voltage from damaging it.

8. Panel and display



◆ Key Function Description

KEYS	NAME	Main Function
	Stop Reset Revert	◆Can stop generator under manual/auto mode; ◆Can reset shutdown alarm ◆During stop procession, pressing this key again can stop generator immediately. ◆Pressing this key can cancel the setting and back to upper class under edition. ◆Under the setting mode with checking data, the data can be saved and system will exit after pressing.
	Start	◆Start the genset under manual mode. ◆Pressing this key can start the genset under manual testing mode.

	Manual	◆Pressing this key will set the module into manual mode.
	Auto	◆Pressing this key will set the module into auto mode.
	Records	◆Pressing this key to check the alarm records under stop mode.
	LED Test/ Warning clear	◆Test if all LED lights are ok, pressing this key to test if all lighted, all off when loosen it. ◆Under warning, pressing this key in 3 seconds can clear warning and controller will re-check warning. ◆Under alarm, pressing this key can clear the buzzer call. ◆Pressing this key in 6 seconds can clear the buzzer call, pressing it again in 6 seconds can recover the buzzer call.
	Gens Close/On	◆Under manual mode, pressing this key can transfer load to genset.
	Left	◆Under display mode, pressing this key to turn left page. ◆Under edition mode, pressing this key to move the digit.
	Right	◆Under display mode, pressing this key to turn right page. ◆Under edition mode, pressing this key to move the digit.
	Up	◆Under display mode, parts of the page can move up. ◆Under edition mode, pressing this key to move the digit or increase the numbers. ◆Under records mode, pressing this key to move the digit.
	Down	◆Under display mode, parts of the page can move down. ◆Under edition mode, pressing this key to move the digit or decrease the numbers. ◆Under records mode, pressing this key to move the digit.
	OK UI Change	◆Confirm the change under edition mode. ◆Page exited under records checking mode. ◆Black UI and white UI can be switched when Pressing. ◆In standby state, press for 3 seconds to enter the parameter setting mode.
	Setting mode	◆Pressing OK and STOP simultaneously to come into setting mode
	Alarm Records checking	◆Pressing STOP and RIGHT to check the records and any buttons pressed to exit from the page.

◆ **Engine flywheel teeth automatic adjustment**

1) Crank disconnect must be set to include both "speed" and "frequency" options.

2) When the generator frequency and engine speed are not zero, press  and  for more than 0.5 seconds, the controller will automatically calculate and

save the number of flywheel teeth according to the generation frequency and generator poles.

3) After calculating and saving the number of flywheel teeth successfully, the controller shows: " **Flywheel xxx teeth, saved successfully!**"

◆ **Alarm records checking**

DC100D MK2 controller can save 30 group of alarm records which contains the alarm record data includes detailed data such as alarm time, generator parameters, engine parameters, etc.

How to check the alarm records:

1) Enter alarm record page: under stop mode, press to come into alarm records page;

2) Press to turn upper digit and press to turn lower digit in order to choose the record you need. Press OK to confirm the record and come into history records checking page.

3) Press to turn lower records under records checking page. Press to turn upper records and press to revert back to alarm history records page.

4) Exit from records page: In the history records page and checking page, press to exit.

9. Control and operation instruction

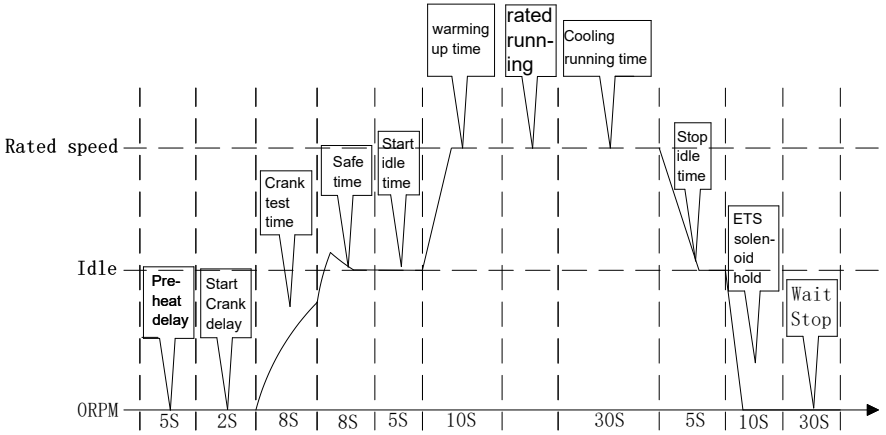
◆ **Manual Start Mode**

press and make sure it is in the stop position before starting.

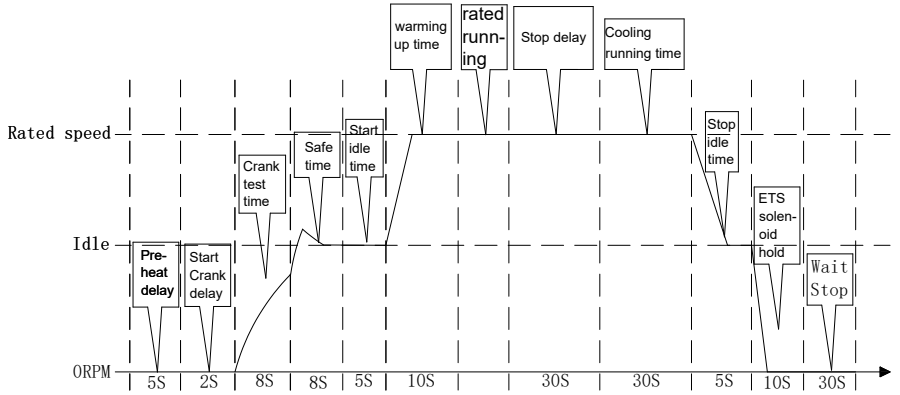
Press " " and the test file indicator is on. At this time, it is detected whether the connection of each sensor is normal. If the sensor is open, the sensor opens an alarm. If it is normal, the unit start process is executed in the following sequence after pressing the " ". automatically switch to Generator provide the power when the unit is running normally. Press the "close/open button" , if the busbar has no voltage, the closing action will be executed directly, if the busbar has voltage, the synchronization will be executed first, and the closing action will be performed after the synchronization is effective. After synchronization, if there is a load on the busbar, the slow load process is executed first, and the load is evenly divided. After closing, press the "close/open button" . If the unit is not loaded, the opening action will be performed directly. If the unit is loaded and more than 2 units are closing, the load reduction process will be executed first, and then the opening action will be executed.

Press " " The controller performs the parking process at the following timing:

Manual start and stop process:



After the manual start is successful, pressing the "automatic key" can be converted into an automatic file. The specific working time is as follows:



◆ **Automatic starting mode:**

In case of running in parallel, after the warming up delay:

a) If bus has no voltage, then the controller will send a closing signal to other waiting parallel gensets and generator close relay will activate, this prevents other sets in the system from attempting to close their own breakers at the same time.

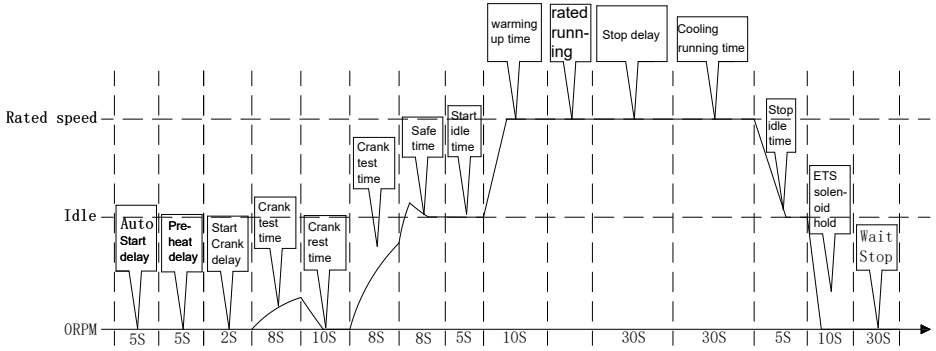
b) If bus has voltage or other gensets are already closed, the controller will adjust speed and voltage through GOV and AVR to synchronize the gensets to the bus; when synchronism requirements has been achieved, breaker close signal will be initiated and the genset will be paralleled with the bus. Once they are paralleled, the controller will control the generator to gradually accelerate and share load with other paralleled gensets.

When started via "Remote Start (off Load)" input, same procedures as above but generator close relay deactivated, moreover, genset off load.

Press the "stop button" to ensure that it is in the stop gear before starting. Press the "auto button" and the automatic gear indicator light is on. At this time, it will detect whether the connection of each sensor is normal. If the sensor is open, it will report an open sensor alarm. If it is normal, wait for the remote start signal to be valid, and when the "start option" is set to "all" Start", the unit will execute the starting process according to the following sequence. When the "start option" is set to "start on demand", the unit will judge the current unit priority (the smaller the value, the higher the priority). If the unit priority is the highest in the MSC network, the unit will execute the starting process according to the following sequence . If the unit priority is not high in the MSC network, according to the load situation of the units already running on the MSC network, if the load of the units already running on the MSC network exceeds the "scheduling start-up percentage", the highest priority of the MSC network not running will be Start, evenly share the load; if the load of the units already running on the MSC network is lower than the "scheduling shutdown percentage", the lowest priority of the MSC network already running will stop and unload the load;

When the unit enters normal rated operation, it will automatically switch to the power supply of the generator set. The controller will detect the remote start signal in real time. When the remote start signal fails, it will execute the "stop delay" and the subsequent shutdown process. Sequence diagram of automatic start and stop:

Auto start and stop process:



◆ Notices in Starting Process

Note 1: During the Cranking time, the controller automatically detects the speed signal, frequency signal and oil pressure value or the charging voltage (according to the parameter setting) to reach the judgment condition of successful start, then the judgment is that the start is successful and the motor relay is closed.

Note 2: Within the safety delay, only respond to emergency stop, immediate stop, over speed, over frequency, Over voltage, ECU communication Failure, ECU alarm shutter open abnormal, other alarms are not responded to.

 Note 3: No response to alarm and warning of under speed, low frequency, under voltage, over current, over power, during start idle time.

 Note 4: No response to low frequency, under voltage, over current, over power is required when entering the Warming-up time.

 Note 5: After entering rated operation, the Gens load relay output.

 Note 6: In the process of shutdown, if the remote starting signal is restored to be valid within the " Cooling time", the rated operation will be entered again.

 Note 7: If the stop key is pressed again during idle time, the idle time will be canceled and the stop operation will be executed directly.

10. Commissioning and precautions

◆ SINGLE UNIT DEBUGGING

1) Check the parameter configuration of the controller;
2) Check the gen-set connections and MSC CAN connection lines between the units. (E.g. if 3 generators are correctly connected, SYNC screen will display Module Number: 3).
3) In manual mode, check if engine and generator data is normal;
4) In manual mode check if switch opens and closes normally;
5) In manual mode, after closing the breaker check if generator frequency can be adjusted to the
rated frequency (e.g. set the rated frequency as 52Hz/48Hz);
6) In manual mode, after closing the breaker check if generator voltage can be adjusted to the
rated voltage (e.g. set the rated voltage as 240V/220V);
7) Activate manual start on-load, check if power factor, active power and reactive power are normal; if negative value occurs, check generator voltage and current phase sequence, current transformer incoming line direction, current transformer secondary current dotted terminal;
8) In manual mode do performance tests according to the national standards.

 Note: Please refer to DC100D MK2 Synchronization Plan List for more information on GOV and AVR settings.

◆ MANUAL PARALLEL OPERATION OFF-LOAD

1) Manually close parallel sets, check that the units synchronization is balanced and breaker close impulse current is not too high;
2) During parallel operation off load, check that there is no high circumfluence on current screen;
3) During parallel operation off load, check if the output of active and reactive power is equal to zero; if it is not, then check if there is power oscillation; if there is, adjust the gain and stability values of HGM9510 controller, or adjust engine GOV or generator AVR gain and stability potentiometer to avoid active and reactive power oscillation; output close to 0.

◆ **MANUAL PARALLEL OPERATION ON-LOAD**

1) During manual parallel, perform on-load test and check if active and reactive power is evenly distributed between all the gensets;
2) During manual parallel, perform ramp on-load test to see if there is high overshoot or power oscillation during this period; if there is, regulate Load Ramp via PC software;
3) During manual parallel, perform ramp off-load test to see if gen-set breaker opens after reaching minimum set value (%);
4) During manual parallel, perform impact load test and damp load test to check if there is power oscillation.

◆ **AUTOMATIC PARALLEL OPERATION**

When the controller is in auto status, if digital input "remote start on-load (on demand)" is active, it will carry out automatic parallel, start and stop operation. There are 3 ways of automatic parallel operation:
1) Start on demand: the module with the highest priority starts firstly. When load exceeds the pre-set start maximum percentage, the second according to the priority module will start the gen-set, synchronize and share load. When load falls lower than the preset minimum stop percentage, after stop delay the second module breaker will be open and the module will be cooled down and stopped.
2) Start all sets initially: all the modules start at the same time; the first module to reach load condition closes first; when other modules reach load condition, they synchronize one by one.
3)Start on demand all sets: all the modules start at the same time; When the load falls lower than the preset minimum stop percentage, after stop delay the second module breaker will be open and the module will be cooled down and stopped.
4) Engine balanced running time: Engine with the lowest total run time starts first. When the running gen-set total run time exceeds the other gen-set balanced running time, then the gen-set with the next lowest total run time starts (both "start on demand" or "start all sets initially" or "Start on demand all sets" modes are possible); other gen-sets enter parallel operation after synchronizing. Opening breaker, unloading and stop is performed automatically. All the gen-sets are repeatedly started and stopped according to their total run time.

◆ **Mains grid-connected mode**

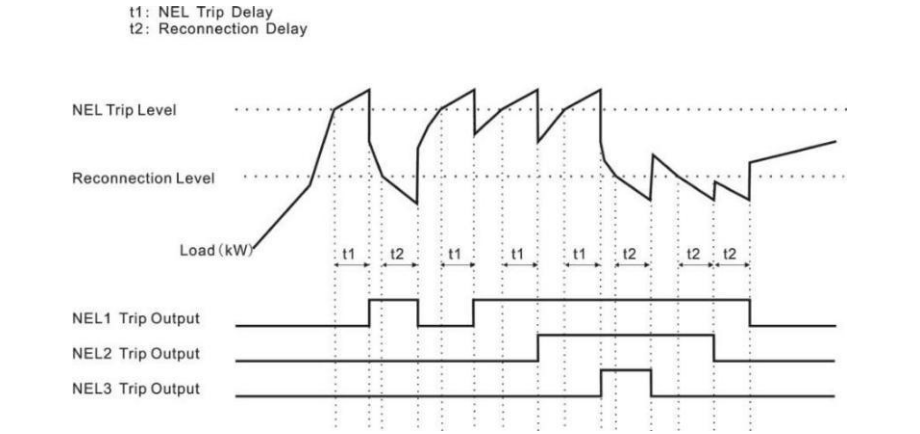
When the AUX.INPUT is valid for mains grid connection, two modes are fixed output:
The unit is based on the rated Full kW rating * mains kW output percentage;
The unit is based on the rated Full kvar rating * mains kvar output percentage;

◆ **LOAD SHEDDING**

Non-essential load ---- NEL for short. The controller can control the NEL1, NEL2 and NEL3 to trip separately. The order of the essentiality is: NEL3 > NEL2 > NEL1

1)Auto trip：

When NEL auto trip is enabled: If the genset power has exceed the NEL trip value, after the trip delay, NEL1 will trip the earliest, and then is NEL2，NEL3； When NEL auto reconnection is enabled: If the genset power has fallen below the auto reconnection set value, after the auto reconnection delay, NEL3 will reconnection the earliest, and then is NEL2，NEL1；



2)Manual Trip

If NEL manual trip input is active (earthed failing edge is active), NEL1 will trip without delay; If NEL manual trip input is active again, NEL2 will trip; If NEL manual trip input is active the third time, NEL3 will trip. During this process, the controller do not detect if the genset power has exceed the NEL trip value or not. If NEL manual reconnection input is active (earthed failing edge is active), NEL3 will reconnect without delay; If NEL manual reconnection input is active again, NEL2 will reconnect; If NEL manual reconnection input is active the third time, NEL1 will reconnect. During this process, the controller detects the genset power: if the genset power has fallen below the NEL reconnection value, then the input is active; if it doesn’ t, the input is deactivated.

Note: When auto trip and auto reconnection are enabled, manual trip is still active.

11. Warnings and Shutdown Alarms

◆ Warnings

Notes: Warning is a non-serious failure state, which will not harm the gensets system for the time being. It only reminds operators to pay attention to the situation that does not meet the requirements and solve it in time to ensure the continuous operation of the system. When the warning occurs, the gensets does not stop. Once the fault is removed, the warning is automatically canceled.

Over Speed Warning

When the controller detects that the engine speed is higher than "**Over speed warning**", Then start warning delay and the duration (Over Speed Warning delay) have not returned to normal, the warning of over speed is reported. "**WARNING**" lights will light up, Generators will not stop, displays " **Over speed** " on the current fault screen.

Under Speed Warning

When the controller detects that the engine speed is lower than "**Under speed warning**", Then start warning delay and the duration (Under Speed Warning delay) have not returned to normal, the warning of under speed is reported. "**WARNING**" lights will light up, Generators will not stop, displays " **Under speed** " on the current fault screen.

Low fuel level sensor warning

When the controller detects that the fuel level value is lower than the "**Low fuel level warning"**, Then start warning delay and the duration (Low fuel level sensor alarm delay) have not returned to normal, the warning of Low fuel level warning is reported. "**WARNING**" lights will light up, Generators will not stop, displays "**Low fuel level-A**" on the current fault screen.

Low fuel level switch warning

When the controller detects that the programmable input "**Low fuel level warning input"** switch is active, it starts warning delay and lasts for Normal alarm delay. When the **"Low fuel level warning input"** switch is enabled, the engine low fuel level switch warning is reported. "**WARNING**" lights will light up, Generators will not stop, displays "**Low fuel level-D**" on the current fault screen.

External instant warning

When the controller detects that the programmable input "**External instant warning input"** switch is active, it starts warning delay and lasts for Normal alarm delay. When the **"External instant warning input"** switch is enabled, the warning is reported. "**WARNING**" lights will light up, Generators will not stop, displays "**Instant warn**" on the current fault screen.

Speed signal lost warning

When the controller parameter "**Action if RPM lost**" is set to "**warning**", the detected speed value is 0, Then start warning delay and the duration (Speed signal alarm delay) have not returned to normal, the warning of speed signal lost warning is reported. "**WARNING**" lights will light up, Generators will not stop, displays "**Lose speed**" on the current fault screen.

Oil pressure sensor disconnected warning

When the controller parameter **"Action if low oil pressure sensor disconnected"** is set to "**warning**", When the oil pressure sensor is detected to be disconnected, Then start warning delay and the duration (Normal alarm delay) have not returned to normal, the warning of Oil pressure sensor disconnected warning is reported. **"WARNING"** lights will light up, Generators will not stop, displays **"OP sensor open**" on the current fault screen.

Coolant temperature sensor disconnected warning

When the controller parameter **"Action if water temperature sensor disconnected"** is set to **"warning"**, When the coolant temperature sensor is detected to be disconnected, Then start warning delay and the duration (Normal alarm delay) have not returned to normal, the warning of coolant temperature sensor disconnected warning is reported. "**WARNING**" lights will light up, Generators will not

stop, displays **"WT sensor open"** on the current fault screen.

Fuel Level sensor disconnected warning
When the controller parameter **"Action if fuel Level sensor disconnected"** is set to **"warning"**, When the fuel Level sensor is detected to be disconnected, Then start warning delay and the duration (Normal alarm delay) have not returned to normal, the warning of fuel Level sensor disconnected warning is reported. **"WARNING"** lights will light up, Generators will not stop, displays **"FL sensor open"** on the current fault screen.

Gens over frequency warning
When the controller detects that the generator frequency is higher than "**Over frequency warning**", Then start warning delay and the duration (Over frequency warning delay) have not returned to normal, the warning of over frequency is reported. "**WARNING**" lights will light up, Generators will not stop, displays " **Over frequency** " on the current fault screen.

Gens under frequency warning
When the controller detects that the generator frequency is lower than "**Under frequency warning**", Then start warning delay and the duration (Under frequency warning delay) have not returned to normal, the warning of under frequency is reported. "**WARNING**" lights will light up, Generators will not stop, displays " **Under frequency** " on the current fault screen

Gens over voltage warning
When the controller detects that the generator voltage is higher than "**Over voltage warning**", Then start warning delay and the duration (Over voltage warning delay) have not returned to normal, the warning of over voltage is reported. "**WARNING**" lights will light up, Generators will not stop, displays " **Over voltage** " on the current fault screen.

Gens under voltage warning
When the controller detects that the generator voltage is lower than "**Under voltage warning**", Then start warning delay and the duration (Under voltage warning delay) have not returned to normal, the warning of under voltage is reported. "**WARNING**" lights will light up, Generators will not stop, displays " **Under voltage** " on the current fault screen.

Over current warning
When the controller detects that the generator current is higher than "**Phase current over-load warning**", Then start warning delay and the duration (Over current warning delay) have not returned to normal, the warning of over current is reported. "**WARNING**" lights will light up, Generators will not stop, displays " **Over current** " on the current fault screen.

Over power warning
When the controller detects that the generator power is higher than "**Over total power warning**", Then start warning delay and the duration (Over power warning delay) have not returned to normal, the warning of over power is reported. "**WARNING**" lights will light up, Generators will not stop, displays " **Over power** " on the current fault screen.

Gen Loss of Phase
When the controller detects that the generator "**Gen Loss of Phase**", Then start warning delay and the duration (Normal warning delay) have not returned to normal, the warning of gen loss of phase is reported. "**WARNING**" lights will light up, Generators will not stop, displays " **Gen Loss of Phase** " on the current fault screen.

Gen Phase Sequence Wrong
When the controller detects that the generator "**Gen Phase Sequence Wrong**", Then start warning delay and the duration (Normal warning delay) have not returned to normal, the warning of gen phase sequence wrong is reported. "**WARNING**" lights will light up, Generators will not stop, displays " **Gen Phase Sequence Wrong** " on the current fault screen.

Maintenance expiration warning
When the controller parameter "**Maintenance expire**" is set to "**warning**", when the primary countdown to maintenance is detected as "0" or primary maintenance date less than current date, then start warning delay and the duration (normal alarm delay), the warning of maintenance expiration is reported. "**ALARM**" lights on, without stopping the engine, and displays "**maintain end**" on the LCD screen.

ECU faults warning
When the controller detects the warning information of ECU, Then start warning delay and the duration (Normal alarm delay) have not returned to normal, the warning of ECU faults warning is reported. "**WARNING**" lights will light up, Generators will not stop, displays "**ECU faults warn**" on the current fault screen.

ECU Communication Failure Warning
When the controller parameter "**CAN failure**" is set to "**warning**", and controller does not receive any message sent by ECU. It started to delay and lasted for some time (Normal alarm delay), but still did not receive the message from ECU, the warning of ECU faults warning is reported. "**WARNING**" lights will light up, Generators will not stop, displays "**ECU comm. fail**" on the current fault screen.

Low coolant level switch warning
When the controller detects that the programmable input "**Low water level warning**" switch is active, it starts warning delay and lasts for Normal alarm delay. When the "**Low water level warning**" switch is enabled, the engine low coolant level switch warning is reported. "**WARNING**" lights will light up, Generators will not stop, displays "**Low water level**" on the current fault screen.

Over battery voltage warning
When the controller detects that the battery voltage is over than the "**Over battery voltage warning**", Then start warning delay and the duration (Over battery voltage

alarm delay) have not returned to normal, the warning of over battery voltage warning is reported. "**WARNING**" lights will light up, Generators will not stop, displays "**Over BATT volt**" on the current fault screen.

Under battery voltage warning

When the controller detects that the battery voltage is lower than the "**Under battery voltage warning"**, Then start warning delay and the duration (Under battery voltage alarm delay) have not returned to normal, the warning of Under battery voltage warning is reported. "**WARNING**" lights will light up, Generators will not stop, displays "**Under BATT volt**" on the current fault screen.

Charging failure warning

When the gap between D+ and B+ is over than this value, and there is charging failure but still high (Charging failure warning delay), then charge failure warns. "**WARNING**" lights will light up, Generators will not stop, displays "**Charger fault**" on the current fault screen. Once the gap is lower than the value, warns clear.

Floating charger fault warning

When the controller detects that the programmable input "**Charging failure warning"** switch is active, it starts warning delay and lasts for Normal alarm delay. When the **"Charging failure warning"** switch is enabled, the engine floating charger fault warning is reported. "**WARNING**" lights will light up, Generators will not stop, displays "**Batt charge fail**" on the current fault screen.

MSC Too Few Modules

When the controller detects that the generator "**MSC Too Few Modules**", Then start warning delay and the duration (Normal warning delay) have not returned to normal, the warning of MSC Too Few Modules is reported. "**WARNING**" lights will light up, Generators will not stop, displays " **MSC Too Few Modules** " on the current fault screen.

Fail to sync

When the controller does not detect the "synchronization signal" within the synchronization time, a synchronization failure warning is reported. the warning of Fail to sync is reported. "**WARNING**" lights will light up, Generators will not stop, displays " **Fail to sync** " on the current fault screen.

Reverse Power

When the controller parameter " **Reverse Power**" is set to "**warning**", Controller detects higher than the" **Reverse Power"**, it starts warning delay and lasts for Normal alarm delay. "**WARNING**" lights will light up, Generators will not stop, displays " **Reverse Power** " on the current fault screen.

Gen onload fail

When the controller generates power and closes the output, controller does not detect the " **Gen onload signal"** within the 5 seconds, the warning of Gen onload fail is reported. "**WARNING**" lights will light up, Generators will not stop, displays " **Gen onload fail** " on the current fault screen.

Gen unload fail

When "Action if Gen unload fail " is set to "warning" the controller generates power and opens the output, controller does not detect the " **Gen unload signal**" within the 5 seconds, the warning of Gen unload fail is reported. "**WARNING**" lights will light up, Generators will not stop, displays " **Gen unload fail** " on the current fault screen.

◆ **Starting fault**

Fail to Start

If the number of cranks exceeds the predetermined number of cranks, the failure of start-up will be reported if the start-up of the generating unit is still unsuccessful. "**ALARM**" lights on, without stopping the engine, and displays " **Crank failure** " on the current fault screen.

◆ **Shutdown Alarms**

 Warning: After the Shutdown Alarm occurs, the system will be locked immediately and the generator set will be stopped. Only after troubleshooting, press  key to clear the alarm, can it be re-operated.

 Notes：When the shutdown alarm failure occurs, the "**ALARM**" lights will light up and the generator unit automatically stops.

Over Speed Alarm

When the controller detects that the engine speed is higher than "**Over speed alarm**", Then start alarm delay and the duration (Over Speed Alarm delay), the alarm of over speed is reported. "**ALARM**" lights will light up, Generator stops running, and displays " **Over speed** " on the current fault screen.

Under Speed Alarm

When the controller detects that the engine speed is under than "**Under speed alarm**", Then start alarm delay and the duration (Under Speed Alarm delay) the alarm of under speed is reported. "**ALARM**" lights will light up, Generator stops running, and displays " **Under speed** " on the current fault screen.

Low Oil Pressure Sensor Alarm

When the controller detects that the engine Oil Pressure is lower than "**Low oil pressure alarm**", Then start alarm delay and the duration (Normal alarm delay) have not returned to normal, the alarm of low Oil Pressure is reported. "**ALARM**" lights will light up, Generator stops running, and displays "**Low OP sensor**" on the current fault screen.

Low oil pressure switch alarm

When the controller detects that the programmable input port "**Low oil pressure alarm input"** switch is active. Start low oil pressure switch alarm delay, for a period of time "Normal alarm delay" programmable input port "**low oil pressure alarm input**" switch is valid. Then the alarm, the public alarm light "**ALARM**" lights will light

up, stop the unit operation, and display **"Low OP switch"** on the current fault screen.

High coolant temperature sensor alarm

When the controller detects that the coolant temperature value is higher than the "**High coolant temperature alarm"**, Then start alarm delay and the duration (High coolant temperature sensor alarm delay) have not returned to normal, the alarm of High coolant temperature alarm is reported. "**ALARM**" lights will light up, Generator stops running, and displays "**High WT sensor**" on the current fault screen.

High coolant temperature switch alarm

When the controller detects that the programmable input port "**High coolant temperature alarm switch"** switch is active. Start low oil pressure switch alarm delay, for a period of time "Normal alarm delay" programmable input port "**High coolant temperature alarm switch**" is valid. Then the alarm, the public alarm light "**ALARM**" lights will light up, stop the unit operation, and display **"High WT switch"** on the current fault screen.

Low fuel level sensor alarm

When the controller detects that the fuel level value is lower than the "**Low fuel level alarm"**, Then start alarm delay and the duration (Low fuel level sensor alarm delay) have not returned to normal, the alarm of Low fuel level alarm is reported. "**ALARM**" lights will light up, Generator stops running, and displays "**Low fuel level-A**" on the current fault screen.

Low fuel level switch alarm

When the controller detects that the programmable input "**Low fuel level alarm input"** switch is active, it starts alarm delay and lasts for Normal alarm delay. When the **"Low fuel level alarm input"** switch is enabled, the engine low fuel level switch alarm is reported. "**ALARM**" lights will light up, Generator stops running, and displays "**Low fuel level-D**" on the current fault screen.

External instant alarm

When the controller detects that the **"External instant alarm input"** switch of the programmable input port is valid, the external instant trip is started and the shutdown alarm delay is delayed for a period of time **"Normal alarm delay"** programmable input port **"External instant alarm input"** switch When it is valid, it will alarm, the public alarm light **"ALARM"** lights will light up, Generator stops running, and display **"Instant parking"** on the current fault screen.

Speed signal lost alarm

When the controller parameter "**Action if RPM lost**" is set to "**alarm**", the detected speed value is 0, Then start alarm delay and the duration (Speed signal lost alarm delay) have not returned to normal, the alarm of speed signal lost warning is reported. "**ALARM**" lights will light up, Generator stops running, displays "**Lose speed**" on the current fault screen.

Oil pressure sensor disconnected alarm

When the controller parameter **"Action if low oil pressure sensor disconnected"** is set to **"alarm"**, When the oil pressure sensor is detected to be disconnected, Then

start alarm delay and the duration (Normal alarm delay) have not returned to normal, the alarm of Oil pressure sensor disconnected alarm is reported. **"ALARM"** lights will light up, Generator stops running, displays **"OP sensor open"** on the current fault screen.

Coolant temperature sensor disconnected alarm
When the controller parameter **"Action if water temperature sensor disconnected"** is set to **"alarm"**, When the coolant temperature sensor is detected to be disconnected, Then start alarm delay and the duration (Normal alarm delay) have not returned to normal, the alarm of coolant temperature sensor disconnected alarm is reported. **"ALARM"** lights will light up, Generator stops running, displays **"WT sensor open"** on the current fault screen.

Fuel Level sensor disconnected alarm
When the controller parameter **"Action if fuel Level sensor disconnected"** is set to **"alarm"**, When the fuel Level sensor is detected to be disconnected, Then start alarm delay and the duration (Normal alarm delay) have not returned to normal, the alarm of fuel Level sensor disconnected alarm is reported. **"ALARM"** lights will light up, Generator stops running, displays **"FL sensor open"** on the current fault screen.

Gens over frequency alarm
When the controller detects that the generator frequency is higher than "**Over frequency alarm**", Then start alarm delay and the duration (Over frequency delay) the alarm of over frequency is reported. "**ALARM**" lights will light up, Generator stops running, displays " **Over frequency** " on the current fault screen.

Gens under frequency alarm
When the controller detects that the generator frequency is lower than "**Under frequency alarm**", Then start alarm delay and the duration (Under frequency alarm delay) the alarm of under frequency is reported. "**ALARM**" lights will light up, Generator stops running, displays " **Under frequency** " on the current fault screen

Gens Over voltage alarm
When the controller detects that the generator voltage is higher than "**Over voltage alarm**", Then start alarm delay and the duration (Over voltage alarm delay) the alarm of over voltage is reported. "**ALARM**" lights will light up, Generator stops running, displays " **Over voltage** " on the current fault screen.

Gens Under voltage alarm
When the controller detects that the generator voltage is lower than "**Under voltage alarm**", Then start alarm delay and the duration (Under voltage alarm delay) the alarm of under voltage is reported. "**ALARM**" lights will light up, Generator stops running, displays " **Under voltage** " on the current fault screen.

Over current alarm
When the controller detects that the generator phase current is higher than "**Phase current over-load alarm**", Then start alarm delay and the duration (Over current

alarm delay) the alarm of over current is reported. "**ALARM**" lights will light up, Generator stops running, displays " **Over current** " on the current fault screen.

Over power alarm
When the controller detects that the generator power is higher than "**Over total power alarm**", Then start alarm delay and the duration (Over power alarm delay) the alarm of over power is reported. "**ALARM**" lights will light up, Generator stops running, displays " **Over power** " on the current fault screen.

Generator loading failure
When the controller parameter "**Gens breaker checking**" is set to "**alarm**", When the ATS switch is switched, it is detected that the programmable input switch of "**Gens un/loading input**" is invalid. Then start alarm delay and the duration (Normal alarm delay) have not returned to normal, the alarm of generator loading failure is reported. "**ALARM**" lights will light up, Generator stops running, displays " **Gens onload fail** " on the current fault screen.

Mains over frequency alarm
When the controller detects that the mains frequency is higher than "**mains over frequency alarm**", Then start alarm delay and the duration (mains over frequency delay) the alarm of over frequency is reported. "**ALARM**" lights will light up, Generator stops running, displays "**Mains over frequency**" on the current fault screen.

Mains under frequency alarm
When the controller detects that the mains frequency is lower than "**mains under frequency alarm**", Then start alarm delay and the duration (mains under frequency alarm delay) the alarm of under frequency is reported. "**ALARM**" lights will light up, Generator stops running, displays " **Mains Under frequency** " on the current fault screen

Mains over voltage alarm
When the controller detects that the mains voltage is higher than "**mains over voltage alarm**", Then start alarm delay and the duration (mains over voltage alarm delay) the alarm of over voltage is reported. "**ALARM**" lights will light up, Generator stops running, displays " **Mains over voltage**" on the current fault screen.

Mains Under voltage alarm
When the controller detects that the mains voltage is lower than "**mains under voltage alarm**", Then start alarm delay and the duration (mains under voltage alarm delay) the alarm of under voltage is reported. "**ALARM**" lights will light up, Generator stops running, displays " **Mains under voltage** " on the current fault screen.

Maintenance expiration alarm
When the controller parameter "**Primary maintenance expire**" is set to "**alarm**", when the primary countdown to maintenance is detected as "0" or primary

maintenance date less than current date, then start alarm delay and the duration (normal alarm delay), the alarm of maintenance expiration is reported. "**ALARM**" lights on, without stopping the engine, and displays "**Maintain end**" on the LCD screen.

ECU faults alarm
When the controller detects the alarm information of ECU, Then start alarm delay and the duration (Normal alarm delay) have not returned to normal, the alarm of ECU faults alarm is reported. "**ALARM**" lights will light up, Generator stops running, displays "**ECU faults warn**" on the current fault screen.

ECU communication failure alarm
When the controller parameter "**CAN failure**" is set to "**alarm**", and controller does not receive any message sent by ECU. It started to delay and lasted for some time (Normal alarm delay) but still did not receive the message from ECU, the alarm of ECU faults alarm is reported. "**ALARM**" lights will light up, Generator stops running, displays "**ECU comm. fail**" on the current fault screen.

Low coolant level switch alarm
When the controller detects that the programmable input "**Low water level alarm"** switch is active, it starts alarm delay and lasts for Normal alarm delay. When the **"Low water level alarm"** switch is enabled, the engine low coolant level switch alarm is reported. "**ALARM**" lights will light up, Generator stops running, displays "**Low water level**" on the current fault screen.

Louver opening exception alarm
When the controller detects that the programmable input "**Louver status input"** switch is active, it starts alarm delay and lasts for Normal alarm delay. When the **"Louver status input"** switch is enabled, the Louver status input alarm is reported. "**ALARM**" lights will light up, Generator stops running, displays "**Louver abnormal**" on the current fault screen.

Emergency stop alarm
When the controller detects that the input voltage of PIN 3 is less than 2V, then start alarm delay and the duration (Emergency delay) have not returned to normal, the alarm of Emergency Stop is reported. "**ALARM**" lights will light up, Generator stops running, and displays "**Emergency stop**" on the current fault screen.

Stop failure with speed alarm
When the controller detects that the speed is not "0" after the execution of the shutdown, the alarm of stop failure is reported. "**ALARM**" lights will light up and displays "**Stop fail-RPM**" on the current fault screen.

Stop failure with frequency alarm
When the controller detects that the frequency is not "0" after the execution of the shutdown, the alarm of stop failure is reported. "**ALARM**" lights will light up and displays "**Stop fail-Hz**" on the current fault screen.

Stop failure with pressure alarm
When the controller detects that the Oil **Pressure** is not "0" after the execution of the

shutdown, the alarm of stop failure is reported. "**ALARM**" lights will light up and displays " **Stop fail-OP-A** " on the current fault screen.

MSC Too Few Modules
When the controller parameter "**MSC Too Few Modules**" is set to "**alarm**", and detects that the MSC too few modules. It started to delay and lasted for some time (Normal alarm delay) but still did not receive the message from MSC ID, the alarm of MSC faults alarm is reported. "**ALARM**" lights will light up, Generator stops running, displays " **MSC Too Few Modules** " on the current fault screen.

Fail to sync
When the controller parameter " **Fail to sync**" is set to "**alarm**" and not detected sync signal within the synchronization time, the alarm of Fail to sync faults alarm is reported. "**ALARM**" lights will light up, Generator stops running, displays " **MSC Too Fail to sync** " on the current fault screen.

Reverse Power
When the controller parameter " **Reverse Power**" is set to "**alarm**", and detects higher than "**Reverse Power alarm**", Then start alarm delay and the duration (Reverse Power alarm delay) the alarm of reverse power is reported. "**ALARM**" lights will light up, Generator stops running, displays " **Reverse Power** " on the current fault screen.

Over current Trip and running
When the controller detects that the generator phase current is higher than "**Phase current over-load** T**rip and running**", Then start alarm delay and the duration (Normal alarm delay) have not returned to normal, the alarm of over current is reported. "**ALARM**" lights will light up, Generator trip and running, displays " **Over current Trip and running** " on the current fault screen.

Over power Trip and running
When the controller detects that the generator power is higher than "**Over power Trip and running**", Then start alarm delay and the duration (Over power alarm delay) the alarm of over power is reported. "**ALARM**" lights will light up, Generator trip and running, displays " **Over power Trip and running** " on the current fault screen.

Reverse Power Trip and running
When the controller detects that the generator reverse power is higher than "**Reverse Power Trip and running**", Then start alarm delay and the duration (Reverse Power alarm delay) the alarm of over power is reported. "**ALARM**" lights will light up, Generator trip and running, displays " **Reverse Power Trip and running** " on the current fault screen.

Sync fail no stop and running
When the controller not detects the busbar voltage after closing, fail to sync then start alarm delay and the duration (Sync fail alarm delay) the alarm of over power is reported. "**ALARM**" lights will light up, Generator trip and running, displays " **Sync fail no stop and running** " on the current fault screen.

MSC failed to open

When "Action if Gen unload fail " is set to "All Alarm and stop" the controller generates power and opens the output,controller does not detect the " **Gen unload signal**" within the 5 seconds, the alarm of "**MSC failed to open** " is reported. "**ALARM**" lights will light up, MSC ordered all units to open and shut down immediately.displays " **MSC failed to open** " on the current fault screen.

12. Parameters setting

◆ Enter the edition page

Please set the parameters according to below steps:

1) In the stop mode, Press and hold the OK button for more than 3 seconds, or the button, press the OK button, and then release the button to enter the setting menu interface;

2) Select the detailed parameter settings of the controller and press the OK key to enter the password interface;

3) The default factory password of the controller is "07623";

4) Press and add number 1, press to reduce number 1, press to turn the digit into right, press to turn the digit into left, press OK once done. Then system comes into menu after confirmation of password setting. The screen will display error if password is wrong. The correct password should be put after pressing any button.

5) Press to turn the digit into upper position, press to turn the digit into lower position, press OK to get into parameters setting page.

6) Press to shift up the parameters, press to shift down the parameters, press OK to get into parameter changing page.

7) Press to add number 1, press to reduce number 1, press to turn the digit into right and press to turn the digit into left, press OK once done. If the parameters setting is in the valid setting range, then it can be saved, if not, it can't be saved.

8) Press OK and to save the parameters and exit from edition page.

9) Press to revert back to last class if in any setting position.

Revert back to default: put password "97011" when coming into parameters setting, then all the parameters can be set as defaults.

Note: the data can't be saved if the user didn't press OK and to confirm the setting.

◆ **Parameter list.**

1)Delay time setting

No	Parameter	Range***(default)***	Notes
1	Start delay	0-65000s***(5s)***	The time during the genset starts after the remote signal is valid.
2	Preheat time	0-6500.0s ***(0.0s)***	The time needed to be preheated before the starter on power.
3	Fuel output delay	1.0-60.0s ***(2.0s)***	The time the fuel valve relay outputs before the motor operates.
4	Cranking time	3.0-60.0s ***(8.0s)***	The time when the starter is on power.
5	Crank rest time	3.0-60.0s ***(10.0s)***	If crank failure, the waiting time before the second test time.
6	Safety delay	1.0-60.0s ***(8.0s)***	Low oil pressure, high water temperature, under speed, under frequency, under voltage, charge failure are all invalid during this time except for emergency stop and over speed.
7	Start idle time	0-3600.0s ***(5.0s)***	Idle running time when crank successfully.
8	Warming-up time	0-3600.0s ***(10.0s)***	The time needed for loading.
9	Cooling time	0-3600.0s ***(30.0s)***	After unloading, the time of cooling down by radiator before stop. during the delay, if the remote start signal is valid, then genset will come into rated running.
10	Stop idle time	0-3600.0s ***(5.0s)***	Idle-speed running time.
11	E.T.S. hold time	0-600.0s ***(10.0s)***	Stop solenoid on power time.
12	Fail to stop	5-180.0s ***(30.0s)***	If the RPM is 0 during the stop failure time, then the stop failure time is no needed.
13	Emergency delay	0-10.0s ***(1.0s)***	Emergency and over frequency alarm delay.
14	Normal alarm delay	2.0-20.0s ***(5.0s)***	The alarm delay except for emergency stop and over frequency
15	Normal warning delay	1.0-20.0s ***(2.0s)***	The warning delay.
16	Pulse speed up delay	0.1－60.0s ***(0.2s)***	The interval time of the pulse speed up relay change.
17	Pulse speed down delay	0.1－60.0s ***(0.2s)***	The interval time of the pulse speed down relay change.
18	Load pulse width	1.0-10.0s ***(5.0s)***	Gens loading and unloading pulse width, when it is 10s, it is regarded as continuous output.
19	Unload pulse width	1.0-10.0s ***(3.0s)***	
20	Stop delay	0-3600.0s ***(10.0s)***	The time from when the remote start signal is invalid to when the unit stops.
21	Gas enrichment time	0-60.0s***(0.0s)***	When the starter is running, the gas enrichment relay output time.
22	Delay of gas opening	0-60.0s***(0.0s)***	When the starter is running, the gas valve opens with a delay; When this time is not set to 0, the oil valve relay will switch to the gas valve function.
23	Ignition shutdown	0-60.0s***(0.0s)***	The gas ignition relay is turned off delay, and the

	delay		gas ignition relay is turned off after the gas valve is closed.
24	Close times	1-10 ***(1 time)***	Sets the maximum number of closures allowed.
25	Close interval time	0-3600.0s***(5.0s)***	The interval between re-closure.

2)Engine setting

No	Parameter	Range ***(defaults)***	Notes
1	CAN Protocol	***0- Disabled*** 1: J1939 2: Cummins ISB 3: Cummins-CM850 4: Cummins QSX15-CM570 5: Cummins-CM850-PCC13X 6: Cummins-DCEC-QSZ13 7: Cummins-CCEC-QSN 8: Perkins 9: Perkins-1100 10: Volvo 11: Volvo-EMS2 12: Volvo-EMS2b 13: Volvo-EDC4 14: Scania 15: Scania-kw2000 16: Scania-kw2k-coo 17: John Deere 18: mtu-ADEC 19: mtu-ADEC-SAM 20: mtu-ADEC-303 21: mtu-ADEC-304 22: BOSCH 23: GTSC1 24: MTSC1 25: YUCHAI-YCECU 26: Y&C ENGINE-YC6K 27: WEICHAI-WISE15 28: CHANGCHAI-ECU15 29: YUCHAI-LMB 30: MAN 31: J1939-C 32: SDEC-H/D 33: SDEC-E 34: YTO 35: DEUTZ EMR2-2001 36: DEUTZ EMR2-2012 37: DEUTZ EMR3 38: DEUTZ EMR4 39:NEWND ECU13 40:Cummins-CM2150	CAN protocol Option: the Engine par ameters like RPM, oil pressure, wate r temperature are all from ECU data after choosing the relative protocol.
2	Flywheel teeth	0-300***(0)***	If the setting is 0, (RPM sensor Disabled), then RPM is resulted by Hz.

3	Rated RPM	500-4500RPM ***(1500)***	Choose the meter range and calculate the alarm value.
4	Loading Speed	0-200% ***(90%)***	Setting value is percentage of rated speed. Controller detects when it is ready to load. It won't switch on when speed is under loading speed.
5	Action if RPM lost	***Warning*** Alarm and stop	This fault can be checked only if there is gens frequency checked as one condition of crank successfully.
6	Loss of Speed Signal	0-3600.0s***(5.0s)***	Speed delay time for loss of speed signal
7	Over speed warning	0-200% ***(107%)***	Rated RPM multiplying by this value is regarded as over speed warning value. When the RPM is higher than the warning value and comes into over speed delay but still higher, then over speed warns. if the value is set as 200, then the over speed alarm is disabled.
8	Over speed warning delay	0-3600.0s***(5.0s)***	Overspeed warning delay value.
9	Overspeed alarm	0-200%***(114%)***	Rated RPM multiplying by this value is regarded as over speed alarm value. When the RPM is higher than the alarm value and comes into over speed delay but still higher (emergency faults delay), then over speed alarms. if the value is set as 200, then the over speed alarm is disabled.
10	Overspeed alarm delay	0-3600.0s***(2.0s)***	Overspeed alarm delay value.
11	Under speed warning	0-200%***(86%)***	Rated RPM multiplying by this value is regarded as under speed warning value. When the RPM is lower than the warning value and comes into under speed delay but still lower (normal warning delay), then under speed warns. if the value is set as 0, then the over speed alarm is disabled.
12	Under speed warning delay	0-3600.0s***(5.0s)***	Under speed warning delay value.
13	Under speed alarm	0-200%***(80%)***	Rated RPM multiplying by this value is regarded as under speed alarm value. When the RPM is lower than the alarm value and comes into under speed delay but still lower (normal faults delay), then under speed alarms. if the value is set as 0, then the under speed alarm is disabled.
14	Under speed alarm delay	0-3600.0s***(3.0s)***	Under speed alarm delay value.
15	Battery Rated Voltage	8.0-36.0V***(24.0V)***	Standard for detecting of over/under voltage of battery.
16	Over battery voltage warning	0-200%***(135%)***	Rated battery voltage multiplying by this value is regarded as over battery voltage warning value. When the battery input is higher than the warning value and comes into over battery voltage delay but still higher (normal faults

			delay), then over battery voltage warns. if the value is set as 200, then the over battery voltage is disabled.
17	Over battery voltage warning delay	0-3600.0s***(60.0s)***	Over battery voltage delay value.
18	Under battery voltage warning	0-200%***(67%)***	Rated battery voltage multiplying by this value is regarded as under battery voltage warn value. When the battery input is lower than the warning value and comes into under battery voltage delay but still lower (normal faults delay), then under battery voltage warns. if the value is set as 0, then the under battery voltage is disabled.
19	Under battery voltage warning delay	0-3600.0s ***(60.0s)***	Under battery voltage delay value.
20	Charger warning	1.0-30.0V ***(30.0V)***	When the gap between D+ and B+ is over than this value, and there is charging failure but still high (normal warning delay), then charge failure warns. Once the gap is lower than the value, warns clear. If the value is set as 300, then the charge failure is disabled.
21	Charger warning delay	0-3600.0s***(10.0s)***	Charger warning delay value.
22	Manual crank times	1-30 ***(1 time)***	Crank times under mode and test mode.
23	Auto start crank times	1-30 ***(3 times)***	Crank times under auto mode.
24	E.T.S. hold times	1-10***(2 times)***	The max E.T.S. hold on power shall be canceled once stop success under auto mode. the output interval time is " Fail to stop ".
25	Crank disconnect	RPM Frequency Oil pressure ***RPM/Frequency*** RPM/Oil Pressure Frequency/Oil Pressure RPM/Frequency/Oil press.	1.If there is no oil pressure sensor, please don't choose the type. 2.Oil pressure switch input is not the crank condition 3.Please check if the running status, stop condition are according with crank condition. 4.Means either of the conditions can be acceptable as crank condition. But all of them should be meet together to regard as stop condition.
26	Frequency disconnect	0-200% ***(28%)***	Rated frequency multiplying by this value is regarded as crank success condition. When the gens frequency is over the condition value, then system regards it as crank success.
27	RPM disconnect	0-200% ***(24%)***	Rated RPM multiplying by this value is regarded as crank success condition. When the RPM is over the condition value, then system regards it as crank success, motor escaped.
28	Oil pressure	0-400kpa***(200kpa)***	When the engine oil pressure is over the

	disconnect		condition value, then system regards it as crank success, motor escaped.
29	Oil pressure delay	0-20.0s ***(0.0s)***	When the crank condition contains oil pressure, if the oil pressure is higher than the presets value and continue for few seconds, then it is regarded as crank success.
30	Fuel pump open	0-100% ***(25%)***	When the fuel level is lower than preset value and remains 10S, fuel pump opened signal output
31	Fuel pump close	0-100% ***(80%)***	When the fuel level is higher than preset value and remains 1S, fuel pump closed signal output.
32	Maximum fuel pump on time	0-65000s***(65000s)***	The maximum output time of the fuel pump.
33	Battery charging start	8.0-30.0***(25.6V)***	When the battery voltage is lower than start value and remains 10s under non-running status, then the relay is opened. When it is higher than the close value and remains 10s, relay is closed. Once coming into running mode, there is no output.
34	Battery charging stop	10.0-36.0***(27.8V)***	

3)Generator parameters

No	Parameter	Range***(defaults)***	Notes
1	Gens AC system	Disable 1 phase 2 wire 2 phase 3 wire 3 phase 3 wire ***3 phase 4 wire***	Gens phases: No gens parameters can be displayed if setting as disable, which is applied to water pump genset.
2	Gens poles	2-64***(4)***	When the flywheel teeth are set as 0, the RPM will be resulted by frequency. (Calculation formula RPM=F*120/N)
3	Rated frequency	40.0-80.0Hz ***(50.0Hz)***	Setting generator rated frequency to choose the meter range and calculate the alarm value.
4	Loading Frequency	0-200%***(90%)***	Setting value is percentage of generator rated frequency. When generator frequency under load frequency, it won't enter into normal running.
5	Over freq warning	0-200% ***(110%)***	Rated frequency multiplying by this value is regarded as under over frequency warn value. When the Freq is higher than the value and comes into over freq warning delay but still higher (normal warn delay), then over frequency warns. If it is lower than the value then warning clears. If the value is set as 200, then the warning is disabled.
6	Over freq warning delay	0-3600.0s***(5.0s)***	Over freq warning delay value.
7	Over freq alarm	0-200% ***(114%)***	Rated frequency multiplying by this value is regarded as under over frequency alarm value. When the Freq is higher than the value and comes into over freq delay but still higher (emergency faults delay), then over frequency alarms, If the value is set as 200, then the alarm is disabled.

8	Over freq alarm delay	0-3600.0s***(2.0s)***	Over freq alarm delay value.
9	Under freq warning	0-200% ***(90%)***	Rated frequency multiplying by this value is regarded as under frequency warn value. When the Freq is lower than the value and comes into under freq delay but still lower (normal warn delay), then under frequency warns, If the value is set as 0, then the warning is disabled.
10	Under freq warning delay	0-3600.0s***(5.0s)***	Under freq warning delay value.
11	Under freq alarm	0-200% ***(80%)***	Rated frequency multiplying by this value is regarded as under frequency alarm value. When the Freq is lower than the value and comes into under freq delay but still lower (normal faults delay), then under frequency alarms, If the value is set as 0, then the alarm is disabled.
12	Under freq alarm delay	0-3600.0s ***(3.0s)***	Under freq alarm delay value.
13	Rated phase voltage	80-30000V ***(230V)***	Setting generator phase voltage to choose the meter range and calculate the alarm value.
14	Loading Voltage	0-200% ***(90%)***	Setting value is percentage of generator rated voltage. When gens voltage under load voltage, won't enter into normally running, during the period of when controller ready to detect loading.
15	Over voltage warning	0-200% ***(112%)***	Rated voltage multiplying by this value is regarded as over voltage warn value. When the voltage is higher than the value and comes into over voltage delay but still higher (normal warn delay), then over voltage warns, If the value is set as 200, then the warning is disabled.
16	Over voltage warning delay	0-3600.0s ***(5.0s)***	Over voltage warning delay value.
17	Over voltage alarm	0-200% ***(120%)***	Rated voltage multiplying by this value is regarded as over voltage alarm value. When the voltage is higher than the value and comes into over voltage delay but still higher (normal faults delay), then over voltage alarms, If the value is set as 200, then the alarm is disabled.
18	Over voltage alarm delay	0-3600.0s ***(3.0s)***	Over voltage alarm delay value.
19	Under voltage warning	0-200% ***(90%)***	Rated voltage multiplying by this value is regarded as under voltage warn value. When the voltage is lower than the value and comes into under voltage delay but still lower (normal warn delay), then under voltage warns, If the value is set as 0, then the warning is disabled.
20	Under voltage warning delay	0-3600.0s ***(5.0s)***	Under voltage warning delay value.
21	Under voltage alarm	0-200% ***(80%)***	Rated voltage multiplying by this value is regarded as under voltage alarm value. When the voltage is

			lower than the value and comes into under voltage delay but still lower (normal faults delay), then under voltage alarms, If the value is set as 0, then the alarm is disabled.
22	Under voltage alarm delay	0-3600.0s ***(3.0s)***	Under voltage alarm delay value.
23	Loss of Phase	0-Disable ***1- Enable***	Monitor the phase loss of the generator.
24	Phase Sequence	0- Disable ***1-Enable***	Monitor whether the phase sequence of the generator is normal.
25	Action if Gen unload fail	0-Warning ***1-All alarm and stop***	Action if Gen unload fail, unit will alarm and stop
26	Volt. Trans.(PT)	***0-Disable*** 1- Enable	Whether to open the voltage transformer function.
27	Volt.Primary(PT)	80-30000V ***(10000V)***	Voltage transformer primary voltage.
28	Volt.Secondary (PT)	30-1000V ***(100V)***	Voltage transformer secondary voltage.

4)Mains parameters

No	Parameter	Range ***(default)***	Notes
1	Mains AC system	Disable 1 phase 2 wire 2 phase 3 wire 3 phase 3 wire ***3 phase 4 wire***	Mains phases: No mains parameters can be displayed if setting as disable, which is applied to water pump mains set.
2	Mains rated phase voltage	80-30000V***(230V)***	Setting mains phase voltage to choose the meter range and calculate the alarm value.
3	Mains rated frequency	40.0-80.0Hz ***(50.0Hz)***	Setting mains rated frequency to choose the meter range and calculate the alarm value.
4	Mains over voltage alarm	0-200% ***(120%)***	Rated voltage multiplying by this value is regarded as over voltage alarm value. When the voltage is higher than the value and comes into over voltage delay but still higher (normal faults delay), then over voltage alarms, If the value is set as 200, then the alarm is disabled.
5	Mains over voltage alarm delay	0-3600.0s ***(3.0s)***	Over voltage alarm delay value.
6	Mains under voltage alarm	0-200% ***(80%)***	Rated voltage multiplying by this value is regarded as under voltage alarm value. When the voltage is lower than the value and comes into under voltage delay but still lower (normal faults delay), then under voltage alarms, If the value is set as 0, then the alarm is disabled.
7	Mains under voltage alarm delay	0-3600.0s ***(3.0s)***	Under voltage alarm delay value.
8	Mains over freq alarm	0-200% ***(114%)***	Rated frequency multiplying by this value is regarded as under over frequency alarm value.

			When the Freq is higher than the value and comes into over freq delay but still higher (emergency faults delay), then over frequency alarms, If the value is set as 200, then the alarm is disabled.
9	Mains over freq alarm delay	0-3600.0s***(2.0s)***	Over freq alarm delay value.
10	Mains under freq alarm	0-200% ***(80%)***	Rated frequency multiplying by this value is regarded as under frequency alarm value. When the Freq is lower than the value and comes into under freq delay but still lower (normal faults delay), then under frequency alarms, If the value is set as 0, then the alarm is disabled.
11	Mains under freq alarm delay	0-3600.0s ***(3.0s)***	Under freq alarm delay value.
12	Mains ROCOF	0-20.00HZ***(0.2HZ)***	When the controller detects mains ROCOF is above the pre-set value, it will initiate a warning alarm. It is detected after “Mains Parallel Mode” is active and after “Gen closed”.
13	Mains ROCOF delay	0-60.0S***(0S)***	Mains ROCOF delay value
14	Mains Vector Shift	0-20° ***(6.0°)***	When the controller detects mains voltage vector shift is above the pre-set value, it will initiate a warning alarm. It is detected after “Mains Parallel Mode” is active and after “Gen closed”.
15	Mains Vector Shift delay	0-60.0S***(0S)***	Mains Vector Shift delay value

5)Loading setting

No	Parameter	Range ***(default)***	Notes
1	CT rate	5-6000A/5A ***(500A/5A)***	Used for setting genset CT primary current, secondary rated current 5A.
2	Rated phase current	5-6000A***(500A)***	Setting generator phase current to choose the meter range and calculate the alarm value.
3	Rated total power	5-20000Kw ***（276Kw）***	Set total power of generator to choose the meter range and calculate the average loading rate and alarm value.
4	Phase current over-load alarm	0-200% ***(100%)***	Rated current multiplying by this value is regarded as over current alarm value. When the current is higher than the value and comes into over current delay but still higher (over current faults delay), then over current alarms, If the value is set as 200, then the alarm is disabled.
5	Over phase current delay	0-3600.0s***(30s)***	When this parameter is set to 0, the over current delay is the inverse time; if not, the over current delay is the time set for this parameter.
6	Over current 【inverse time】	0.1-36.0***(36.0)***	This option will not take effect until the **[23-Over phase current delay]** is set to **0**. The over

			current delay is inverse time, and the formula is **T=t/((IA/IT) -1)^2.**
7	Action if over current	Warning ***Alarm and stop*** Trip stop Trip and running	If the system is set as trip stop, then the unloading procession shall be acted and then stop with alarm.
8	Over total power alarm	0-200% ***(100%)***	Rated power multiplying by this value is regarded as over power alarm value. When the loading power is higher than the value and comes into delay but still higher (power faults delay), then over power alarms, If the value is set as 200, then the alarm is disabled.
9	Over total power delay	0-3600.0s***(10s)***	When this parameter is set to 0, the over power delay is the inverse time; if not, the over current delay is the time set for this parameter.
10	Over power 【inverse time】	0.1-36.0***(36.0)***	This option will not take effect until the **[24-Over total power delay]** is set to **0**. The over power delay is inverse time, and the formula is **T=t/((IA/IT) -1)^2.**
11	Action if over power	Warning ***Alarm and stop*** Trip stop Trip and running	If the system is set as trip stop, then the unloading procession shall be acted and then stop with alarm.
12	Reverse Power alarm	0-200% ***(10%)***	Rated power multiplying by this value is regarded as reverse power alarm value. When the loading power is higher than the value and comes into delay but still higher (power faults delay), then reverse power alarms, If the value is set as 200, then the alarm is disabled.
13	Reverse Power alarm delay	0-3600.0s***(2.0s)***	Reverse Power alarm delay value.
14	Action if Reverse Power	Warning ***Alarm and stop*** Trip stop Trip and running	If the system is set as trip stop, then the unloading procession shall be acted and then stop with alarm.

6)input setting

No	Parameters	Range***(defaults)***	Notes
1	Coolant temperature sensor	0: Disable 1.Self-define resistance curve ***2.VDO 40-120℃*** 3: MEBAY-001B 4: SGH 5: SGD 6: SGX 7: CURTIS 8: DATCON 9: VOLVO-EC 10: 3015238 11:PT100	Choose the usual water temperature sensor, If the sensor used by the user is not the commonly used type, it can be User-defined.

		12: MEBAY-Mier 13: 13: WEICHAI 40-120℃ 14: GENCON 40-120℃	
2	Action if water temperature sensor disconnected	Disable ***Warning*** Alarm and stop	Action if Water temperature sensor disconnected.
3	High water temperature alarm	20-200℃***(98℃)***	When the water temperature is higher than the alarm value and comes into high temperature delay but still higher (normal faults delay), then high temperature alarms. if the value is set as 200, then the high temperature alarm is disabled.
4	High water temperature alarm delay	0-3600.0s***(5.0s)***	High water temperature alarm delay value.
5	Oil pressure sensor	0: Disable 1: Self-define resistance curve 2: Self-define voltage curve 3: Voltage type 1MPa-0-5V 4: Voltage type 1MPa-0.5-4.5V ***5: VDO 0-10Bar*** 6: MEBAY-003B 7: SGH 8: SGD 9: SGX 10: CURTIS 11: DATCON 10Bar 12: VOLVO-EC 13: 3015237 14: WEICHAI 0-0.6Mpa 15: GENCON 0-10BAR	Choose the usual oil pressure sensor, If the sensor used by the user is not the commonly used type, it can be User-defined.
6	Action if oil pressure sensor disconnected	Disable ***Warning*** Alarm and stop	Action if oil pressure sensor disconnected.
7	Low oil pressure alarm	0-999kpa***(103kpa)***	When the oil pressure is lower than the alarm value and comes into low oil pressure delay but still lower (normal faults delay), then low oil pressure alarms. if the value is set as 0, then the under speed alarm is disabled.
8	Low oil pressure alarm delay	0-3600.0s ***(5.0s)***	Low oil pressure alarm delay value.
9	Fuel level sensor	***0: Disable*** 1. Self-define resistance curve 2. 0-100Ω 3. 100-0Ω 4. 0-107Ω 5. 107-0Ω 6. 0-180Ω	If the sensor used by the user is not the commonly used type, it can be User-defined.

		7. 180-0Ω 8. 180-10Ω 9. 10-180Ω 10. 120-10Ω 11.10-120Ω 12. 90-0Ω 13. 0-90Ω 14. 0-30Ω 15. 73-10Ω 16. 240-33Ω 17. 33-100Ω 18. 0-200Ω 19. 200-0Ω	
10	Action if fuel Level sensor disconnected	Disable ***Warning*** Alarm and stop	Action if Fuel level sensor disconnected.
11	Low fuel level warning	0-100%***(20%)***	When the fuel level is lower than the value and comes into low fuel level warning delay but still lower (normal warning delay), then low fuel level warns. If it is higher than the value then warning clears. If the value is set as 0, then the low fuel level warning is disabled.
12	Low fuel level warning delay	0-3600.0s ***(5.0s)***	Low fuel level warning delay value.
13	Low fuel level alarm	0-100%***(0%)***	When the fuel level is lower than the alarm value and comes into low fuel level delay but still lower (normal faults delay), then low fuel level alarms. if the value is set as 0, then the low fuel level alarm is disabled.
14	Low fuel level alarm delay	0-3600.0s ***(5.0s)***	Low fuel level alarm delay value.
15	AUX.SENSOR 1	***Disable*** Oil pressure Water temperature Fuel level	Custom sensor type
16	Action if AUX. SENSOR1 disconnected	Disable ***Warning*** Alarm and stop	Action if Programmable sensor 1 disconnected.
17	AUX.SENSOR 2	***Disable*** Oil pressure Water temperature Fuel level	Custom sensor type
18	Action if AUX. SENSOR 2 disconnected	Disable ***Warning*** Alarm and stop	Action if Programmable sensor 2 disconnected.
19	AUX. INPUT 1	0-40 ***(18. Remote start)***	0. **Disable.** 1. **Low oil pressure alarm switch.**
20	AUX. INPUT 1	***0-Normal close***	

	valid	1-Normal open	2. **High water temperature alarm switch.** 3. **Low water level warning switch.** 4. **Low water level alarm switch.** 5. **Low fuel level warning input.** 6. **Low fuel level alarm input.** 7. **Charging failure warning:** output when charging failure. 8. **Reserved** 9. **Reserved** 10. **External instant warning input.** 11. **External instant alarm input.** 12. **Gens un/loading input:** connect to the gens loading switch auxiliary point. 13. **Prohibition of generating load.** 14. **Louver status input.** 15. **Auto start disabled:** gens will not start if there are signal input. 16. **Auto stop disabled:** gens will not stop if there are signal input. 17. Reserved 18. **Remote start (with load):** the gens comes into start procession if this signal is valid and under auto mode. 19. **Soundproof alarm:** audio alarm output is disabled if there is signal output. 20. **Front face button disabled:** any button except for page button is disabled if there is signal output. 21. **Meter mode:** all output are disabled, alarm and warns are invalid. any button except for page button is disabled. 22. **Remote control mode:** any button except for page button is disabled if the input is valid, LCD will display remote mode, remote control module can start/stop and monitor parameters through front face buttons. 23. **NEL manual trip;** 24. **NEL manual recon;** 25. **Main choice;** 26. **Mains grid-connected:** When the input is valid, the unit can be connected to the mains in parallel; 27. **Simulate STOP;** 28. **Simulate MANUAL;**
21	AUX. INPUT 2	0-40 ***(1. Low oil pressure alarm switch)***	
22	AUX. INPUT 2 valid	***0-Normal close*** 1-Normal open	
23	AUX. INPUT 3	0-40***(2. High water temperature alarm switch)***	
24	AUX. INPUT 3 valid	***0-Normal close*** 1-Normal open	
25	AUX. INPUT 4	0-40 ***(12. Gens un/loading input)***	
26	AUX. INPUT 4 valid	***0-Normal close*** 1-Normal open	
27	AUX. INPUT 5	0-40 ***(0. Disable)***	
28	AUX. INPUT 5 valid	***0-Normal close*** 1-Normal open	
29	AUX. INPUT 6	0-40 ***(0. Disable)***	
30	AUX. INPUT 6 valid	***0-Normal close*** 1-Normal open	
31	AUX. INPUT 7	0-40 ***(0. Disable)***	
32	AUX. INPUT 7 valid	***0-Normal close*** 1-Normal open	

			29. **Simulate AUTO;** 30. **Simulate START;** 31. **Simulation GENS CLOSE/ON;** 32. **Idle Control Mode:** Under voltage/ frequency/speed protection is inactive. 33. **KW output increase:** Increase active power output; 34. **Kvar output reduction**: Reduce active power output; 35. **Reserved;** 36. **Disable alarms when brake is not closed:** When the switching value is valid and the controller is not closed: The low-speed, low-voltage and low-frequency protection functions are cancelled, but other alarms respond. 37. **Power management mode:** Power management mode will be displayed on the LCD when the input is active. In this mode, the controller will control genset synchronize, power sharing, scheduled start, scheduled stop, generator closed, generator opened but genset start or stop.(requires 110D to be used in conjunction) 38. **Alarm reset:**After the switch is valid, the alarm is reset, but the gear position remains unchanged. 39. **-40 Reserved**

7) Output setting

1	AUX.OUTPUT 1	0-95***(1. Public warning output)***	**0. Disable.** **1. Public warning output:** when there is any warning output. **2. Public alarm output:** when there is any alarm output, alarm locks till revert back. **3. Audio alarm:** when there is any alarm output, the Audio controls. **4. Louver control:** there is output once genset starts and stop till stable. **5. Preheat mode:** preheat before start. **6.** Reserved **7. Fuel output:** output once gens starts and off till stable. **8. Crank output:** output once cranking, no output in other mode. **9. Genset running:** output under running, off once RPM is lower than cranking RPM. The crank success condition can be set.
2	AUX.OUTPUT 1 type	***0-Normal open*** 1-Normal close	
3	AUX.OUTPUT 2	0-95***(2. Public alarm output)***	
4	AUX.OUTPUT 2 type	***0-Normal open*** 1-Normal close	
5	AUX.OUTPUT 3	0-95***(17.E.S.T. hold)***	
6	AUX.OUTPUT 3 type	***0-Normal open*** 1-Normal close	
7	AUX.OUTPUT 4	0-95 ***(10. Idle speed control)***	
8	AUX.OUTPUT 4 type	***0-Normal open*** 1-Normal close	
9	AUX.OUTPUT 5	0-95***(14. Gens loading)***	

10	AUX.OUTPUT 5 type	***0-Normal open*** 1-Normal close	**10. Idle speed control:** used for speed controller, there is output under idle but no output under high speed. **11. Speed-up control:** there is output when coming into high speed warming up, which time is **Longest RPM-up time**. **12. High speed control:** The output is valid after idle delay is completed, and the output is closed after high-speed heat dissipation. **13. Excitation output:** there is output during cranking procession and there is 2s output if there is no frequency under high speed status. **14. Gens loading:** continuous or pulse type according to time setting. **15. Gens unloading:** continuous or pulse type according to time setting. **16. Speed-down control:** the output time is shutdown idle delay during shutdown idle or shutdown on power procession. **17. E.S.T. hold:** shutdown output, it is used for gens with stop solenoid. when the setting value of shutdown delay is over, then it is off. **18. System in stop:** there is output under stop mode. **19. System in manual:** there is output under manual mode. **20. System in auto:** there is output under auto mode. **21. Fuel pump output:** there is output if the oil capacity is lower than start condition for 10s and shutdown if it is higher than the shutdown condition for 1s. **22. Battery charging control:** there is output if the voltage is lower than the preset value under standby status and shutdown after start and in running status. **23. ECU power:** apply to electrical ECU engine, used for control ECU power. **24. ECU stop:** apply to electrical ECU engine, used for control ECU shutdown. **25. ECU warning:** there is a warn signal from ECU. **26. ECU alarm:** there is an alarm signal from ECU. **27. ECU communication failure:** Cannot communicate with ECU. **28. Pulse speed up output:** the pulse shall be sent out in the interval of "Pulse speed up delay" under speed –up. **29. Pulse speed down output：** the pulse shall be sent out in the interval of "Pulse speed down delay" under stop idle speed. **30. Synchronizing** **31. NEL1 Trip** **32. NEL2 Trip**
11	AUX.OUTPUT 6	0-95***(15. Gens unloading)***	
12	AUX.OUTPUT 6 type	***0-Normal open*** 1-Normal close	

			33. **NEL3 Trip** 34. **Rated running:** there is output under rated running. 35. **Oil pump control:** when the CAN protocol is Yuchai LMB. When the genset is in the standby state, the oil pump controls the output every 30 minutes. If the oil pressure is higher than 100kPa or the output is 1 minute (whichever comes first), the oil pump control output will stop; when the genset is in the preheating state, the oil pump control will always output. 36. **ATS control output:** Output when the total rated power of the parallel unit is greater than the set value; 37. **Gas enrichment:** Used for gas-fired units, it will act during starting, the action time is the set "gas enrichment time". 38. **Gas ignition:** For gas-fired units, it will act when the engine is turned on and disconnect when the engine is stopped. 39. **Throttle control:** Actions during overspeed alarm shutdown and emergency shutdown, the engine air intake can be turned off to achieve rapid shutdown. 40. **Remote control output:** The output port is controlled by communication (PC). 41. **Successful start:** Output after successful start. 42. **Normal power output:** Action when the generating voltage is greater than the "load voltage". 43. **Allow the load:** When the speed is greater than "load speed", the frequency is greater than "load frequency", the voltage is greater than "load voltage" and the module is in the rated operation and shutdown delay. 44. **Public fault:** Action when the generator set has warning or alarm. 45. **Public trip stop:** Action when trip and shutdown alarm. 46. **Public trip NO stop:** Action when tripping without shutdown alarm. 47. **Input 1 valid:** Action when input 1 is valid. 48. **Input 2 valid:** Action when input 2 is valid. 49. **Input 3 valid:** Action when input 3 is valid. 50. **Input 4 valid:** Action when input 4 is valid. 51. **Input 5 valid:** Action when input 5 is valid. 52. **Input 6 valid:** Action when input 6 is valid. 53. **Input 7 valid:** Action when input 7 is valid. 54. **High battery volt:** Action when the battery voltage is too high warning. 55. **Low battery volt:** Action when the battery voltage

			is too low warning. 56. **Charging failure:** Action when charging failure warning. 57. **Emergency stop:** Action when emergency stop alarm. 58. **Start failure:** Action when starting failure alarm. 59. **STOP failure:** Action when shutdown failure alarm. 60. **Underspeed warning:** Action when underspeed warning. 61. **Underspeed alarm:** Action when underspeed alarm. 62. **Overspeed warning:** Action when speeding warning 63. **Overspeed alarm:** Action when overspeed alarm. 64. **Gens over freq warning:** Action when over-frequency warning. 65. **Gens over freq alarm:** Action when over frequency alarm. 66. **Gens over voltage warning:** Action when over-voltage warning. 67. **Gens over voltage alarm:** Action when over-voltage alarm. 68. **Gens under freq warning:** Action when under frequency warning. 69. **Gens under freq alarm:** Action when under frequency alarm. 70. **Gens under voltage warning:** Action when undervoltage warning. 71. **Gens under voltage alarm:** Action when undervoltage alarm. 72. **Phase deficiency:** Action when generating phase loss warning. 73. **Reverse phase:** Action when generating reverse phase sequence warning. 74. **Overpower alarm:** Action when over power alarm. 75. **Reverse power alarm:** Action when reverse power alarm. 76. **Over-current alarm:** Action when over-current alarm. 77. **High temp alarm:** Action when high temperature alarm. 78. **Low oil pres alarm:** Action when low oil pressure alarm. 79. **Open oil pressure:** Action when the oil pressure sensor is open. 80. **Low fuel level warn:** Action when low fuel level warning. 81. **Low fuel level alarm:** Action when low fuel level alarm. 82. **Loading_instructions:** Action after successful

			closing. **83. Mains grid-connected:** Action after successful grid connection. **84. Mains over voltage alarm:** Action when over-voltage alarm. **85. Mains under voltage alarm:** Action when under voltage alarm. **86. Mains over freq alarm:** Action when over frequency alarm. **87. Mains under freq alarm:** Action when under frequency alarm. **88. -95. Reserved**

8)Sync Setting

No	Parameter	Range***(defaults)***	Notes
1	MSC ID	0-31 ***(0)***	It is the ID mark of the MSC communication internet. All the MSC ID should be unique.
2	MSC Priority	0-31 ***(0)***	Smaller values represent higher priorities.
3	Full kW rating	5-2000kVar***(276kW)***	Used for load sharing.
4	Full kVar rating	5-2000kVar***(210kVar)***	Used for load sharing.
5	Scheduled Run PCT	0-200%***(80%)***	Schedule the load value of other genset when start on demand.
6	Scheduled Stop PCT	0-200%***(50%)***	Schedule the load value of other genset when start on demand.
7	Starting Options	Start all sets ***Start Sets as Load Requires*** Start on demand all sets	Unit start-up type
8	MSC Modules	1-32 ***(2)***	Unit communication number
9	MSC Too Few Modules Action Type	Disable ***Warning*** Trip	Actions when the MSC module is low
10	Dead Bus Volt	10-50 ***(30V)***	It is considered Bus no power when Bus voltage is lower than dead Bus voltage.
11	Voltage Difference	0-30 ***(3V)***	It is considered voltage synchronization when the voltage difference between Generator and Bus is lower than synchronization voltage difference.
12	Freq Difference	0-2.0 ***(0.20Hz)***	When the frequency difference between the generator and the bus or mains is within the frequency difference range, it is regarded as frequency synchronization.
13	Phase Angle Offset	0-360.0°***(0°)***	Gen initial phase will add pre-set phase offset based on the sampling initial phase.
14	Phase Angle	0-20.0° ***(10.0°)***	It is considered Check Phase Angle

	Difference		when the initial phase difference is lower than synchronization phase difference.
15	Slip Frequency Sync	0-1.00 ***(0.10Hz)***	Adjust generator frequency and enable it greater than Bus frequency.
16	Fail to Sync Delay	5.0-300.0 ***(60.0S)***	When the controller detects no Sync signal during the preset delay, it will send corresponding alarm signal according to the action type.
17	Fail to Sync Action	***Warning*** Trip	Fail to Sync Action
18	Load Ramp Rate	0-100 ***(3%)***	Speed rate(%/s) of genset upload/unload
19	NEL (Load Shedding) Trip	***Disable*** Enable	0: disable trip, disable reconnect 1: enable trip, disable reconnect 2: enable trip, enable reconnect
20	NEL Trip 1 Set Value	0-200% ***(90%)***	NEL trip value
21	NEL Trip 1 Delay	0-3600.0S***(5.0S)***	NEL trip delay
22	NEL Trip 2 Set Value	0-200%***(100%)***	NEL trip value
23	NEL Trip 2 Delay	0-3600.0S***(1.0S)***	NEL trip delay
24	NEL Auto Reconnection	***Disable*** Enable	NEL auto reconnect function
25	NEL Auto Reconnection Set Value	0-200%***(50%)***	NEL reconnect value
26	NEL Auto Reconnection Delay	0-3600.0S***(5.0S)***	NEL reconnect delay
27	NEL Load Shedding Number	1-3***(3)***	Number of NEL
28	ATS closing condition total power	0-60000KW***(0)***	When the total rated power of parallel units is greater than this set value, the ATS relay output.
29	Mains KW output	0-200% ***(30%)***	When the mains connected in parallel, Full kW rating output percentage.
30	Mains Kvar output	0-200% ***(8%)***	When the mains connected in parallel, Full kvar rating output percentage.
31	Pre-sync	Disable ***Enable***	Whether the units has opened the pre-synchronization function.
32	Engine balance hours	0-1000H***(0H)***	The controllers must have the same priority, will start/stop the genset automatically according to the running time and the pre-set balanced running time. this function is disabled when set to 0.

9)GOV Setting

No	Parameter	Range***(defaults)***	Notes
1	GOV Action	Disable ***Enable***	GOV speed control function
2	GOV Center Voltage	0-10.00 ***(0V)***	Default central voltage

	SW1		
3	GOV Voltage Range SW2	+/-10V***(+/-2.5)***	Default volt. range
4	Action when loading	0：None ***1：Adjust to Rated Frequency*** 2：Adjust to Center Point	GOV Action when loading
5	GOV Reverse	***Disable*** Enable	GOV reverse control function
6	Freq Sync gain	0-9999 ***(20)***	Unit frequency adjustment.
7	Freq Sync Stability	0-9999 ***(20)***	
8	Load Gain	0-9999 ***(20)***	Unit active power adjustment.
9	Load Stability	0-9999 ***(20)***	

a） AVR Setting

No	Parameter	Range***(defaults)***	Notes
1	AVR Action	Disable ***Enable***	AVR control function
2	AVR Center Voltage SW1	0-10.00 ***(0V)***	Default central voltage
3	AVR Voltage Range SW2	+/-10V***(+/-2.5)***	Default voltage range
4	Action when loading	0：None ***1：Adjust to Rated Frequency*** 2：Adjust to Center Point	AVR Action when loading
5	AVR Reverse	***Disable*** Enable	AVR reverse control function
6	Voltage Sync gain	0-9999 ***(20)***	Unit voltage adjustment.
7	Voltage Sync Stability	0-9999 ***(20)***	
8	Load Gain	0-9999 ***(20)***	Unit reactive power adjustment.
9	Load Stability	0-9999 ***(20)***	

b） CAN communication

NO	Parameter	Range***(default)***	Notes
1	CAN failure	Disable Warn ***Alarm and Stop***	ECU communication failure.
2	ECU warning	Disable***/Enable***	ECU warnings enable.
3	ECU alarm	Disable***/Enable***	ECU alarms enable.
4	Mask SPN	0-12	Up to 12 sets of alarm codes can be input, and the controller will not respond to the input alarm codes.
5	Rated idle speed	500-4500rpm ***(750rpm)***	ECU idle speed value.
6	Slow rise time	0-120.0S***(5.0S)***	The time of ECU from idling to high speed.

c） Module settings

NO	Parameter	Range***(default)***	Notes
1	Language	*0-English* 1-*简体中文* 2-繁体中文 3-español 4-русский	Language option.
2	User password	00000-65535 ***(07623)***	Change the password.
3	Controller ID	1-255***(16)***	The IP built by controller and PC.
4	RS485 baud rate	0-4800 1-9600 ***2-19200*** 3-38400 4-57600 5-115200	RS485 communication baud rate.
5	Primary Modes	***STOP*** Manual Auto Auto save	The primary modes on power, easy for user operation. Note: auto record function can't record the mode with load.
6	Start screen display time	0-20.0s ***(5.0s)***	Start screen display time,0: No-display.
7	Back lightness	20-100% ***(80%)***	Back lightness adjustment.
8	Saving mode	5.0-6000.0s ***(600.0s)***	LCD light will be closed automatically without any button pressed after delay. If setting as 6000.0s, back light always lighted.
9	Homing display	5.0-600.0s ***(600.0s)***	The time when the page reverts back to the home page. If setting as 600.0s: disabled.
10	LOGO delay display under standby	5.0-6000.0 ***(6000.0s)***	Start screen will be opened without any button pressed after delay. If setting as 6000.0s: disabled.

d） Working plan and maintenance setting

No	Parameter	Range***(defaults)***	Notes
1	Working plan format	***Disable*** Every month Every week	This mode must be under auto mode. Working plan is disabled once setting as disable. The working plan will be executed according the chosen date when setting as every month. The working plan will be executed according the chosen date when setting as every week.
2	Maintenance date per month	From 1st to 31st ***Default: the first day***	The date chosen for every month.
3	Maintenance date per week	Monday to Sunday ***Default: Sunday***	The date chosen for every week.
4	Maintenance with load or not	***Disabled***/with load	To choose if the genset starts with load or not.
5	Maintenance	00:00-23:59***(00:00)***	Maintenance start time setting.

	start time		
6	Maintenance running time	1-120m***(5min)***	Maintenance running time setting.

e） working plan

No	Parameter	*Range**(default)***	Notes
1	Working plan	***Disable*** Enable 1: remote start Enable 2: running always	Working plan start condition.
2	Start time	00:00-23:59 ***(08:00)***	The start time allowed.
3	End time	00:00-23:59 ***(17:00)***	The end time allowed (the next day is valid).
4	Dates	1-31	Multiple choices according to the reality. The longest running time is 24 hours.

f） Maintenance plan

No	Parameter	Range***(defaults)***	Notes
1	Maintenance countdown	0-5000h***(5000h)***	When it is set as 5000, then this function is disabled.
2	Maintenance date	***2000/01/01***-2099/12/31	When it is set as 2000/01/01, this function is disabled.
3	Maintenance expire	***Warning*** Alarm and stop	The action after the primary maintenance expired.

g） Data/time setting

No	Parameter	Range***(defaults)***	Notes
1	Date/Time	2016/01/01-2099/12/31	Internal calendar, please calibrate regularly.
2	Current time	00:00:00-23:59:59	
3	Current week	Monday to Sunday	

h） Self-define curve

NO	Parameter	Notes
1	Self-define oil pressure resistance curve	***Sensor curve can be User-defined by panel buttons, resistance and according value should be input, MAX 15 groups, MIN 2 groups.*** ***Rule: resistance should be input from small to large.***
2	Self-define oil pressure voltage curve	
3	Self-define water temperature curve	
4	Self-define fuel level curve	

13. Fault finding

Symptoms	Possible Solutions
Controller no response with power	Check DC voltage. Check DC fuse. Check if the terminal 1 and 2 is with battery voltage.
Genset shutdown	Check the water/cylinder temperature is too high or not. Check the genset AC voltage. Check DC fuse.
Genset Emergency Stop	Check the emergency stop button. Check that the voltage of the controller's 3 feet to the ground

	should be the battery voltage. Check the controller connection.
Low oil pressure alarm	Check oil pressure sensor and its wiring. Check the oil pressure sensor type and controller settings must be consistent. Check whether the low oil pressure sensor is normal.
High temperature alarm	Check temperature sensor and its wiring. Check the temperature sensor type and controller settings must be consistent. Check whether the temperature sensor is normal.
Shutdown Alarm in running	Check related switch and its connections according to the information on LCD. Check programmable inputs.
Fail to start	Check fuel return circuit and wiring. Check start battery. Consult engine manual.
Starter motor does not respond	Check the wiring to the starter. Check start battery.
USB communication is abnormal	Check the USB connection. Check whether the USB port of the computer is normal. Check whether the USB driver is installed.
RS485 cannot communicate normally	Check the connection. Check if the communication ID number setting is correct. Check if the A and B lines of RS485 are reversed. Check if the RS485 communication line driver is installed or not. Check if the communication port of the PC is damaged. Add a 120 Ω resistor between the AB of the controller RS485.
ECU warning or stop	Get information from LCD of alarm page; If there is detailed alarm, check engine according to description. If not, please refer to engine manual according to SPN alarm code.