Operation and Maintenance Manual

Diesel generator set

SHANDONG HUALI ELECTROMECHANICAL CO., LTD

China · Shandong

Preface

First of all, thank you for using the "Shanhua" diesel generator set, allowing us to serve you!

In order to help you quickly understand the use method of the unit and avoid faults or accidents caused by improper operation and maintenance, please read this manual and use it according to relevant regulations and requirements.

This manual is revised, supplemented and improved on the basis of various instructions and training materials published by factory over the years against ISO ISO8528-13 and GB2820-2009

For diesel generator sets, maybe you are the first place to start, and worried about the danger, we put safety and health in Chapter 1 and the basic composition and working principles of the diesel generator sets (Chapter 2); Chapter 3 briefly describes the installation and commissioning of the generator sets, which is mainly directed by our service engineers, but we think you must want to know what they did.Next, here is the key content that you want to learn, (Chapter 4) how to use the generator set, the specific operation process, this is what you have to learn.Of course, a good machine should also be in good maintenance, Chapter 5 maintenance will help the unit to maintain a good working state; in the actual operation process, the generator set may have some minor problems, Chapter 6 will provide you with possible faults and troubleshooting measures, so that you can solve this small problem independently.If this problem is not solved, please contact +86-0537-7169777;Factory after-sales service will provide comprehensive technical guidance and support.

This manual has received guidance and assistance from technical, service and quality inspectors; with the continuous improvement and improvement of Huali electromechanical products, the contents of the manual may be slightly different from the actual product structure. In addition to timely supplement and revise this manual, we remind you to pay special attention in use, subject to the physical object.

Given the limited level, the propriety of this manual is inevitable, please criticize and correct.

Contents

Chapter 1 Safety and health

1.1 General description

The generator set is very safe during normal operation, but the safety is ultimately based on the responsibility of the unit installer, operator and maintenance personnel.The operation and maintenance procedures specified in this manual are strictly followed to minimize unsafe factors.Note: The unit shall be operated by the authorized or trained staff, and the operator shall understand the safety precautions and operating procedures.

WARNING:

- Safety precautions in this manual must be read and understood before using and repairing the unit
- Failure to operate the unit in accordance with this manual instructions and safety procedures will increase the likelihood of an accident.
- Do not try to drive the unit even knowing it is unsafe.
- If the unit is known to be unsafe, a warning sign should be affixed and the battery cable disconnected so that the unit will not start and pick back after normal conditions.
- If cleaning and maintenance, it shall be handled as per the above method, that is, disconnect the battery connection.
- The installation and operation of the unit must strictly comply with the standards, specifications or other requirements of the relevant country, region or organization.

1.2 Installation, movement, and transportation

Chapter III of this manual will detailed unit installation and commissioning, and note the following safety points:

- The power supply cable must be connected in accordance with the relevant standards, specifications and other relevant requirements, including grounding requirements and leakage fault protection.
- The installation of separate oil cylinder and fuel system must comply with the relevant specifications, standards and other relevant requirements.
- The exhaust gas emitted by the diesel engine is harmful to humans.All units installed in the house must have standard sealing pipes to discharge the exhaust gas outdoors.Ensure that heating objects such as exhaust pipes or silencers are away from flammable substances and that the smoke is not a public hazard.
- Do not lift the unit with the engine or alternator earrings, but use the "crossbar" and other tools to lift the unit through the base lifting hole
- Ensure that the hanging and supporting structure are stable and properly connected and can withstand the weight of the suspension material.
- When the unit is lifted, everyone should keep safely distance.
- When moving the generator set with a trailer, comply with relevant local standards, regulations and traffic rules including the maximum and minimum speed limits when towing heavy objects and check the brake system performance.
- Make sure everyone leaves before closing the door to the sound-proof enclosure unit.
- No one is allowed to stand on a trailer unit or walk on it during transportation.
- Do not install or use this unit in any hazardous goods storage location unless specially designed.

1.3 Fire-proof and explosion-proof prevention

The fuel used and the smoke discharged from the unit are flammable and dangerous to explosion.Careful handling of these substances can be nip in the bud.At the same time, the machine room shall be equipped with good-condition BC and ABC fire extinguishers. Users must know how to use these fire extinguishers and try them out for themselves.

Warning:

- Ensure that the machine room has adequate ventilation
- Ensure that the machine room, floor and unit surface are clean immediately in case of fuel, battery electrolyte or coolant leakage.
- Do not store flammable materials near the unit.
- Oil-stained wipes should be stored in covered metal containers
- Smoking, sparks, or other behavior near the battery and fuel causing an open fire are not allowed.Hydrogen generated by fuel volatile gas and batteries can explode with an open fire.
- Disconnect the battery charger before connecting or disconnected the battery.

- Conductive objects such as metal tools are kept away from exposed charged parts (e. g. output electrodes) to prevent fuel or gas explosion.
- Do not feed the fuel tank when the unit is running.
- Never try to turn on when a known fuel leak is possible.
- Because the unit is started repeatedly, or by checking the air valve, or stopping the heat engine, it may result in excessive gas body in the exhaust system. Due to the potential explosion risk, the gas should be discharged out before starting the unit.

1.4 Protection cover

The rotating position of the unit is equipped with a protective shield, but the operator must be careful at the beginning of the unit.

- Do not attempt to drive the unit when the fan shield or other safety shield is removed.Do not attempt to reach under or near the guard for repair while the unit is running.
- Palms, arms, long hair, loose clothes and hand accessories should be kept away from the pulley and other rotating parts.
- Note: Some rotating parts are not clearly visible at the beginning of the unit.
- If a repair door is installed on the unit with sound enclosure, close the door if not necessary.
- Lubricating oil, coolant, unit discharge gas are as high temperature as far as possible, be careful to be scalded.Avoid the sharp part of the unit to avoid scratches.
- Wear overalls, gloves and hats when operating the unit.
- Do not unscrew the radiator cover when the coolant is not fully cooled.To wait until the coolant has cooled, unscrew the lid to release the air pressure in the tank before turning the lid off completely.
- Ether combustion combustion ignition is not suitable for engines with gas preheating device. In general, the combustion ignition device should be avoided, otherwise the engine efficiency and service life will be shortened.

1.5 Chemicals

The fuel, oil, coolant, lubricating oil and battery electrolyte used in this unit are commonly used industrial and chemical products.However, if improper use and treatment, it can also cause harm to the human body.

Warning

- Do not swallow or contact with fuel, oil, coolant, lubricating oil or battery electrolyte.If accidentally swallowed, should find a doctor to deal with it, such as skin contact, immediately with soap and clean water.
- Do not wear clothes that are already stained with fuel or lubricating oil.
- When dealing with the battery, wear an acid-proof apron, mask, or goggles, once the body is stained with the electrolyte, immediately rinse with a lot of water.

1.6 Noise

If the unit is not equipped with sound proof housing, it will produce noise of about 95-105dB@2m inner, and continuous exposure to a noise environment over 85dB@2m inner will cause damage to hearing.

Warning

- Ear protection equipment must be worn when operating on or around the unit.

1.7 Power unit

Power devices may only operate effectively and safely if they are properly installed, operated and repaired.

Warning:

- The unit must be load connected by a qualified and experienced electrician, and the load connection operation must comply with the relevant electrical regulations, standards and other relevant codes.Before the official operation of the unit, the user should better send the factory (or the seller) to check the inspection.
- Ensure that the grounding specifications of the unit (including trailer units) comply with local electrical safety regulations and standards.
- Stop or disconnect the negative electrode (-) of the battery before connecting or disconnecting the load.
- Do not stand in water or on wet ground to connect or remove the load.Stand to face the unit controller on dry ground.
- When the unit generates electricity, the human body or the metal objects without insulation protection should not touch the live part of the unit or the power wire
- The cover of the junction box shall be reset immediately after the load is connected or removed, and do not start the unit without opening the lid of the junction box.
- The load or power system using the unit must be compatible with the electrical characteristics of the

unit and have power within the capacity of the unit.

- Remember to disconnect all external power supply when repairing the unit.
- Keep all of the electrical equipment dry and clean.The conductor shall be replaced immediately if any conductor insulation is cracked, cut or worn.Keep the wires and wiring posts clean and tightly connected.
- Ensure that all live parts of the unit and power cables are properly insulated.
- Electrical devices can only be extinguished with Class BC or Class ABC fire extinguishers.

1.8 Rescue the injured

Special Warning:

- Before the power supply is cut off, do not barefoot contact the skin of the injured person.
- If possible, cut off the power, unplug or pull the wire from the injured person.
- If the above measures cannot be taken, they shall stand on a dry and insulated plane, such as dry wooden rods, to push the injured away from the live conductor.
- If the injured are in a coma, take immediate artificial respiratory rescue as necessary.

1.8.1 Electric shock emergency aid must be done:

① **Remove the electric shock person quickly from the power supply;**
② **Minutes and time, local rescue;**
③ **The correct way to do the rescue.**

Method of breaking voltage power supply:
1) Remove the wire;
2) Power is cut off at the nearby power switch;
3) Cut off the power cord;
4) Pull the clothes of the electric shock person to remove them from the power supply;
5) Insulation material pad under the body of the electric shock.
Out of the high-voltage power supply method:
1） Immediately call the power supply department to pull the power failure;
2） Open the circuit breaker, or pull open the drop fuse with an insulation rod to cut off the power supply;
3） In exceptional cases, the short-circuit method can be used to short-circuit the high-voltage lines.

1.8.2 Emergency treatment method for electric shock:

- The patient was conscious, but had fatigue, dizziness, palpitations, cold sweat, nausea or vomiting.Such patients should rest quietly to ease the burden on the heart and speed up recovery.
- The patient breathing, heartbeat is still in, but mental coma, should be closely observed, and also prepare for artificial respiration and compressions.
- If the patient is in the state of "fake death" after examination, it should be given symptomatic treatment for different types of "fake death" immediately.

1.8.3 Method of mouth-to-mouth artificial respiration:

1) Remove the foreign body in the mouth

Make the patient lie on his back, and then tilt his head to one side, remove the mouth dentures, blood clots, vomit, with the mouth, so that there is no foreign body in the mouth.

2） Keep your airways unobstructed

On the side of the patient, the rescuer pinched the patient's nose with the hand close to the head, and pressed the edge of the palm to the forehead, the other hand under the patient's neck, lift the neck or use the head lifting method, so that the head was fully raised 70-90 degrees, to remove the respiratory tract obstruction caused by the tongue falling.

3） kiss of life

The rescuer first take a deep breath, and then blow with the mouth close to the injured mouth, together to observe the injured person's chest bulge, to determine whether the blow is effective and moderate.(Generally blow volume 500-600ml, which is proportional to the patient's body volume)

4） Natural exhaust

After the blowing stopped, the rescuer's head deflected, and immediately relaxed the hands of the injured's nostrils, let the gas naturally discharged from the injured's lungs.At this time should pay attention to the chest recovery, listen to the sound of breath, happily check whether there is no respiratory tract obstruction.

5） Stick to don't understand

Repeat, blowing 10-12 times per minute, or every 5-6 seconds (duration of 1 second)

6） **Mouth-to-mouth blowing precautions**

The pressure of mouth-to-mouth blowing should be mastered well, the pressure can be slightly larger at the beginning, the frequency is a little faster, after 10-20 times to gradually reduce the pressure, maintain the chest slightly rise.When children blowing, can not pinch the nostrils, should let its natural leakage, in order to prevent excessive pressure, damage to the patient's lungs.
Blowing time should be short, accounting for about 1 / 3 of the respiratory cycle, but it should not be too short, otherwise affect the ventilation effect.
In case of closed teeth, you can use the mouth-to-nose artificial breathing method, and the method is basically the same as the mouth-to-mouth method.This entry can close the lips of the injured, the rescuer aimed at the injured nostril blow, the pressure should be slightly greater, the time should be a little longer, to benefit the gas into the lungs.

1.8.4 Thoracic compressions method

Let the electric shock lying on a flat place, rescue personnel stand or kneeling on the side of the shoulder, two palm root (children can use one hand), two arms straight, the palm in a little higher place (1 / 3 under the sternum), palm root force pressure (to the electric shock back), make the blood inside the heart.Adult depression 3-4cm, children less force, press the palm root quickly lifted, so that the chest automatically recover, blood is full of the heart.Chest heart compressions should be performed at a uniform rate, about 80 times per minute.Each time you relax, the palm does not have to completely leave the chest wall.When doing heart compressions, the position of the palm must be found accurately, too strong force is easy to cause fracture, pneumothorax or liver rupture, too light force can not reach the effect of the heart jump and blood circulation.It should be noted that the heartbeat and breathing are correlated, and that once both breathing and heartbeat stop, mouth-to-mouth artificial respiration and chest compressions should be performed in time.
In particular, if there is only one person on the scene for rescue, the two methods should be conducted alternately. The rescue personnel can kneel on the shoulder side of the shocked person, blow 1~2 times, and press 10~15 times.After pressing and blowing the gas for one minute, judge whether the breathing and heartbeat of the electrocuted person should be recovered within 5~7 seconds.If the carotid artery of the electrocuted person has beat but no breathing, chest compressions are suspended, and two mouth-to-mouth artificial respiration is performed, and then blow once every 5 seconds. If the pulse and breathing are not recovered, you should continue to adhere to cardiopulmonary resuscitation.In the process of rescue, the judgment should be made again every few minutes, and each judgment time should not exceed 5~7 seconds.

Warning: Do not give them water or other drinks.

Chapter 2 Diesel generator set description

2.1 General description and identification of the generator set

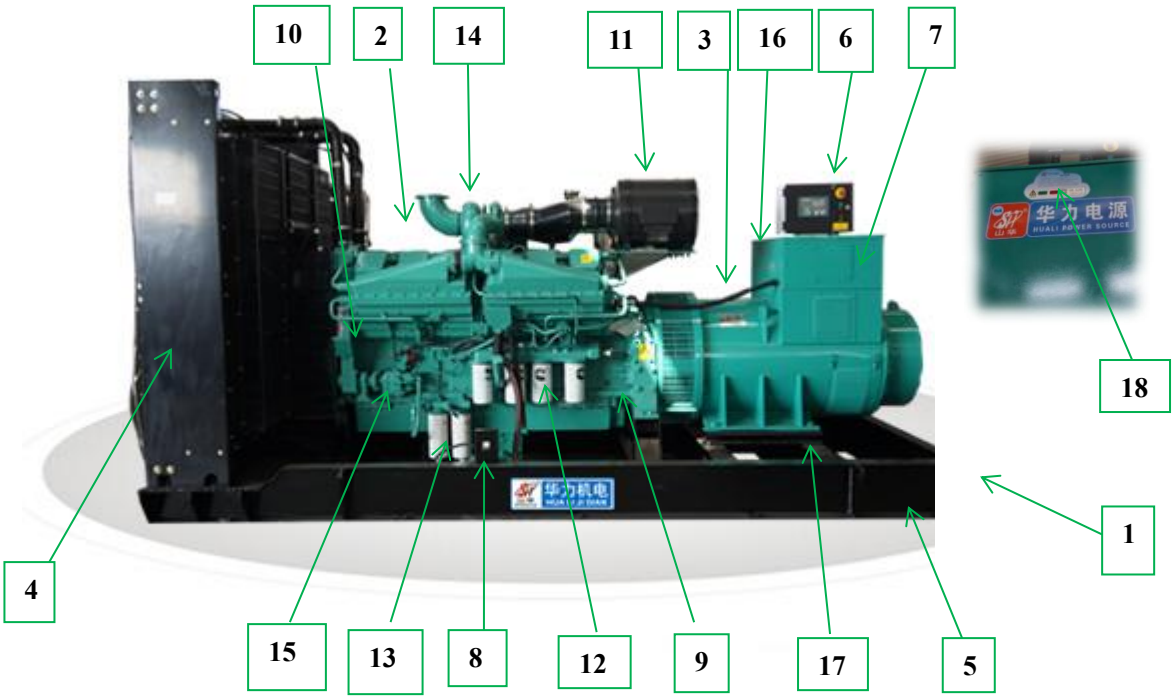


Figure 2.1 Construction diagram of the standard generator set

Project, Name

1 Generator set nameplate (fixed to the end surface of the base)
2 Diesel engine
3. Alternator
4. Radiator
5. Common Base Frame
6. Control screen Panel
7 Output junction box
8 Water sleeve heater (optional)
9 Starter motor (installed on the opposite side)
10 Charging generator (installed on the opposite side)
11 Air filter
12 The Oil Filter
13 Diesel filter
14 Turbocharger (for some models)
15 Engine governor (for some models)
16 Generator junction box
17 Shock absorption pad
18 Cloud services

Huali generator set is composed of diesel engine (2), three-phase AC brush-less synchronous generator (3), output junction box (cabinet) (7), radiator (4), electrical control screen panel (6), fuel tank, silencer and common base frame (5), etc., and provides excellent and reliable performance.Figure 2.1 shows the main components, a construction diagram of a standard generator set.However, there may also be slightly changed depending on the main structure of the different models.The main components are installed on the common base made of welded type steel, easy for movement and installation.The flywheel shell of the diesel engine is

directly connected with the axial direction of the front-end cover of the generator, and the SAE standard rigid flywheel coupling plate is used to drive the generator rotation directly by the flywheel.This coupling mode is fixed together by screws to connect the two into a rigid body, ensuring that the concentricity of the crankshaft of the diesel engine and the generator rotor is within the specified allowable range.To reduce the vibration of the unit, shock absorbers or rubber shock absorption pads are usually installed at the connection of the diesel engine, generator, radiator and electrical control box to the common base frame.Each generator set has a nameplate (1) nailed to the housing of common base frame.The data on the nameplate is used to identify the unit characteristics and their operating characteristics.These data include model, unit number, output voltage and frequency, and the output power is indicated by kVA or kW.For reference, these data are repeated in the technical data sheet attached to this manual.Model and serial numbers are unique and are not repeated, and must be provided when accessories and warranty services are required.

2.2 Classification of diesel generator sets

There are many types of diesel generator sets, with different classifications according to different standards.

① can be divided into common generator sets and standby generator sets according to nature and use, generally located in areas away from municipal power or near industrial and mining enterprises to meet the construction, production and living electricity in these places. The standby generator set is the power supply by municipal power supply or other reasons, to ensure basic production, life or emergency power supply for some important equipment.

② can be divided into: by structural type, control mode and protection function:

A.—— It is the most common unit, consisting of diesel engine, closed radiator, fuel tank, silencer, synchronous alternator, control box (screen), couplings and chassis.The unit has the automatic adjustable voltage and rotational speed adjustment function.Usually available as a main or backup power supply.

B.The self-protection unit ——It adds the manual integrated control system to the basic unit, and can detect the diesel oil pressure, coolant temperature, speed, generator voltage, power generation current, and display the measured value. When the measurement value reaches the set alarm shutdown value, the controller will automatically issue the alarm or shutdown action.For example ,when the oil pressure is too low, oil temperature or cooling water temperature is too high, can automatically send out sound and light alarm signal; when the unit over speed, can automatically emergency shutdown for protection and etc.

C .Self-start unit —— This unit adds the municipal power detection function on the basis of the self-protection unit.It has automatic start and remote control start and stop functions.When the municipal power suddenly power out, the unit can automatically start, automatically operate, with automatic circuit breaker.

D .Microcomputer control automatic unit ——Generator unit consists of perfect performance of diesel engine, three-phase brush-less synchronous generator, automatic fuel supply unit and automatic control screen.The automatic control screen is controlled by a programmable automatic controller or an oil machine special micro-processing controller.In addition to the functions of self-start, self-switching, self-operation, self-input and self-shutdown, and equipped with various fault alarm and automatic protection devices, in addition, it is through the RS232 or RS485 communication interface, connected with the main computer,

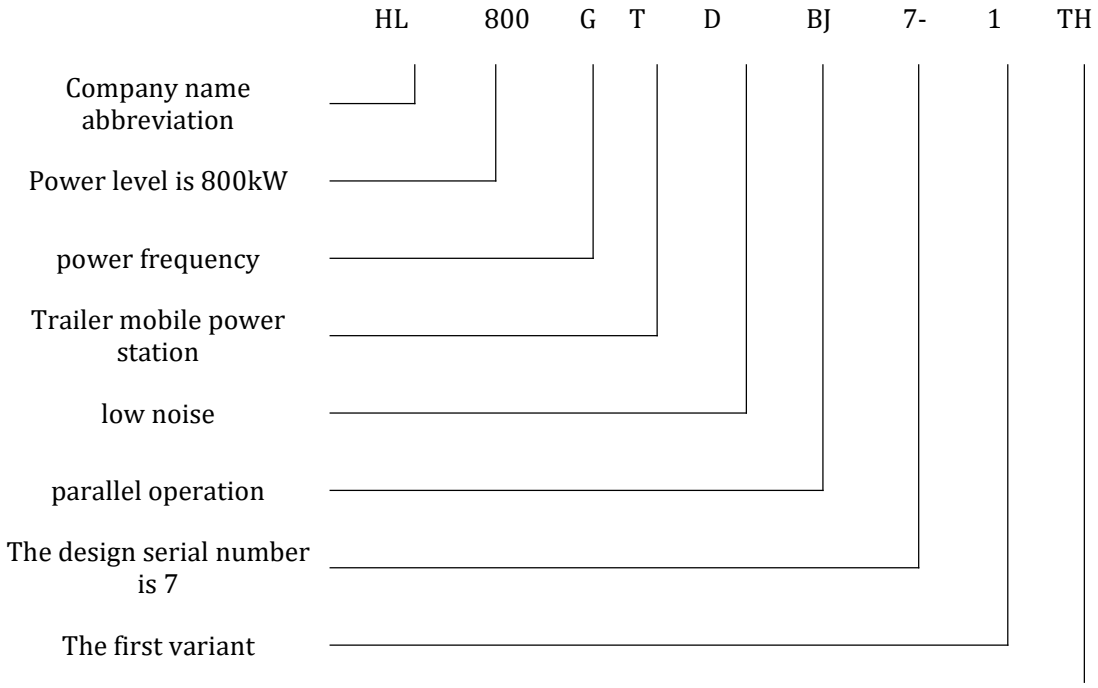
centralized monitoring, to achieve remote control, remote trust, telemetry, do unattended.

E.The parallel control system of generator unit—— It can realize the automatic startup / shutdown, parallel, data measurement, alarm protection and "three remote" functions of multiple generator sets.The controller adopts large-screen LCD (LCD) display, can choose the Chinese and English operation interface, easy operation, reliable operation.The controller has the function of controlling GOV and AVR, which can automatically synchronize and divide the load.

F.The generator set and municipal power parallel controller of the grid-connected unit——it is suitable for the manual / automatic parallel system of a single generator set and municipal power, which can realize the automatic startup / shutdown, data measurement, alarm protection and "four remote" functions of the generator set.The controller adopts large-screen LCD (LCD) display, can choose the Chinese and English operation interface, easy operation, reliable operation.The controller has the function of controlling the generator set regulator GOV and the voltage regulator AVR, and has a variety of mode choices for parallel operation with the municipal power, such as: the generator set constant active power and reactive power / power factor output, the municipal electric peak shear function, and uninterrupted recovery to the municipal electric power supply function.

2.3 Model description of Huali generator

The generator set is a power supply equipment powered by a diesel engine and driving a synchronous alternator.In order to facilitate production management and use, the state has made unified provisions on the name and model preparation method of diesel generator sets, and the model arrangement and symbol meanings of Huali generators are shown in the figure below:



damp-heat type

The first HL is the company name abbreviation suffix numbers and symbols, where the symbols and numbers represent the following model meanings:

1- - -Output rated power (KW), expressed by numbers.

2- - -Output voltage type G represents AC power frequency; P represents AC medium frequency; S represents AC dual frequency; and Z represents DC.

3- - -generator set type; F represents land power station; FC represents Marine power station; Q represents automobile mobile power station; T represents trailer mobile power station; J represents container (discharge) power station.

4- - -Functional feature, absence is manual (ordinary type) unit; F represents rain-proof unit; D represents low-noise unit;

5- - -Control characteristics, BH represents four protection; ZQ represents self-startup; Z D represents automation; BJ represents parallel machine; BW represents high voltage grid connection; B J W represents high voltage grid connection

6- - -Design serial number, indicated by numbers.

7- - -variant code, indicated by numbers.

8- - -Environmental characteristics, absent from normal type; TH represents wet and humid type.

2.4 Diesel engine

Diesel engine is the power source of the generator set (2), is specially designed and manufactured for this generator set, safe and reliable performance.Diesel engines are heavy industrial, with 4 or 2 stroke compression combustion cylinders to provide stable power.They include a cylindrical air filter (11), some diesel models equipped with a turbocharger (14), and a mechanical or electronic governor (15) to accurately control the speed of the diesel engine.

2.5 Power system of the engine

The engine power system is 12 or 24 volts negative ground DC, depending on the model.This system includes a starting motor (9), battery and battery rack, in some large engines, this system may be positioned on the floor near the engine, a battery charger (10).The engine is generally providing a lead acid battery, which will be discussed in detail in chapter 10 of this manual.The unit can also be used with other types of batteries at customer request.

2.6 Cooling system

The engine cooling system includes a radiator (4), a high-energy axial flow fan, and a thermostat.The alternator is equipped with a separate fan to cool its elements.Note that the airflow is pushed through the radiator, the cooling airflow is first through the alternator, then through the engine, and finally through the cooling tank.

2.7 Alternator

The output power is generated by a case with a shield and drip protection, brush-less, self-excitation, autostatic alternator (3) mounted on top of the power junction box (16).

2.8 Fuel tank and common base frame

Both the engine and the alternator are mounted on a heavy steel common base frame (5).In addition to the largest generator sets, the common base frame generally includes a fuel tank with full load running for six hours.If no fuel tank is on the base frame, a separate fuel tank may be purchased attached.

2.9 The shock absorber

The generator set is equipped with shock absorbers (17), which is designed to reduce the vibrational transmission to the common base frame when it runs.These shock absorbers are mounted between the engine / alternator foot and the bottom frame.However, in larger generator sets, the engine / alternator is fixed to the common base frame, while the shock absorbers are provided for the customer to install between the common base frame and the concrete floor.

2.10 Muffler and exhaust system

The exhaust silencer is randomly attached to be installed. The silencer and the exhaust system can reduce the noise and directly discharge the exhaust gas outdoors.

2.11 Control system (configured according to different control requirements)

There are several control systems and control screens, including one (6) to control the operation and output, and to protect the unit from damage due to incorrect operation.Chapter 9 of this manual provides detailed data and has markers to help identify different control systems.

2.12 Power supply air switch

To protect the alternator, a main power switch (7) suitable for the relevant model and related power output is installed in a separate switch box.In some cases, the switch may be fitted with an automatic conversion delivery system or a control screen.

2.13 Adjustment of the prime power

The generator prime power is the power at the standard temperature and atmospheric pressure.the ambient temperature is 27℃, the relative humidity is 60%, and the altitude of 1000 meters.

The engine and generator adjustments are allowed when the conditions are different from those described above.The prime power is adjusted as follows:

The power of the engine, that is the output power and active power of generator sets, can output all the nominal power under the altitude, air temperature and relative humidity of not exceeding 60% (except the Huali air-cooled generator set).

Note: The Huali air-cooled generator set adopts air-cooling technology, its actual output power increases with altitude and temperature, and the power decline is larger than the water-cooled generator set (the specific conversion method can be connected with the Huali application engineering).

If the equipment is operating at low pressure, high temperature or high relative humidity, it is necessary to reduce the nominal power.Accurate calculation reduction refer to British standard BS.5514.part1. Or get an approximate data of adjusting power from below:

Atmospheric pressure (altitude):

The atmospheric pressure is lower than 750mm(29.5inch) with mercury power decreases by 2.5% per 25mm (1 inch).That is, above 1525m (5000ft), the power per 300m (1000ft) is reduced to 4%.

When the atmospheric pressure is below 560mmHg (22 inch HG), i. e. above 2450m (8000,000 f t), Huali Sales can be contacted for assistance.

Air temperature at the air filter inlet:

Each 4- ℃ increase in power decreases by 2% at temperatures above 40℃.

humidity:

The reduction of humidity depends on the relative humidity and atmospheric temperature (air temperature at the inlet); when the atmospheric temperature is below 30℃, the influence can usually be ignored.

The table below shows the amount of humidity reduction in most environments, and both high temperature and high air pressure are rare, with up to 6% power reduction anywhere in the world, which can usually serve as a maximum.

free	relative humidity								
.	20	30	40	50	60	70	80	90	
30	-	-	-	0.1	0.6	1.2	1.7	2.2	
32	-	-	-	0.4	1.0	1.6	2.1	2.7	
34	-	-	0.1	0.8	1.4	2.1	2.7	3.3	
36	-	-	0.4	1.2	1.9	2.6	3.3	4.0	
38	-	-	0.8	1.6	2.4	3.1	3.9	4.7	
40	-	0.2	1.1	2.0	2.9	3.8	4.7	5.5	

Chapter 3 Installation and commissioning

3.1 Installation of generator set

3.1.1 General description

The Huali generator set adopts the component structure, which is a coupling connecting the engine and the generator, enabling it to form a single overall unit with huge strength and steel strength, and it has two advantages:

1) It can maintain the engine and alternator assembly accuracy for a long time.

2) Because the generator set is fixed to an whole steel base frame and equipped with special vibration absorber, it is necessary to use a heavy concrete foundation with shock absorption function in order to bear its weight.

3.1.2 Concrete foundation

When selecting the location of the generator in the generator room, there must be at least one meter of air passage room at its four sides to facilitate maintenance work.The generator may be installed directly mounted on a concrete block with a smooth surface which shall be 150-200m m above the ground level and the actual height and size shall be determined according to the model of the generator.When constructing the foundation, you need reserve any anchor bolts, and fixed bolt position on common base frame, then expansion bolt, and secure the generator.

3.1.3 Size of the generator room

The ideal generator room should be arranged so that each side of the generator is at least one meter away from the wall, so as to meet the needs of the maintenance space, and open a convenient door on both sides of the machine room.See the recommended generator room size in the figure below (the recommended size is suitable for 12-1000K W generators): Note:

1) The dimensions on the drawing are based on the conventional chassis devices. If the chassis fuel tank is used, the C and G dimensions are slightly changed.

2) The size on the drawing is generator set according to the conventional exhaust silencer. If the residential structure is configured, the size of the exhaust silencer will be changed.

3）Standard Huali generator has been randomly equipped with standard exhaust silencer and shock absorber throat (flexible connection pipe).

Commonly used power （k W ）	Commonly used power (k V A)	long A (mm)	wide B (mm)	tall C (mm)	Air-inlet area (m^2)	Air port area (m^2)	Smoke exhaust pipe height G mm ）
12	15	2500	2000	1800	1.1	0.75	1300
16	20	2500	2000	1800	1.1	0.75	1300
32	40	3200	2400	2000	1.2	0.80	1400
45	56	3600	2500	2200	1.55	1.2	1500
68	85	4000	3000	3200	1.60	1.35	2700
75	93.75	4000	3000	3200	1.60	1.35	2700
110	137.5	4300	3200	3200	1.80	1.45	2700
120	150	4300	3200	3200	1.80	1.45	2700
148	185	4500	3200	3200	1.85	1.5	2000
200	250	5500	3500	3400	2.00	1.55	2900
215	268.75	5500	3500	3400	2.00	1.55	2900
250	312.5	5500	3500	3500	2.10	1.60	2900
280	350	5600	3500	3500	2.10	1.67	2900
300	375	5700	3500	3600	3.00	2.32	3100
329	411	5600	3500	3600	3.00	2.36	3100
360	450	5800	3500	3700	3.00	2.47	3100
400	500	5900	3500	3700	3.50	2.92	3100
500	625	6100	4000	3800	4.50	3.25	3200
600	750	7000	4500	4000	5.50	3.90	3300
800	1000	7000	4800	4000	6.60	4.00	3300
1000	1250	8000	5000	4000	6.80	4.80	3300
1200	1500	9000	6000	5000	7.00	5.00	3600

3.2 Equipment is in place

3.2.1 Consult the following relevant departments before installing the generator :

1) Engineer of architectural design institute shall be familiar with the building structure of exhaust and external flame pipe;

2) Personnel of the environmental protection should be management organization;

3) Fire control personnel: the management personnel of combustion, fire prevention, gasoline storage and separate distribution board shall be familiar with the relevant grounding methods and follow the local fire control regulations.

3.2.2 Inlet and outlet wind direction

At any time, the main axis of the generator' inlet and outlet wind direction should be consistent with the main wind direction in order to disperse the heated cooling air.

3.2.3 Vibration

When the generator is installed and running for the first time, press on common base frame with a finger to try the vibration of the main frame simply. If there is an abnormal vibration, the fingers touching the common base frame will be felt.The vibration reduction system of Huali generator can eliminate above

90% vibration.

3.3 Exhaust system

The exhaust system has the function to safely discharge engine exhaust gas outdoors and keep exhaust gas, smoke and noise away from buildings and people (see figure below).The precautions are as follows:

1) When the generator is installed as shown in the figure below, to absorb heat expansion, displacement and vibration, retractable stainless steel bellows connected to 24 inches (610mm).Similarly, the small outlet exhaust system of generator directly fixed to the floor shall be connected with bellows over 18 inches.

2) The bellows are strictly prohibited to act as bends and compensate for pipe installation errors.

3) To reduce condensation corrosion, the exhaust pipe silencer shall be installed as close to the engine as possible for rapid heating.

4) The silencer and exhaust pipe shall be carried out by hanger (or bracket), and the engine is strictly prohibited to bear the heavy of exhaust pipe.Otherwise, it will damage the engine exhaust pipe and reduce the turbocharger life.

5) Black iron pipe is recommended for the exhaust pipe.

6) Choose bends with a larger radius as much as possible.

7) It is recommended that under the engine exhaust pipe back pressure limit, the nominal diameter of the whole exhaust system pipe is consistent with the engine exhaust port.Pipe with a diameter less than the exhaust pipe are prohibited, because thick pipes are more prone to condensation corrosion and expand exhaust displacement to cause power loss.The smaller the pipe diameter change of the exhaust system is the less the friction loss .

8)It is recommended to heat isolate all silencers and exhaust pipes to avoid accidental contact with fire or miss-starting of automatic fire extinguishing equipment and reduce condensation and corrosion and the thermal radiation from the generator room.

9) Unless the coolant temperature is very low, without separating the engine exhaust pipe and the turbocharger hood, the high temperature can burn down the exhaust pipe and the turbocharger hood.

10) The exhaust pipe and flammable spot shall be at least 9 inches (299mm) apart.The exhaust pipe shall be fitted with flame retardant sleeve or insulation when it must cross walls and ceiling.

11) The exhaust pipe swell up about 0.0076 inches (1.14mm / m 100) when generator room temperature rise up 100F.It is recommended that stainless steel bellows should be used to absorb the thermal expansion of long straight tubes.(Random distribution bellows of Huali generator)

12) Longitudinal exhaust pipe shall have a slope away from low terminal of the engine and exhaust pipe extend outdoors or condensate collector.

13) Condensation drainage outlets and plugs shall be installed at the vertical steering point of the exhaust pipe.

14) The end of the exhaust system shall be installed away from the building and air inlet to avoid dyeing black walls and windows.

15) It is recommended that the end of the exhaust system be installed at the back wind of the building, as high as possible, to facilitate the exhaust gas discharge.

16) Some standards stipulate that the end of the exhaust pipe should be at least 3 meters from the ground, 1 meters from the external wall or roof, 3 meters from the entrance of the building, higher than the adjacent construction Build for at least 3 m.

17) Vertical exhaust hole shall be equipped with rain-proof cover.

18) The generator shall not share the exhaust system (including other generators) with other equipment.Smoke, corrosive condensate and high-temperature exhaust gas shall not damage the general equipment.

19) The value of engine exhaust pipe back pressure shall not exceed the allowable value of the instruction manual.Excessive back pressure will produce high-temperature exhaust gas and smoke , and reduce the generator's power and service life of the engine.Therefore, the value of engine exhaust back pressure should be estimated before determining the exhaust system layout; the exhaust back pressure value during full load operation should be measured before the generator is officially put into operation.

3.4 Engine cooling system

The water-cooled engine drives the cooling water pump to generate a circulating pressure, causing the coolant in the cylinder body and the cylinder head lines to continuously circulate for heat dissipation.The engine, cooling pump, radiator (or heat exchanger) form a closed pressure circulation cooling system.The most common cooling components are the online mode radiator and the engine-driven cooling fans.The alternative is an on-line mode liquid heat exchanger.

3.4.1 Online mode radiator

When the radiator is installed at the end of engine , the generator shall be positioned to make the radiator as close as possible to the exhaust hole, otherwise the return that may produce hot air suggests that the maximum distance from the outlet hole is 150m m.

If this generator cannot be positioned as described above, another exhaust drain must be incorporated in the system.The minimum cross-sectional area of the trench must be equal to the cooling area of the radiator, and you can generally use a canvas duct with a steel flange to connect the radiator and the exhaust shutter.the section area of the bend of the groove must be enlarged to reduce the back pressure of the radiator; the sound attenuation pipe (silencer) long flow channel requires must be designed in various buildings (refer to the silencer part).

In buildings, the air inlet and outlet are usually equipped with shutters or mesh, and the invalid area occupied of the shutter sheet or mesh must be considered when calculating the orifice size.The large

amount of air required for cooling and combustion of diesel engines is generally overlooked; therefore, the Company recommends that the intake area should be at least twice the outlet of the engine radiator,

All holes shall be protected from rainwater entry. In winter, the generator is used for standby operation only accidentally, when the machine room shall keep warm and the air inlet shall have adjustable blinds so that the generator stop then and blinds can be closed; a thermostatic controlled engine heater is available in all the engine cooling water system.

3.4.2 Remote radiator cooling system

Installation of generator sets below ground level or limits the use of air duct, but other cooling methods can be used.The radiator in the remote radiator cooling system is separate from the engine and cooling by an electric fan, which can be used for outdoor use as a fully enclosed unit assembly or in an open form for indoor devices.

When the radiator is installed more than 3 meters above the generator, most engines require a separate water tank and an electric water pump, whose size depends on the entire cooling system, the total amount of pipe required plus the amount of cooling water.The cooling water is driven by an electric circulating pump that circulates from the split tank through the radiator and the engine.General radiator fan and pump motor are powered by the generator and that load power shall be included in the total generator power.

When the generator is discontinued, the water will flow from the radiator into the separate water tank, and when the generator running, it must have sufficient water to fill the full cooling system and maintain sufficient cooling water for a long time to ensure efficient circulation.Note to this system:

1) To prevent foreign impurities from polluting the cooling water ;

2) The disturbance of the separate water tank can oxidize the water;

3) Avoid the air being enclosed in the system, and the pipes shall be equipped with ventilation holes;

4) Conduct appropriate water treatment should be meet the recommendations of the engine manufacturer;

5) To prevent water condensation and corrosion, the whole cooling water system must be added with coolant according to the regulations;

6) The cooling water is maintains (without pressure) natural flow in the engine.If the radiator is mounted on the same level as the engine, the cooling system shall be install an expansion water tank above the radiator in order to the expansion of the cooling water.

3.4.3the heat exchanger Cooling system

This system requires smaller space than remote radiator, and its closed water tank can automatically replenish the cooling water with the lost cooling water by ball valve.Most generator sets can be equipped with heat exchanger, which can be used where the water quality may be contaminated or the cooling water can be provided from large storage tanks, but after the water passes through the heat exchanger, it should be regarded as contaminated water and not used for domestic water.Since

the used water has to flow to the waste water pipe, heat exchanger cooling water is not allowed for drinking water in most places.Cooling use of the heat exchanger,The water pressure of the heat exchanger can be maintained at about 1.406 kg per square centimeter.

Note: When using a cooling system with a remote radiator or heat exchanger, a certain ventilation allowance must be maintained to provide sufficient air to burn the engine and as the ventilation room and the radiation heat emitted by the cooling system.

3.4.4 The coolant treatment

Regardless of the basic water quality, once the engine is put into running, the whole engine cooling water system must adopt softening treatment water and cooling water additives, which cost much less than the hole damage caused by no use or insufficient treatment.If the cooling system is well maintained, the diesel engine can generally run after 12500 to 18750 hours, only few holes damage; if the maintenance is not good, the diesel engine must be replaced after 1250 hours.Therefore, the diesel engine users are required to closely monitor the concentration of the additives in the diesel engine coolant, and to carry out the correct maintenance of the diesel engine.Please refer to the engine operation and maintenance manual used to determine what type of cooling system protection fluid used.Or try to contact your supplier immediately.

3.4.5 The Coolant Heater

Automatic thermostatic-controlled coolant heaters are usually required for the engine.For secondary emergency power systems, the NFPA 110 stipulates that the engine cooling temperature shall not be less than 90 °F (32°C).The engine coolant heater must be connected to the mains power supply or the load power supply for other standby power.

3.5 Ventilation system

The generator room ventilation is important. Air circulation must be ensured to discharge heat, smoke and exhaust gas from the engine, alternator and ancillary equipment to replenish the air required for combustion.The ventilation airflow shall ensure that the temperature rise of the machine room is less than 30 °F.

3.5.1 The following points should be paid attention to for online mode radiator ventilation:

1) The intake baffle and louvers shall be able to adjust the air flow during generator running (for example, the louver assembly of the narrow blade has greater resistance than the wide window assembly).

2) When the generator is stopped under the high and cold climate conditions, the automatic switch shall close the inlet and exit air hole; the constant temperature regulating valve shall be partially opened to circulate some air to reduce the cold air intake.The inlet and outlet switch valves shall be fully opened when the generator starts: the circulating control valves shall be closed when the temperature is higher than 60 °F (16°C).

3) Except for the circulating cooling airflow allowed in the generator room in the alpine climate, the other ventilation airflow should be directly discharged outdoors, and it is strictly prohibited to heat

other rooms (except the generator room).

4) Radiator must use elastic pipe joint to absorb generator displacement and vibration to prevent noise propagation.The baffle shall be added appropriately near the ventilation inlet and outlet to reduce the fan noise and reduce the adverse effects of the external wind.

3.5.2 Remarks

As long-distance ventilation pipe airflow resistance exceeds the allowable value of the engine drive fan or exceeds the noise, the heat exchanger with remote radiator cooling system shall be selected.The precautions are as follows:

1) The generator room must be installed with a ventilation fan to overcome the resistance of the air flow and provide sufficient air.

2) The model selection of the remote radiator fan should first meet the requirements of the radiator.It can also be used to ventilate the generator room based on the positioning situation.

3) The fan and air intake hole must be positioned to ensure that the ventilation flow passes through the generator set.

4) The actual output power of the generator is equal to the prime power plus the fan power of the manual, and then minus the generator power consumed by the remote radiator fan, ventilation fan, cooling pump and other components.

3.6 Fuel supply system

For different models of generator sets, Huali Company is equipped with the corresponding standard fuel tank and lubrication supply system for users to purchase.At the same time, the bottom fuel tank can also be designed according to the user's requirements.Separate fuel tanks can also be designed for various capacities according to user requirements.Users can also design their own fuel tank, but the installation design must follow the following principles:

3.6.1 Installation principles:

1) The fuel tank must be stored safe to prevent fire. The fuel tank or oil barrel should be placed alone in a visible place, appropriately far away from the generator, and no smoking is strictly prohibited.

2) The fuel tank capacity should ensure the daily supply.

3) After the fuel tank is placed, the maximum fuel surface cannot be 2.5 m higher than the base of the generator. If the fuel surface of the large fuel depot is higher than 2.5 m, the daily fuel tank should be added between the large fuel depot and the generator, so that direct supply fuel surface is not more than 2.5 m.Even during the diesel engine shutdown, the fuel is not allowed to flow into the diesel engine through the fuel intake pipe or the fuel injection cylinders.

4) The resistance at the fuel hole is not allowed to exceed the specified value of the clean filter element specified in the diesel engine performance data sheet.This resistance value is based on half of the fuel tank.

5) Fuel return resistance can not exceed the provisions in the used diesel engine performance data sheet.

6) The connection of the fuel return pipe shall not cause the shock wave of the fuel in the pipe.

3.6.2 Design principles:

About fuel tank:

1) The fuel output position shall be 50mm higher than the bottom of the fuel tank to avoid inhaling the sediment into the generator.

2) The fuel tank shall have a fuel vent, which shall prevent dust and water from entering the fuel tank.

3) Additional fuel tray shall be added to the bottom of the fuel tank to collect the spilled fuel , or open the drain ditch beside the fuel tank to discharge the spilled fuel.

4) The fuel tank top must be equipped with an inspection hole for easy maintenance.

About fuel supply pipe:

5) The fuel supply pipe shall be black iron pipe which damages the generator, galvanized pipe cannot be galvanized.

6) The fuel supply pipe diameter is from25mm to 32mm, 25mm used for less than 640KW generator and 32mm used for greater than 650KW generator.

7) The connection between the fuel supply pipe and the generator must be connected by a hose to isolate the vibration of the generator set.

About fuel pipe:

8) The same dimensions and materials used as connection between the return pipe and the generator so that must be connected with a hose to isolate the vibration of the generator set.

9) Due to the limited pressure of the fuel pump, the fuel of the return pipe to the fuel tank must be kept below the height difference of 2.5 meters.

3.6.3 Installation of oil & water separator

No matter how carefully fuel is used and stored, dust, rust, moisture, ink and other impurities always have to survive.The water in fuel is also harmful to the engine in two ways: first,it will cause rust; second, it will damage the nozzle to reduce the accuracy when it is turned into steam.Water will be constantly cold knot in the fuel tank, so it is impossible to completely isolate the fuel and water, so the fuel and water separator is needed to use the fuel and water separation.For users with generator sets as a common power supply, using the fuel and water separator for the initial separation of fuel, which can achieve the maximum economic return.Users should choose different filter elements according to the different service conditions and fuel quality.

3.7 Battery starting system

The usual operating voltage of the generator battery starting system is 12V or 24V, and the precautions are as follows:

1) The battery shall provide the starting current specified in the generator instructions.Lead-acid batteries or nickel-cadmium batteries can be selected.The battery shall be a dedicated or authority-approved type.

2) Engine-driven large capacity DC generator and automatic voltage regulator shall be provided to ensure the battery when the generator is running.

3) The emergency power supply system shall be equipped with a floating charging charger

powered by ordinary power supply, it ensure that the battery is full when the generator is on standby, and the engine can be started at any time.

4) The usual standard will stipulate the maximum charging time of the battery, and the charging current is calculated as follows: charging current = (12X battery ampere hours) / charging time

5) The standard generator is randomly equipped with batteries and batteries connection cable.

6) The voltage drop of the connection cable between the batteries and the start motor shall be less than 1V in 12V system and below 2V in 24V system.

3.8 Connection of the power system

The generator has been randomly equipped with the whole control box and a complete wiring device, and also provides the input and output terminals such as generator running, failure alarm and shutdown.Please consult the electrical circuit diagram on the attached page for the specific connection methods.Power wires shall be installed in accordance with general power standards and constructed by professionals due to different site conditions and inconsistent materials for cables.

The following data lists the multi-core soft cable rating for reference only

Cable specification area	Core root number and diameter	The temperature rises to 50 with good air circulation Maximum current allowed to	Voltage drop is m V / m
1	32/0.20	18	54
1.5	30/0.25	24	34
2.5	50/025	35	19
4	56/0.30	46	12
6	84/0.30	59	7.7
10	80/0.40	81	4.6
16	126/0.40	109	2.9
25	196/0.40	140	1.8
35	276/0.40	177	1.3
50	396/0.40	205	0.97
70	360/0.50	260	0.68
95	475/0.50	320	0.51
120	608/0.50	370	0.41
150	756/0.50	420	0.35
185	925/0.50	480	0.3
240	1221/0.50	570	0.25

300	1525/0.50	660	0.22
400	2013/0.50	770	0.2

In fact, as the ambient temperature of the cable use site is different, the grade of the selected cable has also changed, and the grade coefficient listed in the following table must be taken.

ambient temperature ℃	25	35	40	45	50	55	60	65
Allow the temperature	60	50	45	40	35	30	25	15
equivalent coefficient	1.05	0.95	0.89	0.83	0.77	0.71	0.64	0.49

Coefficient of multiple stock cables

number of piles	2	3	4	5	6	7	8
coefficient	0.9	0.7	0.65	0.6	0.56	0.52	0.48

Note: The actual size of the cable used shall be referred to the allowable load flow at the local ambient temperature specified in the Supplier's product catalog.

The following details the working steps that must be done before the generator set is used. The factory assembly of all equipment and power tests is more complex, usually the factory products have been tested and need to drain the water and oil of the engine tank, fuel tank and machine tank before being delivered to our respected customers.

3.9 Preparation before startup

The engine fuel supply system may generate gas trap circuits and therefore require delete it.Similarly, the engine lubrication system may require oil injection in the system, and full details of these procedures and fuel and lubricants are described in the engine manual.NOTE: Once the fuel tank is drained, the engine must exhaust the oil supply system before running again.

3.9.1 Selection of diesel fuel

Generally, the diesel engine instructions require clean diesel without water and low sulfur content.Use the standard fuel of grade BS: A 1 or A 2, or G B 252 or D I N / E N 590, A S T M D 975-88:1-D and 2-D, and choose the appropriate license number according to the temperature of the working place.Take G B 252 as an example, see the table below:.2869

Minimum ambient temperature	Light diesel brand
>4℃	0, Number
>-5℃	-No.10
-5℃~-14℃	-No.20
-14℃~-29℃	-No.35

-29℃~-44℃	-No.50

From the very beginning, fuel use should be strictly controlled to ensure fuel cleanliness. If the project is done well, then expensive engine maintenance costs can be avoided.The oil from the tank should be added to the tank before it should be placed for 24 hours to precipitate foreign material in the tank.The oil hole around the oil hole should be cleaned with a cloth, and then open the oil hole cover.The hose and hand shake pump units used must be kept in a clean environment.

3.9.2 the selection of Lube oil

For the generator set cooler, add lubricating oil to the engine oil pan until the maximum scale of the oil gauge.Follow here if specified on the tank cover.

Different engine viscosity groups are selected for different engines under different temperature conditions. China adopts the international GM American Automotive Engineering Association (S A E) viscosity classification, namely S A E J 300 engine oil viscosity classification, see the table below:

SAE rank	Low, temperature, degree, movement,	Edge, boundary, pump, send	100℃ Sport Viscosity, m i n.m m^2/s	It's equivalent to our old Adhesion number
0W	-30 3250	-35	3.8	
5W /40	-25 3500	-30	3.8	
10W	-20 3500	-25	4.1	
15W	-1.5 3500	-20	5.6	
20W	-10 4500	-15	5.6	
25W	-5 6000	-10	9.3	
20			5.6-9.3	6# 8#
30			9.3-12.5	10# 11#
40			12.5-16.3	14#
50			16.3-21.9	15# 16#
experimental method	A S T M D 5293	A S T M D 4684	A S T M D 445	

"W" is representing W i n t e r or winter, which means this viscosity of oil, suitable for winter use, this classification has 6 winter oil viscosity level (0W-25W) 4 summer oil viscosity group (20-25).Oil viscosity level for every winter requires low-temperature power viscosity (m P a.The s are millipasca seconds), maximum boundary pumping water temperature and 100℃ minimum motion viscosity.The two requirements of low-temperature power viscosity and boundary pumping temperature reflect the difficulty that the oil viscosity level in winter can make the engine start smoothly and enter the normal

lubrication state in winter, that is, the difficulty of starting from 0W to 25W at low temperature increases successively.The minimum motion viscosity of 100℃ reflects the evaporation loss of winter stain viscosity level at high temperature, namely low viscosity means greater evaporation loss and large oil consumption due to evaporation loss.The summer oil viscosity level requires only a 100℃ motion viscosity range.Thus, the viscosity level 0 to 0, increases with the viscosity, the thickness of the oil film formed by the engine friction surface increases, correspondingly increases the engine energy consumption (fuel quantity), each viscosity level can save about energy consumption of 0.5%.Winter oil viscosity levels and summer oil viscosity levels are combined, e. g

5W / 30,15W / 40,20W / 50, with an engine oil of two viscosity classes, called multistage oil, such as 15W / 40 oil, which is equivalent to 15W oil alone in winter and S A E 40 in summer.This multiple sets of oil works both in winter and summer, in the cold north and in the hot south, with the advantages of temperature range and wide regional range.It also has the energy-saving characteristics.Compared with single-stage oil (summer oil), the former saves fuel than the latter by 2-5%, diesel oil has been popularized in North America to about 50% in North America and Western Europe, and the proportion of multi-stage oil used will further increase and tend to be low viscosity.For Huali generator units, we recommend using 15W / 40 oil in most parts of our country, but also 5W / 30 or 5W / 40 in the cold areas in the north.

3.9.3 Selection of the coolant

For water-cooled engines using a water tank radiator or heat exchanger, the cooling system protection fluid must be added to the cooling water system to prevent corrosion, erosion and freezing, and users without antifreeze cannot pay the warranty.In cold climates, the coolant may freeze, so a mixture of antifreeze should be added.Antiantifreeze and corrosion resistance shall comply with BS.3151 Standard.

Please refer to the engine operation and maintenance manual used to determine what type of cooling system protection fluid is to be used or to contact your supplier immediately.

Note: When the engine is running, the cooling system will be pressurized to a pressure above 0.7kg per m meter, and the pressure relief valve shall always be installed on the radiator cap.

Make sure the radiator cap is properly installed and do not try to remove the radiator cap when the engine is hot.Otherwise, it may shoot out hot water and burn the body.

3.10 Grounding device

The ground wiring point are arranged at the end of the generator set chassis and must be connected to the proper ground position.At the construction site with a suitable connection site, the ground rod or ground pad should be used, the effect depends on soil conditions, and should be consulted from local professionals.The grounding system is a life and death equipment, which can prevent the damage caused by power failure or abuse of electricity, and the land generator set or the inner middle line of the equipment must be connected to the ground line.The responsibility of the customer is to require his competent electrician to ensure that the grounding of the equipment has been effectively maintained, and the maintenance of the grounding system shall be done in strict accordance with the instructions.Huali Company and its agents shall not be liable for accidents caused by ungrounding or unit grounding failure.

The connection of the alternator ground center line is usually determined by the user upon installation, which must be connected directly to the plant ground line when the generator set is used to be the sole power source.For complex installations, the grounding midpoint should be selected to ensure proper operation or protection of equipment such as finding grounding faults and minimizing the grounding cycle current.The provision of such grounding wires must be arranged by the advice of the users

and the local authorities.

3.11 No-load inspection

Run generator set for several minutes. See Chapter 4 for operation procedures.If a fault occurs, turn off the machine immediately.Check the following items in detail.

A. Engine oil pressure reading of 2.0 bar or more.

b. Whether the engine fan blade and fan frame fall off or touch the case.

c. Check the generator outlet frequency and whether the voltage is normal.

d. Whether the engine fuel is leaking.

e. Whether the vents of the system have enough fresh air.

f. Whether the cooling water pipe leaks.

The g. Whether the exhaust system leaks the gas.

3.12 Load inspection

Run the unit with a load for at least 1 hour (see the operating instructions in Chapter 5).Note during testing:

A. The generator frequency is recorded by the frequency table. The generator shaft speed is actually a linear function, and the general engine speed of 1500RPM is consistent with the generator frequency of 50HZ.During engine acceleration the speed may run slightly faster and overfrequency readings of about 1-5HZ, which is allowed.

b. The recorded fluctuation of the output voltage at any phase must be ± within 2% during the entire operating state.

c. Check the load as balanced by the per-phase current record to ensure that the current does not exceed the allowable value for each or all phase at the full load.

The d. Engine lubricating oil pressure.As the engine temperature increases, the lubricating oil viscosity will decrease.Therefore, an oil pressure reference reading is required, and the engine temperature will stabilize after about 1 hour of the full load operation, when the oil pressure should not be less than 2.0 bar.

e. Engine coolant temperature: run the generator set for 1 hour, the engine water temperature will rise until it is stabilized again. At this time, the coolant temperature should not exceed 97℃.

f. When the unit is running stably, carefully check the leakage, water leakage or oil leakage around the engine.

Chapter 4 operation declaration

4.1 General description (control box model description)

Through many years of experience in the generator set design, Combined with the control design theory of many diesel generator sets, In full consideration of the user's problems in using diesel generator sets, According to the reliable, efficient and simple design principles, HLCS-A02 of Huali four protection control system and HLCS-C02 are designed, Huali self-start control system HLCS-A12 / 12; Huali automation control system HLCS-A22 / C22; Huali-parallel machine control system HLCS-A32 / C32 / D32; Huali grid-connected control system HLCS-A42 / C42 / D42; Control system of Huali HP unit HLCSHV-A52 / C52 / D52.

Control system name	number	Main module	manufacturer
Ordinary instrument	HLBD-01		Huali mechanical and electrical
Self-protection and control system	HLCS-A02	HGM6110U	Zhengzhou wisdom
	HLCS-C02	MRS10/16	Czech Comai
Start the control system automatically	HLCS-A12	HGM6120U	Zhengzhou wisdom
	HLCS-C12	AMF20/25	Czech Comai
Automatic control system	HLCS-A22	HGM6120U	Zhengzhou wisdom
	HLCS-C22	AMF20/25	Czech Comai
And machine control system	HLCS-A32	HGM9510	Zhengzhou wisdom
	HLCS-C32	IC-NT MINT	Czech Comai
	HLCS-D32	DSE 8610	Britain's deep sea
Grid-connected control system	HLCS-A42	HGM9520	Zhengzhou wisdom
	HLCS-C42	IC-NT SPTM	Czech Comai
	HLCS-D42	DSE 8620	Britain's deep sea
High-voltage unit control system	HLCSHV-A52	HGM6320	Zhengzhou wisdom
	HLCSHV-C52	AMF20/25	Czech Comai
	HLCSHV-D52	DSE 7320	Britain's deep sea

The controllers used by the company use microprocessor technology, realizing precision measurement, value adjustment, timing, threshold adjustment and other functions of various parameters. All parameters of the controller can be adjusted from the front panel of the controller, or using PC through programming interface, or PC through RS485 interface adjustment and monitoring.Its compact structure, simple wiring and high reliability can be widely used in various types of generator set automation systems.

4.2 Check before startup (for all control systems)

The following inspection shall be made before the startup:

warn ※

! Since the generator set with an automatic control system (HLCS- * 12 series above) can be started remotely without warning, the switch of the control screen should be turned off before inspection.

1. Ensure that the battery switch is turned off.

! Before the coolant drops to the normal temperature, do not open the lid of the radiator, do not add a lot of coolant to the rolling hot cooling system, otherwise it will cause serious damage.

remarks:

The ● diesel engine normally consumes 0.25% to 1% of the fuel consumption.

2. Check the level of lubricating oil and coolant of diesel engine and fill up when insufficient.

warn ※

! When injecting fuel into the fuel tank, do not smoke or use an open flame nearby.

3. Check the fuel level and add it when needed.

4. Check the tightness of the diesel cooling fan and the charger belt, such as loosening.

5. Check all hoses to see if there will be loose or wear, tighten or replace.

6. Check the battery electrode without corrosion, clean or replace.

warn ※

! When sorting out the battery, do not smoke or use an open fire nearby. The hydrogen produced by the battery will cause an explosion.

! Do not short-circuit the battery output electrode.

7. Non-maintenance-free battery, check the electrolyte level, and add distilled water if necessary. If the battery is new and never overcharged, add a pre-equipped electrolyte.

8. Check whether there is a accumulation of dust on the control screen and generator set, and clean up.These dust and dirt can cause electrical shock or cause unit cooling problems.

9. Check the blocking indicator of the air filter, and replace the filter if blocked.

10. The site around the generator set should be cleaned up to remove the unsafe objects to avoid affecting the operation or causing danger.Make sure that the cooling ventilation net is not blocked.

11. Observe and check the fuel system, cooling system and lubricating oil oil seal of the unit without leakage.

12. If the smoke exhaust system has a drainage valve, the condensed water is discharged regularly.

13. Ensure that the alternator output circuit switch is in the off (OFF) state (or handle down).

4.3.2 Initial start / shutdown of HLBD-01

The following steps can be used to first start the generator set of the HLBD-01 series control screen, or after the generator set is disabled for a period of time due to fault maintenance:

pay attention to:

The ● turns the key to the "O" (OFF) position to stop the unit at any time.

1. Complete the pre-start inspection according to Section 4.2.

2. Connect the battery to the generator, connect the positive electrode first, and then connect the negative electrode.

3. Lubrbe the lubrication system of the diesel engine.The method is to disconnect the throttle cable or throttle switch, and then turn the key to the starting position for the starting motor to turn the unit until the oil pressure gauge shows that the unit oil pressure rises.Do not turn the unit for more than 5 to 7 seconds when no oil pressure appears.Turn the key to the shutdown position "O" to rest the unit for 10 seconds and try the next turn.After 3 rotation attempts, if there is still no oil pressure, check the cause for no oil pressure.

warn ※

! Continuous starting in a combustion system that fails to work properly will cause unfired volume clustering in the exhaust system with a potential explosion hazard.

4. Fill the fuel with the fuel system with a hand pump and release the air trapped in the fuel filter (see the Diesel Engine Manual for details).

5. Start: spin the key from the "O" counterclockwise to the "preheat" position to intensify the preheater (if there is a device).Hold 7 seconds to inhale the preheated gas, 7 seconds, turn the key back to the "O" position through the "I" position to the "(START)" position, start, immediately when the engine starts, let go of the key to reply to the "I" (ON) position.

If you cannot start, the start time should not exceed 5-7 seconds, keep each start apart for 10 seconds, and the key should be fully restored to the "O" (OFF) bit.If you have still started for 3 times, stop and see section 6.1 of this manual to find out the reason for the failure, or check the Diesel Engine Manual.

warn ※

When multiple starts are still impossible, the unburned oil and gas will gather in the exhaust system.Unscrew the connector of the exhaust outlet to dissipate the unfuel gas.Once the ungas body (white smoke) disappears and the cause of the fire failure has been corrected, the exhaust pipe can be reinstalled and repeat the starting step.

6. When the engine has adjusted the throttle to the rated speed (only for manual throttle) and run for about 1 minute, switch to "O" through the key switch, unscrew the radiator cover for about 5 minutes, bring the system recovery and the air blocked in the radiator is discharged, check the coolant surface, and add coolant if needed.

Tip: When the coolant is first added, a small amount of air may be "blocked" in the cooling system, it must be the engine to be briefly opened to make these "blocked" air discharged, so that the coolant can flow smoothly in the whole cooling system.

7、Refer to step 5, and restart the unit.
8、Check the unit for abnormal noise and vibration.
9、Check the unit discharge system for gas or liquid leakage.
10、Check the control screen for any abnormal indication, especially the high water temperature or low oil pressure display.The oil pressure shall enter the normal range within approximately 8-10 seconds after the engine runs.
11、Display the indication of the check voltage and frequency through the control screen.The output voltage of the unit has been adjusted at the factory and therefore should be indicated to the rated voltage at the rated frequency of ± within 1.25% without load.Any voltage adjustment shall be made by a qualified electrician or technical personnel.There are three methods to adjust the voltage: if the control screen is equipped with the voltage adjustment resistance, the voltage can be adjusted by a potentiometer installed on the automatic voltage modulator in the alternator junction box. If the output voltage is changed in the alternator junction box.

warn ※

! During a phase check, if the load is connected, keep the air switch in the switch position (handle down).

12、When the unit has generated a voltage, connect the phase meter to the generator circuit breaker side and check whether the unit phase is correct.The inspection shall be carried out by qualified technicians.
13、Determine that the phase and the load phase can connect the cable for normal power generation.

warn ※

! When the load cable is connected or removed, the air switch must be disconnected, shutdown and the battery negative cable removed.

14. Stop: adjust the throttle to low speed (for manual throttle only), turn the key switch to the "O" off position, that is, stop.

4.3.3 Normal startup / shutdown of HLBD-01

The following are the general steps for normal startup / shutdown of the instrument cluster control screen:

Tip; In any case, the unit can be stopped by turning the key switch to the "O" off position.

1、Complete the prestartup check according to section 4.2.
2、Turn the key from the "O" counterclockwise to the "preheating" position to intensify the preheater (if available).Hold 7 seconds to inhale the preheated gas, 7 seconds, turn the key back to the "O" position through the "I" position to the "(START)" position, start, immediately when the engine starts, let go of the key to reply to the "I" (ON) position.

warn ※

! The key switch cannot be transferred to the preheating position or start-up position during unit operation.

If you cannot start, the start time should not exceed 5-7 seconds, keep each start apart for 10 seconds, and the key should be fully restored to the "O" (OFF) bit.If you have still started for 3 times, stop and see section 6.1 of this manual to find out the reason for the failure, or check the Diesel Engine Manual.

warn ※

When multiple starts are still impossible, the unburned oil and gas will gather in the exhaust system.Unscrew the connector of the exhaust outlet to dissipate the unfuel gas.Once the ungas body (white smoke) disappears and the cause of the fire failure has been corrected, the exhaust pipe can be reinstalled and repeat the starting step.

When the unit is started normally

4、Check the unit for abnormal noise and vibration.
5、Check the exhaust system for gas or liquid leakage.
6、Check the control screen for abnormal indications, especially for high temperature or low oil pressure, which should enter the normal range within approximately 10 seconds after the engine is turned on.
7、Close the air switch to the closing position (handle up), and the unit can provide power outward.

point out:

The unit can now be loaded.However, the size of the primary input load capacity depends on the unit operating temperature.When the operating temperature of the unit is lower than 20℃, the primary input load capacity cannot be higher than 50% of the rated power; when the unit operating temperature is above 80℃, the primary input load capacity can reach 70-100% (depending on the unit model, the primary input capacity can reach 100% below 100KVA).

8、8. Shutdown: When shutdown, first adjust the load to near empty load and pull the air switch to the switch position (handle down), let the unit run under no load for several minutes, and then adjust the throttle to low speed (only for manual throttle), turn the key switch to the "O" off position, the unit can be shut down.If the key switch to the "O" off position without the above shutdown steps due to emergency, stop directly.
9、6. Check the abnormal noise or abnormal vibration.
10、7. Check for any liquid leakage.
11、8. Check the control screen for abnormal indications, especially for high temperature or low oil pressure. The oil pressure should enter the normal range within about 10 seconds after the engine is turned on.
12、9. Check the output voltage and frequency from the control screen.The output voltage has been adjusted at the factory and therefore should be indicated to the rated voltage.Units with 50Hz frequency without load shall be close to 52Hz and 60Hz shall be close to 62Hz.Adjustment should be made by a qualified electrician or technical personnel, and there are three voltage adjustment methods that can be adopted:

13、If the control screen is equipped with the voltage adjustment resistance, you can adjust the voltage through this adjustment of the resistance;
14、Fine tuning can be performed by a potentiometer installed in the automatic voltage regulator in the alternator terminal box;
15、A complete change in the output voltage requires changing the alternator terminal box output coil connection to obtain.Refer to the alternator Manual for details.
16、warn ※
17、! Do not open the open switch during phase check.
18、10. When the generator set has generated a voltage, use the phase inspector to check whether the phase is correct, and connect the phase meter to the side of the generator open circuit switch.This inspection shall be conducted by qualified technicians.
19、11. Stop: turn the key to the O " (OFF) position, or stop.
20、warn ※
21、! When the load cable is connected or removed, the battery negative wiring must be turned off or removed.
22、12. Now the load cable can be connected and ready for normal power generation.
23、13. When checking the remote control start equipment, relax the emergency stop button and the remote control stop button and twist the control switch to the "automatic" (AUTO) position.
24、Enter the remote start signal and the engine will follow the above procedure; clear the remote start signal and the engine should be stopped.
25、To stop, remove the remote control start signal, press the emergency stop button, and twist the control to the " STOP (stop) position.
26、warn ※
27、Stop before connecting the load cable or disconnecting the load cable.Turn off the open circuit switch and remove the battery negative wiring.
28、Load cable can now be connected and the generator set is ready for normal operation.

4.4 Four protection control system, HLCS- * 02

4.4.1 HLCS- * 02 Control screen face description:

1: HLCS-A02 controller; AMF8 / 16 for HLCS-C02 controller and HLCS-D02 DSE6020

4.4.2 HLCS- * 02 LCS:

The following steps can be used to initially start the generator set of the HLCS- * 02 series control screen, or after the generator set is disabled for a period of time due to fault maintenance:

point out:

The ● presses the emergency stop button or presses the "" stop button to allow the unit to stop at any time.

After the ● presses the emergency shutdown button, the controller will display the emergency shutdown fault. The reset should now rotate the emergency shutdown button clockwise to pop it up, and then return to the standby mode through the controller reset button.

1. Complete the pre-start inspection according to Section 4.2.

2. Connect the battery to the generator, connect the positive electrode first, and then connect the negative electrode.Close the battery switch and close each micro switch in the control screen.

3. Lubrbe the lubrication system of the diesel engine.The method is to disconnect the throttle solenoid valve or throttle switch, and then switch the controller to "" manual mode, then press the "" start button, so to start the motor to turn the unit, switch the LCD screen to show the oil pressure to observe the oil pressure rise of the unit.When there is no oil pressure display, after trying 3 turns, if there is still no oil pressure, then the cause of no oil pressure shall be checked.Do not turn the unit more frequently.

4. Fill the fuel with the fuel system with a hand pump and release the air trapped in the fuel filter (see the Diesel Engine Manual for details).


5. Start: determine that the emergency stop button is in the release state, switch the controller to the "" manual mode, and then press the "" start button. The unit will automatically start the normal operation state of the unit according to the control logic.

If the unit fails not start successfully, it will start automatically three times. If it still cannot start, "Start failure" alarm will be issued. Please refer to section 6.1 of this manual to find the failure to start, or check the Diesel Engine Manual.Then return to standby mode through the controller reset button and start the unit by starting steps above.

warn ※

When multiple starts are still impossible, the unburned oil and gas will gather in the exhaust system.Unscrew the connector of the exhaust outlet to dissipate the unfuel gas.Once the ungas body (white smoke) disappears and the cause of the fire failure has been corrected, the exhaust pipe can be reinstalled and repeat the starting step.


6. When the engine starts normally and runs for about 1 minute, press the emergency stop button or "" stop button, screw the radiator cover for about 5 minutes, and the air with system recovery and blocked in the radiator is discharged, check the coolant surface, and add coolant if needed.

Tip: When the coolant is first added, a small amount of air may be "blocked" in the cooling system, it must be the engine to be briefly opened to make these "blocked" air discharged, so that the coolant can flow smoothly in the whole cooling system.

7. See step 5 and restart the unit.

8. Check the unit for abnormal noise and vibration.

9. Check the unit discharge system for gas or liquid leakage.

10. Check the control screen for abnormal indications, especially the high water temperature or low oil pressure display.The oil pressure shall enter the normal range within approximately 8-10 seconds after the engine runs.

11. Display the indication of the check voltage and frequency through the control screen.The output voltage of the unit has been adjusted at the factory and therefore should be indicated to the rated voltage at the rated frequency of ± within 1.25% without load.Any voltage adjustment shall be made by a qualified electrician or technical personnel.There are three methods to adjust the voltage: if the control screen is equipped with the voltage adjustment resistance, the voltage can be adjusted by a potentiometer installed on the automatic

voltage modulator in the alternator junction box. If the output voltage is changed in the alternator junction box.

warn ※

! During a phase check, if the load is connected, keep the air switch in the switch position (handle down).

12. When the unit has generated a voltage, connect the phase meter to the circuit breaker side of the generator, and check whether the unit phase is correct.The inspection shall be carried out by qualified technicians.

13. Determine that the phase is consistent with the load phase and can connect the cable to normal power generation.

warn ※

! When the load cable is connected or removed, the air switch must be disconnected, shutdown and the battery negative cable removed.

14、  Check the remote control start performance (if this function): when checking the remote control start performance, turn the emergency stop button to relax state, press "" automatic key, enter the remote control start signal, the unit will start following the set program; disconnect the remote control start signal, the unit will stop according to the program.
15、Stop: press the emergency stop button or "" stop button. 

4.4.3 HLCS- * 02 Control system for normal startup / shutdown:

The following steps can be used to normally operate the generator set of the HLCS- * 02 series control screen:

point out:

 **The ● presses the emergency stop button or presses the "" stop button to allow the unit to stop at any time.**

After the ● presses the emergency shutdown button, the controller will display the emergency shutdown fault. The reset should now rotate the emergency shutdown button clockwise to pop it up, and then return to the standby mode through the controller reset button.

1. Complete the pre-start inspection according to Section 4.2.

2. Connect the battery to the generator, connect the positive electrode first, and then connect the negative electrode.Close the battery switch and close each micro switch in the control screen.

3. Start the unit: switch the controller to "" manual mode, then press the "" start button, the unit will start and run according to the program. If not start the program will automatically start 3 times, if 3 times the controller will issue "start failure" alarm, see section 6.1 of this manual to find the reason for no start, or check the Diesel Engine Manual.Then return to standby mode through the controller reset button and start the unit by starting steps above.

warn ※

When multiple starts are still impossible, the unburned oil and gas will gather in the exhaust system.Unscrew the connector of the exhaust outlet to dissipate the unfuel gas.Once the ungas body (white smoke) disappears and the cause of the fire failure has been corrected, the exhaust pipe can be reinstalled and repeat the starting step.

When the engine starts normally.

4. Check the unit for abnormal noise and vibration.

5. Check the unit discharge system for gas or liquid leakage.

6. Check the control screen for abnormal indications, especially the high water temperature or low oil pressure display.The oil pressure shall enter the normal range within approximately 8-10 seconds after the engine runs.

7. Close the air switch (handle up).

point out:

The unit can now be loaded.However, the size of the primary input load capacity depends on the unit operating temperature.When the operating temperature of the unit is lower than 20℃, the primary input load capacity cannot be higher than 50% of the rated power; when the unit operating temperature is above 80℃, the primary input load capacity can reach 70-100% (depending on the unit model, the primary input capacity can reach 100% below 100KVA).

8. Shutdown: When shutdown, adjust the load to near empty load and pull the air switch to the switch position (handle down), and then press the "" shutdown key, the unit can shut down according to the program.Press the emergency stop button without an emergency.

4.4. Four protection control system

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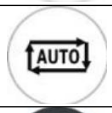
4.4.4. 1 HLCS-A02 control screen function:

Line voltage Uab, Ubc, Uca
Phase voltage Ua, Ub, Uc
frequency,Hz
Load current IA, IB, IC
active power kW
Reactive power, kVar

apparent output kVA
power factor PF
Accumulated electric power of kWh
Power generation has overpressure, underpressure, overfrequency, underfrequency and overcurrent functions;
At the same time, the various parameters of the engine are accurately collected:
Temperature WT °C / °F is shown simultaneously
Oil pressure of OP kPa / Psi / Bar is displayed simultaneously
Fuel level in FL unit:%
Speed: SPD unit: RPM
Battery Voltage VB unit: V
Charger voltage VD unit: V
The timer HC can accumulate 999999 hours
The power supply range is wide (8~35) VDC, which can adapt to different starting battery voltage environment;

4.4.4.2 Description of the controller key button

	Downtime / reset key	Stop the operating generator sets in both manual / automatic mode.In the generator set alarm state, any shutdown alarm can be reset.In shutdown mode, press this key above the 3s clock to test whether the panel indicator light is normal (test light).During the shutdown process, press this key again to stop quickly.
	Boot key	In manual mode or manual trial mode, press the stationary generator set to start.
	manipulating key	Press this button to place the controller in manual mode.
	automatic key	Press this button to place the controller in automatic mode.
	Close the lock key	In manual mode, press this key to control the switch closing.
	Set / confirm the key	Move the cursor and confirm the settings information in the parameter settings.
	Upturn / increase	Turn over, move the cursor up in the parameter settings, or increase the number in which the cursor sits.
	Lower turn / decrease	Turn over to move the cursor down in the parameter settings or reduce the number in which the cursor holds.
	menu key	Press this key to enter the Settings menu and press it again to return to the main interface.

4.4.4.3 Control process:

A.Manual startup operation: the generator unit shall not start and stop with load, and divide the circuit breaker before starting,


Press the controller to "Manual mode", manual mode indicator lights on, then press to start the generator set. 

After turning on, the preheating relay output (if configured), the LCD screen shows "boot preheating delay XX s";

After the preheating delay, the fuel relay output for 1s and then start the relay output; If the generator set does not start successfully within the Start time, the fuel relay and start relay stop the output, enter the Start interval, and wait for the next start;

In the three start times, if the generator set does not start successfully, the fourth row of LCD display window is reverse black, and the fourth row of LCD display window shows the start failure alarm;

At any start, if the start is successful, the "safe operation time" is entered, during which the low oil, high water temperature, low speed, charging failure, auxiliary input (configured) alarm volume are invalid. After the safe operation delay, the "boot idle delay" (if the start idle delay is configured);

In the process of startup idle delay, speed, underfrequency and underpressure alarm are invalid, the startup idle delay is over, enter the "high speed heater time delay" (if the high speed heater delay is configured);

When the high-speed heating generator delay ends, if the generator is on. If the generator voltage and frequency meet the load requirements, the switch relay output. If the voltage or frequency is abnormal, the controller alarm is shutdown (LCD screen shows the generation alarm quantity).

B.Manual shutdown operation:


Press key to shut down the running generator set.

Start the "high-speed heat dissipation delay",

When entering the shutdown idle delay " (if configured), the idle relay adds the output;

When entering the "electric shutdown delay", the electric shutdown relay adds the output and the fuel relay output is disconnected;

When entering the "generator set stop time", automatically judge whether the stop time;

When the unit is stopped, enter the power standby state; if the unit cannot stop, the controller alarm (LCD screen shows the shutdown failure warning).

After manual shutdown, check the generator periphery and then turn off the battery power (negative switch)

special explanation:

1) In case of an emergency, press the "Emergency Stop" button, and the unit will stop quickly!

2) When the unit fails, the module will issue an alarm, and the fault indication on the unit will be lit at the same time and emit sound and light alarm.

3) The generator set is strictly prohibited to start and stop with load. The circuit breaker must be split before starting and before shutdown!

4.4.5 Function and detailed operation of H L C S-C 02 control screen:

The 4.4.5.1HLCS-C02 Controller display parameters:

Line voltage Uab, Ubc, Uca
Phase voltage Ua, Ub, Uc
frequency,Hz
Load current IA, IB, IC
active power kW
Reactive power, kVar
apparent output kVA
power factor PF
Accumulated electric power of kWh
Power generation has over pressure, under pressure, over frequency, underfrequency and overcurrent

functions;

At the same time, the various parameters of the engine are accurately collected:
Temperature WT °C / °F is shown simultaneously
Oil pressure of OP kPa / Psi / Bar is displayed simultaneously
Fuel level FL unit:% speed SPD unit: RPM
Battery Voltage VB unit: V
Charger voltage VD unit: V

4.4.5.2 Description of the controller key button

Compact gen-set controller for single genset operating in standby prime power modes
Meets all requirements for Auto Mains Failure (AMF) applications
Easy to setup
Wide gen-set monitoring and protection
Running hours event and performance log
Multiple languages (user changeable) in controller, even more in installation suite
Plug-in extension modules capability
Automatic SMS on alarm or event & gen-set control over SMS*
Modbus
Supports prime power (MRS) applications
Automatic and manual GCB and MCB control
D+ preexcitation terminal
True RMS measurement
3 phase power measurement
3 configurable analog inputs
4 binary inputs
6 binary outputs
* Plug-in module required

Controller for single gen-set applications

	Stop / reset the key	Press this button to perform a program request for engine shutdown.Press or press this button repeatedly for more than 2 seconds to stop the engine directly, and skip the process in the middle
	activate key	Working only in manual mode, pressing this button to start the engine starter procedure is a request for engine start.
	Fault reset key	Use this button to indicate that the user is aware of the warning and to release the warning output.The warning will no longer exist and the cause must be found and resolved after its elimination.
	ventil	Use this button to remove the beep output and the associated warnings.
	Change the operation mode of the unit to the left	Turn off the manual automatic test.This key is the mode of switching to the current controller.
	Change the operation mode of the unit to the right	Turn off the manual automatic test.This key is the mode of switching to the current controller.
	Up-Setpoint selection	Select the screen, select History or change the set parameters.
	Set the fixed-point selection below	Select the screen, select History or change the set parameters.
	menu key	Press this key to enter the Settings menu and press it again to return to the main interface.
	Confirm the key	Use this button to confirm the edit setting point or go directly to the history page.

4.4.5.3 Control process:

A. Manual startup operation:

The generator unit is strictly prohibited to start and stop with load. Break the circuit breaker before startup,

1) Press the controller to "Manual mode"

2) When the unit is stationary, press the start button, open the throttle, and connect the start motor to drive. When the first start is unsuccessful, the second start attempt is automatically made. After three starts,

the start failure signal is sent and the throttle is turned off.

3) When the unit is in the cooling shutdown state, press the START start button to cancel the cooling shutdown delay and return the unit to normal operation (with load) state.

4) When the generator voltage reaches the set value, the generator voltage is green normally.

Then close the unit switch (with load)

B, halt

1) Press the key, the unit will first automatically disconnect the unit output switch, and start the cooling shutdown delay, and after the cooling shutdown delay.

2) When the unit is in the cooling shutdown state, press the key to cancel the cooling shutdown.The unit is stopped immediately. 

Datasheet

InteliLite 4 AMF 8

Product description

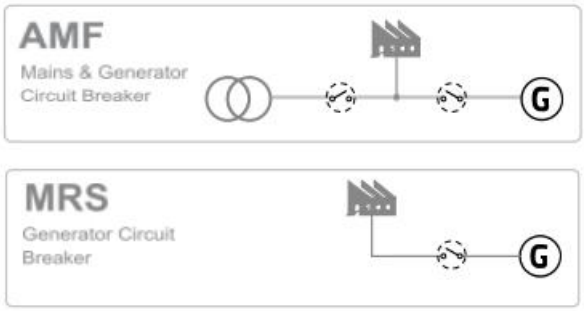
- Single Gen-set controller for stand-by and prime-power applications
- All-in-one intuitive & powerful PC tool for configuration/monitoring/control, locally or remotely
- Easy to install, configure and use

Key features

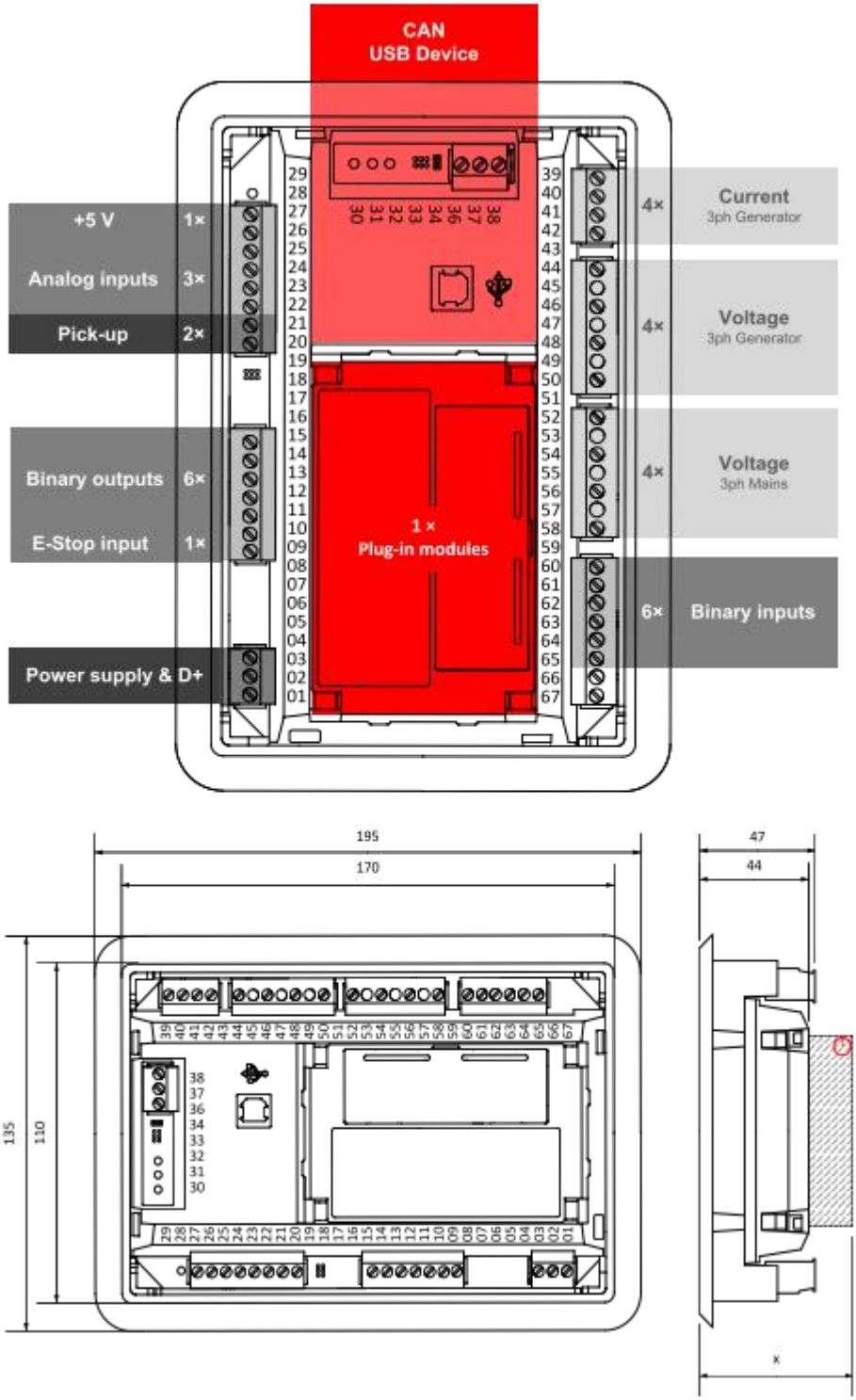
- Stand-by and prime-power application in one unit
- 6 binary outputs, 6 + 1 binary inputs, 3 analog inputs (U/I/R)
- +5 V output reference for analog inputs
- 2 high-current E-Stop binary outputs
- 1 slot for extension plug-in module (Modbus, Internet, SMS, inputs/outputs)
- Extension CAN modules
- ECU support (Tier 4 Final, Stage V)
- RTC with battery back-up (full calendar)
- Power over USB for controller configuration
- Zero power mode
- True RMS measurement
- In-built PLC, complemented with a PLC monitoring tool in InteliConfig
- Full remote communications support (AirGate 2.0, WSV)
- Internet access using Ethernet / 4G, Modbus TCP/RTU, SNMP v1/v2c
- Active SMS and emails
- Detailed history log with up to 150 records
- Remote display

- User setpoints and protections
- 5 languages in the controller & Translator functionality
- User Access Management
- Cyber security improvement
- Alternative configurations
- Multi-purpose schedulers
- 3 maintenance timers
- Modbus register mapping possibility
- Fuel pump management
- Run Hours source selector
- Cut-out: 172 × 112 mm

Application overview



Dimensions, terminals and mounting



Note: *The final depth of the controller depends on the selected plug-in module – it can vary between 41 mm and 56 mm. Mind also the size of connectors and cables (e.g. in case of RS232 connector, add about 60 mm more for standard RS232 connector and cable).*

Note: *The controller is to be mounted into panel doors as a standalone unit using provided holders. The requested cutout size is 172 × 112 mm. Use the screw holders delivered with the controller to fix the*

controller into the door.

Technical data

Power supply

Power supply range	8-36 VDC
Power consumption (without modules)	2.5 W
RTC battery	Replaceable (3 V)
Fusing power	4 A w/o BOUT consumption
E-Stop fusing	10 A
Max. Power Dissipation	7 W

Operating conditions

Protection degree (front panel)	IP 65
Operating temperature	-20 ˚C to +70 ˚C
Storage temperature	-30 ˚C to +80 ˚C
Operating humidity	95 % non-condensing (EN 60068-2-30)
Vibration	5-25 Hz, ± 1.6 mm 25-100 Hz, a = 4 g
Shocks	a = 500 m/s^2
Surrounding air temperature rating 70 °C Suitable for pollution degree 2	

D+

Max. output current	250 mA
Charging fail threshold	Adjustable

Voltage measurement

Measurement inputs	3ph-n Gen voltage , 3ph-n Mains
Measurement range	10-277 V AC / 10-480 V AC (EU) 10-346 V AC / 10-600 V AC (US/Canada)
Linear measurement and protection range	350 V AC Ph-N 660 V AC Ph-Ph
Accuracy	1 %
Frequency range	30-70 Hz (accuracy

	0.1 Hz)
Input impedance	0.72 MΩ ph-ph , 0.36 MΩ ph-n

Display

Type	Build-in monochromatic 3.2"
Resolution	132 × 64 px

Communications

USB Device	Non-isolated type B connector
CAN 1	Non-isolated, 250 / 50 kbps, Terminator impedance 120 Ω

Current measurement

Measurement inputs	3ph Gen current
Measurement range	5 A
Max. allowed current	10 A
Accuracy	±20 mA for 0-2 A; 1 % of value for 2-5 A
Input impedance	<0.1 Ω

E-Stop

Dedicated terminal for safe E-Stop input. Physical supply for binary outputs 1 & 2.

Binary inputs

Number	6
Close/Open indication	0-2 VDC close contact 6-36 VDC open contact

Binary outputs

Number	6
Max. current	BO1,2 = 5 A; BO3-6 = 0.5 A
Switching to	positive supply terminal

Analog inputs

Number	3, switchable (R/U/I)
Range	R = 0-2500 Ω; U = 0-10 V; I = 0-20 mA
Accuracy	R: ±2 % from value ±5 Ω in range 0-250 Ω R: ±4 % from value in range 250 Ω-2500 Ω U: 1 % from value ±100 mV I: 1 % from value ±0.2 mA

+5 V Power supply output

Max. current	45 mA

Magnetic pickup

Voltage input range	4 Vpk-pk to 50 Vpk-pk in range 4 Hz to 1 kHz 6 Vpk-pk to 50 Vpk-pk in range 1 to 5 kHz 10 Vpk-pk to 50 Vpk-pk in range 5 to 10 kHz
Frequency input range	4 Hz to 10 kHz
Frequency measurement tolerance	0.2 % from measured value

Available plug-in modules

Product	Description	Order code
CM-RS232-485	Dual port interface	CM223248XBX
CM2-4G-GPS	4G & GPS plug-in communication module	CM2 4 GGPSXBX
CM3 - Ethernet	Internet / Ethernet plug-in communication module	CM3 ETHERXBX

EM-BIO8-EFCP	8 additional binary inputs/outputs	EM2BIO8EXBX

Note: *Controller has 1 slot for plug-in modules.*

Available CAN modules

Product	Description	Order code
IGL-RA15	CAN remote annunciator with 15 LEDs	EM2IGLRABAA
Inteli AIN8	CAN module with 8 analog inputs	I-AIN8
Inteli IO8/8	CAN module with 8 binary inputs and 8 binary outputs	I-IO8/8
IGS-PTM	CAN module with 8 binary inputs, 8 binary outputs, 4 analog inputs and 1 analog output	IGS-PTM
Inteli AIN8TC	CAN module with 8 analog inputs dedicated for thermocouple sensors only.	I-AIN8TC
Inteli AIO9/1	CAN module with analog inputs and outputs – designed for DC measurement.	I-AIO9/1

Functions and protections

Support of functions and protections as defined by ANSI (American National Standards Institute):

Description	ANSI code	Description	ANSI code
Master unit	1	Incomplete sequence relay	48
Stopping device	5	Overcurrent	50/50TD
Multifunction device	11	Breaker failure	50BF
Underspeed	14	Overvoltage	59
Overspeed	12	Aux Over Voltage	59X
Starting-to-running transition contactor	19	Pressure switch	63
Thermal relay	26	Liquid level switch	71
Undervoltage	27	Alarm relay***	74
Aux Battery Under Voltage	27X	Reclosing relay	79
Annunciator	30	Overfrequency	81O
Overload (real power)	32P	Underfrequency	81U
Master sequence device	34	Auto selective control/transfer	83
Negative sequence voltage	47		

*** extension module IGL-RA15 required

Certifications and standards

- EN 61000-6-2
- EN 61000-6-4
- EN 61010-1
- EN 60068-2-1 (-20 °C/16 h)
- EN 60068-2-2 (70 °C/16 h)
- EN 60068-2-6 (2÷25 Hz / ±1,6 mm; 25÷100 Hz / 4.0 g)
- EN 60068-2-27 (a=500 m/s^2 ; T=6 ms)
- EN 60068-2-30:2005 25/55°C, RH 95%, 48hours
- EN 60529 (front panel IP65, back side IP20)
- UL 6200

Special explanation:

1) In case of an emergency, press the "Emergency Stop" button, and the unit will stop quickly!
2) When the unit fails, the module will issue an alarm, and the fault indication on the unit will be lit at the same time and emit sound and light alarm.
3) The generator set is strictly prohibited to start and stop with load. The circuit breaker must be

split before starting and before shutdown!

4.5 Start-up of the control system HLCS- * 12

4.5.1 HLCS- * 12 Control screen face description:

1: Select intelligent HGM6120 for HLCS-A12 controller; MRS20 / 25 for HLCS-C12 controller and HLCS-D12 controller for deep-sea DSE7320

4.5.2 HLCS- * 12 Initial shutdown / start of the control system:

Step is the same as 4.4.2
4.5.3 HLCS- * 12 Manual startup / shutdown of the control system:

Step is the same as 4.4.3
4.5.4 HLCS- * 12 Automatic startup / shutdown of the control system:

The following steps can be used for automatic operation of generator sets of the HLCS- * 12 series control screen:

point out:

The ● presses the emergency stop button or presses the "" stop button to allow the unit to stop at any time.

After the ● presses the emergency shutdown button, the controller will display the emergency shutdown fault. The reset should now rotate the emergency shutdown button clockwise to pop it up, and then return to the standby mode through the controller reset button.

1. Complete the pre-start inspection according to Section 4.2.

2. Connect the battery to the generator, connect the positive electrode first, and then connect the negative electrode.Close the battery switch and close each micro switch in the control screen.

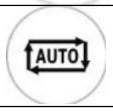
3. Automatic start the unit: switch the controller to "" automatic mode and close the air switch (handle up).If the market power is abnormal or the remote control start signal is valid, the unit will automatically start and operate according to the program; if the market power is normal or the remote control signal is cancelled, the unit will be automatically stopped according to the program.

4.5.5 Function and detailed operation of H L C S-A 12 control screen:

4.5.5.1. HLCS-A12 controller display parameters:

Electricity: line voltage Uab, Ubc, Uca
Phase voltage Ua, Ub, Uc
frequency,Hz
Generator: Line voltage Uab, Ubc, Uca
Phase voltage Ua, Ub, Uc
frequency,Hz
Load current IA, IB, IC
active power kW
Reactive power, kVar
apparent output kVA
power factor PF
Accumulated electric power of kWh
Power generation has overpressure, underpressure, overfrequency, underfrequency and overcurrent functions;
At the same time, the various parameters of the engine are accurately collected:
Temperature WT °C / °F is shown simultaneously
Oil pressure of OP kPa / Psi / Bar is displayed simultaneously
Fuel level FL unit:% speed SPD unit: RPM
Battery Voltage VB unit: V
Charger voltage VD unit: V
The timer HC can accumulate 999999 hours

4.5.5.2. Controller key description

	Downtime / reset key	Stop the operating generator sets in both manual / automatic mode.In the generator set alarm state, any shutdown alarm can be reset.In shutdown mode, press this key above the 3s clock to test whether the panel indicator light is normal (test light).During the shutdown process, press this key again to stop quickly.
	Boot key	In manual mode or manual trial mode, press the stationary generator set to start.
	Manipulating key	Press this button to place the controller in manual mode.
	Automatic key	Press this button to place the controller in automatic mode.

	Bring the test key	Press this button to place the controller in manual test mode.In this mode, the generator set will automatically run with load when power generation is normal.
	Close the lock key	In manual mode, press this key to control the switch closing.
	Set / confirm the key	Move the cursor and confirm the settings information in the parameter settings.
	Upturn / increase	Turn over, move the cursor up in the parameter settings, or increase the number in which the cursor sits.
	Lower turn / decrease	Turn over to move the cursor down in the parameter settings or reduce the number in which the cursor holds.
	Menu key	Press this key to enter the Settings menu and press it again to return to the main interface.

4.5.5.3 Control process:

Manual startup operation:

The generator unit is strictly prohibited to start and stop with load. Break the circuit breaker before startup,

 1) Press the controller to enter "manual mode", manual mode indicator on, then press to start the generator set. 

2) After startup, the preheating relay output (if configured), and the LCD screen shows the "startup preheating delay XX s";

3) After the preheating delay, the fuel relay output for 1s and then the starting relay output. If the generator set does not start successfully in "start time", the fuel relay and start relay stop output and enter "start interval time" and wait for the next start;

4) In the number of three starts, if the generator set does not start successfully, the fourth row of LCD display window is turned back to black, and the fourth row of LCD display window shows the start failure alarm;

5) At any start, if the start is successful, enter the "safe operation time", during which the low oil pressure, high water temperature, low speed, charging failure and auxiliary input (configured) alarm volume are invalid. After the safe operation delay ends, enter the "boot idle delay" (if the start idle delay is configured);

6) During the process of startup idle delay, the speed, underfrequency and underpressure alarm are invalid, the startup idle delay is over, enter the "high speed heater time delay" (if the high speed heater delay is configured);

7) When the high-speed heater delay ends, if the generator is on, if the generator voltage and frequency meet the load requirements, the generator switch relay output, "normal generation" indicator lights and the generator set can load. When the generator set output circuit breaker, the generator set enters normal operation state; if the generator set voltage or frequency is not normal, the controller alarm is shutdown (the LCD screen shows the generation alarm amount).

Manual shutdown operation:

The generator unit is strictly prohibited to start and stop with load. Break the circuit breaker before shutdown

 1) Press the key to stop the running generator set.

2) Start the "high-speed heat dissipation delay",

3) When entering the shutdown idle delay " (if configured), the idle relay adds output;

4) When entering the "electric shutdown delay", the electric shutdown relay has an added output, and the fuel relay output is disconnected;
5) When entering the "generator set stop time", automatically judge whether the stop time is stable;
6) When the unit is stopped, enter the power generation standby state; if the unit cannot stop, the controller will alarm (the LCD screen shows the shutdown failure warning).
7) After manual shutdown, check the generator periphery and then turn off the battery power (negative switch)

special explanation:
1) In case of an emergency, press the "Emergency Stop" button, and the unit will stop quickly!
2) When the unit fails, the module will issue an alarm, and the fault indication on the unit will be lit at the same time and e

Automatic start

Press the key and the light next to the generator set is in automatic start mode.

Automatic start-on sequence:

1) HGM6120U: When the municipal power is abnormal (over pressure, underpressure, phase shortage), enter the "municipal power abnormal delay", the LCD screen shows the countdown, and after the abnormal municipal power delay is over, enter the "start delay";
2) The LCD screen shows the "boot delay" countdown;
3) After the start-on delay ends, the preheating relay output (if configured), and the LCD screen displays "start-up delay XX s";
4) After the preheating delay, the fuel relay output for 1s and then start the relay output. If the generator set does not start successfully in "start time", the fuel relay and start relay stop output and enter "start interval time" and wait for the next start;
5) Within the set number of starts, if the generator set does not start successfully, the fourth row of the LCD display window is turned back to black, and the fourth row of the LCD display window shows the start failure alarm;
6) At any start, if the start is successful, enter the "safe operation time", during which the low oil pressure, high water temperature, low speed, charging failure, auxiliary input (configured) alarm volume are invalid, etc. After the safe operation delay, enter the "boot idle delay" (if the start idle delay is configured);
7) During the process of startup idle delay, speed, underfrequency and underpressure alarm are invalid, the startup idle delay is over, enter the "high speed heater time delay" (if the high speed heater delay is configured);
8) When the high-speed heater delay ends, if the generator status indicator, if the generator voltage and frequency meet the load requirements, the generator switch relay output, the generator set with load, the generator supply indicator, the generator set enters normal operation state; if the generator set voltage or frequency is abnormal, the controller alarm shutdown (the LCD screen shows the generation

alarm amount).

Automatic shutdown operation:

1) HGM6120UC: In the normal operation of the generator set, if the municipal power returns to normal, enter the "municipal power voltage normal delay". After confirming that the municipal power is normal, the municipal power state indicator light is on and the "stop delay" starts;

2) After the shutdown delay ends, the "high-speed heat dissipation delay" begins, and the power generation switch relay is disconnected. After the "switch conversion delay", the municipal switch relay is output, the municipal power belt load, the power generation power supply indicator is off, and the municipal power supply indicator is lit;

3) When entering the shutdown idle delay " (if configured), the idle relay adds output;

4) When entering the "electric shutdown delay", the electric shutdown relay has an added output, and the fuel relay output is disconnected;

5) When entering the "generator set stop time", automatically judge whether the stop time is stable;

6) When the unit is stopped, enter the power generation standby state; if the unit cannot stop, the controller alarm (the LCD screen shows the shutdown failure warning).

4.5.6 Start-up of the control system HLCS-C12

4.5.6.1 HLCS-C12 controller display parameters:

Electricity: line voltage Uab, Ubc, Uca
Phase electricity
Press the Ua, Ub, and Uc
frequency,Hz
Generator: Line voltage Uab, Ubc, Uca
Phase voltage Ua, Ub, Uc
frequency,Hz
Load current IA, IB, IC
active power kW
Reactive power, kVar
apparent output kVA
power factor PF
Accumulated electric power of kWh
Power generation has overpressure, underpressure, overfrequency, underfrequency and overcurrent functions;
At the same time, the various parameters of the engine are accurately collected:
Temperature WT °C / °F is shown simultaneously
Oil pressure of OP kPa / Psi / Bar is displayed simultaneously
Fuel level FL unit:% speed SPD unit: RPM
Battery Voltage VB unit: V
Charger voltage VD unit: V
The timer HC can accumulate 999999 hours

4.5.6.2. Controller key description

InteliLite 4 AMF 8 is a single gen-set controller for stand-by and prime power applications. Intuitive, flexible, easy to install and use, the InteliLite 4 AMF 8 controller offers multiple configuration options to create the best solution for controlling and monitoring your gen-sets on-site and remotely.

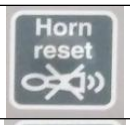
Easy configuration with InteliConfig
Remote monitoring
Cybersecurity by design

Easy-to-use and configure, the InteliLite 4 AMF 8 provides secure and flexible control of single gen-sets for stand-by and prime power applications. Due to its connectivity and communication features, this product enables you to monitor your sites anytime, anywhere.

The InteliLite 4 AMF 8 offers:

Flexible and efficient setup and monitoring using InteliConfig, ComAp's PC configuration and monitoring tool
Built-in PLC logic and PLC editor with easy-to-use drag and drop editing blocks
AirGate 2.0 for easy connection to your equipment remotely, without worrying about your asset's IP address
User-defined protections and setpoints on top of default protection
Remote control and monitoring of your gen-set operations from anywhere, anytime with WebSupervisor, our cloud-based fleet management tool
High-level security features keeping your business and data as safe as possible
Event-based history with 150 records for fast and easy troubleshooting
Stand-by and prime power application control from one unit
Integrated communication and control ports on board (USB, CAN)
One slot for plug-in modules for 4G, Ethernet, RS232/485 connections and additional binary inputs and outputs
Improved hardware platform with switchable analogue inputs and 5V reference output for analogue sensors
CAN module extensions
More precise measuring with a True Root Mean Square measurement feature
Zero power mode to avoid battery drainage for prime power applications
Option to integrate InteliSCADA, our intuitive software tool for quick and simple creation and monitoring of complex SCADA systems
Secure user management
Multi-purpose maintenance timers and exercise timers with a back-up RTC battery
Multi ECU (Electronic Control Unit) with support for two control units
Compatibility with remote displays
Modbus register mapping
Load shedding ensuring the most important loads are running even when there is a lack of power
Multilingual support
Power over USB for controller configuration
Dummy load management preventing genset unloaded operation

4.5.6.3 Control process:

	Stop / reset the key	Press this button to perform a program request for engine shutdown.Press or press this button repeatedly for more than 2 seconds to stop the engine directly, and skip the process in the middle
	activate key	Working only in manual mode, pressing this button to start the engine starter procedure is a request for engine start.
	Fault reset key	Use this button to indicate that the user is aware of the warning and to release the warning output.The warning will no longer exist and the cause must be found and resolved after its elimination.
	ventil	Use this button to remove the beep output and the associated warnings.
	Change the operation mode of the unit to the left	Turn off the manual automatic test.This key is the mode of switching to the current controller.
	Change the operation mode of the unit to the right	Turn off the manual automatic test.This key is the mode of switching to the current controller.
	Up-Setpoint selection	Select the screen, select History or change the set parameters.
	Set the fixed-point selection below	Select the screen, select History or change the set parameters.
	menu key	Press this key to enter the Settings menu and press it again to return to the main interface.
	Confirm the key	Use this button to confirm the edit setting point or go directly to the history page.
	Municipal power switch button	Control the municipal electric circuit breaker sharing
	Power switch button	Control the power generation circuit breaker split

Manual startup operation:

The generator unit is strictly prohibited to start and stop with load. Break the circuit breaker before startup,

1) Press the controller to "Manual mode"

2) When the unit is stationary, press the start button, open the throttle, and connect the start motor

to drive. When the first start is unsuccessful, the second start attempt is automatically made. After three starts, the start failure signal is sent and the throttle is turned off.

3) When the unit is in the cooling shutdown state, press the START start button, cancel the cooling shutdown delay, and the unit returns to normal operation (with load) state.

4) When the generator voltage reaches the set value, the generator voltage is green normally.

5) Close the unit switch (with load) (basic type manual closing, optional mounting frame circuit breaker to realize automatic closing)

6) Press the key, the unit will first automatically break the unit output switch, and start the cooling shutdown delay, and automatically stop the unit after the cooling shutdown delay.

7) When the unit is in the cooling shutdown state, press the key to cancel the cooling shutdown.The unit is stopped immediately. 

AUT automatic mode

1) Press the controller into "automatic mode"

2) In case of failure of municipal power, the unit will start after the start delay. If the start of the unit will return to normal by municipal power, and the unit will be automatically stopped after the delay.

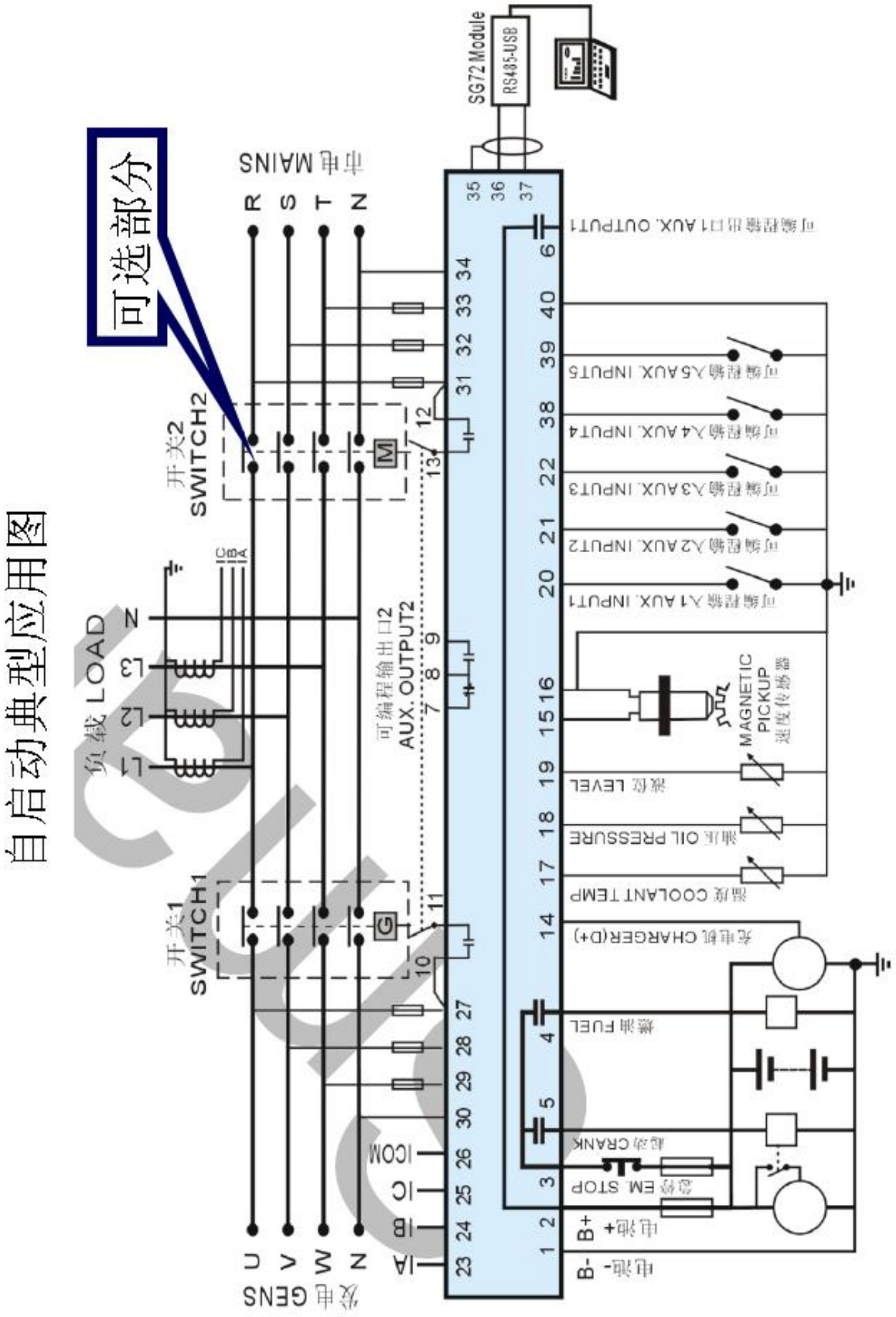
3) If the unit voltage reaches the set value within a certain delay, the peripheral equipment can be manually controlled to supply the power out. If the unit voltage does not reach the set value within the delay range, the unit will automatically alarm and stop.

4) When the power supply is over, the peripheral circuit breaker should be disconnected first, and then the municipal power returns to normal. The generator shall be delayed and stopped on standby after heat dissipation.

Tip: In automatic mode, manually pressing the start button or the shutdown button does not work.

Important: In automatic mode, the unit may start automatically after manually pressing the fault reset key after a shutdown failure.

Important: When the battery cable needs to be removed or the controller power supply, the controller should first put the unit in off mode in case the unit starts suddenly because the controller is placed in automatic mode.


自启动典型应用图
可选部分
市电 MAINS
R
S
T
N
SG72 Module
RS485-USB
开关2
SWITCH2
开关1
SWITCH1
负载 LOAD
L1
L2
L3
N
可编程输出口2
AUX. OUTPUT2
可编程输出口1 AUX. OUTPUT1
可编程输入1 AUX. INPUT1
可编程输入2 AUX. INPUT2
可编程输入3 AUX. INPUT3
可编程输入4 AUX. INPUT4
可编程输入5 AUX. INPUT5
MAGNETIC PICKUP
速度传感器
液位 LEVEL
油压 OIL PRESSURE
温度 COOLANT TEMP
充电机 CHARGER(D+)
燃油 FUEL
起动 CRANK
急停 EM. STOP
电池+ B+
电池- B-
发电 GENS
U
V
W
N
IA
IB
IC
ICOM

4.6 Automatic control system HLCS- * 22

4.6.1 HLCS- * 22 series screen face description

2: HLCS-A22 controller is intelligent HGM6120; AMF8 for HLCS-C22 controller and HLCS-D22 controller

4.6.2 HLCS- * 22 Initial shutdown / start of the control system:

Step is the same as 4.4.2
4.6.3 HLCS- * 22 Manual start / shutdown of control system:

Step is the same as 4.4.3
4.6.4 HLCS- * 22 Automatic startup / shutdown of the control system:

The following steps can be used for automatic operation of generator sets of the HLCS- * 22 series control screen:

point out:

The ● presses the emergency stop button or presses the "" stop button to allow the unit to stop at any time.

After the ● presses the emergency shutdown button, the controller will display the emergency shutdown fault. The reset should now rotate the emergency shutdown button clockwise to pop it up, and then return to the standby mode through the controller reset button.

1. Complete the pre-start inspection according to Section 4.2.

2. Connect the battery to the generator, connect the positive electrode first, and then connect the negative electrode.Close the battery switch and close each micro switch in the control screen.

3. Automatic start unit: switch the controller to "" automatic mode.If the market power is abnormal or the remote control start signal is valid, the unit will start and operate automatically according to the program, then control the ATS to power to load; if the market power is normal or the remote control signal is cancelled, the unit will control ATS to power to load, and then automatically stop according to the program.

4.6.5 Function and detailed operation of H L C S-A 22 control screen:
4.6.5.1 HLCS-A22 Brief description:

Through many years of generator set design experience, combined with many diesel generator set control design experience, in fully considering the user problems in the use of diesel generator sets, according to the reliable, efficient, simple design principles, designed the Huali automation control system HLCS-A22. The system is suitable for standby diesel generator sets with high automation requirements, with simple operation and reliable operation.

Compared with HLCS-A12 self-start control system, this system increases the automatic switching function of municipal power generation. Once there is abnormal phenomenon, the diesel generator set can be automatically controlled, reach the normal operation state, will realize ATS automatic switching of municipal power generation, when the control system detects normal power, will first switch ATS to the municipal power side, and then control the generator set heat dissipation and shutdown, the standby state,

shorten the user's reaction time.At the same time, it is equipped with external animal battery charging and other functions to ensure the battery power of the generator set when starting.

The controller adopts microprocessor technology, realizing the precision measurement, value adjustment, timing and threshold adjustment of various parameters. All parameters of the controller can be adjusted from the front panel of the controller, or using PC through programming interface, or PC through adjustment and monitoring through RS485 interface.Its compact structure, simple wiring and high reliability can be widely used in various types of generator set automation systems.

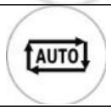
4.6.5.2 Controller display parameters:

Electricity: line voltage Uab, Ubc, Uca
Phase voltage Ua, Ub, Uc
frequency,Hz
Generator: Line voltage Uab, Ubc, Uca
Phase voltage Ua, Ub, Uc
frequency,Hz
Load current IA, IB, IC
active power kW
Reactive power, kVar
apparent output kVA
power factor PF
Accumulated electric power of kWh

Power generation has overpressure, underpressure, overfrequency, underfrequency and overcurrent functions;

At the same time, the various parameters of the engine are accurately collected:
Temperature WT °C / °F is shown simultaneously
Oil pressure of OP kPa / Psi / Bar is displayed simultaneously
Fuel level FL unit:% speed SPD unit: RPM
Battery Voltage VB unit: V
Charger voltage VD unit: V
The timer HC can accumulate 999999 hours

4.6.5.3 Control key description

	Downtime / reset key	Stop the operating generator sets in both manual / automatic mode.In the generator set alarm state, any shutdown alarm can be reset.In shutdown mode, press this key for over 3s clock to test whether the panel indicator light is normal (test light).During the shutdown process, press this key again to stop quickly.
	Boot key	In manual mode or manual trial mode, press the stationary generator set to start.
	manipulating key	Press this button to place the controller in manual mode.
	automatic key	Press this button to place the controller in automatic mode.
	Bring the test key	Press this button to place the controller in manual test mode.In this mode, the generator set will automatically run with load when power generation is normal.
	Close the lock key	In manual mode, press this key to control the switch closing.
	Set / confirm the key	Move the cursor and confirm the settings information in the parameter settings.
	Upturn / increase	Turn over, move the cursor up in the parameter settings, or increase the number in which the cursor sits.
	Lower turn / decrease	Turn over to move the cursor down in the parameter settings or reduce the number in which the cursor holds.
	menu key	Press this key to enter the Settings menu and press it again to return to the main interface.

4.6.5.4 Control process:

Automatic boot operation

 Press the key and the light next to the generator set is in automatic start mode.Automatic start-on sequence:

1) HGM6120UC: When the municipal power is abnormal (over pressure, underpressure, phase shortage), enter the "municipal power abnormal delay", the LCD screen shows the countdown, and after the abnormal municipal power delay is over, enter the "start delay";

2) The LCD screen shows the "boot delay" countdown;

3) After the start-on delay ends, the preheating relay output (if configured), and the LCD screen displays "start-up delay XX s";

4) After the preheating delay, the fuel relay output for 1s and then start the relay output. If the generator set does not start successfully in "start time", the fuel relay and start relay stop output and enter "start interval time" and wait for the next start;

5) Within the set number of starts, if the generator set does not start successfully, the fourth row of the LCD display window is turned back to black, and the fourth row of the LCD display window shows the start failure alarm;

6) At any successful start, enter the "safe operation time", during which low oil, high water temperature, failure, charging failure, auxiliary input (configured) alarm volume are invalid. After the safe operation delay, enter the "boot idle delay" (if the startup idle delay is configured); the normal power generation indicator will be lit.

7) During the process of startup idle delay, speed, underfrequency and underpressure alarm are invalid, the startup idle delay is over, enter the "high speed heater time delay" (if the high speed heater delay is configured);

8) When the high-speed heater delay ends, if the generator is normal, if the generator voltage and frequency meet the load requirements, the generator switch relay output, ATS will switch to the power generation side and the generator set enters normal operation state; if the generator set voltage or frequency is not normal, the controller alarm shutdown (LCD screen shows power generation alarm quantity).

Automatic shutdown order:
1) HGM6120UC: In the normal operation of the generator set, if the municipal power returns to normal and the municipal power normal indicator light is lit, then enter the "municipal power voltage normal delay". After confirming that the municipal power is normal, the "shutdown delay" will start;

2) After the shutdown delay, the power generation closing relay is disconnected. After the "switch conversion delay", the municipal switch relay is output, the municipal power belt load, the power supply indicator is off, the municipal power supply indicator is on; the "high-speed heat dissipation delay" begins,

3) When entering the shutdown idle delay " (if configured), the idle relay adds output;

4) When entering the "electric shutdown delay", the electric shutdown relay has an added output, and the fuel relay output is disconnected;
5) When entering the "generator set stop time", automatically judge whether the stop time is stable;

6) When the unit is stopped, enter the power generation standby state; if the unit cannot stop, the controller alarm (the LCD screen shows the shutdown failure warning).

Manual start-on and shutdown operation:

1) 

HGM6120UC: Press the controller to Manual mode and the manual mode indicator is on.Press the controller to enter Manual Test mode, and the manual test mode indicator is on.In both modes, press the key, then start the generator set, automatically judge the start success, and automatically rise to high-speed operation.When the water temperature is high, low oil pressure, overspeed and abnormal voltage during operation, it can be protected and quickly.(See Step 3- ~ 8).In the "manual mode", the load switch will not automatically convert, you need to manually press the key to switch the load switch and switch.In "manual test mode", after the generator set is running normally at high speed, the load switch is converted to the power generation load no of whether the power is normal or not.

2) 
Manual shutdown: Press the key to stop the running generator set.(See automatic shutdown process 3~7).

4.6.6 HLCS-C22 control function and detailed operation

The main core part of this system is the imported Comai AMF20 controller.

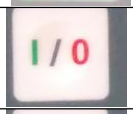
4.6.6.1 Controller display parameters:

Electricity: line voltage Uab, Ubc, Uca
Phase voltage Ua, Ub, Uc
frequency,Hz
Generator: Line voltage Uab, Ubc, Uca
Phase voltage Ua, Ub, Uc
frequency,Hz

Load current IA, IB, IC
active power kW
Reactive power, kVar
apparent output kVA
power factor PF
Accumulated electric power of kWh
Power generation has overpressure, underpressure, overfrequency, underfrequency and overcurrent functions;
At the same time, the various parameters of the engine are accurately collected:
Temperature WT °C / °F is shown simultaneously
Oil pressure of OP kPa / Psi / Bar is displayed simultaneously
Fuel level FL unit:% speed SPD unit: RPM
Battery Voltage VB unit: V
Charger voltage VD unit: V
The timer HC can accumulate 999999 hours

4.6.6.2 Control device key description

	Stop / reset the key	Press this button to perform a program request for engine shutdown.Press or press this button repeatedly for more than 2 seconds to stop the engine directly, and skip the process in the middle
	activate key	Working only in manual mode, pressing this button to start the engine starter procedure is a request for engine start.
	Fault reset key	Use this button to indicate that the user is aware of the warning and to release the warning output.The warning will no longer exist and the cause must be found and resolved after its elimination.
	ventil	Use this button to remove the beep output and the associated warnings.
	Change the operation mode of the unit to the left	Turn off the manual automatic test.This key is the mode of switching to the current controller.

	Change the operation mode of the unit to the right	Turn off the manual automatic test.This key is the mode of switching to the current controller.
	Up-Setpoint selection	Select the screen, select History or change the set parameters.
	Set the fixed-point selection below	Select the screen, select History or change the set parameters.
	menu key	Press this key to enter the Settings menu and press it again to return to the main interface.
	Confirm the key	Use this button to confirm the edit setting point or go directly to the history page.
	Municipal power switch button	Control the municipal electric circuit breaker sharing
	Power switch button	Control the power generation circuit breaker split

4.6.6.3 Control process:

Automatic boot operation

Press the key and the light next to the generator set is in automatic start mode.

Automatic start-on sequence:

1) AMF20: when the municipal power is abnormal (over pressure, underpressure, phase deficiency), enter the "municipal power abnormal delay", the LCD screen shows the countdown, after the abnormal municipal power delay is over, enter the "start delay";

2) The LCD screen shows the "boot delay" countdown;

3) After the start-on delay ends, the preheating relay output (if configured), and the LCD screen displays "start-up delay XX s";

4) After the preheating delay, the fuel relay output for 1s and then start the relay output. If the generator set does not start successfully in "start time", the fuel relay and start relay stop output and enter "start interval time" and wait for the next start;

5) Within the set number of starts, if the generator set does not start successfully, the fourth row of the LCD display window is turned back to black, and the fourth row of the LCD display window shows the start failure alarm;

6) At any successful start, enter the "safe operation time", during which low oil, high water temperature, failure, charging failure, auxiliary input (configured) alarm volume are invalid. After the safe operation delay, enter the "boot idle delay" (if the startup idle delay is configured); the normal power generation indicator will be lit.

7) During the process of startup idle delay, speed, underfrequency and underpressure alarm are invalid, the startup idle delay is over, enter the "high speed heater time delay" (if the high speed heater delay is configured);

8) When the high-speed heater delay ends, if the generator is normal, if the generator voltage and frequency meet the load requirements, the generator switch relay output, ATS will switch to the power generation side and the generator set enters normal operation state; if the generator set voltage or frequency is not normal, the controller alarm shutdown (LCD screen shows power generation alarm quantity).

Automatic shutdown order:

1) AMF20: During the normal operation of the generator set, if the municipal power returns to normal and the normal indicator is lit, enter the "municipal voltage normal delay". After confirming that the municipal power is normal, the "shutdown delay" starts;

2) After the shutdown delay, the power generation closing relay is disconnected. After the "switch conversion delay", the municipal switch relay is output, the municipal power belt load, the power supply indicator is off, the municipal power supply indicator is on; the "high-speed heat dissipation delay" begins,

3) When entering the "electric shutdown delay", the electric shutdown relay has an added output, and the fuel relay output is disconnected;

4) When entering the "generator set stop time", automatically judge whether the stop time is stable;

5) When the unit is stopped, enter the power generation standby state; if the unit cannot stop, the controller will alarm (the LCD screen shows the shutdown failure warning).

Manual start-on and shutdown operation:

1) 

AMF20: Press the key, mode to select mode, and the controller enters Manual mode,.Press the key, then start the generator set, automatically judge the success of the start, automatically rise to high-speed operation.When the water temperature is high, low oil pressure, overspeed and abnormal voltage during operation, it can be protected and quickly.(See Step 3- ~ 8).Under "manual mode", the load switch will not be automatically converted. Press the key manually to switch the load switch. After the generator set is running normally at high speed, the load switch will be converted to the power generation with load no of whether the market power is normal or not. 

2) 

Manual shutdown: Press the key to stop the running generator set.(See automatic shutdown process 3~7).

Generator set operation guide

一、 Precautions before generator star tup

1、 The antifreeze oil of the generator should be checked before starting the generator.

2、 Battery: Check that the positive and negative electrodes correspond accurately with the starter electrodes; connect the connection firmly; and measure the battery voltage with a multimeter.

3、 Connect the fuel tank and exhaust the air from the fuel pipe of the diesel engine if necessary.

4、Check whether the load of the generator set and the connecting cable meet the conditions for outward transmission.

二、 Operation method of the unit operation

1. Preparation work before startup:

1) Turn the battery master switch on.

2) Keep the control cabinet panel door open and dial the air switch on the inner panel to the on position.

3) Make sure that the emergency stop button on the control cabinet panel is unturned.

4) Turn on the power switch on the control cabinet panel.

2. Generator operation

2.1 Generator Start-up:

2.1.1 Convert the control mode to the manual mode through the control module and the keys.

2.1.2 Press the start button, the control module gives the start signal, the start motor receives the start signal generator set to start.(The start output signal is generally 5-8 seconds and the three start intervals are 10 seconds)

2.1.3 After the successful start of the generator set, through safe operation, idle operation, high-speed heating, etc., the normal indicator light of the module after no timing beam will be on, and the operator can ensure that the generator output circuit breaker is closed after safe power transmission.

2.1.4 When the generator set needs to be stopped, press the stop button, and the generator set will enter the shutdown mode. Through the shutdown delay, high speed heat dissipation, idle heat dissipation, and stop after the idle heat dissipation.(Press two consecutive

shutdown, reset key, and the generator set stops directly)

2.1.5 After the shutdown of the generator set is stopped, the control module provides the stop delay, and can start again in the standby state.

2.1.6 During the generator stop process, if the operator closes the output circuit breaker, the operator should also disconnect the output circuit breaker.

3. disorderly close-down

1. If any alarm control module occurs during the operation of the generator set, it will give a warning and stop signal, control the warning and shutdown of the generator set, and the alarm device of the control cabinet panel will issue sound and light alarm at the same time. If the shutdown of the site operator to repair the generator set according to the alarm information, after removing the fault, press the noise button and the reset button to eliminate the flash and sound. 

2. When there is a serious accident in the operation of the generator set, the operator can press the emergency stop button, and the generator set can be shut down immediately.

4. Note after generator **shutdown**

1. If the generator does not start for a long time after shutdown, attention should be paid to the charging and maintenance of the battery;

2. If the coolant should be released after shutdown in winter (when the coolant is not antifreeze);

3. Please refer to the diesel engine maintenance manual after other shutdown.

Chapter 5 Maintenance

Correct maintenance is a necessary guarantee to ensure the long-term fault-free operation of the diesel generator set and to achieve the normal power supply.Therefore, all users shall conduct normal maintenance of the unit as following the following steps and contents.The maintenance content of different types of units may vary slightly. The content of this section is for reference only. The details must refer to the random information of the engine and generator.

5.1 Unit maintenance plan

！！！Note: the standby unit shall be checked at least 2-3 times a month, for more than 20 minutes each time; it is recommended to operate with more than 30% load.

5.1.1 Maintenance before each startup

I. Clean the unit surface

Check the coolant surface of water tank; the liquid surface should be as close as possible to 5cm below the welding surface of water tank cover, it is recommended not to exceed.

Check the outside of the radiator core and intercooler of the tank. no foreign body is allowed.

Check the blockage of the air filter. If the blocking indicator is in the red zone, the filter should be replaced immediately after the unit is stopped.The air filter under the replacement is not allowed for reuse.

V. Check the lubricating oil surface of the diesel engine to ensure that the lubricating oil level is between the maximum value and the minimum value of the oil gauge scale.

. Check whether the electrical connection of the control system is loose

5.1.2 Maintenance after each operation

I. Check and tighten the bolts of all rotating parts, especially the connection bolts of oil injection pump, water pump, pulley, fan, etc., and tighten the anchor bolts.

. Check whether there are three leaks, and clean them up if necessary

Eliminate the simple faults and abnormal phenomena found in the operation

. Clean up the dust on the air filter filter element

V. Check the oil level and the oil level of the oil injection pump, and add the oil with a quality that can meet the technical requirements if necessary.

. Check the cooling water and liquid surface of the water tank, and add soft and pure water if necessary.

. Check whether the electrical connection of the control system is loose

, Clean the surface of the unit comprehensively

5.1.3 Maintenance for every 50 hours

In addition to completing the above maintenance items, the following work shall be added:

I. Check the battery; measure the battery voltage and fill it up if necessary.When handling batteries, wear goggles containing explosive gas and corrosive sulfuric acid.Ignition near the battery may cause an explosion.

Check for three-liquid leakage

. Check whether the three-meter filter system is good, and replace it if necessary

. Check and adjust the fan belt tightness

V. Add or replace the cooling water in the water tank and the body if necessary

. Check whether the wiring heads of the generator and the electric control part are reliable

The unit with oil and water separator shall regularly drain and clean or replace the filter element every 50 hours.

All the oil and oil filter elements shall be replaced after 50 hours of the initial operation of the new unit.

5.1.4 Maintenance for every 250 hours

I. Change oil and drain oil during heat engine.The normal replacement time of oil and oil filter element is every 250 hours, and the timing of oil and oil filter element under bad conditions is 100 hours.Change, attention should be paid to safety, hot oil can cause scald.

. Replace the oil filter and the bypass filter; remove the filter with a special tool.Make sure to fill the oil into the new filter to drain the air, screw it by hand and screw another 1 / 2 after touching the gasket.Start the unit to check for oil leakage.

Replace the diesel filter; remove the diesel filter with special tools.Lubricate the liner and hand-screw the new filter filled with clean diesel.Turn it for half a circle again after touching the liner.Note that no dust goes into the fuel system.This can only be replaced after the unit is completely cooled to avoid fire from diesel splashing on the exhaust pipe.

The diesel filter element changes for every 300 hours

5.1.5 Maintenance for every 400 hours

I. Check all the water pump overflow ports.

. The air filter element shall be replaced for every 400 hours. The air filter shall be replaced according to the air filter indicator. If the air filter indicator enters the red area.

5.1.6 Maintenance for every 800 hours

I. If possible, please thoroughly remove the oil mud accumulated in the fuel oil faucet;

. Check the oil pipe in and out of the turbocharger for leakage;

. Check the air valve and its interface for air leakage;

Check all air valves for damage, replace them if necessary, and re-tighten all fixing screws after replacement;

V. Clean the fuel tank and pipeline;

. Clean the oil pan and the oil filter;

Check and fastening rod bolts, main bearing bolts, cylinder head bolts;

. Check the specific proportion of the battery electrolyte, and supplement the electrolyte if necessary;

. Check the proofreading instrument;

X. Check and adjust the excitation electric circuit.

5.1.7 Maintenance for every 1,200 hours

I. Complete all the inspection work for every 800 hours;

. Check the valve clearance.And required by the professional training, qualified engineering and technical personnel.Shutime during inspection.

5.1.8 Maintenance for every 2,400 hours

I. Complete all the inspection work for every 1,200 hours;

Check the turbocharger and make comprehensive inspection of diesel engine and its accessories.

5.1.9 Maintenance for every 6 months

I. Replace the coolant filter.Turn off the cooling faucet, remove the filter with a special tool, and reinstall a new one.Finally, open the tap.

5.1.10 Maintenance for every 12 months

I. Complete all the inspection work for every 6 months

If the air compressor is equipped with the air compressor, please replace the air filter on the air compressor; the method is to open the valve fastening device, remove the filter and destroy it, install a new filter and tighten the fastening screws.

, Clean cooling system / replace coolant (only for units without coolant filter);

Check for any leakage.

5.1.11 Maintenance for every 24 months

I. Clean cooling system / replace coolant; (only for units with coolant filter)

Check for any leakage.The coolant can be caused by low fluid level, throttle valve, exhaust fan, or blockage of the intercooler / radiator or other parts of the cooling system.

5.2 Generator maintenance

5.2.1 Generator maintenance (see the generator maintenance instructions for details)

1） Motor must not be damp, when stored, must be placed in a dry place.

2） Storage or transfer, try to avoid dirt, water droplets, metal debris and other debris invasion.

3） Pay attention to ventilation and heating of motor and current and voltage not to overload.

4） Do not use the motor in water vapor, too much dust and more combustible gas.

5） The silicon elements shall be regularly checked for dust and tighten the bolt fasteners.

6） Check the components of the excitation device for dewelding, head breaking and loosening.

5.2.2 Maintenance of the generator

In order to ensure the safe and reliable operation, the motor must be maintained.

1) Around the group

Winding conditions can be measured by measuring the ground-to-ground insulation resistance.When this test must be done, the AVR must be completely disconnected and all RTD (thermistor temperature detector) are ground and tested with 500V memeters or similar instruments.All windings have ground to ground insulation resistance must be greater than 1.0 MΩ, otherwise the motor windings must be dried.

2） **bearing**

It is recommended for the bearings to check the overheating and noise regularly during the service life of the bearing.If an excessive vibration occurs after a period of time,

May be caused by bearing wear, check the bearing damage, possibly a lack of lubricant.Replacement is

required if necessary.Note: the inspection of winding and bearing must be carried out by professional maintenance personnel, otherwise the generator will be damaged.

5.2.3 Notes required during maintenance:

1) The removed parts shall be properly preserved without loss.

2) Main parts such as rotor, end cover, machine seat, ash brush, etc.Must be put lightly, do not touch the deformation.

3) Mark the removed thread head so as to avoid misconnection during installation.

4) The bearing and its cover shall be properly covered with clean paper to avoid dust entry.

5) End cover, magnetic pole bolts must be screwed alternately.

6) After the motor is assembled, turn the rotor gently by hand, with no impact or lag at this time.

7) Refer to generator manual for installation and maintenance for specific operation process of generator maintenance.

Chapter 6.Query and troubleshooting of unit faults

6.1. Partial fault and troubleshooting of the diesel engine

(1) Can not drive the engine or the drive speed is too low

Causes, causes:	processing method:
A) Battery charging is insufficient or the battery is broken	A) Check the electrolyte level, make up if necessary, charge the battery, and replace the battery if necessary
B) System power supply is disconnected	B) Close, and switch the power switch
C) The micro switch in the control box is disconnected	C) Close the microswitch
D) Poor contact / line open circuit	D) Eliminate any bad broken circuit / contact fault, check the joint for oxidation, and clean it if necessary
E) Start-up relay fault	E) Replace the start-up relay
F) Start-up motor fault	F) Contact with the authorized personnel
G) Any starting line fault	G) Check for all other starting lines
H) Low in the lubricating oil temperature	H) Install the oil pan lubricating oil heater
I) Use the wrong type of lubricant	I) Replace the lubricating oil and filter / ensure that the correct type of

	lubricating oil is used
J) Other internal and external causes affecting the engine rotation	J) Check that the crankshaft is flexible disk

(2) The engine is difficult to start or cannot start, but the exhaust pipe will smoke

Causes, causes:	processing method:
A) Start motor drive engine speed is too low	A) See "No drive engine or drive speed is too low"
B) The engine driver engwith the engine	B) Unconnect the engine drive
C) Error in the use of the cold startup device	C) Check how the user manual can operate the cold start system
D) Insufficient preheating	D) Contact with the authorized personnel
E) Blocking of the fuel filter	E) Replace the fuel filter
F) Air is present in the fuel system	F) Use the hand press to drain the air from the fuel system
G) Oil suction line is blocked	G) Clean the pipeline
H) The air intake system is blocked	H) Clean up the air inlet pipeline
I) Water is present in the fuel oil	I) Replace the fuel oil and add the oil-water separator
J) Fuel with the wrong type or license number	J) Drive the engine with a temporary fuel tank to distinguish it
K) Injector fault or fuel injector model is wrong	K) Contact with the authorized personnel
L) Oil injector inlet and return pipe joint is loose	L) Tighten the pipe joint
M) Oil transmission pump failure	M) Contact with the authorized personnel
N) Fuel injection pump failure	N) Ask the oil pump agent to check the oil injection pump
O) Wrong oil supply timing	O) Contact with the authorized personnel
P) Correct gas distribution and correct timing	P) Contact with the authorized personnel
Q) Low compression pressure	Q) Contact with the authorized personnel
R) Fuel shutdown valve is blocked	R) See "possible fuel shutdown valve"

S) Exhaust pipe obstruction	S) Check the exhaust pipe for obstruction
T) Intercooler is dirty	T) Replace the intercooler
U) Low battery charge	U) Check whether the main motor is powered on, whether the zinc panel is black, and if so, replace the battery
V) The ambient temperature is too low	V) Use the corresponding preheating device

(3) The engine can be coiled but not started, and the exhaust pipe is smoke-free

(4) The engine can start but can not keep running

(5) Black smoke

Causes, causes:	processing method:
A) Fuel tank without fuel	A) Fill it with fuel oil
B) Electronic governor fault	B) Check the electronic governor and replace it if necessary
C) Fuel shutdown valve failure	C) Check for the fuel shutdown valve
D) Oil injector	D) Release the oil pipe between the first cylinder head of the oil injection pump, start the engine, and check for fuel overflow
E) Loosuction connector of oil pump	E) Tighten all filter pipe connections between oil tank to oil pump
F) Fuel filter block or fuel straw block	F) Replace the fuel filter and check the fuel hose for obstruction
G) No fuel is available in the oil pump	G) Feed the oil pump and pump the oil
H) Blocking of the air intake or exhaust system	H) Check the air intake and exhaust system for obstruction
I) Oil pump drive shaft is broken	I) Contact the agent
J) Gear pump pull injury or gear wear	J) Contact the agent
K) Oil transmission pump failure	K) Contact the agent
L) Injector injector obstruction	L) Check / repair the oil transmission pump and replace it if necessary

Causes, causes:	processing method:
A) Blocking of the air intake system	A) Check the air intake system for obstruction
B) Fuel injector failure	B) Contact with the authorized personnel
C) Cold start system fault	C) Install the cold start device, check and repair, and replace it if necessary
D) Fuel with the wrong type or license number	D) Drive the engine with a temporary fuel tank to distinguish it
E) Exust pipe obstruction	E) Check the exhaust pipe for obstruction and check for the correct size
F) Engine temperature is too low	F) See "Coolant temperature is below normal temperature"
G) Wrong valve clearance	G) Adjust the valve clearance
H) Air leakage in air inlet pipeline between turbocharger and cylinder head	H) Check for air leakage in the inlet pipeline
I) Return oil is blocked	I) Check the return oil line for obstruction, distortion, or depression
J) Excessive temperature or excessive altitude causes thin air	J) Correct according to the correction method in the engine sales manual
K) Wrong oil supply timing	K) Contact with the authorized personnel

Causes, causes:	processing method:
A) Air is present in the fuel system	A) Echarge air from the fuel and tighten the pipe connector and filter
B) Leak or blockage of the fuel system	B) Check the fuel tank upright pipe
C) The engine drive engwith the engine	C) Unconnect the engine drive
D) Fuel filter blocking or fuel freezing due to too low temperature	D) Replace the fuel filter and install the fuel heater
E) Oil suction line is blocked	E) Clean the pipeline
F) Fuel with the wrong type or card	F) Start the engine with a temporary fuel tank to distinguish it
G) Water is present in the fuel oil	G) Replace the fuel oil and add the oil-water separator
H) Insufficient warm-heating (if any)	H) Check the user manual / check pipe, press the button to reset if required, check the wire / interlocking button and preheating relay.If the preheating element need to be replaced, contact the authorized personnel
I) The air intake system is blocked	I) Clean up the air inlet pipeline
J) Broken pressure pipe	J) Install the new pressure pipe

(6) Take a blue smoke or a white smoke

Causes, causes:	processing method:
A) Use the wrong type of lubricating oil	A) Replace the lubricating oil and filter / ensure that the correct type of lubricating oil is used
B) Cooling start system fault	B) Install the cold start device, check and repair, and replace it if necessary
C) Too low engine temperature	C) See "Coolant temperature is below normal temperature"
D) Too much engine lubricating oil	D) Check the lubricating oil level
E) Turbo-charger seal rings and bearings for wear	E) Contact with the authorized personnel
F) Fuel with the wrong type or card	F) Start the engine with a temporary fuel tank to distinguish it
G) The engine has reached the overhaul period	G) Overhaul engine
H) leaky cylinder head	H) Check the cylinder head and cylinder pad, and replace it if necessary
I) Diesel has water	I) Replace diesel conforming meets standard

(7) The engine does not reach the rated speed

Causes, causes:	processing method:
A) Problem tachometer	A) Check with a handheld tachometer or a digital tachometer
B) Throttle stroke problem	B) Check the throttle stroke
C) Oil sorbing obstruction	C) Check the oil straw for obstruction and replace it if necessary
D) or improper setup	D) Check / adjust the governor
E) The maximum speed limit of the governor is set is too low	E) Check / adjust the governor
F) Water is present in the fuel oil	F) Replace the fuel oil and add the oil-water separator
G) Check for the fuel travel core without blockage	G) If blocked, replace it

(8) The engine cannot be stopped

Causes, causes:	processing method:
A) Controller or, shutdown button	A) Replace the controller

failure	
B) Governor fault	B) Check / replace the governor
C) Fuel shutdown valve failure (if any)	C) Check for the fuel shutdown valve
D) Return oil pipe is blocked	D) Check the return pipe for obstruction, distortion, or depression
E) The throttle lever stuck	E) Press the button on the insurance tube to reset the insurance tube

(9) Insufficient engine output power / poor unit power belt

Causes, causes:	processing method:
A) Excessive load relative to the rated power engine	A) Reduce the load
B) High altitude causes insufficient power	B) Correct the engine at an altitude of over 1,000 m
C) Fuel pipe is blocked	C) Check the oil road for obstruction
D) Too high lubricating oil level	D) Check the oil gauge scale and oil pan volume
E) The throttle control lever movement is blocked	E) Check the control lever position when the throttle is fully open
F) Blocking of the air intake or exhaust system	F) Check the air intake and exhaust system for obstruction
G) Air is present in the fuel oil	G) Echarge air from the fuel and tighten the pipe connector and filter
H) Return oil line is blocked or fuel tank ventilation is poor	H) Check the return oil system for obstruction, distortion, or depression.Remove, clean up, or replace, etc
I) Wrong valve clearance	I) Contact with the authorized personnel
J) Fuel with the wrong type or license number	J) Start the engine with a temporary fuel tank equipped with suitable fuel oil
K) Incoming temperature is too high (above 40 degrees C)	K) Introduce air from the outside to the supercharger when the temperature is high
L) Incoming temperature is too low (below 0 ° C)	L) Bring the air under the hood into the engine when the temperature is low
M) High fuel temperature (above 70 ° C)	M) Fuel the fuel tank, turn off the fuel heater, and the maximum fuel temperature is 70 ° C

N) Fuel injector failure	N) Contact with the authorized personnel
O) Output pump failure	O) Contact with the authorized personnel
P) Clean up with the fuel filter	P) Replace the fuel filter
Q) High governor resistance: a fault or incorrect setting	Q) Contact with the authorized personnel
R) Pressure regulator: with fault or wrong setting	R) Contact with the authorized personnel
S) The maximum speed limit of the governor is set is too low	S) Check / adjust the governor
T) Fuel injection pump failure	T) Ask the agent to check the oil injection pump
U) Wrong oil supply timing	U) Contact with the authorized personnel
V) Low compression pressure	V) Contact with the authorized personnel
W) turbocharger impeller damaged or dirty	W) Contact with the authorized personnel
X) The exhaust gas door is not working properly (if installed)	X) Check out the cause, clean up, repair, or replace the exhaust gas door
Y) Oil and water separator is blocked	Y) Clean the oil-water separator

(10) Lube oil pressure is too low

Causes:	**processing method:**
A) Improper lubricating oil level	A) Check for any lubricating oil level.
B) Problems with the lubricant pressure gauge	B) Check the lubricating oil pressure gauge
C) The oil is diluted by fuel	C) Replace the lubricating oil.If the lubricating oil is diluted again, contact the authorized repair agency
D) The lubricating oil plate number is wrong	D) Replace the lubricating oil and check the lubricating oil plate number
E) Lubricating oil temperature above normal value (120 ° C)	E) Check, clean up, or replace the lubricating oil cooler
F) Lube oil filter is dirty	F) Replace the lubricating oil filter
G) Wear or damage of the crankshaft bearings	G) Contact with the authorized personnel

H) Wear of the lubricating oil pump	H) Contact with the authorized personnel
I) The pressure relief valve is not closed	I) Contact with the authorized personnel
J) Pressure relief valve is damaged	J) Contact with the authorized personnel
K) Failure of the lubricating oil pump and the oil suction straw	K) Contact with the authorized personnel
L) Oil pan suction filter is blocked	L) Contact with the authorized personnel

(11) Lube oil pressure is too high

Causes, causes:	processing method:
A) The pressure relief valve is not open	A) Contact with the authorized personnel

(12) Coolant temperature is below the normal temperature

Causes, causes:	processing method:
A) Too low in the coolant level	A) Add the coolant
B) The radiator is blocked or damaged	B) Clean as per the user manual and repair if necessary
C) The radiator hose is depressed or blocked	C) Check the hose.Replace it, if necessary
D) Fan drive belt is loose	D) Check the tension of the fan belt and tighten it
E) Improper lubricating oil level	E) Add to or discharge the lubricating oil.Check the oil gauge scale
F) The cooling fan cover is damaged or lost	F) Check the fan cover.Repair, replace, or reinstall it
G) Wrong pressure cover of radiator or wrong model	G) Check the radiator pressure cover.Replace it, if necessary
H) Problems with the temperature meter	H) Test / repair the temperature meter.Replace it, if necessary
I) The radiator shutter is not fully open	I) Check / repair the window blinds.Replace it, if necessary
J) Blocking of air filter or wrong model	J) Check, or replace, the air filter

K) Injector fault or fuel injector model is wrong	K) Check / adjust or replace the fuel injector
L) Exhaust pipe obstruction	L) Check the exhaust pipe for obstruction, and check whether the size is appropriate
M) The fan is damaged	M) Replace the fan
N) Radiator air path or waterway obstruction	N) Check and clean up
O) Insufficient coolant in the system	O) Add the coolant
P) Air and air accumulation in the cooling system	P) Excharge the air from the cooling system
Q) Water pump fault	Q) Check / repair or replace the water pump
R) Thermostat fault / wrong model	R) Check / replace the thermostat
S) Air is present in the cooling system	S) Check the hose clamp on the suction side for leakage and the cylinder head for leakage
T) Fuel injection pump failure	T) Ask the oil pump agent to check the oil injection pump
U) Wrong oil supply timing	U) Check the oil injection pump data and adjust it
V) Correct gas distribution and correct timing	V) Adjust to the specified data
W) Air leakage in the cylinder pad	W) Check the cylinder pad
X) The piston is damaged	X) Replace the cylinder sleeve and the piston.Check out the cause of the damage
Y) Wear and air leakage of the inlet and exhaust doors	Y) renewal
Z) Supercharger fault	Z) renewal

(13) Fuel consumption rate exceeds the normal level

Causes, causes:	processing method:
A) Blocking of air filter or wrong model	A) Find cause / replace if necessary
B) Injector fault or fuel injector model is wrong	B) Check / adjust or replace the oil injector
C) Too low engine temperature	C) See "Coolant temperature is below normal temperature"

D) Wrong valve clearance	D) Adjust / check the valve clearance
E) Pressure regulator: provided with fault or improper setting	E) Repair / readjust
F) Wrong oil supply timing	F) Check the oil injection pump data and adjust it
G) Improper adjustment of the oil control lever	G) Check the full throttle stroke
H) High temperature or too high altitude to cause thin air	H) Correction according to the correction method in the engine sales manual
I) Engine overload	I) Check the maximum load and reduce the load if necessary
J) External or internal fuel leakage	J) Eliminate the leakage
K) Fuel tank ventilation is blocked	K) Clean up / install the ventilation duct
L) Restricted exhaust pipe	L) Check the exhaust pipe for obstruction, and check whether the size is appropriate
M) Cold start system fault	M) Install the cold start device, check, repair, and replace it if necessary
N) The valve card is stuck	N) Clean up / replace or regrind the valves
O) Low compression pressure	O) See "Low Compression Pressure"

(14) Engine knock on the cylinder

Causes, causes:	processing method:
A) Oil transmission pump failure	A) Check / repair the oil transmission pump, and replace it if necessary
B） Injector fault or fuel injector model is wrong	B) Check / replace the oil injector
C) Cold start system fault	C) Install the cold start device, check and repair, and replace it if necessary
D) Fuel with the wrong type or license number	D) Use diesel with low sulfur content, with the highest sulfur content of 0.5%
E) Improper adjustment of the throttle control lever	E) Check the throttle stroke
F) Too high engine temperature	F) See "Engine Temperature Above Normal Temperature"
G) Wrong valve clearance	G) Adjust / check the valve clearance

H) Excessive lubricating oil or wrong lubricating specifications used	H) Check the correct lubricating oil capacity and specifications in the convenience manual
I) Air leakage in the oil suction pipeline	I) Check for no leakage and replace the faulty parts
J) Wrong oil supply timing	J) Check the oil injection pump setting data and adjust it
K) The valve card is stuck	K) Clean up / replace or regrind the valves
L) Low compression pressure	L) See "low compression pressure"
M) Wear, or damage to the crankshaft bearings	M) Replace the crankshaft bearing and check the lubricating oil replacement cycle
N) Broken valve spring	N) Replace the valve spring

(15) Lube oil consumption rate is too large

Causes, causes:	processing method:
A) Turbo-charger seal rings and bearings for wear	A) Repair / replace the turbocharger and check the lubricating oil and it
B) The piston ring is worn or broken	B) Refer to the piston, piston ring, bearing and neck wear replacement cycle
C) The cylinder sleeve and piston are worn or pulled	C) See "Pistons, piston rings, bearings, and axle neck wear"
D) The lubricating oil plate number is wrong	D) Replace the lubricating oil / filter to ensure that the correct lubricating oil is used

(16) Instable engine operation

Causes, causes:	processing method:
A) Stability adjustment fault of the speed governor controller	A) Adjust the governor stability knob or replace the speed control controller
B) Fuel pipe is blocked	B) Check / replace the fuel line
C) Oil transmission pump failure	C) Check / repair the oil transmission pump, and replace it if necessary
D) Clean up with the fuel filter	D) Replace the fuel filter
E) Injector fault or fuel injector	E) Check / adjust or replace the fuel injector

model is wrong	
F) Fuel tank ventilation is blocked	F) Clean up / install the ventilation duct
G) Air is available in the fuel system	G) Excharge the air from the fuel oil
H) Blocking of air filter or wrong model	H) Replace the air filter / ensure the correct air filter is installed
I) Movement component lag of the engine speed control system	I) Inspection and cleaning
J) Too high engine temperature	J) See " Coolant temperature above normal temperature
K) Incorrect valve clearance	K) Check / adjust the valve clearance
L) Too much lubricating oil, or the wrong number of lubricating oil varieties used	L) Check and adjust the oil quantity or replace the lubricating oil variety and license number
M) Cold start system has a fault	M) Install the cold-start auxiliary device.Check and repair the cold start device and replace it if necessary
N) Exust pipe blockage	N) Check and remove the blockage.Check the correct
O) Fuel injection pump failure	O) Please contact the agent
P) Low compression pressure	P) See "Low compression pressure"
Q) The valve card is stuck	Q) Clean the valve rod and catheter holes
R) Wrong use or wrong installation of the high-pressure oil pipe	R) Correct it or replace it
S) Broken valve spring	S) Replace the valve spring

(17) Engine vibration

Causes, causes:	processing method:
A) Injector fault or fuel injector model is wrong	A) Check, adjust, or repair the oil injectors.Or replace the correct type of fuel injector
B) The speed control system stuck	B) Inspection and cleaning
C) Too high engine temperature	C) Check and supplement coolant, check fan and thermostat for water leakage
D) Damrupt fan for cooling	D) Repair the fan
E) Engine assembly fault	E) Contact with the authorized repair personnel
F) Fuel injection pump failure	F) Fuel injection pump failure

G) Low compression pressure	G) See "Low compression pressure"
H) Wrong use or wrong installation of the high-pressure oil pipe	H) Replace or correct it
I) The coaxial degree of the flywheel case and flywheel does not meet the requirements	I) Contact the agent

(18) Engine coach

Causes, causes:	processing method:
A) The throttle lever	A) Check whether the gap between the rod coupling point is too large, adjust to the correct gap, and replace the parts if necessary
B) Gas is present in the oil inlet pipeline	B) Check for any leakage and replace the damaged parts
C) Stability adjustment fault of the speed governor controller	C) Adjust the governor stability knob or replace the governor controller

(19) Pistons, piston ring, bearing and shaft neck wear, cylinder sleeve wear

Causes, causes:	processing method:
A) Air leakage between the air filter and the turbocharger	A) Replace the parts, if necessary.Make sure that there is no air leakage between the air filter and the turbocharger
B) The fuel sulfur content is too high	B) Check the fuel specifications / contact the fuel supplier.Recommended maximum sulfur content: 0.5%

(20) The crankcase air pressure is too high

Causes, causes:	processing method:
A) Air ventilation duct obstruction	A) Check the ventilation duct for obstruction
B) The cylinder head is worn	B) See "Pistons, piston rings, bearings, and axle neck wear"
C) Piston ring is stuck, worn out, or broken	C) See "Pistons, piston rings, bearings, and axle neck wear"
D) Valve rod and / or valve duct wear	D) Replace the valve and / or the valve catheter
E) The piston is damaged	E) See "Pistons, piston rings, bearings, and axle neck wear"

(21) Low compression pressure

Causes, causes:	processing method:
A) Air filter or air intake system is blocked	A) Clean up the air intake system / replace the air filter
B) Valve clearance is wrong	B) Check / adjust the valve clearance
C) Correct gas distribution and correct timing	C) Adjust to the specified data
D) Air leakage of the cylinder pad	D) Check the maintenance manual to measure the plane and replace the cylinder pad
E) Flexible valve opening and closing	E) Clean up, replace, or regrind the valves
G) Air leakage between the valve and the valve seat	G) Replace / regrind valves and valves
H) Piston ring is stuck, worn, or broken	H) Replace the piston ring
I) Valve rod and / or valve duct wear	I) Replace the valve and valve catheter
J) Broken valve spring	J) Replace the valve spring

6.2. Generator partial fault and troubleshooting

⑴ unit has no voltage output

A. Check whether the AVR wiring is correct and reliable;

B. Check the rotational speed of the diesel generator set;

C. Check the residual magnetic voltage of the generator, and charge the magnetic voltage if necessary;

D. Check the damage of the generator, AVR or rotary diode by the steps of the excitation separation test method.

Find and unplug of F1 F2 excitation coil on AVR, lead a 12V DC voltage from the battery, F1 positive electrode, F2 negative electrode, start generator to rated speed, if normal, exciter or rectifier is normal; start again, if normal, magnetic loss, if no voltage indicates AVR fault.

The output voltage of the ⑵ unit is unstable

A. Check whether the rotation speed of the unit is stable;

B. Check that the stability setting is correct.

C.Check the generator main wiring for loose or false connection.

The ⑶ output voltage is too high

A. Check whether the unit rotation speed is too high;

B. Check whether the load of the unit is compatible load (advanced power factor).

C.Check the generator main wiring for loose or false connection.

The ⑷ voltage is too low on no-load

A． Check whether the rotation speed of the unit is too low;

B. Check whether the main wiring of the generator is loose or virtual.

C. _ Check whether the K_1-K_2 wiring of AVR or the external manual fine-tuning is well connected (brush generator) .

⑸ The voltage is too low when loaded

A. Check whether the speed of the unit is normal;

b. Check whether the generator AVR is normal according to the steps of the excitation separation test method;

c. Damaged rotating diode.

6.3 . Fault and elimination of electrical control part

⑴For the manual control unit , when the key is turned to "START", the unit will not start or the LCD module controls the unit, press the unit start button, the unit will not start

A. Check if the key switch is working well and correctly or if the module start port has output,

b. Check whether there is a fault indication, repair the fault if necessary, and reset the corresponding fault information

c. Check the battery voltage. If the voltage is too low, you need to recharge the battery to full. If the voltage value is normal, you need to gradually check whether the voltage signal is correctly sent to all control links according to the drawing, such as the accelerator solenoid valve and the starter motor, etc.

D. Check if the emergency stop button is released

E. Is the start relay good?

2) Start the motor to run, but the unit does not start the car

A. Check the fuel level and make sure the fuel lines are properly connected

b. For the mechanical speed control system unit, check whether the throttle solenoid valve is properly pulled in

c. For the electronic speed control system unit, check whether the power supply of the speed control

controller is correctly connected and whether the voltage is normal

D. For the electronic speed control system unit, when the motor is started, use an electric meter to measure whether the MPU has a correct AC voltage signal

E. Check whether the unit speed has reached or exceeded the set start normal speed

F. Check the fuel delivery system for blockages

g. Check if the air filter is clogged

H. For units in cold areas, make sure that the unit is preheated before starting.

(3) High water temperature fault alarm/shutdown

A. Check if the unit is overloaded

b. Check fan belt tension

c. After the standby group is completely cooled, check whether the water level of the cooling water is sufficient

D. Check the water temperature sensor for damage

E. _ Check whether the switch alarm of the water temperature sensor is correct.

F. Check that the thermostat valve opens correctly

g. Check that the clearance between the fan and the water tank is correct

H. _ Confirm that the temperature in the equipment room is not higher than 40°C

⑷After the unit starts, the low speed normally does not turn to the high speed

A. Use a multimeter to measure whether the high and low speed terminals on the speed control board are disconnected. Under normal circumstances, the idle speed is closed and the high speed is disconnected.
b. Check whether the high-speed control wiring in the control box is good

c. Check the internal settings of the controller and whether the output signal is normal

⑸ Low oil pressure fault alarm/shutdown

A. Check the oil level

b. Check oil quality and viscosity

c. Check oil temperature

D. _ Check the oil pressure sensor for damage

E. _ Check whether the oil filter and oil circuit are blocked

F. _ Check whether the oil pressure sensor switch alarm is correct.

⑹ Overspeed fault shutdown

A. Check the tachometer for any abnormality

b. For mechanical speed control mechanism, check whether the throttle lever is flexible and make sure it is adjusted correctly

c. For the electronic speed control system, check whether the throttle lever is flexible and whether the actuator operates correctly

D. Recalibrate and adjust overspeed protection limits

E. Check whether the speed sensor is installed properly

F. After troubleshooting, reset the alarm signal on the control screen

(7) **High voltage alarm**

A. Measure the actual value of the output voltage of the unit

b. Confirm that the display meter has no deviation

c. If the voltage is actually too high, you can follow the steps to check and readjust the AVR in detail

D. Confirm that the load is non-capacitive and the power factor is not leading

E. Confirm that the unit speed/frequency is normal

F. If the measured voltage value is normal, you can check whether the circuit part of the voltage display is correct

g. Check whether the set limit value of the high voltage alarm is correct and reasonable

(8) **Low voltage alarm**

A. Measure the actual value of the output voltage of the unit

b. Confirm that the display meter has no deviation

c. If the voltage is actually low, you can check and readjust the AVR in detail according to the steps

D. Confirm that the unit speed/frequency is normal

E. If the measured voltage value is normal, you can check whether the circuit part of the voltage display is correct

F. Focus on checking whether the voltage sampling micro switch of the generator control box is normal and the connection is firm

g. Confirm that the three-phase voltage value has no large deviation

H. Confirm that there is no phase loss

i. Confirm that when an alarm occurs, the load changes are not large

J. Make sure the unit is not overloaded

K. Check whether the set limit value of the voltage high and low alarm is correct and reasonable

⑼ The unit cannot be loaded

A. Check if the voltage is normal

b. Check the nature of the load to confirm that there is no overload and power factor leading

c. Confirm whether the switch is closed and the settings are correct and reasonable

D. For users who are equipped with ATS, they should focus on checking the ATS and related parts

E. Check all wiring for ATS control transitions and make sure they are correct

F. Make sure that the ATS transfer control switch is in the "AUTO" position

g. When the ATS transfer control switch is in the "AUTO" position, confirm that the connected mains has no normal voltage

H. Confirm that the unit power is correctly introduced into the unit end of the ATS

i. Confirm that the main AC contactor of the ATS is flexible and free from jamming

⑽Can not stop manually

A. Check that the key switch and control switch are in the correct position

b. Confirm that all electrical control parts are normal

c. Check whether the fuel solenoid valve is normal, replace if necessary

D. For the electronic speed control system unit, confirm that the settings of the speed control controller are correct and reasonable

E. Make sure the fuel quantity of the fuel injection pump is set correctly

F. Confirm that the unit is running in manual mode

⑾ In automatic mode, the unit cannot automatically stop

A. Confirm that the utility power is fully restored to normal

b. Make sure no mains sensor is activated

c. Confirm that the automatic shutdown delay of the unit has been counted

D. Check whether the fuel solenoid valve is normal, replace if necessary

E. For the electronic speed control system unit, confirm that the settings of the speed control controller are correct and reasonable

F. Make sure the fuel quantity of the fuel injection pump is set correctly

⑿Cannot realize remote monitoring of cloud services

A. Confirm that the monitoring software has been correctly installed into the remote PC

b. Confirm that the communication parameter settings of the monitoring interface correspond to the actual connection form correctly

c. Confirm that the communication line is correct and reliable, and there is no busy line

D. Confirm that the communication port of the unit end is correctly connected to the communication module

E. Confirm that the communication equipment meets the communication requirements

⑬Cannot realize remote emergency shutdown of cloud services

A. Confirm that the remote communication of the unit has been realized normally

b. Confirm that the relevant wiring is correct and there is no omission

C. _ Confirm that the login permission is entered correctly

Note: For more detailed fault analysis and troubleshooting of the control module , please refer to the random information of the control box.