CONSTRUYENDO PROGRESO

CONSORCIO
AEROPUERTO INTERNACIONAL
LETICIA

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Contrato Obra No. 14000160-OK-2014, Construcción del Terminal, Torre de Control, Cuartel de Bomberos y Obras de Infraestructura complementaria del Aeropuerto “Alfredo Vásquez Cobo” de la ciudad de Leticia-Amazonas.

DOSSIER DE CALIDAD

ÍTEM No 4.5.2.07. PLANTA ELÉCTRICAS 300 KVA 440-220V EFECTIVOS.
ÍTEM No 4.5.2.08. PLANTA ELÉCTRICAS 300 KVA 120-208V EFECTIVOS.
ÍTEM No 4.5.2.09. PLANTA ELÉCTRICA 200 KVA 120-208V EFECTIVOS.
ÍTEM No 4.5.03.11. TABLERO DE ALTERNANCIA 1.
ÍTEM No 4.5.03.19. TABLERO DE ALTERNANCIA 2.

MANUAL DE OPERACIÓN GENERADOR

SUB CONTRATISTA

Emcorp Group
International Holding

LEES

GENERATOR SET---USER MANUAL

POWER YOUR LIFE...



Preface

Thank you for purchasing generator sets.

Please read this instruction and ensure understand all regulations concerning handling, check and maintenance thoroughly prior to application.

Failure to follow this instruction may cause serious accidents.

⚠ WARNING

Incorrect operation is likely to lead accidents.
Operate and maintain the machine on the basis of thorough understanding of this instruction.

- Place this instruction in the fitting box or near machine after reading because it is regularly needed.

- If this introduction is lost or damaged, please order one from local dealer.

- Please provide this introduction to another user whom machine will be transferred to.

- Machine may be improved or modified. Therefore actual conditions may be different from this introduction.

- If you have any doubt, please consult local dealer.

- Safety information contained in this introduction is extremely important. Please read and understand it.

CONTENT

Preface 1

1. Safety instruction 3

2. Product instruction 9

3. Installation and transportation 10

4. Connection of load 13

5. Fuel, lubricant, cooling water, battery 19

6. Running the generator 26

7. Periodical maintenance and service 34

8. Troubleshooting 41

9. Long-term storage 44

10. Appendix 45

1. SAFETY INSTRUCTION

⚠ WARNING

Please read and observe all safety and precaution information. Failure to observe them and incorrect operation can lead to serious injury even death.

(1) Safety label

The followings are illumination of the safety label.

⚠ DANGER — Indicates a strong possibility of severe personal injury even death if instructions are not followed.

⚠ WARNING — Indicates a possibility of personal injury or equipment damage if instructions are not followed.

⚠ CAUTION — Attention reminds operator not to ignore potential risks. If no measures are taken to avoid risk, mild or moderate injury or mechanical damage is very likely to occur.

[Attended operation]

Indicates that mechanical damage or shorter duration is likely to occur in case of neglect.

Don't lend this generator to others, or use it together with others until you read this manual and understand the whole operation manual.

It will impact on the safety performance and reduce the generator's life if you modify it. We wouldn't warrant the generator that is modified or not used with genuine parts.

However, it is impossible for our company to expect all risks concerning conditions of operation, check and maintenance. Therefore warnings contained in the introduction and identified on the machine are exclusive and complete. User shall take own responsibility for safety if user does operation, check and maintenance not mentioned herein.

Matters need attention

⚠ CAUTION Operator's duties



■Don't operate the generator when the operator is very tired, drunk, or unconscious.

■ Be care to operate the generator set according to the instructions, otherwise it will cause an accident.

■Wear protective clothing and mask to avoid an unexpected hurt.



■Keep the children or pets away from the generator.

■Only professional technicians with required skills are allowed to operate this machine. Otherwise, accidental injury or electric shock is possible.

If any abnormality is found

■ Please pay attention to any abnormality concerning sound, vibration, color or exhaust, oil leakage and abnormal alarm during running, check or maintenance. If any abnormality is found, stop running machine immediately. Report to the superior and take proper measures. Forbid working the machine before abnormality is eliminated.

⚠ WARNING

The warning labels should be stick to the main body of the generator.

■Stick the labels firmly

■Don't damage the label or let the labels fall off.

■Strictly follow the labels

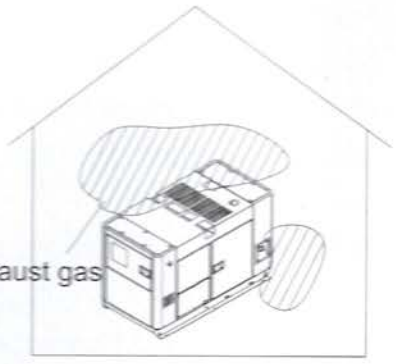
⚠ DANGER Exhaust gas is toxic

■Exhaust gas contains poisonous carbon monoxide.

■Never run the generator in an enclosed area.

■Be sure to provide adequate ventilation.

■The exhaust vent shouldn't open to the passenger and the others.



⚠ DANGER Danger Rotary parts

Don't touch the inner rotary parts. It's very dangerous.

■Close and lock the side door when running the super quiet generator. If you have to open the side door, don't stick head and hands to generator inner.

■Maintain and service the generator inner parts only after stopping it.

■The cooling fan of the radiator will go on rotating, don't maintain or service it until the engine is thoroughly stopped. .

⚠ DANGER Electric shock

■It will cause electric shock even death if touch the naked cable during the running. Never touch the machine with wet hands, or electric shock will occur.

■Cut off the circuit to stop the generator before connecting the terminal.

■Output terminal cover should be closed. Tighten all screws before running this generator.

■There is enough voltage even at an idle speed, therefore, make sure the generator is stopped thoroughly.

■Don't touch the inner circuit when generator is running.

■Control box should be closed all along and all of its screws should be tightened before running the generator.



■Close and lock the side door of the super quiet generator before operating.

■Cut off the breaker circuit to stop the generator, before opening the control box to transfer the voltage.

⚠ DANGER Ground protection

If ground mode is not right, the ground protection won't function. And it will cause electric shock even to death. (Refer to 4-2)

■The outer box grounding terminal and load machine outer box must be grounded.

⚠ CAUTION Fire hazard

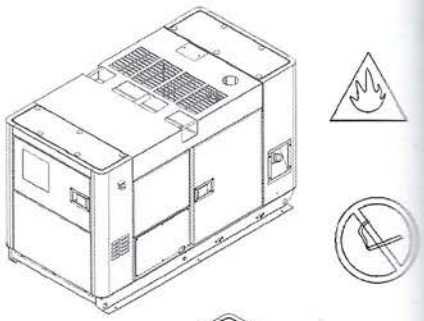
Fuel and lubrication is extremely flammable under certain conditions.

■Refuel in a good ventilated area with the engine stopped. Keep away from cigarette, smoke and sparks when refueling the generator.

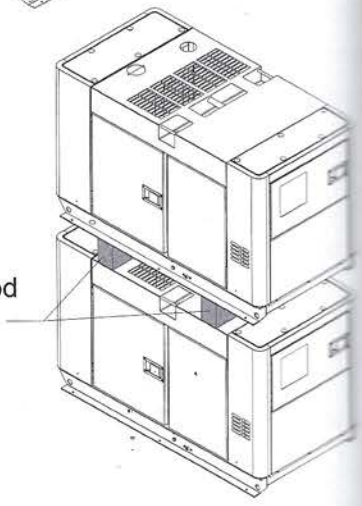
■Don't place the flammable and explosive materials near the generator.

■Wipe up spilled fuel at once.

■It is limited to use the generator in high-hazard risk area.



⚠ CAUTION Storage



■It will fall off or collapse to cause an accident if placed in a wrong position.

■Make sure that engine cover is not broken, and its screws are not

loosened or missed.

■The generator set should be put on a level ground hard enough to afford its weight.

■If put a generator set on another generator, the weight and size of above one should be less than that of the other.

■Don't run the generators set when stacks together. Otherwise, the above generator will fall off to cause an accident.

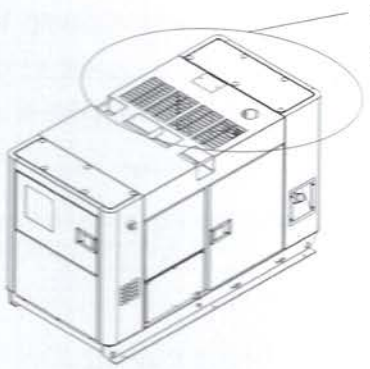
⚠ CAUTION Hot parts

The muffler becomes very hot during operation and remains hot for a while after stopping the engine. Be careful not to touch the muffler while it is hot.

■Let the engine cool before storing the generator indoors. The engine exhaust system is heated during operation and remains hot immediately after stopping the engine.

■To prevent scalding, pay attention to the warning marks attached to the generator.

■Close and lock the side door when running the super quiet generator. And don't put hand and head into the engine to avoid scalding.



⚠ CAUTION Radiator cover

If you open the radiator cover while the temperature of the cooling water is very high, the splashed water or steam may scald you seriously.

■The temperature of cooling water is very high immediately after stopping the engine.

■Don't check or refill the cooling water until the engine is cooled or thoroughly stopped. (The temperature of cooling water is under 50℃).



⚠ CAUTION The usage of the battery

The battery may produce flammable gas. Be careful to avoid any explosive accident.

■Charge the battery in a good ventilated place. Otherwise, the flammable gas will gather enough to cause fire hazard or explosive accident.

■The positive terminal shouldn't be connected to the negative terminal when connects with an extension cable. Otherwise, it will cause the fire hazard even explosive accident.

■Disconnect the ground table when servicing and maintaining the generator.

■Avoid touching the electrolyte because it contains sulfuric acid. Otherwise, it may burn you seriously.

■If electrolyte contacts with skin or clothes, clean it with a large quantities of water.

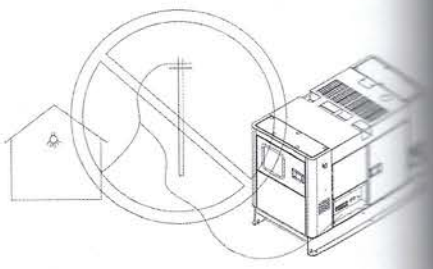
■Check the battery after stopping the engine.

⚠ CAUTION Noise

■Close the door of the super quiet generator when it is running. Otherwise its noise will reach a very high level.

■Open-frame generator would cause a hearing damage for its high noise level if stay at the condition for a long time. Put on the earplug if necessary or take other protective measures.

⚠ CAUTION Cable Connection



■Use a disconnecting switch for cable connection. Cut off the utility lines before running the generator.

■Connections for standby power to a building's electrical system must be made by a qualified electrician, which accords with all applicable laws and electrical codes.

■Usage of standby power must obey relevant rules and regulations. Please perform and follow the normal and legal procedure.

⚠ WARNING Maintenance attentions

DANGER
NOT RUN!

- Don't start the engine when checking or maintaining the generator.
- Identify the warning label "DANGER NOT RUN" at obvious positions, such as starting switch, in order to avoid unnecessary persons carry out unintended operation.
- Never check or maintain the generator when the engine is still running.
- If maintenance requires running engine, such maintenance must be done by two persons. One person is responsible for maintenance, while the other person is ready for stopping running engine at any time.
- Maintenance operator shall take precautions against body or clothes getting involved into the rotating parts of generator.

The handling of wasted fuel or water

- Waste fuel pollute environment, so don't pour them into the stream, ocean or lake.
- When handling the waste fuel, please use container.
- Handle of poisonous engine oil, fuel, cooling water and battery, please refer to the related regulations.

Transportation attentions

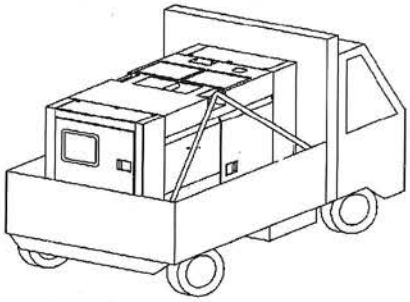
Don't use rope or ladder to lift the generator. Otherwise, the generator may fall down and be broken.

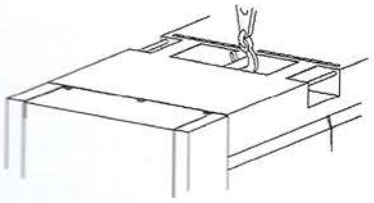
■Lift the generator by using the lifting lever at the center of the engine cover.

■Anyone shouldn't stand under the lifted generator.

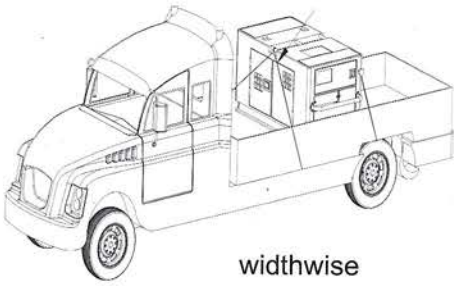
■Don't lift or move the generator when the engine isn't stop. Otherwise, it may break the cooling fan, and cause a fatal fault.

■Fix the generator with ropes, after putting a generator into the car.



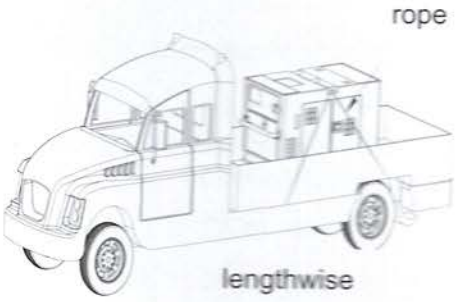


rope



widthwise

rope



lengthwise

2. PRODUCT INSTRUCTION

2.1 Use and laws

■ This machine is portable and used as main or auxiliary power supply for outside work.

Some countries regulate the connection of machine with inside distribution line accepting power from the power company. Please pay particular attention to and observe relevant laws and regulations in local countries and areas.

■ This product is applicable for moving electrical equipments. Please observe relevant laws and regulations and make legal declaration.

■ Only professional technicians with required skills are allowed to operate this machine for safety concern.

⚠ DANGER

It is forbidden to connect the generator with distribution line of power company and distribution line in the building willfully.

Only professional technicians with required skills are allowed to connect the machine with the current electrical system.

⚠ CAUTION

Lock the control panel door and maintenance door securely when the generator is not used. Keep the door keys in the operator for safe keeping.

Keep children or other people who may not realize the danger of operation away from the generator.

2.1.1 General instruction

No.	Item	Description
1	Purpose	Outdoor standby power
2	Environment conditions	Environment temperature: -5℃~25℃ Relative humidity: 30% Elevation: 0m
3	Installation	On the hard level ground

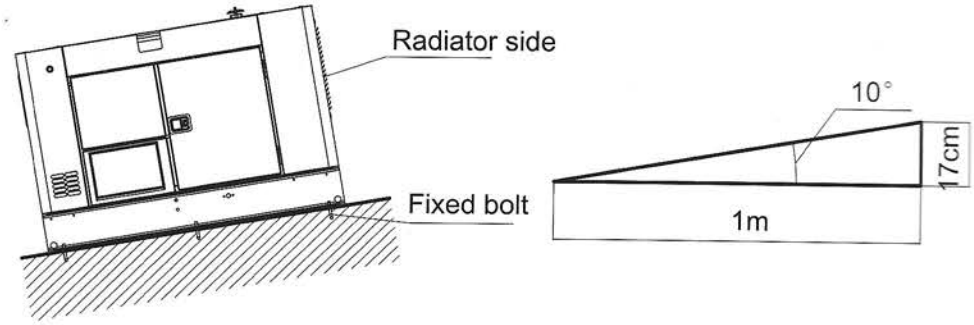
3. INSTALLATION AND TRANSPORTATION

3.1 Installation

Pay attention to the following items during installation:

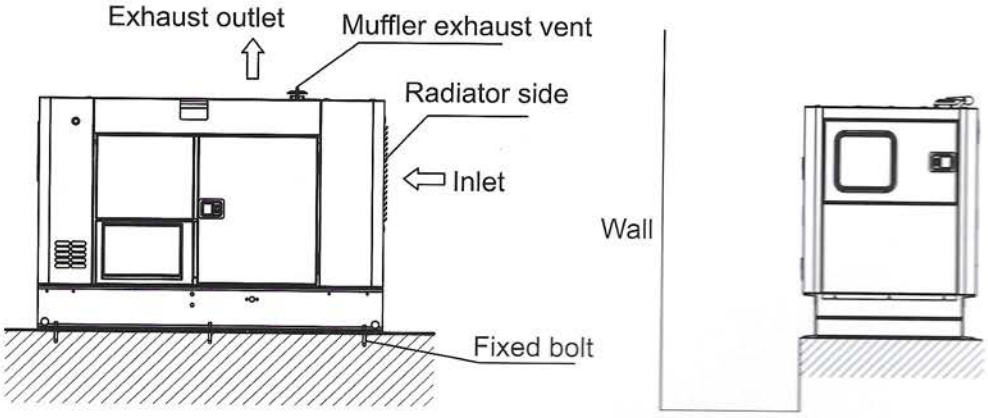
(1) Please install the machine on the flat and solid ground. Make sure bottom of the generator contacts ground evenly. Error may occur due to generator vibration.

(2) If it is necessary to run the machine on the inclined ground, make sure the side with radiator upwards and inclination angle within 10°. Engine may face overheat due to bad working of water temperature switch or mixed air in the cooling water.



(3) Keep the machine at least 200-300mm away from walls upon installation. Keep radiator air vent and engine inlet/ exhaust vent upwards, preventing them from any jam. Otherwise, temperature may rise or cooling airflow may be reduced, thus causes overheat of engine or reduction of rotation speed. In addition, temperature of exhaust or increase of load may also lead to shorter duration.

Don't put any barrier on the exhaust outlet, vent, or muffler exhaust vent.



(4) Run the machine in the place free of moisture, dust and rubbish and with free air.

Electricity leakage causes electric shock. If air vent of radiator is jammed, overheat of engine may occur.

(5) Place the generator near to working equipments like motor, lamps and etc.

Long line reduces efficiency because of large resistance and electricity loss. In addition, the electricity fee turns more.

3.2 Storage

⚠ DANGER Poisonous Exhaust

The poor ventilation will cause shortage of oxygen, which resulted in the poisoning even death.

■Don't operate the set in the building or poor-ventilated places.

■The unit can't be operated at the situations such as: indoor, store, subway, deck.

■The exhaust vent shouldn't open to the passenger and others.

⚠ CAUTION Vibration

There will be delivery vibration when the unit is running because of its rotary parts. Be care for the following items when install the generator:

■The generator should be put on a hard level surface. If the supporting surface is uneven, it will cause abnormal vibration.

■Don't disturb the others' for the vibration.

⚠ CAUTION Noise

Loud noise will be caused while working.

■Close and lock the door of the super quiet generator after assembling the generator.

■The noise of the open-frame generator may impact on the people nearby.

■Take measures to prevent the noises, ex, to build room against noises.

⚠ CAUTION Placement

■The generator should be put on a hard level surface.

■In order to refuel the generator easily, keep a 1m distance at the side of the refueling vent .

■In order to check the all parts of the generator, add the lubrication, and connect the cable, keep a 1.2m distance near the control box.

■Keep the special space for the exhaust and adding cooling water.

■The radiator is easy to be clogged and the insulation of the electric parts is bad when used in the places that are dusty.

⚠ CAUTION Indoor Installation

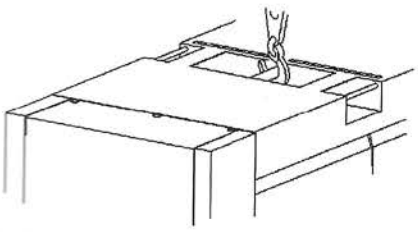
■The exhaust gas can be exhausted by the exhaust pipe.

■The intake port should be big enough to avoid generator become over-hot when intakes air.

■The ambient temperature around the generator will become higher and higher if used in a poor ventilated places. It will shorten the service life of the generator.

3.3 Transportation

⚠ CAUTION Transportation attention



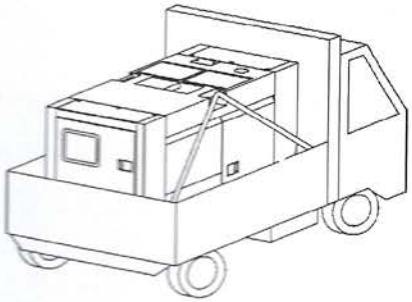
Don't use rope or ladder to lift the generator. Otherwise, the generator may fall down and be broken.

■Lift the generator by using the lifting lever at the center of the engine cover.

■Anyone shouldn't stand under the lifted generator.

■Don't lift or move the generator when the engine isn't stop. Otherwise, it may break the cooling fan, and cause a fatal fault.

■Fix the generator with ropes, after putting a generator into the car.



4. CONNECTION OF LOAD

4.1 Input power

[Attended operations]

If select the motor with improper capacity, it is possible to fail in starting the motor.

Decide the capacity of motor as per followings:

•According to load type, purpose, start mode, quantity, loading factor, features of generator, and type of auto voltage regulator, the starting power is different.

Upon starting motor, its current is 5-8 times of rated current. The rapid rise of starting current causes instant overload of generator. Then voltage of generator falls down rapidly. Therefore sometimes it is difficult to start the motor.

It is recommended to discuss with manufacturer upon decision of capacity.

●User can calculate the capacity simply with below formulas.

○Input power of squirrel-cage asynchronous motor (kVA)

$$\text{Input power (kVA)} = \frac{\text{Rated power of motor (kW)}}{\text{Motor efficiency x Power factor}}$$

Power factor of motor: 0.8 Motor efficiency: 0.8

Input power (kVA)=1.56x rated power of motor (kW)

○Direct-starting squirrel-cage asynchronous motor (with knife switch)

Generator capacity = 2x input power of motor

○Direct-starting squirrel-cage motor (with contactor)

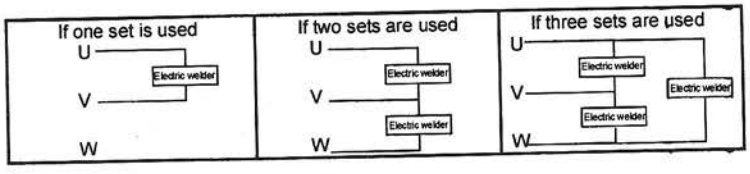
Generator capacity = 3x input power of motor

○Star/ triangular-starting squirrel-cage motor

Generator capacity = 1.2~1.5x input power of motor

●It is required to balance the load if more than one AC electric welder is used.

Therefore user shall distribute phases equally as per following:



Attended operation:

Input power of each welder shall be 1/3 below the output power of generator.

Over-load may cause motor damage.

Start the starter with no load, and never start the starter with load.

Start the bigger power starter first and then the smaller power starter.

4.2 The grounding of the protection unit

⚠ DANGER Electric Shock

(1) It will result in electric shock even death if connected with the output terminals.

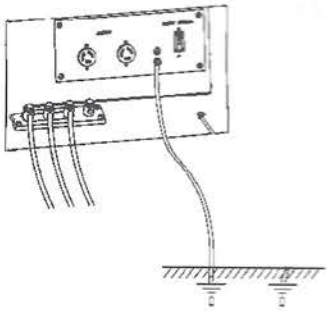
■ Cut off the breaker circuit of the control box and stop the engine before connecting the load.

■ Close the output terminal cover and tighten the forcing screw when running the generator.

(2) Don't use the broken cable. Otherwise it will cause a shock accident. If the forcing screw isn't tightened, the connected part will become hot and may cause fire hazard.

4.3 Grounding method

(1) The grounding of the generator



The grounding terminal of the outer box should be connected in this way.

The section of the grounding cable should accord with the generator capacity specified in the technical standard for the electric appliance. Please use the grounding rod of whose resistance meets the electrical standard.

If it classes to D grounding (No.3 grounding), ground it when resistance is below 100Ω.(When the voltage is over 300V, please use C class grounding, and the grounding resistance is below 10Ω).

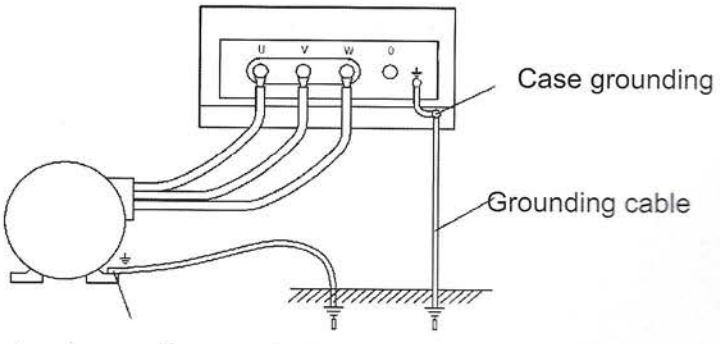
(2) The grounding of the load appliance

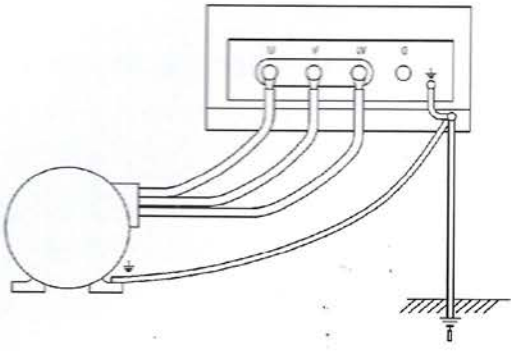
⚠ CAUTION

Don't neglect the grounding of the load appliance, even if generator is equipped with electrical-leakage protector.

The outer box of the load appliance should be grounded, as well as the generator. The section of grounding cable depends on the relative electrical standard and the capacity of the load. Please prepare the grounding rod for following resistance.

The grounding of the load appliance should be D class (No.3 grounding), and its resistance should be below 500Ω.





(2) Information of common grounding

Implement grounding of outside box and loading equipments independently. However, common grounding is acceptable if independent grounding is difficult.

① Select the right grounding cable with the maximum diameter.

② Select the right grounding cable with the minimum grounding resistance.

③ Reliably screw down the terminals.

(4) Cautions when grounding the generator

- Grounding rod should be placed in the shady and wet place. Upper part of it shall be completely in the soil.
- Clamp the cable securely to avoid catching the people who walk pass.
- Connect the extended cable as following:
  Weld the extended cable or use the proper sleeve. Cover the connection part with insulation tape. The connection part shall be above the ground. Please check it periodically.
- Keep the grounding rod at least 2m away from the lighting rod.
- Don't use the same grounding cable with telephone.
- Don't use the same grounding cable with others.

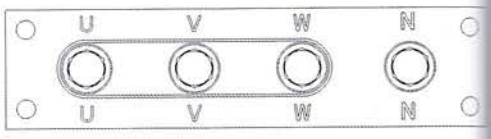
⚠ CAUTION

Screw on the bolts securely with a wrench when connecting the load equipment. Otherwise, overheat may be resulted, even fire hazard.

4.4 Connection of load equipment

(1) The connection method of the three-phase four-wire terminal

Connect the cable with 3-phase joint of output terminal.

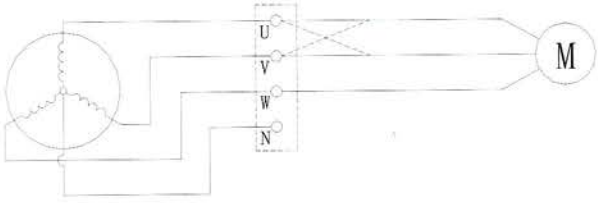


⚠ CAUTION

Don't connect the terminal until you make sure the phase and voltage of the load. There are terminal posts of three-phase four-wire on the panel.

⚠ CAUTION

If 3-phase motor rotates in the reverse direction, please exchange any two lines of three terminals.



(2) The output power of the single-phase (230/240V)

There are two connection methods for single-phase power: single-phase receptacle and three-phase joint, as indicated in the below drawing.

Please select the proper connection method.

Receptacle and breaker are two 15A circuits (W phase). Three-phase joint combines N-phase with U,V,W-phase.

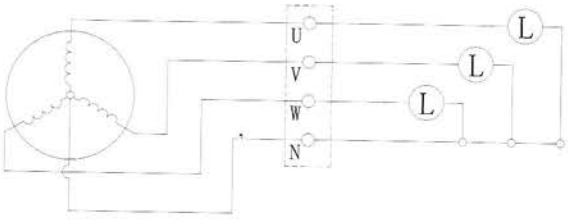
Regulate the voltage with voltage regulator.

1. Use of three-phase joint

Check whether AC current on the control panel is up to or over the rated current.

【Attention operation】

① Tolerable current of generator takes single-phase and three-phase current into account. When AC voltage meter reading is 400/416, the single-phase output voltage is 230/240V.



Single-phase load

② If select the single-phase output, output of single-phase is only 1/3 of three-phase output (unit: KW). If select single-phase and three-phase at the same time, please limit output of each phase below 1/3 of rated power (unit: KW).

Maximum power of single-phase is $P_N/3\times0.8$.

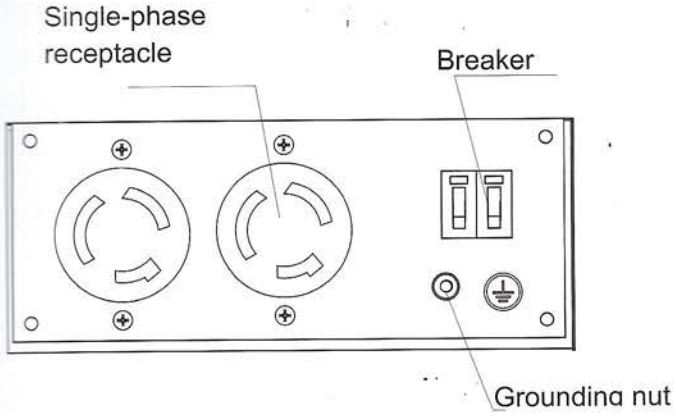
P_N indicates the rated power.

③ Prevent overloading. If unbalance load is necessary, difference between three-phase shall be within 20%.

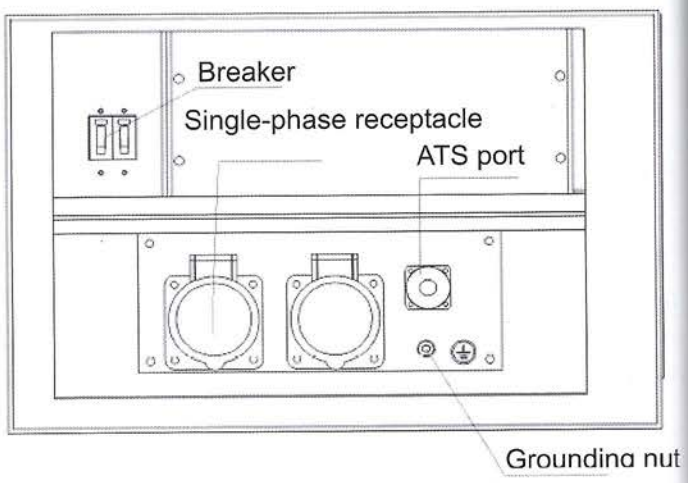
2. Use of receptacle

- Single-phase receptacle

  Turn the breaker to ON to energize the receptacle.
- There are two single-phase receptacles on the panel.

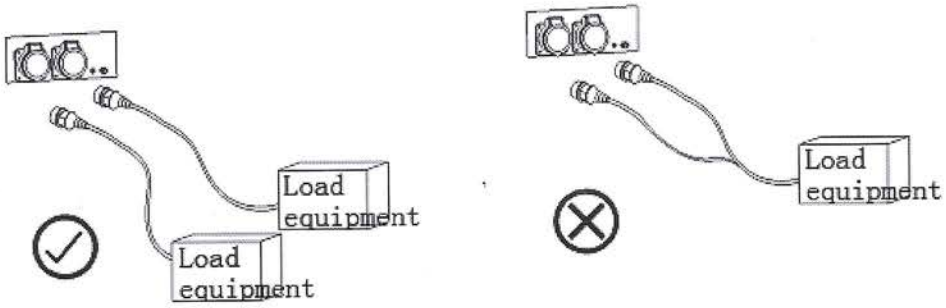


Picture 1



Picture 2

● Prevent overload of generator of single-phase power is used via single-phase receptacle.



(3) When connect the load, you should take care of:

① Install a switch between output terminal and load to control the load connect. If supply the electricity for the appliance by using the breaker directly, there will be fault with the breaker.

② When the generator is connected to the load, the breaker of the control box and junction plate should be turn to OFF to stop the engine.

③ The cable that connected to load can't be connected to the other output terminal.

④ After connecting with load, close the junction box, and tighten the forcing screw securely.

4.4 Selection of 3-phase cable

【Attended operations】

Please select the cable with proper diameter after taking into account tolerable current of cable and distance from generator to loading equipments.

If load current exceeds tolerable current, lead is burnt to damage due to over-heat. In addition, following conditions also can cause lead damage such as too long cable, super-small diameter, excessively large voltage-drop of lead, reduction of input voltage of loading equipments, or reduction of efficiency of loading equipments.

● Choose the possible cable length and section within the range of 5% of rated voltage, and you can calculate the value of the potential "e" in the following formula:

$$\text{Potential e (V)} = \frac{1}{58} \text{ X } \frac{\text{Length}}{\text{Section area}} \text{ X Current (A) X } \sqrt{3}$$

The relations among of the allowable current, and length, section of the insulating cable (single core, multi-core) are as follows:

(Presume that the use voltage is 220V and the potential is below 10V).

The application of the single-core insulating cable mm^2

Length / Current	Below 50m	75m	100m	125m	150m	200m
50A	8	14	22	22	30	38
100A	22	30	38	50	50	60
200A	60	60	60	80	100	125
300A	100	100	100	125	150	200

The application of the multi-core insulating cable mm^2

Length / Current	Below 50m	75m	100m	125m	150m	200m
50A	14	14	22	22	30	38
100A	38	38	38	50	50	60
200A	38×2	38×2	38×2	50×2	50×2	50×2
300A	60×2	60×2	60×2	60×2	80×2	100×2

【Attended operation】

Use rubber elasticity cable.

Limit length of electric line when using the extension line or distribution network is: less than 60m for cables of $1.5mm^2$, and less than 100m for cables of $2.5mm^2$.

5. FUEL, LUBRICANT, COOLING WATER, BATTERY

5.1 Fuel

【Attended operation】

Only designated fuel is allowed. Otherwise it is impossible to take full use of engine performance even leads to errors. Choose the fuel type according to the temperature condition.

Applicable for the international diesel standard.

GB/T252-1994 light diesel 0# in summer, -10# , -20#, -30# in winter

1) Fuel type and air temperature

Fuel type is classified according to the solidifying point. Select the fuel type on the basis of following conditions and with reference to outside temperature.

Diesel type		
Ambient temperature	GB/T252-1994	JISK2204
-5℃ or above	-10#	2#
-15℃ or above	-20#	3#
-25℃ or above	-30#	

2) Use of fuel

a. Fuel with water or foreign matters may cause bad working.

b. Store the fuel in the clean container

c. Container shall be protected against rainwater or other foreign matters.

d. Do not move the fuel container and keep it static for several hours. Then water and foreign matters contained in the fuel deposit at the bottom.

Only use clear and clean fuel upper with pump.



Use the fuel in the middle as there is water or foreign matters residue at the bottom.

⚠ CAUTION

(1) It will be penalized for using heavy oil, kerosene, light mixed fuel, or other fuel. Make sure use light oil.

If use other fuel, or water, dirty mixed fuel, the engine performance might decline, resulting in serious troubleshooting.

(2) Fill the proper fuel. Improper fuel may lead to risk of fire. Please confirm the type of fuel in advance.

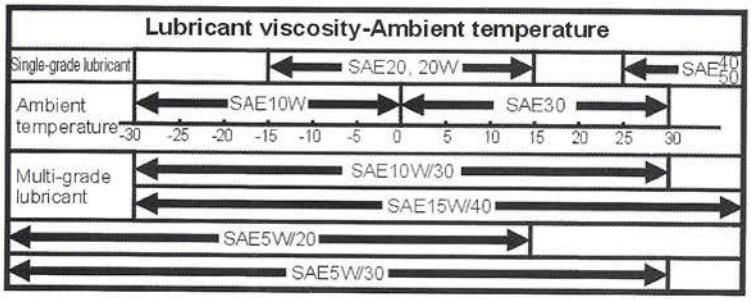
5.2 Lubricant

【Attended operation】

Only designated lubricant is allowed. Otherwise it may cause engine damages such as blow engine or cylinder scoring, or earlier wearing thus to reduce machine duration.

(1) Selection of lubricant

- It is recommended to use original lubricant.
- Use 10W-30 and 15W-40 high-grade diesel lubricant (CD grade).
- It is required to select the CD grade (API classification) of marketable lubricant.

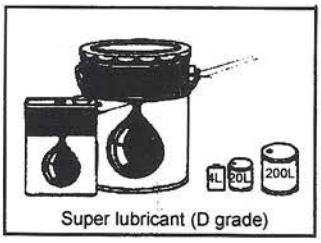


(2) Lubricant viscosity

- Choose the lubricant viscosity according to the ambient temperature.
- It is recommended to use the SAE 10W-30 or SAE15W-40 lubricant.

(3) Use of lubricant

- Avoid foreign matters or dust falling into lubricant upon storage and handling.
- Please pay particular attentions to minor foreign matters around lubricant inlet upon lubricant fill-in.
- Do not combine different lubricant in order to prevent bad performance of lubrication.



Super lubricant (D grade)

5.3 Cooling water

It is important to carry on the routine management for cooling water of engine.

Make sure to use clean soft water (fresh water).

(1) Use of cooling water

Cooling water indicates the water combined with LLC, which is frost and rust proofing.

The mixture ratio is among 30% to 50%. When the mixture ratio is lower than 30%, the rust prevention performance is poor.

The relation between LLC mixture ratio and ambient temperature is as following:

30%: -10℃

40%: -20℃

50%: -30℃

Use the same LLC for refilling.

【Attended operations】

● Add anti-rustiness & anti-freezing liquid when handling cooling water. In the cold winter, frozen cooling water expands and damages parts in the cooling water pipe. Exclusive use of fresh water and rustiness of water pipe lead to bad cooling effect.

● If the generator is used in the hot area without freezing risk, it is also recommended to add specified anti-freezing liquid to avoid rustiness.

● Little anti-freezing liquid may affect cooling effect or lead to rustiness when temperature falls down.

Thick anti-freezing liquid also affects cooling effect for engine.

Mix according to proper combination ratio.

(2) Anti-freezing liquid

It is no need to add more anti-rustiness agent because anti-freezing liquid combines the function of anti-rustiness. Life of anti-freezing liquid is one year. Combination ratio: 30%-55%.

Lowest temperature ℃	<-15	-20	-25
Combination ratio ℃	30	40	50

(3) If use the marketable anti-freezing liquid

Select the anti-rustiness& anti-freezing liquid.

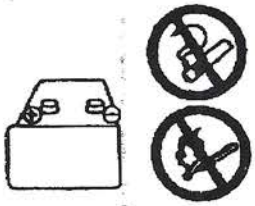
Observe the combination ratio specified by the manufacturer.

Replace the anti-freezing liquid once per year.

5.4 Operation of battery

⚠ DANGER

As storage battery easily produces inflammable gas; incorrect operation sometimes may lead to explosion or serious human injury.





5.4.1 Observe the followings when handling the battery

■ Charge the battery in the well-ventilated place.

If charge the battery in the badly ventilated place, there is ignition or fire risk due to inflammable gas.

■ Prevent (+) pole from contacting (-) pole when connecting cable of battery.

Incorrect connection may produce spark and ignite inflammable gas in the battery thus leading to explosion.

■ Disconnect the negative terminal cable when maintaining the generator.

■ Electrolyte contains thin sulfuric acid. Therefore incorrect operation may lead to serious injury or damage.

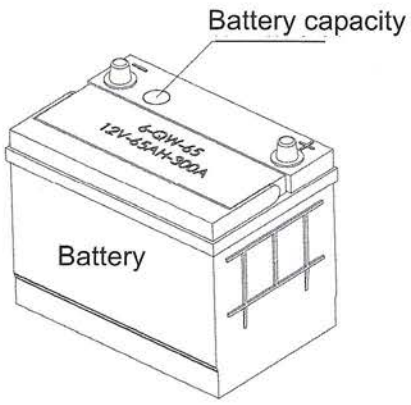
If clothes or skin touches electrolyte of storage battery, immediately wash with plenty of water. If eyes touch electrolyte of battery, immediately wash with plenty of water and consult physician.

■ If electrolyte of battery is below LOWER LEVEL, do not use the battery. Inside aging of battery leads to shorter life even explosion.

■ Start or stop the starter continuously will consume much battery energy, even burn the starting motor.

■ Never check the battery until the engine is stopped.

■ Don't disconnect the battery when the generator is still running, otherwise, the motor or control circuit may be damaged or burnt out.



5.4.2 Check the battery

(1) Check electrolyte level

Check the battery indicator lamp for maintenance free battery.

Blue lamp indicates sufficient power while red lamp indicates insufficient power.

(2) Check specific gravity of electrolyte level

When the engine starts, the rotation speed is slow, so please charge the battery. If the machine still can't start after charging, you should change the battery.

Measure the specific gravity of electrolyte level if engine starts bad. The purpose is to check if any shelf depreciation.

If rest volume is below 75%, charge the storage battery.

Check the battery voltage before using if the battery hasn't been used for 3 months. Charge the battery if the voltage is lower than 12V. Starting the generator in low voltage will burnt the starting motor.

Calculate the charging ratio on the basis of measured specific gravity and according to the below table

Temperature ℃ / Charging ratio %	20	-10	0
100	1.28	1.30	1.29
90	1.26	1.28	1.27
80	1.24	1.26	1.25
75	1.23	1.25	1.24

Remarks: ±0.01 tolerance is possible.
Charge the battery immediately when the charging ratio is lower than 75%.

(3) Charging attentions

When charge the equipped storage battery:

- Disconnect the distribution line of battery before charging.
- Charge at ventilated place.
- Disconnect the negative wire first when disconnecting the distribution line of battery.

(If there is any tool between positive pole and machine, electrical spark may be produced, leading to extreme risk.)

When connecting the distribution line of storage battery, connect the positive wire first and negative wire finally.

- Ensure sufficient ventilation during charging.

Keep away from ignition source or forbid any actions producing electrical spark because charging produces inflammable gas.

- Re-charge the storage battery after intervals if storage battery is extremely hot, i.e. electrolyte temperature is above 45℃.
- Stop charging immediately as storage battery is full.

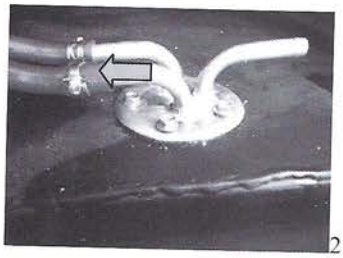
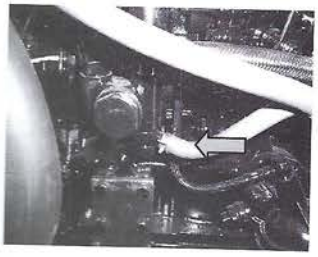
  There are following disadvantages if the charging continues when storage battery is full.

  1) Over-heat of storage battery
  2) Reduction of electrolyte
  3) Abnormality of storage battery
- Connect the positive wire prior to negative wire.
- Incorrect wiring may damage the engine.

5.5 Fuel-water separator

The fuel-water separator is installed in the fuel inlet line, to separator the fuel and water. As there is density difference between the fuel and water, they can be separated under the gravity settling separation. Also, there are divergent cone and filter assisting separation.

- The fuel-water separation is optional, we will install it according to the customer's specific demands.
- Following is how the fuel-water separator installed in the fuel inlet line.

1  2  3 

5.5.1 How to use the fuel-water separator?

- First use

Tools needs: No.13 open end wrench, cleaning rags

Use instructions:

Step 1: Fulfill the fuel tank before starting the generator.

Step 2: Use the No.13 open end wrench (picture 1) to loosen the fuel filter bolt (picture 2) in counter-clockwise direction (picture 3, 4).

Step 3: Press the hand pump for 10 to 15 times, to exhaust the air in the fuel filter. (picture 5).

Step 4: Keep pressing the hand pump until the fuel-water separator cup was full of fuel. (picture 6, 7)

Step 5: Use the No.13 open end wrench (picture 1) to tighten the fuel filter bolt in clockwise direction (picture 8).

1  2  3  4 

5  6  7  8 

● Second use

There will be water or impurities gathered in the fuel-water separator cup after long-time running or in case of unpurified fuel. Make sure clean up the fuel-water separator before using.

Tools needs: No.13 open end wrench, cleaning rags

Use instructions:

Step 1: Use the No.13 open end wrench to loosen the water-drain bolt (picture 9) in clockwise direction. (picture 10, 11)

Step 2: Exhaust the water or impurities. (picture 12)

Step 3: Repeat the same steps as first use. (picture 1 - picture 8)

9 

10 

11 

12 

⚠ CAUTION

Don't start the generator until the fuel-water separator cup is fulfilled. Make sure check it each time starting the generator, otherwise, the generator will alarm.

6. RUNNING THE GENERATOR

6.1 Pre-start preparation

Implement pre-start preparations in the following order upon preliminary use.

6.1.1 Fill fuel

Recommended fuel type:

GB/T252-1994 light diesel 0# in summer, -10#, -20#, -30# in winter

⚠ DANGER



- Fill the proper fuel. Improper fuel may lead to risk of fire. Please confirm the type of fuel in advance.
- Clean any overflowed fuel. Don't start the engine before cleaning.
- In order to prevent any overflow when machine is running, fill-in amount shall be approximately 90% of tank volume.

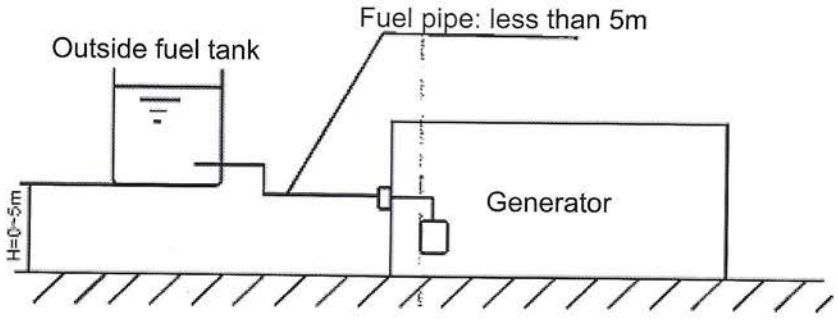
6.1.2 Keynotes for filling fuel with outside fuel tank

- Ensure tight connection of fuel pipe with the outside fuel tank. Any loose connection may lead to fuel spill.
- Idle running of fuel feed pump causes damage. Please pay special attention to the fuel level of outside fuel tank, preventing idle running.

(1) Location of outside fuel tank

Place the outside fuel tank within 5m away from the generator.

In addition, the foundation height for outside fuel tank must be within 0-5m.



(2) Pipe connection

【Attention operations】

Idle running of fuel feed pump causes damage.

Check the fuel level of outside fuel tank periodically.

6.1.3 Fill lubricant

⚠ CAUTION

Keep lubricant level between upper and lower scale marks. Lubricant level shall not exceed the upper mark (H). Ejection of lubricant from the breather hole may cause engine errors.

a. Keep engine level when filling in lubricant.

b. Take off the black cover of lubricant inlet on the top of gear chamber. Add recommended lubricant up to the upper mark (H) of oil gauge.

c. Measure the lubricant with oil gauge. In order to get correct level, please clean the oil gauge before inserting it into lubricant. Lubricant trace remained on the oil gauge indicates measurement.

d. Re-confirm it after 3-5min running.

6.1.4 Fill cooling water

⚠ WARNING

Close the radiator water inlet cover tightly.

Otherwise, ejected steam or hot water may cause scalding.

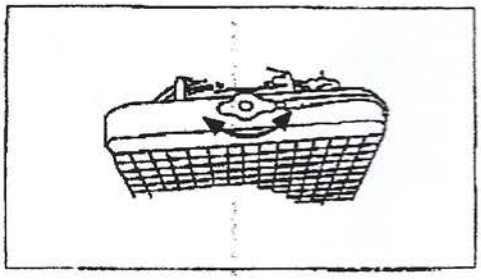
Add cooling water as per following procedures. Please add anti-freezing liquid into cooling water.

- Fill water into radiator

a. Turn the radiator anticlockwise and take it off.

b. Add the cooling water till it overflows from radiator water inlet. Slowly fill cooling water to avoid any foam.

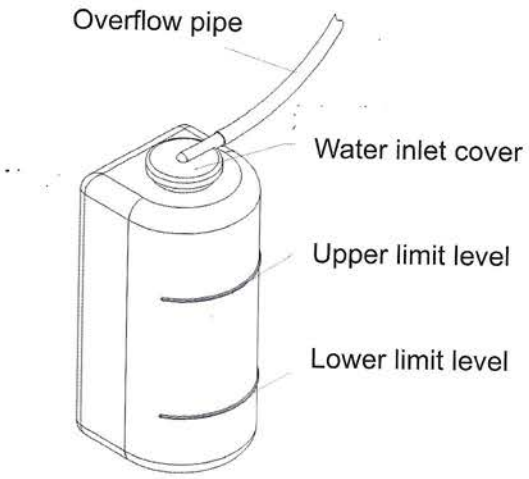
c. Close the radiator cover tightly to prevent any water leakage. Direct the inside clip towards notch of water inlet. Then press down the cover and turn the cover towards right side for 1/3 cycle to close the cover.



- Fill water into overflow bucket of auxiliary tank

d. Please take off the water inlet cover of auxiliary tank. Add cooling water up to the upper scale mark. Then re-mount the cover.

e. Check if joints of rubber hoses connecting auxiliary tank and radiator are loose, released or damaged. If any, please repair or change them to avoid cooling water leakage.



6.2 Trial running

Run the generator that is new or idle for long-term at low speed and without load for short term before load running. Deliver the lubricant to all abrasion parts. If start the load running without mentioned operation, it may cause abnormal abrasion or damage to piston, cylinder sleeve, crank shaft, bearing and other parts.

a. Check if any abnormal sound or leakage of water, oil or gas.
b. Reconfirm the quantity of lubricant and cooling water.

Please re-confirm the quantity of lubricant and cooling water after 5-minute trial running, if lubricant or cooling water is filled into for the first time or is replaced.

Trial running distributes lubricant and cooling water around the machine. During re-check, the level of lubricant and cooling water shall be lower. By then, please make up insufficiency.

- Fill in lubricant （refer to 6.1.3）
- Fill in cooling water（refer to 6.1.4）

6.3 Running

⚠ DANGER

Following parts in the running generator are extremely dangerous, such as radiator fan, belt, engine, cylinder hood, exhaust pipe, muffle and other parts at high temperature and high voltage.







- Close the side door of running machine.
- Stop running machine before check and maintenance.

Run the machine with all instruments on the operation panel.

6.3.1 Pre-start checks

Carry on following checks prior to each start.

1) Remove foreign matters in the generator

- Check if there is any tool or rag in the generator.
- Check if there is any rubbish or inflammable matter around muffle or engine. If any, remove it away immediately.
- Check if suction inlet and exhaust vent of generator is jammed by rubbish or rag. If any, remove it away immediately.

2) Check in the generator

- Any oil leakage in the engine
- Any fuel leakage in the fuel system
- Any water leakage in cooling water system
- Broken distribution line, short circuit or loose joint
- Check if any screw is loose or released

Do not run the machine before eliminating any founded abnormality.

3) Check and fill fuel

Regularly check rest fuel level in the fuel tank and add recommended fuel on time (refer to 6.1.1).

4) Check and fill lubricant

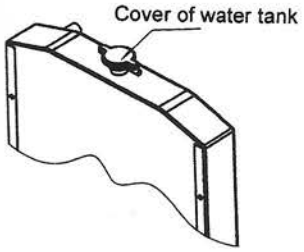
- Check lubricant level with oil gauge.
- Add recommended diesel lubricant from oil-inlet of gear chamber when oil level is insufficient. Check the lubricant with oil gauge. Add lubricant up to upper scale mark with check (refer to 6.1.3).

5) Check and fill cooling water

⚠ WARNING

Generator is still hot when machine is running or after machine stops. In such case, do not open the water inlet cover of radiator because ejected steam and hot water are extremely dangerous. As temperature falls down, envelop the cover of water inlet of radiator with cloth. Then open the cover. Remove the water inlet cover after releasing the inner pressure.

Check and fill the cooling water before running the machine when the engine is cool.



【Attended operations】

Check quantity of cooling water

Confirm and check the quantity of cooling water by level in the auxiliary tank.

If water level is between the upper and lower scale marks, it means normal.

Check if there is any change on water level prior to use of machine every day.

- Normal change on water level

Prior to running (cold status): low level

After stop (high-temperature status): upper level

(remarks) Open the radiator cover. Check and add cooling water if there is no change on water level after running compared to that prior to running. In addition, check rubber hoses connecting radiator cover and auxiliary tank. Confirm if any connection is released, loose or broken.

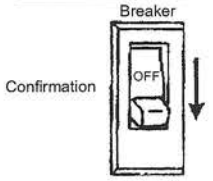
6) Check special earth of generator

Confirm if special earth for generator body and leakage alarm and earth of loading equipments work properly.

Please do not connect N-phase of 3-phase joint directly to earth line.

6.3.2 Adjustment upon start and no-load

⚠ DANGER



● If the breaker at side of generator and loading equipments are at ON, please do not start the machine. Power is supplied to loading equipments and runs machine suddenly when engine starts, which leads to damage. And it may cause electric shock or errors of loading equipments.

1) Start the machine at normal temperature

Start the machine in the following order

a. Confirm breaker at side of generator and loading equipments at OFF.

b. Insert the start key and turn it to ON. Indication lamp of intelligent display is on. Please confirm it.

2) Adjustment of frequency and voltage

Make adjustment after machine is heated and runs.

Heat the machine for about 5 minutes (no-load).

a. Adjust the regulating screw rod of oil-pump till frequency is up to rated value.

b. Adjust the voltage with voltmeter as per specifications.

3) Run at low load

⚠ WARNING

Prevent running the generator for long time at low load.

● It is allowed to run the generator for long time, only when the load is up to or above 1/4 of full load.

● It is prohibited to run the generator for more than 5 hours, when the load is only 1/8 to 1/4 of full load.

Running the generator for long time at low load will cause carbon deposit on the engine and exhaust pipe, thus reducing the engine performance.

6.3.3 Keynote for load running

1) Pre-running check

a. Confirm that voltage, current and frequency shown in the intelligent panel are normal.

b. Check the environment of engine.

● Check the color of exhaust

Colorless or light gray: Normal

Black: Abnormal (insufficient combustion)

Blue: Abnormal (Combustion of lubricant)

White: Abnormal (No combustion of fuel or too much water contained in the fuel)

- Check the sound, running state and vibration
- Check leakage of fuel, lubricant and cooling water
- Check if breaker at the side of loading equipments is at OFF
- Turn the 3-phase breaker of generator to ON.

2) Load conditions

【Attended operations】

Forbid increasing or decreasing speed rapidly, over-load or other unreasonable operations during the first 50hours for new engine.

a. Turn the breaker to ON

b. Turn the breaker at the side of loading equipments to ON

3) Adjustment during running

a. Adjust the rotating speed, frequency and voltage according to load.

4) Checks during running

【Attended operations】

If generator produces any abnormal sound, please stop running it immediately for check and repair. If continue to run machine at abnormal status, unexpected serious accidents may occur.

Check if there is any abnormality of generator, or below conditions occur for running generator.

a. Check all instruments and central indication lamps

Check voltage, current and frequency in accordance with specifications. Check if indication lamps are on.

b. Check the color of exhaust

Colorless or light gray: Normal

Black: Abnormal (insufficient combustion)

Blue: Abnormal (Combustion of lubricant)

c. Check abnormal sound and vibration

d. Check leakage of fuel, lubricant or cooling water

e. Check the rest fuel level

If fuel supply is interrupted during machine runs, please eliminate air remained in the fuel pipe after fuel fill-in.

6.4 Stop operation

Stop running the generator in following orders:

a. Turn off the breaker of loading equipment.

b. Turn off the breaker of generator.

c. Run the generator for 5 minutes at zero load.

d. Turn off the starting switch key to stop the engine.

e. Pull out the key and keep it safely.

【Attended operations】

Never stop the engine emergently. Otherwise, the temperature of engine parts will rise rapidly, resulting in damage or scuffing of cylinder.

7. PERIODICAL MAINTENANCE AND SERVICE

⚠ CAUTION Carry out periodic check

Aging and poorer performance appear if engine runs for long time.
Accident and error may occur if no check, maintenance or service, causing great consumption of fuel, bad exhaust and large noise. What's more, the service life of engine becomes shorter. Routine and periodic check and maintenance can effectively avoid error or accidents. In addition, periodic check on electrical system can avoid electric shock.

⚠ DANGER Electric shock

Never check or maintain the generator until it is completely stopped, with the breaker cut off.

⚠ CAUTION Please observe pre-start checks

Implement routine and periodic check before work every day. It is a good practice to do routine check before machine starts every day.

(Refer to 6.1 for keynotes about check before work).

⚠ CAUTION Please use the original parts

Replace the damaged parts with our original parts.
Otherwise, the mechanical performance falls or duration of engine turns shorter.

⚠ CAUTION Warning label for maintenance

During checking or maintaining the generator, identify the warning label "DANGER NOT RUN" at obvious positions, such as starting switch, in order to avoid unnecessary persons carry out unintended operation.

⚠ CAUTION Protective clothing

- Wear the protective clothing and use safe tools when servicing the generator.
- Don't wear the tie or loosen clothing. Otherwise, it will catch the unit and cause an unexpected accident.

⚠ CAUTION The handling of wasted water

- When handling the wasted fuel, please use the container.
- Wasted fuel pollute environment, so don't pour them into stream, ocean or lake.

■ Handle of poisonous engine oil, fuel, cooling water and battery, please refer to the related provision.

⚠ CAUTION Periodic check as per running record

Establish the running record for daily operation, maintenance and check.
Periodic check is divided into several intervals like 50 hours, 250 hours, 500 hours, 750 hours and 1000 hours.

7.1 Check period
Check for initial 50 hours:
- Replace engine oil
- Replace engine oil filter element
- Check the fan belt tension

Check for every 250 hours:
- Replace engine oil
- Replace engine oil filter element
- Clean air cleaner
- Measure insulation resistance of the generator.(Once for a month)
- Check specific gravity of the battery electrolyte.

Check for every 500 hours:
- Replace the fuel filter element
- Clean the radiator
- Check the electrical circuit terminal & wiring connector
- Cooperating with the check every 250 hours.

Check for the 1000 hours
- Clean inner part of the fuel tank
- Replace air cleaner element
- Adjust fuel injection time
- Check anti-vibration rubber
- Check the nylon tube & rubber tube
- Check sound absorber
- Cooperate with the check every 250 hours and check every 500 hours.

Refer to engine operation manual for the details

7.1.1 Check for the initial 50 hours

(1) Replace engine oil

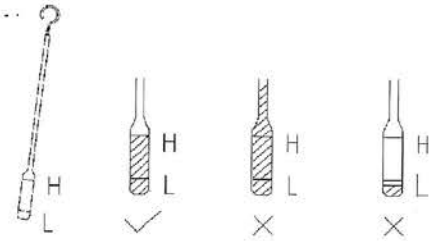
Replace engine oil in 50 Hrs for the first time, after the second time, replace it in 250 Hrs.

a. Remove oil drain bolt, drain oil empty, and run the engine for 3-5 minutes. It is easy to drain oil out empty, if the engine warms.

b. After that recover the oil drain bolt and tighten.

c. If it is new oil, please fill with filling pipe. Fill under the upper lever.

d. Run engine for a few minutes after fill engine oil, and check oil position (between the position of H and L).



(2) Replace engine oil filter element.

Remove the oil filter with special wrench.

Clear the filter installation end.

Smear thin lubricant on the seal gasket.

Screw on the filter with hands and then tighten it with the special wrench securely.

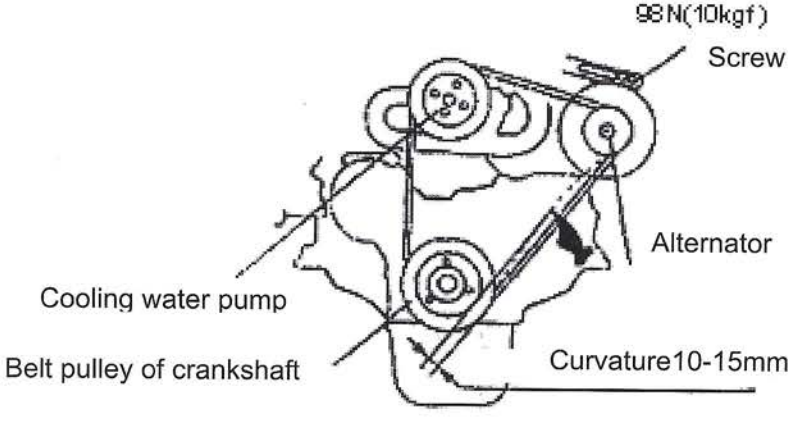
(3) Check the fan belt tension

Poor belt tension will cause bad driving of fan, cooling water pump and alternator, resulting in overheated engine or insufficient battery charging. However, excessive belt tension will cause damage to the bearing of water pump or alternator. So make sure to adjust the belt tension according to the following instructions.

a. Open the side door.

b. Check the belt tension and curvature.

	Fan belt
Tension	98.1N(10kgf)
Curvature	10~15mm



Adjustment of fan belt tension

c. To adjust the belt tension, please firstly screw off the fixed bolt of alternator. Then remove the alternator until the belt curvature is 10-15mm, the tension is 98.1N (10kgf).

d. Screw on the fixed bolts.

e. Keep the belt away from oil or dirty. Otherwise, the belt will skid or get longer. Replace the damaged belt in time.

7.1.2 Check for every 250 hours.

(1) Replace engine oil

Replace for every 250 Hrs

(2) Replace oil filter element

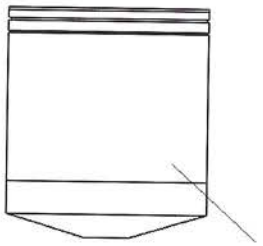
Replace for every 250 Hrs

The maintenance time should be shortened in case of dusty area.

Before replace spring gasket, it is upturned. Remove the oil drain bolt and drain out the oil.

a. Remove element by oil cleaner wrench.

b. Clean element, spread oil film on the spring gasket surface. Install it by oil cleaner wrench, connect surface with oil cleaner gasket, and tighten.



Oil filter

c. Run engine for a while after replace the element. Check oil position. Be sure oil position is between the position of H and L

d. Concerning oil filter spring gasket, you can consult manufacturer and diesel engine operation manual.

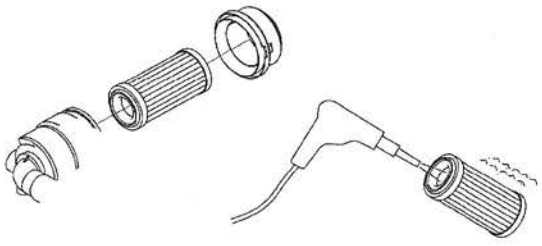
(3) Clean air filter element

Refer to diesel engine operation manual.

When dry dust clag on element, please remove the element and blow it with dry, clean compressed air.

■ Check the element. If it has been scathed, replace it.

■ Install air filter, and clean it.



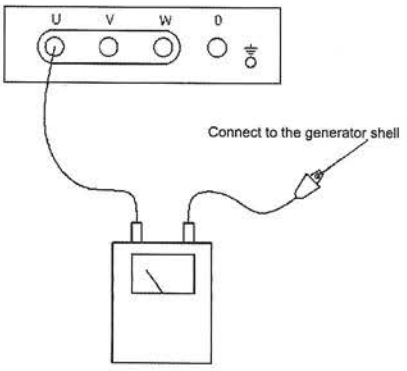
(4) Check the insulation resistance

⚠ DANGER Electric Shock

■Check insulation resistance after stopping engine.

■Don't measure the insulation resistance until disconnecting the connection wire of AVR or controller. Otherwise, they will be severely damaged.

Measure the insulation resistance once a month by using 500V insulating-resistance meter. Check if it is above 1MΩ.



Measurement:

Disassemble the three-phase cable, and turn breaker to ON. Measure the insulation resistance between output terminal and engine frame.

It is possible for electricity leakage or fire hazard when the insulation resistance is lower than 1MΩ. Clean and dry output terminal, breaker, and cable. Consult with dealer for any question.

(5) Check battery proportion

The engine may not start due to the battery leakage. If that happens, you should measure the proportion of battery electrolyte.

(Refer to 5.4.2 for the relation between battery and battery electrolyte proportion.)

7.1.3 Check for every 500 Hrs

Check for every 500 Hrs should cooperate with check for every 250 Hrs.

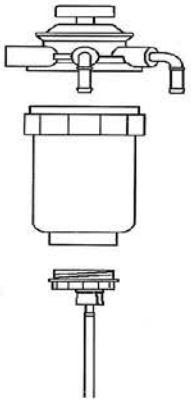
(1) Check spring gasket of fuel filter.

a. Screw off the fuel filter by filter wrench, and take off the spring gasket.

b. Clean filter and daub slim engine oil on filter surface, then install it. Don't screw so tight.

c. Eliminate the air of fuel pipe, after replace spring gasket.

(Refer to the engine operation manual for the manufacturer and model of spring gasket)

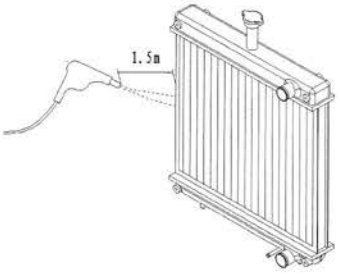


(2) Clean radiator

Please clean the radiator orifice by using steam or high-pressure air.

⚠ CAUTION

Cleaning operation with high pressure air should be done beyond1.5M, in order not to damage the fan and pipe. Besides, take off the electric fan, avoid it being connected with steam or high pressure water directly.



(3) Check circuit terminal and connection terminal

Check if there is rust and burnout in main and vice circuitry

7.1.4 Check every 1000Hrs

Check for every 1000 Hrs should cooperate with check for every 250,500 Hrs.

(1) Clean the fuel tank

Eliminate the sediment and water in the fuel tank.

(2) Replace the air filter element

Refer to the relative item.

(Consult with the agent for the manufacturer and model of air filter)

(3) Check anti-vibration material

If the shockproof material damaged or distorted, you can consult with agent.

(4) Check the nylon tube & rubber tube

If the nylon tube &rubber tube is vulcanized or bad quality, you can consult with agent to change it.

(5) Check sound absorber.

If sound absorber looks aged obviously or it has been peeled, you can consult with agent.

⚠ WARNING Periodic replace of important parts

● Make sure to periodically replace the parts which may cause fire hazard due to aging or damage.

● Replace the parts of fuel system, fuel pipe and fuel tank cover every two years or 4000 hours, whatever there is any abnormality.

●Replace the air filter element, fuel filter element and oil filter element periodically. Otherwise, the engine may be damaged, reducing its useful life.

7.2 Periodic check and service schedule

Routine and periodic checks are extremely important for maintaining good conditions of generator.

【Attended operations】

Establish the periodic check plan in order not to miss any required check. Neglect or ignore will lead to errors or shorter duration, even electric shock.

Professional technology and skills are needed for check and maintenance whose check interval is over 1000 hours. Please consult with the sales department or the deals.

◇Check and clean ● Replace

	Check & service item	Daily check	50 hrs	250 hrs	500 hrs	1000 hrs
Engine	Check engine oil	◇				
	Check the cooling water	◇				
	Check fan belt	◇				
	Check fuel, drain out sediment and impurity	◇		◇		
	Check battery electrolyte	◇				
	Check for water or oil leakage	◇				
	Check the loosen assembly	◇				
	Check the exhaust color	◇				
	Check meters and warming light	◇				
	Replace engine oil			●		
	Replace oil filter element		☆First	●		
	Clean air cleaner element		☆First	◇		
	Check battery electrolyte density			◇		
	Clean the radiator				◇	
	Replace seal ring of fuel filter				●	
	Clean the inner of the fuel tank					◇
	Replace the air cleaner element					●
	*Check valve clearance			☆First		◇
	*Adjust fuel nozzle					◇
	*Check fuel injection time					◇
	*Check damper rubber					◇
	Check the nylon tube & rubber tube					◇
	Check sound- absorbed material					◇
Generator	Check if the relay can work	◇				
	Check protection for electrical leakage	◇				
	Measure insulated resistance			◇		
	Check circuit terminal and connection				◇	

Note: The item with "*" Mark, you can consult with agent/dealer.

The item with "☆" mark indicates time for the initial check.

Refer to different type of the engine; check time is a little different.

Relative manual reading is required.

8. TROUBLESHOOTING

【Attended operations】

Immediately stop the running generator for check and repair if any abnormality is found.

Continue running the abnormal generator may cause unexpected serious accidents.

⚠ DANGER Rotating Part

It's very dangerous to touch the rotating parts in the generator.

■Stop the engine to service and maintain the inner parts of the unit.

■The cooling fan of the radiator will go on rotating after stopping the engine for a while. Don't service the electric fan until it stops entirely.

⚠ DANGER Electric shock

■Don't touch the inner parts with high voltage during the running.

■Stop the engine and disconnect the breaker to service and maintain the inner structure.

⚠ CAUTION Hot Part

It's very dangerous to touch the hot parts in the generator.

■Stop the engine to service and maintain the inner parts of the unit.

■The machine keeps hot after stopping the engine for a while. Don't service the machine until it totally cools down,

⚠ CAUTION The Usage of the Battery

■It will explode to cause a severe accident if the battery used in a wrong way.

■Remove the negative terminal when servicing the generator.

Engine can not start	Start motor doesn't run or its speed is so slow.	Battery leakage	liquid measure
		Battery unclamped or rusted	Install after cleaning
		The earth terminal is imperfect	Repair
		Fuse disconnection	Replace
		Start switch badness	Replace
		Starter badness	Replace
		The wire breaks	Repair
	Engine can't start while starter is running.	Speed handle lever trouble	Repair
		No fuel oil	Fill oil
		Fuel oil cleaner walled up	Clean , and replace fuel oil cleaner
		Air in the oil pipe	Empty air
		Fuel winding does not work	Check the fuse, if disconnection, replace it, check and replace winding if necessary
	Ambient temperature is very low.	Fuel is frozen.	Use JIS-3 oil, or choose the applicable viscosity oil according to the freeze area
		Some water accumulated in the fuel system is frozen	Heat, empty fuel oil tank ,fuel oil cleaner and water in oil pipe
The engine stops automatically. And the rotating speed can't reach the rated speed.		Bad Air around pipe	Empty air
		Fuel oil cleaner walled up	Replace fuel oil cleaner element, clean or replace filter
		Compression leakage	Mend the engine
		Air cleaner is clogged.	Replace air cleaner element

Fault		Reason	Solution
Engine stops because of low oil pressure		engine oil is not enough	Fill engine oil
		Badness oil switch	Replace switch
		Engine air cleaner walled up	Replace filter
Engine can't reach the highest rotary speed		Badness regulator lever	Adjust to short
		Air in the oil pipe	Eliminate air
Zero load speed is too high		Regulator lever regulates badly	Adjust regulator lever to get longer
Slow zero load speed		Regulate pole to regulates badly	Adjust regulator lever to get shorter
		Air in the oil pipe	Eliminate air
Vibration is too big.		Not fix tightly	Fix tightly
Abnormal noise	Engine	Abnormal voice	Mend
	Generator	Bad axletree	Replace
		fasten bolt loose	Tight
	Engine shell	Abnormal voice	Mend
	Electrical fan	Abnormal voice	Mend

Over hot	Check around	Move thing
	If cooling-water lacked	Check if cooling water lacked
	Fan strap loose s	Maintain fan strap
	Radiator cooling orifice walled up	Clean radiator cooled part
	Thermostat abnormal	Maintain thermostat
	Electrical fan abnormal	Check and replace fuse
	Electrical fan abnormal	Check and mend receptacle guarder

Fault	Reason	Solution
The voltage value is not right or there is no voltage.	Bad voltmeter	Replace
	Bad AVR	Consult with dealer
	ZNR is burnt	
	Rotary rectifier is burnt	
	Rotor circuitry break	
	Engine circuitry is burnt	
The generator can't reach rated voltage.	Bad voltmeter	Replace
	Bad AVR	Consult with dealer
	Bad VR	
	Rotary rectifier is burnt	
	ZNR is burnt	
	Generator cable is burnt	
	Rotation speed is too low	Increase the speed
Over voltage	Bad voltmeter	Replace
	Bad AVR	Consult with dealer
	Bad VR	
Voltage decreases too much when connected with load.	Rotary rectifier is burnt	Consult with dealer
	Bad AVR	
	Load is not equal	Make them equal.
Breaker can't work.	Bad breaker	Consult with dealer
	Bad breaker	
	Load circuitry is shorted	Check

9. LONG-TERM STORAGE

Pay attention to the following items for long-term storage.

1) Drain off cooling water in cold season or at the status of long-term storage.

(Mentioned action is no need if anti-freezing liquid is used.)

a. Take off side door and open radiator cover.

b. Take off drainage plug of cooling water in the frame of generator to drain out water.

c. Loosen the drainage plug at the side of cylinder and drain out the water.

[Attended operations]

It is necessary to drain off cooling water. Otherwise rest cooling water in the engine may freeze and expand thus to damage the machine.

d. Drain out the cooling water

e. Close radiator cover, hood and drainage plug after drainage finishes.

2) Stop the engine after having run for 3 minutes. Drain out the used oil when the engine is still hot and refill in fresh oil.

3) Drain out the rest fuel completely and clear the sediment in the fuel tank.

4) Lubricate the supporting and connecting joint of regulating system.

5) Wipe off the dirty and grease stain on the machine.

6) Remove the battery cable. Charge the battery once a month.

7) Check the generator periodically.

8) Prevent vapor or dust falling into the control box, radiator, or exhaust pipe muffler. Use a plastic cover to cover the machine. Special notice for the outdoor generators.

9) Store the generator in ventilated place without moisture or dust.

10) If start the generator after long-time storage, please perform accord with the chapter "6.1 Preparation before running".

Refer to the engine operation manual for usage of engine.

(2) Storage

⚠ CAUTION

■ It will fall off or collapse to cause an accident if placed in a wrong position.

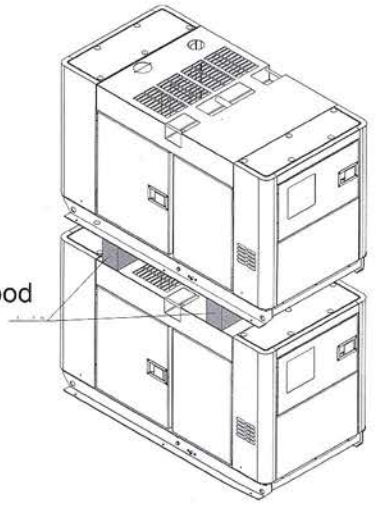
Pay attention to the following items if place machines or other things on the generator:

■Make sure that engine cover is not broken, and its screws are not loosened or missed.

■The generator set should be put on a level ground hard enough to afford its weight.

■If put a generator set on another generator, the weight and size of above one should be less than that of the other.

■Don't run the generator set when stacks together. Otherwise, the above generator will fall off to cause an accident.



10. APPENDIX

Ambient condition power modification

Modified coefficient table of ambient condition power

The conditions of generator rated output:

Altitude: 0 m Ambient temperature: 25℃ Relative humidity: 30%

Ambient modified coefficient: C (Relative humidity 30%)

Altitude (m)	Ambient temperature (℃)				
	25	30	35	40	45
0	1	0.98	0.96	0.93	0.90
500	0.93	0.91	0.89	0.87	0.84
1000	0.87	0.85	0.82	0.80	0.78
2000	0.75	0.73	0.71	0.69	0.66
3000	0.64	0.62	0.6	0.58	0.56
4000	0.54	0.52	0.5	0.48	0.46

Note: When the relative humidity is 60%, the modified coefficient is C-0.01

When the relative humidity is 80%, the modified coefficient is C-0.02

When the relative humidity is 90%, the modified coefficient is C-0.03

When the relative humidity is 100%, the modified coefficient is C-0.04

Counting example:

When the rated power of generator is PN =5KW, altitude is 1000m, ambient temperature is 35℃, relative humidity is 80%, the rated power of generator is:

P=PN ×(C-0.02) = 5 × (0.82-0.02) = 4KW

⚠ CAUTION

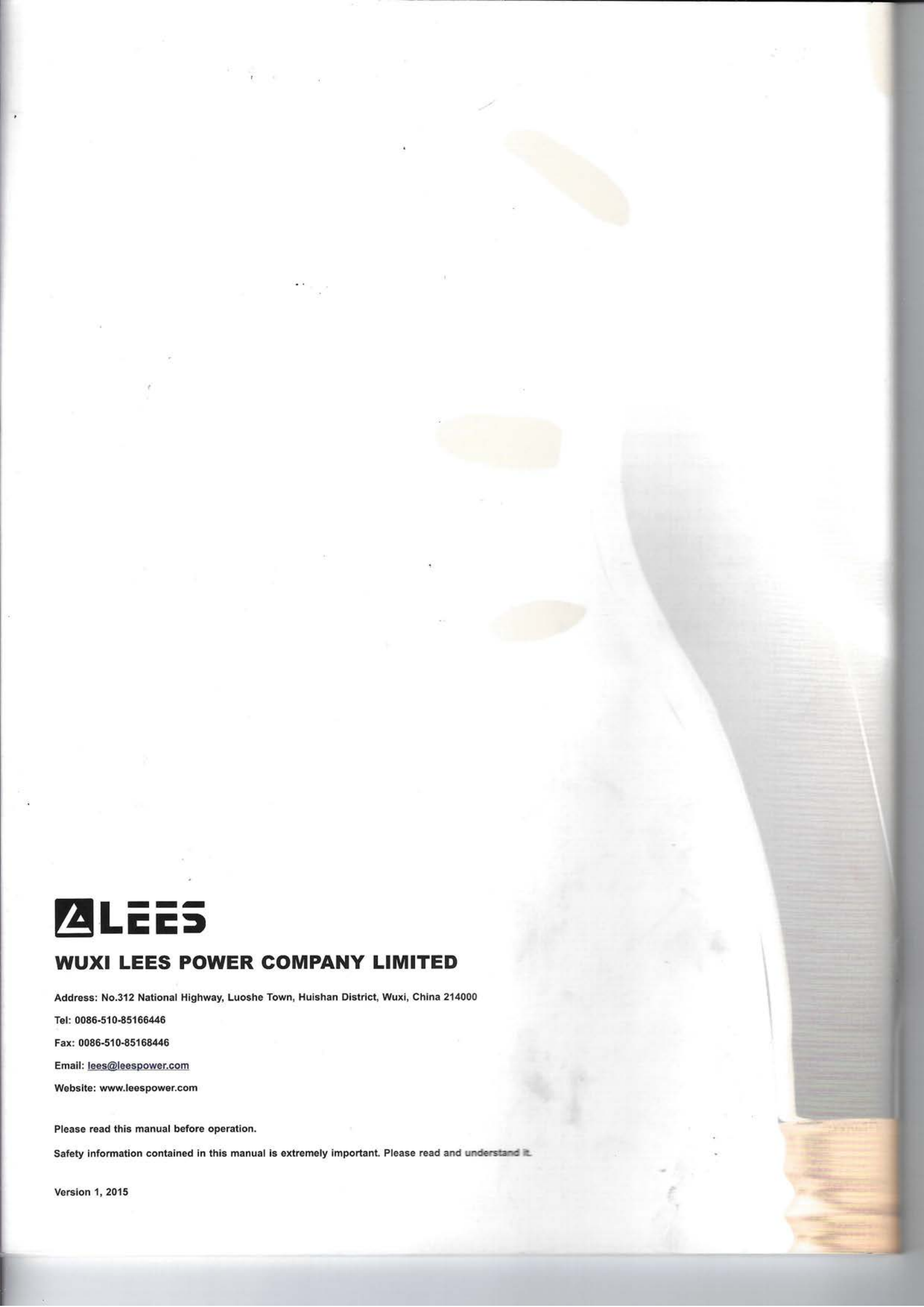
Ambient condition:

1000 mbar, 25℃, relative humidity: 30%, the rated power can meet with ISO 3046.

1-P.R.P. Prime Power—ISO8528: the normal power indicates that the maximum power running continuously in fluctuant load, and within the maintaining interval. In case of 24 hours continuous running, the average using rate should not exceed 80% of the normal power.

2-Standby power (ISO3046 Fuel Stop power): the stand-by power indicates the maximum running power of generator set. In case of fluctuant load or emergency, the generator set annual running term should not exceed 500 hours, the annual running term at 100% load should not exceed 25 hours, and the annual running term at 90% load should not exceed 200 hours. Overload is prohibition.

NOTE:



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Please read this manual before operation.

Safety information contained in this manual is extremely important. Please read and understand it.

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